Appendix IA

Preliminary Contamination Report

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Preliminary Contamination Investigation: M2 – Macquarie Park Motorscapes Project

1. Introduction

Jacobs Group (Australia) Pty Ltd (Jacobs) was commissioned by Transurban to undertake a Preliminary Contamination Investigation (PCI) to support the proposed development of vacant land located adjacent to the M2 Motorway, Macquarie Park NSW (herein after referred to as "the site").

For the purposes of the investigation, the site has been divided into three distinct areas (refer to Figure 1) as detailed below:

- Area 1 - Industrial Creek
- Area 2 - Former compound site
- Area 3 – Shrimptons Creek

2. Understanding of the proposed development at the site

Jacobs understand that the proposed development of the site will comprise the following:

- Creation of construction vehicular access both from the motorway and Khartoum Road, and foot access from Leisure Close.
- Establishment of internal traffic haulage routes, environmental controls, laydown areas and site compound facilities.
- Control of noxious weed species including removal and disposal (or mulching and burial on site).
- Revetment work to the base of creek banks along stretches of Shrimptons Creek and Industrial Creek
- Installation of gross pollutant traps at both creeks
- Repair of the existing drainage swale next to the motorway
- Modification work to the existing water quality basin
- Earthworks associated with the revegetation of the site
- Management of known areas of soil contamination
- Earthworks and re-profiling associated with the art installation on the deck area of the site
- Revegetation of the site with native vegetation species

- Importation of up to 15,000 m3 of Virgin Extracted Natural Material (VENM) and 1,500m3 of clean topsoil
- Erection of the art installation
- Relocation of road signage
- Ongoing weed management including long term maintenance and monitoring activities.

3. Background

Jacobs were previously commissioned by Transurban to undertake a site assessment and constraints study (*M2 Park Site Assessment and Constraints Study, March 2015*). The March 2015 study included a preliminary contamination assessment based on a review of available information and observations made during a site inspection. The conclusions and recommendations from this preliminary contamination assessment are detailed below:

- The north eastern portion of the site has been subject to substantial filling. Although some analytical testing has been undertaken within 3m below ground level, the quality of the fill material below 3m is unknown.
- Although sampling and analysis of fill materials within Area 2 by Parsons Brinkerhoff (PB, 2008) generally reported low levels of contaminants, a number of these contaminants cannot be assessed in the context of current guidelines as the guidelines used in the PB (2008) report have changed.
- The presence of anthropogenic materials within the fill profile could indicate a potential higher contamination risk in comparison to if the fill material only comprised rock and soil materials.
- It is unknown whether the site has been used for potentially contaminating activities since completion of the PB (2008) investigation.
- Asbestos was identified in a sample of fibre cement sheeting observed at the surface of the site. There is the potential for more asbestos containing materials to be present across the surface of the site or within the deeper fill profile.

Broad recommendations detailed in the preliminary contamination assessment to address potential contamination at the site were as follows:

- Undertake intrusive investigations to quantify the contamination risk in the context of the proposed land use.

4. Objectives

The objectives of the contamination investigation were to identify whether contamination is present within areas that will be disturbed as part of the proposed redevelopment. If contamination is identified, appropriate measures will need to be implemented to reduce impacts to construction works, site users and environmental receptors.

5. Scope of works

The scope of works undertaken as part of the PCI is detailed below.

5.1 Traffic Management

Traffic management and associated planning activities were undertaken to enable access for an excavator to the site from the motorway.

5.2 Excavation

The investigation undertaken was preliminary in nature and was designed to provide general site coverage (laterally and vertically) to inform the proposed construction activities at the site. The number of sampling locations does meet the minimum sampling requirements as detailed in the NSW EPA (1995) *Contaminated Sites: Sampling Design Guidelines.*

Test pitting with the aid of track mounted excavator was undertaken at five locations (TP01 to TP05) across the former compound site. All test pits were excavated to the limit of the investigation to a depth of 1.5 m below ground level (bgl).

Two boreholes (BH01 and BH02) were drilled within Area 1 (Industrial Creek) and one borehole (BH03) was drilled within Area 3 (Shrimptons Creek) to a maximum depth of 1.0 mbgl with the aid of a decontaminated hand auger.

The co-ordinates of the sampling locations were surveyed using a hand held non-differential GPS.

The sampling locations are presented as Figure 1.

5.3 Sampling

For test pits, samples were collected directly from the centre of the excavator bucket. Samples from boreholes were collected directly from the auger head. New nitrile gloves were worn during the collection of each sample. Care was taken to ensure that representative samples were obtained from the depth required and that the integrity was maintained, particularly when dealing with potentially volatile and semi-volatile compounds.

The hand auger was decontaminated between each sampling location using a decontaminating agent (Decon 90) and rinsed with potable water.

All soil samples were placed in jars provided by the primary laboratory. All sample jars were fitted with Teflon lined lids. The jars were completely filled with soil, labelled with the date, unique sampling point identification and sampler information. The soil jars, once filled with sample and sealed, were immediately placed in an esky / cool box in which a cooling medium had been added to keep the samples below a temperature of approximately 4ºC.

At the end of the sampling program the samples in the cool box were transported to the laboratory. Custody seals were placed on the esky / cool box for delivery to the laboratory under Chain of Custody (CoC).

5.4 Analytical Plan

Selected soil/fill samples were analysed at a National Association of Testing Authorities (NATA) accredited laboratory for the following potential contaminants of concern:

- Eight samples for heavy metals, Total Recoverable Hydrocarbons (TRH), monocyclic aromatic hydrocarbons (BTEX), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), polychlorinated biphenyls (PCB) and asbestos.

5.5 Reinstatement

Cuttings generated during excavation of test pits and boreholes, were used to backfill the respective excavations. Care was taken to ensure that the excavated materials were returned to the excavations in the approximate order in which they were excavated (deep cuttings returned to the base of the excavation and shallow cuttings to the surface).

6. Site Assessment Criteria

To address potential health and environmental impacts at the site, Jacobs compared the analytical testing results against a set of health and ecological based soil investigation levels (referred to as the Site Assessment Criteria (SAC)) appropriate for the proposed land use (considered to be open space). That is, the SAC have been set at a level that provides confidence that contaminant concentrations below the SAC will not adversely affect human health or terrestrial ecosystems.

The SAC developed for the investigation has been derived from Schedule B1 Guideline on Investigation levels for Soil and Groundwater (NEPC, 2013).

6.1 Aesthetics

Aesthetics on sites relates to the presence of observable odours, discoloration and erroneous wastes materials in soil which could possibly indicate contamination. Such olfactory evidence can point to how receptors can be impacted by vapours on and migrating from the site. Odour threshold for organic substances can be exceeded in offsite settings (through groundwater transmission of hydrocarbons) and whilst may not represent a direct health risk, could possibly prompt civil action. Aesthetics were continually assessed during the investigation and reported on the field logs (where present). Generalised site stratigraphy is presented in **Section 8**.

6.2 Ecological investigations levels

The site is located adjacent to the Lane Cove National Park. As such, ecological investigation levels (EILs) were considered as part of this investigation.

EILs adopted for this investigation are presented in **Table 4.1**.

Table 4.1 Ecological investigation levels (expressed as mg/kg)

Contaminant	Ecological investigation level
Arsenic	100 [1]
Cadmium	3 [2]
Chromium	400 [2]
Copper	100 [2]
Lead	600 [2]
Mercury	1 [2]
Nickel	60 [2]
Zinc	200 [2]

[1] NEPC 2013 generic calculated EIL.

[2] NEPC 1999 generated EILs (no EIL provided in NEPC 2013).

6.3 Ecological screening levels

Ecological Screening Levels (ESLs) are focused on petroleum hydrocarbon and total recoverable hydrocarbon (TRH) compounds and are compared against actual site conditions (sub-surface materials and depth) to assess the potential risk to terrestrial ecosystems. For the purposes of calculating the ESLs, the generic soil type (i.e. three broad classes of sands, silts or clays) and land use needed to be defined.

For the purposes of this assessment, Jacobs considered clays to be the most representative for the soil profile across the different areas of the site.

Given the proposed use of the site is likely to be open space, the corresponding land use and associated ESL was used to determine the assessment criteria. **Table 4.2** describes the ESLs adopted for the site.

Table 4.2 Site ESLs for petroleum based fractions (expressed as mg/kg)

Fraction	ESL
F1 $C_6 – C_{10}$	180
F2 $>C_{10} – C_{16}$	120
F3 $>C_{16} – C_{34}$	1300
F4 $>C_{34} – C_{40}$	5600
Benzene	65
Toluene	105
Ethylbenzene	125
Xylenes	45
Benzo(a)pyrene	0.7

6.4 Health investigation levels

To address potential health impacts at the site, Jacobs compared the analytical testing results against a set of appropriate health based Soil Investigation Levels (SILs) in context of the proposed land use and taken into consideration the potential for contamination in soil to impact upon groundwater and generate vapours which could impact upon on site and off site human receptors.

The health based soil investigation levels are a combination of Health Investigation Levels (HILs) and Health Screening Levels (HSLs).

HILs have been developed for a broad range of metals and organic substances. The HILs are applicable for assessing human health risk via all relevant pathways of exposure. The HILs are generic to all soil types and apply generally to a depth of three metres below the surface for residential use. Site-specific conditions should determine the depth to which HILs apply for other land uses.

HSLs have been developed for selected petroleum compounds and fractions and are applicable to assessing human health risk via the inhalation and direct contact pathways. The HSLs depend on specific soil physico-chemical properties, land use scenarios, and the characteristics of building structures. They apply to different soil types, and depths below surface to >4 m. Further detail on their use is provided in *Friebel and Nadebaum* (2011a, 2011b & 2011c).

The HSLs defined within the NEPC 2013 relate only to the volatile fractions of the petroleum hydrocarbons range i.e. BTEX, naphthalene and TRH $C_6 – C_{10}$, TRH $C_{10} – C_{16}$.

HSLs for the TRH $C_{16} – C_{40}$ petroleum fractions are defined within the CRC CARE Technical Document (Friebel and Nadebaum 2011). Chemicals in the $>C_{16}$-C_{34} and $>C_{34}$-C_{40} fractions are non-volatile and therefore not of concern for vapour intrusion, however, exposure can be via direct contact

pathways (dermal contact and incidental ingestion and inhalation of soil particles). Direct contact HSLs for these fractions can be found in Friebel and Nadebaum (2011a).

Based on the proposed use of the site, the site has been classed as open space for the purpose of this investigation. Therefore, Jacobs have adopted the lower value from the following criteria:

- NEPC (2013) Health Investigation Levels recommended for exposure setting 'C' which includes public open space such as parks, playgrounds, playing fields, secondary schools and footpaths.

Based on specific site conditions, Jacobs have adopted the specific soil Health Screening Levels (HSLs) detailed in NEPC (2013) in consideration of the following:

- Based on the proposed land use, the site could be used as an open space.
- The site is within close proximity to areas which are considered to be of ecological significance (i.e. Lane Cove National Park).
- The material excavated during the investigation generally comprised clay or had fine grained soil texture.
- All samples were collected above 1.5 mbgl.

NEPC (2013) provides health based screening levels for different forms of asbestos contamination in soil. To apply these screening levels, significant investigations, excavation and sample volumes are required to assess the volume of asbestos relative to soil. Jacobs have adopted a high level criterion to assess the presence / absence of asbestos in soil samples and whether additional investigations are required to assess the risk to site users. The high level criterion adopted by Jacobs is no asbestos in any form present in soil samples or observed in excavated materials.

A summary of the adopted Health Investigation Levels (HILs) is provided in **Table 4.3**.

Table 4.3 Soil investigation levels (expressed as mg/kg)

Contaminant	Soil Investigation Levels
Metals/Metalloids [1]	
Arsenic (total)	300
Cadmium	90
Chromium (VI)	300
Copper	17,000
Lead	600
Mercury (inorganic)	80
Nickel	1,200
Zinc	30,000
Polychlorinated Biphenyls (PCB) [1]	
PCB	1
Organochlorine Pesticides (OCP) [1]	
Chlordane	70
Endosulfan	340

Endrin	20
Heptachlor	10
HCB	10
Methoxychlor	400
BTEX Compounds [2]	
Benzene	NL
Toluene	NL
Ethylbenzene	NL
Xylenes	NL
Naphthalene	NL
Total Recoverable Hydrocarbons (TRH)	
F1 C6 – C10	5,100 [3]
F2 >C10 – C16	3,800 [3]
>C16 – C34	5,300 [3]
>C34 - C40	7,400 [3]
Polycyclic Aromatic Hydrocarbons (PAHs)	
Carcinogenic PAHs (as BaP TEQ)	3 [1]
Naphthalene	NL [2]
Sum of PAHs	300 [1]
Asbestos	
Asbestos ID in soil	Not Detected
Trace Analysis	No Respirable Fibres

Notes:

[1] NEPC (2013) Table 1 A(1) Health investigations levels for soil contaminants – Recreational C.

[2]NEPC (2013) Table 1A(3) Soil HSLs for Vapour Intrusion (mg/kg) HSL C Recreational / Open Space.

[3] HSL-C Recreational / Open Space Criteria detailed within Table 4, Friebel, E & Nadebaum, P 2011, Soil Health screening levels for direct contact, Technical Report 10.

NL – NL indicates the HSL is not limiting.

7. Quality Assurance / Quality Control

Field and laboratory Quality Assurance / Quality Control (QA/QC) requirements (where applicable) compliant with NEPC (2013) requirements undertaken as part of the field work program (PCI only) are outlined below.

All soil and water samples were collected by an experienced Jacobs scientist, under established Jacobs protocols. Jacobs personnel have been trained in sample collection and handling techniques.

Jacobs did not collect and analyse field QC samples. The laboratory completed their own internal QC.

7.1 Laboratory quality assurance

All analysis was undertaken by a NATA accredited laboratory using NATA accredited analytical methods.

7.2 Laboratory quality control

Laboratory QA/QC data is presented in full in the laboratory certificates in **Appendix A**.

7.2.1 Laboratory duplicates

RPDs for all laboratory duplicate samples were within the laboratory acceptance criteria.

7.2.2 Laboratory control samples

Laboratory control samples conformed to the laboratory acceptance criteria.

7.2.3 Surrogates

Recoveries for laboratory surrogate samples conformed to the laboratory acceptance criteria.

7.2.4 Matrix spikes

The matrix spike recoveries were within the laboratory acceptance criteria.

7.2.5 Method blanks

All method blanks reported analyte concentration below the laboratory LOR and therefore conformed to the laboratory acceptance criteria.

7.2.6 Sample holding times

All samples were extracted and analysed within the specified holding times.

7.2.7 Sample condition

All samples were received by the analytical laboratory in correctly preserved and chilled containers with no reported breakages. Sample receipt advice is presented with the laboratory reports in **Appendix A**.

8. Results

All fieldwork was undertaken by an experienced Jacobs environmental scientist between 17 and 18 February 2016.

8.1 Site stratigraphy

The sub-surface material encountered across the respective areas of the site generally comprised fill material overlying natural soils (BH01) and fill material in all other sampling locations (to the limit of investigation). The fill material observed across Area 1 and Area 3 compromised mainly of soil materials (i.e. sandy clays, silty clays). The fill material observed across Area 2 comprised mainly of sandstone, shale and concrete with minor inclusions of other waste materials such as wood and plastic. Stratigraphy information is detailed in the test pit and bore logs provided in **Appendix A**.

8.2 Soil analytical results

Soil analytical results are presented in full in **Table A** and discussed below. Laboratory certificates are provided in **Appendix B**.

8.2.1 Heavy metals

Concentrations of heavy metals in all samples analysed were below the SAC with the exception of zinc (434 mg/kg) detected in sample BH01_0.0-0.15 which exceeded the EIL of 200 mg/kg.

8.2.2 BTEX

Concentrations of BTEX compounds in all samples analysed were below the LOR and below the SAC.

8.2.3 TRH

Concentrations of TRH in all samples analysed were below the LOR and below the SAC.

8.2.4 OCP

Concentrations of all OCP compounds in all samples were below the LOR and below the SAC.

8.2.5 PAH

Concentrations of all PAH compounds in all samples analysed were below the SAC.

8.2.6 PCB

Concentrations of all PCB compounds in all samples analysed were below the LOR and below the SAC.

8.2.7 Asbestos

A loose bundle of friable asbestos fibres was identified in sample TP01_0.4-0.6. Asbestos was not identified in any other sample submitted for identification.

9. Conclusions

Based on field observations and laboratory results, the key findings of the PCI were as follows:

- The sub-surface material encountered across the respective areas of the site generally comprised fill material overlying natural soils (BH01) and fill material in all other sampling locations (to the limit of investigation). The fill material observed across Area 1 and Area 3 compromised mainly of soil materials (i.e. sandy clays, silty clays). The fill material observed across Area 2 comprised mainly of sandstone, shale and concrete with minor inclusions of other waste materials such as wood and plastic.

- Asbestos fibres were identified within the fill material excavated from Area 2. The presence of asbestos within the fill mass is further supported by the identification of bonded asbestos at the surface of Area 2 during an earlier site walkover. There is the potential for asbestos to be present in other locations within the fill mass.

- Considering that zinc concentrations were detected in one sample at concentrations only exceeding the EIL, it is unlikely that zinc at these concentrations would impact upon construction works, site users and environmental receptors.

10. Recommendations

Based on the results of the PCI and the broad understanding of the project, Jacobs recommend the following:

Asbestos fibres were detected in one sampling location in Area 2 and there is the potential for asbestos to be present in other locations. Any works undertaken within Area 2 that disturb site surfaces will need to be managed under an appropriate asbestos management plan during construction and the ongoing operation of the site. The asbestos management plan would need to be prepared in accordance with the requirements of the Work Health and Safety Regulations (2011). Depending on the activities to be undertaken, the asbestos management plan would be prepared in accordance with the following:

- Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC:2002 (2005)]
- Code of Practice for the Management and Control Asbestos in the Workplace [NOHSC:2018 (2005)].

Although no notable contamination was identified within Areas 1 and 3, fill is present in this area. To manage potential contamination risks not identified during the PCI, an appropriate unexpected finds protocol should be incorporated into the construction environmental management plan.

11. Limitations

The sole purpose of this report and the associated services performed by Jacobs is to assess the condition of the site (with respect to soil contamination) in accordance with the scope of services set out in the contract between Jacobs and Transurban (the Client). That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any), from observations made during the investigations and data from analytical laboratories. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs' Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

Yours sincerely

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Figure 1 **Site sampling locations**

Table A **Soil Analytical Results**

Appendix A **Test Pit and Borehole Logs**

Appendix B **Laboratory Certificates**

Figure 1 Test locations

Key

- Site boundary
- Existing water quality basin
- Boreholes
- Test pits
- Areas of investigation

Table A: Analytical Results						ALS Sample number:	ES1603869001	ES1603869008	ES1603869006	ES1603869010	ES1603869013	ES1603869019	ES1603869024	ES1603869027
						Sample date:	17/02/2016	18/02/2016	17/02/2016	17/02/2016	18/02/2016	18/02/2016	18/02/2016	18/02/2016
						Sample ID	BH01_0.0-0.15	BH03_0.3-0.4	BH02_0.4-0.5	TP01_0.4-0.6	TP02_0.0-0.15	TP03_0.8-1.0	TP04_1.4-1.5	TP05_0.8-1.0
						Depth (m):	0.0-0.15	0.3-0.4	0.4-0.5	0.4-0.6	0.0-0.15	0.8-1.0	1.4-1.5	0.8-1.0
							Area 1	Area 3	Area 1	Area 2	Area 2	Area 2	Area 2	Area 2
Analyte grouping/Analyte	**Units**	**LOR**	**EIL**	**ESL**	**HIL**									
EA002 : pH (Soils)														
pH Value	pH Unit	0.1					6.4	----	----	----	7.5	7.8	----	7.8
EA010: Conductivity														
Electrical Conductivity @ 25°C	µS/cm	1					134	----	----	----	73	91	----	45
EA055: Moisture Content														
Moisture Content (dried @ 103°C)	%	1					33.8	13.2	10.0	9.7	21.7	15.3	11.2	12.8
EA200: AS 4964 - 2004 Identification of Asbestos in Soils														
Asbestos Detected	g/kg	0.1					No	No	No	Yes	No	No	No	No
Asbestos Type	--					ND	-	-	-	Ch	-	-	-	-
Sample weight (dry)	g	0.01					64.2	92.6	93.7	93.6	106	94.9	101	101
Description	--						Mid brown clay soil with grey rocks.	Mid brown clay soil with grey rocks.	Mid brown sandy soil with grey rocks.	Mid brown clay soil with one loose bundle of friable asbestos fibres approx 3 x 1 x 0.5 mm.	Mid brown clay soil with grey rocks.	Mid brown clay soil with grey rocks.	Mid grey - brown clay soil with grey rocks.	Mid grey - brown clay soil with grey rocks.
EG005T: Total Metals by ICP-AES														
Arsenic	mg/kg	5	100		300		<5	5	<5	<5	6	<5	5	<5
Cadmium	mg/kg	1	3		90		2	<1	<1	<1	<1	<1	<1	<1
Chromium	mg/kg	2	400		300		30	8	9	8	11	10	10	7
Copper	mg/kg	5	100		17000		73	16	<5	9	25	16	26	40
Lead	mg/kg	5	600		600		258	16	17	14	52	18	23	114
Nickel	mg/kg	2	60		1200		16	7	3	5	8	10	18	<2
Zinc	mg/kg	5	200		30000		434	46	21	20	52	43	81	10
EG035T: Total Recoverable Mercury by FIMS														
Mercury	mg/kg	0.1	1		80		0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)														
Total Polychlorinated biphenyls	mg/kg	0.1			1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)														
alpha-BHC	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
beta-BHC	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
gamma-BHC	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
delta-BHC	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	mg/kg	0.05			10		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Chlordane (sum)	mg/kg	0.05			70		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
alpha-Endosulfan	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDE	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	mg/kg	0.05			20		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan (sum)	mg/kg	0.05			340		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
beta-Endosulfan	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4.4`-DDT	mg/kg	0.2					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin ketone	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	mg/kg	0.2			400		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Sum of DDD + DDE + DDT	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sum of Aldrin + Dieldrin	mg/kg	0.05					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons														
Naphthalene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	mg/kg	0.5					0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	mg/kg	0.5					0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	mg/kg	0.5					0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	mg/kg	0.5		0.7			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sum of polycyclic aromatic hydrocarbons	mg/kg	0.5			300		1.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ (zero)	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ (half LOR)	mg/kg	0.5					0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (LOR)	mg/kg	0.5			3		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons														
C6 - C9 Fraction	mg/kg	10					<10	<10	<10	<10	<10	<10	<10	<10
C10 - C14 Fraction	mg/kg	50					<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	mg/kg	100					<100	<100	<100	<100	<100	<100	<100	<100
C29 - C36 Fraction	mg/kg	100					160	<100	<100	<100	<100	<100	<100	<100
C10 - C36 Fraction (sum)	mg/kg	50					160	<50	<50	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions														
C6 - C10 Fraction	mg/kg	10					<10	<10	<10	<10	<10	<10	<10	<10
C6 - C10 Fraction minus BTEX (F1)	mg/kg	10		180	5100		<10	<10	<10	<10	<10	<10	<10	<10
>C10 - C16 Fraction	mg/kg	50					<50	<50	<50	<50	<50	<50	<50	<50
>C16 - C34 Fraction	mg/kg	100		1300	5300		180	<100	<100	<100	<100	<100	<100	<100
>C34 - C40 Fraction	mg/kg	100		5600	7400		120	<100	<100	<100	<100	<100	<100	<100
>C10 - C40 Fraction (sum)	mg/kg	50					300	<50	<50	<50	<50	<50	<50	<50
>C10 - C16 Fraction minus Naphthalene (F2)	mg/kg	50		120	3800		<50	<50	<50	<50	<50	<50	<50	<50
EP080: BTEXN														
Benzene	mg/kg	0.2		65			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	0.5		105			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	0.5		125			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	mg/kg	0.5					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Xylenes	mg/kg	0.5		45			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sum of BTEX	mg/kg	0.2					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	mg/kg	1					<1	<1	<1	<1	<1	<1	<1	<1

Concentrations exceeds human health investigation level

Concentrations exceeds ecological investigation level

Appendix A – Test Pit and Borehole Logs

JACOBS

BOREHOLE No. BH01

Sheet 1 of 1

Project: M2 Park

Client: Transurban

Location: West of Industrial Creek
Job No: IA104600
Start - Finish Date: 17/02/16 - 17/02/16

Bore dia: 100 mm
Driller: BC
Rig: Hand Auger

Surface Conditions: Topsoil
Northings:
Eastings:

RL:
Logged: BC
Checked:

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
BH01_0.0 - 0.15	●	0	A					TOPSOIL: Silty CLAY: (CL) dark brown, slightly moist, soft, trace fine grained sands, minor rootlets and medium sized roots, no odour.	S	Sl. M	
BH01_0.2 - 0.3	●	0	A					FILL: Sandy CLAY: (CL) brown, slightly moist, soft, fine to medium grained sands, no odour.	S	Sl. M	
BH01_0.4 - 0.5	●	0	A					Silty CLAY: (CL) brown/grey mottled orange/brown, moist, soft, minor fine grained sands, no odour.	S	M	
								Silty CLAY: (CL) dark grey/brown mottled orange/brown, wet, soft, minor fine to medium grained sands, no odour.	S	W	
BH01_0.9 - 1.0	●	0	A			1		Borehole terminated at 1.0 m bgl. Limit of Investigation.			
						2					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

BOREHOLE No. BH02

Sheet 1 of 1

Project: M2 Park

Client: Transurban

Location: East of Industrial Creek
Job No: IA104600
Start - Finish Date: 17/02/16 - 17/02/16

Bore dia: 100 mm
Driller: BC
Rig: Hand Auger

Surface Conditions: Fill
Northings:
Eastings:

RL:
Logged: BC
Checked:

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
BH02_0.0 - 0.15	●	1	A					FILL: Sandy CLAY: (CL) brown, dry, soft, medium grained sands, minor small to medium fragments of sandstone, minor rootlets, no odour.	S	D	
BH02_0.4 - 0.5	●	1	A					FILL: Clayey SAND: (SC) orange/brown, dry, medium density, medium grained sands, minor small to medium fragments of sandstone, no odour.	MD	D	
						1		Bore terminated at 0.5 m bgl. Refusal in Fill.			

VISUAL RANKING

0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING

A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS

PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS

● = Environmental Sample
X = Non Environmental Sample

MOISTURE CONDITION

D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

BOREHOLE No. BH03

Sheet 1 of 1

Project: M2 Park

Client: Transurban

Location: East of Shrimpton's Creek
Job No: IA104600
Start - Finish Date: 18/02/16 - 18/02/16

Bore dia: 100 mm
Driller: BC
Rig: Hand Auger

Surface Conditions: Weeds
Northings:
Eastings:

RL:
Logged: BC
Checked:

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
BH03_0.0 - 0.15	●	0	A					FILL: Silty CLAY: (CL) dark brown, dry, soft, minor fine grained sands, minor small fragments of sandstone and shale, cobbles of sandstone, no odour.	S	D	
BH03_0.3 - 0.4	●	0	A					FILL: Sandy CLAY: (CL) brown and light brown, slightly moist, firm, fine to medium grained sands, some small to medium fragments of shale and sandstone, no odour.	F	Sl. M	
						1		Borehole terminated at 0.4 m bgl. Refusal in Fill.			

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

BOREHOLE No. TP01

Sheet 1 of 1

Project: M2 Park

Client: Transurban

Location: Area 2 - Old Compound Area
Job No: IA104600
Start - Finish Date: 17/02/16 - 17/02/16

Bore dia: 600 mm
Driller: Ken Coles
Rig: 5.5 t Excavator

Surface Conditions: Long grass
Northings:
Eastings:

RL:
Logged: BC
Checked:

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP01_0.0 - 0.15	●	1	A					FILL: gravelly Sandy CLAY: (CL) brown, dry, firm, medium to coarse grained sands, fine shale, sandstone and concrete gravel, some large fragments of shale concrete and sandstone, no odour.	F	D	
								FILL: Sandy CLAY: (CL) brown and orange/brown, dry, firm, medium to coarse grained sands, minor small fragments of shale, sandstone and concrete, some large fragments of shale, concrete and sandstone, no odour.	F	D	
TP01_0.4 - 0.6	●	1	A								
								As above but grey/brown and slightly moist.	F	D	
TP01_0.8 - 1.0	●	1	A			1					
								FILL: sandy Silty CLAY: (CL) dark grey/brown, slightly moist, firm, medium grained sands, some small fragments of shale, some large fragments of shale and sandstone, no odour.	F	Sl. M	
TP01_1.4 - 1.5	●	1	A								
								Test Pit terminated at 1.5 m bgl. Limit of Investigation.			
						2					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

JACOBS

BOREHOLE No. TP02

Sheet 1 of 1

Project: M2 Park

Client: Transurban

Location: Area 2 - Old Compound Area
Job No: IA104600
Start - Finish Date: 18/02/16 - 18/02/16

Bore dia: 600 mm
Driller: Ken Coles
Rig: 5.5 t Excavator

Surface Conditions: Long grass
Northings:
Eastings:

RL:
Logged: BC
Checked:

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP02_0.0 - 0.15	●	1	A					FILL: Sandy CLAY: (CL) brown, dry, firm, some small fragments of sandstone and concrete, minor large fragments of sandstone and concrete, minor small fragments of plastic, no odour.	F	D	
								FILL: Sandy CLAY: (CL) grey/brown, slightly moist, firm, fine to medium grained sands, some small to medium fragments of shale, sandstone and concrete, cobbles and boulders of concrete and sandstone, no odour.	F	Sl. M	
TP02_0.4 - 0.6	●	1	A								
								FILL: Clayey SAND: (SC) brown, slightly moist, medium density, some small to medium fragments of shale, concrete and sandstone, cobbles and boulders of sandstone, no odour.	MD	Sl. M	
TP02_0.8 - 1.0	●	1	A								
						1					
								FILL: Sandy CLAY: (CL) brown and dark brown, slightly moist, soft, minor small fragments of wood, minor small to medium fragments of shale, concrete and sandstone, cobbles and boulders of sandstone, no odour.	S	Sl. M	
TP02_1.4 - 1.5	●	1	A								
								Test Pit terminated at 1.5 m bgl. Limit of Investigation.			
						2					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

BOREHOLE No. TP03

Sheet 1 of 1

Project: M2 Park

Client: Transurban

Location: Area 2 - Old Compound Area
Job No: IA104600
Start - Finish Date: 18/02/16 - 18/02/16

Bore dia: 600 mm
Driller: Ken Coles
Rig: 5.5 t Excavator

Surface Conditions: Long grass
Northings:
Eastings:

RL:
Logged: BC
Checked:

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP03_0.0 - 0.15	●	1	A					FILL: Sandy CLAY: (CL) brown, dry, firm, medium grained sands, some small fragments of concrete and sandstone, some large fragments of sandstone, shale and concrete, no odour.	F	D	
								As above but stiff, minor small to medium fragments of shale and sandstone, cobbles and boulders of sandstone.	St	D	
TP03_0.4 - 0.6	●	1	A								
								FILL: Sandy CLAY: (CL) brown, grey/brown and light grey, slightly moist, stiff, minor medium to large fragments of shale and sandstone, minor large pieces of shale and sandstone, no odour.	St	Sl. M	
TP03_0.8 - 1.0	●	1	A			1					
								FILL: Silty CLAY: (CL) dark grey/brown and brown, slightly moist, firm, some fine to medium grained sands, some small to medium fragments of sandstone and shale, cobbles and boulders of shale, no odour.	F	Sl. M	
TP03_1.4 - 1.5	●	1	A								
								Test Pit terminated at 1.5 m bgl. Limit of Investigation.			
						2					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

ENV 1 MODIFIED IA104600 - M2 PARK.GPJ 25/2/16

BOREHOLE No. TP04

Sheet 1 of 1

Project: M2 Park

Client: Transurban

Location: Area 2 - Old Compound Area
Job No: IA104600
Start - Finish Date: 18/02/16 - 18/02/16

Bore dia: 600 mm
Driller: Ken Coles
Rig: 5.5 t Excavator

Surface Conditions: Long grass
Northings:
Eastings:

RL:
Logged: BC
Checked:

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP04_0.0 - 0.15	●	1	A					FILL: Sandy CLAY: (CL) brown, dry, firm, some small to medium fragments of shale, sandstone and concrete, cobbles and boulders of sandstone, no odour.	F	D	
TP04_0.4 - 0.6	●	1	A					FILL: Silty CLAY: (CL) brown and light grey, dry, stiff, some fine to medium grained sands, some small fragments of shale, minor medium to large fragments of shale and sandstone, cobbles and boulders of sandstone, no odour. As above but brown and dark grey/brown.	St St	D D	
TP04_0.8 - 1.0	●	1	A			1		FILL: Silty CLAY: (CL) dark brown/grey, slightly moist, firm, minor fine to medium grained, minor small fragments of sandstone and shale, cobbles and boulders of shale, no odour.	F	Sl. M	
TP04_1.4 - 1.5	●	1	A					Test Pit terminated at 1.5 m bgl. Limit of Investigation.			
						2					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

ENV 1 MODIFIED IA104600 - M2 PARK.GPJ 25/2/16

JACOBS

BOREHOLE No. TP05

Sheet 1 of 1

Project: M2 Park

Client: Transurban

Location: Area 2 - Old Compound Area
Job No: IA104600
Start - Finish Date: 18/02/16 - 18/02/16

Bore dia: 600 mm
Driller: Ken Coles
Rig: 5.5 t Excavator

Surface Conditions: Long grass
Northings:
Eastings:

RL:
Logged: BC
Checked:

FIELD DATA							SOIL DESCRIPTION				COMMENTS
sample ID	sample type	visual ranking	odour ranking	PID (ppm)	QA/QC Sample ID	ground water depth (m)	graphic log	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
TP05_0.0 - 0.15	●	1	A					FILL: Sandy CLAY: (CL) brown, dry, firm, fine to medium grained sands, some small to medium fragments of shale and sandstone, cobbles and boulders of shale and sandstone, minor rootlets, no odour.	F	D	
								Bundle of plastic mesh observed.	F	D	
								As above but brown and grey/brown, no rootlets.	F	D	
TP05_0.4 - 0.6	●	1	A								
								FILL: Clayey SAND: (SC) grey and brown/grey, slightly moist, medium density, fine to medium grained sands, some small to medium fragments of shale, sandstone and wood, cobbles and boulders of shale and sandstone, no odour.	MD	Sl. M	
TP05_0.8 - 1.0	●	1	A								
						1					
								FILL: Silty CLAY: (CL) light grey and brown, slightly moist, firm, some fine to medium grained sands, some small to medium fragments of shale and sandstone, cobbles and boulders of shale, no odour.	F	Sl. M	
TP05_1.4 - 1.5	●	1	A					Large boulder of concrete observed	F	Sl. M	
								Test Pit terminated at 1.5 m bgl. Limit of Investigation.			
						2					

VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
PID = Photo Ionisation Detector reading (ppm, v/v)
QA/QC Sample ID = Quality Assurance /Quality Control Sample ID

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

FIELD DATA SYMBOLS
● = Environmental Sample
× = Non Environmental Sample

MOISTURE CONDITION
D = Dry M = Moist W = Wet
Sl. M = Slightly Moist

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

ENV 1 MODIFIED IA104600 - M2 PARK.GPJ 25/2/16

Appendix B – Laboratory Certificates

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1603869**	Page	: 1 of 27
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: BLAIR CUMMINGS	Contact	:
Address	: 100 CHRISTIE STREET P O BOX 164 ST LEONARDS NSW, AUSTRALIA 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: blair.cummings@jacobs.com	E-mail	:
Telephone	: +61 02 9928 2100	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 9928 2272	Facsimile	: +61-2-8784 8500
Project	: M2 PARK	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: IA104600	Date Samples Received	: 19-Feb-2016 03:15
C-O-C number	: 233253-233255	Date Analysis Commenced	: 23-Feb-2016
Sampler	: BLAIR CUMMINGS	Issue Date	: 29-Feb-2016 15:11
Site	: ----		
		No. of samples received	: 28
Quote number	: ----	No. of samples analysed	: 19

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Pabi Subba	Senior Organic Chemist	Sydney Inorganics, Smithfield, NSW Sydney Organics, Smithfield, NSW
RICHARD TEA	Lab technician	Sydney Inorganics, Smithfield, NSW
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: Negative results for vinyl tiles should be confirmed by an independent analytical technique.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH01_0.0-0.15	BH02_0.4-0.5	BH03_0.0-0.15	BH03_0.3-0.4	TP01_0.0-0.15
			Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[17-Feb-2016]
Compound	CAS Number	LOR	Unit	ES1603869-001	ES1603869-006	ES1603869-007	ES1603869-008	ES1603869-009
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	5.8	----	6.0	----	6.7
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	6.4	----	7.9	----	8.5
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	134	----	76	----	124
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	33.8	10.0	----	13.2	----
EA150: Particle Sizing								
+75µm	----	1	%	52	----	55	----	59
+150µm	----	1	%	40	----	46	----	51
+300µm	----	1	%	16	----	36	----	39
+425µm	----	1	%	6	----	29	----	31
+600µm	----	1	%	3	----	26	----	26
+1180µm	----	1	%	<1	----	25	----	23
+2.36mm	----	1	%	<1	----	24	----	21
+4.75mm	----	1	%	<1	----	21	----	17
+9.5mm	----	1	%	<1	----	16	----	11
+19.0mm	----	1	%	<1	----	6	----	10
+37.5mm	----	1	%	<1	----	<1	----	<1
+75.0mm	----	1	%	<1	----	<1	----	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	19	----	14	----	15
Silt (2-60 µm)	----	1	%	25	----	26	----	21
Sand (0.06-2.00 mm)	----	1	%	56	----	36	----	42
Gravel (>2mm)	----	1	%	<1	----	24	----	22
Cobbles (>6cm)	----	1	%	<1	----	<1	----	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.49	----	2.49	----	2.65
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	----	No	----
Asbestos Type	1332-21-4	-	--	-	-	----	-	----
Sample weight (dry)	----	0.01	g	64.2	93.7	----	92.6	----
APPROVED IDENTIFIER:	----	-	--	S.SPOONER	S.SPOONER	----	S.SPOONER	----
ED006: Exchangeable Cations on Alkaline Soils								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH01_0.0-0.15	BH02_0.4-0.5	BH03_0.0-0.15	BH03_0.3-0.4	TP01_0.0-0.15
				Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[17-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-001	ES1603869-006	ES1603869-007	ES1603869-008	ES1603869-009
					Result	Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued									
Exchangeable Calcium	----	0.2	meq/100g		----	----	5.6	----	4.1
Exchangeable Magnesium	----	0.2	meq/100g		----	----	6.0	----	1.7
Exchangeable Potassium	----	0.2	meq/100g		----	----	<0.2	----	<0.2
Exchangeable Sodium	----	0.2	meq/100g		----	----	0.3	----	<0.2
Cation Exchange Capacity	----	0.2	meq/100g		----	----	242	----	118
Exchangeable Calcium Percent	----	0.2	%		----	----	46.5	----	69.7
Exchangeable Magnesium Percent	----	0.2	%		----	----	50.3	----	28.2
Exchangeable Potassium Percent	----	0.2	%		----	----	1.0	----	2.2
Exchangeable Sodium Percent	----	0.2	%		----	----	2.2	----	<0.2
Calcium/Magnesium Ratio	----	0.2	-		----	----	0.9	----	2.4
Magnesium/Potassium Ratio	----	0.2	-		----	----	47.4	----	13.0
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		10.9	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		3.0	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		0.1	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.5	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		14.6	----	----	----	----
Exchangeable Aluminium	----	0.1	meq/100g		<0.1	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%		3.7	----	----	----	----
Exchangeable Magnesium Percent	----	0.1	%		20.8	----	----	----	----
Exchangeable Potassium Percent	----	0.1	%		1.0	----	----	----	----
Exchangeable Calcium Percent	----	0.1	%		74.5	----	----	----	----
Calcium/Magnesium Ratio	----	0.1	-		3.6	----	----	----	----
Magnesium/Potassium Ratio	----	0.1	-		20.5	----	----	----	----
ED040: Sulfur as SO4 2-									
Sulfate as SO4 2-	14808-79-8	100	mg/kg		820	----	----	----	----
ED093S: Soluble Major Cations									
Calcium	7440-70-2	10	mg/kg		60	----	40	----	50
Magnesium	7439-95-4	10	mg/kg		20	----	50	----	20
Sodium	7440-23-5	10	mg/kg		160	----	90	----	80
Potassium	7440-09-7	10	mg/kg		20	----	70	----	<10
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	----	5	----
Cadmium	7440-43-9	1	mg/kg		2	<1	----	<1	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH01_0.0-0.15	BH02_0.4-0.5	BH03_0.0-0.15	BH03_0.3-0.4	TP01_0.0-0.15
				Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[17-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-001	ES1603869-006	ES1603869-007	ES1603869-008	ES1603869-009
					Result	Result	Result	Result	Result
EG005T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		**30**	**9**	----	**8**	----
Copper	7440-50-8	5	mg/kg		**73**	<5	----	**16**	----
Lead	7439-92-1	5	mg/kg		**258**	**17**	----	**16**	----
Nickel	7440-02-0	2	mg/kg		**16**	**3**	----	**7**	----
Zinc	7440-66-6	5	mg/kg		**434**	**21**	----	**46**	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		**0.2**	<0.1	----	<0.1	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg		<0.1	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg		**5.1**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		**5.1**	----	----	----	----
EK074: Fluoride Extractable Phosphorus (Bray)									
Fluoride Extractable P (Bray)	----	1	mg/kg		**8.8**	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	----	<0.1	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	----	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH01_0.0-0.15	BH02_0.4-0.5	BH03_0.0-0.15	BH03_0.3-0.4	TP01_0.0-0.15
				Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[17-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-001	ES1603869-006	ES1603869-007	ES1603869-008	ES1603869-009
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	----	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	----	<0.2	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	<0.05	----	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		**0.7**	<0.5	----	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		**0.6**	<0.5	----	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		**0.5**	<0.5	----	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		**1.8**	<0.5	----	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	**0.6**	----	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	**1.2**	----	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	----	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	----	<50	----
C15 - C28 Fraction	----	100	mg/kg		<100	<100	----	<100	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH01_0.0-0.15	BH02_0.4-0.5	BH03_0.0-0.15	BH03_0.3-0.4	TP01_0.0-0.15
				Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[17-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-001	ES1603869-006	ES1603869-007	ES1603869-008	ES1603869-009
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	100	mg/kg		**160**	<100	----	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		**160**	<50	----	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	----	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	----	<10	----
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	----	<50	----
>C16 - C34 Fraction	----	100	mg/kg		**180**	<100	----	<100	----
>C34 - C40 Fraction	----	100	mg/kg		**120**	<100	----	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		**300**	<50	----	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	----	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	----	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	----	<0.2	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	<0.5	----	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	<1	----	<1	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**74.3**	**93.3**	----	**97.0**	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**92.6**	**102**	----	**109**	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**94.4**	**91.4**	----	**96.9**	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**101**	**91.4**	----	**99.2**	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**97.0**	**99.1**	----	**96.7**	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**114**	**108**	----	**113**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**96.9**	**96.2**	----	**98.5**	----
Anthracene-d10	1719-06-8	0.5	%		**91.7**	**93.0**	----	**98.0**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	BH01_0.0-0.15	BH02_0.4-0.5	BH03_0.0-0.15	BH03_0.3-0.4	TP01_0.0-0.15
				Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[17-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-001	ES1603869-006	ES1603869-007	ES1603869-008	ES1603869-009
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		100	99.4	----	106	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		85.3	88.6	----	96.7	----
Toluene-D8	2037-26-5	0.2	%		79.6	77.1	----	92.1	----
4-Bromofluorobenzene	460-00-4	0.2	%		78.3	76.0	----	87.3	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP01_0.4-0.6	TP01_0.8-1.0	TP02_0.0-0.15	TP02_0.4-0.6	TP02_0.8-1.0
			Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit	ES1603869-010	ES1603869-011	ES1603869-013	ES1603869-014	ES1603869-015
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	----	6.9	6.8	7.4	7.4
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	----	8.3	7.5	8.5	8.6
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	252	73	142	113
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	9.7	----	21.7	----	----
EA150: Particle Sizing								
+75µm	----	1	%	----	61	66	65	75
+150µm	----	1	%	----	58	59	60	68
+300µm	----	1	%	----	50	46	49	56
+425µm	----	1	%	----	43	32	40	46
+600µm	----	1	%	----	37	20	32	38
+1180µm	----	1	%	----	33	16	28	34
+2.36mm	----	1	%	----	28	14	24	33
+4.75mm	----	1	%	----	22	11	20	30
+9.5mm	----	1	%	----	10	7	16	23
+19.0mm	----	1	%	----	4	7	10	11
+37.5mm	----	1	%	----	<1	<1	<1	<1
+75.0mm	----	1	%	----	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	----	17	16	15	11
Silt (2-60 µm)	----	1	%	----	19	16	16	13
Sand (0.06-2.00 mm)	----	1	%	----	34	54	44	43
Gravel (>2mm)	----	1	%	----	30	14	25	33
Cobbles (>6cm)	----	1	%	----	<1	<1	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	2.66	2.58	2.63	2.64
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	Yes	----	No	----	----
Asbestos Type	1332-21-4	-	--	Ch	----	-	----	----
Sample weight (dry)	----	0.01	g	93.6	----	106	----	----
APPROVED IDENTIFIER:	----	-	--	S.SPOONER	----	S.SPOONER	----	----
ED006: Exchangeable Cations on Alkaline Soils								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP01_0.4-0.6	TP01_0.8-1.0	TP02_0.0-0.15	TP02_0.4-0.6	TP02_0.8-1.0
				Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-010	ES1603869-011	ES1603869-013	ES1603869-014	ES1603869-015
					Result	Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued									
Exchangeable Calcium	----	0.2	meq/100g		----	3.0	3.0	4.2	3.6
Exchangeable Magnesium	----	0.2	meq/100g		----	2.7	1.5	2.1	1.0
Exchangeable Potassium	----	0.2	meq/100g		----	<0.2	<0.2	<0.2	<0.2
Exchangeable Sodium	----	0.2	meq/100g		----	0.2	<0.2	<0.2	<0.2
Cation Exchange Capacity	----	0.2	meq/100g		----	117	89.1	129	88.2
Exchangeable Calcium Percent	----	0.2	%		----	50.7	67.9	65.0	81.1
Exchangeable Magnesium Percent	----	0.2	%		----	42.6	28.1	32.2	18.9
Exchangeable Potassium Percent	----	0.2	%		----	3.0	4.0	2.8	<0.2
Exchangeable Sodium Percent	----	0.2	%		----	3.7	<0.2	<0.2	<0.2
Calcium/Magnesium Ratio	----	0.2	-		----	1.1	2.0	2.0	3.7
Magnesium/Potassium Ratio	----	0.2	-		----	13.9	7.0	11.6	<0.2
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		----	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		----	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		----	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		----	----	----	----	----
Exchangeable Aluminium	----	0.1	meq/100g		----	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%		----	----	----	----	----
Exchangeable Magnesium Percent	----	0.1	%		----	----	----	----	----
Exchangeable Potassium Percent	----	0.1	%		----	----	----	----	----
Exchangeable Calcium Percent	----	0.1	%		----	----	----	----	----
Calcium/Magnesium Ratio	----	0.1	-		----	----	----	----	----
Magnesium/Potassium Ratio	----	0.1	-		----	----	----	----	----
ED040: Sulfur as SO4 2-									
Sulfate as SO4 2-	14808-79-8	100	mg/kg		----	260	240	----	----
ED093S: Soluble Major Cations									
Calcium	7440-70-2	10	mg/kg		----	90	40	70	60
Magnesium	7439-95-4	10	mg/kg		----	60	20	30	20
Sodium	7440-23-5	10	mg/kg		----	60	60	40	40
Potassium	7440-09-7	10	mg/kg		----	20	80	40	40
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	----	6	----	----
Cadmium	7440-43-9	1	mg/kg		<1	----	<1	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP01_0.4-0.6	TP01_0.8-1.0	TP02_0.0-0.15	TP02_0.4-0.6	TP02_0.8-1.0
				Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-010	ES1603869-011	ES1603869-013	ES1603869-014	ES1603869-015
					Result	Result	Result	Result	Result
EG005T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		8	----	11	----	----
Copper	7440-50-8	5	mg/kg		9	----	25	----	----
Lead	7439-92-1	5	mg/kg		14	----	52	----	----
Nickel	7440-02-0	2	mg/kg		5	----	8	----	----
Zinc	7440-66-6	5	mg/kg		20	----	52	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	----	<0.1	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg		----	<0.1	0.2	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg		----	<0.1	0.7	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		----	<0.1	0.9	----	----
EK074: Fluoride Extractable Phosphorus (Bray)									
Fluoride Extractable P (Bray)	----	1	mg/kg		----	1.5	2.9	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	----	<0.1	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	<0.05	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	<0.05	----	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	<0.05	----	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	<0.05	----	----
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	<0.05	----	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	<0.05	----	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	<0.05	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	<0.05	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	----	<0.05	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	<0.05	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	<0.05	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	<0.05	----	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	<0.05	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	<0.05	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	<0.05	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	<0.05	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP01_0.4-0.6	TP01_0.8-1.0	TP02_0.0-0.15	TP02_0.4-0.6	TP02_0.8-1.0
				Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-010	ES1603869-011	ES1603869-013	ES1603869-014	ES1603869-015
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	<0.05	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	<0.05	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	<0.05	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	<0.2	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	<0.05	----	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	<0.2	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	<0.05	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	<0.05	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	----	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	----	**0.6**	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	----	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	<10	----	----
C10 - C14 Fraction	----	50	mg/kg		<50	----	<50	----	----
C15 - C28 Fraction	----	100	mg/kg		<100	----	<100	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP01_0.4-0.6	TP01_0.8-1.0	TP02_0.0-0.15	TP02_0.4-0.6	TP02_0.8-1.0
				Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-010	ES1603869-011	ES1603869-013	ES1603869-014	ES1603869-015
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	100	mg/kg		<100	----	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg		<50	----	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	<50	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	<0.2	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	----	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	<1	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**78.6**	----	**79.3**	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**105**	----	**107**	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**86.0**	----	**98.5**	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**107**	----	**111**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**100**	----	**103**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**104**	----	**116**	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**96.5**	----	**100**	----	----
Anthracene-d10	1719-06-8	0.5	%		**95.9**	----	**98.3**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP01_0.4-0.6	TP01_0.8-1.0	TP02_0.0-0.15	TP02_0.4-0.6	TP02_0.8-1.0
				Client sampling date / time	[17-Feb-2016]	[17-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-010	ES1603869-011	ES1603869-013	ES1603869-014	ES1603869-015
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		106	----	107	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		93.8	----	96.4	----	----
Toluene-D8	2037-26-5	0.2	%		93.5	----	90.6	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		84.1	----	90.6	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP03_0.0-0.15	TP03_0.4-0.6	TP03_0.8-1.0	TP04_0.0-0.15	TP04_0.4-0.6
			Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit	ES1603869-017	ES1603869-018	ES1603869-019	ES1603869-021	ES1603869-022
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	6.7	6.4	6.5	7.0	5.8
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	8.6	6.9	7.8	8.7	7.0
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	126	47	91	130	49
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	----	----	15.3	----	----
EA150: Particle Sizing								
+75µm	----	1	%	66	51	46	66	45
+150µm	----	1	%	60	43	40	58	38
+300µm	----	1	%	46	32	28	44	28
+425µm	----	1	%	35	24	21	32	21
+600µm	----	1	%	28	18	16	24	16
+1180µm	----	1	%	24	15	12	21	13
+2.36mm	----	1	%	23	13	10	20	11
+4.75mm	----	1	%	20	10	5	17	8
+9.5mm	----	1	%	12	5	<1	9	4
+19.0mm	----	1	%	7	3	<1	1	1
+37.5mm	----	1	%	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	15	22	25	15	25
Silt (2-60 µm)	----	1	%	15	22	23	16	25
Sand (0.06-2.00 mm)	----	1	%	47	42	41	49	39
Gravel (>2mm)	----	1	%	23	14	11	20	11
Cobbles (>6cm)	----	1	%	<1	<1	<1	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.64	2.65	2.66	2.63	2.63
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	----	----	No	----	----
Asbestos Type	1332-21-4	-	--	----	----	-	----	----
Sample weight (dry)	----	0.01	g	----	----	94.9	----	----
APPROVED IDENTIFIER:	----	-	--	----	----	S.SPOONER	----	----
ED006: Exchangeable Cations on Alkaline Soils								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP03_0.0-0.15	TP03_0.4-0.6	TP03_0.8-1.0	TP04_0.0-0.15	TP04_0.4-0.6
				Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-017	ES1603869-018	ES1603869-019	ES1603869-021	ES1603869-022
					Result	Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued									
Exchangeable Calcium	----	0.2	meq/100g		4.4	----	3.4	5.9	----
Exchangeable Magnesium	----	0.2	meq/100g		1.0	----	2.6	1.3	----
Exchangeable Potassium	----	0.2	meq/100g		<0.2	----	<0.2	<0.2	----
Exchangeable Sodium	----	0.2	meq/100g		<0.2	----	<0.2	<0.2	----
Cation Exchange Capacity	----	0.2	meq/100g		109	----	122	144	----
Exchangeable Calcium Percent	----	0.2	%		80.0	----	55.7	82.6	----
Exchangeable Magnesium Percent	----	0.2	%		17.6	----	42.2	17.4	----
Exchangeable Potassium Percent	----	0.2	%		2.4	----	2.1	<0.2	----
Exchangeable Sodium Percent	----	0.2	%		<0.2	----	<0.2	<0.2	----
Calcium/Magnesium Ratio	----	0.2	-		4.5	----	1.3	4.7	----
Magnesium/Potassium Ratio	----	0.2	-		7.5	----	20.0	<0.2	----
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	3.2	----	----	2.6
Exchangeable Magnesium	----	0.1	meq/100g		----	2.1	----	----	2.2
Exchangeable Potassium	----	0.1	meq/100g		----	0.1	----	----	0.1
Exchangeable Sodium	----	0.1	meq/100g		----	0.3	----	----	0.1
Cation Exchange Capacity	----	0.1	meq/100g		----	5.6	----	----	5.1
Exchangeable Aluminium	----	0.1	meq/100g		----	<0.1	----	----	<0.1
Exchangeable Sodium Percent	----	0.1	%		----	4.7	----	----	2.6
Exchangeable Magnesium Percent	----	0.1	%		----	37.3	----	----	43.8
Exchangeable Potassium Percent	----	0.1	%		----	2.2	----	----	2.1
Exchangeable Calcium Percent	----	0.1	%		----	55.7	----	----	51.5
Calcium/Magnesium Ratio	----	0.1	-		----	1.5	----	----	1.2
Magnesium/Potassium Ratio	----	0.1	-		----	16.7	----	----	20.6
ED040: Sulfur as SO4 2-									
Sulfate as SO4 2-	14808-79-8	100	mg/kg		----	200	----	430	----
ED093S: Soluble Major Cations									
Calcium	7440-70-2	10	mg/kg		90	<10	20	90	20
Magnesium	7439-95-4	10	mg/kg		30	<10	20	20	30
Sodium	7440-23-5	10	mg/kg		70	40	60	60	60
Potassium	7440-09-7	10	mg/kg		70	<10	10	80	150
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		----	----	<5	----	----
Cadmium	7440-43-9	1	mg/kg		----	----	<1	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP03_0.0-0.15	TP03_0.4-0.6	TP03_0.8-1.0	TP04_0.0-0.15	TP04_0.4-0.6
				Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-017	ES1603869-018	ES1603869-019	ES1603869-021	ES1603869-022
					Result	Result	Result	Result	Result
EG005T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		----	----	10	----	----
Copper	7440-50-8	5	mg/kg		----	----	16	----	----
Lead	7439-92-1	5	mg/kg		----	----	18	----	----
Nickel	7440-02-0	2	mg/kg		----	----	10	----	----
Zinc	7440-66-6	5	mg/kg		----	----	43	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		----	----	<0.1	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg		----	<0.1	----	0.2	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg		----	0.1	----	0.5	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		----	0.1	----	0.7	----
EK074: Fluoride Extractable Phosphorus (Bray)									
Fluoride Extractable P (Bray)	----	1	mg/kg		----	<1.0	----	2.9	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		----	----	<0.1	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		----	----	<0.05	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		----	----	<0.05	----	----
beta-BHC	319-85-7	0.05	mg/kg		----	----	<0.05	----	----
gamma-BHC	58-89-9	0.05	mg/kg		----	----	<0.05	----	----
delta-BHC	319-86-8	0.05	mg/kg		----	----	<0.05	----	----
Heptachlor	76-44-8	0.05	mg/kg		----	----	<0.05	----	----
Aldrin	309-00-2	0.05	mg/kg		----	----	<0.05	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		----	----	<0.05	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		----	----	<0.05	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		----	----	<0.05	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		----	----	<0.05	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		----	----	<0.05	----	----
Dieldrin	60-57-1	0.05	mg/kg		----	----	<0.05	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		----	----	<0.05	----	----
Endrin	72-20-8	0.05	mg/kg		----	----	<0.05	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		----	----	<0.05	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP03_0.0-0.15	TP03_0.4-0.6	TP03_0.8-1.0	TP04_0.0-0.15	TP04_0.4-0.6
				Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-017	ES1603869-018	ES1603869-019	ES1603869-021	ES1603869-022
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		----	----	<0.05	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		----	----	<0.05	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		----	----	<0.05	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		----	----	<0.05	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		----	----	<0.2	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		----	----	<0.05	----	----
Methoxychlor	72-43-5	0.2	mg/kg		----	----	<0.2	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		----	----	<0.05	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		----	----	<0.05	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	----	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	----	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg		----	----	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg		----	----	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg		----	----	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg		----	----	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg		----	----	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg		----	----	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	----	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg		----	----	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	----	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	----	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	----	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	----	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	----	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	----	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	----	**0.6**	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	----	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	----	<10	----	----
C10 - C14 Fraction	----	50	mg/kg		----	----	<50	----	----
C15 - C28 Fraction	----	100	mg/kg		----	----	<100	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP03_0.0-0.15	TP03_0.4-0.6	TP03_0.8-1.0	TP04_0.0-0.15	TP04_0.4-0.6
				Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-017	ES1603869-018	ES1603869-019	ES1603869-021	ES1603869-022
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	100	mg/kg		----	----	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	----	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	----	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	----	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg		----	----	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg		----	----	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg		----	----	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	----	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	----	<50	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	----	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		----	----	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		----	----	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	----	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		----	----	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	----	<0.2	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		----	----	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg		----	----	<1	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		----	----	**80.1**	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		----	----	**112**	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		----	----	**93.1**	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	----	**106**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	----	**99.1**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	----	**113**	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	----	**100.0**	----	----
Anthracene-d10	1719-06-8	0.5	%		----	----	**98.2**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP03_0.0-0.15	TP03_0.4-0.6	TP03_0.8-1.0	TP04_0.0-0.15	TP04_0.4-0.6
				Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]
Compound	CAS Number	LOR	Unit		ES1603869-017	ES1603869-018	ES1603869-019	ES1603869-021	ES1603869-022
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		----	----	107	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	----	94.8	----	----
Toluene-D8	2037-26-5	0.2	%		----	----	90.9	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	----	89.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TP04_1.4-1.5	TP05_0.0-0.15	TP05_0.4-0.6	TP05_0.8-1.0	----
			Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	----
Compound	CAS Number	LOR	Unit	ES1603869-024	ES1603869-025	ES1603869-026	ES1603869-027	--------
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	----	5.8	5.8	6.0	----
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	----	7.3	7.0	7.8	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	16	48	45	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	11.2	----	----	12.8	----
EA150: Particle Sizing								
+75µm	----	1	%	----	59	48	72	----
+150µm	----	1	%	----	50	40	59	----
+300µm	----	1	%	----	36	28	41	----
+425µm	----	1	%	----	25	22	27	----
+600µm	----	1	%	----	18	17	13	----
+1180µm	----	1	%	----	15	15	7	----
+2.36mm	----	1	%	----	13	14	5	----
+4.75mm	----	1	%	----	10	9	3	----
+9.5mm	----	1	%	----	4	<1	<1	----
+19.0mm	----	1	%	----	2	<1	<1	----
+37.5mm	----	1	%	----	<1	<1	<1	----
+75.0mm	----	1	%	----	<1	<1	<1	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	----	17	21	11	----
Silt (2-60 µm)	----	1	%	----	20	26	16	----
Sand (0.06-2.00 mm)	----	1	%	----	50	39	67	----
Gravel (>2mm)	----	1	%	----	13	14	6	----
Cobbles (>6cm)	----	1	%	----	<1	<1	<1	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	2.48	2.62	2.60	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	----	----	No	----
Asbestos Type	1332-21-4	-	--	-	----	----	-	----
Sample weight (dry)	----	0.01	g	101	----	----	101	----
APPROVED IDENTIFIER:	----	-	--	S.SPOONER	----	----	S.SPOONER	----
ED006: Exchangeable Cations on Alkaline Soils								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP04_1.4-1.5	TP05_0.0-0.15	TP05_0.4-0.6	TP05_0.8-1.0	----
				Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	----
Compound	CAS Number	LOR	Unit		ES1603869-024	ES1603869-025	ES1603869-026	ES1603869-027	--------
					Result	Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued									
Exchangeable Calcium	----	0.2	meq/100g		----	3.8	----	3.1	----
Exchangeable Magnesium	----	0.2	meq/100g		----	1.8	----	1.4	----
Exchangeable Potassium	----	0.2	meq/100g		----	0.2	----	<0.2	----
Exchangeable Sodium	----	0.2	meq/100g		----	<0.2	----	<0.2	----
Cation Exchange Capacity	----	0.2	meq/100g		----	113	----	90.1	----
Exchangeable Calcium Percent	----	0.2	%		----	68.2	----	69.4	----
Exchangeable Magnesium Percent	----	0.2	%		----	29.5	----	27.8	----
Exchangeable Potassium Percent	----	0.2	%		----	2.3	----	2.8	----
Exchangeable Sodium Percent	----	0.2	%		----	<0.2	----	<0.2	----
Calcium/Magnesium Ratio	----	0.2	-		----	2.2	----	2.3	----
Magnesium/Potassium Ratio	----	0.2	-		----	8.5	----	9.8	----
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	----	3.6	----	----
Exchangeable Magnesium	----	0.1	meq/100g		----	----	1.6	----	----
Exchangeable Potassium	----	0.1	meq/100g		----	----	0.1	----	----
Exchangeable Sodium	----	0.1	meq/100g		----	----	0.2	----	----
Cation Exchange Capacity	----	0.1	meq/100g		----	----	5.6	----	----
Exchangeable Aluminium	----	0.1	meq/100g		----	----	<0.1	----	----
Exchangeable Sodium Percent	----	0.1	%		----	----	4.4	----	----
Exchangeable Magnesium Percent	----	0.1	%		----	----	29.4	----	----
Exchangeable Potassium Percent	----	0.1	%		----	----	2.2	----	----
Exchangeable Calcium Percent	----	0.1	%		----	----	63.9	----	----
Calcium/Magnesium Ratio	----	0.1	-		----	----	2.2	----	----
Magnesium/Potassium Ratio	----	0.1	-		----	----	13.3	----	----
ED040: Sulfur as SO4 2-									
Sulfate as SO4 2-	14808-79-8	100	mg/kg		----	----	----	----	----
ED093S: Soluble Major Cations									
Calcium	7440-70-2	10	mg/kg		----	20	20	20	----
Magnesium	7439-95-4	10	mg/kg		----	20	20	10	----
Sodium	7440-23-5	10	mg/kg		----	40	60	60	----
Potassium	7440-09-7	10	mg/kg		----	120	100	70	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		5	----	----	<5	----
Cadmium	7440-43-9	1	mg/kg		<1	----	----	<1	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP04_1.4-1.5	TP05_0.0-0.15	TP05_0.4-0.6	TP05_0.8-1.0	----
				Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	----
Compound	CAS Number	LOR	Unit		ES1603869-024	ES1603869-025	ES1603869-026	ES1603869-027	--------
					Result	Result	Result	Result	Result
EG005T: Total Metals by ICP-AES - Continued									
Chromium	7440-47-3	2	mg/kg		**10**	----	----	**7**	----
Copper	7440-50-8	5	mg/kg		**26**	----	----	**40**	----
Lead	7439-92-1	5	mg/kg		**23**	----	----	**114**	----
Nickel	7440-02-0	2	mg/kg		**18**	----	----	<2	----
Zinc	7440-66-6	5	mg/kg		**81**	----	----	**10**	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	----	----	<0.1	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg		----	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg		----	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		----	----	----	----	----
EK074: Fluoride Extractable Phosphorus (Bray)									
Fluoride Extractable P (Bray)	----	1	mg/kg		----	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	----	----	<0.1	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	----	----	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	----	----	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	----	----	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	----	----	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg		<0.05	----	----	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	----	----	<0.05	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	----	----	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	----	----	<0.05	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	----	----	<0.05	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	----	----	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	----	----	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	----	----	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	----	----	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	----	----	<0.05	----
Endrin	72-20-8	0.05	mg/kg		<0.05	----	----	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	----	----	<0.05	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP04_1.4-1.5	TP05_0.0-0.15	TP05_0.4-0.6	TP05_0.8-1.0	----
				Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	----
Compound	CAS Number	LOR	Unit		ES1603869-024	ES1603869-025	ES1603869-026	ES1603869-027	--------
					Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued									
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	----	----	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	----	----	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	----	----	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	----	----	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	----	----	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	----	----	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	----	----	<0.2	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg		<0.05	----	----	<0.05	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	----	----	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	----	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	----	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	----	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	----	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	----	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	----	----	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	----	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	----	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	----	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	----	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		**0.6**	----	----	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		**1.2**	----	----	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	----	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	----	----	<50	----
C15 - C28 Fraction	----	100	mg/kg		<100	----	----	<100	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP04_1.4-1.5	TP05_0.0-0.15	TP05_0.4-0.6	TP05_0.8-1.0	----
				Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	----
Compound	CAS Number	LOR	Unit		ES1603869-024	ES1603869-025	ES1603869-026	ES1603869-027	--------
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	100	mg/kg		<100	----	----	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	----	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	----	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	----	<10	----
>C10 - C16 Fraction	----	50	mg/kg		<50	----	----	<50	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	----	<100	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	----	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	----	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	----	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	----	<0.2	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		<0.5	----	----	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	<1	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**78.0**	----	----	**75.3**	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**107**	----	----	**109**	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**75.9**	----	----	**97.7**	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**99.2**	----	----	**102**	----
2-Chlorophenol-D4	93951-73-6	0.5	%		**92.1**	----	----	**95.2**	----
2.4.6-Tribromophenol	118-79-6	0.5	%		**102**	----	----	**104**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**95.7**	----	----	**92.9**	----
Anthracene-d10	1719-06-8	0.5	%		**92.1**	----	----	**94.9**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TP04_1.4-1.5	TP05_0.0-0.15	TP05_0.4-0.6	TP05_0.8-1.0	----
				Client sampling date / time	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	[18-Feb-2016]	----
Compound	CAS Number	LOR	Unit		ES1603869-024	ES1603869-025	ES1603869-026	ES1603869-027	--------
					Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates - Continued									
4-Terphenyl-d14	1718-51-0	0.5	%		111	----	----	103	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		104	----	----	105	----
Toluene-D8	2037-26-5	0.2	%		99.0	----	----	101	----
4-Bromofluorobenzene	460-00-4	0.2	%		92.5	----	----	94.1	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOIL**

Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	BH01_0.0-0.15 - [17-Feb-2016]	Mid brown clay soil with grey rocks.
EA200: Description	BH02_0.4-0.5 - [17-Feb-2016]	Mid brown sandy soil with grey rocks.
EA200: Description	BH03_0.3-0.4 - [18-Feb-2016]	Mid brown clay soil with grey rocks.
EA200: Description	TP01_0.4-0.6 - [17-Feb-2016]	Mid brown clay soil with one loose bundle of friable asbestos fibres approx 3 x 1 x 0.5 mm.
EA200: Description	TP02_0.0-0.15 - [18-Feb-2016]	Mid brown clay soil with grey rocks.
EA200: Description	TP03_0.8-1.0 - [18-Feb-2016]	Mid brown clay soil with grey rocks.
EA200: Description	TP04_1.4-1.5 - [18-Feb-2016]	Mid grey - brown clay soil with grey rocks.
EA200: Description	TP05_0.8-1.0 - [18-Feb-2016]	Mid grey - brown clay soil with grey rocks.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1603869**	Page	: 1 of 13
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: BLAIR CUMMINGS	Contact	:
Address	: 100 CHRISTIE STREET P O BOX 164 ST LEONARDS NSW, AUSTRALIA 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: blair.cummings@jacobs.com	E-mail	:
Telephone	: +61 02 9928 2100	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 9928 2272	Facsimile	: +61-2-8784 8500
Project	: M2 PARK	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: IA104600	Date Samples Received	: 19-Feb-2016
C-O-C number	: 233253-233255	Date Analysis Commenced	: 23-Feb-2016
Sampler	: BLAIR CUMMINGS	Issue Date	: 29-Feb-2016
Site	: ----	No. of samples received	: 28
Quote number	: ----	No. of samples analysed	: 19

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Quality Control Report contains the following information:

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

General Comments

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

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

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

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

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Pabi Subba	Senior Organic Chemist	Sydney Inorganics, Smithfield, NSW
		Sydney Organics, Smithfield, NSW
RICHARD TEA	Lab technician	Sydney Inorganics, Smithfield, NSW
Shaun Spooner	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA001: pH in soil using 0.01M CaCl extract (QC Lot: 375914)									
ES1603869-001	BH01_0.0-0.15	EA001: pH (CaCl2)	----	0.1	pH Unit	5.8	5.8	0.00	0% - 20%
ES1603869-021	TP04_0.0-0.15	EA001: pH (CaCl2)	----	0.1	pH Unit	7.0	7.0	0.00	0% - 20%
EA002 : pH (Soils) (QC Lot: 373166)									
ES1603869-001	BH01_0.0-0.15	EA002: pH Value	----	0.1	pH Unit	6.4	6.4	0.00	0% - 20%
EA002 : pH (Soils) (QC Lot: 374559)									
ES1603862-002	Anonymous	EA002: pH Value	----	0.1	pH Unit	5.2	5.1	3.50	0% - 20%
ES1603869-007	BH03_0.0-0.15	EA002: pH Value	----	0.1	pH Unit	7.9	7.9	0.00	0% - 20%
EA002 : pH (Soils) (QC Lot: 374564)									
ES1604006-008	Anonymous	EA002: pH Value	----	0.1	pH Unit	6.7	6.7	0.00	0% - 20%
ES1603869-026	TP05_0.4-0.6	EA002: pH Value	----	0.1	pH Unit	7.0	7.0	0.00	0% - 20%
EA010: Conductivity (QC Lot: 373167)									
ES1603869-001	BH01_0.0-0.15	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	134	139	4.03	0% - 20%
EA010: Conductivity (QC Lot: 374560)									
ES1603869-007	BH03_0.0-0.15	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	76	79	4.51	0% - 20%
ES1603869-026	TP05_0.4-0.6	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	48	44	8.32	0% - 20%
EA055: Moisture Content (QC Lot: 372811)									
ES1603865-013	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	21.6	21.7	0.762	0% - 20%
ES1603869-013	TP02_0.0-0.15	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	21.7	21.1	2.44	0% - 20%
EA055: Moisture Content (QC Lot: 372812)									
ES1603869-025	TP05_0.0-0.15	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	19.1	23.1	19.2	0% - 20%
ES1603877-004	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	21.5	22.3	3.37	0% - 20%
ED006: Exchangeable Cations on Alkaline Soils (QC Lot: 376385)									
ES1603869-007	BH03_0.0-0.15	ED006: Calcium/Magnesium Ratio	----	0.1	-	0.9	0.9	0.00	No Limit
		ED006: Magnesium/Potassium Ratio	----	0.1	-	47.4	46.8	1.38	0% - 20%
		ED006: Exchangeable Calcium Percent	----	0.1	%	46.5	46.9	0.927	0% - 20%
		ED006: Exchangeable Magnesium Percent	----	0.1	%	50.3	49.8	0.896	0% - 20%
		ED006: Exchangeable Potassium Percent	----	0.1	%	1.0	1.1	0.00	No Limit
		ED006: Exchangeable Sodium Percent	----	0.1	%	2.2	2.2	0.00	0% - 50%
		ED006: Cation Exchange Capacity	----	0.1	meq/100g	242	241	0.483	0% - 20%
		ED006: Exchangeable Calcium	----	0.1	meq/100g	5.6	5.6	0.00	0% - 20%
		ED006: Exchangeable Magnesium	----	0.1	meq/100g	6.0	6.0	0.00	0% - 20%
		ED006: Exchangeable Potassium	----	0.1	meq/100g	<0.2	<0.2	0.00	No Limit
		ED006: Exchangeable Sodium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
ES1603869-025	TP05_0.0-0.15	ED006: Calcium/Magnesium Ratio	----	0.1	-	2.2	2.2	0.00	0% - 50%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED006: Exchangeable Cations on Alkaline Soils (QC Lot: 376385) - continued									
ES1603869-025	TP05_0.0-0.15	ED006: Magnesium/Potassium Ratio	----	0.1	-	8.5	8.6	0.00	0% - 20%
		ED006: Exchangeable Calcium Percent	----	0.1	%	68.2	68.2	0.00	0% - 20%
		ED006: Exchangeable Magnesium Percent	----	0.1	%	29.5	29.5	0.00	0% - 20%
		ED006: Exchangeable Potassium Percent	----	0.1	%	2.3	2.3	0.00	0% - 50%
		ED006: Exchangeable Sodium Percent	----	0.1	%	<0.2	<0.2	0.00	No Limit
		ED006: Cation Exchange Capacity	----	0.1	meq/100g	113	113	0.00	0% - 20%
		ED006: Exchangeable Calcium	----	0.1	meq/100g	3.8	3.8	0.00	0% - 50%
		ED006: Exchangeable Magnesium	----	0.1	meq/100g	1.8	1.8	0.00	No Limit
		ED006: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED006: Exchangeable Sodium	----	0.1	meq/100g	<0.2	<0.2	0.00	No Limit
ED007: Exchangeable Cations (QC Lot: 377073)									
ES1603862-002	Anonymous	ED007: Exchangeable Calcium Percent	----	0.1	%	67.2	66.6	0.843	0% - 20%
		ED007: Exchangeable Magnesium Percent	----	0.1	%	14.6	14.3	2.58	0% - 20%
		ED007: Exchangeable Potassium Percent	----	0.1	%	14.7	15.0	2.32	0% - 20%
		ED007: Exchangeable Sodium Percent	----	0.1	%	3.5	4.1	15.5	0% - 20%
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	0.5	0.6	0.00	No Limit
		ED007: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Exchangeable Calcium	----	0.1	meq/100g	0.4	0.4	0.00	No Limit
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
ES1603862-017	Anonymous	ED007: Calcium/Magnesium Ratio	----	0.1	-	9.6	9.7	1.48	0% - 20%
		ED007: Magnesium/Potassium Ratio	----	0.1	-	1.1	1.1	0.00	0% - 50%
		ED007: Exchangeable Calcium Percent	----	0.1	%	83.4	83.6	0.208	0% - 20%
		ED007: Exchangeable Magnesium Percent	----	0.1	%	8.6	8.5	1.21	0% - 20%
		ED007: Exchangeable Potassium Percent	----	0.1	%	7.6	7.5	0.00	0% - 20%
		ED007: Exchangeable Sodium Percent	----	0.1	%	0.4	0.4	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	8.0	8.1	1.43	0% - 20%
		ED007: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Exchangeable Calcium	----	0.1	meq/100g	6.7	6.8	1.64	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.7	0.7	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
ED040T : Total Sulfate by ICPAES (QC Lot: 372982)									
ES1603869-001	BH01_0.0-0.15	ED040T: Sulfate as SO4 2-	14808-79-8	100	mg/kg	820	820	0.00	No Limit
ES1603983-008	Anonymous	ED040T: Sulfate as SO4 2-	14808-79-8	100	mg/kg	320	440	31.0	No Limit
ED093S: Soluble Major Cations (QC Lot: 374556)									
ES1603661-012	Anonymous	ED093S: Calcium	7440-70-2	10	mg/kg	90	90	0.00	No Limit
		ED093S: Magnesium	7439-95-4	10	mg/kg	110	100	0.00	0% - 50%
		ED093S: Potassium	7440-09-7	10	mg/kg	70	60	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093S: Soluble Major Cations (QC Lot: 374556) - continued									
ES1603661-012	Anonymous	ED093S: Sodium	7440-23-5	10	mg/kg	1550	1580	2.25	0% - 20%
ES1603661-002	Anonymous	ED093S: Calcium	7440-70-2	10	mg/kg	80	80	0.00	No Limit
		ED093S: Magnesium	7439-95-4	10	mg/kg	120	140	16.3	0% - 50%
		ED093S: Potassium	7440-09-7	10	mg/kg	40	40	0.00	No Limit
		ED093S: Sodium	7440-23-5	10	mg/kg	1410	1490	5.13	0% - 20%
ED093S: Soluble Major Cations (QC Lot: 374563)									
ES1603869-021	TP04_0.0-0.15	ED093S: Calcium	7440-70-2	10	mg/kg	90	90	0.00	No Limit
		ED093S: Magnesium	7439-95-4	10	mg/kg	20	30	0.00	No Limit
		ED093S: Potassium	7440-09-7	10	mg/kg	80	70	0.00	No Limit
		ED093S: Sodium	7440-23-5	10	mg/kg	60	60	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 373143)									
ES1603863-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	3	6	46.3	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	5	7	41.4	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	6	9	35.2	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	8	13	50.2	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	25	39	43.1	No Limit
ES1603865-015	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	6	24.6	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	4	4	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	119	116	2.78	0% - 20%
		EG005T: Lead	7439-92-1	5	mg/kg	134	123	8.96	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	114	94	19.7	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 373144)									
ES1603863-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1603865-015	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 373170)									
ES1603869-001	BH01_0.0-0.15	EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 374561)									
ES1603869-013	TP02_0.0-0.15	EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	0.2	0.2	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 373169)									
ES1603869-001	BH01_0.0-0.15	EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	5.1	5.1	0.00	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 374562)									
ES1603869-013	TP02_0.0-0.15	EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	0.9	0.9	0.00	No Limit
EK074: Fluoride Extractable Phosphorus (Bray) (QC Lot: 372398)									
ES1603869-001	BH01_0.0-0.15	EK074: Fluoride Extractable P (Bray)	----	1	mg/kg	8.8	8.8	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 371483)									
ES1603869-001	BH01_0.0-0.15	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 371480)									
ES1603869-001	BH01_0.0-0.15	EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.00	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 371482)									
ES1603869-001	BH01_0.0-0.15	EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	0.7	<0.5	33.2	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 371482) - continued									
ES1603869-001	BH01_0.0-0.15	EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	0.6	<0.5	23.2	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	1.8	<0.5	113	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 371481)									
ES1603896-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1603869-001	BH01_0.0-0.15	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	160	140	13.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 371567)									
ES1603869-001	BH01_0.0-0.15	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES1603877-051	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 371481)									
ES1603896-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1603869-001	BH01_0.0-0.15	EP071: >C16 - C34 Fraction	----	100	mg/kg	180	180	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	120	110	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 371567)									
ES1603869-001	BH01_0.0-0.15	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES1603877-051	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 371567)									
ES1603869-001	BH01_0.0-0.15	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES1603877-051	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	0.4	0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA010: Conductivity (QCLot: 373167)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	95.9	92	108
EA010: Conductivity (QCLot: 374560)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	97.5	92	108
ED006: Exchangeable Cations on Alkaline Soils (QCLot: 376385)								
ED006: Calcium/Magnesium Ratio	----	0.1	-	<0.1	----	----	----	----
ED006: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	----	----	----	----
ED006: Exchangeable Calcium	----	0.1	meq/100g	<0.1	1 meq/100g	105	80	110
ED006: Exchangeable Calcium Percent	----	0.1	%	<0.1	----	----	----	----
ED006: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.67 meq/100g	88.6	80	110
ED006: Exchangeable Magnesium Percent	----	0.1	%	<0.1	----	----	----	----
ED006: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.51 meq/100g	87.0	80	110
ED006: Exchangeable Potassium Percent	----	0.1	%	<0.1	----	----	----	----
ED006: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.87 meq/100g	86.0	80	110
ED006: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED006: Magnesium/Potassium Ratio	----	0.1	-	<0.1	----	----	----	----
ED007: Exchangeable Cations (QCLot: 377073)								
ED007: Calcium/Magnesium Ratio	----	0.1	-	<0.1	----	----	----	----
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	----	----	----	----
ED007: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	----	----	----	----
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	1 meq/100g	94.0	76	122
ED007: Exchangeable Calcium Percent	----	0.1	%	<0.1	----	----	----	----
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.67 meq/100g	85.6	76	118
ED007: Exchangeable Magnesium Percent	----	0.1	%	<0.1	----	----	----	----
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.51 meq/100g	92.4	80	120
ED007: Exchangeable Potassium Percent	----	0.1	%	<0.1	----	----	----	----
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.87 meq/100g	99.0	80	120
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED007: Magnesium/Potassium Ratio	----	0.1	-	<0.1	----	----	----	----
ED040T : Total Sulfate by ICPAES (QCLot: 372982)								
ED040T: Sulfate as SO4 2-	14808-79-8	100	mg/kg	<100	----	----	----	----
ED093S: Soluble Major Cations (QCLot: 373168)								
ED093S: Calcium	7440-70-2	10	mg/kg	<10	50 mg/kg	106	85	119
ED093S: Magnesium	7439-95-4	10	mg/kg	<10	50 mg/kg	100	85	119
ED093S: Potassium	7440-09-7	10	mg/kg	<10	50 mg/kg	104	83	125

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
ED093S: Soluble Major Cations (QCLot: 373168) - continued								
ED093S: Sodium	7440-23-5	10	mg/kg	<10	50 mg/kg	105	81	123
ED093S: Soluble Major Cations (QCLot: 374556)								
ED093S: Calcium	7440-70-2	10	mg/kg	<10	50 mg/kg	105	85	119
ED093S: Magnesium	7439-95-4	10	mg/kg	<10	50 mg/kg	99.5	85	119
ED093S: Potassium	7440-09-7	10	mg/kg	<10	50 mg/kg	94.5	83	125
ED093S: Sodium	7440-23-5	10	mg/kg	<10	50 mg/kg	104	81	123
ED093S: Soluble Major Cations (QCLot: 374563)								
ED093S: Calcium	7440-70-2	10	mg/kg	<10	50 mg/kg	107	85	119
ED093S: Magnesium	7439-95-4	10	mg/kg	<10	50 mg/kg	99.2	85	119
ED093S: Potassium	7440-09-7	10	mg/kg	<10	50 mg/kg	94.8	83	125
ED093S: Sodium	7440-23-5	10	mg/kg	<10	50 mg/kg	106	81	123
EG005T: Total Metals by ICP-AES (QCLot: 373143)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	107	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	102	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	93.8	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	103	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	102	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	103	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	107	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 373144)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	88.0	70	105
EK057G: Nitrite as N by Discrete Analyser (QCLot: 373170)								
EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	2.5 mg/kg	96.0	85	111
EK057G: Nitrite as N by Discrete Analyser (QCLot: 374561)								
EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	2.5 mg/kg	95.8	85	111
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 373169)								
EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	2.5 mg/kg	102	88	118
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 374562)								
EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	2.5 mg/kg	101	88	118
EK074: Fluoride Extractable Phosphorus (Bray) (QCLot: 372398)								
EK074: Fluoride Extractable P (Bray)	----	1	mg/kg	<1.0	3.5 mg/kg	96.3	88	118
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 371483)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	84.0	62	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 371480)								
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	107	69	121
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	107	67	115
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	91.0	66	120

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 371480) - continued								
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	93.4	69	115
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	82.0	69	113
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	106	66	116
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	87.3	67	119
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	108	69	115
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	99.2	64	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	81.7	65	117
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	98.1	66	116
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	100.0	62	124
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	106	67	123
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	79.5	56	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	91.6	64	122
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	77.7	68	116
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	80.0	67	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	94.4	62	118
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	82.1	65	117
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	83.5	54	130
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	102	63	117
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 371482)								
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	92.7	73	127
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	92.7	72	124
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	93.7	77	127
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	95.4	69	123
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	98.9	70	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	99.1	68	116
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	97.1	63	121
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	106	74	126
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	97.2	75	127
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	89.5	62	118
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	75.1	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	96.3	72	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	92.8	61	121
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	87.4	77	125
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	95.3	75	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	79.2	74	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 371481)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	113	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	115	77	131

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 371481) - continued								
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	108	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 371567)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	80.5	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 371481)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	250 mg/kg	112	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	117	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	150 mg/kg	96.7	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 371567)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	82.0	68	128
EP080: BTEXN (QCLot: 371567)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	76.8	62	116
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	75.7	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	83.7	66	118
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	72.8	63	119
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	79.0	68	120
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	75.8	67	121

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 373143)							
ES1603863-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	101	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	102	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	107	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	103	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	103	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	104	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	109	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 373144)							
ES1603863-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	98.6	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 373170)							
ES1603869-001	BH01_0.0-0.15	EK057G: Nitrite as N (Sol.)	14797-65-0	2.5 mg/kg	95.3	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK057G: Nitrite as N by Discrete Analyser (QCLot: 374561)							
ES1603869-013	TP02_0.0-0.15	EK057G: Nitrite as N (Sol.)	14797-65-0	2.5 mg/kg	84.0	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 373169)							
ES1603869-001	BH01_0.0-0.15	EK059G: Nitrite + Nitrate as N (Sol.)	----	2.5 mg/kg	111	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 374562)							
ES1603869-013	TP02_0.0-0.15	EK059G: Nitrite + Nitrate as N (Sol.)	----	2.5 mg/kg	91.6	70	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 371483)							
ES1603869-001	BH01_0.0-0.15	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	89.0	70	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 371480)							
ES1603869-001	BH01_0.0-0.15	EP068: 4.4`-DDT	50-29-3	2 mg/kg	85.7	70	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	78.1	70	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	83.5	70	130
		EP068: Endrin	72-20-8	2 mg/kg	97.2	70	130
		EP068: gamma-BHC	58-89-9	0.5 mg/kg	96.0	70	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	88.3	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 371482)							
ES1603869-001	BH01_0.0-0.15	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	86.4	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	78.3	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 371481)							
ES1603869-001	BH01_0.0-0.15	EP071: C10 - C14 Fraction	----	523 mg/kg	93.8	73	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	104	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	121	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 371567)							
ES1603869-001	BH01_0.0-0.15	EP080: C6 - C9 Fraction	----	32.5 mg/kg	105	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 371481)							
ES1603869-001	BH01_0.0-0.15	EP071: >C10 - C16 Fraction	----	860 mg/kg	92.2	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	117	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	120	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 371567)							
ES1603869-001	BH01_0.0-0.15	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	106	70	130
EP080: BTEXN (QCLot: 371567)							
ES1603869-001	BH01_0.0-0.15	EP080: Benzene	71-43-2	2.5 mg/kg	72.0	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	80.4	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	86.0	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	80.1	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	85.2	70	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 371567) - continued							
ES1603869-001	BH01_0.0-0.15	EP080: Toluene	108-88-3	2.5 mg/kg	73.9	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1603869**	Page	: 1 of 11
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: BLAIR CUMMINGS	Telephone	: +61-2-8784 8555
Project	: M2 PARK	Date Samples Received	: 19-Feb-2016
Site	: ----	Issue Date	: 29-Feb-2016
Sampler	: BLAIR CUMMINGS	No. of samples received	: 28
Order number	: IA104600	No. of samples analysed	: 19

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA001: pH in soil using 0.01M CaCl extract							
Soil Glass Jar - Unpreserved							
BH01_0.0-0.15,	TP01_0.0-0.15,	26-Feb-2016	24-Feb-2016	**1**	----	----	----
TP01_0.8-1.0							
Soil Glass Jar - Unpreserved							
BH03_0.0-0.15,	TP02_0.0-0.15,	26-Feb-2016	25-Feb-2016	**0**	----	----	----
TP02_0.4-0.6,	TP02_0.8-1.0,						
TP03_0.0-0.15,	TP03_0.4-0.6,						
TP03_0.8-1.0,	TP04_0.0-0.15,						
TP04_0.4-0.6,	TP05_0.0-0.15,						
TP05_0.4-0.6,	TP05_0.8-1.0						

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Cations - soluble by ICP-AES	3	32	9.38	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA001: pH in soil using 0.01M CaCl extract								
Soil Glass Jar - Unpreserved (EA001)								
BH01_0.0-0.15,	TP01_0.0-0.15,	**17-Feb-2016**	**26-Feb-2016**	24-Feb-2016	×	**26-Feb-2016**	26-Feb-2016	✓
TP01_0.8-1.0								
Soil Glass Jar - Unpreserved (EA001)								
BH03_0.0-0.15,	TP02_0.0-0.15,	**18-Feb-2016**	**26-Feb-2016**	25-Feb-2016	×	**26-Feb-2016**	26-Feb-2016	✓
TP02_0.4-0.6,	TP02_0.8-1.0,							
TP03_0.0-0.15,	TP03_0.4-0.6,							
TP03_0.8-1.0,	TP04_0.0-0.15,							
TP04_0.4-0.6,	TP05_0.0-0.15,							
TP05_0.4-0.6,	TP05_0.8-1.0							
EA002 : pH (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
BH01_0.0-0.15,	TP01_0.0-0.15,	**17-Feb-2016**	**24-Feb-2016**	24-Feb-2016	✓	**24-Feb-2016**	24-Feb-2016	✓
TP01_0.8-1.0								
Soil Glass Jar - Unpreserved (EA002)								
BH03_0.0-0.15,	TP02_0.0-0.15,	**18-Feb-2016**	**25-Feb-2016**	25-Feb-2016	✓	**25-Feb-2016**	25-Feb-2016	✓
TP02_0.4-0.6,	TP02_0.8-1.0,							
TP03_0.0-0.15,	TP03_0.4-0.6,							
TP03_0.8-1.0,	TP04_0.0-0.15,							
TP04_0.4-0.6,	TP05_0.0-0.15,							
TP05_0.4-0.6,	TP05_0.8-1.0							
EA010: Conductivity								
Soil Glass Jar - Unpreserved (EA010)								
BH01_0.0-0.15,	TP01_0.0-0.15,	**17-Feb-2016**	**24-Feb-2016**	24-Feb-2016	✓	**24-Feb-2016**	23-Mar-2016	✓
TP01_0.8-1.0								
Soil Glass Jar - Unpreserved (EA010)								
BH03_0.0-0.15,	TP02_0.0-0.15,	**18-Feb-2016**	**25-Feb-2016**	25-Feb-2016	✓	**25-Feb-2016**	24-Mar-2016	✓
TP02_0.4-0.6,	TP02_0.8-1.0,							
TP03_0.0-0.15,	TP03_0.4-0.6,							
TP03_0.8-1.0,	TP04_0.0-0.15,							
TP04_0.4-0.6,	TP05_0.0-0.15,							
TP05_0.4-0.6,	TP05_0.8-1.0							
EA055: Moisture Content								
Soil Glass Jar - Unpreserved (EA055-103)								
BH01_0.0-0.15,	BH02_0.4-0.5,	**17-Feb-2016**	**----**	----	----	**23-Feb-2016**	02-Mar-2016	✓
TP01_0.4-0.6								
Soil Glass Jar - Unpreserved (EA055-103)								
BH03_0.3-0.4,	TP02_0.0-0.15,	**18-Feb-2016**	**----**	----	----	**23-Feb-2016**	03-Mar-2016	✓
TP03_0.8-1.0,	TP04_1.4-1.5,							
TP05_0.8-1.0								

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA150: Soil Classification based on Particle Size							
Snap Lock Bag (EA150H) BH01_0.0-0.15, TP01_0.0-0.15, TP01_0.8-1.0	**17-Feb-2016**	**----**	----	----	**24-Feb-2016**	15-Aug-2016	✓
Snap Lock Bag (EA150H) BH03_0.0-0.15, TP02_0.0-0.15, TP02_0.4-0.6, TP02_0.8-1.0, TP03_0.0-0.15, TP03_0.4-0.6, TP03_0.8-1.0, TP04_0.0-0.15, TP04_0.4-0.6, TP05_0.0-0.15, TP05_0.4-0.6, TP05_0.8-1.0	**18-Feb-2016**	**----**	----	----	**24-Feb-2016**	16-Aug-2016	✓
EA152: Soil Particle Density							
Snap Lock Bag (EA152) BH01_0.0-0.15, TP01_0.0-0.15, TP01_0.8-1.0	**17-Feb-2016**	**----**	----	----	**24-Feb-2016**	15-Aug-2016	✓
Snap Lock Bag (EA152) BH03_0.0-0.15, TP02_0.0-0.15, TP02_0.4-0.6, TP02_0.8-1.0, TP03_0.0-0.15, TP03_0.4-0.6, TP03_0.8-1.0, TP04_0.0-0.15, TP04_0.4-0.6, TP05_0.0-0.15, TP05_0.4-0.6, TP05_0.8-1.0	**18-Feb-2016**	**----**	----	----	**24-Feb-2016**	16-Aug-2016	✓
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag: Separate bag received (EA200) BH01_0.0-0.15, BH02_0.4-0.5, TP01_0.4-0.6	**17-Feb-2016**	**----**	----	----	**23-Feb-2016**	15-Aug-2016	✓
Snap Lock Bag: Separate bag received (EA200) BH03_0.3-0.4, TP02_0.0-0.15, TP03_0.8-1.0, TP04_1.4-1.5, TP05_0.8-1.0	**18-Feb-2016**	**----**	----	----	**23-Feb-2016**	16-Aug-2016	✓
ED006: Exchangeable Cations on Alkaline Soils							
Soil Glass Jar - Unpreserved (ED006) TP01_0.0-0.15, TP01_0.8-1.0	**17-Feb-2016**	**26-Feb-2016**	16-Mar-2016	✓	**26-Feb-2016**	16-Mar-2016	✓
Soil Glass Jar - Unpreserved (ED006) BH03_0.0-0.15, TP02_0.0-0.15, TP02_0.4-0.6, TP02_0.8-1.0, TP03_0.0-0.15, TP03_0.8-1.0, TP04_0.0-0.15, TP05_0.0-0.15, TP05_0.8-1.0	**18-Feb-2016**	**26-Feb-2016**	17-Mar-2016	✓	**26-Feb-2016**	17-Mar-2016	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007)							
BH01_0.0-0.15	**17-Feb-2016**	**26-Feb-2016**	16-Mar-2016	✓	**26-Feb-2016**	16-Mar-2016	✓
Soil Glass Jar - Unpreserved (ED007)							
TP03_0.4-0.6, TP04_0.4-0.6, TP05_0.4-0.6	**18-Feb-2016**	**26-Feb-2016**	17-Mar-2016	✓	**26-Feb-2016**	17-Mar-2016	✓
ED040: Sulfur as SO4 2-							
Soil Glass Jar - Unpreserved (ED040T)							
BH01_0.0-0.15, TP01_0.8-1.0	**17-Feb-2016**	**23-Feb-2016**	24-Feb-2016	✓	**24-Feb-2016**	22-Mar-2016	✓
Soil Glass Jar - Unpreserved (ED040T)							
TP02_0.0-0.15, TP03_0.4-0.6, TP04_0.0-0.15	**18-Feb-2016**	**23-Feb-2016**	25-Feb-2016	✓	**24-Feb-2016**	22-Mar-2016	✓
ED093S: Soluble Major Cations							
Soil Glass Jar - Unpreserved (ED093S)							
BH01_0.0-0.15, TP01_0.0-0.15, TP01_0.8-1.0	**17-Feb-2016**	**24-Feb-2016**	15-Aug-2016	✓	**24-Feb-2016**	15-Aug-2016	✓
Soil Glass Jar - Unpreserved (ED093S)							
BH03_0.0-0.15, TP02_0.0-0.15, TP02_0.4-0.6, TP02_0.8-1.0, TP03_0.0-0.15, TP03_0.4-0.6, TP03_0.8-1.0, TP04_0.0-0.15, TP04_0.4-0.6, TP05_0.0-0.15, TP05_0.4-0.6, TP05_0.8-1.0	**18-Feb-2016**	**25-Feb-2016**	16-Aug-2016	✓	**25-Feb-2016**	16-Aug-2016	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
BH01_0.0-0.15, BH02_0.4-0.5, TP01_0.4-0.6	**17-Feb-2016**	**24-Feb-2016**	15-Aug-2016	✓	**24-Feb-2016**	15-Aug-2016	✓
Soil Glass Jar - Unpreserved (EG005T)							
BH03_0.3-0.4, TP02_0.0-0.15, TP03_0.8-1.0, TP04_1.4-1.5, TP05_0.8-1.0	**18-Feb-2016**	**24-Feb-2016**	16-Aug-2016	✓	**24-Feb-2016**	16-Aug-2016	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
BH01_0.0-0.15, BH02_0.4-0.5, TP01_0.4-0.6	**17-Feb-2016**	**24-Feb-2016**	16-Mar-2016	✓	**26-Feb-2016**	16-Mar-2016	✓
Soil Glass Jar - Unpreserved (EG035T)							
BH03_0.3-0.4, TP02_0.0-0.15, TP03_0.8-1.0, TP04_1.4-1.5, TP05_0.8-1.0	**18-Feb-2016**	**24-Feb-2016**	17-Mar-2016	✓	**26-Feb-2016**	17-Mar-2016	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK057G: Nitrite as N by Discrete Analyser							
Soil Glass Jar - Unpreserved (EK057G) BH01_0.0-0.15, TP01_0.8-1.0	**17-Feb-2016**	**24-Feb-2016**	15-Aug-2016	✓	**24-Feb-2016**	15-Aug-2016	✓
Soil Glass Jar - Unpreserved (EK057G) TP02_0.0-0.15, TP03_0.4-0.6, TP04_0.0-0.15	**18-Feb-2016**	**25-Feb-2016**	16-Aug-2016	✓	**25-Feb-2016**	16-Aug-2016	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Soil Glass Jar - Unpreserved (EK059G) BH01_0.0-0.15, TP01_0.8-1.0	**17-Feb-2016**	**24-Feb-2016**	15-Aug-2016	✓	**24-Feb-2016**	15-Aug-2016	✓
Soil Glass Jar - Unpreserved (EK059G) TP02_0.0-0.15, TP03_0.4-0.6, TP04_0.0-0.15	**18-Feb-2016**	**25-Feb-2016**	16-Aug-2016	✓	**25-Feb-2016**	16-Aug-2016	✓
EK074: Fluoride Extractable Phosphorus (Bray)							
Soil Glass Jar - Unpreserved (EK074) BH01_0.0-0.15, TP01_0.8-1.0	**17-Feb-2016**	**26-Feb-2016**	15-Aug-2016	✓	**26-Feb-2016**	15-Aug-2016	✓
Soil Glass Jar - Unpreserved (EK074) TP02_0.0-0.15, TP03_0.4-0.6, TP04_0.0-0.15	**18-Feb-2016**	**26-Feb-2016**	16-Aug-2016	✓	**26-Feb-2016**	16-Aug-2016	✓
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066) BH01_0.0-0.15, BH02_0.4-0.5, TP01_0.4-0.6	**17-Feb-2016**	**23-Feb-2016**	02-Mar-2016	✓	**24-Feb-2016**	03-Apr-2016	✓
Soil Glass Jar - Unpreserved (EP066) BH03_0.3-0.4, TP02_0.0-0.15, TP03_0.8-1.0, TP04_1.4-1.5, TP05_0.8-1.0	**18-Feb-2016**	**23-Feb-2016**	03-Mar-2016	✓	**24-Feb-2016**	03-Apr-2016	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068) BH01_0.0-0.15, BH02_0.4-0.5, TP01_0.4-0.6	**17-Feb-2016**	**23-Feb-2016**	02-Mar-2016	✓	**24-Feb-2016**	03-Apr-2016	✓
Soil Glass Jar - Unpreserved (EP068) BH03_0.3-0.4, TP02_0.0-0.15, TP03_0.8-1.0, TP04_1.4-1.5, TP05_0.8-1.0	**18-Feb-2016**	**23-Feb-2016**	03-Mar-2016	✓	**24-Feb-2016**	03-Apr-2016	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071) BH01_0.0-0.15, BH02_0.4-0.5, TP01_0.4-0.6	**17-Feb-2016**	**23-Feb-2016**	02-Mar-2016	✓	**24-Feb-2016**	03-Apr-2016	✓
Soil Glass Jar - Unpreserved (EP071) BH03_0.3-0.4, TP02_0.0-0.15, TP03_0.8-1.0, TP04_1.4-1.5, TP05_0.8-1.0	**18-Feb-2016**	**23-Feb-2016**	03-Mar-2016	✓	**24-Feb-2016**	03-Apr-2016	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) BH01_0.0-0.15, BH02_0.4-0.5, TP01_0.4-0.6	**17-Feb-2016**	**23-Feb-2016**	02-Mar-2016	✓	**23-Feb-2016**	03-Apr-2016	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) BH03_0.3-0.4, TP02_0.0-0.15, TP03_0.8-1.0, TP04_1.4-1.5, TP05_0.8-1.0	**18-Feb-2016**	**23-Feb-2016**	03-Mar-2016	✓	**23-Feb-2016**	03-Apr-2016	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) BH01_0.0-0.15, BH02_0.4-0.5, TP01_0.4-0.6	**17-Feb-2016**	**23-Feb-2016**	02-Mar-2016	✓	**25-Feb-2016**	02-Mar-2016	✓
Soil Glass Jar - Unpreserved (EP080) BH03_0.3-0.4, TP02_0.0-0.15, TP03_0.8-1.0, TP04_1.4-1.5, TP05_0.8-1.0	**18-Feb-2016**	**23-Feb-2016**	03-Mar-2016	✓	**25-Feb-2016**	03-Mar-2016	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Cations - soluble by ICP-AES	ED093S	3	32	**9.38**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	3	17	**17.65**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride extractable Phosphorus (Bray)	EK074	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055-103	4	24	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	2	5	**40.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	2	5	**40.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	5	34	**14.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH in soil using a 0.01M CaCl2 extract	EA001	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate as SO4 2- Total	ED040T	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Cations - soluble by ICP-AES	ED093S	3	32	**9.38**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	2	17	**11.76**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride extractable Phosphorus (Bray)	EK074	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	2	5	**40.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	2	5	**40.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Cations - soluble by ICP-AES	ED093S	3	32	**9.38**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	2	17	**11.76**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride extractable Phosphorus (Bray)	EK074	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	2	5	**40.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	2	5	**40.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate as SO4 2- Total	ED040T	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	2	5	**40.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	2	5	**40.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH in soil using a 0.01M CaCl2 extract	EA001	SOIL	In house: Referenced to Rayment and Higginson 4B1 (mod.) 10 g of soil is mixed with 50 mL of 0.01M CaCl2 and tumbled end over end for 1 hour. pH is measured from the continuous suspension. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
pH (1:5)	EA002	SOIL	In house: Referenced to APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 104)
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Soil Particle Density	* EA152	SOIL	Soil Particle Density by AS 1289.3.5.1-2006 : Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Exchangeable Cations on Alkaline Soils	ED006	SOIL	In house: Referenced to Rayment & Lyons (2011) Method 15C1. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with alcoholic ammonium chloride at pH 8.5. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil.
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons (2011) Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Sulfate as SO4 2- Total	ED040T	SOIL	In house: Total Sulfate is determined off a HCl digestion by ICPAES as S , and reported as SO4
Cations - soluble by ICP-AES	ED093S	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010 (ICPAES) Water extracts of the soil are analyzed for major cations by ICPAES. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N - Soluble by Discrete Analyser	EK057G	SOIL	In house: Referenced to APHA 4500-NO3- B. Nitrite in a water extract is determined by direct colourimetry by Discrete Analyser.

Analytical Methods	Method	Matrix	Method Descriptions
Nitrate as N - Soluble by Discrete Analyser	EK058G	SOIL	In house: Referenced to APHA 4500-NO3- F. Nitrate in the 1:5 soil:water extract is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	SOIL	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) in a water extract is determined by Chemical Reduction, and direct colourimetry by Discrete Analyser.
Fluoride extractable Phosphorus (Bray)	EK074	SOIL	In house: Referenced to Rayment & Higginson (1992) Method 9E1. Phosphorus is extracted from the soil using NH4F and determined by discrete analyzer.
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 504)
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM (2013) Schedule B(3) (Method 504,505)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.

Preparation Methods	Method	Matrix	Method Descriptions
Methanolic Extraction of Soils for Purge and Trap	* ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **ES1603869**		
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: BLAIR CUMMINGS	Contact	:
Address	: 100 CHRISTIE STREET P O BOX 164 ST LEONARDS NSW, AUSTRALIA 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: blair.cummings@jacobs.com	E-mail	:
Telephone	: +61 02 9928 2100	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 9928 2272	Facsimile	: +61-2-8784 8500
Project	: M2 PARK	Page	: 1 of 3
Order number	: IA104600	Quote number	: ES2015SINKNI0472 (EN/003/15)
C-O-C number	: 233253-233255	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: BLAIR CUMMINGS		

Dates

Date Samples Received	: 19-Feb-2016 3:15 AM	Issue Date	: 22-Feb-2016
Client Requested Due Date	: 26-Feb-2016	Scheduled Reporting Date	: **26-Feb-2016**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 0.9'C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 28 / 19

General Comments

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

Sample Container(s)/Preservation Non-Compliances

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

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

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

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA010 (solids): Electrical Conductivity (1:5)	SOIL - EA200 Asbestos Identification in Soils -	SOIL - ED008 Def Exchangeable Cations with pre-treatment Default	SOIL - ED093S Cations - Soluble	SOIL - EK074 Fluoride Extractable P (Bray)	SOIL - S-11 OC/PCB	SOIL - S-26 8 metals/TRH/BTEXN/PAH
ES1603869-001	[17-Feb-2016]	BH01_0.0-0.15	✓	✓	✓	✓	✓	✓	✓
ES1603869-006	[17-Feb-2016]	BH02_0.4-0.5		✓				✓	✓
ES1603869-007	[18-Feb-2016]	BH03_0.0-0.15	✓		✓	✓			
ES1603869-008	[18-Feb-2016]	BH03_0.3-0.4		✓				✓	✓
ES1603869-009	[17-Feb-2016]	TP01_0.0-0.15	✓		✓	✓			
ES1603869-010	[17-Feb-2016]	TP01_0.4-0.6		✓				✓	✓
ES1603869-011	[17-Feb-2016]	TP01_0.8-1.0	✓		✓	✓	✓		
ES1603869-013	[18-Feb-2016]	TP02_0.0-0.15	✓	✓	✓	✓	✓	✓	✓
ES1603869-014	[18-Feb-2016]	TP02_0.4-0.6	✓		✓	✓			
ES1603869-015	[18-Feb-2016]	TP02_0.8-1.0	✓		✓	✓			
ES1603869-017	[18-Feb-2016]	TP03_0.0-0.15	✓		✓	✓			
ES1603869-018	[18-Feb-2016]	TP03_0.4-0.6	✓		✓	✓	✓		
ES1603869-019	[18-Feb-2016]	TP03_0.8-1.0	✓	✓	✓	✓		✓	✓
ES1603869-021	[18-Feb-2016]	TP04_0.0-0.15	✓		✓	✓	✓		
ES1603869-022	[18-Feb-2016]	TP04_0.4-0.6	✓		✓	✓			
ES1603869-024	[18-Feb-2016]	TP04_1.4-1.5		✓				✓	✓
ES1603869-025	[18-Feb-2016]	TP05_0.0-0.15	✓		✓	✓			
ES1603869-026	[18-Feb-2016]	TP05_0.4-0.6	✓		✓	✓			
ES1603869-027	[18-Feb-2016]	TP05_0.8-1.0	✓	✓	✓	✓		✓	✓

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA001 pH (CaCl)	SOIL - EA002 pH (1:5)	SOIL - EA055-103 Moisture Content	SOIL - EA150H/EA152 Particle Sizing with Hydrometer + Soil Particle	SOIL - ED040T Sulfate Total	SOIL - EK058G (solids) Nitrate as N - soluble by Discrete Analyser
ES1603869-001	[17-Feb-2016]	BH01_0.0-0.15		✓	✓	✓	✓	✓	✓
ES1603869-002	[17-Feb-2016]	BH01_0.2-0.3	✓						
ES1603869-003	[17-Feb-2016]	BH01_0.4-0.5	✓						
ES1603869-004	[17-Feb-2016]	BH01_0.9-1.0	✓						
ES1603869-005	[17-Feb-2016]	BH02_0.0-0.15	✓						

			(On Hold) SOIL No analysis requested	SOIL - EA001 pH (CaCl)	SOIL - EA002 pH (1:5)	SOIL - EA055-103 Moisture Content	SOIL - EA150H/EA152 Particle Sizing with Hydrometer + Soil Particle	SOIL - ED040T Sulfate Total	SOIL - EK058G (solids) Nitrate as N - soluble by Discrete Analyser
ES1603869-006	[17-Feb-2016]	BH02_0.4-0.5				✓			
ES1603869-007	[18-Feb-2016]	BH03_0.0-0.15		✓	✓	✓	✓		
ES1603869-008	[18-Feb-2016]	BH03_0.3-0.4				✓			
ES1603869-009	[17-Feb-2016]	TP01_0.0-0.15		✓	✓	✓	✓		
ES1603869-010	[17-Feb-2016]	TP01_0.4-0.6				✓			
ES1603869-011	[17-Feb-2016]	TP01_0.8-1.0		✓	✓	✓	✓	✓	✓
ES1603869-012	[17-Feb-2016]	TP01_1.4-1.5	✓						
ES1603869-013	[18-Feb-2016]	TP02_0.0-0.15		✓	✓	✓	✓	✓	✓
ES1603869-014	[18-Feb-2016]	TP02_0.4-0.6		✓	✓	✓	✓		
ES1603869-015	[18-Feb-2016]	TP02_0.8-1.0		✓	✓	✓	✓		
ES1603869-016	[18-Feb-2016]	TP02_1.4-1.5	✓						
ES1603869-017	[18-Feb-2016]	TP03_0.0-0.15		✓	✓	✓	✓		
ES1603869-018	[18-Feb-2016]	TP03_0.4-0.6		✓	✓	✓	✓	✓	✓
ES1603869-019	[18-Feb-2016]	TP03_0.8-1.0		✓	✓	✓	✓		
ES1603869-020	[18-Feb-2016]	TP03_1.4-1.5	✓						
ES1603869-021	[18-Feb-2016]	TP04_0.0-0.15		✓	✓	✓	✓	✓	✓
ES1603869-022	[18-Feb-2016]	TP04_0.4-0.6		✓	✓	✓	✓		
ES1603869-023	[18-Feb-2016]	TP04_0.8-1.0	✓						
ES1603869-024	[18-Feb-2016]	TP04_1.4-1.5				✓			
ES1603869-025	[18-Feb-2016]	TP05_0.0-0.15		✓	✓	✓	✓		
ES1603869-026	[18-Feb-2016]	TP05_0.4-0.6		✓	✓	✓	✓		
ES1603869-027	[18-Feb-2016]	TP05_0.8-1.0		✓	✓	✓	✓		
ES1603869-028	[18-Feb-2016]	TP05_1.4-1.5	✓						

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE (Brisbane)

- A4 - AU Tax Invoice (INV)	Email	AU-AP@Jacobs.com

BLAIR CUMMINGS

- *AU Certificate of Analysis - NATA (COA)	Email	blair.cummings@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	blair.cummings@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	blair.cummings@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	blair.cummings@jacobs.com
- A4 - AU Tax Invoice (INV)	Email	blair.cummings@jacobs.com
- Chain of Custody (CoC) (COC)	Email	blair.cummings@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	blair.cummings@jacobs.com
- EDI Format - XTab (XTAB)	Email	blair.cummings@jacobs.com

ALS Environmental — CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ ADELAIDE ☐ BRISBANE ☐ CHINCHILLA ☐ DARWIN ☐ EMERALD ☐ GLADSTONE ☐ MACKAY ☐ MELBOURNE ☐ MUDGEE ☐ NEWCASTLE ☐ NOWRA ☐ PERTH ☐ ROMA ☑ SYDNEY ☐ TOWNSVILLE ☐ WOLLONGONG

CLIENT:	Jacobs
OFFICE:	St Leonards
PROJECT:	M2 Park
PURCHASE ORDER NUMBER:	IA104600
PROJECT MANAGER:	Mary-Ellen Feeney
CONTACT PH:	
SAMPLER:	Blair Cummings
SAMPLER MOBILE:	0408 427 609
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):	Blair.Cummings.com
Email Invoice to (will default to PM if no other addresses are listed):	

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

ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle)
COC: (1) 2 3 4 5 6 7
OF: 1 2 (3) 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
B. Cummings	Frank ARS		
DATE/TIME: 19/02/16 1000	DATE/TIME: 19-2-16 1515	DATE/TIME:	DATE/TIME:

COMMENTS/ SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX - SOLID (S), WATER (W)			CONTAINER INFORMATION	ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or dissolved (field filtered bottle required).												Additional Information
LAB ID	SAMPLE ID	DATE/ TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	S-11	S-26	Asbestos Presence/ Absence EA030	EA002	EA001	EA010	EA035	ED008	EA150H - EA152	EK058	EK074	ED040T	
1	BH01_0.0-0.15	17/02/16	S		2 JAR 3 BAGS	X	X	X	X	X	X	X	X	X	X	X	X	
2	BH01_0.2-0.3				1 Jar													
3	BH01_0.4-0.5				1 Jar	[redacted]												
4	BH01_09-1.0				1 Jar													
5	BH02_0.0-0.15				2 JARS 3 BAGS													
6	BH02_0.4-0.5	17/02/16			1 JAR 1 BAG	X	X	X										
7	BH03_0.0-0.15	18/02/16			2 JARS 3 BAGS	[redacted]			X	X	X	X	X	X				
8	BH03_0.3-0.4	18/02/16			1 JAR 1 BAG	X	X	X										
9	TP01_0.0-0.15	17/02/16			2 JARS 3 BAGS				X	X	X	X	X	X				
10	TP01_0.4-0.5					X	X	X										
11	TP01_0.8-1.0					[redacted]			X	X	X	X	X	X	X	X	X	
12	TP01_1.4-1.5	17/02/16	S		1 JAR													
				TOTAL														

Environmental Division
Sydney
Work Order Reference
ES1603869

Telephone : +61-2-8784 8555

Subcon / Forward Lab / Split WO
Lab / Analysis: PSP
Organised By / Date: Asbestos
Relinquished By / Date:
Courier: Newcastle
WO No:
Attach By PO / Internal Sheet:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; LI = Lugols Iodine Preserved; STT = Sterile Sodium Thiosulfate Preserved; Z = Zinc Acetate Preserved Bottle; E = Ed TA Preserved Bottles; ST = Sterile Bottle ***Soil Container Codes:*** ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

233253

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ALS Laboratory: please tick →

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CLIENT:	Jacobs	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	St Leonards		
PROJECT:	M2 Park	ALS QUOTE NO.:	
PURCHASE ORDER NUMBER:	IA104600		
PROJECT MANAGER:	Mary-Ellen Feeney	CONTACT PH:	
SAMPLER:	Blair Cummings	SAMPLER MOBILE:	0408 427 609
COC emailed to ALS? (YES / (NO))		EDD FORMAT (or default):	
Email Reports to (will default to PM if no other addresses are listed):	Blair.Cummings@jacobs.com		
Email Invoice to (will default to PM if no other addresses are listed):			

COC SEQUENCE NUMBER (Circle)
COC: 1 (2) 3 4 5 6 7
OF: 1 2 (3) 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
B. Cummings	Frank me		
DATE/TIME: 19/02/16 1000	DATE/TIME: 19-2-16 1515	DATE/TIME:	DATE/TIME:

COMMENTS/ SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX - SOLID (S), WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or dissolved (field filtered bottle required).												Additional Information
LAB ID	SAMPLE ID	DATE/ TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	S-11	S-26	Asbestos Arsenic Arsenic EA200	EA002	EA001	EA010	ED035	ED008	EA150H - Mn/Mn/Mn EA152	EK058	EK074	ED040T	
13	TP02_0.0-0.15	18/02/16	S		2 JAR 3 BAG	X	X	X	X	X	X	X	X	X	X	X	X	
14	TP02_0.4-0.6				↓				X	X	X	X	X	X				
15	TP02_0.8-1.0				↓				X	X	X	X	X	X				
16	TP02_1.4-1.5				1 JAR 1 BAG													
17	TP03_0.0-0.15				2 JAR 3 BAG				X	X	X	X	X	X				
18	TP03_0.4-0.6				↓				X	X	X	X	X	X	X	X	X	
19	TP03_0.8-1.0				↓	X	X	X	X	X	X	X	X	X				
20	TP03_1.4-1.5				1 JAR 1 BAG													
21	TP04_0.0-0.15				2 JAR 3 BAGS				X	X	X	X	X	X	X	X	X	
22	TP04_0.4-0.6				↓				X	X	X	X	X	X				
23	TP04_0.8-1.0	↓	↓		↓													
24	TP04_1.4-1.5	18/02/16	S		1 JAR 1 BAG	X	X	X										
				TOTAL														

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; LI = Lugols Iodine Preserved; STT = Sterile Sodium Thiosulfate Preserved; Z = Zinc Acetate Preserved Bottle; E = Ed TA Preserved Bottles; ST = Sterile Bottle ***Soil Container Codes:*** ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

233254

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ALS Laboratory: please tick →

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CLIENT: Jacobs

OFFICE: St Leonards

PROJECT: MZ - Park

PURCHASE ORDER NUMBER: IA004600

PROJECT MANAGER: Mary-Ellen Feeney

SAMPLER: Blair Cummings

SAMPLER MOBILE: 0408 427 609

COC emailed to ALS? (YES / (NO))

EDD FORMAT (or default):

Email Reports to (will default to PM if no other addresses are listed): Blair.Cummings@jacobs.com

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

COMMENTS/ SPECIAL HANDLING/STORAGE OR DISPOSAL:

TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)

☑ Standard TAT (List due date):

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

ALS QUOTE NO.:

CONTACT PH:

COC SEQUENCE NUMBER (Circle)

COC: 1 2 (3) 4 5 6 7

OF: 1 2 (3) 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
B. Cummings	Frank ALS		
DATE/TIME: 19/02/16 10:00	DATE/TIME: 19-2-16 1515	DATE/TIME:	DATE/TIME:

ALS USE	SAMPLE DETAILS MATRIX - SOLID (S), WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or dissolved (field filtered bottle required).												Additional Information
LAB ID	SAMPLE ID	DATE/ TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	S-11	S-26	Asbestos Absence/ Presence EA200	EA002	EA001	EA010	ED093S	ED008	EA150H-EA152	EK074	EK058	ED040T	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
25	TP05_0.0-0.15	18/02/16	S		2 JARS 3 BAGS				X	X	X	X	X	X				
26	TP05_0.4-0.6	↓	↓		↓				X	X	X	X	X	X				
27	TP05_0.8-1.0	↓	↓		↓	X	X	X	X	X	X	X	X	X				
28	TP05_1.4-1.5	18/02/16	S		1 JAR 1 BAG													
				TOTAL														

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; LI = Lugols Iodine Preserved; STT = Sterile Sodium Thiosulfate Preserved; Z = Zinc Acetate Preserved Bottle; E = Ed TA Preserved Bottles; ST = Sterile Bottle ***Soil Container Codes:*** ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

233255

Appendix IB

Soil Investigation Report

100 Christie Street
St Leonards NSW 2065 Australia
PO Box 164 St Leonards NSW 2065
Australia
T +61 2 9928 2100
F +61 2 9928 2500
www.jacobs.com

11 March 2016

Mr Daniel Noaeen
Transurban
Level 9
1 Chifley Square
Sydney NSW 2000

Our ref: IA104600

Soils Investigation: M2 – Macquarie Park Motorscapes Project

1. Introduction

Jacobs (Australia) Pty Ltd (Jacobs) were commissioned by Transurban to conduct an on-site soil assessment and survey for development of vacant land located adjacent to the M2 Motorway, Macquarie Park NSW (the site).

Transurban is seeking to rehabilitate approximately five hectares of the leased site, substantially improving its ecological functionality and increasing community engagement. Works will include landform modification and re-vegetation of the disturbed area.

The site has been significantly modified from its original condition, with the central part of the site recently occupied by a secure storage compound for plant and equipment used to upgrade M2 infrastructure. The site will be managed by Transurban until the lease agreement expires in 2048.

The objective of the project is to identify which soils are potentially valuable for landscaping. The scope of the study is as follows:

- Site survey and soils investigation
- Interpretation of results
- Proposal soil management measures

This assessment outlines the results of the investigation.

1.1 Soils for landscaping

A landscape soil is defined as *'An anthropic soil profile that is either modified from a natural in situ soil or manufactured and installed using artificial components for the purpose of sustaining vegetation chosen for landscape design or land rehabilitation*' (Leake & Haege 2014).

For a soil to be suitable for landscaping purposes, it must have physical, chemical and biological properties that are suitable for reliable establishment of vegetation. The Australian Standard for Garden Soils (AS2223) defines the general requirements for soils for domestic use as '*General purpose soils shall be of a friable porous nature. General purpose soils shall not set hard or become difficult to work (lose their friable nature) as a consequence of water drying*

out of the soil following precipitation or domestic watering'. While this description is specific to garden soils, it is useful as a general guide to soil properties for landscaping.

Understanding the soil resource is a vital and influential step in the processes of determining the quality of soils for landscaping purposes. Once there is knowledge of the soil resource, the soil approach method can be determined.

To understand the soil resource, the observations outlined in **Table 1** are used as a guide. The checklist is dependent on the nature of the soil/material being investigated.

Table 1: Site observation list (Haege & Leake 2014)

Aspect	Observations
General site	Slope, Aspect and slope position
Vegetation	Species and condition of vegetation Degree of alteration from natural conditions Presence and condition of any weeds Degree of stress and/or disease
Surface conditions	Grass and forbs Intact litter layer Crusted or compacted surface
Topsoil	Depth Colour, texture, structure Moisture condition Presence of inclusions (anthropic objects) Degree of compacting Surface cracking and crusting Presence of any pallid layer (A2 horizon) on top of the subsoil
Subsoil	Depth of boundary Depth of subsoil Colour, texture, structure Colour and texture changes to the deep subsoil Depth to parent material

To evaluate the soil resource at the site, existing soils data was reviewed, and a field survey undertaken. The following sections outline the scope of the survey and the results of the investigation.

2. Existing Geology and Soils

The geology of the area is characterised by the plateau surfaces of the Mittagong Formation. The Mittagong Formation is comprised of Hawkesbury Sandstone and Wianamatta Shale. These lithologies act as the parent material for soil formation, which is further reflected by the variation in native vegetation establishment.

The soils of the project area are a combination of Lucas Heights soil landscape in the south and Gymea soil landscape in the north The Lucas Height landscape is characterised by gentle undulating crest and ridge with moderately deep hard-setting duplex sand gradational soils. The Gymea landscape is typically characterised by gently rolling low hills on Hawkesbury Sandstone with a wide range of soil properties. Soils in the area can have low fertility, stony steep slopes and high soil erosion.

3. Soil Sampling and Analysis

3.1 Sampling

All fieldwork was undertaken by an experienced Jacobs environmental scientist between 17 and 18 February 2016, and was run in parallel with the preliminary contamination investigation (PCI).

The site survey has been divided into three distinct areas, consistent with the PCI as outlined below:

- Area 1 – Industrial Creek (BH01 & BH02)
- Area 2 – Former compound site (TP01 – TP05)
- Area 3 – Shrimptons Creek (BH03)

A track mounted excavator was used for excavation of test pits to a depth of 1.5 m below ground level (blg) at five locations within Area 2 (TP01 to TP05). Two boreholes (BH01 and BH02) were drilled within Area 1 (Industrial Creek) and one borehole (BH03) was drilled within Area 3 (Shrimptons Creek) to a maximum depth of 1.0 mbgl with the aid of a decontaminated hand auger. Sampling locations are illustrated in Figure 1..

Test pit samples were collected directly from the centre of the excavator bucket. Borehole samples were collected directly from the auger head. Care was taken to ensure representative samples were obtained from the required depth. Excess material generated during excavation of test pits and boreholes were backfilled in the approximate order of excavation.

Sample collection was in line with contaminated procedures. Sampling equipment was decontaminated between samples and sites. All samples were placed in soil jars, sealed and immediately placed in an esky / cool box to keep sample temperature below approximately 4^{o}C. Samples were then transported to the laboratory under strict Chain of Custody procedures.

3.2 Analysis

A total of 15 samples were analysed for soil properties at a National Association of Testing Authorities (NATA) accredited laboratory, with the analytical suite outlined in **Table 2** below.

Table 2: Laboratory analysis suite

Chemical	Physical	Nutrient
• pH ($CaCl_2$) • pH (H_2O) • Electrical conductivity (µS/cm) • Exchangeable Cations • Cation Exchange Capacity • Exchangeable Sodium Percentage (ESP)	• Particle Size Distribution • Moisture content • Soil particle density	• Sulfur as Sulfate • Nitrogen as Nitrate • Nitrogen as Nitrite • Fluoride extractable Phosphorus (Bray)

Analysis was undertaken on samples from each distinct area:

- Area 1: Industrial Creek – 1 sample
- Area 2: Former compound site – 13 samples
- Area 3: Shrimptons Creek – 1 sample

4. Results

4.1 Field observations

The site was generally covered in long grass and small shrubs, with a vegetative cover of >80%. In the majority of profiles, roots were abundant within the top 10 cm, varying in size from coarse to fine.

Observations at Area 1 indicated a distinct topsoil layer (herein referred to as M2 topsoil) overlying fill material. At Area 1 and Area 3, the fill materials (herein referred to as the M2 subsoils) were generally comprised of disturbed soil material. Silty and sandy clays were noted in the M2 subsoils consisting of fine to medium grained sands with minor sandstone and shale inclusions.

The fill materials within Area 2 (herein referred to as the M2 waste soils) were comprised of sandstone, shale and concrete with minor inclusions of other waste materials (e.g. wood and plastic). The <2 mm fraction of the M2 waste soils were dominated by sandy and silty clays, with medium to coarse sand grains. Larger size fractions consist of sandstone, shale and concrete cobbles and boulders. Moisture content increased down the profiles, in most cases from dry to moderately moist.

Based on the above, three distinct material types were identified at site:

- Area 1 – M2 Topsoil overlying M2 subsoils (minor sandstone/shale inclusions)
- Area 2 - M2 waste soils (wood, concrete and plastic inclusions)
- Area 3 - M2 subsoils (minor sandstone/shale inclusions)

Based on the Australian Soil Classification (ASC), the soils of the area are classified as Anthroposols (Isbell 2002). These are soils that result from human activities which cause profound modification, mixing, truncation or burial of the original soil horizons.

Stratigraphic information is detailed in the test pit and bore logs provided in **Appendix A**.

4.2 Analytical results

The results from the laboratory analyses are provided in **Table 3**, with laboratory reports provided in **Appendix B**.

Table 3: Laboratory results

Sample No.	pH (H_20)	pH ($CaCl_2$)	EC	Particle Size Distribution (%)				Density	Exchangeable Cations (meq/100g)				CEC	ESP	SO_4^{2-}	Nitrite	Nitrate	Ext. P
	pH unit		dS/m	Clay (<2 µm)	Silt (2-60 µm)	Sand (0.06-2.00 mm)	Gravel (>2mm)	g/cm^3	Ca^{2+}	Mg^{2+}	K^+	Na^+	meq/100g	%	mg/kg	mg/kg	mg/kg	mg/kg
BH01 0.0 – 0.15 m	6.4	5.8	0.13	19	25	56	<1	2.49	10.9	3.0	0.1	0.5	14.5	3.7	820	<0.1	5.1	8.8
BH03 0.0 – 0.15 m	7.9	6.0	0.07	14	26	36	24	2.49	5.6	6.0	<0.2	0.3	11.9	2.2	-	-	-	-
TP01 0.0 – 0.15 m	8.5	6.7	0.12	15	21	42	22	2.65	4.1	1.7	<0.2	<0.2	5.8	<0.2	-	-	-	-
TP01 0.8 – 1.0 m	8.3	6.9	0.25	17	19	34	30	2.66	3.0	2.7	<0.2	0.2	5.9	3.7	260	<0.1	<0.1	1.5
TP02 0.0 – 0.15 m	7.5	6.8	0.07	16	16	54	14	2.58	3.0	1.5	<0.2	<0.2	4.5	<0.2	240	0.2	0.7	2.9
TP02 0.4 – 0.6 m	8.5	7.4	0.14	15	16	44	25	2.63	4.2	2.1	<0.2	<0.2	6.3	<0.2	-	-	-	-
TP02 0.8 – 1.0 m	8.6	7.4	0.11	11	13	43	33	2.64	3.6	1.0	<0.2	<0.2	4.6	<0.2	-	-	-	-
TP03 0.0 – 0.15 m	8.6	6.7	0.13	15	15	47	23	2.64	4.4	1.0	<0.2	<0.2	5.4	<0.2	-	-	-	-
TP03 0.4 – 0.6 m	6.9	6.4	0.05	22	22	42	14	2.65	3.2	2.1	0.1	0.3	5.7	4.7	200	<0.1	0.1	<0.1
TP03 0.8 – 1.0 m	7.8	6.5	0.09	25	23	41	11	2.66	3.4	2.6	<0.2	<0.2	6.0	<0.2	-	-	-	-
TP04 0.0 – 0.15 m	8.7	7.0	0.13	15	16	49	20	2.63	5.9	1.3	<0.2	<0.2	7.2	<0.2	430	0.2	0.5	2.9
TP04 0.4 – 0.6 m	7.0	5.8	0.05	25	25	39	11	2.63	2.6	2.2	0.1	0.1	5.0	2.6	-	-	-	-
TP05 0.0 – 0.15 m	7.3	5.8	0.02	17	20	50	13	2.48	3.8	1.8	0.2	<0.2	5.8	<0.2	-	-	-	-
TP05 0.4 – 0.6 m	7.0	5.8	0.05	21	26	39	14	2.62	3.6	1.6	0.1	0.2	5.5	4.4	-	-	-	-
TP05 0.8 – 1.0 m	7.8	6.0	0.05	11	16	67	6	2.60	3.1	1.4	<0.2	<0.2	4.5	<0.2	-	-	-	-

Area 1 – Industrial Creek

Results from analysis of the single M2 topsoil sample (BH01, 0-0.15 m) indicate the soil is dominated by sand sized particles (56%), with significant portions of silt (25%) and clay (19%). No gravel (particles > 2 mm in size) is present within the sample.

The M2 topsoil is classed as neutral and non-saline. The cation exchange capacity is moderate, indicating that the soil has a reasonable capacity to retain nutrients and is considered stable (Hazelton & Murphy 2007). This is further illustrated by a low ESP (<5%) indicating a low susceptibility to clay dispersion (Hazelton & Murphy 2007). Nitrate levels are low, available phosphorus is low to moderate and sulfate levels are moderate to high (Hazelton & Murphy 2007).

No samples were taken of the underlying fill material was undertaken. Based on the soil logs, the observations of the fill material indicated a likeness in material properties to those observed in Area 3 fill, and for the purpose of this investigation both are considered as M2 subsoil.

Area 2 – Former Compound Site

Samples taken from the M2 waste soil at the former compound site (TP01 – TP05) contained primarily sand (34 – 67%) and gravel (6 – 33%), with lower proportions of silt (13 – 25%) and clay (11 – 25%).

The M2 waste soil ranges from neutral to alkaline, with all samples classed as non-saline. The cation exchange capacities are low across the samples, indicating a low capability to retain nutrients. ESP results indicate the samples have a low risk of clay dispersion and are considered stable. Nitrate and available phosphorus are low in all samples (Hazelton & Murphy 2007). Sulfate levels are low to moderate.

Overall, the M2 waste soils are composed primarily of sand, with similar proportions of gravel, silt and clay. The materials lack the ability to retain nutrients and had generally low nutrient levels across the board. Additionally, properties were similar across the sampling depths, indicating the material is homogenous.

Area 3 – Shrimptons Creek

Results from analysis of the M2 subsoil (BH03, 0-15 m) show a significant portion of sand (36%), silt (26%) and gravel (24%), with a smaller fraction of clay (14%). This is similar to the fill material within Area 2.

The M2 subsoil is classed as neutral and non-saline. The cation exchange capacity is borderline low to moderate, indicating the fill material has a reasonable capacity to retain nutrients and is considered stable (Hazelton & Murphy 2007). Similar to the M2 waste soils, the M2 subsoil is characterised by a low ESP indicating a low risk of clay dispersion.

Nutrient levels were not analysed for the M2 subsoil, but are expected to be in line with samples from the M2 waste soil given the similarity in material properties.

5. Soils Management Strategy

5.1 Soil Approach Method

There are three approaches that can be adopted when considering the use of soils for landscaping:

1. Use the existing site soils ‘as found’ without modification

2. Recovery, conditioning soil and importing soils to improve its characteristics

3. Properties are considered too inhibitive for use in landscaping

It is necessary to consider the type of soil profile required to support the intended landscape treatment in a sustainable way with minimum of maintenance inputs (irrigation, fertiliser, etc.) and with reasonable growth and appearance. The soil method approach is outlined in **Table 4** below.

Table 4: Soil method approach (Haege & Leake 2014)

No.	Method	Purpose
1	Use existing site soil as is	If appropriate and the nutrition is adequate for optimal growth and health of proposed plant material. Most common in land rehabilitation and mass planting.
2	Use existing site soil with recovery, conditioning and improvement	Recovery and re-use may require imported materials such as, ameliorants (lime and gypsum) fertilisers and integration of organic matter to the top horizon and de-compaction and amelioration of subsoils
3	Integrate imported soil with existing site soil	Such as where depth needs to be increased or texture needs modifying (e.g. adding sand to playing field soils)
4	Use existing site soils but import new soils for specific locations	A common important requirement is for sandy root zone soils for sports field topsoils (e.g. a playing field in a housing development). Other landscape areas can use site soils as is or improved.
5	Import and install new topsoil, ameliorate subsoil or subgrade	Where the subgrade is adequate and there is no available topsoil (e.g. site has been stripped of all topsoil, such as in a contaminated area or brownfields site). A common example is placing imported topsoil over former landfill sites. Most often subsoil or subgrade will need to be ameliorated.
6	Import and install new subgrade material and topsoil or container soil media	The most common example where no existing soil is available or the site is completely manufactured (such as on a rooftop or vertical wall). This will be the case in most CBD developments.

The best approach is dependent on the proposed landscaping use. A sports park or golf course will have different requirements to vegetation of a housing development. The nature of the soil on a site will have an overriding influence on design as any other site factor. Soil factors also influence the landscape objectives, e.g. the presence of alkaline soils will rule out plant species that are intolerant of alkaline conditions.

The soil management strategy is dependant of the intended use. The landscape design is based on re-instatement of native bush land. To achieve the intended landscape purpose the limiting properties to establishment of vegetation will be identified, and the most appropriate soil method (as outlined in **Table 3**) will be recommended.

5.2 Proposed land use

The vegetation community proposed for rehabilitation of the site is Hornsby Enriched Sandstone Exposed Woodland (HESEW). Providing the soil properties prove suitable, species of Sydney Turpentine Ironbark Forest (STIF) will also be included.

For effective establishment of native bushland (including HESEW vegetation community), the following soil properties are desirable:

- Well drained soils with a low water table
- Neither strongly alkaline or strongly acidic
- Non-saline to moderately saline
- Low to moderate fertility
- No risk of dispersion

For establishment of STIF vegetation community, the following additional properties are desirable:

- Moderately wet soils throughout the year
- Clay rich soils to retain moisture

5.3 Evaluation of soil resources

The properties of the M2 topsoil were generally favourable. The abundance of silt and clay (44%) indicates a high water holding capacity, but presents a potential limitation to drainage. Fine clay and silt can fill the spaces between the sand grains, blocking the pores and slowing drainage.

A neutral pH and low salt content provide good conditions for the establishment of vegetation. Nutrient levels were moderate within the topsoil. Additionally, the high percentage of silt and clay increases the capacity of the soil to hold nutrients. An abundance of grass and shrub cover on the surface indicates that the topsoil has a strong capacity to support vegetation.

Both M2 waste soil (Area 2) and M2 subsoil (Area 3) had similar characteristics. On average, the proportion of silt and clay in the fill material was high (37%), and similar to the topsoil will present a potential limitation to drainage. The alkalinity in some of the materials could present a challenge to non-resistant vegetative species, or species that favour acidic environments.

Nutrient levels were generally low to very low in the M2 waste soil, as typically associated with bush land sites. The establishment of thick grass cover on the fill material indicates that there is a capacity to support some species of vegetation. The wood, concrete and sandstone/siltstone inclusions may prevent the use of the M2 waste soil for more intensive landscaping purposes.

5.4 Limiting factors

The following limiting factors may affect the potential re-use of the M2 topsoil (Area 1):

- High silt and clay abundance potentially reducing permeability

The following limiting factors may affect potential re-use of the M2 waste soils (Area 2) and M2 subsoils (Area 1 & 3)

- High silt and clay abundance potentially reducing permeability
- Alkalinity in some materials
- Low nutrient levels
- Low capacity to retain nutrients
- Wood, concrete and sandstone/siltstone inclusions (*M2 waste soils only)*

5.5 Management strategies

Based on the limiting factors as outlined above, the M2 topsoils, M2 subsoils & M2 waste soils have some potential for use for establishment of native vegetation. Strategies to manage the material are outlined below.

M2 Topsoil (Area 1)

The effect of reduced permeability of the topsoil is dependent on the intended use. The high proportions of silt and clay will assist in retaining moisture and provide moderately wet soils throughout the year, which may provide suitable conditions for establishment of the STIF community. However, the material has an overall moderate drainage, and may suffer from pooling of water on the surface during heavy rain.

Mitigation strategies can be built into the inherent design, and include strategies such as:

- Preventative drainage: surface drainage is used to divert and prevent excess run-on from upslope from impacting a site. This can include installation of diversion ditches and swales to divert and conduct water around the site, or by a sloping design to prevent ponding of runoff.
- Curative drainage: this includes strategies such as buried drainage, vertical drainage, cellular drainage, and filters to reduce the accumulation of water in the soil profile.

Given theIf these options are not viable, the next step is to consider integrating imported soil with the existing topsoil. Importing sandy soil from offsite and mixing it with the topsoil material will increase the proportion of sand, and reduce the influence of the silt and clay fractions.

M2 waste soil (Area 3)

The M2 waste soils have several potentially limiting factors depending on the proposed landscaping purpose.

The alkalinity may present an issue for some plant species, and can reduce the availability of some nutrients. The addition of an ameliorant is not recommended, as lowering the pH of soils above 7.5 is considered difficult and impractical. As the alkalinity is limited to only some of the fill material, vegetation can be targeted to each area. Alkaline resistant species can be planted in moderately alkaline areas, and a wider variety of vegetation used in neutral zones. This would also provide natural variability in the establishment of vegetation.

Large inclusions such as wood, concrete and sandstone/siltstone present in Area 2 fill material should be removed if the material is to act as topsoil. This can be as simple as traversing the site and removing all obvious inclusions from the top 0.15 m of the profile. If the fill material is used as subsoil, the inclusions should not impact on the proposed use.

While the nutrient levels are considered as low, this is in line with the soils of the area and should not inhibit establishment of native bushland. The addition of fertilisers may help with initial vegetative growth, but is likely to encourage weed infestation.

M2 subsoil (Area 1 & Area 3)

Strategies for management of the M2 subsoils are the same as above for M2 waste soil, with the exception of the large inclusions of wood, concrete and plastics. As a result, these materials

require fewer management strategies, and if used as subsoil a thinner layer of topsoil would be required.

5.6 Recommendations

The M2 topsoil from Area 1 could be used as the top layer in a constructed soil profile for native bushland. The permeability of the topsoil along with significant proportions of silt and clay may provide the appropriate conditions for establishment of the STIF vegetation community. The other option is to implement management techniques (preventative or curative drainage), to increase the permeability of the topsoil. If a mitigated design is not possible, importing sand will improve the material properties.

Overall, the following methods are proposed for the M2 Topsoil:

- **Use existing site soil as is (method 1)**: Given the good qualities of the soil, it is generally suitable for use without amelioration or management strategies. While there is a risk of reduced permeability, the properties of the material could provide variation in the establishment of vegetation similar to the natural bushland.
- **Integrate imported soil with existing site soil (method 3)**: If the reduced permeability presents too great a risk to the establishment of native bushland, sandier soils could be imported and mixed to reduce the overall proportion of silt and clay.

The M2 waste soil from Area 2 has some potential for use for landscaping purposes, but is limited by its inherent properties. It has the capacity to sustain vegetation and could be used without adjustment for low rehabilitation with native vegetation without amelioration. However, large inclusions in the M2 waste soil may prohibit its use as a growth media. Additionally, the M2 waste soil could be used as a subsoil layer in a reconstructed profile.

Overall, the following methods are proposed for the M2 waste soil:

- **Use existing site soil as is (method 1)**: While the M2 waste soils have some limitations, their overall properties are sufficient for the establishment of the HESEW vegetation community. However, the inclusions (Area 2 fill material) may inhibit the use of equipment for revegetation, and provide a site safety issue.
- **Use existing site soils but import new soils for specific locations (method 4)**: By using the M2 waste soils in some areas and covering them with a suitable material in other areas, natural variation in vegetative communities will be encouraged. The inclusions would still need to be managed in areas where the fill material is exposed. Imported material could be either sandy or clay soils.
- **Import and install new topsoil, ameliorate subsoil or subgrade (method 5)**: The M2 waste soils are well suited for use as subsoil. Importing a new material to cover the material would mitigate its associated limitations. This would also prevent any deleterious effects from the wood, concrete and plastic inclusions.

For methods three to five, commercially supplied topsoil with low phosphorus content can be imported. The topsoil would provide both an unconsolidated physical cap on the top of the current material and a suitable growth media for native vegetation.

It must be noted that the outcomes of the preliminary site investigation indicate the presence of asbestos fibres in fill material within Area 2, with the potential for asbestos to be present in other locations. As a result, the fill material throughout the site may not be suitable for use in

landscaping. Confirmation of the risk will need to be confirmed prior to the adoption of method 1 3, and 4.

Based on the above, the final recommendations are as follows:

- Import 0.5 m of sandy soil to mix with the M2 topsoil to increase the drainage potential of the soil at **Area 1**.
- Place a 0.5 m layer of imported topsoil on top of the M2 waste soils (**Area 2**). Commercially supplied topsoil will contain beneficial properties to enable establishment of the HESEW and STIF vegetation communities.
- Import 0.5 m of a balanced sand/clay soils to place above the M2 subsoils (**Area 3**). A sand/clay mix will assist in retaining nutrients without decreasing drainage.
- Imported material (Areas 2 & 3) should be placed to a minimum of 0.5 m over all existing fill material to prevent exposure of asbestos as a precautionary method. This strategy is subject to change based on confirmation of the extent of asbestos exposure.

Yours sincerely

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Appendix J

Monitoring Plan

Monitoring Plan

Hills M2 Biolink Reserve

Macquarie Park



Document Control

Project Name

HILLS M2 BIOLINK RESERVE

		Date
Prepared by	Alastair Jones	29/2/2016
Reviewed by	Shane Norrish	29/2/2016
Approved by	Shane Norrish	29/2/2016

Revision date	**Amendment Description**
29/2/2016	Draft Version 1

Cover Photos: L-R; Table drain, Shrimptons Creek riparian vegetation, Industrial Creek bank erosion.

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1. Introduction

Through our partnership with Transurban, Landcare Australia has been requested to implement an innovative urban landcare initiative for a site adjoining the Hills M2 Motorway in Macquarie Park, NSW. As part of the Hills M2 Motorway Agreement, Transurban leases the site on the northern side of the M2 Motorway between Khartoum Road and Christies Road (**Figure 1**). The site has been significantly modified from its original condition and the central part of the site was recently occupied by a secure storage compound for plant and equipment used to upgrade M2 infrastructure. The site will be managed by Transurban until the lease agreement expires in 2048. Consistent with their significant commitment to sustainability and encouraging positive impacts with stakeholders and the environment, Transurban is seeking to rehabilitate approximately eight hectares of the leased site, substantially improving its ecological functionality and increasing community engagement. Roads and Maritime Services NSW is the owner of the site and will provide final approval for any rehabilitation works and improved ecological condition.

Figure 1 Transurban Cultural Biolink rehabilitation site adjoining the Hills M2 Motorway, Macquarie Park NSW

This Monitoring Plan (the 'Plan') outlines project goals, monitoring objectives and data collection methodology. The Plan outlines key steps to assess ecological recovery of the site.

2. Project goals and monitoring objectives

2.1. Project Target

The rehabilitation work will have a strong focus on establishing Sydney Turpentine-Ironbark Forest

(STIF), with the primary location on consolidated higher clay content fill deck area. Sydney Turpentine-Ironbark Forest is an endangered ecological community listed under the *Threatened Species Conservation Act 1995* (NSW). Once a widespread vegetation community, there is less than 0.5% of the original area of this species assemblage remaining intact. Characteristic tree species in the STIF community are *Syncarpia glomulifera, Eucalyptus globoidea, Eucalyptus resinifera, Eucalyptus paniculata, Angophora costata* and *Angophora floribunda*.

Sydney Turpentine–Ironbark Forest is an open-forest association occurring on moderately wet sites, with an annual rainfall of 800–1,100 mm per year, growing on clay soils derived from Wianamatta shale (DECC NSW, 2008)

2.1. Goals

The following goals describe the status of the target community the project is aiming to achieve and, broadly, how it will be achieved. Project goals include:

- Rehabilitate the Subject Property (approximately 5.4 ha) to improve the native bushland condition, ecological functionality and community engagement;
- Reduce current off-site impacts on adjoining properties, particularly Lane Cove National Park, through including actions for weed control, revegetation, vertebrate pest management, creek riparian zone stability and improvements to site drainage;
- Map weed density, identify vectors for spreading weeds between adjoining properties and identify priority areas for weed control within the M2 Biolink Reserve and in adjacent areas;
- Provide strategies and actions to facilitate an indigenous vegetation community that may include appropriate selected species of the STIF critically endangered ecological community;
- Guide interventions to mitigate impacts caused by past land uses, and then on-going management of the rehabilitated bushland to establish and then protect significantly improved conservation values;
- To establish and protect bushland, inclusive of a healthy groundcover stratum as a natural stabiliser of the soil surface;
- To improve water quality in Shrimptons and Industrial Creeks which drain the Subject Property; and
- To retain bushland in a size and configuration that will enable the existing plant and animal communities to survive in the long term and adapt to impacts of climate change through enhanced connectivity to a local and regional network of bushland.

2.2. Objectives

Objectives list the specific changes and outcomes required to meet the goals identified in Section 2.1. Objectives are divided based on ecosystem attributes identified in the *Draft National Standards for the practice of Ecological Restoration in Australia,* SERA Australasia, 2015. M2 Park Urban biolink site specific objectives are provided in Table 1.

Table 1 M2 Park Urban Biolink Objectives

Attribute Detail	Objective
Controlling Threats	Less than 5% cover of exotic plant species within 3 years
	Rabbit populations reduced to 0.5/ha on site within 2 years
Physical conditions	Concentration of contaminants entering Shrimpton's creek is reduced through the implementation of a stormwater infrastructure
	Soil quality appropriate for planting of STIF community (e.g. low phosphorous) at time of establishment
	Pollution entering Industrial creek reduced through implementation of trash rack
Species composition	Woody and herbaceous weeds reduced to <5% cover and represented by only benign species within 3 years
	>50% canopy cover of native trees within 5 years
	Number of native fauna species utilizing the site increased by 10% within 5 years
Community Structure	Characteristic diversity of native plant species from each stratum established and reflective of reference site
Ecosystem Function	Planted native species regenerating and producing seed
External Exchanges	Water quality has increased when discharged offsite via Shrimpton's creek into Lane Cove River.

3. Monitoring Framework

The M2 Park Monitoring Plan (the 'Plan') includes the collection of:

- Baseline data: Baseline assessments will be carried out before the commencement of work at the M2 Park site and at a suitable reference site in the Lane Cove National Park. This will provide data against which the restoration works can be assessed and evaluated.
- Photo point monitoring data
- Threat data
    - Assessment of weeds and weed mapping
    - Assessment of pest animal populations
- Physical Condition data
    - Condition assessment type and degree of threats that cause degradation, damage or destruction on the site and ways to mitigate these. This includes:
        - Soil quality
        - Creek bank stability
- Species Composition and community structure data
    - Flora and fauna assessment identifying the main ecological communities, component species native and non-native, and likely presence of any threatened species
    - Assessment of ecosystem function including logs, leaf litter, bare ground, presence and absence of other functional groups (e.g. fungi)
- Management Implementation data: captures key activities, weed and pest animal control techniques, plant survival and the regeneration method used on site.

4. Baseline data

4.1. Flora and fauna assessment

A baseline flora and fauna assessment was completed by UBM consultants in February 2016 (Ecological Investigations: Flora and fauna survey report). The subsequent report provides a list of native and non-native flora and fauna occurring at the site, a weed map, identification of threats likely to impact regeneration and a description of habitat characteristics.

A baseline assessment of a suitable reference site (nominally remnant STIF community at Macquarie University) will be completed using quadrat methodology. A 30 X 30 m quadrat will be established and the species (native, non-native), their height and cover will be recorded. Other ecosystem attributes including leaf litter cover, canopy cover, percent bare ground and presence/absence of logs, hollows will be recorded. This will form the reference ecosystem condition to which the M2 Park restoration will aim to achieve in the long-term.

4.2. Photopoint monitoring

A total of 11 photopoint sites were established by Landcare Australia staff on 19 January 2016 and their location mapped using a GPS. An additional 32 sites were established on 18 February.large number of sites will allow flexibility in monitoring change throughout the project.

To ensure high quality images a digital camera was set to between ISO200 and ISO400 and the image type selected to the largest JPEG setting. The camera was set to landscape selection to ensure the image is focused appropriately. Photopoint locations were chosen to capture projected changes in the landscape without needing to change position. Where possible the works will be located to the south of the photopoint sites to reduce the impact of light flare degradation of the photograph. The photo points were geo-referenced and the direction they were taken recorded in order to replicate in subsequent sampling periods.

At least two photographs looking in different directions were taken at each monitoring site. Images were downloaded as soon as possible and renamed to reflect the site name, project number, date and time and image number. The images are stored electronically and backed up on a separate server.

Results of baseline photopoint monitoring for the first suite of sites are provided in Appendix A .

Photopoint monitoring frequency

Timeframes for ongoing monitoring at photopoint locations established in the baseline assessment will be adaptive. For example, photos may be taken frequently during management works to capture before and after interventions. Photos will then extend to medium to long timeframes as management actions slow and the environmental response is captured. Adaptive timeframes will include:

- Short: before and after management actions (e.g. weed control);
- Medium: every 6-12 months when multiple management actions are undertaken; and
- Long: annual, when management actions complete and more subtle environmental changes are occurring.

5. Threat assessment

The key threats to regeneration of this site that require monitoring include:

- Weeds
- Pest animals (rabbits)
- Pollution
- Erosion

5.1. Weed monitoring

The UBM Vegetation Management Plan (VMP) provides a baseline weed distribution map for the site. During management interventions the map will be periodically updated to reflect removal of weed species and emergence of any new weedy species. Prior to conclusion of intervention works weed mapping will be periodically updated to track emergence of weeds and guide implementation of maintenance requirements.

Weed maps will be updated using GPS in the field. Emergent weed infestations will be recorded and their location mapped using ArcGIS software.

5.2. Pollution and Erosion Monitoring

Pollution, particularly along Shrimptons and Industrial creeks during high rainfall events will be monitored periodically by established photopoint sites.

5.3. Pest Animal Monitoring - Rabbits

The Rabbit Abundance Score developed by Cook, McPhee and Hart (2008) will be used to estimate the level of rabbit activity through the works site. Rabbit warrens as well as scratches and 'buck heaps' or latrines may be present. The abundance of rabbit faeces is the best estimate of their number. The following categories are used in scoring abundance (Cook,McPhee &Hart 2008):

0. None found in a 15 minute search
1. Isolated pellets and small clumps of 5-10 pellets 10 metres of more apart
2. Scattered pellets and clumps less than 10 metres apart
3. Common, pellets in larger clumps and occasional buck-heaps on about half the areas observed
4. Abundant, pellets often in large clumps and buck-heaps obvious but not present across whole area
5. Very abundant, pellets and buck-heaps always apparent

Rabbit warrens will be geo-referenced and mapped to track rabbit control activities.

5.3.1.Rabbit population density

The Rabbit Abundance Score is not a direct measure of abundance or population density. However, an approximate conversion is as follows:

Rabbit Abundance Score	Approximate Density (Adults/Ha)
0	0
1	0.5
2	1
3	2
4	5
5	10 or more

5.3.2.Rabbit Damage

Where seedlings are present it is possible to assess rabbit damage and quantitatively assess impact. Cook, McPhee and Hart (2008) developed a Rabbit Damage Score to provide evidence of rabbit dameg to seedlings less than 0.5 m high. Secateur like cuts through stems, defoliation and gnawing of bark are indications rabbits are actively feeding in an area. Rabbit damage is assessed using the following categories (Cook, Mcphee & Hart 2008):

0. No evidence of rabbit damage
1. Slight damage to some seedlings
2. Obvious damage but confined to some seedlings
3. Many seedlings moderately damaged
4. Heavy general damage, some seedlings retain foliage
5. Foliage, twigs and bark stripped from all seedlings

5.3.3.Rabbit corrected regeneration score

The seedling abundance score (see Section 5.3.4) and rabbit damage scores are used in the below matrix to determine the corrected regeneration score for rabbits. The corrected regeneration score is then used to assess overall rabbit impact in the area.

Seedling abundance	0	1	2	3	4	5
Rabbit damage						
0	0.20	1.00	2.00	3.00	4.00	5.00
1	0.20	0.5	1.00	1.50	2.00	2.50
2	0.20	0.34	0.70	1.00	1.30	1.70
3	0.20	0.28	0.50	0.80	1.00	1.30
4	0.20	0.20	0.40	0.60	0.80	1.00
5	0.20	0.20	0.30	0.50	0.70	0.80

Figure 2. Matrix to determine corrected regeneration score using Seedling Abundance and Rabbit Damage scores. Source: Cook, McPhee and Hart (2008)

The overall rabbit impact is determined using the corrected regeneration score and the rabbit damage score and gives a management recommendation for the site.

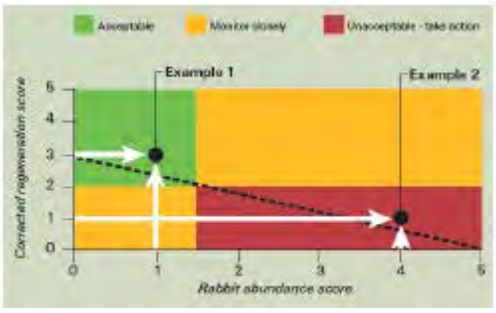


Figure 3. Assessing overall rabbit impact. Source: Cook, McPhee and Hart (2008). Example 1: Corrected Regeneration Score of 3 and rabbit abundance score of 1. Example 2: Corrected regeneration score of 1 and rabbit abundance score of 4.

5.3.4.Seedlings and damage thresholds

Record the vegetation condition within each transect, this is used to record any incidence of pest, disease or environmental constraints that might be affecting vegetation. The following categories are used:

0. No damage
1. Minor visual damage/discolouration to leaves
2. Significant loss of leaf material
3. Plant structural damage
4. Death

The Seedling Abundance Score (Cook, McPhee & Hart 2008) will be used to estimate the number of seedlings and shrubs that are present at the site that have resulted from natural regeneration. The presence of seedlings is a measure of the health of the vegetation community. The following categories are used:

0. None found during 15 minute search
1. Very few, only 1-5 individual seedlings encountered
2. Uncommon, 6-20 seedlings encountered
3. Common, 20-100 seedlings encountered
4. Abundant, 100-200 seedlings encountered
5. Very abundant, many hundreds of seedlings encountered

5.4. Pest invertebrates

To assess for evidence of pest invertebrates (particularly snails) assess physical signs. Inspecting plants and seedling for actual evidence can be completed by looking at individual plants. Signs of invertebrate activity can be identified on the bases of seedling and tree health in terms of foliage cover and dieback.

The following points can be used to determine the presence of pest insects at the project site:

0. No evidence found in a 15 minute search – Nil
1. Some physical sightings and slight evidence of foliage cover loss and dieback – Medium
2. Physical sightings and high levels of evidence of foliage cover loss and dieback – High
3. Abundant physical sightings, low foliage cover and many dead plants – Very High

6. Physical Condition Data

6.1. Erosion and assessing effectiveness of stormwater interventions

Established photo monitoring points will track erosion over time pre, during and post intervention.

To assess the success of bioretention facility and retention dam chute realignment gross pollutant traps will be installed in both directions of the new weir at the head of swale. Accumulation of material would be monitored after high rainfall events to determine flow of water. This will act as a proxy determinant to ascertain whether hydrocarbons from the road are discharging into the retention dam or directly into the creek.

7. Species Composition and community structure data

Upon completion of intervention works annual flora and fauna assessments will be completed to determine progress on achieving objectives. This will be completed by:

- Establishing permanent marked and GPS quadrats, 30 m X 30 m on the site. Within each quadrat component species native and non-native, and likely presence of any threatened species will be identified. In addition assessment of ecosystem function including logs, leaf litter, bare ground, presence and absence of other functional groups (e.g. fungi)
- The Reference site will also continue to be monitored using the same methodology to track the M2 park site progress
- Diurnal Fauna assessments will be completed at the same time as vegetation assessments and species recorded via visual assessment.

8. Management implementation data

Implementation attributes will record details about the specifications used to complete the works at the site. This methodology identifies data about regeneration establishment including details on row spacings, seed treatment, equipment usage, seed rates, site preparation and pest plant and animal control.

8.1. Species selection

For the target vegetation community the botanical composition, species name, provenance, seed lot and growth form will be recorded. The planting density (stems/ha) and required spacing for plantings will also be recorded.

8.2. Regeneration methodology

All techniques for restoration, their timing and equipment used will be recorded including:

Site preparation

- Herbicide application (type used, volume used);
- Soil preparation (e.g. scalping);
- Pest animal control techniques (e.g. rabbit baiting);
- Mapping of areas baited/poisoned; and
- Start and finish dates of control actions will be recorded.

Seeding/regeneration

- Natural regeneration: List the species to be retained on site and those most likely to establish;
- Record proportion planted of each species and their density;
- Source of seed for tubestock planting; and
- Continue photopoint monitoring of works throughout implementation phase.

8.3. Planting survival

Monitoring revegetation will be completed via:

- Survival rates, measured by seedling counts;
- Photopoint monitoring sites.

To measure survival at the project site where tubestock has been used, a sample number of each species planted will be recorded along established transects. The number of plants of each species that are surviving will be counted and, divided by the number of plants established of that species and multiplied by 100 to express as % survival. Monitoring for survival will be completed at one, three and 10 months after planting.

$$\% \text{ survival} = \frac{\text{number of remaining plants}}{\text{number of plants established}} \times 100$$

8.4. Other

Additional factors that might impact monitoring and management should be recorded. For example:

- Factors affecting the adequacy of the record—such as whether access or vision was limited, or the method used to estimate revegetation;
- Significant events/climatic conditions that might have affected the revegetation site; and
- In the event of revegetation failure, the possible reasons for such failure.

9. Monitoring frequency

The frequency of monitoring will be adequate to detect changes in ecosystem attributes, with greater frequency during the funding programme to estimate plant establishment density and manage threats to the revegetation. Monitoring will also be timed to reflect the impact of events that might influence the vegetation (Atyeo & Thackway 2009), such as pest damage. The site will be monitored multiple times in the first two years post intervention and will become less frequent as vegetation becomes established.

The site conditions and revegetation works will be monitored informally and formally.

Informal monitoring will occur whenever project partners are on site, identifying pests and other threats to revegetation works. Informal monitoring results will be communicated to the Programme Manager to review and implement an appropriate strategy. This may include a site validation and formal monitoring assessment, scheduling or re-scheduling of control works, or no action necessary.

Three, six, nine, 12 and 18 month site assessments

Formal monitoring will occur at a minimum of three, six, nine, 12 and 18 month intervals. This will determine establishment rates and where replacement works are required. These visits will also confirm threat thresholds and required additional management (e.g. pest and weed control).

Pests will be monitored pre-intervention and then at regular intervals after control methods have been applied.

Annual monitoring (2-4 years post intervention)

Two years after planting, monitoring will extend to an annual period and assess the vegetation condition and survival rates of revegetation works.

Long term monitoring (>5 years post intervention)

Many indicators of biodiversity function will not become evident in a site that has undergone revegetation works until at least 5 to 10 years post intervention (Atyeo & Thackway 2009). Vegetation condition and community structure may be monitored annually during this period.

10. Data management

As the revegetation is expected to take 3-5 years to become self-sustaining monitoring changes requires robust data management. Data management will include data integrity, data security and maintaining metadata.

10.1. Data integrity

Data entered into data sheets in the field will be double checked whilst on site. Fieldsheet data will be entered into an Excel spreadsheet as soon as possible after collection (same day or week preferably), while the information is still fresh. The data entered into spreadsheets will be checked for errors by a second staff member with knowledge of the project.

10.2. Data security

At least one backup copy of the data on a suitable long-lasting medium will be created. The original field sheets and a backup copy of the data will be stored in a secure and well-maintained filing system. For additional security, a second back-up copy of the data will be stored at another location.

10.3. Maintaining metadata

Keep a description of the data and methodology used to collect the data with the field sheets and the backup data. Keep a written record of where the data are stored, the format and the names of relevant computer files with the fieldsheets and backup data.

11. Assessment of Recovery

To track progress towards project goals over time, SER Australasia standards recommend a 5-star tool to progressively assess and rank degree of recovery over time. Five-star recovery is the ultimate aim for ecological restoration projects. However, given the location of the site and influences from outside the site boundary (e.g. water quality inputs, introduction of weed seed during flood events) full recovery of some ecosystem functions is unlikely. Full recovery of some attributes (e.g. ecosystem function) can take sufficient time as vegetation maturation and successional processes take long time periods to conclude. This tool is summarised in Table 2 and project specific goals, relative to the six attributes of ecological restoration is provided in Table 3. As recovery is achieved over time segments of the project assessment (Figure 4) can be shaded for each metric after formal or informal evaluation as detailed in Sections 4-8.

Table 2 Summary of standards for 1-5 recovery levels for M2 Park Biolink. (Note each level is cumulative and attributes will progress at different rates).

Number of Stars	**Recovery outcome** (modeled on a reference ecosystem)
1	Ongoing deterioration prevented. Substrates contain appropriate chemical composition for restoration of vegetation community. Some indigenous biota present. Future improvements of all attributes planned and future site management secured
2	Site has a small subset of characteristic indigenous species and there is little if any threat from undesirable species. Improved connectivity established with Land Cove National Park
3	Threats being managed or mitigated. A subset of characteristic indigenous species is established. Improved connectivity commencing.
4	A substantial subset of characteristic biota present (representing all species groupings) providing evidence of a developing community structure. Improved connectivity established and threats managed or mitigated
5	Establishment of a characteristic assemblage of biota to a point where structural complexity is likely to develop with minimal intervention. Appropriate ecosystem exchanges are enabled to allow for recruitment. Long term management arrangements in place.

Table 3 M2 Park Biolink Reserve Recovery Scale (Note: the 5-star scale represents a gradient from very low to very high similarity to the reference ecosystem)

Attribute	**1-Star**	**2-Stars**	**3 - stars**	**4-Stars**	**5-Stars**
Absence of threats	Further deterioration discontinued and security arranged for site	Threats starting to be managed or mitigated. Site management secured	On-site threats being managed or mitigated	On-site threats being managed or mitigated. Off-site inputs managed or mitigated	All threats being managed or mitigated to a high extent
Physical conditions	Physical and chemical problems remediated and substrate stabilized	Substrate properties within natural range for planting of STIF community	Substrate maintaining natural range and supporting indigenous vegetation	Substrate supporting growth of characteristic indigenous vegetation and niches suitable for recruitment	Substrate exhibiting natural characteristics and supporting species highly similar to that of the reference ecosystem
Species composition	<5% of indigenous species present on site. Significant threat from exotic invasive or undesirable species	Small subset of characteristic indigenous species establishing (~10%). Low threat from invasive or undesirable species	Subset of key indigenous species (~25%) establishing over substantial proportions of the site, with low threat from undesirable species.	Intermediate diversity of characteristic biota (~60%) present on site representing a diversity of species groups. No inhibition by undesirable species	High diversity of characteristic species (~80%) across the site with high similarity to reference ecosystem.
Community Structure	Very low structural complexity relative to reference	Low structural complexity	Medium structural complexity compared to reference site	Community structure is developing including different	All vegetation strata are established and native fauna from different

	ecosystem			successional phases	functional groups are utilizing the site
Ecosystem Function	Substrates and hydrology modified to reflect reference ecosystem	Increased potential for a wider range of functions including habitat provision and resources for native species	Low level functions showing evidence of commencing e.g. provision of habitat	Substantial evidence of key processes commencing including recruitment	Complexity of functions and processes increasing
External Exchanges	Potential for exchanges with surrounding landscape identified	Potential exchanges with surrounding landscape arranged through determination of stormwater improvements	Improved linkages established with surrounding landscape commencing through creek remediation works	Appropriate connectivity with natural areas (Lane Cove national park and river) established to extent practicable.	Potential flows for water optimized and managed as appropriate. Long term management arrangements are in place and operative

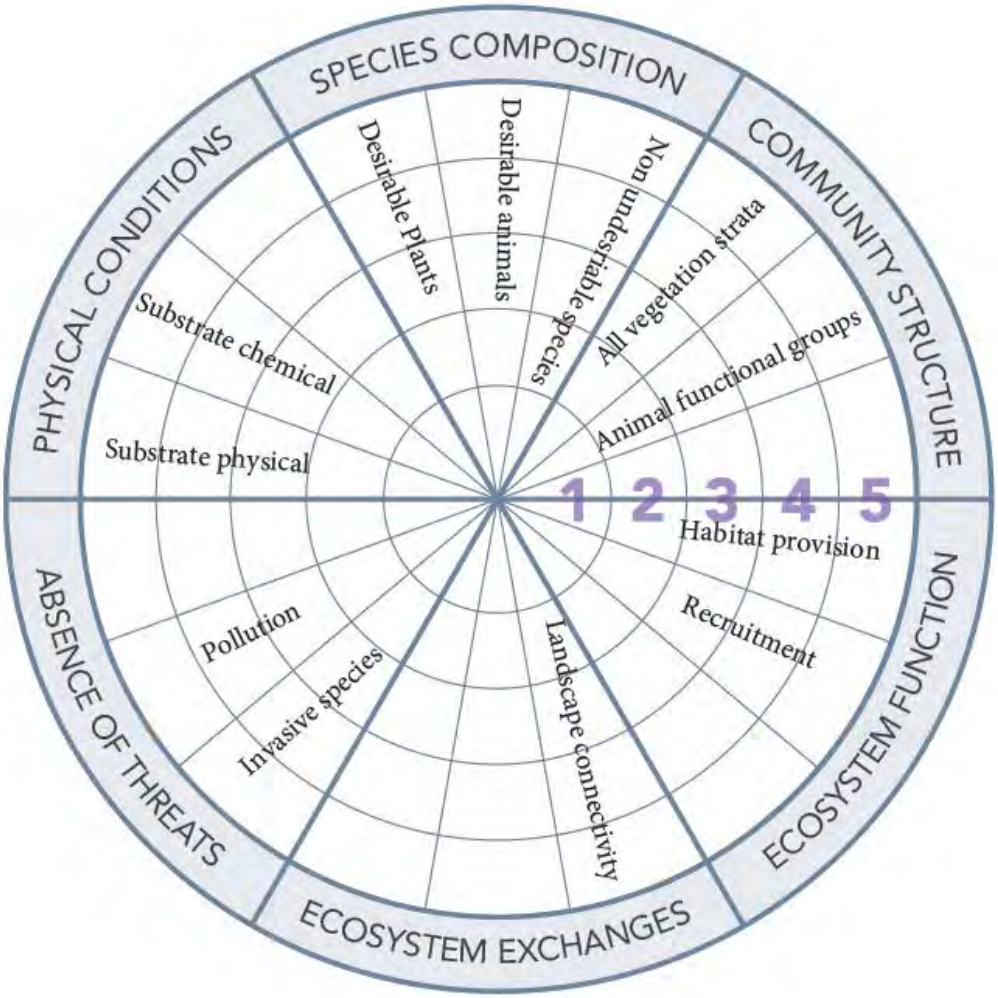


Figure 4. Progress assessment template for M2 Park Biolink (Note: areas can be shaded to visually track progress to project outcomes)

12. References

Atyeo C & Thackway R 2009, *A Field Manual for Describing and Mapping Revegetation*

Activities in Australia, Bureau of Rural Sciences, Canberra

Cooke B, McPhee S and Hart Q (2008). *Rabbits: A Threat to Conservation and Natural Resource Management.* Bureau of Rural Sciences, Canberra

Department of Environment and Climate Change (DECC), NSW, 2008. *Best Practice Guidelines – Sydney Turpentine Forest*. Available online at http://www.environment.nsw.gov.au/resources/threatenedspecies/08528tsdssydturpironforestbpg.pdf

Soceity for Ecological Restoration Australasia (2015). *National Standards for the Practice of Ecological Restoration in Australia* - DRAFT

Vivian-Smith, G., Connell, M., Cupitt, S., & Donatiu, P. (2001) *Tracking your community vegetation project* Greening Australia Queensland, Brisbane, QLD.

Appendix A Photopoint Monitoring Baseline Data

Site ID Number	Date	Time	Coordinates	Camera Image Number	Direction	Notes	Image HTML Link
1	19/01/2016	1:55	33 46.572 S 151 07.625 E	2357	154 SE	Industrial creek	http://s11.postimg.org/li2kqsjgz/DSC02357.jpg
2	19/01/2016	2:15	33 46.571 S 151 07.620 E	2358	174 S	Industrial creek	http://s15.postimg.org/db62weg4r/DSC02358.jpg
				2359	248 W		http://s15.postimg.org/ennryadkb/DSC02359.jpg
3	19/01/2016	2:40	33 46.430 S 151 07.366 E	2360	316 NW	Shrimptons Creek	http://s24.postimg.org/5f5odvfn9/DSC02360.jpg
				2361	35 NE		http://s15.postimg.org/afszpjc4r/DSC02361.jpg
4	19/01/2016	2:47	33 46.398 S, 151 07.374 E	2362	191 S		http://s30.postimg.org/68v728j1d/DSC02362.jpg
				2363	295 NW		http://s30.postimg.org/tod47l2sh/DSC02363.jpg
5	19/01/2016	3:02	33 46.425 S 151 07.408 E	2364	274 W	Adjacent retention dam	http://s30.postimg.org/f2m3jc601/DSC02364.jpg
6	19/01/2016	3:05	33 46.449 S 151 07.397 E	2365	27 NE	Top of hill looking south toward retention dam	http://s30.postimg.org/oklujdroh/DSC02365.jpg
7	19/01/2016	3:09	33 46.453 S 151 07.407 E	2366	132 SE	Adjacent M2 road boundary	http://s30.postimg.org/lwwe90yn5/DSC02366.jpg
8	19/01/2016	3:15	33 46.477 S, 151 07.461 E	2367	284 W	Middle of Site	http://s30.postimg.org/rsqbwfdy9/DSC02367.jpg
				2368	139 SE		http://s30.postimg.org/8inwqqhcx/DSC02368.jpg
9	19/01/2016	3:21	33 46.495 S, 151 07.505 E	2369	162 S	Eastern section of site	http://s30.postimg.org/d5tysi4pt/DSC02369.jpg
				2370	227 SW		http://s30.postimg.org/ad0r8h4dd/DSC02370.jpg

				2371	299 NW		http://s30.postimg.org/o7z1qxysh/DSC02371.jpg
10	19/01/2016	3:30	33 46.475 S, 151 07.510 E	2372	345 N	Adjacent N boundary fence	http://s30.postimg.org/ftjf2uxr5/DSC02372.jpg
				2373	102 E		http://s30.postimg.org/f2qox2vdt/DSC02373.jpg
11	19/01/2016	3:47	33 46.556 S, 151 07.574 E	2374	348 N	Adjacent brick housing unit block	http://s30.postimg.org/kuqt4857l/DSC02374.jpg
				2375	102 E		http://s30.postimg.org/822p4atlt/DSC02375.jpg

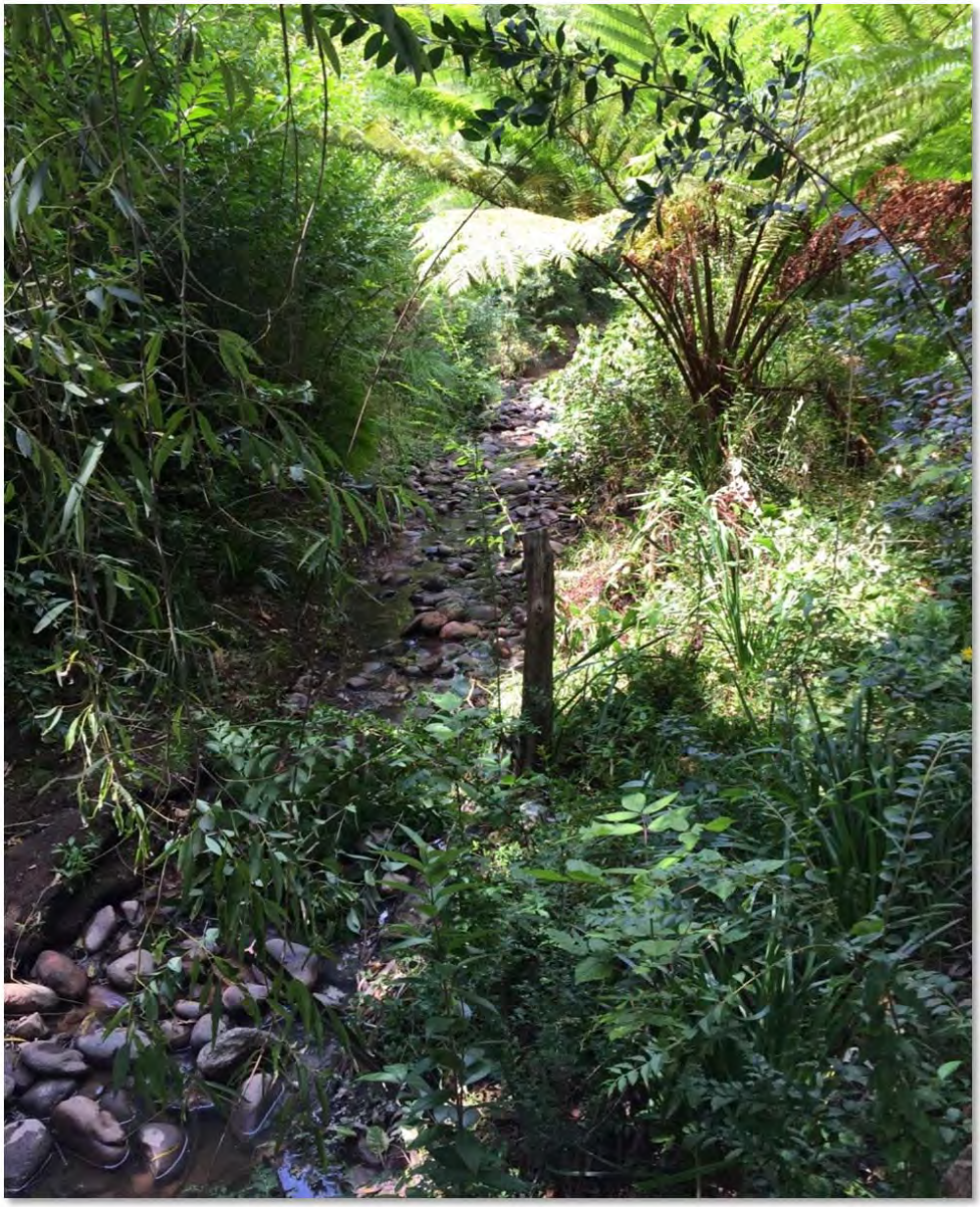
Figure 5. Photo monitoring baseline data. Site visit completed on the 19 January 2016

Appendix K

Communications and Stakeholder Engagement Plan

M2 Macquarie Park Site Rehabilitation and Artwork Installation

Communication and Stakeholder Engagement Plan for the M2 Macquarie Park Motorscapes Project



Contents

Introduction and context

Purpose

This Community and Stakeholder Engagement Plan has been developed for the rehabilitation of Hills M2 Motorway land between Khartoum road and Christie road (the site) as well as an art installation in Macquarie Park in Sydney's Northwest.

This plan describes the communication and consultation approach and activities for the project and outlines how key stakeholders and the community will be informed prior to and during the project.

Project background

The intention is to undertake bush rehabilitation and provide a public art installation at the site situated to the north of the Hills M2 Motorway between Khartoum road to the east and Christie road to the west.

For the proposed rehabilitation work, new self-supporting ecological communities will be created at the site that complement the communities within Lane Cove National Park immediately to the north of the site and provide an ecological 'buffer' to the site.

In addition, the waterways to the east and west of the site - Industrial and Shrimptons Creek respectively - are to be enhanced with a view to improving the quality of surface water draining into the National Park.

The project will provide a permanent ecological legacy and the rehabilitation efforts will be maintained over the remaining duration of the deed to ensure that the value of the legacy is not diminished.

In addition to, and complementing, the rehabilitation work, a public artwork will be installed roughly midway along the site's east-west alignment and situated towards the southern portion of the site. The form and execution of this artwork has been determined via a public 'ideas competition' and is of a scale that allows motorists to appreciate it within a very short time period as they drive past from either an eastbound or westbound direction. The detailed design and construction of the installation will take into account a range of considerations to ensure that the artistic merit is maximized and the adverse visual and environmental impacts are minimized.

Both the rehabilitation activity and art installation are subject to RMS approval.

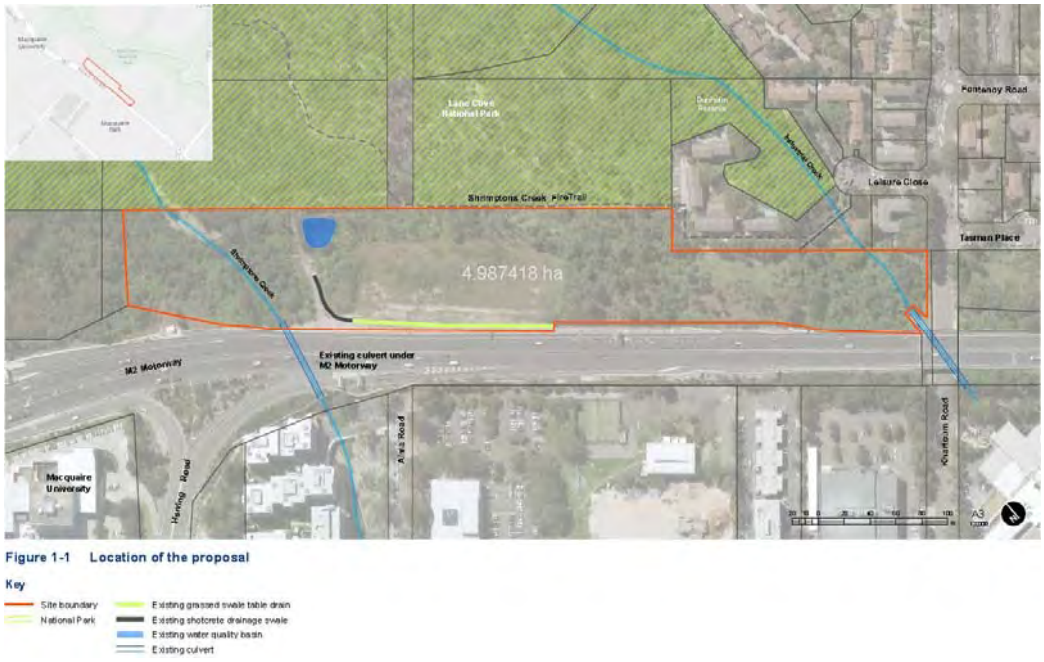
It is expected that substantial progress will be achieved with the rehabilitation works by the end of calendar 2016 (see Appendix B) and the artwork would be installed by mid-2017.

Project area profile

The project is located in the Ryde local government area (LGA), the Ryde electorate and within the suburb of Macquarie Park in Sydney's North-west.

The Site borders the Hills M2 Motorway to the south, Lane Cove National Park to the north, a medium density residential area accessed via Leisure Close and bushland reserve to the east and bushland and playing fields to the west. As shown in the figure, the site is within close proximity to Macquarie Park Shopping Centre, Macquarie University, various business premises and a serviced apartment complex. These land uses occur on the southern side of the motorway.

Figure 1 – Site Location



Two watercourses occur on the site. Towards the western end, Shrimpton's Creek flows under the Hills M2 motorway via a large culvert arch and drains in a northerly direction to the Lane Cove River. Industrial Creek is close to the eastern boundary of the site and also flows onto Lane Cove River. Both creeks have heavily urbanized catchments and the water quality reflects this.

The site has been significantly modified from its original condition and the central part of the site (around 1ha in area) was most recently used as a storage compound and spoil management area as a part of the Hills M2 Upgrade which concluded in 2013. This portion of the site contains a stable flat 'deck' of compacted fill (sandstone rubble, clay and spoil) that does support some vegetation.

Overall, the site has been significantly disturbed and is in very poor ecological and aesthetic condition. Small remnants of native vegetation remain but are badly degraded. The majority of the site is dominated by exotic weed species. Creekside vegetation is also in very poor condition.

Project timeline

Subject to planning approvals, the first phase of the project entails the bush rehabilitation work and is scheduled to start in July 2016. This work will encompass site establishment, weed clearing, creek improvements, revegetation and will take place over approximately 9 months (until early 2017), with ongoing maintenance and monitoring to continue until mid-2019. In addition, the artwork will be fabricated off site, with a scheduled installation date of June 2017.

Communication and engagement

Both elements of the project – the regeneration and artwork - will generate interest among a wide range of stakeholders including Lane Cove National Park and the surrounding community.

The nature of public art is polarising, such that opinions may vary greatly, we will implement robust engagement tools and techniques to inform and educate the community about the project.

The engagement process will focus on key stakeholders particularly visually impacted residents in close proximity to the site and be supported by regular communication through a variety of channels such as letter, print advertisements, website and information sessions. Broader stakeholders will be communicated with and kept informed via channels such as the Hills M2 website and other methods identified in the *Engagement tools and techniques* section of this plan.

Objectives

- To build strong support for and understanding of the project with a view to enhance the quality of natural vegetation in the site.
- To inform and build key stakeholders' (including road users) understanding of the project throughout the duration of the project.
- To identify any reasonable issues that key stakeholders may have in relation to the project and seek to resolve these if possible.
- To provide regular and clear communication to support engagement and ongoing awareness of the project.

- To ensure that community and stakeholder enquiries about the project are effectively managed and resolved.
- To ensure that project information is distributed in an effective and timely manner.
- To capture lessons for application to future similar projects.

Stakeholder analysis

Table 1 below identifies stakeholders that have an interest in the project. These stakeholders may either be impacted by the project or may influence or become advocates for the project.

Table 1 – Stakeholder Management

Stakeholder Group	Stakeholder	Involvement	Proposed communication activities
RMS	Motorway Management and media	Keep informed	Face to face briefing
Elected government representatives	The Hon. Victor Dominello MP	Good news story for the electorate	Face to face briefing
Federal Government	John Alexander	Keep informed	Stakeholder letter
State Government	The Hon. Duncan Gay MP	Good news story Prevent customer backlash	RMS CEO briefings-updates via RMS
Lane Cove National Park	Michele Cooper	Keep informed	Face to face briefing
Department of Primary Industries	Fisheries	Works Notification	Email notification of works prior to commencement
Local Government	Ward councilors	Keep informed	Stakeholder letter
Emergency services	SES, Police	Dealt with via project manager	Email advice for lane closures
Visually impacted residents	Local residents	Keep informed	Community Information Session Information letters and website Open lines of communication
Local business	Meriton and Macquarie University	Keep informed	Information letters and website
Road users	Customers	Keep informed	Website
Interest groups	Friends of Lane Cove National Park, Lane Cove National Park	Keep informed	Information letters Community Information Session
Wider community		Keep informed	Website, press and

			media release Community Information Session

Identified issues

The impact of construction works on stakeholders and the community is anticipated to be minor; given work will generally occur during standard construction hours.

Table 2 below is a summary of identified issues and the strategies to manage these.

Table 2 – Issues Management

Issue	Management Strategy
Noise: caused by site establishment works, weed clearing and mulching activities	- turning off equipment and vehicles when not in use - where possible, direct noise generating equipment away from homes - effective and timely response to complaints and enquiries - ensure residents are informed of night works 5 days prior
Dust: caused by site establishment works, mulching and spreading of top soil	- Use of water to suppress dust - effective and timely response to complaints and enquiries
Visual Impact: 9 individual artwork sculptures will be installed on site from 2-11 metres in height that will be visible from the motorway and surrounding properties	- Visually impacted residents will be contacted directly by mail and open lines of communication will be established via phone, email and a website. - Community Update to be distributed to local residents, local businesses and key stakeholders to inform about the project and the artwork. - Ongoing construction updates to be distributed throughout the project to local residents, local businesses and key stakeholders. These updates will reinforce key messages, including an artist's impression of the artwork and what to expect upon project completion. - Print advertisements will be run prior to artwork installation to further inform the community. - A 'drop-in' community information session held locally for community members to discuss project with project team, including the artwork design and its meaning. - Dedicated website developed to include images, artwork explanation, artwork selection criteria etc. - Enquiries email address created to be managed by a Transurban Public Affairs representative as a point of contact for the community in the event they would like to raise questions or concerns about the project and the artwork. - Media to be generated upon project completion to raise awareness about the project and the artwork.

Key messages

Key messages will be developed and updated as the project progresses to ensure consistency across all communication and engagement activities. Project team members should be aware of the key messages to ensure consistent information is shared with communities and stakeholders.

- Transurban is committed to taking a sustainable approach to all our operations, projects and business practices to create the best outcomes for our government clients and the communities we serve.
- Our sustainability strategy underpins our corporate strategy and reinforces Transurban's vision "to strengthen communities through transport."
- One of the ways we aim to 'be good neighbours' is by investing in communities where we operate our road networks with a project such as this.
- 'Thinking long term' is one of our three sustainability pillars, the rehabilitated site will create healthy functioning eco-systems and enhance quality of water flow into Lane Cove river providing long-term environmental benefits.
- Here in NSW, we are excited to follow the successful model used in Melbourne to incorporate a public artwork installation on site. We expect that this installation will be well supported through the Sydney art community.
- The overall project will enhance the visual diversity of the area.
- Rehabilitation of the site will be designed in conjunction with Landcare Australia.
- We anticipate the project to start in mid-2016 and be completed by mid-2017.
- Once the project is complete, it will make a positive contribution to visual landscape and the community.

Communication approach

Our communication approach for the project will focus on establishing open lines of communication with the community, specifically visually impacted residents. Further, construction updates and notifications will be regularly distributed to inform the community of progress and delivery of the project. We want to establish relationships and maintain regular communication, information and interface with key stakeholder groups.

Engagement tools and techniques

- Visually impacted residents will receive targeted correspondence, including relevant work notifications, construction updates and an invitation to a community information session. On all pieces of collateral, 'contact us' information will be clearly defined so visually impacted residents can reach the project team at any time through a variety of communication channels such as email, post, phone and website.

- An 'enquiries' email address to be created and managed by Transurban

- Community updates and construction notifications for nearby residents, businesses and stakeholders
- Meetings and briefings for stakeholders, businesses and residents (as required)
- Print advertisements in local newspapers
- One ‘drop-in’ community information session held locally for community members to discuss project with project team
- Site inductions, training and tool box sessions
- Project updates on websites, including the formation of a dedicated project page (Transurban, Roam Express and Landcare Australia)
- Consultation Management database
- Site signage

Communication protocols

Contacts management

Transurban will establish and maintain a register of all electronic, written and verbal contact concerning the proposal and any work, monitor responses to community within an agreed timeframe and provide a record of correspondence received by the project team.

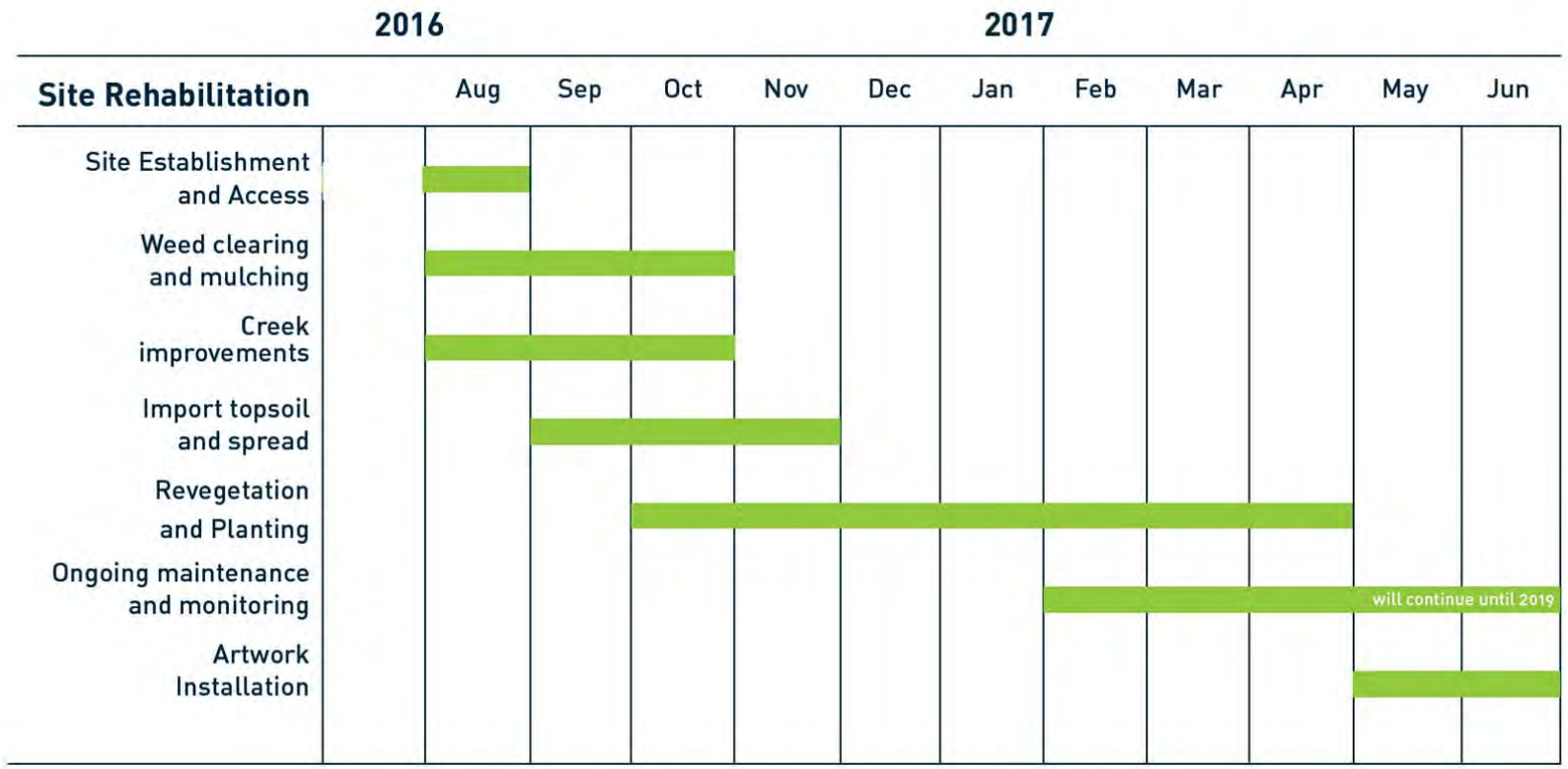
Issues resolution

The Transurban Public Affairs team will expeditiously address and seek the early resolution of all complaints and claims by members of the community in relation to the project. The team will manage dispute resolution mechanisms and procedures to enable the prompt resolution of any issues.

Appendix A: Communications timeline

Project Milestone	Communications activities	Audience	Timing	Responsibility	Status
Ideas Competition Launch	Media release Stakeholder letter Website update Email blasts Briefings	Art community Participants Stakeholders	September 2015	Transurban with external resourcing	Complete
Winners of Ideas Competition Announced	Media release Stakeholder letter Website update Email blasts Briefings Awards event	Art community Participants Stakeholders	December 2015	Transurban with external resourcing	Complete
Project REF submitted to RMS for approval			May 2015	Transurban	Complete
Project REF approved	Stakeholder briefings Brochure – overview of project Website update Media release Doorknock	Residents Stakeholders Internal comms	July 2016	Transurban	
Site preparation works start	Letter advising works start Website update	Residents Motorists	August 2016	Transurban with assistance from Landcare Australia	
Rehabilitation works	Bi-monthly construction updates Works notifications Website update Stakeholder briefing	Residents Motorists Stakeholders	August 2016 – April 2017	Transurban with assistance from Landcare Australia	
Community Information Session	One ‘drop-in’ community information session held locally for community members to discuss project with team	Visually impacted residents Stakeholders Project Team Other community members	Mar – April 2017 (Date TBC)	Transurban with assistance from artwork design and construction contractor	
Art Installation complete	Information letter Website update	Residents Stakeholders	May 2017	Transurban	
Project Complete	Post card Timelapse footage	Resident Stakeholders Media	May 2017	Transurban	
Opening Launch	Media release Website update	VIPs, RMS Media, Key stakeholders	June 2017	Transurban	

Appendix B: Program of works



Appendix L

PACHCI Clearance Letter

Transport
Roads & Maritime
Services

30/06/2016

Lyndall Thornhill
Environment Officer
27-31 Argyle Street
Parramatta NSW 2150

Dear Lyndall

Re: Preliminary assessment results for the M2 Macquarie Park Motorscapes Project proposal based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation* (the procedure).

The project, as described in the Stage 1 assessment checklist, was assessed as being unlikely to have an impact on Aboriginal cultural heritage. The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate any known Aboriginal objects or places in the immediate study area.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Roads and Maritime Services' procedure.
- There will be no removal of mature trees in the study area.
- The compound site will be in a previously disturbed area.
- The works being undertaken are within the disturbed zone of the RMS road corridor.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If the scope of your project changes, you must contact me to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Roads and Maritime Services' *Unexpected Archaeological Finds Procedure.*

For further assistance in this matter do not hesitate to contact me.

Yours sincerely

Jeff Nelson
Aboriginal Cultural Heritage Officer (ACHO) – Sydney Region