Woomera Hanger 5

Environmental Baseline Measurements

Document No. | 706815_01_Rev01

December 2018

684331

CSIRO – Woomera Site Measurements

Project No:	706815
Document Title:	Environmental Baseline Measurements at Hanger 5
Document No.:	706815_01_Rev01
Revision:	Revision 01 - Revised Draft for Client Review
Date:	December 2018
Client Name:	Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Client No:	684331
File Name:	*\\SYDFPP03\es\Projects\706815 - Woomera Site Measurements for CSIRO\D4-Deliverables\Environmental Baseline Measurements*

CH2M HILL Australia Pty Ltd (On December 15, 2017, CH2M HILL Companies Ltd. and its subsidiaries, including CH2M HILL Australia Pty. Ltd., became part of Jacobs Engineering Group Inc. [Jacobs])

177 Pacific Highway1999 Bryan Street, Suite 1200
Dallas, Texas 75201
United States
T +1.214.638.0145 9928 2100
www.jacobs.com

Contents

Tables

Appendices

Figures -Appendix A

Acronyms and Abbreviations

µSv/hr	Micro-Sieverts per Hour
ANSTO	Australian Nuclear Science and Technology Organisation
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AS	Australian Standard
As	Arsenic
B(a)P	Benzo(a)pyrene
B(a)P TEQ	Benzo(a)pyrene Toxicity Equivalent Quotient
Bq	Becquerel
Bq/kg	Becquerel per kilogram
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
BTEXN	BTEX and Naphthalene
Cd	Cadmium
CoC	Chain of Custody
Cr	Chromium
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cu	Copper
EPA	Environment Protect Authority
GPS	Global Positional System
H5	Hanger 5
HIL	Health Investigation Level
HSL	Health Screening Level
Hg	Mercury
IAEA	International Atomic Energy Agency
LOR	Limit of Reporting
m	Metre
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
mm	Millimetres
NATA	National Association of Testing Authorities
NEMP	National Environmental Management Plan
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
Ni	Nickel
Pb	Lead
PAH	Polycyclic Aromatic Hydrocarbons
CoPC	Contaminants of Potential Concern
PCSM	Preliminary Conceptual Site Model

PEF	Potency Equivalence Factor
SWMS	Safe Work Method Statement
Th	Thorium
TRH	total recoverable hydrocarbons
U	Uranium
UCL	Upper Confidence Limit
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
WPA	Woomera Prohibited Area

Executive Summary

CH2M HILL Australia Pty Ltd (Jacobs) was commissioned by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to prepare an environmental baseline survey around the radioactive waste store located in the Annex to Hanger 5, Evetts Field, Woomera Prohibited Area (WPA), South Australia. CH2M was acquired globally by Jacobs in December 2017 and in this report CH2M will be referred to as Jacobs.

The store (the Annex) has been used to store radiologically contaminated soil that was discovered at the former CSIRO and Aeronautical Research Laboratory at Fishermans Bend in Victoria. The soil had been contaminated with residues from uranium and thorium extraction processes

This report is to be incorporated in a compendium of baseline reports collated by CSIRO. This portion of the environmental baseline survey is mainly focused on soil sampling. The objectives of this report include:

- Documentation of the existing soil's radiological and chemical nature surrounding the Annex
- Provision of data suitable for a baseline monitoring study, as required by the International Atomic Energy Agency's safety standards
- Investigation of a thin, stained layer of soil underlying the bitumen surrounding the Annex, to determine if this layer was contaminated due to historic soil stabilisation processes
- Constructing a preliminary conceptual site model for the Annex, which graphically represents possible contamination dispersion
- Investigation of a previously identified, localised area which had radiological emissions that were above average (when compared with the surrounding areas)

A secondary objective was to conduct a survey of gamma emissions from the Annex. The primary survey was to be carried out by the Australian Nuclear Safety and Technology Organisation (ANSTO), and this primary survey is reported in a separate ANSTO report[1].

The soil sampling was undertaken on a systematic, gridded sampling pattern around the Annex, and chemical and radiological characteristics of the soil was analysed by off-site laboratories. Samples were taken of the surface layer (0-200 mm) only.

A portion of the site was to be excavated for the construction of a concrete slab in July 2018. As a consequence, the site investigation was carried out in two mobilisations. The first mobilisation examined the areas where the slab was to be built, and the second mobilisation examined the balance of the Site. The objective was to determine if the soil had any impacts that would act as an impediment to the soil being placed in the Woomera West landfill.

Findings

The analysis of the soil samples showed:

- Besides the thin layer of stained soil, there are no visual or analytical indications of contamination impacts in the soil sampled. Laboratory analysis of the stained layer indicates that there is no impediment to incorporation of this stained layer with other excavated soils and placement in the landfill at Woomera West.
- No soil sample exceeded any criteria for Commercial/Industrial land use, which is the current Site use
- Although the land use is not designated for residential use, the soil was also compared to residential criteria
- When soil analyses were compared against residential criteria, the results indicated the soil was suitable for residential land use, except for one sample of the 157 samples analysed, which exceed the criteria of

---

[1] ARPANSA, Inspection Report, Report No: R16/05292, Licence Holder: CSIRO Hangar 5 Annex, Licence Number: S0013, Date of inspection: 27-29 April 2016, https://www.arpansa.gov.au/sites/g/files/net3086/f/legacy/pubs/regulatory/inspections/2016/R16-05292.rtf

lead at one location. The area where this exceedance occurred is not destined for excavation and transport to Woomera West landfill.

- When soil samples were compared to the normal, world-wide distribution range for natural soils, it was found that:
  - The uranium content is below the minimum of the published range of natural soils
  - The median thorium content is approximately equal to the minimum of the published range of natural soils
  - The median and mean radium-226 content is below the minimum of the published range of natural soils.
- For the soil being transported to Woomera West and stockpiled separately, the chemical and radiological content of the soil does not represent an impediment to the soil being transported to the landfill. This soil stockpile is considered suitable for general reuse

1. Introduction

CH2M HILL Australia Pty Ltd (Jacobs) was commissioned by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to conduct an environmental baseline survey around the radioactive store located in the Annex to Hanger 5, Evetts Field, Woomera Prohibited Area (WPA), South Australia.

The store (the Annex) has been used to store radiologically contaminated soil that was discovered at the former CSIRO and Aeronautical Research Laboratory at Fishermans Bend in Victoria. The soil had been contaminated with residues from radiological extraction processes carried out by CSIRO. It is understood the residues arose from experiments conducted in the 1950s to extract uranium and thorium. In 1990, the residues and soil mixed in with residues soil was excavated at Fishermans Bend and placed into drums, which were then transported and temporarily stored at the Australian Nuclear Science and Technology Organisation (ANSTO) facility at Lucas Heights, in New South Wales. The drums were subsequently transported to the Annex, located on Department of Defence land at Woomera, in 1994 and 1995.

1.1 Objectives

As indicated in the International Atomic Energy Agency (IAEA) Safety Standards Series No. RS-G-1.8[2], baseline monitoring studies (which include both monitoring and collection of available statistical data) should be carried out to establish the existing environmental radiation levels and activity concentrations (baseline), against which subsequent impacts can be compared.

This report is to be incorporated in a compendium of baseline reports collated by CSIRO. This portion of the environmental baseline survey is mainly focused on soil sampling.

The objective of the Jacobs work, and documented in this report, was to conduct a portion of the baseline environmental monitoring program, which included:

- Soil sampling to document the existing soil's radiological and chemical characteristics surrounding the Annex
- Provision of data suitable for a baseline monitoring study, as required by the IAEA safety standards
- Investigation of a thin, stained layer of soil underlying the bitumen surrounding the Annex, to determine if this layer is contaminated due to historical soil stabilisation practices
- Constructing a preliminary conceptual site model (PCSM) for the Annex, which graphically represents possible contamination dispersion
- Investigation of a previously identified localised area, which had radiological emissions that were above average when compared with the surrounding areas.

A secondary objective was to conduct a survey of gamma emissions from the Annex. The primary survey was to be carried out by the ANSTO, and this primary survey is reported in a separate ANSTO report[3].

Note that in-situ gamma surveys of the soil and the Annex, and studies of radon emissions from soil, are being undertaken by others. The data and reports from this work will form part of the compendium of reports collated by CSIRO.

---

[2] IAEA *Environmental and Source Monitoring for Purposes of Radiation Protection*; Safety Guide No. RS-G-1.8

[3] Boardman, D and Hagan, S, *Woomera Characterisation: Gamma Survey of Area 1*, ANSTO Report Number R180057S, 15 May 2018

1.2 Scope of Works

Preliminaries

- Prepare a Work, Health, Safety and Environment Plan (WHSEP), inclusive of a Safe Work Method Statement (SWMS) for the execution of the sampling.
- Discussion with Defence to determine if underground services are present in proximity to the proposed soil sampling locations.

Investigation Works

- Measure the gamma emissions from the wall of the Annex.
- Soil sampling - Undertake systematic (grid-based) and land-form specific baseline soil sampling of the topmost 200 mm of soil.
- Soil analysis – analyse the chemical composition of the soil samples for heavy metals, uranium and thorium, and a subset of samples for specific radionuclides by gamma spectrometry.
- Submit samples to National Association of Testing Authorities (NATA) accredited laboratories for analysis of contaminants of potential concern (CoPC).
- Compare the reported chemical analyses results to screening criteria presented in National Environment Protection Council, *National Environment Protection (Assessment of Site Contamination) Measure (NEPM*, 1999 (2013 amendment) as applicable to the identified land use.
- Preparation of this Environmental Baseline report.

1.3 Guidance Documents

Relevant state and national assessment guidelines were considered during the development of this environmental baseline report, including:

- Australian Standard (AS) 4482.1 2005, *Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: non-volatile and semi-volatile compounds*
- NEPM (1999, 2013 amendment)
- South Australian Environment Protection Authority, *Guidelines for the Assessment and Remediation of Site Contamination*, July 2018 (we note that these guidelines default to NEPM guidelines where applicable)

2. Site Location and Description

The Annex is located approximately 50 km from the Woomera township, as indicated on **Figure 1** in **Appendix A.** An aerial view, with site features indicated, is presented on **Figure 2** in **Appendix A**. The area located inside the fence-line is considered as the "Site" (**Figure 2**). A large portion of the Site had a bitumen surface, which was degrading in places. A concrete slab was constructed over portions of the area surrounding the Annex, as indicated on **Figure 2** in **Appendix A**. Construction of the concrete slab commenced in July 2018.

The Site and the surrounding land is understood to be Crown land, managed under the South Australia Crown Land Management Act 2009. The land is military grounds (Commonwealth owned). According to the South Australia Department of Environment and Water website[4], the land and its surroundings are described as:

Parcel Identifier:	H833800SE358
Title:	CT5864/105
Property:	Lot 358
Address:	Stuart Highway
Suburb:	Wirraminna
State:	South Australia

In accordance with NEPM (1999, 2013 amendment), the Site land use would be classified as for Commercial / Industrial purposes.

2.1 Regional Geology and Hydrology

The area in which the Site is located is described in references as the Koolymilka regional area, which is reported[5] to be underlain at shallow depth by Cretaceous aged kaolinitic siltstone, shale and sandstone with erratic boulders, gravels and conglomerates.

A previous investigation[6] at the Site reported the natural soil profile below the bitumen surface to comprise a layer of orange brown sand to clayey sand over medium and high plasticity, yellow and orange brown clay.

Groundwater in the Koolymilka area is within an unconfined aquifer, at least 25 m deep, with salinity more than 12,000 milligrams per litre (mg/L)[7]. The recharge rate is less than 1 mm per year.

2.2 Site Features

With reference to **Figure 2** in **Appendix A**, the Site (within the fence-line) consists of:

- The Annex and Hanger 5 (H5) structures, which all have concrete floors
- The surrounding hardstand, which in July 2018 was predominately degrading bitumen to the north and west and some areas of concrete to the north of H5 (At the time of this December 2018 revision of this report, the concrete areas depicted in Figure 2 in Appendix A had been constructed)
- Offices, mess room, ablution block and covered breezeways north of H5
- Unsealed soil east and south of H5

---

[4] http://maps.sa.gov.au/plb/

[5] Geological Survey of South Australia *Andamooka Map*, SA Geological Atlas Series Sheet SH 53-12, 1:250,000, May 22, 2012, Marree Subgroup (Bulldog Shale)

[6] Wallbridge Gilbert Aztec (WGA), Hangar 5 Hardstand Pavement, Geotechnical Investigation, 10 November 2017

[7] Kellett, J; et al, *Hydrogeological Assessment of a Region in Central Northern South Australia*, Bureau of Rural Sciences, 1999

The Site and the surrounding area is gently graded with drainage lines directing surface flow away from the structures and fenced area. Outside of the fence-line, greener areas can be seen, particularly west of the Annex. These are local (minor) depressions, which accumulate rainwater run-off from the hardstand.

2.3 Surrounding Land Use

The surrounding land use is associated with rocket range activities, namely Range Head E Launcher site, as well as the adjacent (disused) Evetts Field airfield (refer to **Figure 3** in **Appendix A**). It is understood that the associated activities, and possible ordinance, have not impacted the soil within the fenced area.

With regard to radiological areas in the surroundings:

- The Olympic Dam mine (the largest uranium mine in the world) is located approximately 100 km north east of the Site
- The Maralinga test site, where nuclear bombs were detonated between 1956 and 1963, is located approximately 600 km west of the Annex.

2.4 Site Services

No service maps are available from Defence. Consequently, the possible location of services was discussed with Defence personnel, and known services were avoided during soil sampling.

2.5 Previous Environmental Investigations

2.5.1 Historical Environmental Audits

Investigations have been carried out and documented in several radiological “Environmental Audits”, including the following:

- Australian Radiation Laboratory[8], *Environmental Audit of Evetts Field Waste Facility - November 1996*
- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), *Environmental Audit of Evetts Field Waste Facility - January 2004,*
- CH2M HILL, *March 2009 Environmental Audit, Hanger 5 Annex, Evetts Field, Woomera Test Facility*, Aug 2009
- CH2M HILL, *April 2013 Environmental Audit, Hangar 5 Annex, Evetts Field, Woomera Test Facility*, April 2013

All of the above audits concluded that the radiation emanating from the Annex/store is not a concern for human health, the drums appear to be in good condition, and measured radon emissions are low.

2.5.2 ARPANSA Inspection April 2016

In April 2016, ARPANSA conducted an inspection of the Annex drum store. The ARPANSA Inspection Report[9] found:

- *Concerns regarding the future integrity of the drums. Evidence was sighted that indicates that the drums are now beginning to deteriorate rapidly*
- *A radiation measurement was taken that had elevated from 90 nSv.hr-1 to 2 µSv.hr-1 when compared to the same measurement conducted by ARPANSA eight (8) years ago. A spectrum was taken at this location confirming the presence of 226-Ra* [radium-226]. *It was unclear whether the elevated dose rate was due to the in-growth of daughter products or due to material that may have leaked from the drums.*

---

[8] The Australian Radiation Laboratory was replaced by ARPANSA, which was established by the Australian Radiation Protection and Nuclear Safety Act 1998 (ARPANS Act). ARPANSA, commenced operation on 5 February 1999. ARPANSA also replaced the Nuclear Safety Bureau.

[9] ARPANSA, *Inspection Report, Report No: R16/05292, Licence Holder: CSIRO Hangar 5 Annex, Licence Number: S0013*, Date of inspection: 27-29 April 2016, https://www.arpansa.gov.au/sites/g/files/net3086/f/legacy/pubs/regulatory/inspections/2016/R16-05292.rtf

- *There is also the potential for the build-up of hydrogen gas within the drums due to the hydrolysis of water mixed with concentrated thorium.*
- *There is the possibility that …... some of the drums …. may be leaking into the environment.*

Because of these observations, ARPANSA inspectors collect soil samples, which were submitted for chemical and radiological analysis. These soil results were issued to CSIRO, and made available by CSIRO to Jacobs for incorporation into this report. The laboratory reports of the chemical and radiological analysis are included in **Appendix B**. The chemical analysis of the two soil samples[10] were compared by Jacobs to the NEPM (1999, 2013 amendment) health intervention levels (HILs) for commercial/industrial land use. A thorough explanation of the HILs and other adopted assessment criteria is provided in **Section 4.1**. However, to interpret the ARPANSA results, a brief explanation is provided here.

HILs are scientifically based, generic assessment criteria designed to be used in the first screening stage of an assessment of potential risks to human health from contaminants. They are conservative and are based on reasonable, worst-case scenarios for four generic land use settings, namely:

HIL A	Residential with garden/accessible soil, also includes children's day care centres, preschools and primary schools
HIL B	Residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats
HIL C	Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths.
HIL D	Commercial/industrial such as shops, offices, factories and industrial sites.

The reported results from the two ARPANSA soil samples were compared to HIL D criteria (**Appendix B**), with the results below the screening criteria. To examine the data further, the results were compared to HIL A and HIL B residential criteria, with the results less than the conservative residential HILs.

The radiological analysis[11] of the six soil samples were compared by Jacobs to the world-wide mean natural radionuclide content in soil, as reported in Appendix B, Table 5 of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) 2000 report[12], which gives mean soil values for potassium-40 (140 to 850 Becquerels per kilogram (Bq/kg)), uranium-238 (16 to 110 Bq/kg), radium-226 (17 to 60 Bq/kg) and thorium-232 (11 to 64 Bq/kg). Comparison with these mean soil values is a valid appraisal and is used in other contexts, including by ARPANSA, in their report "*A Survey of Naturally Occurring Radioactive Material Associated with Mining*[13]". The ARPANSA soil samples reported detectable radionuclides for potassium-40 and radium-226, however the results were within the published range of mean soil values. The maximums reported were 450 ±54 Bq/kg for potassium-40 and 35.4 ±4.9 Bq/kg for radium-226.

In summary, the ARPANSA soil samples showed:

- No chemical analysis which exceeded NEPM (1999, 2013 amendment) commercial/industrial or residential HIL soil criteria
- No radiological analysis that exceeded UNSCEAR 2000 mean natural soil radionuclide content

2.5.3 CSIRO Site Visit November 2016

On 6 November 2017, a site visit was conducted by CSIRO, where informal gamma measurements were conducted of the soil outside the Annex. These field measurements identified one area of the Site where the soil had greater than average gamma emissions when compared to the surrounding soils. The area

---

[10] ChemCentre Residues Laboratory, *Report of Examination, Reference 15S2516*, 8-Aug-2016.

[11] ARPANSA, *Radioactive Analysis Report EA16-075 (Interim Report)*, received 30 May 2017,

[12] United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), *Sources and Effects of Ionizing Radiation*, UNSCEAR 2000, Report to the General Assembly, United Nations.

[13] Long, S et al, *A Survey of Naturally Occurring Radioactive Material Associated with Mining*, ARPANSA, Technical Report No. 161, August 2012

(approximately 3 m by 4 m) was outlined with road paint for future investigation. The discovery of this area with above average emissions coincided with the location of above average gamma emission from the drums stored inside the Annex. In addition, a termite was discovered in one of the pallets in the same location.

The November site visit also visually confirmed the existence of a stained layer of soil underlying the bitumen. This layer was 2 – 4 mm thick on average. It was understood that an old practice of stabilising soil was to spray a heavy oil over the soil before putting on a bitumen surface. As the bitumen and soil were to be excavated for the construction of a concrete slab, there was a concern that the stained soil layer may exceed landfill acceptance criteria for the landfill at Woomera West (within the WPA).

3. Contamination Status

Besides the above average gamma readings from one area outside the Annex, there is no solid evidence of contamination escaping from the Annex. However, insufficient data has been collected to satisfy the IAEA Safety Standards Series No. RS-G-1.8, "*Environmental and Source Monitoring for Purposes of Radiation Protection*", which requires collection of a baseline of statistical data, to establish the existing environmental radiation levels and activity concentrations. This data is then used for subsequent comparisons, to determine if there are impacts arising from the material stored at the site.

As there is no solid evidence of contamination escaping from the Annex, and the depth to groundwater is approximately 25 m, no measurement of groundwater was considered necessary at this stage of the investigation.

3.1 Contaminants of Potential Concern and Preliminary Conceptual Site Model

A PCSM was developed for the Site (refer to **Figure 4** in **Appendix A**), and it included possible mechanisms for the transfer of radionuclides, including dispersion and reconcentration mechanisms. The following possible radiological sources of contamination were identified:

- Natural atmospheric and terrestrial radiological deposition
- Wind-blown dust or radon gas from Olympic Dam uranium mine, 100 km away
- Radon emissions from soil and the drums stored in the Annex, which would then decay to lead-210, which can deposit onto the soil
- Possible leakage from drums, which could leak water or solids to the concrete floor of the Annex (note that no leakage from drums has been detected – however, restricted access limits the inspection to perimeter drums close to the Annex doors)
- Possible migration of leaked water through the concrete to the underlying soil
- Postulated movement of spilled material by physical transport by termites to one area where above average gamma emissions were recorded – this was speculatively proposed because a termite was discovered in one wooden pallet adjacent to the area with above average emissions
- Possible leakage or transport of material onto the bitumen outside the Annex, which is then transported by rainwater to the drainage area west of the Annex

Chemically, there is also the possibility of the layer of stained soil under the bitumen having heavy, long chain hydrocarbons, or polycyclic aromatic hydrocarbons (PAH), contained in the layer. Volatile hydrocarbons are not considered as a concern, as the layer under the bitumen has been exposed to full sun for decades, and volatiles would have likely already evaporated.

3.1.1 Radioactive Elements of Concern and Analysis of these Elements

As reported in **Section 1** of this report, the drums contain the by-products of experiments to extract uranium and thorium. Consequently, the radiological contaminants of concern are the most prevalent isotopes, namely uranium-238 and thorium-232, as well as their decay products. However, measurement of uranium-238 and thorium 232 isotopes is difficult and time consuming, as their half-lives are 4,500,000,000 years and 14,000,000,000 years, respectively. Measurement is usually accomplished by measuring the daughter products or progeny in the decay chain, and assuming the series is in equilibrium. However, soil of interest to this study is surface soil. At the surface, the series will not be in equilibrium, as equilibrium will be disrupted by: radon gas emanation; vegetation uptake; deposition of other radionuclides from solar and terrestrial sources, and other factors. In addition, as the drums are the result of extraction experimentation, the series would have been disrupted by the extraction or concentration processes that the material had been subjected to. Consequently, chemical measurement of uranium and thorium was chosen as a measurement technique, with the result assumed to represent uranium-238 and thorium-232. It is acknowledged that this measurement will over-estimate the amount of uranium and thorium, and consequently will be a conservative estimate. In natural uranium deposits, approximately 99.28% of the uranium is uranium-238, so chemical analysis would overestimate by approximately 1%. The natural abundance of thorium-232 is 99.98%, so the over-estimation by chemical analysis would be negligible.

Chemical measurement of uranium and thorium provides a mass concentration in in milligrams per kilogram (mg/kg). However, data on the distribution of the radionuclides of uranium and thorium is typically reported in Bq/kg. The conversion factors for the primordial nuclides are given by[14]:

- 1 Bq/kg uranium-238 = 8.1 x 10^{-8} g/g, or 0.081 mg/kg – or conversely 1 mg/kg = 12.3 Bq/kg
- 1 Bq/kg thorium-232 = 2.46 x 10^{-7} g/g or 0.246 mg/kg – or conversely 1 mg/kg = 4.07 Bq/kg

The uranium-238 series includes the elements: astatine, bismuth, polonium, protactinium, radium, radon, thallium, and thorium, and terminates with stable lead-206. The thorium-232 series includes the elements actinium, bismuth, polonium, radium, radon and thallium, and terminates with stable lead-208. All elements are present, at least transiently, in any natural sample. **Figure 4** in **Appendix A** presents a simplified uranium-238 series, with short-lived, transient elements excludes. The figure also shows the half-lives of longer lived elements, which includes radium-226 and lead-210.

Measurement of the radium-226 isotope from the uranium series is possible. This isotope was reported in the ARPANSA April 2017 report. In addition, there is published data on the terrestrial distribution of radium, so comparison can be made.

Both series terminate with stable lead. However, chemical measurement of lead is not a good indicator of the disrupted series, as lead is wide spread in the environment.

---

[14] http://radiopurity.in2p3.fr/conversion.html

4. Site Assessment Criteria

The following section outlines the site assessment criteria adopted for the Site, against which individual analyte results have been compared.

4.1 Soil Criteria

The current and intended future use of the Site is Commercial / Industrial, as defined by the NEPM (1999, 2013 amendment). Therefore, investigation and screening criteria developed for Industrial (HIL D) were adopted unless otherwise specified.

4.1.1 Heath Investigation Levels

The NEPM (1999, 2013 amendment) presents health investigation levels (HILs) applicable for assessing human health risks via relevant exposure pathways for a range of metal and non-volatile organic substances. The HILs are generic to all soil types. The HIL D values, applicable for a commercial/industrial site, such as shops, offices, factories and industrial sites, have been adopted for comparison of the soil analytical results, unless otherwise noted. The HILs are generic to all soils types and apply generally to a depth of 3 m below the surface.

The ARPANSA soil analysis (refer **Section 2.5.2**) results indicated that the Site's soil was not contaminated by the presence of the drummed material stored in the Annex. Consequently, comparison was also be made against residential criteria (as if the Site were a "greenfield" site), but this comparison is for information only.

As stated previously, HILs are scientifically based, generic assessment criteria designed to be used in the first stage (Tier 1 or 'screening') of an assessment of potential risks to human health from chronic exposure to contaminants. They are intentionally conservative and are based on a reasonable worst-case scenario for four generic land use settings:

HIL A	Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake, (no poultry), also includes children's day care centres, preschools and primary schools – this is the most conservative HIL
HIL B	Residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats
HIL C	Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves) which should be subject to a site-specific assessment where appropriate
HIL D	Commercial/industrial such as shops, offices, factories and industrial sites.

Heavy metals for all soil samples have been compared against HIL D screening levels, but are also viewed against HIL B and HIL A residential screening levels – this is for information only.

Carcinogenic PAHs and heavy metals for soil samples taken from the stained soil layer underlying the bitumen have been compared against HIL D screening levels, but are also viewed against HIL B and HIL A residential screening levels – this is for information only.

A summary of these screening levels is presented in **Table 4-1**.

Table 4-1: Selected Health Investigation Levels

		For Information Only	
Analyte	Commercial/ industrial HIL D	Residential B HIL B	Residential A HIL A
Arsenic	3 000	500	100
Cadmium	900	150	20
Copper	240 000	30 000	6000
Lead	1 500	1200	300
Mercury	730	120	40
Nickel	6 000	1200	400
Zinc	400 000	60 000	7400
Carcinogenic PAHs (as B(a)P TEQ [1],)	40	4	3

Notes

[1] Toxicity Equivalent Quotient

4.1.2 Health Screening Levels

Health screening levels (HSLs) are also listed in the NEPM (1999, 2013 amendment), which were 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 physicochemical properties, land use scenarios, and the characteristics of building structures. They apply to different soil types, and depths below surface to >4 m.

The HSLs for petroleum compounds are predominately for volatile compounds, particularly benzene, toluene, ethylbenzene, and xylene (collectively referred to as BTEX). Other volatile concerns relate to total recoverable hydrocarbons (TRH) where the carbon chain is less than or equal to 16 carbon atoms (C6 to C16), and naphthalene (a C10 aromatic compound consisting of two fused benzene rings).

At the Site, volatiles and light fractions are not a concern, as the only indication of petroleum derived substances is the stained soil layer under the bitumen. In addition:

- This layer has been exposed to full sun for decades, and no volatile components would remain.
- The soil is not beneath any occupied buildings, and consequently does not pose an inhalation risk

As BTEX and TRH data is available from laboratories when requesting PAH analysis, the data will be compared against Industrial HSL criteria. However, this comparison will be made for information only.

A summary of these HSLs that used for comparison are presented in **Table 4-2**

Table 4-2: Selected Health Screening Levels – For Information Only

	For Information Only For vapour Intrusion – Sand 0 m to <1 m	
Analyte	Commercial/Industrial HSL D	Residential A and B HSL A & B
Benzene	3	0.5
Ethylbenzene	Non-limiting [1]	55
Toluene	Non-limiting [1]	160
Xylene	230	40
TRH >C6 - C10 less BTEX (F1)	260	45
>C10-C16 less naphthalene	Non-limiting [1]	110
Naphthalene	Non-limiting [1]	3

[1] The HSLs are based on three-phase equilibrium theory and soil vapour is limited by the maximum solubility limit of the chemical in the soil pore water phase. The soil saturation concentration is the condition where pore water is at its solubility limit and soil vapour is at the maximum vapour concentration. When a calculated HSL in soil or groundwater exceeds this limit, the vapour cannot result in an unacceptable vapour risk and is denoted as **non-limiting**. Also, soil vapour HSLs that exceed the possible maximum contaminant vapour pressure are similarly denoted as **non-limiting**.

4.1.3 Natural Radionuclides in Soil

As stated in **Section 2.5.2**, UNSCEAR 2000 reports that naturally occurring radionuclides of terrestrial origin (also called primordial radionuclides) are present in various degrees in all media in the environment, and that natural irradiation from soil is mainly by gamma radiation from radionuclides in the uranium-238 and thorium-232 series, as well as Potassium-40. As CSIRO’s experimentation at Fishermans Bend involved the processing of uranium and thorium ore and mineral sands, it is appropriate to compare the soil surrounding the Annex with the natural terrestrial concentrations of uranium and thorium, as a mechanism to determine if any leakage of material from the Annex has altered the natural concentration of these two elements in the soil.

UNSCEAR 2000 has published data on the natural radionuclide content in soil for different regions/countries around the world. These include concentrations of uranium-238 and thorium-232, as well as radium-226 from the uranium-238 series. Unfortunately, no data is presented for Australia.

Due to the lack of data on Australia, the median range of all soils worldwide will be used as the basis of comparison for the soils sampled on site. As stated before, this is a valid comparison, and has been adopted by ARPANSA and others.

The world-wide mean natural radionuclide content in soil, as reported in Appendix B, Table 5 of UNSCEAR 2000 report[15], gives mean soil values for uranium-238 (16 to 110 Bq/kg, median 35 Bq/kg), radium-226 (17 to 60 Bq/kg, median of 35 Bq/kg) and thorium-232 (11 to 64 Bq/kg, median of 30 Bq/kg). These are summarised in **Table 4-3**. It is noted that the comparison of a single soil sample is not compared against either the maximum or minimum or median of the range. Rather, the results are compared against the range, as is described in **Section 7.3.3**

---

[15] United Nations Scientific Committee on the Effects of Atomic Radiation, *Sources and Effects of Ionizing Radiation*, UNSCEAR 2000, Report to the General Assembly, United Nations.

Table 4-3: Natural Radionuclide Content in Soil

Analyte	Mean Minimum Bq/kg	Mean Maximum Bq/kg	Median Bq/kg
Uranium or uranium-238	16	110	35
Thorium or thorium-232	11	64	30
Radium-226	17	60	35

4.1.4 Waste Classification of Excavated Soil

Soil that was to be excavated and transported to Woomera West landfill is required to be classified under waste acceptance criteria. The assumed waste acceptance criteria are those used by the South Australian Environment Protect Authority (EPA), especially if the stockpiled soil is reused elsewhere and may be placed on land that is not Commonwealth land.

The South Australian EPA has published criteria for the classification of waste[16]. The classification system divides the material into two categories for acceptance by the waste depots, namely “Intermediate” and “Low-level Contaminated” material, with the “Intermediate” classification being more stringent.

In addition, the EPA also defines criteria for reuse of material, with this material being defined as “Waste Derived Fill”. The criteria for “Waste Derived Fill” is more stringent than for “Intermediate”

The EPA supports the beneficial reuse of wastes specifically recovered for use as fill and should comply with the Environment Protection Act 1993 (EP Act) to ensure the reuse of waste derived fill constitutes a genuine waste resource recovery and reuse activity, as distinct from waste disposal.

A summary of these screening levels is presented in **Table** 4-1.

Table 4-4: Selected Waste Classification Criteria

Analyte	Intermediate Waste	Waste Derived Fill
Arsenic	<200	20
Cadmium	<30	3
Copper	<2,000	60
Lead	<1,200	300
Mercury	<30	1
Nickel	<600	60
Zinc	<14,000	200
PAH (Total)	<40	5
TPH > C9	<1,000	1,000

---

[16] South Australian EPA, *Current criteria for the classification of waste—including Industrial and Commercial Waste (Listed) and Waste Soil*, Issued March 2010, EPA 889/10:

5. Site Investigation Methodology

The site investigation methodology is discussed in the below sections.

5.1 Investigation Works

The investigation program comprised the following scope of work to address the project objectives (**Section 1.1**).

- Measure emissions from the wall of the Annex.
- Undertake grid-based sampling of the topmost 200 mm of the soil profile.
- Analyse the chemical nature of the soil sampled, and a subset of samples for specific radionuclides by gamma spectrometry
- Analyse the chemical nature of the stained layer of soil underlying the bitumen surface

The soil sampling was completed in two mobilisations to the Site to accommodate the construction schedule of the concrete slab. The concrete slab required the soil to be excavated to between 500 and 600 mm below ground level, prior to backfilling, compaction and pouring of the concrete. Approximately 3,000 m^3 of soil was excavated for the slab's construction. The excavation activities would result in the data from the natural distribution of chemicals and radionuclides from this soil being lost when the soil is disturbed. In addition, there was concern that the soil might be contaminated, and might exceed waste disposal criteria. Consequently, the first mobilisation was in February 2018, with samples taken from locations where the concrete slab was to be constructed.

The second mobilisation occurred in June 2018, when the balance of the soil samples was collected.

5.2 Service Clearance

No drawings of underground services were available. Discussions with Defence indicated where services were, and the sampling locations were positioned away from known services.

In addition, as all soil samples were planned to be taken by hand augur, and the samples were only to a depth of 200 mm, the risk of striking and damaging services was low.

5.3 Measurement of Emissions from the Annex

A survey was conducted on Tuesday 6 February 2018 during the February mobilisation using a Ludlum 2401 with an open window.

The Ludlum was moved continuously over the wall of the exterior of the Annex. It was moved in a pattern that surveyed from (approximately) 0.3 m above ground level to 2.0 m above ground level. The pattern moved the detector vertically up, then horizontally along (approximately) 0.25 m, then vertically down, then along 0.25 m. This pattern was repeated all along the outside wall of the Annex until all the accessible perimeter was surveyed. The perimeter was divided into subsection, designated by physical divisions in the structure (for example, each Annex door was considered as a section and reported on separately.

The analogue meter was monitored at all times, to observe fluctuations, and a record was made of the range of measurements. Each subsection was measured separately if the average micro-Sieverts per hour (µSv/hr) were consistent. When there was greater variation over a subsection (e.g. the span of a door), the span was subdivided into smaller sections. Occasional peaks of radiation from particular locations were also recorded.

5.4 Systematic, Gridded Soil Sampling

A systematic, gridded soil sampling plan was prepared based on the following premises:

- Samples were to be taken in close proximity to the Annex, as this area was most likely to exhibit the greatest impact from any leakages from the Annex
- Sample grids should step out from the Annex, with an increasing grid spacing further away from the Annex
- A greater sampling density should be over the area previously identified to emit above average gamma emissions
- All sample points should be surveyed to obtain their spatial coordinates.

Based on these premises, the sampling plan shown on **Figure 5** in **Appendix A** was developed. The area with the highest sampling density was sampled on a 1 m x 1 m grid, as depicted in **Photograph 5-1.**

Photograph 5-1 – One Meter Grid Pattern in Above Average Area

As can be seen on **Figure 5** in **Appendix A**, each sample was given a unique identifier. The numbering was constructed with the following identifiers:

Primary Location Identifier (ID)	Distance from Structure (in m) or secondary ID	Sequence number	Depth of soil sample in mm

An example of a sample number is given below

W	10	G	200

The assigned location identifiers chosen were:

Primary ID	Meaning	Secondary ID	Meaning
N	North of Annex	P	Outside Perimeter Fence
E	East of Annex	D	Drainage Area
W	West of Annex	R	Road at Entry
S	South of Annex		

A survey of each sample location was undertaken using a Trimble® handheld global positional system (GPS). The Trimble® has a horizontal accuracy of <0.5 m, which is considered sufficient for the purposes of this investigation.

5.5 Composite Soil Sampling

Composite soil sampling was taken to determine if the average concentrations of possible contaminants in the layer underlying the bitumen. The choice of composite sample locations was determined in the field, and carried out to produce samples representing:

- The area where there is above average gamma radiation (two composite samples)
- The area west of the Annex where the slab would be located and soil transported to the Woomera West landfill (one composite sample)
- The area north of Hanger 5 where the slab would be located and soil transported to the Woomera West landfill (one composite sample)

The sample locations chosen to make up the composite samples are depicted on **Figure 6** in **Appendix A.**

5.6 Laboratory Analytical Schedule

The chemical and primary radiological laboratory analysis was carried out by SGS Australia (SGS). Secondary radiological analysis (of duplicate samples) was undertaken by ANSTO. No secondary analysis was undertaken of chemical analysis.

National Association of Testing Authorities (NATA) accredits organisations and their test methods. SGS is NATA accredited for the chemical analysis carried out in this report. NATA accreditation does not cover the radiological analysis, so neither SGS nor ANSTO are NATA accredited for radiological analysis.

The analytical schedule is presented in **Table 5-1** below.

Table 5-1: Laboratory Analytical Schedule

Analyte	Number of Primary Samples	Number of secondary samples
Heavy metals – arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), zinc (Zn)	157	0
Metals – uranium (U), thorium (Th)	157	0
TRH, BTEX and naphthalene (BTEXN) and PAH – testing of composite samples only	4	0
Radionuclides by gamma spectrometry – lead-210, radium-226, radium-228, thorium-228	75	12

5.7 Field and Data Quality Assurance and Quality Control

All samples were collected by experienced environmental scientists/engineers from Jacobs in general accordance with Jacobs standard operating procedures.

All soil samples were collected by hand augur. Due to the homogeneity of the soil sampled, the augur was not washed between samples. Instead the augur was brushed clean prior to the next sample being taken.

At each sampling location, and at each soil depth, a new set of disposable nitrile gloves were used to collect the sample. The samples were placed into laboratory prepared sample jars/bottles for chemical analysis, or bags for radiological analysis.

Receipt temperature was not a concern for this analysis, as there was no concern about volatiles in the four composite samples taken of the stained soil layer, as the material had been exposed to full sun for decades. Consequently, no samples were placed on ice. Instead, all samples were collected and placed in laboratory provided cooler boxes (for transport purposes only) and transported to the relevant laboratories under Jacobs chain of custody (CoC) protocols.

5.8 Soil Sample Storage after Analysis

All samples sent for laboratory analysis were collected from the analytical laboratories after analysis had been completed. The samples were relocated for storage at the CSIRO Waite Campus[17].

.

---

[17] Personal correspondence, Dr Dirk Mallants

6. Data Validation and Quality Assessment

Data Quality Indicators (DQIs) were developed to provide goals for the quality of data required to sufficiently meet the specific objectives of this investigation. Precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS parameters), are indicators of data quality and attributes of the DQIs. An assessment of the quality of assurance and quality control indicators is included in **Appendix I**.

Minor non-conformances of PARCCS indicators were identified, however the majority of the PARCCS indicators were within the specified DQIs. The nature of the minor non-conformances is also considered to present negligible impacts on data quality. On this basis, the data is considered to be of sufficient quality to meet the objectives of the assessment. Discussion of the non-conformances is included in **Appendix I**.

7. Observations and Results

The following sections provide details of field observations made during the investigation, along with the reported analytical results.

7.1 Gamma Survey of the Exterior of the Annex

A technical memorandum was produced detailing the radiological measurements collected in February 2018. The memorandum was issued to CSIRO separately to this report. For completeness, the results of this survey are included in **Appendix C**. The maximum average reading recorded (1.0 – 2.0 µSv/h) was over one subsection of the Annex doors, which is located closest to the entry gate.

7.2 Field Observations and Measurements

As documented in the geotechnical investigation[18] and in this investigation, all sample locations reported natural soil below the bitumen pavement, which comprised orange brown sand to clayey sand. The stained soil layer was present immediately below the pavement in all areas and was sampled separately for composite samples. Due to the homogeneity of the samples, no bore logs were produced during this investigation.

During hand auguring in the area, where there were above average gamma emissions, no termite tunnels were observed. Visual observation confirmed the soil below the stained soil layer was homogeneous.

In all soil samples, there was no visual or olfactory indicators of contamination, except for the stained layer beneath the bitumen.

7.3 Soil Analytical Results

The soil analytical results are presented below.

7.3.1 Composite Sampling – Chemical Analysis

Composite soil sampling was undertaken of the stained soil layer underlying the bitumen. The composites were taken from the locations shown on **Figure 6** in **Appendix A**.

The soil analytical results were compared to heavy metals and PAH criteria presented in **Table 4-1** and also compared for information only against the screening criteria presented in **Table 4-2**. The laboratory analytical reports for chemical analysis and the CoCs are presented in **Appendix D**, and a table comparing the data to the adopted criteria presented in **Appendix F**.

Assessment of the composite results does not report any exceedances of the adopted criteria for Commercial/Industrial (HIL D). Further comparison was carried out which demonstrated there were no exceedances for residential criteria (HIL A and B)

7.3.2 Grid Sampling – Chemical Analysis

Grid soil sampling was undertaken according to the sampling plan shown on **Figure 5** in **Appendix A**.

The chemical soil analytical results were compared to heavy metals criteria presented in **Table 4-1**. The laboratory analytical reports for chemical analysis and the CoCs are presented in **Appendix D**, and a table comparing the data is presented in **Appendix G**.

Assessment of the grid-based soil results does not report any exceedances of the adopted criteria for Commercial/Industrial (HIL D).

---

[18] Wallbridge Gilbert Aztec (WGA), *Hangar 5 Hardstand Pavement, Geotechnical Investigation*, 10 November 2017

As the ARPANSA analysis (reported in **Section 2.5.2**) found that soil samples did not exceed residential criteria, the results were also compared against residential criteria (HIL A and B). Only one exceedance, equal to HIL B criteria, was evident amongst all the soil samples. This location of this exceedance (sample E-0-C-200) is indicated on **Figure 7** in **Appendix A**.

7.3.3 Grid Sampling – Radiological Analysis

Grid soil sampling was undertaken according to the sampling plan shown on **Figure 5** in **Appendix A**.

Chemical measurement of uranium and thorium (in mg/kg) was converted to Bq/kg using the conversion factors discussed in **Section 3.1**. This data, and the laboratory analysis for radium-226, were compared to the natural radionuclides distribution presented in **Table 4-3**. The laboratory analytical reports for chemical analysis of uranium and thorium, and the CoCs are presented in **Appendix D**, and the radiological analysis plus CoCs is presented in **Appendix E**. The analytical results are tabulated in **Appendix H**.

To compare the large amount of radiological data in a simple and visual manner, the approach used by ARPANSA in their report "*A Survey of Naturally Occurring Radioactive Material Associated with Mining*[19]" was replicated. In the report, a plot, similar to the box and whisker plot, was compared against the range for natural distribution. The box and whisker plot displays a five-number summary of a set of data, namely the: minimum; first quartile; median; third quartile; and maximum. Box and whisker plots are produced as a standard option in Microsoft Excel, and these plots also include a plot of outliers. In a box plot, a box is drawn from the first quartile to the third quartile, a vertical line goes through the box at the median and the whiskers go from each quartile to the minimum or maximum.

To plot the results, the statistical deviation of each result was removed, and the datum is analysed as a single number. For all data that is below the limit of reporting (LOR), the datum was replaced by the LOR (e.g. < 5 Bq/kg was analysed as if it were 5 Bq/kg, which is conservative). The results are summarised on **Figure 8** in **Appendix A**. It is noted that the comparison of a single soil sample (datum) is not compared against either the UNSCEAR 2000 maximum or minimum or median. Rather, the results of the whole data set are compared against the range.

Assessment of the plotted results on **Figure 8** suggests the following:

- The analysis of uranium, thorium and radium all indicate the range of distribution is below the natural mean distribution in soil
- For uranium, the maximum of the fourth quartile, and all outliers, are all below the median distribution of 35 Bq/kg
- For thorium and radium, the maximum of the fourth quartile is approximately at the median for the natural distribution in soil

7.3.4 Waste Classification of Excavated Soil

The grid soil sampling was undertaken according to the sampling plan shown on **Figure 5** in **Appendix A**. The samples that were positioned where the concrete slab was to be constructed were examined by comparison to criteria presented in **Table 4-1**. The grid samples that were outside of the slab's location were removed from data set and the table of results are presented in **Appendix J**.

---

[19] Long, S et al, *A Survey of Naturally Occurring Radioactive Material Associated with Mining*, Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), Technical Report No. 161, August 2012

8. Discussion

The section below provides a discussion of the results in relation to the objectives of the environmental baseline monitoring.

Soil sampling was undertaken on a systematic and grid-based sampling pattern around the Site and surrounding area. Chemical composition and radiological characteristics of the soil was analysed by off-site accredited laboratories. The samples were taken to determine the baseline environmental conditions of the Site and to examine if the storage of radiological material at the Site had impacted the surrounding environment. Samples were taken of the surface (0-200 mm) as that was determined to be the area most likely to be impacted by the presence of radiological materials stored on site.

A portion of the Site was to be excavated for the construction of a concrete slab. As a consequence, the investigation was carried out in two mobilisations. The first mobilisation examined the areas where the slab was to be built, and the second mobilisation examined the balance of the Site. As the material excavated for the slab's construction included a possible contaminant which was visually identified as a stained soil layer under the bitumen, this layer was also targeted to determine what impacts there were in this stained layer. In addition, the soil to be excavated was compared to waste classification criteria.

A previous gamma survey indicated that one area of the Site had measured above average gamma emissions, and this area was examined in more detail with a denser sampling pattern.

A PCSM was developed for the Site to guide the development of the sampling plan.

8.1 Composite Soil Samples of Stained Layer Under Bitumen

The soil analytical results were compared to the adopted heavy metals and PAH screening, with a table comparing the data presented in **Appendix F**.

Assessment of the results indicates that none of the reported composite sample results exceeded the adopted screening criteria for Commercial/Industrial (HIL D). Further comparison was carried out which demonstrated there were no exceedances for residential criteria (HIL A and B). Besides the thin layer of visual staining, there is no indication of a heavy metal or PAH impacts in this soil layer exceeding any HIL criteria.

The composite samples were also compared to waste criteria for intermediate and "waste derived fill". The criteria for PAH were not exceeded, as no samples reported PAH greater than the limit of reporting. However, the criterion for TPH > C9 was compared to the analytical results for TRH, summed for the ranges C10 to C36, and three of the four results exceeded the TPH criterion. The greatest exceedance is approximately 2½ times the TPH criterion.

The stained layer is 2 to 4 mm and cannot be easily separated from the bulk of the 500 to 600 mm of excavated material. This would reduce the concentration by a factor of approximately 100. With this mixing, the concentration of these long chain THP would make the "waste fill" within criteria, which is consistent with the South Australian EPA's promotion of beneficial reuse of waste recovered for use as waste derived fill.

8.2 Heavy Metal Analysis of Site Soil Samples

All soil samples on Site that were analysed, as well as samples from areas outside of the fence-line, were analysed and the results compared to the adopted criteria. This table of data is presented in **Appendix G**.

Assessment of the results indicates that none of the reported composite sample results exceeded the adopted screening criteria for Commercial/Industrial (HIL D).

In addition, the samples were also compared against residential criteria (HIL A and HIL B). This demonstrated that all soil was suitable for residential criteria, except for one location (sample location E-0-C-200) shown on **Figure** 7 in **Appendix A**. This exceedance of residential criteria for lead does not impact on the industrial use of the site. In addition, this area of the site is not being excavated for construction of a slab, and therefore the soil in this location does not affect any soil being transported to the Woomera West landfill. The origin of this lead is not known, but speculatively could be from a historical activity, such as the use of lead paint on the outside of the Annex.

For the soil being transported to Woomera West, the heavy metal content of the soil was compared to the waste criteria for intermediate and “waste derived fill”. There were no exceedances for heavy metals, except for two zinc exceedances (out of 77 samples) of the waste derived fill criterion of 200 mg/kg. The data set (population) for zinc was used to calculate the upper confidence limit (UCL) of the confidence interval of the mean of the data. This is a standard methodology recommended by the NEPM (1999, 2013 amendment), as well as the South Australian EPA’s waste classification methodology[20]. The South Australian EPA recommends that, when classifying “waste derived fill”, “*if some samples exceed the chemical concentration criteria, statistical evaluation using 95% UCL calculations can be used*”. The 95% UCL demonstrates with 95% certainty that the ‘true’ mean contaminant concentration will not exceed the value determined by this method.

The methodology defaults to the US EPA provided software, ProUCL[21], The data set for zinc was analysed using ProUCL, and the output is included in **Appendix J**. ProUCl calculates the 95%UCL, assuming different distributions (e.g. normal, lognormal, etc) and recommends the best 95%UCL for the distribution. The calculated 95% UCL for the dataset was 64 mg/kg (using the ProUCL recommended Chebyshev inequality methodology), which is less than the waste derived fill criterion of 200 mg/kg.

8.3 Radiological Analysis of Site Soil Samples

Soil samples were analysed chemically for uranium and thorium (in mg/kg), and radiologically for radium-226 and other elements. A table compared the normal distribution of the radiological elements uranium, thorium and radium-226 against the soil samples (**Appendix H)**. The data was further analysed and is presented as a box-and whisker plot on **Figure 8** in **Appendix A.**

Examination of **Figure 8** shows that uranium, thorium and radium are below the normal world-wide distribution range for soils.

- The uranium content of the soil is below the minimum of the published range of natural soils.
- The median thorium content of the soil is approximately equal to the minimum of the published range of natural soils.
- The median and mean radium-226 content of then soil is below the minimum of the published range of natural soils.

For the soil being transported to Woomera West, the radiological content of the soil does not represent an impediment to the soil being transported to the landfill, as it is below standard background ranges.

Examination of sample point E-0-C-200, where there was the highest concentration of lead, was compared to the radiological analysis for lead-210 measured at that sample location. E-0-C-200 recorded 26.6 Bq/kg ±5.3%. Compared to all other lead-210 results on site, 26 Bq/kg is slightly above average but not the maximum value recorded on site. Any link between the origin of this elemental lead being due to the presence of lead-210 can be discounted.

The PCSM indicated that termites might be responsible for transporting radiological material into the area where above average gamma emissions were detected. There is no evidence to indicate that is occurring, and any update of the CSM should remove that as a possible source of material transportation into the environment.

In summary:

---

[20] South Australian EPA, *Current criteria for the classification of waste—including Industrial and Commercial Waste (Listed) and Waste Soil*, Issued March 2010, EPA 889/10:

[21] https://www.epa.gov/land-research/proucl-software

- There is no indication of chemical or radiological leakage from the Annex (except for one sample location which shows a lead content that is above average)
- The soil at the Site and in the surrounding area appears to be a natural soil that has not been impacted by leakage from the Annex
- The soil that is to be stockpiled at the Woomera West landfill could be reused within the WPA for capping or other activities requiring uncontaminated soil (or waste derived fill)

9. Limitations

This report is given strictly in accordance with, and subject to, the following limitations:

- The report was prepared for CSIRO ("Client") in accordance with the Scope of Work agreed between CH2M HILL Australia Pty Ltd (Jacobs) and the Client
- Jacobs assumes no responsibility for conditions we were not authorised to investigate, or conditions not generally recognised as environmentally unacceptable when the services were performed
- This report is based, in part, on information supplied to Jacobs from several sources (e.g. aerial photographs and investigation reports prepared by others) and on information that is publicly available during the project research. Therefore, Jacobs does not guarantee its completeness or accuracy, and assumes no responsibility for errors or omissions related to this external information
- This report was prepared in accordance with, and by reference to, the applicable EPA and industry standards, guidelines and assessment criteria as listed in this report
- Current understanding of the site conditions depends on the integration of many pieces of information, some regional, some site specific, some structure-specific and some experienced-based, which may be contradictory, inconsistent or subject to interpretation
- Any opinions or recommendations presented herein apply to site conditions existing when services were performed. Jacobs is unable to report on or predict events that may change the site conditions after the described services are performed, whether occurring naturally or caused by external forces
- Given the outlined Scope of Works, Jacobs has only assessed the potential for contamination resulting from past and current known uses of the Site
- Jacobs does not guarantee that contamination does not exist at the Site
- This report should not be altered, amended or abbreviated, issued in part and issued incomplete in any way, except for requested review comments, which are then collated by Jacobs and incorporated into later revisions of the report – Jacobs accepts no responsibility for any circumstances that arise from the issue of the report which has been modified as outlined above, and
- This report has been prepared for the use of the Client relating to the property as described in the report in accordance with the terms and limitations stated in the agreement. No warranty, expressed or implied, is made.

10. References

10.1 Websites

Google Earth http://earth.google.com

https://www.epa.gov/land-research/proucl-software

http://maps.sa.gov.au/plb/

http://radiopurity.in2p3.fr/conversion.html

10.2 Documents

ARPANSA, *Inspection Report*, Report No: R16/05292, Licence Holder: CSIRO Hangar 5 Annex, Licence Number: S0013, , Date of inspection: 27-29 April 2016, https://www.arpansa.gov.au/sites/g/files/net3086/f/legacy/pubs/regulatory/inspections/2016/R16-05292.rtf

ARPANSA, *Radioactive Analysis Report EA16-075 (Interim Repor*t), received 30 May 2017,

Australian Standard AS4482.1, *Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: non-volatile and semi-volatile compounds*, AS4482.1 [2005]

Boardman, D and Hagan, S, *Woomera Characterisation: Gamma Survey of Area 1*, ANSTO Report Number R180057S, 15 May 2018

ChemCentre, *Report of Examination*, ChemCentre Residues Laboratory Reference 15S2516, 8-Aug-2016.

Geological Survey of South Australia, *Andamooka Map*, SA Geological Atlas Series Sheet SH 53-12, 1:250,000, May 22, 2012, Marree Subgroup (Bulldog Shale)

IAEA*, Environmental and Source Monitoring for Purposes of Radiation Protection*, IAEA Safety Guide No. RS-G-1.8

Kellett, J; et al, *Hydrogeological Assessment of a Region in Central Northern South Australia*, Bureau of Rural Sciences, 1999

Long, S et al, *A Survey of Naturally Occurring Radioactive Material Associated with Mining*, Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), Technical Report No. 161, August 2012

National Environment Protection Council, National Environment Protection (Assessment of Site Contamination) Measure (NEPM), 1999, 2013 amendment

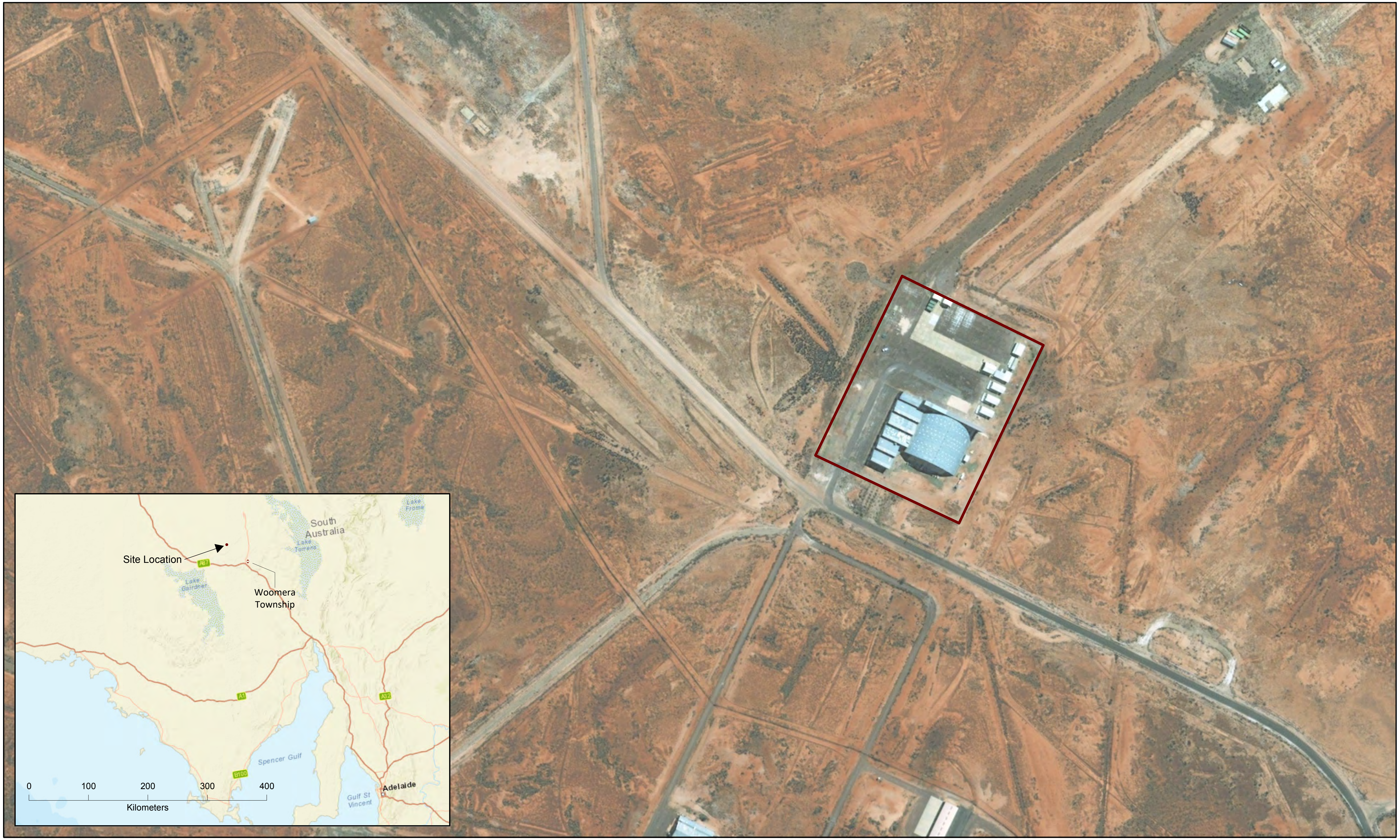
South Australian EPA, *Current criteria for the classification of waste—including Industrial and Commercial Waste (Listed) and Waste Soil*, Issued March 2010, EPA 889/10

South Australian EPA, *Guidelines for the Assessment and Remediation of Site Contamination*, July 2018

United Nations Scientific Committee on the Effects of Atomic Radiation, *Sources and Effects of Ionizing Radiation*, UNSCEAR 2000, Report to the General Assembly, United Nations.

Wallbridge Gilbert Aztec (WGA), *Hangar 5 Hardstand Pavement, Geotechnical Investigation*, 10 November 2017

Appendix A - Figures



N

0 25 50 75 100

Metres

🟥 Site Location/ Fence Line

Notes:
1. Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

DRAFT

Figure 1
Site Location
Hanger 5, Woomera Prohibited Area
Woomera Hanger 5 - Environmental Baseline Measurements

JACOBS

\\KWOFSP01\GIS\PROJECTS\AUSTRALIA_PSI\GIS\MAPFILES\ANNEX\SITELOCATION.MXD VM048279 7/31/2018 9:23:31 AM

⚏ Future Concrete Slab Construction

▨ Building

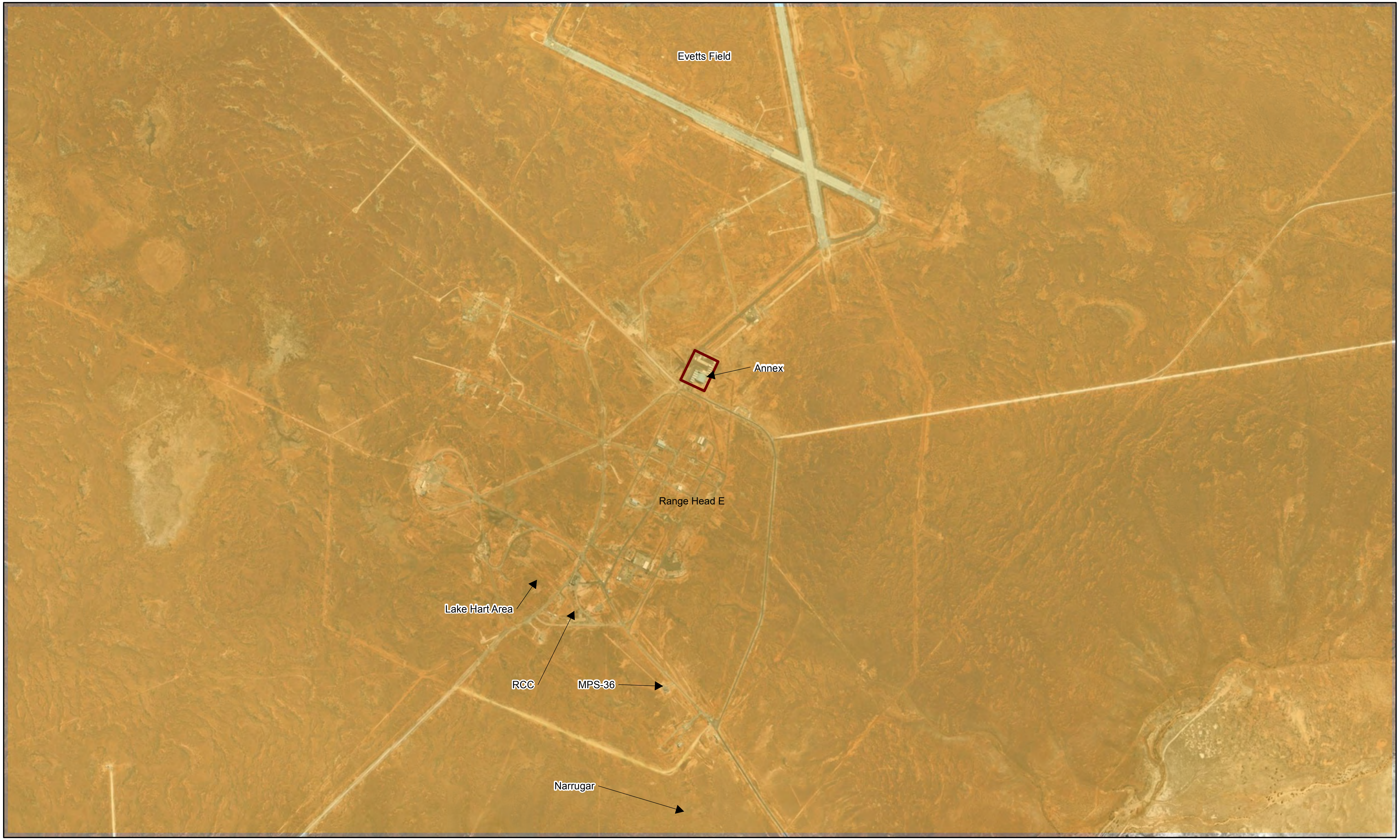
▭ Site Location/ Fence Line

Notes:
1. Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 2
Site Plan
Hanger 5, Woomera Prohibited Area
Woomera Hanger 5 - Environmental Baseline Measurements

JACOBS

\\KWOFSP01\GIS\PROJECTS\AUSTRALIA_PSI\GIS\MAPFILES\ANNEX\SITEPLAN.MXD VM048279 7/31/2018 8:09:19 AM



🟥 Site Location/ Fence Line

Land Use

🟧 Industrial

Notes:
1. Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

DRAFT

Figure 3
Surrounding Land Use
Hanger 5, Woomera Prohibited Area
Woomera Hanger 5 - Environmental Baseline Measurements

JACOBS

\\KWOFSP01\GIS\PROJECTS\AUSTRALIA_PSI\GIS\MAPFILES\ANNEX\LANDUSE.MXD VM048279 7/31/2018 9:13:39 AM

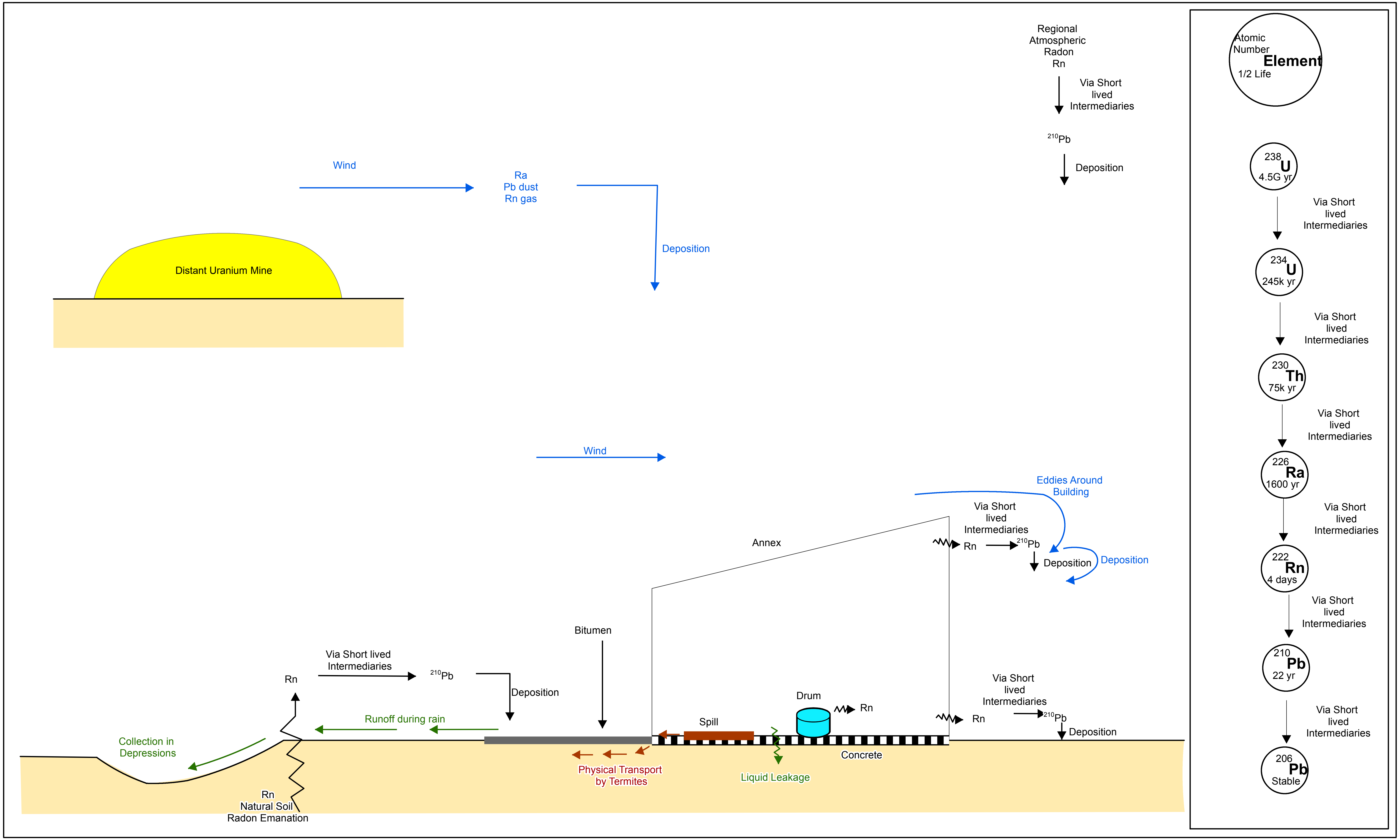
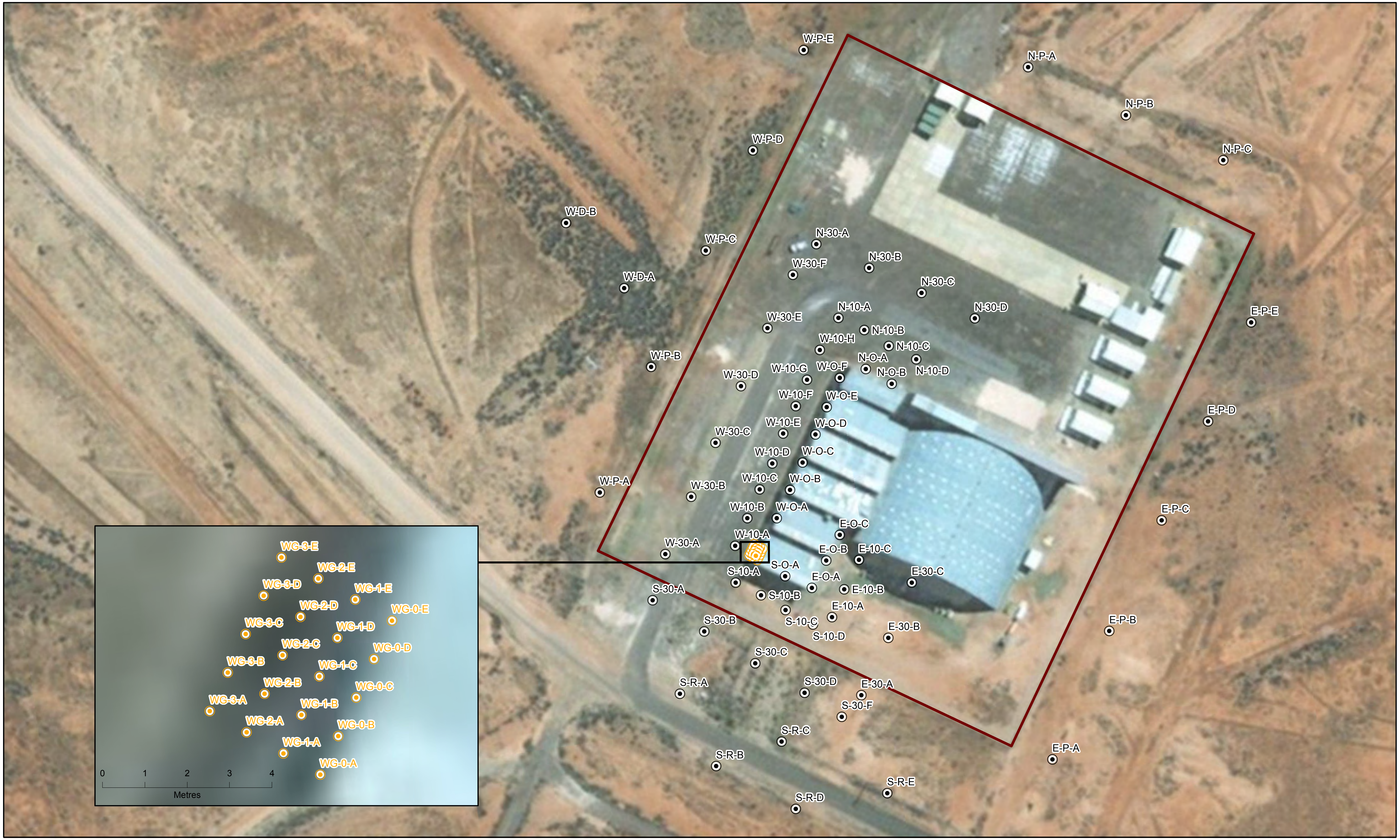


Figure 4
Preliminary Concentual Site Model
Hanger 5, Woomera Prohibited Area
Woomera Hanger 5 - Environmental Baseline Measurements



N

0 10 20 30 40

Metres

⦿ Soil Sample Location
(Sampled at Surface and at depth 200 mm - 300 mm)

⦿ Soil Sample Location
(Sampled at Surface and at depth 100 mm - 300 mm
and >300 mm below ground surface)

▭ Site Location/ Fence Line

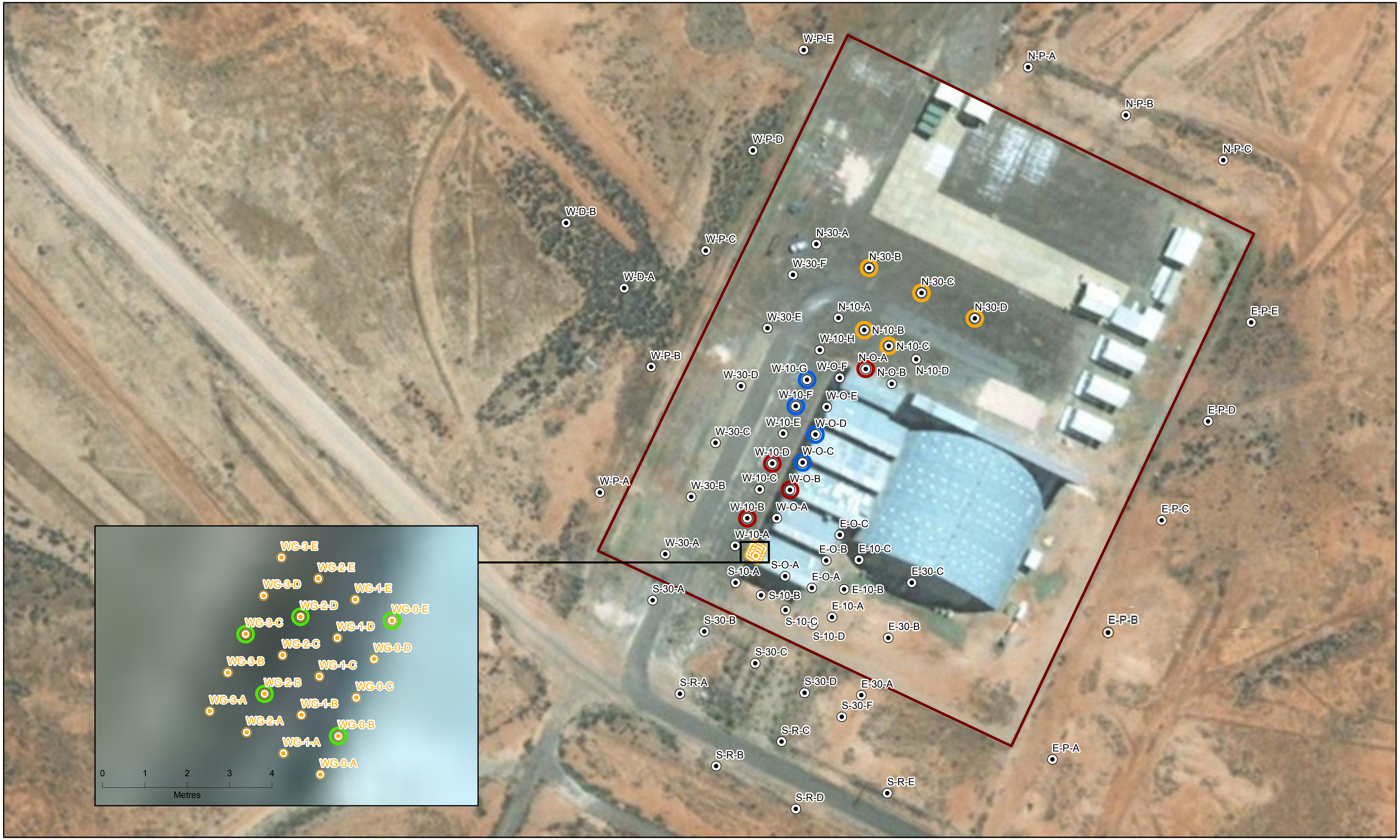
Notes:
1. Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

DRAFT

Figure 5
Soil Sampling Plan
Hanger 5, Woomera Prohibited Area
Woomera Hanger 5 - Environmental Baseline Measurements

JACOBS

\\KWOFSP01\GIS\PROJECTS\AUSTRALIA_PSI\GIS\MAPFILES\ANNEX\SOILSAMPLINGPLAN.MXD VM048279 7/31/2018 8:12:04 AM



⦿ Soil Sample Location
(Sampled at Surface and at depth 200 mm - 300 mm)

⦿ Soil Sample Location
(Sampled at Surface and at depth 100 mm - 300 mm
and >300 mm below ground surface)

○ Location Selected to Produce Sample Composite 01

○ Location Selected to Produce Sample Composite 02

○ Location Selected to Produce Sample Composite 03

○ Location Selected to Produce Sample Composite 04

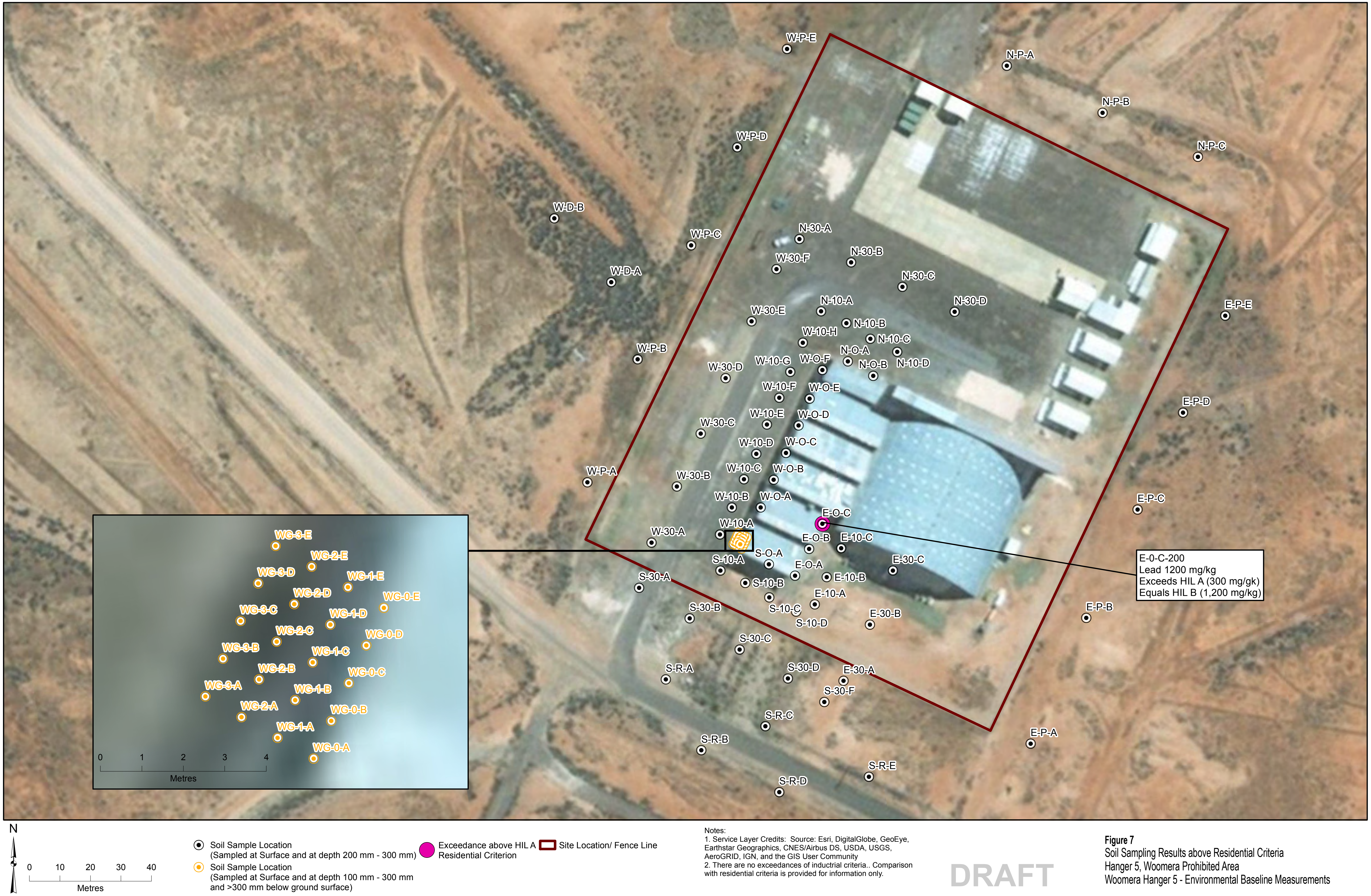
▭ Site Location/ Fence Line

Notes:
1. Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
2. There are no exceedances of inductrial criteria.. Comparison with residential criteria is provided for information only.

Figure 6
Locations of Composite Soil Samples
Hanger 5, Woomera Prohibited Area
Woomera Hanger 5 - Environmental Baseline Measurements

JACOBS

\\KWOFSP01\GIS\PROJECTS\AUSTRALIA_PSI\GIS\MAPFILES\ANNEX\COMPOSITESOILSAMPLES.MXD VM048279 7/31/2018 8:46:14 AM



Notes:
1. Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
2. There are no exceedances of inductrial criteria.. Comparison with residential criteria is provided for information only.

Figure 7
Soil Sampling Results above Residential Criteria
Hanger 5, Woomera Prohibited Area
Woomera Hanger 5 - Environmental Baseline Measurements

\\KWOFSP01\GIS\PROJECTS\AUSTRALIA_PSI\GIS\MAPFILES\ANNEX\RESIDENTIALEXCEEDS.MXD VM048279 7/31/2018 8:18:49 AM

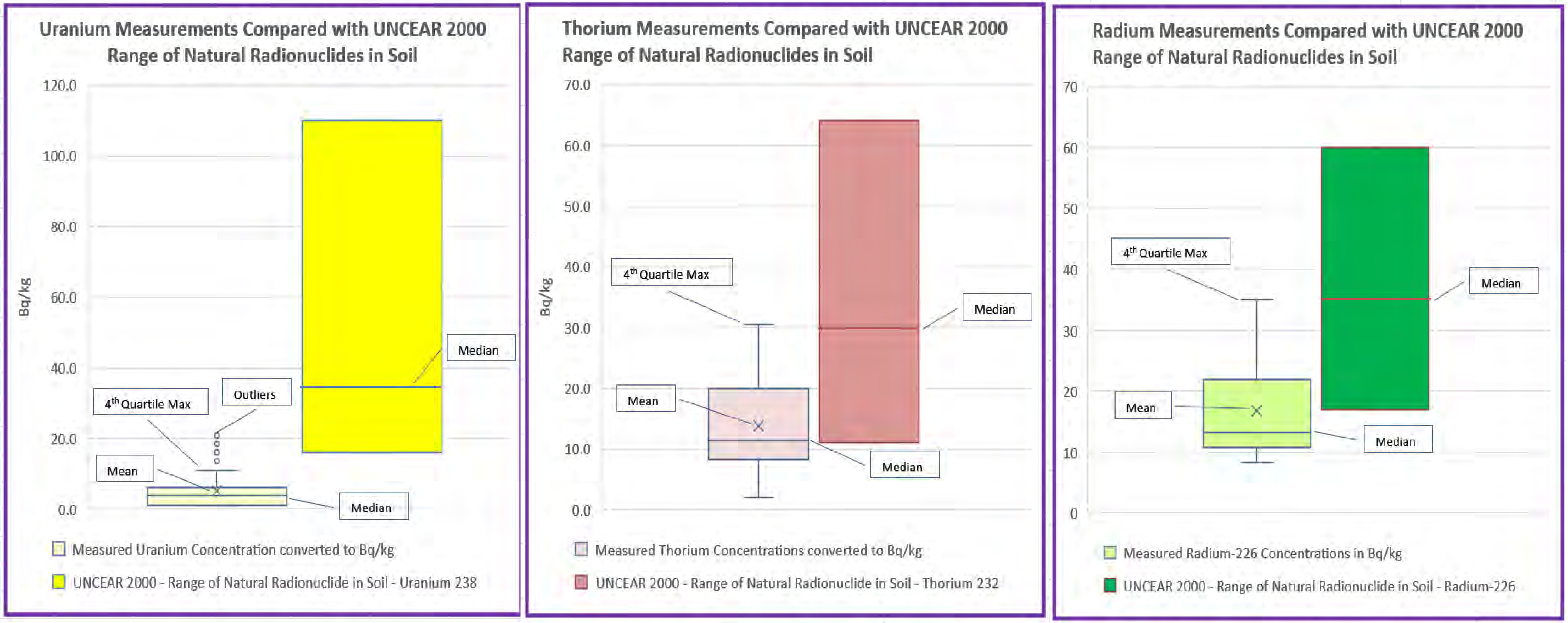


Figure 8
Box and Whisker Plot of Uranium, Thorium and Radium-226
vs Natural Distribution in Soil
Woomera Hanger 5 - Environmental Baseline Measurements

Appendix B – ARPANSA Soil Sampling - Laboratory Reports

THE GOVERNMENT OF WESTERN AUSTRALIA

ChemCentre

Residues Laboratory

Report of Examination

ChemCentre
EXPERT SOLUTIONS
PO Box 1250, Bentley Delivery Centre
Bentley WA 6983
T +61 8 9422 9800
F +61 8 9422 9801
www.chemcentre.wa.gov.au
ABN 40 991 885 705

Purchase Order: None
ChemCentre Reference: 15S2516

Aust. Radiation Protection & Nuclear Safety Agency
P O Box 655
MIRANDA NSW 1490

Attention: Loch Castle

Report on: 2 samples received on 05/05/2016

LAB ID	Material	Client ID and Description
15S2516 / 001	soil	ARP-WOO-07a
15S2516 / 002	soil	ARP-WOO-07b

LAB ID				001	002
Client ID				ARP-WOO-07a	ARP-WOO-07b
Sampled					
Analyte	**Method**	**LOR**	**Unit**		
Aldrin	ORG141S	0.01	mg/kg	<0.01	<0.01
alpha-Endosulfan	ORG141S	0.01	mg/kg	<0.01	<0.01
Antimony	iMET2SAMS	0.05	mg/kg	0.27	0.54
Arsenic	iMET2SAMS	0.2	mg/kg	2.4	7.6
Azinphos Ethyl	ORG141S	0.1	mg/kg	<0.10	<0.10
Azinphos methyl	ORG141S	0.1	mg/kg	<0.10	<0.10
Barium	iMET2SAICP	0.1	mg/kg	140	390
b-BHC	ORG141S	0.01	mg/kg	<0.01	<0.01
Beryllium	iMET2SAMS	0.05	mg/kg	0.32	0.73
B Chlordane	ORG141S	0.01	mg/kg	<0.01	<0.01
beta-Endosulfan	ORG141S	0.01	mg/kg	<0.01	<0.01
Bifenthrin	ORG141S	0.1	mg/kg	<0.10	<0.10
Cadmium	iMET2SAMS	0.05	mg/kg	1.6	2.0
Chlorfenvinphos (E)	ORG141S	0.1	mg/kg	<0.10	<0.10
Chlorfenvinphos (Z)	ORG141S	0.1	mg/kg	<0.10	<0.10
Chlorpyrifos	ORG141S	0.1	mg/kg	<0.10	<0.10
Chlorpyrifos methyl	ORG141S	0.1	mg/kg	<0.10	<0.10
Chromium	iMET2SAICP	0.05	mg/kg	18	36
Cobalt	iMET2SAICP	0.1	mg/kg	17	13
Copper	iMET2SAMS	0.5	mg/kg	13	32
Cyfluthrin	ORG141S	0.1	mg/kg	<0.10	<0.10
Cypermethrin	ORG141S	0.1	mg/kg	<0.10	<0.10
Cyproconazole	ORG141S	0.05	mg/kg	<0.05	<0.05
DDD	ORG141S	0.01	mg/kg	<0.01	<0.01
DDE	ORG141S	0.01	mg/kg	<0.01	<0.01
DDT	ORG141S	0.01	mg/kg	<0.10	<0.10
d-BHC	ORG141S	0.01	mg/kg	<0.01	<0.01
Deltamethrin	ORG141S	0.1	mg/kg	<0.10	<0.10
Demeton-S-methyl	ORG141S	0.1	mg/kg	<0.10	<0.10

LAB ID				001	002
Client ID				ARP-WOO-07a	ARP-WOO-07b
Sampled					
Analyte	**Method**	**LOR**	**Unit**		
Diazinon	ORG141S	0.1	mg/kg	<0.10	<0.10
Dichlorvos	ORG141S	0.1	mg/kg	<0.10	<0.10
Dieldrin	ORG141S	0.01	mg/kg	<0.01	<0.01
Dimethoate	ORG141S	0.1	mg/kg	<0.10	<0.10
Endosulfan sulfate	ORG141S	0.01	mg/kg	<0.01	<0.01
Endrin	ORG141S	0.01	mg/kg	<0.01	<0.01
Endrin Ketone	ORG141S	0.01	mg/kg	<0.01	<0.01
Ethion	ORG141S	0.1	mg/kg	<0.10	<0.10
Fenamiphos	ORG141S	0.1	mg/kg	<0.10	<0.10
Fenitrothion	ORG141S	0.1	mg/kg	<0.10	<0.10
Fenthion	ORG141S	0.1	mg/kg	<0.10	<0.10
Fenvalerate	ORG141S	0.1	mg/kg	<0.10	<0.10
Fipronil	ORG141S	0.05	mg/kg	<0.05	<0.05
Flusilazole	ORG141S	0.05	mg/kg	<0.05	<0.05
Fluvalinate	ORG141S	0.1	mg/kg	<0.10	<0.10
g-Chlordane	ORG141S	0.01	mg/kg	<0.01	<0.01
Heptachlor	ORG141S	0.01	mg/kg	<0.01	<0.01
Heptachlor epoxide	ORG141S	0.01	mg/kg	<0.01	<0.01
Hexachlorobenzene	ORG141S	0.01	mg/kg	<0.01	<0.01
Hexaconazole	ORG141S	0.05	mg/kg	<0.05	<0.05
Iprodione	ORG141S	0.05	mg/kg	<0.05	<0.05
Lead	iMET2SAICP	0.5	mg/kg	25	190
Lindane	ORG141S	0.01	mg/kg	<0.01	<0.01
Malathion	ORG141S	0.1	mg/kg	<0.10	<0.10
Manganese	iMET2SAICP	0.2	mg/kg	110	250
Mercury	iMET2SAMS	0.02	mg/kg	0.19	0.13
Metalaxyl	ORG141S	0.05	mg/kg	<0.05	<0.05
Methidathion	ORG141S	0.1	mg/kg	<0.10	<0.10
Methoxychlor	ORG141S	0.01	mg/kg	<0.01	<0.01
Mevinphos	ORG141S	0.1	mg/kg	<0.10	<0.10
Molybdenum	iMET2SAMS	0.05	mg/kg	0.43	0.30
Myclobutanil	ORG141S	0.05	mg/kg	<0.05	<0.05
Nickel	iMET2SAMS	0.1	mg/kg	6.2	14
Oxychlordane	ORG141S	0.01	mg/kg	<0.01	<0.01
Parathion Ethyl	ORG141S	0.1	mg/kg	<0.10	<0.10
Parathion Methyl	ORG141S	0.1	mg/kg	<0.10	<0.10
Pendimethalin	ORG141S	0.05	mg/kg	<0.05	<0.05
Permethrin	ORG141S	0.1	mg/kg	<0.10	<0.10
Phorate	ORG141S	0.1	mg/kg	<0.10	<0.10
Piperonyl Butoxide	ORG141S	0.05	mg/kg	<0.05	<0.05
Pirimiphos Ethyl	ORG141S	0.1	mg/kg	<0.10	<0.10
Pirimiphos Methyl	ORG141S	0.1	mg/kg	<0.10	<0.10
Propiconazole	ORG141S	0.05	mg/kg	<0.05	<0.05
Pyrazophos	ORG141S	0.1	mg/kg	<0.10	<0.10
Quintozene	ORG141S	0.05	mg/kg	<0.05	<0.05
Selenium	iMET2SAMS	0.05	mg/kg	0.11	0.35
Silver	iMET2SAMS	0.05	mg/kg	<0.05	0.34
Tebuconazole	ORG141S	0.05	mg/kg	<0.05	<0.05
Tetradifon	ORG141S	0.05	mg/kg	<0.05	<0.05
Tin	iMET2SAMS	0.5	mg/kg	1.5	7.8

LAB ID				001	002
Client ID				ARP-WOO-07a	ARP-WOO-07b
Sampled					
Analyte	**Method**	**LOR**	**Unit**		
Zinc	iMET2SAICP	5	mg/kg	860	6400
Electrical Conductivity	(1:5)	1	mS/m	37	11
pH	(H2O)	0.1		8.6	8.2
TRH C6-C10	ORG007SSolv	25	mg/kg	<25	<25
TRH >C10-C16	ORG007S	50	mg/kg	<50	<50
TRH >C16-C34	ORG007S	100	mg/kg	<100	<100
TRH >C34-C40	ORG007S	100	mg/kg	270	120
Total TRHs	ORG007SSolvC	275	mg/kg	360	<280

Method	Method Description
(1:5)	Electrical conductivity of 1:5 soil extract at 25 C by in-house method S02 (Method 3A1; Rayment & Lyons (2011)).
(H2O)	pH of 1:5 soil:water extract by in-house method S01 (Method 4A1; Rayment & Lyons (2011))
iMET2SAICP	Acid digestable metals (dry wt basis) by digestion and ICPAES (USEPA 3051A modification).
iMET2SAMS	Acid digestable metals (dry wt basis) by ICPMS (USEPA 3051A modification).
ORG007S	Total Recoverable Hydrocarbons in Soil
ORG007SSolv	TRH C6-C10 in Soil by Solvent Extraction
ORG007SSolvC	Sum of TRHs in Soils with C6-C10 by Solvent Extraction
ORG141S	Pesticides in Soil by GC-QQQ

"<" signifies a result is less than the limit of quantitation for the method.

These results apply only to the sample(s) as received.

Results may not be reproduced except in full.

Unless requested otherwise, sample(s) will be disposed of after 30 days of the issue of this report.

The QC failed for ORG141 pesticide compounds due to sample interferences.

Traces of DDT and Bifenthrin were detected although the levels were below limits of reporting.

Angela Downey
Senior Scientist & Research Officer
Scientific Services Division
8-Aug-2016

B. Muir

Bob Muir
Principal Scientist
Scientific Services Division

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

RADIOACTIVITY ANALYSIS REPORT EA16-075 (Interim Report)

REQUESTED BY:	ARPANSA Reg branch
	Attention: Loch Castle
ORDER No.:	Request received 30/05/16

SAMPLE DETAILS:

Type:	Soil
Number of Samples:	6
Date Received:	30/05/2016
Sample Pre-treatment:	Samples for radium analysis set in resin.
Sampling:.	Samples tested as received
Date Analysis Started:	02/06/16

ANALYSES REQUESTED:	Uranium-238, Radium-226, Lead-210, Radium-228, Thorium-228, Uranium-235, Potassium-40 and Caesium-137
ANALYTICAL METHOD:	Sample measured by high resolution gamma-ray spectrometry based on ANSI N42.14-1999.

Report Prepared By: Sandra Sdraulig, Technical Manager

Signed: Liesel Green

Date: 13 July 2016

Liesel Green, Analyst
Per: Carl-Magnus Larsson CEO of ARPANSA

RADIOACTIVITY ANALYSIS REPORT EA16-075 (continued) (Interim Report)

RESULTS:

ARPANSA Sample Number	Client Sample Identifier	Sample Reference Date	Radioactivity Concentration (Bq/kg)							
			Potassium -40	Caesium-137	Uranium-238	Radium-226*	Lead-210	Radium-228*	Thorium-228*	Uranium-235
EA16-075-0096	ARP-WOO-01	30/05/2016	309 ± 45	1.17 ± 0.32		20.8 ± 2.4	38 ± 15	27.4 ± 3.5	28.6 ± 3.1	
EA16-075-0097	ARP-WOO-02	30/05/2016	224 ± 35	0.46 ± 0.22		14.5 ± 2.1	32.6 ± 8.2	21.6 ± 3.4	21.6 ± 3.0	
EA16-075-0098	ARP-WOO-03 (comp of 2)	30/05/2016	405 ± 54	<1.2		22.3 ± 2.7	19.8 ± 4.8	31.1 ± 4.6	32.7 ± 4.3	
EA16-075-0099	ARP-WOO-04 (comp of 2)	30/05/2016	295 ± 42	<1.1		19.1 ± 2.6	20.8 ± 4.9	32.1 ± 4.2	34.5 ± 4.4	
EA16-075-0100	ARP-WOO-05 (comp of 2)	30/05/2016	299 ± 43	0.82 ± 0.28		19.4 ± 2.5	128 ± 35	24.9 ± 3.4	26.2 ± 3.4	
EA16-075-0101	ARP-WOO-06 (comp of 2)	30/05/2016	348 ± 49	<0.79		24.9 ± 3.1	71 ± 21	35.4 ± 4.9	38.4 ± 4.7	

* Radionuclide concentration estimated from short-lived gamma-emitting progeny.

The reported uncertainty is an expanded uncertainty (sample mass and counting uncertainties only) calculated using a coverage factor of 2.

These results are reported on a dry weight basis.

Minimum detectable activity concentration (<x): the true activity concentration is estimated to be less than x with 95% confidence, as defined by Currie (Currie,L.A., 1968 Anal. Chem. 40, 586-593)

The radionuclides (from the uranium and thorium series) specified in our reports are the relatively long-lived members of the decay series that can be quantified. If a measure of total radioactivity is required, all radionuclides in the decay series should be considered.

Appendix B

Comparison of ARPANSA Soil Data with NEPM Published Criteria

Summary of ARPANSA Samples with removal of analytes below the limit of reporting
Comparison with NEPM health investigation levels (HIL) for different land use scenarios.
Exceedances in bold and highlighted in the appropriate highlight colour

	Two ARPANSA samples received 5/05/2016		Residential A	Residential B	Commercial / industrial D
	ARP-WOO-07a	ARP-WOO-07b	HIL A	HIL B	HIL D
Antimony	0.27	0.54	-	-	-
Arsenic	2.4	7.6	100	500	3 000
Barium	140	390	-	-	-
Beryllium	0.32	0.73	60	90	500
Cadmium	1.6	2	20	150	900
Chromium	18	36	Only value for chromium VI published		
Cobalt	17	13	100	600	4000
Copper	13	32	6000	30 000	240 000
Lead	25	190	300	1200	1 500
Manganese	110	250	3800	14 000	60 000
Mercury	0.19	0.13	40	120	730
Molybdenum	0.43	0.3	-	-	-
Nickel	6.2	14	400	1200	6 000
Selenium	0.11	0.35	200	1400	10 000
Silver	<0.05	0.34	-	-	-
Tin	1.5	7.8	-	-	-
Zinc	860	6400	7400	60 000	400 000

Comparison of total recoverable hydrocarbons (TRH) with ecological screening levels (ESLs)
Exceedances in bold and highlighted in the appropriate highlight colour

	Two ARPANSA samples received 5/05/2016		Soil Texture	Urban residential and public open space	Commercial and industrial
	ARP-WOO-07a	ARP-WOO-07b			
TRH >C34-C40	270	120	Coarse	2800	3300
			Fine	5600	6600
Total TRHs	360	<280		-	-

Appendix C - Exterior Dose Rate Measurements at Annex

MEMORANDUM

Exterior Dose Rate Measurements at Annex

PREPARED FOR:	[redacted]	[redacted]
COPY TO:	[redacted]	
PREPARED BY:	[redacted]	
DATE:	12 February 2018	
PROJECT NUMBER:	684331	
REVISION NO.:	Draft for Comment	

It was requested that a radiological survey be carried out along the exterior wall of the Evetts Field Annex while CH2M personnel were mobilised to Woomera. This memo reports on the measurements of the survey conducted on Tuesday 6 February 2018.

Methodology

Meters used to Record Does Rates

Two radiological meters were brought to site to conduct measurements. These were:

A **Fluke 481** radiation survey meter (SGS Calibration CAL-17-12529, recalibration date 16 Oct 2018) hired from TechRentals

A **Ludlum Model 2401-P** survey meter (ANSTO Calibration 2470, recalibration date 11 Feb 2018), borrowed from CSIRO (note this is the same survey meter used in previous environmental audits conducted by CH2M).

Testing of both meters was conducted prior to use.

The Fluke 481 has an automatic function to zero the background radiation, so if held in one location for several seconds, the readings dropped to zero. This meter was not used in the survey

The Ludlum 2401 has an open window, so it overreads at low KeV values. The Ludlum did not have a slide to compensate for this overreading. Spot checks were made against two instruments that ANSTO personnel had on site. This showed the Ludlum over-reads the dose rate (in µSv/hr) by approximately 10%, which is within the instrument error reported for the device. This meter was used throughout to measure the µSv/hr emanating from the Annex.

In addition, ANSTO conducted their own measurements of the Annex. The ANSTO results are not reported here, but discussions in the field indicated that similar results to those obtained by CH2M were measured by ANSTO, except that the Ludlum measurements were approximately 10% higher than the ANSTO results

Survey Methodology

The Ludlum was moved continuously in the pattern shown in **Figure 1**, on three sides of the Annex. The sides measured are shown in **Figure 2**. The analogue meter was monitored at all times to observe the fluctuations and record the range of measurements. Occasional bursts of radiation from particular

locations were also recorded. The data is displayed according to which side of the Annex was measured (that is, the western, southern or northern sides, as indicted in Figure 2.

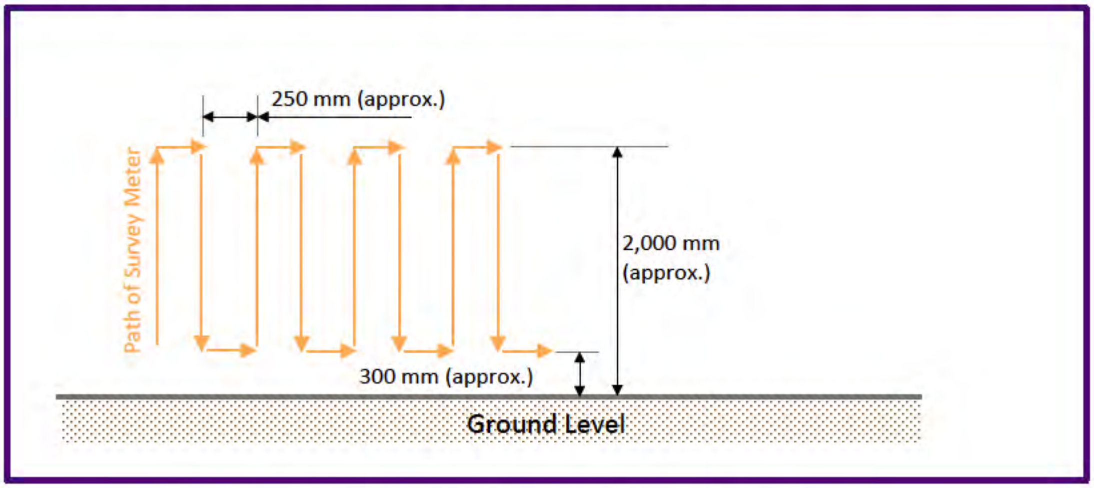
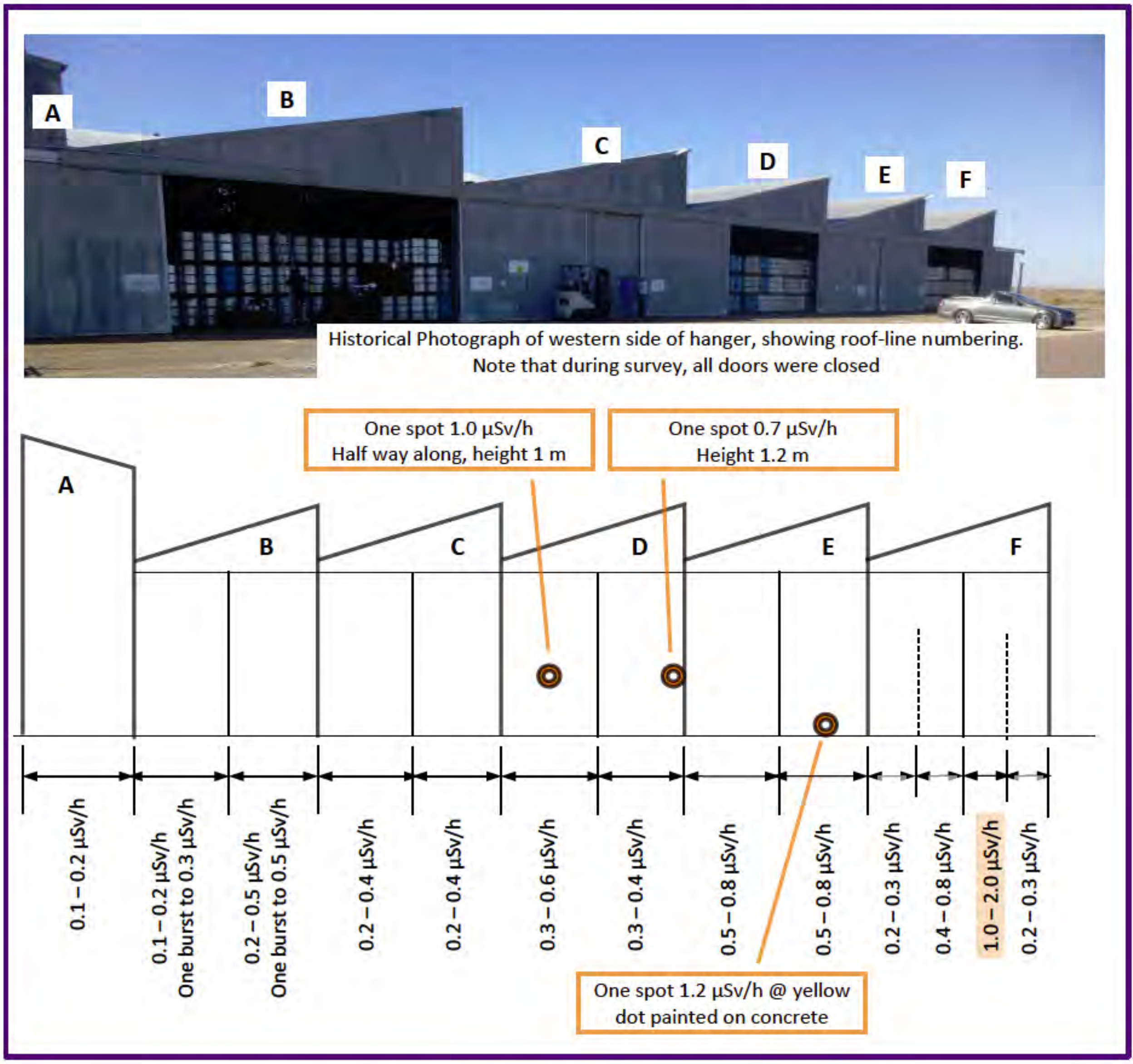


Figure 1 – Survey Pattern Adopted on the Exterior of the Annex

Figure 2 – Survey Areas around the Annex

Survey Measurements of Annex

The results are displayed graphically in Figure 3, Figure 4 and Figure 5.



Historical Photograph of western side of hanger, showing roof-line numbering.
Note that during survey, all doors were closed

One spot 1.0 µSv/h
Half way along, height 1 m

One spot 0.7 µSv/h
Height 1.2 m

One spot 1.2 µSv/h @ yellow
dot painted on concrete

Figure 3 – Measurements along Western Wall of Annex

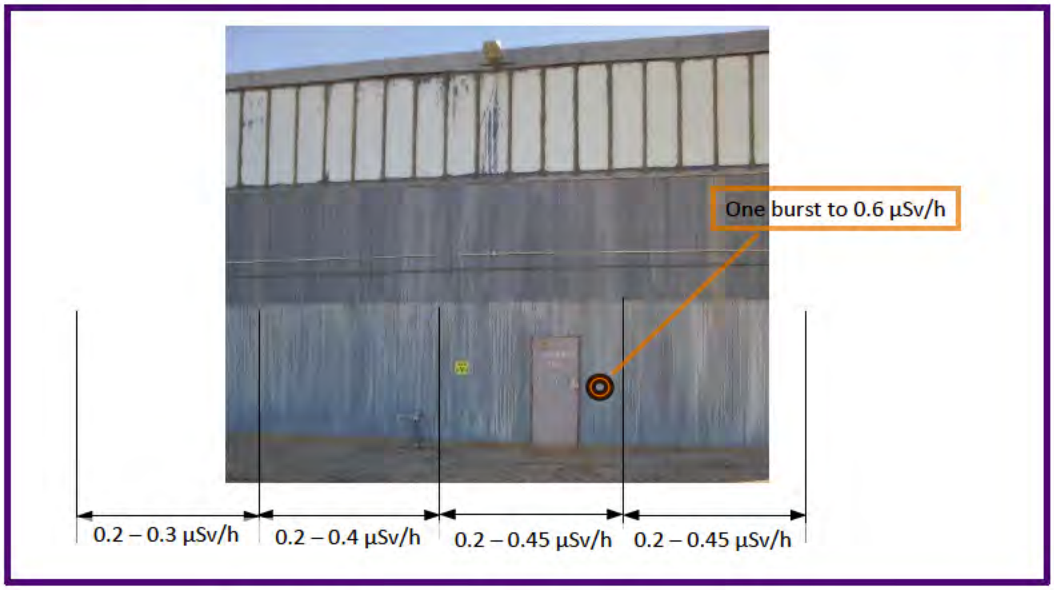


Figure 4 – Measurements along Southern Wall of Annex

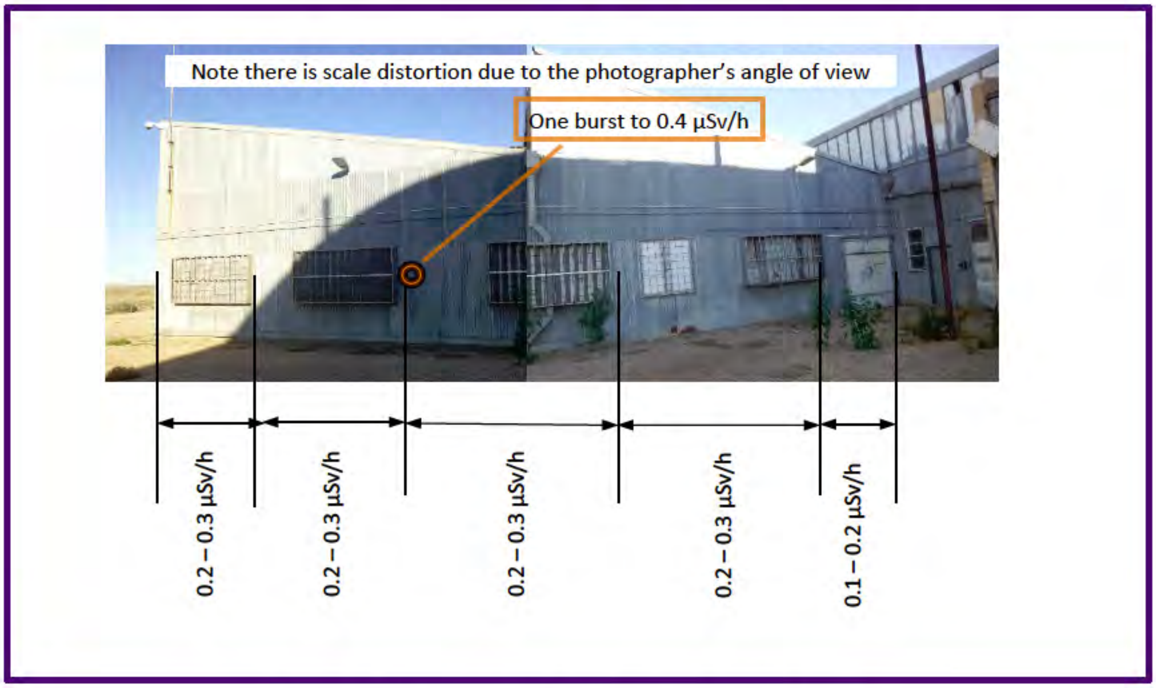


Figure 5 - Measurements along Eastern Wall of Annex

Appendix D – Laboratory Results for Chemical Analysis

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	[redacted]
Client	CH2M HILL AUSTRALIA PTY LTD
Address	PO BOX 5392 CHATSWOOD NSW 1515
Telephone	61 2 99500200
Facsimile	61 2 99500601
Email	[redacted]ch2m.com
Project	**CSIRO Woomera - Project # 684331**
Order Number	(Not specified)
Samples	82

LABORATORY DETAILS

Manager	Ros Ma
Laboratory	SGS Perth Environmental
Address	28 Reid Rd Perth Airport WA 6105
Telephone	(08) 9373 3500
Facsimile	(08) 9373 3556
Email	au.environmental.perth@sgs.com
SGS Reference	**PE123413 R0**
Date Received	14 Feb 2018
Date Reported	09 Mar 2018

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(898/20210).

Total Recoverable Metals:Cr, Cu, Ni & Zn: MSD RPD failed due to sample heterogeneity.

SVOC matrix spikes for sample #55 are not reported due to sample matrix interferences.

TRH: Matrix spikes were analysed on a sample from a different job within the different analytical batch. They could not be reported due to significant TRH within the sample.

Thorium and Uranium subcontracted to SGS Perth Minerals, 28 Reid Rd Perth Airport WA, NATA Accreditation Number 1936, WM182644.

SIGNATORIES

Hue Thanh Ly
Metals Team Leader

Michael McKay
Inorganics and ARD Supervisor

Rashmi Thakur
Laboratory Technician

Stefani Dewi
Chemist

		Sample Number	PE123413.001	PE123413.002	PE123413.003	PE123413.004
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	WG-0-A-10	WG-0-A-200	WG-0-B-10	WG-0-C-10
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
% Moisture	%w/w	1	8.0	8.4	10.1	9.0

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 22/2/2018

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
Arsenic, As	mg/kg	1	<1	2	2	1
Cadmium, Cd	mg/kg	0.3	0.4	0.4	0.9	<0.3
Chromium, Cr	mg/kg	0.5	13	12	13	11
Copper, Cu	mg/kg	0.5	5.3	5.0	7.6	4.8
Lead, Pb	mg/kg	1	5	5	15	4
Nickel, Ni	mg/kg	0.5	4.7	4.3	5.6	3.9
Zinc, Zn	mg/kg	2	66	68	380	24

Mercury in Soil Method: AN312 Tested: 22/2/2018

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
Thorium, Th*	mg/kg	0.5	2.1	2.9	3.0	2.8
Uranium, U*	mg/kg	0.1	<0.1	1.5	1.5	1.3

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.001	PE123413.002	PE123413.003	PE123413.004
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	WG-0-A-10	WG-0-A-200	WG-0-B-10	WG-0-C-10
Parameter	Units	LOR				

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Parameter	Units	LOR	PE123413.001	PE123413.002	PE123413.003	PE123413.004
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.001 Soil 06 Feb 2018 WG-0-A-10	PE123413.002 Soil 06 Feb 2018 WG-0-A-200	PE123413.003 Soil 06 Feb 2018 WG-0-B-10	PE123413.004 Soil 06 Feb 2018 WG-0-C-10

Sample Number / Sample Matrix / Sample Date / Sample Name

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.005	PE123413.006	PE123413.007	PE123413.008
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	WG-0-C-200	WG-0-E-10	WG-0-E-200	WG-1-B-10
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	8.0	8.4	23.8	9.3

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 22/2/2018

Arsenic, As	mg/kg	1	2	1	6	2
Cadmium, Cd	mg/kg	0.3	0.6	0.3	0.6	<0.3
Chromium, Cr	mg/kg	0.5	10	11	27	11
Copper, Cu	mg/kg	0.5	5.3	5.1	18	5.4
Lead, Pb	mg/kg	1	16	4	9	4
Nickel, Ni	mg/kg	0.5	4.6	4.2	14	4.4
Zinc, Zn	mg/kg	2	170	40	49	20

Mercury in Soil Method: AN312 Tested: 22/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	2.7	3.5	3.3	2.6
Uranium, U*	mg/kg	0.1	1.3	1.4	1.7	1.3

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name: PE123413.005 Soil 06 Feb 2018 WG-0-C-200	PE123413.006 Soil 06 Feb 2018 WG-0-E-10	PE123413.007 Soil 06 Feb 2018 WG-0-E-200	PE123413.008 Soil 06 Feb 2018 WG-1-B-10

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.005 Soil 06 Feb 2018 WG-0-C-200	PE123413.006 Soil 06 Feb 2018 WG-0-E-10	PE123413.007 Soil 06 Feb 2018 WG-0-E-200	PE123413.008 Soil 06 Feb 2018 WG-1-B-10

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE123413.009 Soil 06 Feb 2018 WG-1-B-200	PE123413.010 Soil 06 Feb 2018 WG-1-D-10	PE123413.011 Soil 06 Feb 2018 WG-1-D-200	PE123413.012 Soil 06 Feb 2018 WG-2-A-10

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	10.0	8.4	9.2	6.2

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 22/2/2018

Arsenic, As	mg/kg	1	2	3	1	2
Cadmium, Cd	mg/kg	0.3	<0.3	0.6	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	11	11	9.3	9.9
Copper, Cu	mg/kg	0.5	4.9	6.1	3.0	5.0
Lead, Pb	mg/kg	1	4	8	3	4
Nickel, Ni	mg/kg	0.5	4.0	5.0	2.4	4.3
Zinc, Zn	mg/kg	2	14	97	12	19

Mercury in Soil Method: AN312 Tested: 22/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	2.6	2.4	2.9	2.7
Uranium, U*	mg/kg	0.1	1.5	1.2	1.5	1.4

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.009	PE123413.010	PE123413.011	PE123413.012
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	WG-1-B-200	WG-1-D-10	WG-1-D-200	WG-2-A-10
Parameter	**Units**	**LOR**				

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Parameter	Units	LOR	PE123413.009	PE123413.010	PE123413.011	PE123413.012
Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

Parameter	Units	LOR	PE123413.009	PE123413.010	PE123413.011	PE123413.012
TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

Parameter	Units	LOR	PE123413.009	PE123413.010	PE123413.011	PE123413.012
TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Parameter	Units	LOR	PE123413.009	PE123413.010	PE123413.011	PE123413.012
Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Parameter	Units	LOR	PE123413.009	PE123413.010	PE123413.011	PE123413.012
Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Parameter	Units	LOR	PE123413.009	PE123413.010	PE123413.011	PE123413.012
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name: PE123413.009 Soil 06 Feb 2018 WG-1-B-200	PE123413.010 Soil 06 Feb 2018 WG-1-D-10	PE123413.011 Soil 06 Feb 2018 WG-1-D-200	PE123413.012 Soil 06 Feb 2018 WG-2-A-10

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Parameter	Units	LOR	PE123413.009	PE123413.010	PE123413.011	PE123413.012
Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

Parameter	Units	LOR	PE123413.009	PE123413.010	PE123413.011	PE123413.012
2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.013	PE123413.014	PE123413.015	PE123413.016
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	WG-2-A-200	WG-2-C-10	WG-2-C-200	WG-2-E-10
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

Parameter	Units	LOR	PE123413.013	PE123413.014	PE123413.015	PE123413.016
% Moisture	%w/w	1	7.5	6.3	10.2	8.5

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 22/2/2018

Parameter	Units	LOR	PE123413.013	PE123413.014	PE123413.015	PE123413.016
Arsenic, As	mg/kg	1	1	4	2	2
Cadmium, Cd	mg/kg	0.3	<0.3	0.4	<0.3	0.3
Chromium, Cr	mg/kg	0.5	9.0	17	11	12
Copper, Cu	mg/kg	0.5	2.6	11	4.3	5.2
Lead, Pb	mg/kg	1	3	9	3	4
Nickel, Ni	mg/kg	0.5	2.3	8.5	3.2	4.5
Zinc, Zn	mg/kg	2	6	29	10	13

Mercury in Soil Method: AN312 Tested: 22/2/2018

Parameter	Units	LOR	PE123413.013	PE123413.014	PE123413.015	PE123413.016
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Parameter	Units	LOR	PE123413.013	PE123413.014	PE123413.015	PE123413.016
Thorium, Th*	mg/kg	0.5	2.5	2.8	2.7	2.9
Uranium, U*	mg/kg	0.1	1.4	1.4	1.5	1.3

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

Parameter	Units	LOR	PE123413.013	PE123413.014	PE123413.015	PE123413.016
TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Parameter	Units	LOR	PE123413.013	PE123413.014	PE123413.015	PE123413.016
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.013 Soil 06 Feb 2018 WG-2-A-200	PE123413.014 Soil 06 Feb 2018 WG-2-C-10	PE123413.015 Soil 06 Feb 2018 WG-2-C-200	PE123413.016 Soil 06 Feb 2018 WG-2-E-10

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.013 Soil 06 Feb 2018 WG-2-A-200	PE123413.014 Soil 06 Feb 2018 WG-2-C-10	PE123413.015 Soil 06 Feb 2018 WG-2-C-200	PE123413.016 Soil 06 Feb 2018 WG-2-E-10

Sample Number / Sample Matrix / Sample Date / Sample Name

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Parameter	Units	LOR	PE123413.013	PE123413.014	PE123413.015	PE123413.016
Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

Parameter	Units	LOR	PE123413.013	PE123413.014	PE123413.015	PE123413.016
2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.017	PE123413.018	PE123413.019	PE123413.020
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	07 Feb 2018	07 Feb 2018	07 Feb 2018
		Sample Name	WG-2-E-200	W-0-A-5	W-0-A-200	W-10-B-5
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	7.4	7.0	5.8	6.4

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 22/2/2018

Arsenic, As	mg/kg	1	1	2	1	2
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	9.4	11	9.4	9.5
Copper, Cu	mg/kg	0.5	2.9	5.0	6.9	3.7
Lead, Pb	mg/kg	1	3	4	3	2
Nickel, Ni	mg/kg	0.5	2.4	4.4	3.0	3.0
Zinc, Zn	mg/kg	2	7	15	11	8

Mercury in Soil Method: AN312 Tested: 22/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	2.8	2.3	1.7	1.8
Uranium, U*	mg/kg	0.1	1.4	<0.1	<0.1	<0.1

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.017	PE123413.018	PE123413.019	PE123413.020
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	07 Feb 2018	07 Feb 2018	07 Feb 2018
		Sample Name	WG-2-E-200	W-0-A-5	W-0-A-200	W-10-B-5
Parameter	Units	LOR				
Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)						
VPH F Bands						
Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-
TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018						
TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-
TRH F Bands						
TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-
VOC's in Soil Method: AN433 Tested: 22/2/2018						
Monocyclic Aromatic Hydrocarbons						
Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-
Polycyclic VOCs						
Naphthalene	mg/kg	0.1	-	-	-	-
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.017 Soil 06 Feb 2018 WG-2-E-200	PE123413.018 Soil 07 Feb 2018 W-0-A-5	PE123413.019 Soil 07 Feb 2018 W-0-A-200	PE123413.020 Soil 07 Feb 2018 W-10-B-5

Sample Number / Sample Matrix / Sample Date / Sample Name

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.021	PE123413.022	PE123413.023	PE123413.024
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	07 Feb 2018	07 Feb 2018	07 Feb 2018	07 Feb 2018
		Sample Name	W-10-B-200	W-10-A-200	WG-3-B-10	WG-3-B-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	13.3	5.2	7.0	6.5

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	5	2	1	3
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	19	10	10	13
Copper, Cu	mg/kg	0.5	13	4.5	3.6	7.0
Lead, Pb	mg/kg	1	6	3	3	4
Nickel, Ni	mg/kg	0.5	9.9	3.5	3.1	5.7
Zinc, Zn	mg/kg	2	28	10	9	16

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	4.8	2.0	1.8	3.0
Uranium, U*	mg/kg	0.1	0.3	<0.1	<0.1	0.2

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE123413.021 Soil 07 Feb 2018 W-10-B-200	PE123413.022 Soil 07 Feb 2018 W-10-A-200	PE123413.023 Soil 07 Feb 2018 WG-3-B-10	PE123413.024 Soil 07 Feb 2018 WG-3-B-200

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.021 Soil 07 Feb 2018 W-10-B-200	PE123413.022 Soil 07 Feb 2018 W-10-A-200	PE123413.023 Soil 07 Feb 2018 WG-3-B-10	PE123413.024 Soil 07 Feb 2018 WG-3-B-200

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.025	PE123413.026	PE123413.027	PE123413.028
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	07 Feb 2018	07 Feb 2018	07 Feb 2018	07 Feb 2018
		Sample Name	WG-3-D-10	WG-3-D-200	S-0-A-5	S-0-A-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	4.0	7.2	13.9	20.0

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	<1	1	4	6
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	9.0	10	7.8	28
Copper, Cu	mg/kg	0.5	2.7	4.1	10	19
Lead, Pb	mg/kg	1	2	2	3	9
Nickel, Ni	mg/kg	0.5	2.3	3.3	7.6	16
Zinc, Zn	mg/kg	2	6	9	11	46

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	1.6	1.9	1.4	7.5
Uranium, U*	mg/kg	0.1	<0.1	<0.1	0.4	0.6

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.025 Soil 07 Feb 2018 WG-3-D-10	PE123413.026 Soil 07 Feb 2018 WG-3-D-200	PE123413.027 Soil 07 Feb 2018 S-0-A-5	PE123413.028 Soil 07 Feb 2018 S-0-A-200
Sample Number / Sample Matrix / Sample Date / Sample Name						

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.025	PE123413.026	PE123413.027	PE123413.028
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	07 Feb 2018	07 Feb 2018	07 Feb 2018	07 Feb 2018
		Sample Name	WG-3-D-10	WG-3-D-200	S-0-A-5	S-0-A-200
Parameter	Units	LOR				

SVOC in Soil   Method: AN420   Tested: 1/3/2018

PAHs

Parameter	Units	LOR	PE123413.025	PE123413.026	PE123413.027	PE123413.028
Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

Parameter	Units	LOR	PE123413.025	PE123413.026	PE123413.027	PE123413.028
2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.029	PE123413.030	PE123413.031	PE123413.032
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	07 Feb 2018	07 Feb 2018	07 Feb 2018	07 Feb 2018
		Sample Name	S-10-A-5	S-10-A-200	S-10-B-5	S-10-B-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	13.3	9.2	13.9	18.3

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	4	4	5	6
Cadmium, Cd	mg/kg	0.3	0.6	0.5	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	17	14	13	21
Copper, Cu	mg/kg	0.5	14	11	13	19
Lead, Pb	mg/kg	1	16	11	5	11
Nickel, Ni	mg/kg	0.5	9.8	7.9	11	12
Zinc, Zn	mg/kg	2	160	110	23	47

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	3.6	3.1	2.8	5.2
Uranium, U*	mg/kg	0.1	0.3	0.2	0.6	0.5

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE123413.029 Soil 07 Feb 2018 S-10-A-5	PE123413.030 Soil 07 Feb 2018 S-10-A-200	PE123413.031 Soil 07 Feb 2018 S-10-B-5	PE123413.032 Soil 07 Feb 2018 S-10-B-200

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Parameter	Units	LOR	PE123413.029	PE123413.030	PE123413.031	PE123413.032
Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

Parameter	Units	LOR	PE123413.029	PE123413.030	PE123413.031	PE123413.032
TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

Parameter	Units	LOR	PE123413.029	PE123413.030	PE123413.031	PE123413.032
TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Parameter	Units	LOR	PE123413.029	PE123413.030	PE123413.031	PE123413.032
Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Parameter	Units	LOR	PE123413.029	PE123413.030	PE123413.031	PE123413.032
Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Parameter	Units	LOR	PE123413.029	PE123413.030	PE123413.031	PE123413.032
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE123413.029 Soil 07 Feb 2018 S-10-A-5	PE123413.030 Soil 07 Feb 2018 S-10-A-200	PE123413.031 Soil 07 Feb 2018 S-10-B-5	PE123413.032 Soil 07 Feb 2018 S-10-B-200

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Parameter	Units	LOR	PE123413.029	PE123413.030	PE123413.031	PE123413.032
Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

Parameter	Units	LOR	PE123413.029	PE123413.030	PE123413.031	PE123413.032
2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.033	PE123413.034	PE123413.035	PE123413.036
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	07 Feb 2018	07 Feb 2018	07 Feb 2018	07 Feb 2018
		Sample Name	S-10-C-5	S-10-C-200	S-10-D-5	S-10-D-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	12.7	13.5	13.7	20.5

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	4	4	6	6
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	0.5	0.5
Chromium, Cr	mg/kg	0.5	9.1	9.3	17	28
Copper, Cu	mg/kg	0.5	10	11	13	20
Lead, Pb	mg/kg	1	3	3	12	9
Nickel, Ni	mg/kg	0.5	9.3	9.4	11	16
Zinc, Zn	mg/kg	2	12	12	34	45

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	1.7	1.9	3.6	6.7
Uranium, U*	mg/kg	0.1	0.5	0.6	0.5	0.5

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE123413.033 Soil 07 Feb 2018 S-10-C-5	PE123413.034 Soil 07 Feb 2018 S-10-C-200	PE123413.035 Soil 07 Feb 2018 S-10-D-5	PE123413.036 Soil 07 Feb 2018 S-10-D-200

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Parameter	Units	LOR	PE123413.033	PE123413.034	PE123413.035	PE123413.036
Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

Parameter	Units	LOR	PE123413.033	PE123413.034	PE123413.035	PE123413.036
TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

Parameter	Units	LOR	PE123413.033	PE123413.034	PE123413.035	PE123413.036
TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Parameter	Units	LOR	PE123413.033	PE123413.034	PE123413.035	PE123413.036
Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Parameter	Units	LOR	PE123413.033	PE123413.034	PE123413.035	PE123413.036
Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Parameter	Units	LOR	PE123413.033	PE123413.034	PE123413.035	PE123413.036
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.033 Soil 07 Feb 2018 S-10-C-5	PE123413.034 Soil 07 Feb 2018 S-10-C-200	PE123413.035 Soil 07 Feb 2018 S-10-D-5	PE123413.036 Soil 07 Feb 2018 S-10-D-200

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Parameter	Units	LOR	S-10-C-5	S-10-C-200	S-10-D-5	S-10-D-200
Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

Parameter	Units	LOR	S-10-C-5	S-10-C-200	S-10-D-5	S-10-D-200
2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.037	PE123413.038	PE123413.039	PE123413.040
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	08 Feb 2018	08 Feb 2018	08 Feb 2018	08 Feb 2018
		Sample Name	E-0-A-5	E-0-A-200	E-0-B-5	E-0-B-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	22.5	22.3	16.6	7.0

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	7	7	2	2
Cadmium, Cd	mg/kg	0.3	0.6	0.5	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	27	27	11	10
Copper, Cu	mg/kg	0.5	19	19	8.7	6.0
Lead, Pb	mg/kg	1	11	12	4	4
Nickel, Ni	mg/kg	0.5	16	16	6.3	4.4
Zinc, Zn	mg/kg	2	57	55	22	45

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	7.0	6.8	2.2	1.8
Uranium, U*	mg/kg	0.1	0.6	0.6	0.2	0.2

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.037 Soil 08 Feb 2018 E-0-A-5	PE123413.038 Soil 08 Feb 2018 E-0-A-200	PE123413.039 Soil 08 Feb 2018 E-0-B-5	PE123413.040 Soil 08 Feb 2018 E-0-B-200

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Parameter	Units	LOR	PE123413.037	PE123413.038	PE123413.039	PE123413.040
Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

Parameter	Units	LOR	PE123413.037	PE123413.038	PE123413.039	PE123413.040
TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

Parameter	Units	LOR	PE123413.037	PE123413.038	PE123413.039	PE123413.040
TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Parameter	Units	LOR	PE123413.037	PE123413.038	PE123413.039	PE123413.040
Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Parameter	Units	LOR	PE123413.037	PE123413.038	PE123413.039	PE123413.040
Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Parameter	Units	LOR	PE123413.037	PE123413.038	PE123413.039	PE123413.040
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.037 Soil 08 Feb 2018 E-0-A-5	PE123413.038 Soil 08 Feb 2018 E-0-A-200	PE123413.039 Soil 08 Feb 2018 E-0-B-5	PE123413.040 Soil 08 Feb 2018 E-0-B-200

Sample Number / Sample Matrix / Sample Date / Sample Name

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.041	PE123413.042	PE123413.043	PE123413.044
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	08 Feb 2018	08 Feb 2018	08 Feb 2018	08 Feb 2018
		Sample Name	E-0-C-5	E-0-C-200	N-0-A-5	N-0-A-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	9.6	6.7	3.4	7.1

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	4	4	4	4
Cadmium, Cd	mg/kg	0.3	1.5	1.5	0.3	<0.3
Chromium, Cr	mg/kg	0.5	30	28	14	15
Copper, Cu	mg/kg	0.5	17	38	10	9.6
Lead, Pb	mg/kg	1	170	1200	12	7
Nickel, Ni	mg/kg	0.5	8.2	7.6	7.3	7.5
Zinc, Zn	mg/kg	2	510	670	69	38

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	2.8	2.2	3.2	3.2
Uranium, U*	mg/kg	0.1	0.4	0.4	0.3	0.3

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number PE123413.041	PE123413.042	PE123413.043	PE123413.044
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	08 Feb 2018	08 Feb 2018	08 Feb 2018	08 Feb 2018
		Sample Name	E-0-C-5	E-0-C-200	N-0-A-5	N-0-A-200

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.041	PE123413.042	PE123413.043	PE123413.044
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	08 Feb 2018	08 Feb 2018	08 Feb 2018	08 Feb 2018
		Sample Name	E-0-C-5	E-0-C-200	N-0-A-5	N-0-A-200
Parameter	Units	LOR				

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.045	PE123413.046	PE123413.047	PE123413.048
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	08 Feb 2018	08 Feb 2018	08 Feb 2018	08 Feb 2018
		Sample Name	N-0-B-5	N-0-B-200	N-10-A-5	N-10-A-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	3.9	3.9	7.3	9.1

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	3	3	2	2
Cadmium, Cd	mg/kg	0.3	<0.3	0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	12	12	11	12
Copper, Cu	mg/kg	0.5	7.3	7.4	4.4	5.8
Lead, Pb	mg/kg	1	14	15	3	3
Nickel, Ni	mg/kg	0.5	5.4	5.2	3.7	4.8
Zinc, Zn	mg/kg	2	76	70	10	13

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	2.4	2.2	2.0	2.3
Uranium, U*	mg/kg	0.1	0.3	0.2	0.1	0.2

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number Sample Matrix Sample Date Sample Name	PE123413.045 Soil 08 Feb 2018 N-0-B-5	PE123413.046 Soil 08 Feb 2018 N-0-B-200	PE123413.047 Soil 08 Feb 2018 N-10-A-5	PE123413.048 Soil 08 Feb 2018 N-10-A-200
Parameter	Units	LOR				

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.045	PE123413.046	PE123413.047	PE123413.048
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	08 Feb 2018	08 Feb 2018	08 Feb 2018	08 Feb 2018
		Sample Name	N-0-B-5	N-0-B-200	N-10-A-5	N-10-A-200
Parameter	Units	LOR				

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.049	PE123413.050	PE123413.051	PE123413.052
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	08 Feb 2018	08 Feb 2018	08 Feb 2018	08 Feb 2018
		Sample Name	N-10-B-5	N-10-B-200	N-10-C-5	N-10-C-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	7.9	19.2	12.2	20.0

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	2	6	3	9
Cadmium, Cd	mg/kg	0.3	<0.3	0.6	0.4	0.5
Chromium, Cr	mg/kg	0.5	11	25	14	25
Copper, Cu	mg/kg	0.5	4.5	18	7.3	18
Lead, Pb	mg/kg	1	3	8	5	9
Nickel, Ni	mg/kg	0.5	3.8	15	6.2	14
Zinc, Zn	mg/kg	2	10	40	16	37

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	2.0	6.5	3.0	6.3
Uranium, U*	mg/kg	0.1	<0.1	0.6	0.1	0.3

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.049	PE123413.050	PE123413.051	PE123413.052
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	08 Feb 2018	08 Feb 2018	08 Feb 2018	08 Feb 2018
		Sample Name	N-10-B-5	N-10-B-200	N-10-C-5	N-10-C-200
Parameter	Units	LOR				

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.049 Soil 08 Feb 2018 N-10-B-5	PE123413.050 Soil 08 Feb 2018 N-10-B-200	PE123413.051 Soil 08 Feb 2018 N-10-C-5	PE123413.052 Soil 08 Feb 2018 N-10-C-200

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE123413.053 Soil 08 Feb 2018 N-10-D-5	PE123413.054 Soil 08 Feb 2018 N-10-D-200	PE123413.055 Soil 06 Feb 2018 Composite 01	PE123413.056 Soil 06 Feb 2018 Composite 02

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	16.9	17.6	4.3	6.1

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	7	7	2	1
Cadmium, Cd	mg/kg	0.3	0.5	0.4	0.8	0.3
Chromium, Cr	mg/kg	0.5	24	25	8.6	9.9
Copper, Cu	mg/kg	0.5	17	18	7.2	4.1
Lead, Pb	mg/kg	1	8	8	13	4
Nickel, Ni	mg/kg	0.5	13	14	5.0	3.8
Zinc, Zn	mg/kg	2	36	38	240	16

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	6.2	6.1	1.5	1.9
Uranium, U*	mg/kg	0.1	0.4	0.4	0.1	<0.1

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	<20	<20

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	74	103
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	64	108
d8-toluene (Surrogate)	%	-	-	-	104	103
Bromofluorobenzene (Surrogate)	%	-	-	-	78	103

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name: PE123413.053 Soil 08 Feb 2018 N-10-D-5	PE123413.054 Soil 08 Feb 2018 N-10-D-200	PE123413.055 Soil 06 Feb 2018 Composite 01	PE123413.056 Soil 06 Feb 2018 Composite 02

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	-	-	<0.1	<0.1
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	<25	<25

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

TRH C10-C14	mg/kg	20	-	-	48	52
TRH C15-C28	mg/kg	45	-	-	520	320
TRH C29-C36	mg/kg	45	-	-	1900	810

TRH F Bands

TRH >C10-C16	mg/kg	25	-	-	96	94
TRH >C16-C34 (F3)	mg/kg	90	-	-	1400	670
TRH >C34-C40 (F4)	mg/kg	120	-	-	2700	1200

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	-	-	<0.1	<0.1
Toluene	mg/kg	0.1	-	-	<0.1	<0.1
Ethylbenzene	mg/kg	0.1	-	-	<0.1	<0.1
m/p-xylene	mg/kg	0.2	-	-	<0.2	<0.2
o-xylene	mg/kg	0.1	-	-	<0.1	<0.1

Polycyclic VOCs

Naphthalene	mg/kg	0.1	-	-	<0.1	<0.1

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	74	103
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	64	108
d8-toluene (Surrogate)	%	-	-	-	104	103
Bromofluorobenzene (Surrogate)	%	-	-	-	78	103

		Sample Number	PE123413.053	PE123413.054	PE123413.055	PE123413.056
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	08 Feb 2018	08 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	N-10-D-5	N-10-D-200	Composite 01	Composite 02
Parameter	Units	LOR				
SVOC in Soil Method: AN420 Tested: 1/3/2018						
PAHs						
Naphthalene	mg/kg	0.1	-	-	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	-	-	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	-	-	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	-	-	<0.1	<0.1
Acenaphthene	mg/kg	0.1	-	-	<0.1	<0.1
Fluorene	mg/kg	0.1	-	-	<0.1	<0.1
Phenanthrene	mg/kg	0.1	-	-	<0.1	<0.1
Anthracene	mg/kg	0.1	-	-	<0.1	<0.1
Fluoranthene	mg/kg	0.1	-	-	<0.1	<0.1
Pyrene	mg/kg	0.1	-	-	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.1	-	-	<0.1	<0.1
Chrysene	mg/kg	0.1	-	-	<0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	-	-	<0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1	-	-	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	<0.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	-	-	<0.1	<0.1
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	<0.2	<0.2
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	<0.2	<0.2
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	<0.3	<0.3
SVOC Surrogates						
2-fluorobiphenyl (Surrogate)	%	-	-	-	90	92
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	126	128
d5-nitrobenzene (Surrogate)	%	-	-	-	96	94

		Sample Number	PE123413.057	PE123413.058	PE123413.059	PE123413.060
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	Composite 03	Composite 04	W-10-H-5	W-10-H-200
Parameter	**Units**	**LOR**				
Moisture Content Method: AN002 Tested: 26/2/2018						
% Moisture	%w/w	1	6.2	6.1	2.0	15.6
Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018						
Arsenic, As	mg/kg	1	2	2	2	4
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	0.3	0.4
Chromium, Cr	mg/kg	0.5	10	10	5.4	17
Copper, Cu	mg/kg	0.5	4.4	4.3	8.4	10
Lead, Pb	mg/kg	1	6	3	7	6
Nickel, Ni	mg/kg	0.5	4.4	4.0	5.5	8.3
Zinc, Zn	mg/kg	2	34	11	63	24
Mercury in Soil Method: AN312 Tested: 26/2/2018						
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018						
Thorium, Th*	mg/kg	0.5	1.8	2.0	1.6	3.8
Uranium, U*	mg/kg	0.1	0.1	0.1	1.1	0.3
Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 20/2/2018						
TRH C6-C9	mg/kg	20	<20	<20	-	-
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	107	99	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	113	103	-	-
d8-toluene (Surrogate)	%	-	111	104	-	-
Bromofluorobenzene (Surrogate)	%	-	114	106	-	-

		Sample Number	PE123413.057	PE123413.058	PE123413.059	PE123413.060
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	Composite 03	Composite 04	W-10-H-5	W-10-H-200
Parameter	Units	LOR				

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 20/2/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	<0.1	<0.1	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 20/2/2018

TRH C10-C14	mg/kg	20	29	21	-	-
TRH C15-C28	mg/kg	45	260	170	-	-
TRH C29-C36	mg/kg	45	920	400	-	-

TRH F Bands

TRH >C10-C16	mg/kg	25	57	39	-	-
TRH >C16-C34 (F3)	mg/kg	90	670	360	-	-
TRH >C34-C40 (F4)	mg/kg	120	1400	530	-	-

VOC's in Soil Method: AN433 Tested: 20/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	<0.1	<0.1	-	-
Toluene	mg/kg	0.1	<0.1	<0.1	-	-
Ethylbenzene	mg/kg	0.1	<0.1	<0.1	-	-
m/p-xylene	mg/kg	0.2	<0.2	<0.2	-	-
o-xylene	mg/kg	0.1	<0.1	<0.1	-	-

Polycyclic VOCs

Naphthalene	mg/kg	0.1	<0.1	<0.1	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	107	99	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	113	103	-	-
d8-toluene (Surrogate)	%	-	111	104	-	-
Bromofluorobenzene (Surrogate)	%	-	114	106	-	-

		Sample Number	PE123413.057	PE123413.058	PE123413.059	PE123413.060
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	Composite 03	Composite 04	W-10-H-5	W-10-H-200
Parameter	Units	LOR				
SVOC in Soil Method: AN420 Tested: 20/2/2018						
PAHs						
Naphthalene	mg/kg	0.1	<0.1	<0.1	-	-
2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	-	-
1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	-	-
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	-	-
Acenaphthene	mg/kg	0.1	<0.1	<0.1	-	-
Fluorene	mg/kg	0.1	<0.1	<0.1	-	-
Phenanthrene	mg/kg	0.1	<0.1	<0.1	-	-
Anthracene	mg/kg	0.1	<0.1	<0.1	-	-
Fluoranthene	mg/kg	0.1	<0.1	<0.1	-	-
Pyrene	mg/kg	0.1	<0.1	<0.1	-	-
Benzo(a)anthracene	mg/kg	0.1	<0.1	<0.1	-	-
Chrysene	mg/kg	0.1	<0.1	<0.1	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	<0.1	-	-
Benzo(k)fluoranthene	mg/kg	0.1	<0.1	<0.1	-	-
Benzo(a)pyrene	mg/kg	0.1	<0.1	<0.1	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	<0.1	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	-	-
Benzo(ghi)perylene	mg/kg	0.1	<0.1	<0.1	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	<0.2	<0.2	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	<0.2	<0.2	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	<0.3	<0.3	-	-
SVOC Surrogates						
2-fluorobiphenyl (Surrogate)	%	-	92	92	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	128	126	-	-
d5-nitrobenzene (Surrogate)	%	-	96	90	-	-

		Sample Number	PE123413.061	PE123413.062	PE123413.063	PE123413.064
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	W-0-E-5	W-0-E-200	W-10-G-5	W-10-G-200
Parameter	Units	LOR				
Moisture Content Method: AN002 Tested: 26/2/2018						
% Moisture	%w/w	1	8.1	11.8	8.4	6.7
Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018						
Arsenic, As	mg/kg	1	2	3	2	<1
Cadmium, Cd	mg/kg	0.3	<0.3	0.4	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	12	15	10	8.8
Copper, Cu	mg/kg	0.5	5.8	8.6	3.8	2.6
Lead, Pb	mg/kg	1	9	15	3	3
Nickel, Ni	mg/kg	0.5	5.4	7.4	3.2	4.4
Zinc, Zn	mg/kg	2	31	29	9	7
Mercury in Soil Method: AN312 Tested: 26/2/2018						
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018						
Thorium, Th*	mg/kg	0.5	2.5	3.1	1.9	1.5
Uranium, U*	mg/kg	0.1	0.1	0.4	<0.1	0.1
Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018						
TRH C6-C9	mg/kg	20	-	-	-	-
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.061	PE123413.062	PE123413.063	PE123413.064
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	W-0-E-5	W-0-E-200	W-10-G-5	W-10-G-200
Parameter	Units	LOR				

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE123413.061 Soil 06 Feb 2018 W-0-E-5	PE123413.062 Soil 06 Feb 2018 W-0-E-200	PE123413.063 Soil 06 Feb 2018 W-10-G-5	PE123413.064 Soil 06 Feb 2018 W-10-G-200

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.065	PE123413.066	PE123413.067	PE123413.068
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	W-0-D-5	W-0-D-200	W-10-F-5	W-10-F-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	8.1	7.6	6.2	7.0

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	2	1	1	1
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	12	11	8.5	9.6
Copper, Cu	mg/kg	0.5	5.6	4.4	2.3	3.2
Lead, Pb	mg/kg	1	4	4	2	3
Nickel, Ni	mg/kg	0.5	5.2	4.1	2.4	2.9
Zinc, Zn	mg/kg	2	14	12	6	8

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	2.5	2.3	1.4	1.7
Uranium, U*	mg/kg	0.1	0.1	0.1	<0.1	<0.1

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name: PE123413.065 Soil 06 Feb 2018 W-0-D-5	PE123413.066 Soil 06 Feb 2018 W-0-D-200	PE123413.067 Soil 06 Feb 2018 W-10-F-5	PE123413.068 Soil 06 Feb 2018 W-10-F-200

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.065 Soil 06 Feb 2018 W-0-D-5	PE123413.066 Soil 06 Feb 2018 W-0-D-200	PE123413.067 Soil 06 Feb 2018 W-10-F-5	PE123413.068 Soil 06 Feb 2018 W-10-F-200

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.069	PE123413.070	PE123413.071	PE123413.072
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	W-0-C-5	W-0-C-200	W-10-E-5	W-10-E-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	7.0	7.7	6.9	7.8

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	1	1	<1	2
Cadmium, Cd	mg/kg	0.3	0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	13	12	10	16
Copper, Cu	mg/kg	0.5	5.4	5.1	2.8	5.1
Lead, Pb	mg/kg	1	4	4	3	3
Nickel, Ni	mg/kg	0.5	4.9	4.7	2.6	6.3
Zinc, Zn	mg/kg	2	16	15	7	13

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	2.4	2.3	1.7	2.2
Uranium, U*	mg/kg	0.1	0.1	0.1	<0.1	0.1

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.069 Soil 06 Feb 2018 W-0-C-5	PE123413.070 Soil 06 Feb 2018 W-0-C-200	PE123413.071 Soil 06 Feb 2018 W-10-E-5	PE123413.072 Soil 06 Feb 2018 W-10-E-200

Sample Number / Sample Matrix / Sample Date / Sample Name

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Parameter	Units	LOR	PE123413.069	PE123413.070	PE123413.071	PE123413.072
Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

Parameter	Units	LOR	PE123413.069	PE123413.070	PE123413.071	PE123413.072
TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

Parameter	Units	LOR	PE123413.069	PE123413.070	PE123413.071	PE123413.072
TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Parameter	Units	LOR	PE123413.069	PE123413.070	PE123413.071	PE123413.072
Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Parameter	Units	LOR	PE123413.069	PE123413.070	PE123413.071	PE123413.072
Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Parameter	Units	LOR	PE123413.069	PE123413.070	PE123413.071	PE123413.072
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number Sample Matrix Sample Date Sample Name	PE123413.069 Soil 06 Feb 2018 W-0-C-5	PE123413.070 Soil 06 Feb 2018 W-0-C-200	PE123413.071 Soil 06 Feb 2018 W-10-E-5	PE123413.072 Soil 06 Feb 2018 W-10-E-200
Parameter	Units	LOR				

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.073	PE123413.074	PE123413.075	PE123413.076
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	W-0-B-5	W-0-B-200	N-30-A-5	N-30-A-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	8.6	6.7	5.5	9.4

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	2	1	2	3
Cadmium, Cd	mg/kg	0.3	0.5	<0.3	<0.3	0.4
Chromium, Cr	mg/kg	0.5	13	10	10	14
Copper, Cu	mg/kg	0.5	5.7	3.5	3.5	7.2
Lead, Pb	mg/kg	1	4	3	3	4
Nickel, Ni	mg/kg	0.5	5.1	3.1	3.0	5.9
Zinc, Zn	mg/kg	2	16	10	9	17

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	2.6	1.8	1.6	2.8
Uranium, U*	mg/kg	0.1	0.1	<0.1	<0.1	0.2

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.073	PE123413.074	PE123413.075	PE123413.076
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	06 Feb 2018	06 Feb 2018	06 Feb 2018	06 Feb 2018
		Sample Name	W-0-B-5	W-0-B-200	N-30-A-5	N-30-A-200
Parameter	Units	LOR				
Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)						
VPH F Bands						
Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-
TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018						
TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-
TRH F Bands						
TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-
VOC's in Soil Method: AN433 Tested: 22/2/2018						
Monocyclic Aromatic Hydrocarbons						
Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-
Polycyclic VOCs						
Naphthalene	mg/kg	0.1	-	-	-	-
Surrogates						
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE123413.073 Soil 06 Feb 2018 W-0-B-5	PE123413.074 Soil 06 Feb 2018 W-0-B-200	PE123413.075 Soil 06 Feb 2018 N-30-A-5	PE123413.076 Soil 06 Feb 2018 N-30-A-200

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Parameter	Units	LOR	PE123413.073	PE123413.074	PE123413.075	PE123413.076
Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

Parameter	Units	LOR	PE123413.073	PE123413.074	PE123413.075	PE123413.076
2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE123413.077 Soil 06 Feb 2018 N-30-B-5	PE123413.078 Soil 06 Feb 2018 N-30-B-200	PE123413.079 Soil 06 Feb 2018 N-30-C-5	PE123413.080 Soil 06 Feb 2018 N-30-C-200

Moisture Content Method: AN002 Tested: 26/2/2018

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
% Moisture	%w/w	1	6.3	7.3	6.0	6.6

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
Arsenic, As	mg/kg	1	2	2	1	2
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	0.3
Chromium, Cr	mg/kg	0.5	11	11	11	11
Copper, Cu	mg/kg	0.5	4.6	4.5	4.3	3.7
Lead, Pb	mg/kg	1	3	3	3	3
Nickel, Ni	mg/kg	0.5	3.7	3.8	3.9	3.2
Zinc, Zn	mg/kg	2	11	11	11	9

Mercury in Soil Method: AN312 Tested: 26/2/2018

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
Thorium, Th*	mg/kg	0.5	1.9	2.1	2.0	1.8
Uranium, U*	mg/kg	0.1	0.1	0.1	0.1	<0.1

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
TRH C6-C9	mg/kg	20	-	-	-	-

Surrogates

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	PE123413.077 Soil 06 Feb 2018 N-30-B-5	PE123413.078 Soil 06 Feb 2018 N-30-B-200	PE123413.079 Soil 06 Feb 2018 N-30-C-5	PE123413.080 Soil 06 Feb 2018 N-30-C-200

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018 (continued)

VPH F Bands

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
Benzene (F0)	mg/kg	0.1	-	-	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-	-	-

TRH (Total Recoverable Hydrocarbons) in Soil Method: AN403 Tested: 1/3/2018

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
TRH C10-C14	mg/kg	20	-	-	-	-
TRH C15-C28	mg/kg	45	-	-	-	-
TRH C29-C36	mg/kg	45	-	-	-	-

TRH F Bands

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
TRH >C10-C16	mg/kg	25	-	-	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-	-	-

VOC's in Soil Method: AN433 Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
Benzene	mg/kg	0.1	-	-	-	-
Toluene	mg/kg	0.1	-	-	-	-
Ethylbenzene	mg/kg	0.1	-	-	-	-
m/p-xylene	mg/kg	0.2	-	-	-	-
o-xylene	mg/kg	0.1	-	-	-	-

Polycyclic VOCs

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
Naphthalene	mg/kg	0.1	-	-	-	-

Surrogates

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
Dibromofluoromethane (Surrogate)	%	-	-	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-	-	-
d8-toluene (Surrogate)	%	-	-	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE123413.077 Soil 06 Feb 2018 N-30-B-5	PE123413.078 Soil 06 Feb 2018 N-30-B-200	PE123413.079 Soil 06 Feb 2018 N-30-C-5	PE123413.080 Soil 06 Feb 2018 N-30-C-200

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
Naphthalene	mg/kg	0.1	-	-	-	-
2-methylnaphthalene	mg/kg	0.1	-	-	-	-
1-methylnaphthalene	mg/kg	0.1	-	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-
Acenaphthene	mg/kg	0.1	-	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-
Pyrene	mg/kg	0.1	-	-	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-	-	-

SVOC Surrogates

Parameter	Units	LOR	PE123413.077	PE123413.078	PE123413.079	PE123413.080
2-fluorobiphenyl (Surrogate)	%	-	-	-	-	-
d5-phenol (Surrogate)	%	-	-	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-	-	-

		Sample Number	PE123413.081	PE123413.082
		Sample Matrix	Soil	Soil
		Sample Date	06 Feb 2018	07 Feb 2018
		Sample Name	N-30-D-200	W-10-A-5
Parameter	Units	LOR		

Moisture Content Method: AN002 Tested: 26/2/2018

% Moisture	%w/w	1	19.8	4.3

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	6	1
Cadmium, Cd	mg/kg	0.3	0.7	<0.3
Chromium, Cr	mg/kg	0.5	29	9.3
Copper, Cu	mg/kg	0.5	19	2.4
Lead, Pb	mg/kg	1	8	2
Nickel, Ni	mg/kg	0.5	16	2.4
Zinc, Zn	mg/kg	2	45	6

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	6.4	1.5
Uranium, U*	mg/kg	0.1	0.5	<0.1

Volatile Petroleum Hydrocarbons in Soil Method: AN433 Tested: 22/2/2018

TRH C6-C9	mg/kg	20	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-
d8-toluene (Surrogate)	%	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name: PE123413.081 Soil 06 Feb 2018 N-30-D-200	PE123413.082 Soil 07 Feb 2018 W-10-A-5

Volatile Petroleum Hydrocarbons in Soil   Method: AN433   Tested: 22/2/2018   (continued)

VPH F Bands

Benzene (F0)	mg/kg	0.1	-	-
TRH C6-C10 minus BTEX (F1)	mg/kg	25	-	-

TRH (Total Recoverable Hydrocarbons) in Soil   Method: AN403   Tested: 1/3/2018

TRH C10-C14	mg/kg	20	-	-
TRH C15-C28	mg/kg	45	-	-
TRH C29-C36	mg/kg	45	-	-

TRH F Bands

TRH >C10-C16	mg/kg	25	-	-
TRH >C16-C34 (F3)	mg/kg	90	-	-
TRH >C34-C40 (F4)	mg/kg	120	-	-

VOC's in Soil   Method: AN433   Tested: 22/2/2018

Monocyclic Aromatic Hydrocarbons

Benzene	mg/kg	0.1	-	-
Toluene	mg/kg	0.1	-	-
Ethylbenzene	mg/kg	0.1	-	-
m/p-xylene	mg/kg	0.2	-	-
o-xylene	mg/kg	0.1	-	-

Polycyclic VOCs

Naphthalene	mg/kg	0.1	-	-

Surrogates

Dibromofluoromethane (Surrogate)	%	-	-	-
d4-1,2-dichloroethane (Surrogate)	%	-	-	-
d8-toluene (Surrogate)	%	-	-	-
Bromofluorobenzene (Surrogate)	%	-	-	-

Parameter	Units	LOR	Sample Number PE123413.081 Sample Matrix Soil Sample Date 06 Feb 2018 Sample Name N-30-D-200	PE123413.082 Soil 07 Feb 2018 W-10-A-5

SVOC in Soil Method: AN420 Tested: 1/3/2018

PAHs

Naphthalene	mg/kg	0.1	-	-
2-methylnaphthalene	mg/kg	0.1	-	-
1-methylnaphthalene	mg/kg	0.1	-	-
Acenaphthylene	mg/kg	0.1	-	-
Acenaphthene	mg/kg	0.1	-	-
Fluorene	mg/kg	0.1	-	-
Phenanthrene	mg/kg	0.1	-	-
Anthracene	mg/kg	0.1	-	-
Fluoranthene	mg/kg	0.1	-	-
Pyrene	mg/kg	0.1	-	-
Benzo(a)anthracene	mg/kg	0.1	-	-
Chrysene	mg/kg	0.1	-	-
Benzo(b&j)fluoranthene	mg/kg	0.1	-	-
Benzo(k)fluoranthene	mg/kg	0.1	-	-
Benzo(a)pyrene	mg/kg	0.1	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	-	-
Dibenzo(ah)anthracene	mg/kg	0.1	-	-
Benzo(ghi)perylene	mg/kg	0.1	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	TEQ (mg/kg)	0.2	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	TEQ (mg/kg)	0.2	-	-
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	TEQ (mg/kg)	0.3	-	-

SVOC Surrogates

2-fluorobiphenyl (Surrogate)	%	-	-	-
d5-phenol (Surrogate)	%	-	-	-
2,4,6-tribromophenol (Surrogate)	%	-	-	-
d14-p-terphenyl (Surrogate)	%	-	-	-
d5-nitrobenzene (Surrogate)	%	-	-	-

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Mercury in Soil Method ME-(AU)-[ENV]AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery	MSD %RPD
Mercury	LB142699	mg/kg	0.05	<0.05	0%	100%	99%	NA
	LB142799	mg/kg	0.05	<0.05	0%	99%	102%	2%
	LB142800	mg/kg	0.05	<0.05	0%	103%	100%	0%
	LB142801	mg/kg	0.05	<0.05	0%	102%	100%	NA
	LB142803	mg/kg	0.05	<0.05	0%	97%	99%	2%

Moisture Content Method ME-(AU)-[ENV]AN002

Parameter	QC Reference	Units	LOR	DUP %RPD
% Moisture	LB142798	%w/w	1	9 - 12%

SVOC in Soil Method ME-(AU)-[ENV]AN420

PAHs

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Naphthalene	LB142557	mg/kg	0.1	<0.1	94%
2-methylnaphthalene	LB142557	mg/kg	0.1	<0.1	
1-methylnaphthalene	LB142557	mg/kg	0.1	<0.1	
Acenaphthylene	LB142557	mg/kg	0.1	<0.1	
Acenaphthene	LB142557	mg/kg	0.1	<0.1	
Fluorene	LB142557	mg/kg	0.1	<0.1	103%
Phenanthrene	LB142557	mg/kg	0.1	<0.1	97%
Anthracene	LB142557	mg/kg	0.1	<0.1	
Fluoranthene	LB142557	mg/kg	0.1	<0.1	
Pyrene	LB142557	mg/kg	0.1	<0.1	106%
Benzo(a)anthracene	LB142557	mg/kg	0.1	<0.1	117%
Chrysene	LB142557	mg/kg	0.1	<0.1	
Benzo(b&j)fluoranthene	LB142557	mg/kg	0.1	<0.1	
Benzo(k)fluoranthene	LB142557	mg/kg	0.1	<0.1	
Benzo(a)pyrene	LB142557	mg/kg	0.1	<0.1	93%
Indeno(1,2,3-cd)pyrene	LB142557	mg/kg	0.1	<0.1	
Dibenzo(ah)anthracene	LB142557	mg/kg	0.1	<0.1	
Benzo(ghi)perylene	LB142557	mg/kg	0.1	<0.1	
Carcinogenic PAHs (as BaP TEQ)- <LOR=0*	LB142557	TEQ (mg/kg)	0.2	<0.2	
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR/2*	LB142557	TEQ (mg/kg)	0.2	<0.2	
Carcinogenic PAHs (as BaP TEQ)- <LOR=LOR*	LB142557	TEQ (mg/kg)	0.3	<0.3	

SVOC Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
2-fluorobiphenyl (Surrogate)	LB142557	%	-	90%	90%
d14-p-terphenyl (Surrogate)	LB142557	%	-	124%	124%
d5-nitrobenzene (Surrogate)	LB142557	%	-	90%	94%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Total Recoverable Elements in Soil by ICPOES Method: ME-(AU)-[ENV]AN320

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery	MSD %RPD
Arsenic, As	LB142699	mg/kg	1	<1	26 - 34%	103%	89%	14%
	LB142799	mg/kg	1	<1	7 - 12%	96%	95%	7%
	LB142800	mg/kg	1	<1	4 - 27%	99%	94%	4%
	LB142801	mg/kg	1	<1	9 - 21%	110%	93%	11%
	LB142803	mg/kg	1	<1	5 - 13%	97%	98%	NA
Cadmium, Cd	LB142699	mg/kg	0.3	<0.3	0 - 16%	99%	92%	10%
	LB142799	mg/kg	0.3	<0.3	0 - 32%	95%	93%	5%
	LB142800	mg/kg	0.3	<0.3	12 - 24%	104%	98%	0%
	LB142801	mg/kg	0.3	<0.3	13%	107%	97%	3%
	LB142803	mg/kg	0.3	<0.3	0%	99%	97%	NA
Chromium, Cr	LB142699	mg/kg	0.5	<0.5	1 - 11%	99%	93%	16%
	LB142799	mg/kg	0.5	<0.5	1 - 3%	97%	104%	8%
	LB142800	mg/kg	0.5	<0.5	4 - 12%	100%	101%	2%
	LB142801	mg/kg	0.5	<0.5	2 - 4%	100%	85%	31%
	LB142803	mg/kg	0.5	<0.5	2 - 9%	99%	139%	NA
Copper, Cu	LB142699	mg/kg	0.5	<0.5	1 - 6%	98%	95%	14%
	LB142799	mg/kg	0.5	<0.5	0 - 2%	96%	88%	10%
	LB142800	mg/kg	0.5	<0.5	1 - 22%	101%	105%	2%
	LB142801	mg/kg	0.5	<0.5	0 - 5%	102%	90%	29%
	LB142803	mg/kg	0.5	<0.5	5 - 6%	99%	103%	NA
Lead, Pb	LB142699	mg/kg	1	<1	0 - 2%	98%	97%	12%
	LB142799	mg/kg	1	<1	3 - 14%	93%	97%	15%
	LB142800	mg/kg	1	<1	1 - 16%	101%	92%	2%
	LB142801	mg/kg	1	<1	1 - 9%	99%	89%	7%
	LB142803	mg/kg	1	<1	0 - 12%	99%	95%	NA
Nickel, Ni	LB142699	mg/kg	0.5	<0.5	0 - 10%	102%	98%	8%
	LB142799	mg/kg	0.5	<0.5	2%	102%	108%	11%
	LB142800	mg/kg	0.5	<0.5	3 - 18%	108%	104%	2%
	LB142801	mg/kg	0.5	<0.5	7%	114%	94%	17%
	LB142803	mg/kg	0.5	<0.5	0 - 13%	105%	123%	NA
Zinc, Zn	LB142699	mg/kg	2	<2	3 - 18%	95%	145%	31%
	LB142799	mg/kg	2	<2	1 - 2%	92%	96%	21%
	LB142800	mg/kg	2	<2	6 - 16%	97%	104%	3%
	LB142801	mg/kg	2	<2	2 - 6%	98%	77%	117%
	LB142803	mg/kg	2	<2	6 - 7%	96%	99%	NA

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

TRH (Total Recoverable Hydrocarbons) in Soil Method: ME-(AU)-[ENV]AN403

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH C10-C14	LB142557	mg/kg	20	<20	112%
TRH C15-C28	LB142557	mg/kg	45	<45	100%
TRH C29-C36	LB142557	mg/kg	45	<45	100%

TRH F Bands

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
TRH >C10-C16	LB142557	mg/kg	25	<25	112%
TRH >C16-C34 (F3)	LB142557	mg/kg	90	<90	100%
TRH >C34-C40 (F4)	LB142557	mg/kg	120	<120	100%

VOC's in Soil Method: ME-(AU)-[ENV]AN433

Monocyclic Aromatic Hydrocarbons

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery	MS %Recovery	MSD %RPD
Benzene	LB142555	mg/kg	0.1	<0.1	99%	75%	2%
Toluene	LB142555	mg/kg	0.1	<0.1	98%	72%	1%
Ethylbenzene	LB142555	mg/kg	0.1	<0.1	101%	73%	2%
m/p-xylene	LB142555	mg/kg	0.2	<0.2	104%	74%	1%
o-xylene	LB142555	mg/kg	0.1	<0.1	102%	72%	0%

Polycyclic VOCs

Parameter	QC Reference	Units	LOR	MB
Naphthalene	LB142555	mg/kg	0.1	<0.1

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery	MS %Recovery	MSD %RPD
Dibromofluoromethane (Surrogate)	LB142555	%	-	104%	108%	79%	3%
d4-1,2-dichloroethane (Surrogate)	LB142555	%	-	103%	110%	90%	2%
d8-toluene (Surrogate)	LB142555	%	-	95%	106%	82%	0%
Bromofluorobenzene (Surrogate)	LB142555	%	-	89%	105%	85%	0%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Volatile Petroleum Hydrocarbons in Soil   Method ME-(AU)-[ENV]AN433

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery	MS %Recovery	MSD %RPD
TRH C6-C9	LB142555	mg/kg	20	<20	100%	98%	19%

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery	MS %Recovery	MSD %RPD
Dibromofluoromethane (Surrogate)	LB142555	%	-	104%	108%	79%	3%
d4-1,2-dichloroethane (Surrogate)	LB142555	%	-	103%	110%	90%	2%
d8-toluene (Surrogate)	LB142555	%	-	95%	106%	82%	0%
Bromofluorobenzene (Surrogate)	LB142555	%	-	89%	105%	85%	0%

VPH F Bands

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery	MS %Recovery	MSD %RPD
Benzene (F0)	LB142555	mg/kg	0.1	<0.1	99%	75%	2%
TRH C6-C10 minus BTEX (F1)	LB142555	mg/kg	25	<25			

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN040	A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analysis by ASS or ICP as per USEPA Method 200.8.
AN041/AN318	Determination of elements at trace level in soil digest by ICP-MS technique, in accordance with USEPA 6020A.
AN045	A portion of sample is digested with Nitric acid and Hydrogen Peroxide over time and then with Hydrochloric acid through several heating and cooling cycles. It provides a strong oxidising medium for bringing metal analytes into solution according to USEPA3050, after filtration the solution is presented for analysis on AAS or ICP .
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN320	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
AN320	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference USEPA3050, USEPA6010C and APHA 3120 B.
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the Draft NEPM 2011, >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is reported directly and also corrected by subtracting Naphthalene (from VOC method AN433) where available.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Petroleum Hydrocarbons (TPH) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents .
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN420	SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
AN420	Carcinogenic PAHs may be expressed as Benzo(a)pyrene equivalents by applying the BaP toxicity equivalence factor (NEPM 1999, June 2013, B7). These can be reported as the individual PAHs and as a sum of carcinogenic PAHs. The sum is reported three ways, the first assuming all <LOR results are zero, the second assuming all < LOR results are half the LOR and the third assuming all <LOR results are the LOR.
AN433	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

METHOD METHODOLOGY SUMMARY

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
		NVL	Not Validated

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

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

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

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

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

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

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

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

PE 123413   1

CHAIN OF CUSTODY

CLIENT: CH2M   OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted]   EMAIL: [redacted]   PHONE: [redacted]
FIELD LEAD: [redacted]   EMAIL: [redacted]   PHONE: [redacted]
COC emailed ?:
Email Reports to: [redacted]
Email Invoice to (will default to PM if no other addresses are listed): [redacted]
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☒ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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 comments:

RELINQUISHED BY: [redacted]	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY: LADAN KALAN
DATE: 6/2/18	DATE:	DATE:	DATE: 14/2/18
TIME:	TIME:	TIME:	TIME: 11AM

SGS Perth Environmental
PE123413 COC
Received: 14-Feb-2018

Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
1		WG-0-A-10 ✓	6/2/18		S		X	X			
2		WG-0-A-200 ✓					X	X			
3		WG-0-B-10 ✓					X	X			
4		WG-0-C-10 ✓					X	X			
5		WG-0-C-200 ✓					X	X			
[illegible]		WG-0-D-10 ✓								✓	
		WG-0-D-200 ✓								✓	
6		WG-0-E-10 ✓					X	X			
7		WG-0-E-200 ✓					X	X			
		WG-0-E-400 ✓								✓	
		WG-1-A-10 ✓								✓	
		WG-1-A-200 ✓								✓	
		WG-1-A-400 ✓								✓	
8		WG-1-B-10 ✓					X	X			
9	~~SNR~~	WG-1-B-200 (~~SNR~~) C.T.					X	X			
	C.T.	WG-1-B-400 ✓								✓	
		WG-1-C-10 (~~SNR~~) ✓								✓	
		WG-1-C-200 (~~SNR~~) ✓								✓	
		WG-1-C-400 (~~SNR~~) ✓								✓	
10	~~SNR~~	WG-1-D-10 ~~SNR~~ ✓					X	X			
11	~~SNR~~	WG-1-D-200 ~~SNR~~ ✓					X	X			
	~~SNR~~	WG-1-D-400 ~~SNR~~ ✓								✓	
	C.T.	C.T.					11	11		11	

Special Instructions:

2

CHAIN OF COUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: [redacted] EMAIL: PHONE:
COC emailed ?:
Email Reports to: [redacted]
Email Invoice to (will default to PM if no other addresses are listed): [redacted]
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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 comments:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
[redacted]			LK
DATE:	DATE:	DATE:	DATE: 14/2/18
TIME:	TIME:	TIME:	TIME: 11Am

		SAMPLE DETAILS					Analysis																				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)																	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
		WG-1-E-10 * Broken	10/2/18		S																					X	
		WG-1-E-200 ✓																								X	
		WG-1-E-400 ✓																								X	
12		WG-2-A-10 ✓					X	X																			
13		WG-2-A-200 ✓					X	X																			
		WG-2-A-400 ✓																								X	
		WG-2-B-10 ✓																								X	
		WG-2-B-200 ✓																								X	
		WG-2-B-400 ✓																								X	
14		WG-2-C-10 ✓					X	X																			
15		WG-2-C-200 ✓					X	X																			
		WG-2-C-400 ✓																								X	
		WG-2-D-10 ✓																								X	
		WG-2-D-200 ✓																								X	
		WG-2-D-400 ✓																								X	
16		WG-2-E-10 ✓					X	X																			
17		WG-2-E-200 ✓					X	X																			
		WG-2-E-400 ✓																								X	
		WG-3-A-10																								X	
		WG-3-A-200 ✓																								X	
		WG-3-A-400 ✓																								X	
		WG-3-E-10 ✓																								X	
							6	6																		16	

Special Instructions:

3

CHAIN OF CUSTODY

CLIENT:	CH2M	OFFICE:	Sydney
CLIENT ADDRESS:	Level 7, 9 Help St Chatswood NSW 2067		
PROJECT:	CSIRO Woomera		
PROJECT NUMBER:	684331		
PROJECT MANAGER:	[redacted]	EMAIL:	michael.leviton@ch2m.com
FIELD LEAD:	[redacted]	EMAIL:	Philippa.Scott@ch2m.com
COC emailed ?:			
Email Reports to:	[redacted]		

Email Invoice to (will default to PM if no other addresses are listed): michael.leviton@ch2m.com

Notes

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

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

PO / QUOTE NO.:	1712418WM
FORMAT:	Equis and Esdat
PHONE:	[redacted]
PHONE:	

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 comments:			

RELINQUISHED BY: [redacted]	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY: LK
DATE:	DATE:	DATE:	DATE: 14/2/18
TIME:	TIME:	TIME:	TIME: 11Am

SAMPLE DETAILS — **Analysis** — **Additional Information**

Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)	Hold	Additional Information Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
		W-10-D-5 ✓	7/2		S					X	
		W-10-D-200 ✓								X	
18		W-0-A-5 ✓					X	X			
19		W-0-A-200 ✓					X	X			
20		W-10-B-5 ✓						X			
21		W-10-B-200 ✓						X			
22		W-10-A-200 ✓					X	X			
23		WG-3-B-10 ✓					X	X			
24		WG-3-B-200 ✓					X	X			
		WG-3-B-400 ✓								X	
		WG-3-C-10 ✓								X	
		WG-3-C-200 ✓								X	
		WG-3-C-400 ✓								X	
25		WG-3-D-10 ✓					X	X			
26		WG-3-D-200 ✓					X	X			
		WG-3-D-400 ✓								X	
27		S-0-A-5 ✓					X	X			
28		S-0-A-200 ✓					X	X			
29		S-10-A-5 ✓					X	X			
30		S-10-A-200 ✓					X	X			
31		• S-10-B-5 ✓						X			
32		S-10-B-200 ✓						X			
							11	15		7	

Special Instructions:

CHAIN OF COSTODY

4

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: [redacted] EMAIL: PHONE:
COC emailed ?:
Email Reports to: [redacted]
Email Invoice to (will default to PM if no other addresses are listed): [redacted]
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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 comments:

RELINQUISHED BY: [redacted]
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

RELINQUISHED BY:
DATE:
TIME:

RECEIVED BY: LK
DATE: 14/2/18
TIME: 11Am

SAMPLE DETAILS | Analysis | Additional Information

Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)																	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
33		S-10-C-5 ✓	7/12		S		X	X																			
34		S-10-C-200 ✓					X	X																			
35		S-10-D-5 ✓						X																			
36		S-10-D-200 ✓						X																			
37		E-0-A-5 ✓	8/12				X	X																			
38		E-0-A-200 ✓					X	X																			
39		E-0-B-5 ✓						X																			
40		E-0-B-200 ✓						X																			
41		E-0-C-5 ✓					X	X																			
42		E-0-C-200 ✓					X	X																			
43		N-0-A-5 ~~Broken~~		Lid came off			X	X																			
44		N-0-A-200 ✓					X	X																			
45		N-0-B-5 ✓						X																			
46		N-0-B-206 ✓						X																			
47		N-10-A-5 ✓						X																			
48		N-10-A-200 ✓						X																			
49		N-10-B-5 ✓					X	X																			
50		N-10-B-200 ✓					X	X																			
51		N-10-C-5 ✓						X																			
52		N-10-C-200 ✓						X																			
53		N-10-D-5 ✓					X	X																			
54		N-10-D-200 ✓						X																			
							11	22																			

Special Instructions:

5

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: michael.leviton@ch2m.com PHONE: [redacted]
FIELD LEAD: [redacted] EMAIL: Philippa.Scott@ch2m.com PHONE:
COC emailed ?:
Email Reports to: [redacted]
Email Invoice to (will default to PM if no other addresses are listed): [redacted]
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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 comments:

RELINQUISHED BY: [redacted]
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

RELINQUISHED BY:
DATE:
TIME:

RECEIVED BY: LK
DATE: 14/2/18
TIME: 11Am

		SAMPLE DETAILS					Analysis																				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)																	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
		WG-3-E-200 ✓	6/2/18		S																					X	
		WG-3-E400 ✓																								X	
55		Composite 01 ✓						X	X																		
56		Composite 02 ✓						X	X																		
57		Composite 03 ✓						X	X																		
58		Composite 04 ✓						X	X																		
59		W-10-H-5 ✓						X																			
60		W-10-H-200 ✓						X																			
61		W-0-E5 ✓						X																			
62		W-0E-200 ✓						X																			
63		W10-G-5 ✓					X	X																			
64		W-10-G-200 ✓					X	X																			
65		W-0-D-5 ✓						X																			
66		W-0-D-200 ✓						X																			
67		W-10-F-5 ✓						X																			
68		W-10-F-200 ✓						X																			
69		W-0-C-5 ✓					X	X																			
70		W-0-C-200 ✓					X	X																			
71		W-10-E5 ✓					X	X																			
72		W-10-E-200 ✓					X	X																			
73		W-0-B-5 ✓						X																			
74		W-0-B-200 ✓						X																			
							6	20																		2	

Special Instructions:

6

CHAIN OF CUSTODY

CLIENT:	CH2M	OFFICE:	Sydney	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):	Standard TAT	
CLIENT ADDRESS:	Level 7, 9 Help St Chatswood NSW 2067						
PROJECT:	CSIRO Woomera			PO / QUOTE NO.:	1712418WM		
PROJECT NUMBER:	684331			FORMAT:	Equis and Esdat		
PROJECT MANAGER:	[redacted]	EMAIL:	[redacted]	PHONE:	[redacted]		
FIELD LEAD:		EMAIL:		PHONE:			
COC emailed ?:							
Email Reports to:	[redacted]						
Email Invoice to (will default to PM if no other addresses are listed):	[redacted]						
Notes							

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

RELINQUISHED BY: [redacted]	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY: LK
DATE:	DATE:	DATE:	DATE: 14/2/18
TIME:	TIME:	TIME:	TIME: 11AM

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 comments:

Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)	Hold	Additional Information Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
75		N-30-A-S ✓						X			
76		N-30-A-200 ✓						X			
77		N-30-B-S ✓					X	X			
78		N-30-B-200 ✓					X	X			
79		N-30-C-S ✓						X			
80		N-30-C-200 ✓						X			
	*	N-30-D-S Broken						X			
81		N-30-D-200 ✓						X			
82		W-10-A-S ✓	7/2				X	X			
							5	9			

Special Instructions:

SGS

REGISTRATION DETAILS

AUSTRALIA-ENVIRONMENTAL-PERTH AIRPORT- PROFORMA -QU101

APPROVED BY: R. MA

Bottle Map Sample Numbers:	1L Plastic Green	500mL Plastic Green	250mL Plastic Purple	500mL Amber Green	250mL Plastic Green	125mL Plastic Green	125mL UF/F Plastic Red	1L Amber Green	500mL Amber Orange	100mL Amber Green	40mL Glass Vial VOC	40mL Glass Vial HAA	500mL Plastic Blue	250mL Plastic Orange	125mL Plastic Brown	1L Plastic Yellow	250mL Glass Jar	125ml Glass Jar	Bottles Supplied By	Ziplock Bag/ Other
1-82																	1			

Job Number: PE 123413

\# of Eskies: 4

Esky Numbers:

[✓ IB] / ICE / None

Temp: 21 °C

Tray Numbers: Q-006 to Q-010

Registration comments:

- Samples N-30-D-5 and WG-1-E-10 broken in transit.
- Sample N-0-A-5 lid came off in-transit.
- missing WG-1-B-200
- Received extra sample ID: WG-B-200

Action Taken:

- To be booked in separate job upon receipt of sub-sample from Notting Hill as per DB.

Client is Ok to proceed for this sample.

Booked WG-B-200 as WG-1-B-200 as per client.

Registered By: C.T. 15/2/18

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	[redacted]
Client	CH2M HILL AUSTRALIA PTY LTD
Address	PO BOX 5392 CHATSWOOD NSW 1515
Telephone	61 2 99500200
Facsimile	61 2 99500601
Email	[redacted]ch2m.com
Project	**CSIRO Woomera - Project # 684331**
Order Number	(Not specified)
Samples	1

LABORATORY DETAILS

Manager	Ros Ma
Laboratory	SGS Perth Environmental
Address	28 Reid Rd Perth Airport WA 6105
Telephone	(08) 9373 3500
Facsimile	(08) 9373 3556
Email	au.environmental.perth@sgs.com
SGS Reference	**PE123413A R0**
Date Received	23 Feb 2018
Date Reported	09 Mar 2018

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(898/20210).

Thorium and Uranium subcontracted to SGS Perth Minerals, 28 Reid Rd Perth Airport WA, NATA Accreditation Number 1936, WM182643.

SIGNATORIES

Hue Thanh Ly
Metals Team Leader

Michael McKay
Inorganics and ARD Supervisor

Parameter	Units	LOR	Sample Number: PE123413A.083 Sample Matrix: Soil Sample Date: 07 Feb 2018 Sample Name: N-30-D-5

Moisture Content Method: AN002 Tested: 6/3/2018

% Moisture	%w/w	1	2.7

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 26/2/2018

Arsenic, As	mg/kg	1	2
Cadmium, Cd	mg/kg	0.3	<0.3
Chromium, Cr	mg/kg	0.5	9.7
Copper, Cu	mg/kg	0.5	4.2
Lead, Pb	mg/kg	1	3
Nickel, Ni	mg/kg	0.5	3.5
Zinc, Zn	mg/kg	2	12

Mercury in Soil Method: AN312 Tested: 26/2/2018

Mercury	mg/kg	0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 8/3/2018

Thorium, Th*	mg/kg	0.5	1.9
Uranium, U*	mg/kg	0.1	0.1

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Mercury in Soil Method ME-(AU)-[ENV]AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery	MSD %RPD
Mercury	LB142817	mg/kg	0.05	<0.05	0%	96%	97%	2%

Moisture Content Method ME-(AU)-[ENV]AN002

Parameter	QC Reference	Units	LOR	DUP %RPD
% Moisture	LB143093	%w/w	1	1 - 12%

Total Recoverable Elements in Soil by ICPOES Method ME-(AU)-[ENV]AN320

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery	MSD %RPD
Arsenic, As	LB142817	mg/kg	1	<1	20%	95%	105%	7%
Cadmium, Cd	LB142817	mg/kg	0.3	<0.3	0%	96%	91%	4%
Chromium, Cr	LB142817	mg/kg	0.5	<0.5	3%	92%	93%	4%
Copper, Cu	LB142817	mg/kg	0.5	<0.5	1%	94%		
Lead, Pb	LB142817	mg/kg	1	<1	2%	96%	94%	8%
Nickel, Ni	LB142817	mg/kg	0.5	<0.5	1%	98%	103%	9%
Zinc, Zn	LB142817	mg/kg	2	<2	0%	92%		

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN040	A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analysis by ASS or ICP as per USEPA Method 200.8.
AN041/AN318	Determination of elements at trace level in soil digest by ICP-MS technique, in accordance with USEPA 6020A.
AN045	A portion of sample is digested with Nitric acid and Hydrogen Peroxide over time and then with Hydrochloric acid through several heating and cooling cycles. It provides a strong oxidising medium for bringing metal analytes into solution according to USEPA3050, after filtration the solution is presented for analysis on AAS or ICP .
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN320	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
AN320	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference USEPA3050, USEPA6010C and APHA 3120 B.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
		NVL	Not Validated

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

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

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

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

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:
a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

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

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

PE 123413A

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to [redacted]
Email Invoice to (will default to PM if no other addresses are listed): [redacted]
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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 comments:

RELINQUISHED BY: [redacted]
DATE: 6/2/18
TIME:

RECEIVED BY:
DATE:
TIME:

RELINQUISHED BY:
DATE:
TIME:

RECEIVED BY: LADAN KALAN
DATE: 14/2/18
TIME: 11AM

SGS Perth Environmental
PE123413A COC
Received: 23-Feb-2018

		SAMPLE DETAILS					Analysis				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
1		WG-0-A-10 ✓	6/2/18		S		X	X			
2		WG-0-A-200 ✓					X	X			
3		WG-0-B-10 ✓					X	X			
4		WG-0-C-10 ✓					X	X			
5		WG-0-C-200 ✓					X	X			
[illegible]		WG-0-D-10 ✓								✓	
		WG-0-D-200 ✓								✓	
6		WG-0-E-10 ✓					X	X			
7		WG-0-E-200 ✓					X	X			
		WG-0-E-400 ✓								✓	
		WG-1-A-10 ✓								✓	
		WG-1-A-200 ✓								✓	
		WG-1-A-400 ✓								✓	
8		WG-1-B-10 ✓					X	X			
9	~~SNR~~	WG-1-B-200 (SNR C.T.)					X	X			
	C.T.	WG-1-B-400 ✓								✓	
		WG-1-C-10 (SNR) ✓								X	
		WG-1-C-200 (SNR) ✓								X	
		WG-1-C-400 (SNR) ✓								X	
10	~~SNR~~	WG-1-D-10 SNR ✓					X	X			
11	~~SNR~~	WG-1-D-200 SNR ✓					X	X			
	~~SNR~~	WG-1-D-400 SNR ✓								X	
	CT.		C.T.				11	11		11	

Special Instructions:

Received on 23/2/18 @ 9:00a.m

CHAIN OF CUSTODY

2

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to: [redacted]
Email Invoice to (will default to PM if no other addresses are listed): [redacted]

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 171241BWM
FORMAT: Equis and Esdat

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 comments:

RELINQUISHED BY: [redacted]
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

RELINQUISHED BY:
DATE:
TIME:

RECEIVED BY: LR
DATE: 14/2/18
TIME: 11Am

Notes

Field ID	Notes	SAMPLE DETAILS: SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Analysis: Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)																	Hold	Additional Information: Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standard or lab provided containers etc.
		WG-1-E-10 * Broken	12/2/18		\																					✓	
		WG-1-E-200 ✓																								✓	
		WG-1-E-400 ✓																								✓	
12		WG-2-A-10 ✓					X	X																			
13		WG-2-A-200 ✓					X	X																			
		WG-2-A-400 ✓																								X	
		WG-2-B-10 ✓																								X	
		WG-2-B-200 ✓																								X	
		WG-2-B-400 ✓																								X	
14		WG-2-C-10 ✓					X	X																			
15		WG-2-C-200 ✓					X	X																			
		WG-2-C-400 ✓																								X	
		WG-2-D-10 ✓																								X	
		WG-2-D-200 ✓																								X	
		WG-2-D-400 ✓																								X	
16		WG-2-E-10 ✓					X	X																			
17		WG-2-E-200 ✓					X	X																			
		WG-2-E-400 ✓																								✓	
		WG-3-A-10 ✓																								X	
		WG-3-A-200 ✓																								X	
		WG-3-A-400 ✓																								X	
		WG-3-E-10 ✓			↓																					X	
							6	6																		16	

Special Instructions:

3

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted]
FIELD LEAD: EMAIL:
COC emailed ?:
Email Reports to [redacted]
Email Invoice to (will default to PM if no other addresses are listed) [redacted]
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat
PHONE: [redacted]
PHONE:

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 comments

RELINQUISHED BY: [redacted]
DATE
TIME

RECEIVED BY:
DATE
TIME

RELINQUISHED BY:
DATE
TIME

RECEIVED BY: LK
DATE: 14/2/18
TIME 11Am

		SAMPLE DETAILS					Analysis				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc
		W-10-D-5 ✓	7/2		S					X	
		W-10-D-200 ✓								X	
18		W-0-A-5 ✓					X	X			
19		W-0-A-200 ✓					X	X			
20		W-10-B-5 ✓						X			
21		W-10-B-200 ✓						X			
22		W-10-A-200 ✓					X	X			
23		WG-3-B-10 ✓					X	X			
24		WG-3-B-200 ✓					X	X			
		WG-3-B-400 ✓								X	
		WG-3-C-10 ✓								X	
		WG-3-C-200 ✓								X	
		WG-3-C-400 ✓								X	
25		WG-3-D-10 ✓					X	X			
26		WG-3-D-200 ✓					X	X			
		WG-3-D-400 ✓								X	
27		S-0-A-5 ✓					X	X			
28		S-0-A-200 ✓					X	X			
29		S-10-A-5 ✓					X	X			
30		S-10-A-200 ✓					X	X			
31		S-10-B-5 ✓						X			
32		S-10-B-200 ✓						X			
							11	15		7	

Special Instructions:

4

CHAIN OF CUSTODY

CLIENT:	CH2M	OFFICE:	Sydney	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☐ Standard TAT (List due date): Standard TAT ☐ Non Standard or urgent TAT (List due date):
CLIENT ADDRESS:	Level 7, 9 Help St Chatswood NSW 2067				
PROJECT:	CSIRO Woomera			PO / QUOTE NO.:	171241SWM
PROJECT NUMBER:	684331			FORMAT:	Equis and Esdat
PROJECT MANAGER:	[redacted]	EMAIL:	[redacted]	PHONE:	[redacted]
FIELD LEAD:		EMAIL:		PHONE:	
COC emailed ?:					
Email Reports to	[redacted]				
Email Invoice to (will default to PM if no other addresses are listed):	[redacted]				
Notes					

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 comments:

RELINQUISHED BY: [redacted]	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY: LK
DATE	DATE	DATE	DATE 19/2/18
TIME	TIME	TIME	TIME 11Am

		SAMPLE DETAILS					Analysis																				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)																	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc
33		S-10-C-S ✓	7/2		S		X	X																			
34		S-10-C-200 ✓					X	X																			
35		S-10-D-S ✓						X																			
36		S-10-D-200 ✓						X																			
37		E-0-A-S ✓	8/2				X	X																			
38		E-0-A-200 ✓					X	X																			
39		E-0-B-S ✓						X																			
40		E-0-B-200 ✓						X																			
41		E-0-C-S ✓					X	X																			
42		E-0-C-200 ✓					X	X																			
43		X N-0-A-S	Lid came off				X	X																			
44		N-0-A-200 ✓					X	X																			
45		N-0-B-S ✓						X																			
46		N-0-B-200 ✓						X																			
47		N-10-A-S ✓						X																			
48		N-10-A-200 ✓						X																			
49		N-10-B-S ✓					X	X																			
50		N-10-B-200 ✓					X	X																			
51		N-10-C-S ✓						X																			
52		N-10-C-200 ✓						X																			
53		N-10-D-S ✓					X	X																			
54		N-10-D-200 ✓						X																			
							11	22																			

Special Instructions:

5

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to [redacted]
Email Invoice to (will default to PM if no other addresses are listed) [redacted]
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712413WM
FORMAT: Equis and Esdat

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
Was ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comments:

RELINQUISHED BY: [redacted]
DATE
TIME

RECEIVED BY:
DATE
TIME:

RELINQUISHED BY:
DATE:
TIME:

RECEIVED BY: LK
DATE: 14/2/18
TIME: 11Am

		SAMPLE DETAILS					Analysis																				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)																	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
		WG-3-E-200 ✓	6/2/18		✓																					X	
		WG-3-E400 ✓																								X	
55		Composite 01 ✓						X	X																		
56		Composite 02 ✓						X	X																		
57		Composite03 ✓						X	X																		
58		Composite 04 ✓						X	X																		
59		W-10-H-5 ✓						X																			
60		W-10-H-200 ✓						X																			
61		W-0-E5 ✓						X																			
62		W-0E-200 ✓						X																			
63		W10-G-5 ✓					X	X																			
64		W-10 G-200 ✓					X	X																			
65		W-0-D-5 ✓						X																			
66		W-0 D-200 ✓						X																			
67		W-10-F-5 ✓						X																			
68		W-10 F-200 ✓						X																			
69		W-0-C-5 ✓					X	X																			
70		W-0-C-200 ✓					X	X																			
71		W-10-B-5 • ✓					X	X																			
72		W-10-B-200 • ✓					X	X																			
73		W-0-B-5 ✓						X																			
74		W-0-B-200 ✓						X																			
							6	20																		2	

Special Instructions:

6

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to: [redacted]
Email Invoice to (will default to PM if no other addresses are listed): [redacted]
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 [✓ 6] [✓ 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 comments

RELINQUISHED BY: [redacted]
DATE:
TIME:

RECEIVED BY:
DATE
TIME

RELINQUISHED BY:
DATE
TIME

RECEIVED BY: LR
DATE 14/2/18
TIME 11Am

SAMPLE DETAILS							Analysis																				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)																	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc
75		N-30-A-5 ✓						X																			
76		N-30-A-200 ✓						X																			
77		N-30-B-5 ✓					X	X																			
78		N-30-B-200 ✓					X	X																			
79		N-30-C-5 ✓						X																			
80		N-30-C-200 ✓						X																			
	83*	N-30-D-5 Broken						X																			
81		N-30-D-200 ✓						X																			
82		N-30-A-5 ✓	7/2				X	X																			
							5	9																			

Special Instructions:

SGS

AUSTRALIA-ENVIRONMENTAL-PERTH AIRPORT- PROFORMA -QU101

REGISTRATION DETAILS

APPROVED BY: R. MA

Bottle Map Sample Numbers:	1L Plastic Green	500mL Plastic Green	250mL Plastic Purple	500mL Amber Green	250mL Plastic Green	125mL Plastic Green	125mL UF/F Plastic Red	1L Amber Green	500mL Amber Orange	100mL Amber Green	40mL Glass Vial VOC	40mL Glass Vial HAA	500mL Plastic Blue	250mL Plastic Orange	125mL Plastic Brown	1L Plastic Yellow	250mL Glass Jar	125ml Glass Jar	Bottles Supplied By	Ziplock Bag/ Other 100ml Glas jar
83																				/

Job Number: PE 123413A

# of Eskies: None / 1 bar

Esky Numbers:

IB / ICE / [✓ None]

Temp: 20 °C

Tray Numbers: Q-010

Registration comments:

Action Taken:

Registered By: FG 23/2/18

Received 23/2/18 @ 9:00 am

TOLL

MANIFEST FOR PRIORITY

Printed Date: 21-Feb-2018 04 13 23 PM

Manifest ID: 3447349

Sender: SGS AUSTRALIAN RADIATION SERVICES
10 / 585 Blackburn Road NOTTING HILL VIC 3168

Sender Account: 603629

3447349

Dispatch Date: 21-Feb-2018 05:00:00 pm

SHIPMENT NO	PAYER ACCOUNT	SERVICE METHOD	CONNOTE ID	RECEIVER	SUBURB	POST CODE	DANGEROUS GOODS					TOTAL ITEMS	TOTAL CUBIC (M3)	TOTAL WEIGHT (KG)	PALLETS			SHIP UNIT TYPE
							UNCODE	CLASS	SUB RISK	GROUP	WGT (KG)				CHEP	LOSCAM	OTHER	
07139642	603629	PRI_AIR_OVERNIGHT_SATCHEL	ASRX022861	SGS PERTH AIRPORT 28 REID ROAD	PERTH AIRPORT	6105						1	0.005	1.0				PRI_AUS_1KG_SATCHEL

Special Instructions: SOIL SAMPLES
Sender Ref: SARA SHOYOOKHI
Receiver Ref: DAVID BRENNAN
Other Ref: ME305752
References:

6105000001ASRX022861

ASRX022861

TOTALS	1		1	0.005	1.0

CONSIGNMENT DOES NOT CONTAIN DANGEROUS GOODS

IF THE GOODS ARE DANGEROUS IN NATURE THE SENDER MUST DECLARE THEM ACCORDING TO THE SECTION 4 OF THE AUSTRALIAN CODE FOR THE TRANSPORTATION OF DANGEROUS GOODS BY ROAD, RAIL OR SEA.

I HEREBY DECLARE THAT THESE CONSIGNMENTS DO NOT CONTAIN DANGEROUS GOODS, AND THAT THESE CONSIGNMENTS DO NOT CONTAIN ANY UNAUTHORISED EXPLOSIVE OR INCENDIARY DEVICES. PLEASE ACCEPT FOR CARRIAGE THE GOODS DESCRIBED HEREON SUBJECT TO THE TERMS AND CONDITIONS OF THE CARRIER. I AM ALSO AWARE THAT THESE CONSIGNMENTS WILL BE SUBJECT TO SECURITY SCREENING AND CLEARING.

Sender's Name:

Sender's Signature: Sara shoyo

Date: 21-2-18

PALLETS	TO TOLL	FROM TOLL
Chep		
Loscam		
Other		
Chep Other		
Loscam Other		

GOODS DESCRIBED HEREON NUMBERING 1 ITEMS RECEIVED FOR CARRIAGE IN ACCORDANCE WITH CARRIER'S CONDITION OF TRANSPORT.

Driver's Name: ____

Driver's Signature: ____

Date: ____

Fleet Number: ____

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

LABORATORY DETAILS

Contact	[redacted]	Manager	Ros Ma
Client	CH2M HILL AUSTRALIA PTY LTD	Laboratory	SGS Perth Environmental
Address	PO BOX 632 NORTH SYDNEY NSW 2060	Address	28 Reid Rd Perth Airport WA 6105
Telephone	61 2 99500200	Telephone	(08) 9373 3500
Facsimile	61 2 99500601	Facsimile	(08) 9373 3556
Email	[redacted]jacobs.com	Email	au.environmental.perth@sgs.com
Project	**CSIRO Woomera - Project# 684331**	SGS Reference	**PE126215 R0**
Order Number	**1712418WM**	Date Received	07 Jun 2018
Samples	74	Date Reported	21 Jun 2018

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(898/20210).

Total Recoverable Metals: Zn: Spike recovery and MSD RPD failed due to sample heterogeneity.
U and Th subcontracted to SGS Perth Minerals, 28 Reid Rd Perth Airport WA, NATA Accreditation Number 1936, WM185672.

SIGNATORIES

Hue Thanh Ly Metals Team Leader	Michael McKay Inorganics and ARD Supervisor

		Sample Number	PE126215.001	PE126215.002	PE126215.003	PE126215.004
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	29 May 2018	29 May 2018	29 May 2018	29 May 2018
		Sample Name	E-30-A-5	E-30-A-200	E-30-B-5	E-30-B-200
Parameter	Units	LOR				
Moisture Content Method: AN002 Tested: 13/6/2018						
% Moisture	%w/w	1	9.3	12.5	7.4	10.4
Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018						
Arsenic, As	mg/kg	1	6	6	5	6
Cadmium, Cd	mg/kg	0.3	<0.3	0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	20	21	16	16
Copper, Cu	mg/kg	0.5	14	14	20	12
Lead, Pb	mg/kg	1	12	11	25	10
Nickel, Ni	mg/kg	0.5	15	13	10	9.6
Zinc, Zn	mg/kg	2	42	44	54	34
Mercury in Soil Method: AN312 Tested: 7/6/2018						
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018						
Thorium, Th*	mg/kg	0.5	5.1	5.1	3.4	3.7
Uranium, U*	mg/kg	0.1	0.5	0.8	0.4	0.7

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE126215.005 Soil 29 May 2018 E-30-C-5	PE126215.006 Soil 29 May 2018 E-30-C-200	PE126215.007 Soil 29 May 2018 S-30-A-5	PE126215.008 Soil 29 May 2018 S-30-A-200

Moisture Content Method: AN002 Tested: 13/6/2018

% Moisture	%w/w	1	25.8	24.3	3.6	7.5

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018

Arsenic, As	mg/kg	1	4	5	1	2
Cadmium, Cd	mg/kg	0.3	0.3	0.6	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	20	27	7.9	11
Copper, Cu	mg/kg	0.5	18	23	3.2	5.5
Lead, Pb	mg/kg	1	57	99	3	4
Nickel, Ni	mg/kg	0.5	11	13	3.0	4.9
Zinc, Zn	mg/kg	2	1800	1800	9	13

Mercury in Soil Method: AN312 Tested: 7/6/2018

Mercury	mg/kg	0.05	0.11	0.13	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	3.7	4.1	1.7	2.4
Uranium, U*	mg/kg	0.1	0.4	0.4	0.1	0.2

		Sample Number	PE126215.009	PE126215.010	PE126215.011	PE126215.012
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	29 May 2018	29 May 2018	29 May 2018	29 May 2018
		Sample Name	S-30-B-5	S-30-B-200	S-30-C-5	S-30-C-200
Parameter	Units	LOR				
Moisture Content Method: AN002 Tested: 13/6/2018						
% Moisture	%w/w	1	4.0	7.2	5.2	5.3
Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018						
Arsenic, As	mg/kg	1	3	4	2	3
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	11	14	7.1	9.9
Copper, Cu	mg/kg	0.5	5.7	11	6.6	7.5
Lead, Pb	mg/kg	1	4	9	9	11
Nickel, Ni	mg/kg	0.5	5.3	8.3	5.0	6.0
Zinc, Zn	mg/kg	2	15	90	71	92
Mercury in Soil Method: AN312 Tested: 7/6/2018						
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018						
Thorium, Th*	mg/kg	0.5	2.7	3.4	2.2	2.5
Uranium, U*	mg/kg	0.1	0.2	0.3	0.3	0.4

Parameter	Units	LOR	Sample Number PE126215.013 Sample Matrix Soil Sample Date 29 May 2018 Sample Name S-30-D-5	PE126215.014 Soil 29 May 2018 S-30-D-200	PE126215.015 Soil 29 May 2018 S-30-E-5	PE126215.016 Soil 29 May 2018 S-30-E-200

Moisture Content Method: AN002 Tested: 13/6/2018

% Moisture	%w/w	1	2.7	19.2	7.2	8.8

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018

Arsenic, As	mg/kg	1	<1	8	4	4
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	3.2	21	15	17
Copper, Cu	mg/kg	0.5	2.9	16	15	13
Lead, Pb	mg/kg	1	5	8	120	220
Nickel, Ni	mg/kg	0.5	3.3	14	9.9	11
Zinc, Zn	mg/kg	2	12	37	100	61

Mercury in Soil Method: AN312 Tested: 7/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	1.0	6.3	3.9	4.6
Uranium, U*	mg/kg	0.1	<0.1	1.4	0.5	0.6

		Sample Number	PE126215.017	PE126215.018	PE126215.019	PE126215.020
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	29 May 2018	29 May 2018	29 May 2018	29 May 2018
		Sample Name	S-R-A-5	S-R-A-200	S-R-B-5	S-R-B-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 13/6/2018

Parameter	Units	LOR	PE126215.017	PE126215.018	PE126215.019	PE126215.020
% Moisture	%w/w	1	6.2	7.2	5.6	6.7

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018

Parameter	Units	LOR	PE126215.017	PE126215.018	PE126215.019	PE126215.020
Arsenic, As	mg/kg	1	2	2	4	3
Cadmium, Cd	mg/kg	0.3	<0.3	0.8	1.0	1.0
Chromium, Cr	mg/kg	0.5	9.4	9.9	11	12
Copper, Cu	mg/kg	0.5	7.4	5.9	12	10
Lead, Pb	mg/kg	1	5	7	13	8
Nickel, Ni	mg/kg	0.5	5.5	4.8	8.1	8.1
Zinc, Zn	mg/kg	2	22	18	96	50

Mercury in Soil Method: AN312 Tested: 7/6/2018

Parameter	Units	LOR	PE126215.017	PE126215.018	PE126215.019	PE126215.020
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Parameter	Units	LOR	PE126215.017	PE126215.018	PE126215.019	PE126215.020
Thorium, Th*	mg/kg	0.5	2.3	2.3	3.2	3.6
Uranium, U*	mg/kg	0.1	0.2	0.2	0.3	0.3

		Sample Number	PE126215.021	PE126215.022	PE126215.023	PE126215.024
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	29 May 2018	29 May 2018	29 May 2018	29 May 2018
		Sample Name	S-R-C-5	S-R-C-200	S-R-D-5	S-R-D-200
Parameter	Units	LOR				
Moisture Content Method: AN002 Tested: 13/6/2018						
% Moisture	%w/w	1	8.2	9.1	7.6	10.2
Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018						
Arsenic, As	mg/kg	1	3	3	5	4
Cadmium, Cd	mg/kg	0.3	1.3	1.1	1.3	1.2
Chromium, Cr	mg/kg	0.5	13	13	14	18
Copper, Cu	mg/kg	0.5	12	13	14	17
Lead, Pb	mg/kg	1	16	29	16	10
Nickel, Ni	mg/kg	0.5	9.8	9.9	10	12
Zinc, Zn	mg/kg	2	40	46	37	40
Mercury in Soil Method: AN312 Tested: 7/6/2018						
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018						
Thorium, Th*	mg/kg	0.5	4.9	5.2	4.9	5.2
Uranium, U*	mg/kg	0.1	0.4	0.4	0.5	0.4

		Sample Number	PE126215.025	PE126215.026	PE126215.027	PE126215.028
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	29 May 2018	29 May 2018	29 May 2018	29 May 2018
		Sample Name	S-R-E-5	S-R-E-200	E-10-A-5	E-10-A-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 13/6/2018

% Moisture	%w/w	1	6.7	8.7	12.7	20.8

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018

Arsenic, As	mg/kg	1	4	3	4	5
Cadmium, Cd	mg/kg	0.3	0.9	1.2	0.8	1.1
Chromium, Cr	mg/kg	0.5	11	16	5.4	15
Copper, Cu	mg/kg	0.5	11	13	11	14
Lead, Pb	mg/kg	1	14	12	5	6
Nickel, Ni	mg/kg	0.5	8.1	10	7.6	11
Zinc, Zn	mg/kg	2	36	42	26	34

Mercury in Soil Method: AN312 Tested: 7/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	4.3	5.2	2.2	5.7
Uranium, U*	mg/kg	0.1	0.4	0.3	0.4	0.5

		Sample Number	PE126215.029	PE126215.030	PE126215.031	PE126215.032
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	29 May 2018	29 May 2018	29 May 2018	29 May 2018
		Sample Name	E-10-B-5	E-10-B-200	E-10-C-5	E-10-C-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 13/6/2018

% Moisture	%w/w	1	13.4	21.1	12.9	24.2

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018

Arsenic, As	mg/kg	1	4	7	3	<1
Cadmium, Cd	mg/kg	0.3	0.5	1.3	0.5	<0.3
Chromium, Cr	mg/kg	0.5	3.1	17	2.1	1.6
Copper, Cu	mg/kg	0.5	9.8	15	10	1.4
Lead, Pb	mg/kg	1	3	7	4	<1
Nickel, Ni	mg/kg	0.5	7.4	12	6.8	1.1
Zinc, Zn	mg/kg	2	11	35	13	3

Mercury in Soil Method: AN312 Tested: 7/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	1.5	5.6	1.0	0.5
Uranium, U*	mg/kg	0.1	0.4	0.7	0.4	<0.1

		Sample Number	PE126215.033	PE126215.034	PE126215.035	PE126215.036
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	29 May 2018	29 May 2018	29 May 2018	29 May 2018
		Sample Name	W-30-A-5	W-30-A-200	W-30-B-5	W-30-B-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 13/6/2018

% Moisture	%w/w	1	1.9	15.1	6.0	19.1

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018

Arsenic, As	mg/kg	1	2	3	2	3
Cadmium, Cd	mg/kg	0.3	0.4	0.7	0.6	1.4
Chromium, Cr	mg/kg	0.5	<0.5	7.9	10	24
Copper, Cu	mg/kg	0.5	2.0	6.6	3.6	15
Lead, Pb	mg/kg	1	3	4	3	8
Nickel, Ni	mg/kg	0.5	4.1	5.4	3.3	12
Zinc, Zn	mg/kg	2	21	16	9	39

Mercury in Soil Method: AN312 Tested: 7/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	1.9	3.0	1.6	6.0
Uranium, U*	mg/kg	0.1	1.4	0.3	<0.1	0.3

		Sample Number	PE126215.037	PE126215.038	PE126215.039	PE126215.040
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	29 May 2018	29 May 2018	29 May 2018	29 May 2018
		Sample Name	W-30-C-5	W-30-C-200	W-30-D-5	W-30-D-200
Parameter	Units	LOR				
Moisture Content Method: AN002 Tested: 16/6/2018						
% Moisture	%w/w	1	5.6	15.0	6.1	19.1
Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018						
Arsenic, As	mg/kg	1	2	5	<1	4
Cadmium, Cd	mg/kg	0.3	0.5	1.0	0.5	1.1
Chromium, Cr	mg/kg	0.5	9.5	17	9.3	19
Copper, Cu	mg/kg	0.5	3.1	10	3.1	13
Lead, Pb	mg/kg	1	3	5	3	6
Nickel, Ni	mg/kg	0.5	2.8	8.0	2.8	9.6
Zinc, Zn	mg/kg	2	9	23	8	28
Mercury in Soil Method: AN312 Tested: 7/6/2018						
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018						
Thorium, Th*	mg/kg	0.5	1.6	3.7	1.4	4.6
Uranium, U*	mg/kg	0.1	0.1	0.4	0.1	0.4

		Sample Number	PE126215.041	PE126215.042	PE126215.043	PE126215.044
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	29 May 2018	29 May 2018	29 May 2018	29 May 2018
		Sample Name	W-30-E-5	W-30-E-200	W-30-F-5	W-30-F-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 16/6/2018

% Moisture	%w/w	1	5.8	11.5	5.7	11.6

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018

Arsenic, As	mg/kg	1	2	3	1	2
Cadmium, Cd	mg/kg	0.3	0.6	0.7	0.6	0.8
Chromium, Cr	mg/kg	0.5	9.8	13	9.3	14
Copper, Cu	mg/kg	0.5	3.3	6.7	3.1	7.5
Lead, Pb	mg/kg	1	2	4	3	4
Nickel, Ni	mg/kg	0.5	3.0	5.1	2.9	5.9
Zinc, Zn	mg/kg	2	8	15	8	18

Mercury in Soil Method: AN312 Tested: 7/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	1.6	2.7	1.5	2.9
Uranium, U*	mg/kg	0.1	<0.1	0.2	<0.1	0.2

		Sample Number	PE126215.045	PE126215.046	PE126215.047	PE126215.048
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	29 May 2018	29 May 2018	29 May 2018	29 May 2018
		Sample Name	W-D-B-5	W-D-B-200	W-D-A-5	W-D-A-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 16/6/2018

% Moisture	%w/w	1	5.8	2.6	3.7	4.8

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018

Arsenic, As	mg/kg	1	2	2	2	3
Cadmium, Cd	mg/kg	0.3	1.2	0.8	1.0	1.0
Chromium, Cr	mg/kg	0.5	17	13	14	15
Copper, Cu	mg/kg	0.5	10	6.0	8.7	8.6
Lead, Pb	mg/kg	1	8	4	17	11
Nickel, Ni	mg/kg	0.5	7.8	4.9	6.4	6.5
Zinc, Zn	mg/kg	2	34	17	120	69

Mercury in Soil Method: AN312 Tested: 7/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	4.0	2.3	2.6	2.8
Uranium, U*	mg/kg	0.1	0.2	<0.1	0.1	0.1

		Sample Number	PE126215.049	PE126215.050	PE126215.051	PE126215.052
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	30 May 2018	30 May 2018	30 May 2018	30 May 2018
		Sample Name	N-P-A-5	N-P-A-200	N-P-B-5	N-P-B-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 16/6/2018

% Moisture	%w/w	1	10.5	12.9	7.6	14.8

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 7/6/2018

Arsenic, As	mg/kg	1	2	5	5	10
Cadmium, Cd	mg/kg	0.3	1.1	1.4	1.6	<0.3
Chromium, Cr	mg/kg	0.5	20	23	24	32
Copper, Cu	mg/kg	0.5	13	17	17	23
Lead, Pb	mg/kg	1	8	8	20	10
Nickel, Ni	mg/kg	0.5	10	11	12	18
Zinc, Zn	mg/kg	2	43	50	130	55

Mercury in Soil Method: AN312 Tested: 7/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	4.8	5.5	5.1	7.0
Uranium, U*	mg/kg	0.1	0.2	0.2	0.2	0.9

		Sample Number	PE126215.053	PE126215.054	PE126215.055	PE126215.056
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	30 May 2018	30 May 2018	30 May 2018	30 May 2018
		Sample Name	N-P-C-5	N-P-C-200	E-P-A-5	E-P-A-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 16/6/2018

% Moisture	%w/w	1	8.1	12.6	7.7	9.5

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 11/6/2018

Arsenic, As	mg/kg	1	5	7	7	9
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	26	28	28	29
Copper, Cu	mg/kg	0.5	20	21	20	22
Lead, Pb	mg/kg	1	10	11	10	12
Nickel, Ni	mg/kg	0.5	14	15	15	16
Zinc, Zn	mg/kg	2	60	59	48	46

Mercury in Soil Method: AN312 Tested: 11/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	5.8	5.7	6.1	5.9
Uranium, U*	mg/kg	0.1	0.2	0.4	0.4	0.4

		Sample Number	PE126215.057	PE126215.058	PE126215.059	PE126215.060
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	30 May 2018	30 May 2018	30 May 2018	30 May 2018
		Sample Name	E-P-B-5	E-P-B-200	E-P-C-5	E-P-C-200
Parameter	Units	LOR				

Moisture Content Method: AN002 Tested: 16/6/2018

% Moisture	%w/w	1	7.0	12.8	7.5	10.7

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 11/6/2018

Arsenic, As	mg/kg	1	7	7	5	7
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	28	29	23	27
Copper, Cu	mg/kg	0.5	21	25	22	19
Lead, Pb	mg/kg	1	8	8	23	11
Nickel, Ni	mg/kg	0.5	15	16	13	15
Zinc, Zn	mg/kg	2	48	45	61	48

Mercury in Soil Method: AN312 Tested: 11/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	5.6	5.7	5.3	6.0
Uranium, U*	mg/kg	0.1	0.5	0.3	0.4	0.4

Parameter	Units	LOR	Sample Number PE126215.061 Sample Matrix Soil Sample Date 30 May 2018 Sample Name E-P-D-5	PE126215.062 Soil 30 May 2018 E-P-D-200	PE126215.063 Soil 30 May 2018 E-P-E-5	PE126215.064 Soil 30 May 2018 E-P-E-200

Moisture Content Method: AN002 Tested: 16/6/2018

% Moisture	%w/w	1	3.9	3.4	8.1	7.3

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 11/6/2018

Arsenic, As	mg/kg	1	4	4	5	6
Cadmium, Cd	mg/kg	0.3	0.3	0.6	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	19	15	24	23
Copper, Cu	mg/kg	0.5	16	12	18	17
Lead, Pb	mg/kg	1	23	17	9	9
Nickel, Ni	mg/kg	0.5	11	8.7	14	14
Zinc, Zn	mg/kg	2	59	42	45	41

Mercury in Soil Method: AN312 Tested: 11/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	3.9	2.9	5.5	5.2
Uranium, U*	mg/kg	0.1	0.3	0.3	0.3	0.3

		Sample Number	PE126215.065	PE126215.066	PE126215.067	PE126215.068
		Sample Matrix	Soil	Soil	Soil	Soil
		Sample Date	30 May 2018	30 May 2018	30 May 2018	30 May 2018
		Sample Name	W-P-A-5	W-P-A-200	W-P-B-5	W-P-B-200
Parameter	Units	LOR				
Moisture Content Method: AN002 Tested: 16/6/2018						
% Moisture	%w/w	1	6.5	9.9	3.9	13.1
Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 11/6/2018						
Arsenic, As	mg/kg	1	3	5	2	4
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	20	24	15	20
Copper, Cu	mg/kg	0.5	12	17	10	13
Lead, Pb	mg/kg	1	10	9	28	10
Nickel, Ni	mg/kg	0.5	9.9	13	7.6	11
Zinc, Zn	mg/kg	2	44	38	81	44
Mercury in Soil Method: AN312 Tested: 11/6/2018						
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018						
Thorium, Th*	mg/kg	0.5	4.1	5.5	2.6	4.3
Uranium, U*	mg/kg	0.1	0.2	0.3	0.2	0.3

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	PE126215.069 Soil 30 May 2018 W-P-C-5	PE126215.070 Soil 30 May 2018 W-P-C-200	PE126215.071 Soil 30 May 2018 W-P-D-5	PE126215.072 Soil 30 May 2018 W-P-D-200

Moisture Content Method: AN002 Tested: 16/6/2018

% Moisture	%w/w	1	7.7	9.5	7.6	10.6

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 13/6/2018

Arsenic, As	mg/kg	1	1	2	19	5
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	18	<0.3
Chromium, Cr	mg/kg	0.5	22	26	45	30
Copper, Cu	mg/kg	0.5	14	19	38	22
Lead, Pb	mg/kg	1	14	11	28	11
Nickel, Ni	mg/kg	0.5	12	14	33	15
Zinc, Zn	mg/kg	2	55	48	67	64

Mercury in Soil Method: AN312 Tested: 13/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05	0.36	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	4.7	5.5	5.0	6.2
Uranium, U*	mg/kg	0.1	0.1	0.2	0.2	0.2

		Sample Number	PE126215.073	PE126215.074
		Sample Matrix	Soil	Soil
		Sample Date	30 May 2018	30 May 2018
		Sample Name	W-P-E-5	W-P-E-200
Parameter	Units	LOR		

Moisture Content Method: AN002 Tested: 16/6/2018

% Moisture	%w/w	1	8.3	13.3

Total Recoverable Elements in Soil by ICPOES Method: AN320 Tested: 13/6/2018

Arsenic, As	mg/kg	1	8	13
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	29	31
Copper, Cu	mg/kg	0.5	24	26
Lead, Pb	mg/kg	1	11	9
Nickel, Ni	mg/kg	0.5	15	17
Zinc, Zn	mg/kg	2	58	52

Mercury in Soil Method: AN312 Tested: 13/6/2018

Mercury	mg/kg	0.05	<0.05	<0.05

Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318 Tested: 21/6/2018

Thorium, Th*	mg/kg	0.5	5.6	6.3
Uranium, U*	mg/kg	0.1	0.2	0.4

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Mercury in Soil Method ME-(AU)-[ENV]AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery	MSD %RPD
Mercury	LB146619	mg/kg	0.05	<0.05	0%	93%	94%	1%
	LB146620	mg/kg	0.05	<0.05	0%	95%	91%	NA
	LB146621	mg/kg	0.05	<0.05	0%	95%	95%	NA
	LB146729	mg/kg	0.05	<0.05	0%	95%	92%	NA
	LB146835	mg/kg	0.05		0%	100%	103%	2%

Moisture Content Method ME-(AU)-[ENV]AN002

Parameter	QC Reference	Units	LOR	DUP %RPD
% Moisture	LB146833	%w/w	1	0 - 9%
	LB146976	%w/w	1	1 - 17%

Total Recoverable Elements in Soil by ICPOES Method ME-(AU)-[ENV]AN320

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery	MSD %RPD
Arsenic, As	LB146619	mg/kg	1	<1	4 - 31%	95%	101%	1%
	LB146620	mg/kg	1	<1	19 - 28%	93%	95%	NA
	LB146621	mg/kg	1	<1	3 - 40%	89%	72%	NA
	LB146729	mg/kg	1	<1	11 - 14%	93%	89%	NA
	LB146835	mg/kg	1	<1	5%	103%	98%	2%
Cadmium, Cd	LB146619	mg/kg	0.3	<0.3	0%	92%	95%	1%
	LB146620	mg/kg	0.3	<0.3	17 - 18%	86%	85%	NA
	LB146621	mg/kg	0.3	<0.3	10 - 33%	94%	74%	NA
	LB146729	mg/kg	0.3	<0.3	0 - 38%	97%	97%	NA
	LB146835	mg/kg	0.3	<0.3	0%	108%	107%	3%
Chromium, Cr	LB146619	mg/kg	0.5	<0.5	3 - 11%	88%	105%	6%
	LB146620	mg/kg	0.5	<0.5	16 - 18%	126%	102%	NA
	LB146621	mg/kg	0.5	<0.5	9 - 10%	84%	82%	NA
	LB146729	mg/kg	0.5	<0.5	3 - 9%	98%	106%	NA
	LB146835	mg/kg	0.5	<0.5	4%	74%	116%	8%
Copper, Cu	LB146619	mg/kg	0.5	<0.5	1 - 7%	79%	97%	10%
	LB146620	mg/kg	0.5	<0.5	14%	91%	95%	NA
	LB146621	mg/kg	0.5	<0.5	11 - 17%	97%	77%	NA
	LB146729	mg/kg	0.5	<0.5	3 - 9%	94%	101%	NA
	LB146835	mg/kg	0.5	<0.5	3%	105%	114%	7%
Lead, Pb	LB146619	mg/kg	1	<1	3 - 29%	95%	99%	8%
	LB146620	mg/kg	1	<1	16 - 21%	94%	118%	NA
	LB146621	mg/kg	1	<1	7 - 17%	83%	82%	NA
	LB146729	mg/kg	1	<1	3 - 35%	98%	97%	NA
	LB146835	mg/kg	1	<1	16%	107%	104%	5%
Nickel, Ni	LB146619	mg/kg	0.5	<0.5	6 - 8%	96%	117%	2%
	LB146620	mg/kg	0.5	<0.5	5 - 9%	91%	85%	NA
	LB146621	mg/kg	0.5	<0.5	15 - 17%	82%	78%	NA
	LB146729	mg/kg	0.5	<0.5	2 - 12%	105%	107%	NA
	LB146835	mg/kg	0.5	<0.5	5%	110%	111%	6%
Zinc, Zn	LB146619	mg/kg	2	<2	3 - 22%	86%	120%	8%
	LB146620	mg/kg	2	<2	12 - 13%	95%	142%	NA
	LB146621	mg/kg	2	<2	10 - 17%	84%	94%	NA
	LB146729	mg/kg	2	<2	4 - 11%	91%	85%	NA
	LB146835	mg/kg	2	<2	8%	101%	119%	9%

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN041/AN318	Determination of elements at trace level in soil digest by ICP-MS technique, in accordance with USEPA 6020A.
AN045	A portion of sample is digested with Nitric acid and Hydrogen Peroxide over time and then with Hydrochloric acid through several heating and cooling cycles. It provides a strong oxidising medium for bringing metal analytes into solution according to USEPA3050, after filtration the solution is presented for analysis on AAS or ICP .
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN320	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
AN320	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference USEPA3050, USEPA6010C and APHA 3120 B.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
		NVL	Not Validated

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

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

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

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

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

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

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

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.

CHAIN OF CUSTODY

CLIENT: CH2M **OFFICE:** Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] **EMAIL:** [redacted]
FIELD LEAD: **EMAIL:**
COC emailed ?: YES
Email Reports to: [redacted]
Email Invoice to (will default to PM if no other addresses are listed): [redacted]
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT **(List due date):** Standard TAT
☐ Non Standard or urgent TAT **(List due date):**
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat
PHONE: [redacted]
PHONE:

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 comments

RELINQUISHED BY: [redacted]	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE: 01/06/18	DATE:	DATE:	DATE:
TIME:	TIME:	TIME:	TIME:

		SAMPLE DETAILS					Analysis				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc
1	1	E-30-A-5	29/5/18			2		X			NOTE - ALL SAMPLE BAGS FOR RADIONUCLIDES HAVE BEEN FORWARDED TO MELBOURNE - SOIL JARS TO PERTH
2	2	E-30-A-200	29/5/18			2		X			
3	3	E-30-B-5	29/5/18			2	X	X			
4	—	E-30-B-200	29/5/18			2		X		X	
5	4	E-30-C-5	29/5/18			2	X	X			
6	5	E-30-C-200	29/5/18			2	X	X			
7	6	S-30-A-5	29/5/18			2		X			
8	—	S-30-A-200	29/5/18			2		X		X	
9	7	S-30-B-5	29/5/18			2		X			
10	8	S-30-B-200	29/5/18			2		X			
11	9	S-30-C-5	29/5/18			2	X	X			
12	10	S-30-C-200	29/5/18			2	X	X			
13	11	S-30-D-5	29/5/18			2		X			
14	12	S-30-D-200	29/5/18			2		X			
15	13	S-30-E-5	29/5/18			2	X	X			
16	14	S-30-E-200	29/5/18			2		X			
17	15	S-R-A-5	29/5/18			2	X	X			
18	16	S-R-A-200	29/5/18			2	X	X			
19	17	S-R-B-5	29/5/18			2	X	X			
20	18	S-R-B-200	29/5/18			2		X			
21	19	S-R-C-5	29/5/18			2	X	X			
22	20	S-R-C-200	29/5/18			2		X			
23	21	S-R-D-5	29/5/18			2	X	X			
24	22	S-R-D-200	29/5/18			2		X			
25	23	S-R-E-5	29/5/18			2	X	X			
26	24	S-R-E-200	29/5/18			2		X			
27	25	E-10-A-5	29/5/18			2	X	X			

SGS Perth Environmental
PE126215 COC
Received: 07 – Jun – 2018

6/6/18 @ 9:50am

28	26	E-10-A-200	29/5/18			2	X	X																			
29	27	E-10-B-5	29/5/18			2	X	X																			
30	28	E-10-B-200	29/5/18			2		X																			
31	29	E-10-C-5	29/5/18			2	X	X																			
32	30	E-10-C-200	29/5/18			2		X																			
33	31	W-30-A-5	29/5/18			2		X																			
34	32	W-30-A-200	29/5/18			2		X																			
35	33	W-30-B-5	29/5/18			2	X	X																			
36	34	W-30-B-200	29/5/18			2	X	X																			
37	35	W-30-C-5	29/5/18			2	X	X																			
38	36	W-30-C-200	29/5/18			2	X	X																			
39	37	W-30-D-5	29/5/18			2		X																			
40	38	W-30-D-200	29/5/18			2		X																			
41	39	W-30-E-5	29/5/18			2		X																			
42	40	W-30-E-200	29/5/18			2		X																			
43	41	W-30-F-5	29/5/18			2		X																			
44	42	W-30-F-200	29/5/18			2		X																			
45	43	W-D-B-5	29/5/18			2	X	X																			
46	44	W-D-B-200	29/5/18			2	X	X																			
47	45	W-D-A-5	29/5/18			2	X	X																			
48	46	W-D-A-200	29/5/18			2	X	X																			
53	47	N-P-A-5	30/5/18					X																			
54	48	N-P-A-200	30/5/18					X																			
55	49	N-P-B-5	30/5/18				X	X																			
56	50	N-P-B-200	30/5/18				X	X																			
57	51	N-P-C-5	30/5/18					X																			
58	52	N-P-C-200	30/5/18					X																			
59	53	E-P-A-5	30/5/18					X																			
60	54	E-P-A-200	30/5/18					X																			
61	55	E-P-B-5	30/5/18				X	X																			
62	56	E-P-B-200	30/5/18				X	X																			
63	57	E-P-C-5	30/5/18					X																			
64	58	E-P-C-200	30/5/18					X																			
65	59	E-P-D-5	30/5/18					X																			
66	60	E-P-D-200	30/5/18					X																			
67	61	E-P-C-5	30/5/18					X																			
68	62	E-P-C-200	30/5/18					X																			
69	63	W-P-A-5	30/5/18					X																			
70	64	W-P-A-200	30/5/18					X																			
71	65	W-P-B-5	30/5/18				X	X																			

72	66	W-P-B-200	30/5/18				X	X																			
73	67	W-P-C-5	30/5/18				X	X																			
74	68	W-P-C-200	30/5/18				X	X																			
75	69	W-P-D-5	30/5/18					X																			
76	70	W-P-D-200	30/5/18					X																			
77	71	W-P-E-5	30/5/18					X																			
78	72	W-P-E-200	30/5/18					X																			
						96	32	74																		2	

Special Instructions:

SGS

AUSTRALIA-ENVIRONMENTAL-PERTH AIRPORT- PROFORMA -QU101

REGISTRATION DETAILS

APPROVED BY: R. MA

Bottle Map Sample Numbers:	1L Plastic Green	500mL Plastic Green	250mL Plastic Purple	500mL Amber Green	250mL Plastic Green	125mL Plastic Green	125mL UF/F Plastic Red	1L Amber Green	500mL Amber Orange	100mL Amber Green	40mL Glass Vial VOC	40mL Glass Vial HAA	500mL Plastic Blue	250mL Plastic Orange	125mL Plastic Brown	1L Plastic Yellow	250mL Glass Jar	125ml Glass Jar	Bottles Supplied By	Ziplock Bag/ Other
1-74																	1			

Job Number: PE126215

# of Eskies: 2

Esky Numbers:

IB / ICE [✓ None]

Temp: 16.7 °C

Tray Numbers:
Q-004
Q-005
Q-006
Q-007

Registration comments:

Action Taken:

Registered By: AR 7/6/18

Reale, Antonino (Perth)

From: [redacted]
Sent: Thursday, 7 June 2018 11:49 AM
To:
Cc: [redacted]
Subject: RE: 684331 - COC
Attachments: 684331 - Woomera Soil Sampling SGS COC May-June 2018.xlsx

Hello,

Please be advised;

- can confirm that no organics are required.
- For the samples that have hold and analysis ticked, the samples that are to be on hold are for radiological analysis – could you please analyse for metals for all ticked samples.
- continue to book under and invoice CH2M for this analysis.

Kind Regards,

[redacted]
Environment, Health & Safety
Key Account Manager
Phone: +61 (0)8 9373 3650

From: [redacted]
Sent: Wednesday, 6 June 2018 8:25 PM
To: [redacted]
Cc: [redacted]

Appendix E - Laboratory Results for Radiological Analysis

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS / LABORATORY DETAILS

Contact	[redacted]	Manager	Adam Atkinson
Client	CH2M HILL AUSTRALIA PTY LTD	Laboratory	SGS Melbourne EH&S
Address	PO BOX 632 NORTH SYDNEY NSW 2060	Address	10/585 Blackburn Road Notting Hill Victoria 3168
Telephone	61 2 99500200	Telephone	+61395743200
Facsimile	61 2 99500601	Facsimile	+61395743399
Email	[redacted]ch2m.com	Email	Au.SampleReceipt.Melbourne@sgs.com
Project	**115 soil samples (48 for NORM analysis)**	SGS Reference	**ME305752 R0**
Order Number	**1712418WM**	Date Received	14/2/2018
Samples	115	Date Reported	30/4/2018

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(22793).

SIGNATORIES

SShoyookh.

Sara Shoyookhi
Physicist

S. Rutkowski

Stephen Rutkowski
Senior Health Physicist

Radionuclides by Gamma Ray Spectrometry in solids [ARS-SOP-AS303/AS406]   Tested: 17/4/2018

PARAMETER	UOM	LOR	WG-0-A-10 SOIL - 6/2/2018 ME305752.001	WG-0-A-200 SOIL - 6/2/2018 ME305752.002	WG-0-B-10 SOIL - 6/2/2018 ME305752.003	WG-0-C-10 SOIL - 6/2/2018 ME305752.004	WG-0-C-200 SOIL - 6/2/2018 ME305752.005
Radium-226	Bq/kg	-	8.7 ±1.0	7.1 ±1.0	7.7 ±0.8	8.4 ±1.1	9.6 ±1.2
Lead-210	Bq/kg	-	13.0 ±5.6	13.2 ±3.7	10.5 ±2.7	12.4 ±2.5	17.9 ±4.3
Radium-228	Bq/kg	-	10.2 ±1.2	10.4 ±1.7	11.6 ±1.4	11.0 ±1.9	11.7 ±2.1
Thorium-228	Bq/kg	-	10.8 ±1.3	11.0 ±1.4	10.8 ±1.2	11.9 ±1.5	9.5 ±1.3

PARAMETER	UOM	LOR	WG-0-E-10 SOIL - 6/2/2018 ME305752.008	WG-0-E-200 SOIL - 6/2/2018 ME305752.009	WG-1-B-10 SOIL - 6/2/2018 ME305752.014	WG-1-B-200 SOIL - 6/2/2018 ME305752.015	WG-1-D-10 SOIL - 6/2/2018 ME305752.020
Radium-226	Bq/kg	-	7.1 ±1.0	8.1 ±1.0	8.2 ±1.0	7.1 ±0.7	7.6 ±1.0
Lead-210	Bq/kg	-	8.8 ±3.3	9.2 ±7.0	7.5 ±4.4	7.7 ±2.4	19.8 ±4.4
Radium-228	Bq/kg	-	9.7 ±1.7	11.9 ±1.7	11.5 ±1.6	9.9 ±1.2	13.2 ±2.0
Thorium-228	Bq/kg	-	10.7 ±1.4	11.0 ±1.4	12.6 ±1.4	10.2 ±1.2	11.6 ±1.5

PARAMETER	UOM	LOR	WG-1-D-200 SOIL - 6/2/2018 ME305752.021	WG-2-A-10 SOIL - 6/2/2018 ME305752.026	WG-2-A-200 SOIL - 6/2/2018 ME305752.027	WG-2-C-10 SOIL - 6/2/2018 ME305752.032	WG-2-C-200 SOIL - 6/2/2018 ME305752.033
Radium-226	Bq/kg	-	5.9 ±0.9	8.5 ±1.0	7.4 ±1.0	7.8 ±0.9	6.1 ±0.8
Lead-210	Bq/kg	-	15.3 ±3.6	9.5 ±3.0	9.7 ±3.2	<22.0	<18.0
Radium-228	Bq/kg	-	8.6 ±1.6	13.3 ±1.8	12.7 ±1.9	11.9 ±1.6	10.6 ±1.4
Thorium-228	Bq/kg	-	9.1 ±1.2	12.2 ±1.4	11.9 ±1.6	12.7 ±1.6	9.2 ±1.1

PARAMETER	UOM	LOR	WG-2-E-10 SOIL - 6/2/2018 ME305752.038	WG-2-E-200 SOIL - 6/2/2018 ME305752.039	W-0-A-5 SOIL - 7/2/2018 ME305752.047	W-0-A-200 SOIL - 7/2/2018 ME305752.048	W-10-A-200 SOIL - 7/2/2018 ME305752.051
Radium-226	Bq/kg	-	9.3 ±1.2	7.2 ±0.8	8.2 ±0.9	6.6 ±0.7	6.6 ±0.9
Lead-210	Bq/kg	-	7.4 ±3.4	7.9 ±2.6	7.9 ±2.6	4.6 ±2.2	<11.0
Radium-228	Bq/kg	-	11.1 ±2.0	10.4 ±1.2	13.1 ±1.5	9.3 ±1.2	10.9 ±1.7
Thorium-228	Bq/kg	-	12.2 ±1.6	10.4 ±1.1	11.6 ±1.3	9.8 ±1.1	10.5 ±1.4

PARAMETER	UOM	LOR	WG-3-B-10 SOIL - 7/2/2018 ME305752.052	WG-3-B-200 SOIL - 7/2/2018 ME305752.053	WG-3-D-10 SOIL - 7/2/2018 ME305752.058	WG-3-D-200 SOIL - 7/2/2018 ME305752.059	S-0-A-5 SOIL - 7/2/2018 ME305752.061
Radium-226	Bq/kg	-	8.4 ±1.2	6.1 ±0.7	9.8 ±1.3	5.5 ±0.8	15.2 ±1.6
Lead-210	Bq/kg	-	10.4 ±3.9	10.8 ±2.6	12.0 ±3.7	<25.0	11.4 ±3.4
Radium-228	Bq/kg	-	10.5 ±2.0	8.3 ±1.1	9.9 ±1.9	8.6 ±1.4	12.4 ±1.9
Thorium-228	Bq/kg	-	12.7 ±1.7	8.6 ±1.0	11.2 ±1.5	8.4 ±1.1	10.8 ±1.3

PARAMETER	UOM	LOR	S-0-A-200 SOIL - 7/2/2018 ME305752.062	S-10-A-5 SOIL - 7/2/2018 ME305752.063	S-10-A-200 SOIL - 7/2/2018 ME305752.064	S-10-C-5 SOIL - 7/2/2018 ME305752.067	S-10-C-200 SOIL - 7/2/2018 ME305752.068
Radium-226	Bq/kg	-	20.5 ±1.9	17.7 ±2.0	17.5 ±1.7	14.9 ±1.5	21.2 ±1.8
Lead-210	Bq/kg	-	<28.0	32.3 ±5.8	21.9 ±9.2	14.9 ±5.5	20.6 ±4.4
Radium-228	Bq/kg	-	28.9 ±3.0	22.3 ±2.8	25.5 ±2.7	10.8 ±1.5	29.9 ±2.7
Thorium-228	Bq/kg	-	32.1 ±3.2	23.8 ±2.9	25.1 ±2.9	13.1 ±1.4	27.0 ±2.5

Radionuclides by Gamma Ray Spectrometry in solids [ARS-SOP-AS303/AS406] Tested: 17/4/2018 (continued)

PARAMETER	UOM	LOR	E-0-A-5 SOIL - 7/2/2018 ME305752.071	E-0-A-200 SOIL - 7/2/2018 ME305752.072	E-0-C-5 SOIL - 7/2/2018 ME305752.075	E-0-C-200 SOIL - 7/2/2018 ME305752.076	N-0-A-5 SOIL - 7/2/2018 ME305752.077
Radium-226	Bq/kg	-	14.7 ±1.3	22.7 ±2.0	20.5 ±2.0	13.8 ±1.6	12.2 ±1.5
Lead-210	Bq/kg	-	11.3 ±2.9	11.8 ±4.0	32.1 ±10.5	26.6 ±5.3	13.0 ±3.9
Radium-228	Bq/kg	-	10.8 ±1.4	28.7 ±2.8	15.3 ±2.0	13.8 ±2.1	18.6 ±2.5
Thorium-228	Bq/kg	-	9.0 ±1.1	32.0 ±3.4	15.6 ±1.9	13.3 ±1.7	17.7 ±2.1

PARAMETER	UOM	LOR	N-0-A-200 SOIL - 7/2/2018 ME305752.078	N-10-B-5 SOIL - 7/2/2018 ME305752.083	N-10-B-200 SOIL - 7/2/2018 ME305752.084	N-10-D-5 SOIL - 7/2/2018 ME305752.087	W-10-G-5 SOIL - 6/2/2018 ME305752.095
Radium-226	Bq/kg	-	12.9 ±1.5	7.0 ±0.9	9.5 ±1.1	9.2 ±1.1	7.4 ±1.0
Lead-210	Bq/kg	-	12.5 ±3.9	<22.0	12.7 ±5.8	7.7 ±2.9	7.9 ±3.3
Radium-228	Bq/kg	-	20.7 ±2.6	11.4 ±1.6	12.0 ±1.6	16.0 ±2.1	8.1 ±1.7
Thorium-228	Bq/kg	-	19.4 ±2.3	12.2 ±1.5	14.0 ±1.5	13.5 ±1.5	10.2 ±1.3

PARAMETER	UOM	LOR	W-10-G-200 SOIL - 6/2/2018 ME305752.096	W-0-C-5 SOIL - 6/2/2018 ME305752.101	W-0-C-200 SOIL - 6/2/2018 ME305752.102	W-10-E-5 SOIL - 6/2/2018 ME305752.103	W-10-E-200 SOIL - 6/2/2018 ME305752.104
Radium-226	Bq/kg	-	5.7 ±0.9	8.2 ±1.1	8.2 ±1.1	6.8 ±0.7	7.2 ±1.0
Lead-210	Bq/kg	-	10.0 ±3.3	13.3 ±3.8	8.2 ±3.2	7.4 ±2.3	<8.7
Radium-228	Bq/kg	-	9.5 ±1.7	12.5 ±2.0	9.9 ±1.7	9.2 ±1.2	10.5 ±1.7
Thorium-228	Bq/kg	-	7.4 ±1.1	12.0 ±1.6	10.9 ±1.4	9.1 ±1.1	8.7 ±1.2

PARAMETER	UOM	LOR	N-30-B-5 SOIL - 6/2/2018 ME305752.109	N-30-B-200 SOIL - 6/2/2018 ME305752.110	W-10-A-5 SOIL - 7/2/2018 ME305752.115
Radium-226	Bq/kg	-	8.0 ±0.8	6.9 ±1.0	6.6 ±1.0
Lead-210	Bq/kg	-	11.4 ±2.8	15.1 ±3.8	8.2 ±3.1
Radium-228	Bq/kg	-	10.7 ±1.3	9.1 ±1.7	10.0 ±1.8
Thorium-228	Bq/kg	-	11.3 ±1.3	10.4 ±1.4	9.8 ±1.4

METHOD	METHODOLOGY SUMMARY
ARS-SOP-AS303/AS406	Analysis of radionuclides in solid samples by high resolution gamma ray spectrometry after preparation to meet standard calibrated geometries. Preparation involves drying, crushing and sieving, and setting in an epoxy resin where necessary. In some cases, preparation may involve merely transferring the solid directly to a standard geometry container such as a Marinelli beaker.

FOOTNOTES

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

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

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

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

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

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:
a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

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

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.

David Brenna
confirmed the Job number → DE123413 for this job 16/02/18 (J.) ME305752

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted]
FIELD LEAD: EMAIL:
COC emailed ?:
Email Reports to: michael.leviton@ch2m.com, Philippa.Scott@ch2m.com
Email Invoice to (will default to PM if no other addresses are listed): michael.leviton@ch2m.com
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☒ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat
PHONE: [redacted]
PHONE:

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 comments

RELINQUISHED BY: [redacted]	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE: 6/2/18	DATE:	DATE:	DATE:
TIME:	TIME:	TIME:	TIME:

SGS Melbourne EHS
ME305752 COC
Received: 14 – Feb – 2018

		SAMPLE DETAILS					Analysis				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
1	✓	WG-0-A-10 ✓	6/2/18		S		X	X			
2	✓	WG-0-A-200 ✓					2 X	X			
3	✓	WG-0-B-10 ✓					3 X	X			
4	✓	WG-0-C-10 ✓					4 X	X			
5	✓	WG-0-C-200 ✓					5 X	X			
6	✓	WG-0-D-10 ✓								X	6
7	✓	WG-0-D-200 ✓								X	7
8	✓	WG-0-E-10 ✓					8 X	X			
9	✓	WG-0-E-200 ✓					9 X	X			
10	✓	WG-0-E-400 ✓								X	10
11	✓	WG-1-A-10 ✓								X	11
12	✓	WG-1-A-200 ✓								X	12
13	✓	WG-1-A-400 ✓								X	13
14	✓	WG-1-B-10 ✓					14 X	X			
15 ✓	SNR	WG-1-B-200 (SNR)	X				15 X	X			
16	✓	WG-1-B-400 ✓								X	16
17	✓	WG-1-C-10 (SNR) ✓								X	17
18		WG-1-C-200 (SNR) ✓								X	18
19 ✓	✓	WG-1-C-400 (SNR) ✓								X	19
20 ✓	SNR	WG-1-D-10 SNR ✓					20 X	X			
21 ✓	SNR	WG-1-D-200 SNR ✓					21 X	X			
22 ✓	SNR	WG-1-D-400 SNR X								X	22

Special Instructions:

Received 22 samples 14/02/18 (S.)

14/02/18
Received by Sarashayzadeh

3

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to: michael.leviton@ch2m.com, Philippa.Scott@ch2m.com
Email Invoice to (will default to PM if no other addresses are listed): michael.leviton@ch2m.com
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT ✓
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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 comments

RELINQUISHED BY: [redacted]
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

RELINQUISHED BY:
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

		SAMPLE DETAILS					Analysis																				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)																	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
45	✓	W-10-D-5 ✓	7/2		S																					X	45
46	✓	W-10-D-200 ✓																								X	46
47	✓	W-0-A-5 ✓					47 X	X																			
48	✓	W-0-A-200 ✓					48 X	X																			
49	✓	W-10-B-5 ✓						X	49																		
50	✓	W-10-B-200 ✓						X	50																		
51	✓	W-10-A-200 ✓					51 X	X																			
52	✓	WG-3-B-10 ✓					52 X	X																			
53	✓	WG-3-B-200 ✓					53 X	X																			
54	✓	WG-3-B-400 ✓																								X	54
55	✓	WG-3-C-10 ✓																								X	55
56	✓	WG-3-C-200 ✓																								X	56
57	✓	WG-3-C-400 ✓																								X	57
58	✓	WG-3-D-10 ✓					58 X	X																			
59	✓	WG-3-D-200 ✓					59 X	X																			
60	✓	WG-3-D-400 ✓																								X	60
61	✓	S-0-A-5 ✓					61 X	X																			
62	✓	S-0-A-200 ✓					62 X	X																			
63	✓	S-10-A-5 ✓					63 X	X																			
64	✓	S-10-A-200 ✓					64 X	X																			
65	✓	S-10-B-5 w ✓						X	65																		
66	✓	S-10-B-200 ✓						X	66																		
							11	15																		7	

SGS Melbourne EHS
ME305752 COC
Received: 14-Feb-2018

Special Instructions:

Received 22 Samples 14/2/18 (S.)

5

C AIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to: michael.leviton@ch2m.com, Philippa.Scott@ch2m.com
Email Invoice to (will default to PM if no other addresses are listed): michael.leviton@ch2m.com
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT ✓
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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

RELINQUISHED BY: [redacted]
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

RELINQUISHED BY:
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

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 comments:

SAMPLE DETAILS

Analysis

Additional Information

Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium ✓	TPH and PAH (16 analytes) ✓		Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standard or lab provided containers etc.
89	✓	WG-3-E-200 ✓	6/2/18		S						X	89
90	✓	WG-3-E400 ✓									X	90
NOT received		Composite 01 ✓						X	X	91		
		Composite 02 ✓						X	X	92		
		Composite 03 ✓						X	X	93		
		Composite 04 ✓						X	X	94		
91	✓	W-10-H-S ✓						91 X		95		
92	✓	W-10-H-200 ✓						92 X		96		
93	✓	W-0-E-S ✓						93 X		97		
94	✓	W-0-E-200 ✓						94 X		98		
95	✓	W-10-G-S ✓					95 X	X				
96	✓	W-10-G-200 ✓					96 X	X				
97	✓	W-0-D-S ✓						X	97			
98	✓	W-0-D-200 ✓						X	98			
99	✓	W-10-F-S ✓						X	99			
100	✓	W-10-F-200 ✓						X	100			
101	✓	W-0-C-S ✓				101	X	X				
102	✓	W-0-C-200 ✓					102 X	X				
103	* ✓	W-10-E-S [illegible] ✓					103 X	X				
104	✓	W-10-E-200 ✓					104 X	X				
105	✓	W-0-B-S ✓						X	105			
106	✓	W-0-B-200 ✓			6			X	106			
							6	20			2	

SGS Melbourne EHS
ME305752 COC
Received: 14-Feb-2018

Special Instructions:

Received 18 samples 14/02/18 (5.1)

David Brenna

confirmed the Job number → DE123413 for this job 16/02/18 (J.) ME305752

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to: michael.leviton@ch2m.com, Philippa.Scott@ch2m.com
Email Invoice to (will default to PM if no other addresses are listed): michael.leviton@ch2m.com
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☑ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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 comments:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
[redacted]			
DATE: 6/2/18	DATE:	DATE:	DATE:
TIME:	TIME:	TIME:	TIME:

SAMPLE DETAILS / Analysis / Additional Information

Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
1	✓	WG-0-A-10 ✓	6/2/18		S		X	X			
2	✓	WG-0-A-200 ✓					2 X	X			
3	✓	WG-0-B-10 ✓					3 X	X			
4	✓	WG-0-C-10 ✓					4 X	X			
5	✓	WG-0-C-200 ✓					5 X	X			
6	✓	WG-0-D-10 ✓								X	6
7	✓	WG-0-D-200 ✓								X	7
8	✓	WG-0-E-10 ✓					8 X	\			
9	✓	WG-0-E-200 ✓					9 X	\			
10	✓	WG-0-E-400 ✓								X	10
11	✓	WG-1-A-10 ✓								X	11
12	✓	WG-1-A-200 ✓								X	12
13	✓	WG-1-A-400 ✓								X	13
14	✓	WG-1-B-10 ✓					14 X	X			
15 ✓	SNR	WG-1-B-200 (SNR)	X				15 X	X			
16	✓	WG-1-B-400 ✓								X	16
17	✓	WG-1-C-10 (SNR)	✓							X	17
18	✓	WG-1-C-200 (SNR)	✓							X	18
19	✓	WG-1-C-400 (SNR)	✓							X	19
20 ✓	SNR	WG-1-D-10 SNR	✓				20 X	X			
21 ✓	SNR	WG-1-D-200 SNR	✓				21 X	X			
22 ✓	SNR	WG-1-D-400 SNR	X							X	22

SGS Melbourne EHS
ME305752 COC
Received: 14 – Feb – 2018

Special Instructions:

Reeived 22 samples 14/02/18 (S.)

14/02/18
Received by Sarashoyzakh

2

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to: michael.leviton@ch2m.com, Philippa.Scott@ch2m.com
Email Invoice to (will default to PM if no other addresses are listed): michael.leviton@ch2m.com
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT ✓
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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

RELINQUISHED BY: [redacted]	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE:	DATE:	DATE:	DATE:
TIME:	TIME:	TIME:	TIME:

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 comments:

SGS Melbourne EHS
ME305752 COC
Received: 14-Feb-2018

SAMPLE DETAILS							Analysis				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standard or lab provided containers etc.
23	✓	[illegible] * Broken								X	23
24	✓	[illegible] ✓								X	24
25	✓	[illegible] ✓								X	25
26	✓	[illegible] ✓					26 ✓	✓			
27	✓	[illegible] ✓					27 ✓	✓			
28	✓	[illegible] ✓								X	28
29	✓	[illegible] ✓								X	29
30	✓	[illegible] ✓								X	30
31	✓	[illegible] ✓								X	31
32	✓	[illegible] ✓					32 ✓	✓			
33	✓	[illegible] ✓					33 ✓	✓			
34	✓	[illegible] ✓								X	34
35	✓	[illegible] ✓								X	35
36	✓	[illegible] ✓								X	36
37	✓	[illegible] ✓								X	37
38	✓	[illegible] ✓					38 ✓	✓			
39	✓	[illegible] ✓					39 ✓	✓			
40	✓	[illegible] ✓								X	40
41	✓	[illegible] ✓								X	41
42	✓	[illegible] ✓								X	42
43	✓	[illegible] ✓								X	43
44	✓	[illegible] ✓								X	44
							6	6		16	

Special Instructions:

Received 22 samples 14/02/18 ([illegible])

3

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to: michael.leviton@ch2m.com, Philippa.Scott@ch2m.com
Email Invoice to (will default to PM if no other addresses are listed): michael.leviton@ch2m.com
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT ✓
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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 comments:

RELINQUISHED BY: [redacted]
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

RELINQUISHED BY:
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

		SAMPLE DETAILS					Analysis																				Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (15 analytes)																	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
45	✓	W-10-D-5 ✓	7/2		S																					X	45
46	✓	W-10-D-200 ✓																								X	46
47	✓	W-0-A-5 ✓				47	X	X																			
48	✓	W-0-A-200 ✓				48	X	X																			
49	✓	W-10-B-5 ✓						X	49																		
50	✓	W-10-B-200 ✓						X	50																		
51	✓	W-10-A-200 ✓				51	X	X																			
52	✓	WG-3-B-10 ✓				52	X	X																			
53	✓	WG-3-B-200 ✓				53	X	X																			
54	✓	WG-3-B-400 ✓																								X	54
55	✓	WG-3-C-10 ✓																								X	55
56	✓	WG-3-C-200 ✓																								X	56
57	✓	WG-3-C-400 ✓																								X	57
58	✓	WG-3-D-10 ✓				58	X	X																			
59	✓	WG-3-D-200 ✓				59	X	✓																			
60	✓	WG-3-D-400 ✓																								X	60
61	✓	S-0-A-5 ✓				61	X	X																			
62	✓	S-0-A-200 ✓				62	X	X																			
63	✓	S-10-A-5 ✓				63	X	X																			
64	✓	S-10-A-200 ✓				64	X	X																			
65	✓	S-0-B-5 ✓						X	65																		
66	✓	S-10-B-200 ✓						X	66																		
								15																		7	

SGS Melbourne EHS
ME305752 COC
Received: 14-Feb-2018

Special Instructions:

Received 22 samples 14/2/18 (S.)

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to: michael.leviton@ch2m.com, Philippa.Scott@ch2m.com
Email Invoice to (will default to PM if no other addresses are listed): michael.leviton@ch2m.com
Notes

TURNAROUND REQUIREMENTS : ☐ Standard TAT (List due date): Standard TAT ✓
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 171241BWM
FORMAT: Equis and Esdat

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 comments:

RELINQUISHED BY: [redacted]
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

RELINQUISHED BY:
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

		SAMPLE DETAILS					Analysis																			Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)																Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
67	✓	[illegible] ✓				67	X	X																		
68	✓	[illegible] ✓				68	X	X																		
69	✓	[illegible] ✓						X	69																	
70		[illegible]						X	70																	
71	✓	[illegible] ✓				71	X	X																		
72	✓	[illegible] ✓				72	X	X																		
73	✓	[illegible] ✓						X	73																	
74		[illegible] ✓						X	74																	
75	✓	[illegible] ✓				75	X	X																		
76	✓	[illegible] ✓				76	X	X																		
77	✓	[illegible] Broken				77	X	X																		
78	✓	[illegible] ✓				78	X	X																		
79	✓	[illegible] ✓						X	79																	
80	✓	[illegible] ✓						X	80																	
81	✓	[illegible] ✓						X	81																	
82	✓	[illegible] ✓						X	82																	
83	✓	[illegible] ✓				83	X	X																		
84	✓	[illegible] ✓				84	X	X																		
85	✓	[illegible] ✓						X	85																	
86	✓	[illegible] ✓						X	86																	
87	✓	[illegible] ✓				87	X	X																		
88	✓	[illegible] ✓						X	88																	

SGS Melbourne EHS
ME305752 COC
Received: 14-Feb-2018

Special Instructions:

Rec'd 22 samples 14/02/18 (S.)

5

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to: michael.leviton@ch2m.com, Philippa.Scott@ch2m.com
Email Invoice to (will default to PM if no other addresses are listed): michael.leviton@ch2m.com
Notes

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT ✓
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712410WM
FORMAT: Equis and Esdat

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 comments:

RELINQUISHED BY: [redacted]
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

RELINQUISHED BY:
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)		Hold	Additional Information: Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
89	✓	WG-3-E-200 ✓	6/2/18								X	89
90	✓	WG-3-B400 ✓									X	90
NOT received		Composite 01 ✓						X	X	91		
		Composite 02 ✓						X	X	92		
		Composite 03 ✓						X	X	93		
		Composite 04 ✓						X	X	94		
91	✓	W-10-H-5 ✓						91 X		95		
92	✓	W-10-H-200 ✓						92 X		96		
93	✓	W-10-F5 ✓						93 X		97		
94	✓	W-10-F-200 ✓						94 X		98		
95	✓	W-10-G-5 ✓					95 X	X				
96	✓	W-10-G-200 ✓					96 X	X				
97	✓	W-10-D-5 ✓						X	97			
98	✓	W-10-D-200 ✓						X	98			
99	✓	W-10-E-5 ✓						X	99			
100	✓	W-10-E-200 ✓						X	100			
101	✓	W-10-C-5 ✓					101 X	X				
102	✓	W-10-C-200 ✓					102 X	X				
103 *	✓	W-10-F5 BWR ✓					103 X	X				
104	✓	W-10-R-200 ✓					104 X	X				
105	✓	W-0-B-5 ✓						X	105			
106	✓	W-0-R-200 ✓						X	106			
							6	20			2	

Special Instructions:

Recived 18 samples 14/02/18 (5.1)

SGS Melbourne EHS
ME305752 COC
Received: 14-Feb-2018

6 ✓

CHAIN OF CUSTODY

CLIENT: CH2M OFFICE: Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] EMAIL: [redacted] PHONE: [redacted]
FIELD LEAD: EMAIL: PHONE:
COC emailed ?:
Email Reports to: michael.leviton@ch2m.com, Philippa.Scott@ch2m.com
Email Invoice to (will default to PM if no other addresses are listed): michael.leviton@ch2m.com

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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 comments:

RELINQUISHED BY: [redacted]
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

RELINQUISHED BY:
DATE:
TIME:

RECEIVED BY:
DATE:
TIME:

Notes

SGS Melbourne EHS
ME305752 COC
Received: 14-Feb-2018

		SAMPLE DETAILS					Analysis																			Additional Information
Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)																Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc
107	✓	N-30-A-5 ✓						X	107																	
108	✓	N-30-A-200 ✓						X	108																	
109	✓	N-30-B-5 ✓					109 X	X																		
110	✓	N-30-B-200 ✓					110 X	X																		
111	✓	N-30-C-5 ✓						X	111																	
112	✓	N-30-C-200 ✓						X	112																	
113	✓*	N-30-D-5 Broken						X	113																	
114	✓	N-30-D-200 ✓						X	114																	
115	✓	N-40-A-5 ✓	7/2				115 X	X																		
							5	9																		

Special Instructions:
Received 9 samples 14-2-18 11- [illegible]

SGS

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	[redacted]
Client	CH2M HILL AUSTRALIA PTY LTD
Address	Level 7, Help Street Chatswood NSW 2067
Telephone	0406 383 090
Facsimile	61 2 99500601
Email	[redacted]ch2m.com
Project	**684331 (CSIRO Womera)**
Order Number	**1712418WM**
Samples	74

LABORATORY DETAILS

Manager	Adam Atkinson
Laboratory	SGS Melbourne EH&S
Address	10/585 Blackburn Road Notting Hill Victoria 3168
Telephone	+61395743200
Facsimile	+61395743399
Email	Au.SampleReceipt.Melbourne@sgs.com
SGS Reference	**ME306928 R0**
Date Received	5/6/2018
Date Reported	26/7/2018

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(22793).

SIGNATORIES

SShoyookh.

Sara Shoyookhi
Physicist

Radionuclides by Gamma Ray Spectrometry in solids [ARS-SOP-AS303/AS406]   Tested: 11/7/2018

PARAMETER	UOM	LOR	E-30-B-5 SOIL - 29/5/2018 ME306928.003	E-30-C-5 SOIL - 29/5/2018 ME306928.005	E-30-C-200 SOIL - 29/5/2018 ME306928.006	S-30-C-5 SOIL - 29/5/2018 ME306928.011	S-30-C-200 SOIL - 29/5/2018 ME306928.012
Radium-226	Bq/kg	-	17.9 ±1.9	46.5 ±3.9	17.2 ±1.9	16.5 ±1.6	16.2 ±1.8
Lead-210	Bq/kg	-	25.9 ±5.2	167 ±20	54.5 ±8.6	24.8 ±4.7	26.0 ±5.0
Radium-228	Bq/kg	-	20.9 ±2.6	30.8 ±3.5	22.9 ±3.1	21.9 ±2.5	21.5 ±2.8
Thorium-228	Bq/kg	-	17.3 ±2.1	31.6 ±3.1	24.5 ±2.9	20.6 ±2.2	20.8 ±2.5

PARAMETER	UOM	LOR	S-30-E-5 SOIL - 29/5/2018 ME306928.015	S-R-A-5 SOIL - 29/5/2018 ME306928.017	S-R-A-200 SOIL - 29/5/2018 ME306928.018	S-R-B-5 SOIL - 29/5/2018 ME306928.019	S-R-C-5 SOIL - 29/5/2018 ME306928.021
Radium-226	Bq/kg	-	21.4 ±2.0	13.1 ±1.6	10.3 ±1.1	16.2 ±1.6	18.3 ±1.6
Lead-210	Bq/kg	-	37.8 ±9.8	30.8 ±5.7	<20.0	32.5 ±7.5	36.2 ±5.9
Radium-228	Bq/kg	-	27.5 ±2.8	20.0 ±2.6	13.5 ±1.7	21.6 ±2.2	29.5 ±2.7
Thorium-228	Bq/kg	-	26.6 ±3.1	17.4 ±2.2	15.0 ±1.8	22.9 ±2.3	27.0 ±2.6

PARAMETER	UOM	LOR	S-R-D-5 SOIL - 29/5/2018 ME306928.023	S-R-E-5 SOIL - 29/5/2018 ME306928.025	E-10-A-5 SOIL - 29/5/2018 ME306928.027	E-10-A-200 SOIL - 29/5/2018 ME306928.028	E-10-B-5 SOIL - 29/5/2018 ME306928.029
Radium-226	Bq/kg	-	21.4 ±1.8	20.6 ±1.8	18.2 ±1.8	21.7 ±2.4	13.2 ±1.2
Lead-210	Bq/kg	-	29.9 ±5.2	54.8 ±8.1	17.1 ±4.2	22.8 ±5.6	12.2 ±2.9
Radium-228	Bq/kg	-	29.9 ±2.8	28.5 ±2.7	22.0 ±2.6	27.8 ±3.6	13.0 ±1.5
Thorium-228	Bq/kg	-	29.0 ±3.1	29.6 ±3.1	22.4 ±2.3	30.0 ±3.6	11.2 ±1.3

PARAMETER	UOM	LOR	E-10-C-5 SOIL - 29/5/2018 ME306928.031	W-30-B-5 SOIL - 29/5/18 8:46 ME306928.035	W-30-B-200 SOIL - 29/5/2018 ME306928.036	W-30-C-5 SOIL - 29/5/2018 ME306928.037	W-30-C-200 SOIL - 29/5/2018 ME306928.038
Radium-226	Bq/kg	-	13.5 ±1.6	8.0 ±1.0	23.4 ±2.1	7.9 ±1.1	8.0 ±0.8
Lead-210	Bq/kg	-	12.8 ±4.2	8.2 ±2.8	21.9 ±7.3	11.2 ±3.2	8.6 ±2.5
Radium-228	Bq/kg	-	9.0 ±2.0	9.9 ±1.6	34.9 ±3.2	10.9 ±1.8	13.3 ±1.5
Thorium-228	Bq/kg	-	10.2 ±1.4	10.6 ±1.2	35.3 ±3.5	10.7 ±1.4	10.4 ±1.2

PARAMETER	UOM	LOR	W-D-B-5 SOIL - 29/5/2018 ME306928.045	W-D-B-200 SOIL - 29/5/2018 ME306928.046	W-D-A-5 SOIL - 29/5/2018 ME306928.047	W-D-A-200 SOIL - 29/5/2018 ME306928.048	N-P-B-5 SOIL - 30/5/2018 ME306928.051
Radium-226	Bq/kg	-	14.0 ±1.2	8.1 ±0.8	11.3 ±1.2	11.1 ±1.0	18.9 ±2.0
Lead-210	Bq/kg	-	29.9 ±4.8	14.2 ±3.0	20.7 ±8.3	10.1 ±2.7	44.5 ±7.4
Radium-228	Bq/kg	-	23.2 ±2.2	11.6 ±1.4	15.7 ±1.9	17.0 ±1.8	27.9 ±3.3
Thorium-228	Bq/kg	-	22.9 ±2.2	11.1 ±1.3	16.7 ±2.0	15.4 ±1.7	28.0 ±3.3

PARAMETER	UOM	LOR	N-P-B-200 SOIL - 30/5/2018 ME306928.052	E-P-B-5 SOIL - 30/5/2018 ME306928.057	E-P-B-200 SOIL - 30/5/2018 ME306928.058	W-P-B-5 SOIL - 30/5/2018 ME306928.067	W-P-B-200 SOIL - 30/5/2018 ME306928.068
Radium-226	Bq/kg	-	22.0 ±2.4	19.5 ±2.1	19.0 ±2.1	15.8 ±1.6	17.0 ±1.8
Lead-210	Bq/kg	-	40.2 ±7.0	19.2 ±5.3	17.8 ±4.9	49.1 ±7.3	31.1 ±6.0
Radium-228	Bq/kg	-	35.1 ±4.0	27.6 ±3.4	29.6 ±3.5	20.2 ±2.5	22.4 ±2.9
Thorium-228	Bq/kg	-	36.1 ±4.3	26.7 ±3.2	28.7 ±3.4	21.7 ±2.3	25.9 ±3.0

Radionuclides by Gamma Ray Spectrometry in solids [ARS-SOP-AS303/AS406] Tested: 11/7/2018 (continued)

PARAMETER	UOM	LOR	W-P-C-5 SOIL - 30/5/2018 ME306928.069	W-P-C-200 SOIL - 30/5/2018 ME306928.070
Radium-226	Bq/kg	-	**19.8 ±1.9**	**19.0 ±1.9**
Lead-210	Bq/kg	-	**31.0 ±5.7**	**24.3 ±5.1**
Radium-228	Bq/kg	-	**34.2 ±3.6**	**32.3 ±3.4**
Thorium-228	Bq/kg	-	**33.1 ±3.3**	**31.8 ±3.2**

METHOD	METHODOLOGY SUMMARY
ARS-SOP-AS303/AS406	Analysis of radionuclides in solid samples by high resolution gamma ray spectrometry after preparation to meet standard calibrated geometries. Preparation involves drying, crushing and sieving, and setting in an epoxy resin where necessary. In some cases, preparation may involve merely transferring the solid directly to a standard geometry container such as a Marinelli beaker.

FOOTNOTES

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

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

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

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

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

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

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

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

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.

CHAIN OF CUSTODY

CLIENT: CH2M **OFFICE:** Sydney
CLIENT ADDRESS: Level 7, 9 Help St Chatswood NSW 2067
PROJECT: CSIRO Woomera
PROJECT NUMBER: 684331
PROJECT MANAGER: [redacted] **EMAIL:** [redacted] **PHONE:** [redacted]
FIELD LEAD: **EMAIL:** **PHONE:**
COC emailed ?: YES
Email Reports to: michael.leviton@ch2m.com, Philippa.Scott@ch2m.com; campbell.young@ch2m.com; thomas.frank@ch2m.com
Email Invoice to (will default to PM if no other addresses are listed): michael.leviton@ch2m.com
Notes

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)
☐ Standard TAT (List due date): Standard TAT
☐ Non Standard or urgent TAT (List due date):
PO / QUOTE NO.: 1712418WM
FORMAT: Equis and Esdat

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 Yes No N/A
Random Sample Temperature on Receipt °C
Other comments

RELINQUISHED BY: [redacted]	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE: 01/06/18	DATE:	DATE:	DATE:
TIME:	TIME:	TIME:	TIME:

SAMPLE DETAILS / Analysis / Additional Information

Field ID	Notes	SAMPLE ID	Date	Time	MATRIX: SOLID	TOTAL CONTAINERS	Gamma Spec (Lead210 + Radium)	8 Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) + Uranium and Thorium	TPH and PAH (16 analytes)	Hold	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis, non-standarad or lab provided containers etc.
1		E-30-A-5	29/5/18			2		X			NOTE - ALL SAMPLE BAGS FOR RADIONUCLIDES HAVE BEEN FORWARDED TO MELBOURNE - SOIL JARS TO PERTH
2		E-30-A-200	29/5/18			2		X			
3		E-30-B-5	29/5/18			2	X	X			
4		E-30-B-200	29/5/18			2		X		X	
5		E-30-C-5	29/5/18			2	X	X			
6		E-30-C-200	29/5/18			2	X	X			
7		S-30-A-5	29/5/18			2		X			
8		S-30-A-200	29/5/18			2		X		X	
9		S-30-B-5	29/5/18			2		X			
10		S-30-B-200	29/5/18			2		X			
11		S-30-C-5	29/5/18			2	X	X			
12		S-30-C-200	29/5/18			2	X	X			
13		S-30-D-5	29/5/18			2		X			
14		S-30-D-200	29/5/18			2		X			
15		S-30-E-5	29/5/18			2	X	X			
16		S-30-E-200	29/5/18			2		X			
17		S-R-A-5	29/5/18			2	X	X			
18		S-R-A-200	29/5/18			2	X	X			
19		S-R-B-5	29/5/18			2	X	X			
20		S-R-B-200	29/5/18			2		X			
21		S-R-C-5	29/5/18			2	X	X			
22		S-R-C-200	29/5/18			2		X			
23		S-R-D-5	29/5/18			2	X	X			
24		S-R-D-200	29/5/18			2		X			
25		S-R-E-5	29/5/18			2	X	X			
26		S-R-E-200	29/5/18			2		X			
27		E-10-A-5	29/5/18			2	X	X			
28		E-10-A-200	29/5/18			2	X	X			
29		E-10-B-5	29/5/18			2	X	X			
30		E-10-B-200	29/5/18			2		X			
31		E-10-C-5	29/5/18			2	X	X			
32		E-10-C-200	29/5/18			2		X			
33		W-30-A-5	29/5/18			2		X			
34		W-30-A-200	29/5/18			2		X			
35		W-30-B-5	29/5/18			2	X	X			
36		W-30-B-200	29/5/18			2	X	X			
37		W-30-C-5	29/5/18			2	X	X			
38		W-30-C-200	29/5/18			2	X	X			
39		W-30-D-5	29/5/18			2		X			
40		W-30-D-200	29/5/18			2		X			
41		W-30-E-5	29/5/18			2		X			
42		W-30-E-200	29/5/18			2		X			
43		W-30-F-5	29/5/18			2		X			
44		W-30-F-200	29/5/18			2		X			
45		W-D-B-5	29/5/18			2	X	X			
46		W-D-B-200	29/5/18			2	X	X			
47		W-D-A-5	29/5/18			2	X	X			
48		W-D-A-200	29/5/18			2	X	X			
53		N-P-A-5	30/5/18					X			
54		N-P-A-200	30/5/18					X			
55		N-P-B-5	30/5/18				X	X			
56		N-P-B-200	30/5/18				X	X			
57		N-P-C-5	30/5/18					X			
58		N-P-C-200	30/5/18					X			
59		E-P-A-5	30/5/18					X			
60		E-P-A-200	30/5/18					X			
61		E-P-B-5	30/5/18				X	X			
62		E-P-B-200	30/5/18				X	X			
63		E-P-C-5	30/5/18					X			
64		E-P-C-200	30/5/18					X			
65		E-P-D-5	30/5/18					X			
66		E-P-D-200	30/5/18					X			
67		E-P-C-5	30/5/18					X			
68		E-P-C-200	30/5/18					X			
69		W-P-A-5	30/5/18					X			
70		W-P-A-200	30/5/18					X			
71		W-P-B-5	30/5/18				X	X			
72		W-P-B-200	30/5/18				X	X			
73		W-P-C-5	30/5/18				X	X			
74		W-P-C-200	30/5/18				X	X			
75		W-P-D-5	30/5/18					X			
76		W-P-D-200	30/5/18					X			
77		W-P-E-5	30/5/18					X			
78		W-P-E-200	30/5/18					X			
						96	32	74		2	

SGS Melbourne EHS
ME306928 COC
Received: 05-Jun-2018

Special Instructions:

Rec AMckord-Robertson 5/6/18

Australian Government

ansto
Nuclear-based science benefiting all Australians

NSTLI-Nuclear Stewardship Platform

Ph: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/0041-1

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	W_O_E_5_DUP
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	16/03/2018 10:18:31 AM
Methodology:	ANSTO method VP-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	8.5	16
^{234m}Pa	< 47	
^{230}Th	< 32	
^{214}Pb (^{226}Ra)	8.3	10
^{214}Bi (^{226}Ra)	9.6	10
^{210}Pb	17	15
^{228}Ac (^{228}Ra)	14	12
^{224}Ra	16	13
^{212}Pb (^{228}Th)	14	10
^{212}Bi	< 29	
^{208}Tl	4.7	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 4.7	
^{231}Pa	< 12	
^{227}Th	< 2.2	
^{223}Ra	< 4.5	
^{219}Rn	< 3.7	
^{40}K	120	11
^{241}Am	< 0.44	
^{137}Cs	< 0.42	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 7.8 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 29/03/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 06/04/2018

NSTLI- Nuclear Stewardship Platform

Ph: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/0041-2 Page 1 of 2

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	W_O_A_5_DUP
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	19/03/2018 11:28:55 AM
Methodology:	ANSTO method VP-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	12	19
^{234m}Pa	< 68	
^{230}Th	< 36	
^{214}Pb (^{226}Ra)	7.5	11
^{214}Bi (^{226}Ra)	7.8	13
^{210}Pb	12	20
^{228}Ac (^{228}Ra)	15	13
^{224}Ra	15	17
^{212}Pb (^{228}Th)	13	10
^{212}Bi	< 9.8	
^{208}Tl	4.5	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 5.3	
^{231}Pa	< 12	
^{227}Th	< 2.5	
^{223}Ra	< 2.6	
^{219}Rn	< 5.4	
^{40}K	97	10
^{241}Am	< 0.40	
^{137}Cs	< 0.53	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 8.3 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 3/04/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 6/04/2018

Australian Government

ansto
Nuclear-based science benefiting all Australians

NSTLI- Nuclear Stewardship Platform

Ph: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/0041-3

CERTIFICATE OF ANALYSIS

Client: David Boardman / [redacted]

Company / Organisation: ANSTO / CSIRO

Sample Identification: S_10_C_5_DUP

Analysis required: Gamma-ray spectrometry

Analyst: Lida Mokhber Shahin

Sample collected at: NA

Sample measurement started at: 16/03/2018 11:08:49 AM

Methodology: ANSTO method VP-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	11	19
^{234m}Pa	< 70	
^{230}Th	< 43	
^{214}Pb (^{226}Ra)	13	10
^{214}Bi (^{226}Ra)	13	10
^{210}Pb	21	12
^{228}Ac (^{228}Ra)	15	12
^{224}Ra	15	20
^{212}Pb (^{228}Th)	15	10
^{212}Bi	18	16
^{208}Tl	5.0	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 4.8	
^{231}Pa	< 12	
^{227}Th	< 2.2	
^{223}Ra	< 4.3	
^{219}Rn	< 6.1	
^{40}K	140	10
^{241}Am	< 0.23	
^{137}Cs	< 0.63	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 11.4 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 3/04/2018

Rvan d

Results Checked By: Riley Van De Voorde **Date:** 6/04/2018

Australian Government

Nuclear-based science benefiting all Australians

NSTLI- Nuclear Stewardship Platform

Ph: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/0041-4

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	E_O_C_5_DUP
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	19/03/2018 11:32:30 AM
Methodology:	ANSTO method VP-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	14	18
^{234m}Pa	< 29	
^{230}Th	< 40	
^{214}Pb (^{226}Ra)	12	10
^{214}Bi (^{226}Ra)	14	10
^{210}Pb	42	10
^{228}Ac (^{228}Ra)	18	15
^{224}Ra	14	25
^{212}Pb (^{228}Th)	16	10
^{212}Bi	35	18
^{208}Tl	5.8	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 5.3	
^{231}Pa	< 16	
^{227}Th	< 3.2	
^{223}Ra	< 3.1	
^{219}Rn	< 6.6	
^{40}K	170	10
^{241}Am	< 0.49	
^{137}Cs	< 0.74	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 8.1 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 3/04/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 6/04/2018

Australian Government

ansto
Nuclear-based science benefiting all Australians

NSTLI- Nuclear Stewardship Platform

Ph: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/0041-5 Page 1 of 2

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	N_O_A_5_DUP
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	16/03/2018 11:13:12 AM
Methodology:	ANSTO method VP-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	15	14
^{234m}Pa	< 64	
^{230}Th	< 41	
^{214}Pb (^{226}Ra)	12	10
^{214}Bi (^{226}Ra)	11	10
^{210}Pb	20	10
^{228}Ac (^{228}Ra)	16	10
^{224}Ra	19	10
^{212}Pb (^{228}Th)	18	10
^{212}Bi	23	17
^{208}Tl	6.4	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 4.4	
^{231}Pa	< 14	
^{227}Th	< 2.3	
^{223}Ra	< 2.4	
^{219}Rn	< 5.6	
^{40}K	170	10
^{241}Am	< 0.28	
^{137}Cs	< 0.47	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 3.7 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 3/04/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 6/04/2018

Australian Government

Nuclear-based science benefiting all Australians

NSTLI- Nuclear Stewardship Platform

Ph: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/0041-6

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	N_10_B_5_DUP
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	19/03/2018 11:41:48 AM
Methodology:	ANSTO method VP-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	11	20
^{234m}Pa	< 74	
^{230}Th	< 29	
^{214}Pb (^{226}Ra)	8.2	10
^{214}Bi (^{226}Ra)	8.5	10
^{210}Pb	10	20
^{228}Ac (^{228}Ra)	15	11
^{224}Ra	17	15
^{212}Pb (^{228}Th)	13	10
^{212}Bi	20	20
^{208}Tl	4.9	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 3.1	
^{231}Pa	< 16	
^{227}Th	< 2.0	
^{223}Ra	< 2.6	
^{219}Rn	< 5.0	
^{40}K	92	10
^{241}Am	< 0.32	
^{137}Cs	< 0.57	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 8.0 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 3/04/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 6/04/2018

NSTLI- Nuclear Stewardship Platform

Ph: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/0041-7

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	N_30_B_5_DUP
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	21/03/2018 2:24:29 PM
Methodology:	ANSTO method VP-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	< 5.7	
^{234m}Pa	< 74	
^{230}Th	< 29	
^{214}Pb (^{226}Ra)	7.4	10
^{214}Bi (^{226}Ra)	7.5	11
^{210}Pb	10	17
^{228}Ac (^{228}Ra)	12	13
^{224}Ra	< 9.0	
^{212}Pb (^{228}Th)	12	10
^{212}Bi	15	17
^{208}Tl	4.4	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 4.6	
^{231}Pa	< 16	
^{227}Th	< 2.5	
^{223}Ra	< 2.9	
^{219}Rn	< 5.3	
^{40}K	80	10
^{241}Am	< 0.53	
^{137}Cs	< 0.64	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 5.5 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 3/04/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 6/04/2018

Australian Government

ansto
Nuclear-based science benefiting all Australians

NSTLI- Nuclear Stewardship Platform

Ph: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/0041-8 Page 1 of 2

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	W_O_C_5_DUP
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	21/03/2018 1:24:57 PM
Methodology:	ANSTO method VP-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	< 6.3	
^{234m}Pa	< 89	
^{230}Th	< 47	
^{214}Pb (^{226}Ra)	8.1	11
^{214}Bi (^{226}Ra)	8.2	11
^{210}Pb	15	16
^{228}Ac (^{228}Ra)	18	14
^{224}Ra	< 11	
^{212}Pb (^{228}Th)	13	10
^{212}Bi	< 11	
^{208}Tl	4.0	12

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 4.9	
^{231}Pa	< 18	
^{227}Th	< 3.0	
^{223}Ra	< 3.3	
^{219}Rn	< 6.1	
^{40}K	110	10
^{241}Am	< 0.61	
^{137}Cs	< 0.67	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 6.7 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 3/04/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 6/04/2018

Australian Government

Nuclear-based science benefiting all Australians

NSTLI- Nuclear Stewardship Platform

Ph: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/0041-9

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	WG_O_B_10_DUP
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	19/03/2018 2:33:54 PM
Methodology:	ANSTO method VP-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	< 5.8	
^{234m}Pa	< 59	
^{230}Th	< 41	
^{214}Pb (^{226}Ra)	8.7	10
^{214}Bi (^{226}Ra)	9.2	11
^{210}Pb	31	10
^{228}Ac (^{228}Ra)	12	10
^{224}Ra	13	20
^{212}Pb (^{228}Th)	13	10
^{212}Bi	20	17
^{208}Tl	4.0	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 5.1	
^{231}Pa	< 12	
^{227}Th	< 2.9	
^{223}Ra	< 2.4	
^{219}Rn	< 4.2	
^{40}K	130	10
^{241}Am	< 0.69	
^{137}Cs	< 0.46	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 4.5 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 3/04/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 6/04/2018

Certificate Number: 2018/00182-4 Page 1 of 2

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	DUP04
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	27/07/2018 1:00:23 PM
Methodology:	ANSTO method P-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	14	16
^{234m}Pa	< 44	
^{230}Th	< 31	
^{214}Pb (^{226}Ra)	14	10
^{214}Bi (^{226}Ra)	14	10
^{210}Pb	31	10
^{228}Ac (^{228}Ra)	20	10
^{224}Ra	21	13
^{212}Pb (^{228}Th)	22	10
^{212}Bi	38	10
^{208}Tl	7.4	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 4.8	
^{231}Pa	< 12	
^{227}Th	< 2.2	
^{223}Ra	< 2.4	
^{219}Rn	< 3.7	
^{40}K	160	10
^{241}Am	< 0.57	
^{137}Cs	< 1.1	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 3.2 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 14/08/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 17/08/2018

Australian Government
ANSTO
Science. Ingenuity. Sustainability.

ANSTO-Nuclear Science and Technology and Landmark Infrastructure
Nuclear Stewardship Platform

Tel: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/00182-5 Page 1 of 2

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	DUP05
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	27/07/2018 1:00:10 PM
Methodology:	ANSTO method P-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	16	19
^{234m}Pa	< 76	
^{230}Th	< 39	
^{214}Pb (^{226}Ra)	17	10
^{214}Bi (^{226}Ra)	18	10
^{210}Pb	33	10
^{228}Ac (^{228}Ra)	33	10
^{224}Ra	32	13
^{212}Pb (^{228}Th)	32	10
^{212}Bi	49	10
^{208}Tl	11	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 6.1	
^{231}Pa	< 16	
^{227}Th	< 3.0	
^{223}Ra	11	16
^{219}Rn	< 7.5	
^{40}K	370	10
^{241}Am	< 0.49	
^{137}Cs	< 0.62	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 5.0 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 14/08/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 17/08/2018

Australian Government

ANSTO
Science. Ingenuity. Sustainability.

ANSTO-Nuclear Science and Technology and Landmark Infrastructure
Nuclear Stewardship Platform

Tel: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/00182-7

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	DUP07
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	27/07/2018 12:59:50 PM
Methodology:	ANSTO method P-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	17	19
^{234m}Pa	< 98	
^{230}Th	< 55	
^{214}Pb (^{226}Ra)	19	10
^{214}Bi (^{226}Ra)	20	10
^{210}Pb	25	11
^{228}Ac (^{228}Ra)	35	10
^{224}Ra	30	14
^{212}Pb (^{228}Th)	32	10
^{212}Bi	50	15
^{208}Tl	11	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 5.7	
^{231}Pa	< 17	
^{227}Th	< 2.8	
^{223}Ra	< 3.8	
^{219}Rn	< 8.3	
^{40}K	340	10
^{241}Am	< 0.56	
^{137}Cs	< 0.59	

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 6.6 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 14/08/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 17/08/2018

ANSTO-Nuclear Science and Technology and Landmark Infrastructure

Nuclear Stewardship Platform

Tel: (02) 9717 3419

Email: lms@ansto.gov.au

Certificate Number: 2018/00182-8

CERTIFICATE OF ANALYSIS

Client:	David Boardman / [redacted]
Company / Organisation:	ANSTO / CSIRO
Sample Identification:	DUP08
Analysis required:	Gamma-ray spectrometry
Analyst:	Lida Mokhber Shahin
Sample collected at:	NA
Sample measurement started at:	27/07/2018 12:59:34 PM
Methodology:	ANSTO method P-2747

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{234}Th	21	14
^{234m}Pa	< 97	
^{230}Th	< 61	
^{214}Pb (^{226}Ra)	18	10
^{214}Bi (^{226}Ra)	20	10
^{210}Pb	42	11
^{228}Ac (^{228}Ra)	34	10
^{224}Ra	40	10
^{212}Pb (^{228}Th)	38	10
^{212}Bi	50	10
^{208}Tl	13	10

Radionuclide	Time of count Activity (Bq.kg^{-1})	%Uncertainty (1σ)
^{235}U	< 6.6	
^{231}Pa	< 23	
^{227}Th	< 3.6	
^{223}Ra	< 3.8	
^{219}Rn	< 7.4	
^{40}K	400	10
^{241}Am	< 0.42	
^{137}Cs	1.4	22

Note: ^{214}Pb/^{214}Bi, ^{228}Ac, ^{212}Pb are indicative of ^{226}Ra, ^{228}Ra and ^{228}Th activities. Secular equilibrium between respective parent/daughter couples has been assumed. Reported activities are in dried and ground sample. Moisture content in the received sample is 5.8 %.

Results Calculated By: Lida Mokhber Shahin **Date:** 14/08/2018

Rvand

Results Checked By: Riley Van De Voorde **Date:** 17/08/2018

Appendix F –Comparison of Composite Samples vs. Chemical Screening Criteria

Appendix F

Composite Soil Sample Comparison - Chemistry

Composite Samples - Comparison of Heavy Metals and PAH against Screening Criteria

					Field ID	Composite 01	Composite 02	Composite 03	Composite 04
					Date	6/02/2018	6/02/2018	6/02/2018	6/02/2018
	Unit	LOR	NEPM 2013 Table 1A(1) HIL A Soil	NEPM 2013 Table 1A(1) HIL B Soil	NEPM 2013 Table 1A(1) HIL D Soil				
Classification			Low Density Residential	High Density Residential	Commercial Industrial				
NA									
% Moisture	%w/w	1				4.3	6.1	6.2	6.1
Metals									
Arsenic	mg/kg	1	**100**	**500**	**3,000**	2	1	2	2
Cadmium	mg/kg	0.3	**20**	**150**	**900**	0.8	0.3	<0.3	<0.3
Chromium (III+VI)	mg/kg	0.5				8.6	9.9	10	10
Copper	mg/kg	0.5	**6,000**	**30,000**	**240,000**	7.2	4.1	4.4	4.3
Lead	mg/kg	1	**300**	**1,200**	**1,500**	13	4	6	3
Mercury	mg/kg	0.05	**40**	**120**	**730**	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg	0.5	**400**	**1,200**	**6,000**	5.0	3.8	4.4	4.0
Uranium	mg/kg	0.1				0.1	<0.1	0.1	0.1
Zinc	mg/kg	2	**7,400**	**60,000**	**400,000**	240	16	34	11
Inorganics									
Thorium	mg/kg	0.5				1.5	1.9	1.8	2.0
PAHs									
Benzo(a)pyrene Total Potency Equivalent	TEQ (mg/kg					<0.2	<0.2	<0.2	<0.2
1-Methylnaphthalene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Benz(a)anthracene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Benzo(a) pyrene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Carcinogenic PAHs (as B(a)P TPE)	TEQ (mg/kg					<0.2	<0.2	<0.2	<0.2
Benzo(b)fluoranthene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Dibenz(a,h)anthracene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Carcinogenic PAHs (as B(a)P TPE, PEFx3)	TEQ (mg/kg		**3**	**4**	**40**	<0.3	<0.3	<0.3	<0.3
Fluoranthene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	0.1				<0.1	<0.1	<0.1	<0.1

Laboratory Analytical Results above the Screening Criteria
are in Bold Font and High-lighted.

Appendix F

Composite Soil Sample Comparison - Chemistry

Composite Samples - FOR INFORMATION ONLY - Comparison of Volatiles against Screening Criteria

					Field ID	Composite 01	Composite 02	Composite 03	Composite 04
					Date	6/02/2018	6/02/2018	6/02/2018	6/02/2018
	Unit	EQL	NEPM 2013 Table 1A(1) HIL A Soil	NEPM 2013 Table 1A(1) HIL B Soil	NEPM 2013 Table 1A(1) HIL D Soil				
Classification			Low Density Residential	High Density Residential	Commercial Industrial				
TRH - NEPM 2013 Fractions									
TRH >C10 - C16	**mg/kg**	25				96	94	57	39
TRH >C16 - C34	**mg/kg**	90				1,400	670	670	360
TRH >C34 - C40	**mg/kg**	120				2,700	1,200	1,400	530
TRH >C6 - C10 less BTEX (F1)	**mg/kg**	25				<25	<25	<25	<25
TPH - NEPM 1999 Fractions									
TPH C6 - C9	**mg/kg**	20				<20	<20	<20	<20
TPH C10 - C14	**mg/kg**	20				48	52	29	21
TPH C15 - C28	**mg/kg**	45				520	320	260	170
TPH C29-C36	**mg/kg**	45				1,900	810	920	400
			HSL A & HSL B For Information Only Low - High Density Residential for vapour Intrusion - Sand 0 m to <1 m		HSL D Commercial Industrial				
BTEXN									
Benzene	**mg/kg**		**0.5**		**3**	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	**mg/kg**	0.1	**55**		**Non limiting**	<0.1	<0.1	<0.1	<0.1
Toluene	**mg/kg**	0.1	**160**		**Non limiting**	<0.1	<0.1	<0.1	<0.1
Xylene (m & p)	**mg/kg**	0.2	**40**		**230**	<0.2	<0.2	<0.2	<0.2
Xylene (o)	**mg/kg**	0.1				<0.1	<0.1	<0.1	<0.1
TRH >C6 - C10 less BTEX (F1)	**mg/kg**	25	**45**		**260**	<25	<25	<25	<25
Naphthalene	**mg/kg**	0.1	**3**		**Non limiting**	<0.1	<0.1	<0.1	<0.1
>C10-C16 less naphthalene	**mg/kg**		**110**		**Non limiting**	48	52	29	21

Laboratory Analytical Results above the Screening Criteria
are in Bold Font and High-lighted.

Appendix G - Comparison of Gridded Samples vs. Chemical Screening Criteria

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	**Composite 01**	**Composite 02**	**Composite 03**	**Composite 04**	**E-0-A-5**	**E-0-A-200**	**E-0-B-5**	**E-0-B-200**	**E-0-C-5**	**E-0-C-200**
					Date	**6/02/2018**	**6/02/2018**	**6/02/2018**	**6/02/2018**	**8/02/2018**	**8/02/2018**	**8/02/2018**	**8/02/2018**	**8/02/2018**	**8/02/2018**
	Unit	LOR	**NEPM 2013 Table 1A(1) HIL A Soil**	**NEPM 2013 Table 1A(1) HIL B Soil**	**NEPM 2013 Table 1A(1) HIL D Soil**										
Classification			**Low Density Residential**	**High Density Residential**	**Commercial Industrial**										
			Residential A	**Residential B**	**Commercial Industrial D**										
% Moisture	**%w/w**	1				4.3	6.1	6.2	6.1	22.5	22.3	16.6	7	9.6	6.7
Metals															
Arsenic	**mg/kg**	1	**100**	**500**	**3,000**	2	1	2	2	7	7	2	2	4	4
Cadmium	**mg/kg**	0.3	**20**	**150**	**900**	0.8	0.3	<0.3	<0.3	0.6	0.5	<0.3	<0.3	1.5	1.5
Chromium (III+VI)	**mg/kg**	0.5				8.6	9.9	10	10	27	27	11	10	30	28
Copper	**mg/kg**	0.5	**6,000**	**30,000**	**240,000**	7.2	4.1	4.4	4.3	19	19	8.7	6	17	38
Lead	**mg/kg**	1	**300**	**1,200**	**1,500**	13	4	6	3	11	12	4	4	170	**1,200**
Mercury	**mg/kg**	0.05	**40**	**120**	**730**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05
Nickel	**mg/kg**	0.5	**400**	**1,200**	**6,000**	5	3.8	4.4	4	16	16	6.3	4.4	8.2	7.6
Thorium	**mg/kg**	0.5				1.5	1.9	1.8	2	7	6.8	2.2	1.8	2.8	2.2
Uranium	**mg/kg**	0.1				0.1	<0.1	0.1	0.1	0.6	0.6	0.2	0.2	0.4	0.4
Zinc	**mg/kg**	2	**7,400**	**60,000**	**400,000**	240	16	34	11	57	55	22	45	510	670

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	**E-10-A-5**	**E-10-A-200**	**E-10-B-5**	**E-10-B-200**	**E-10-C-5**	**E-10-C-200**	**E-30-A-5**	**E-30-A-200**	**E-30-B-5**	**E-30-B-200**
					Date	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**
	Unit	LOR	**NEPM 2013 Table 1A(1) HIL A Soil**	**NEPM 2013 Table 1A(1) HIL B Soil**	**NEPM 2013 Table 1A(1) HIL D Soil**										
Classification			**Low Density Residential**	**High Density Residential**	**Commercial Industrial**										
			Residential A	**Residential B**	**Commercial Industrial D**										
% Moisture	**%w/w**	1				12.7	20.8	13.4	21.1	12.9	24.2	9.3	12.5	7.4	10.4
Metals															
Arsenic	**mg/kg**	1	**100**	**500**	**3,000**	4	5	4	7	3	<1	6	6	5	6
Cadmium	**mg/kg**	0.3	**20**	**150**	**900**	0.8	1.1	0.5	1.3	0.5	<0.3	<0.3	0.3	<0.3	<0.3
Chromium (III+VI)	**mg/kg**	0.5				5.4	15	3.1	17	2.1	1.6	20	21	16	16
Copper	**mg/kg**	0.5	**6,000**	**30,000**	**240,000**	11	14	9.8	15	10	1.4	14	14	20	12
Lead	**mg/kg**	1	**300**	**1,200**	**1,500**	5	6	3	7	4	<1	12	11	25	10
Mercury	**mg/kg**	0.05	**40**	**120**	**730**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**400**	**1,200**	**6,000**	7.6	11	7.4	12	6.8	1.1	15	13	10	9.6
Thorium	**mg/kg**	0.5				2.2	5.7	1.5	5.6	1	0.5	5.1	5.1	3.4	3.7
Uranium	**mg/kg**	0.1				0.4	0.5	0.4	0.7	0.4	<0.1	0.5	0.8	0.4	0.7
Zinc	**mg/kg**	2	**7,400**	**60,000**	**400,000**	26	34	11	35	13	3	42	44	54	34

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	E-30-C-5	E-30-C-200	E-P-A-5	E-P-A-200	E-P-B-5	E-P-B-200	E-P-C-5	E-P-C-200	E-P-D-5	E-P-D-200
					Date	29/05/2018	29/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018
	Unit	LOR	NEPM 2013 Table 1A(1) HIL A Soil	NEPM 2013 Table 1A(1) HIL B Soil	NEPM 2013 Table 1A(1) HIL D Soil										
Classification			Low Density Residential	High Density Residential	Commercial Industrial										
			Residential A	Residential B	Commercial Industrial D										
% Moisture	%w/w	1				25.8	24.3	7.7	9.5	7	12.8	7.5	10.7	3.9	3.4
Metals															
Arsenic	**mg/kg**	1	**100**	**500**	**3,000**	4	5	7	9	7	7	5	7	4	4
Cadmium	**mg/kg**	0.3	**20**	**150**	**900**	0.3	0.6	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	0.6
Chromium (III+VI)	**mg/kg**	0.5				20	27	28	29	28	29	23	27	19	15
Copper	**mg/kg**	0.5	**6,000**	**30,000**	**240,000**	18	23	20	22	21	25	22	19	16	12
Lead	**mg/kg**	1	**300**	**1,200**	**1,500**	57	99	10	12	8	8	23	11	23	17
Mercury	**mg/kg**	0.05	**40**	**120**	**730**	0.11	0.13	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**400**	**1,200**	**6,000**	11	13	15	16	15	16	13	15	11	8.7
Thorium	**mg/kg**	0.5				3.7	4.1	6.1	5.9	5.6	5.7	5.3	6	3.9	2.9
Uranium	**mg/kg**	0.1				0.4	0.4	0.4	0.4	0.5	0.3	0.4	0.4	0.3	0.3
Zinc	**mg/kg**	2	**7,400**	**60,000**	**400,000**	1800	1800	48	46	48	45	61	48	59	42

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	E-P-E-5	E-P-E-200	N-0-A-5	N-0-A-200	N-0-B-5	N-0-B-200	N-10-A-5	N-10-A-200	N-10-B-5	N-10-B-200
					Date	30/05/2018	30/05/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018
	Unit	LOR	NEPM 2013 Table 1A(1) HIL A Soil	NEPM 2013 Table 1A(1) HIL B Soil	NEPM 2013 Table 1A(1) HIL D Soil										
Classification			Low Density Residential	High Density Residential	Commercial Industrial										
			Residential A	Residential B	Commercial Industrial D										
% Moisture	%w/w	1				8.1	7.3	3.4	7.1	3.9	3.9	7.3	9.1	7.9	19.2
Metals															
Arsenic	mg/kg	1	100	500	3,000	5	6	4	4	3	3	2	2	2	6
Cadmium	mg/kg	0.3	20	150	900	<0.3	<0.3	0.3	<0.3	<0.3	0.3	<0.3	<0.3	<0.3	0.6
Chromium (III+VI)	mg/kg	0.5				24	23	14	15	12	12	11	12	11	25
Copper	mg/kg	0.5	6,000	30,000	240,000	18	17	10	9.6	7.3	7.4	4.4	5.8	4.5	18
Lead	mg/kg	1	300	1,200	1,500	9	9	12	7	14	15	3	3	3	8
Mercury	mg/kg	0.05	40	120	730	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg	0.5	400	1,200	6,000	14	14	7.3	7.5	5.4	5.2	3.7	4.8	3.8	15
Thorium	mg/kg	0.5				5.5	5.2	3.2	3.2	2.4	2.2	2	2.3	2	6.5
Uranium	mg/kg	0.1				0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.2	<0.1	0.6
Zinc	mg/kg	2	7,400	60,000	400,000	45	41	69	38	76	70	10	13	10	40

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	N-10-C-5	N-10-C-200	N-10-D-5	N-10-D-200	N-30-A-5	N-30-A-200	N-30-B-5	N-30-B-200	N-30-C-5	N-30-C-200
					Date	8/02/2018	8/02/2018	8/02/2018	8/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018
	Unit	LOR	**NEPM 2013 Table 1A(1) HIL A Soil**	**NEPM 2013 Table 1A(1) HIL B Soil**	**NEPM 2013 Table 1A(1) HIL D Soil**										
Classification			**Low Density Residential**	**High Density Residential**	**Commercial Industrial**										
			Residential A	**Residential B**	**Commercial Industrial D**										
% Moisture	**%w/w**	1				12.2	20	16.9	17.6	5.5	9.4	6.3	7.3	6	6.6
Metals															
Arsenic	**mg/kg**	1	**100**	**500**	**3,000**	3	9	7	7	2	3	2	2	1	2
Cadmium	**mg/kg**	0.3	**20**	**150**	**900**	0.4	0.5	0.5	0.4	<0.3	0.4	<0.3	<0.3	<0.3	0.3
Chromium (III+VI)	**mg/kg**	0.5				14	25	24	25	10	14	11	11	11	11
Copper	**mg/kg**	0.5	**6,000**	**30,000**	**240,000**	7.3	18	17	18	3.5	7.2	4.6	4.5	4.3	3.7
Lead	**mg/kg**	1	**300**	**1,200**	**1,500**	5	9	8	8	3	4	3	3	3	3
Mercury	**mg/kg**	0.05	**40**	**120**	**730**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**400**	**1,200**	**6,000**	6.2	14	13	14	3	5.9	3.7	3.8	3.9	3.2
Thorium	**mg/kg**	0.5				3	6.3	6.2	6.1	1.6	2.8	1.9	2.1	2	1.8
Uranium	**mg/kg**	0.1				0.1	0.3	0.4	0.4	<0.1	0.2	0.1	0.1	0.1	<0.1
Zinc	**mg/kg**	2	**7,400**	**60,000**	**400,000**	16	37	36	38	9	17	11	11	11	9

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	**N-30-D-5**	**N-30-D-200**	**N-P-A-5**	**N-P-A-200**	**N-P-B-5**	**N-P-B-200**	**N-P-C-5**	**N-P-C-200**	**S-0-A-5**	**S-0-A-200**
					Date	**7/02/2018**	**6/02/2018**	**30/05/2018**	**30/05/2018**	**30/05/2018**	**30/05/2018**	**30/05/2018**	**30/05/2018**	**7/02/2018**	**7/02/2018**
	Unit	LOR	**NEPM 2013 Table 1A(1) HIL A Soil**	**NEPM 2013 Table 1A(1) HIL B Soil**	**NEPM 2013 Table 1A(1) HIL D Soil**										
Classification			**Low Density Residential**	**High Density Residential**	**Commercial Industrial**										
			Residential A	**Residential B**	**Commercial Industrial D**										
% Moisture	**%w/w**	1				2.7	19.8	10.5	12.9	7.6	14.8	8.1	12.6	13.9	20
Metals															
Arsenic	**mg/kg**	1	**100**	**500**	**3,000**	2	6	2	5	5	10	5	7	4	6
Cadmium	**mg/kg**	0.3	**20**	**150**	**900**	<0.3	0.7	1.1	1.4	1.6	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium (III+VI)	**mg/kg**	0.5				9.7	29	20	23	24	32	26	28	7.8	28
Copper	**mg/kg**	0.5	**6,000**	**30,000**	**240,000**	4.2	19	13	17	17	23	20	21	10	19
Lead	**mg/kg**	1	**300**	**1,200**	**1,500**	3	8	8	8	20	10	10	11	3	9
Mercury	**mg/kg**	0.05	**40**	**120**	**730**	<0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**400**	**1,200**	**6,000**	3.5	16	10	11	12	18	14	15	7.6	16
Thorium	**mg/kg**	0.5				1.9	6.4	4.8	5.5	5.1	7	5.8	5.7	1.4	7.5
Uranium	**mg/kg**	0.1				0.1	0.5	0.2	0.2	0.2	0.9	0.2	0.4	0.4	0.6
Zinc	**mg/kg**	2	**7,400**	**60,000**	**400,000**	12	45	43	50	130	55	60	59	11	46

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	S-10-A-5	S-10-A-200	S-10-B-5	S-10-B-200	S-10-C-5	S-10-C-200	S-10-D-5	S-10-D-200	S-30-A-5	S-30-A-200
					Date	7/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018	29/05/2018	29/05/2018
	Unit	LOR	NEPM 2013 Table 1A(1) HIL A Soil	NEPM 2013 Table 1A(1) HIL B Soil	NEPM 2013 Table 1A(1) HIL D Soil										
Classification			Low Density Residential	High Density Residential	Commercial Industrial										
			Residential A	Residential B	Commercial Industrial D										
% Moisture	%w/w	1				13.3	9.2	13.9	18.3	12.7	13.5	13.7	20.5	3.6	7.5
Metals															
Arsenic	mg/kg	1	100	500	3,000	4	4	5	6	4	4	6	6	1	2
Cadmium	mg/kg	0.3	20	150	900	0.6	0.5	<0.3	<0.3	<0.3	<0.3	0.5	0.5	<0.3	<0.3
Chromium (III+VI)	mg/kg	0.5				17	14	13	21	9.1	9.3	17	28	7.9	11
Copper	mg/kg	0.5	6,000	30,000	240,000	14	11	13	19	10	11	13	20	3.2	5.5
Lead	mg/kg	1	300	1,200	1,500	16	11	5	11	3	3	12	9	3	4
Mercury	mg/kg	0.05	40	120	730	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg	0.5	400	1,200	6,000	9.8	7.9	11	12	9.3	9.4	11	16	3	4.9
Thorium	mg/kg	0.5				3.6	3.1	2.8	5.2	1.7	1.9	3.6	6.7	1.7	2.4
Uranium	mg/kg	0.1				0.3	0.2	0.6	0.5	0.5	0.6	0.5	0.5	0.1	0.2
Zinc	mg/kg	2	7,400	60,000	400,000	160	110	23	47	12	12	34	45	9	13

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	S-30-B-5	S-30-B-200	S-30-C-5	S-30-C-200	S-30-D-5	S-30-D-200	S-30-E-5	S-30-E-200	S-R-A-5	S-R-A-200
					Date	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018
	Unit	LOR	NEPM 2013 Table 1A(1) HIL A Soil	NEPM 2013 Table 1A(1) HIL B Soil	NEPM 2013 Table 1A(1) HIL D Soil										
Classification			Low Density Residential	High Density Residential	Commercial Industrial										
			Residential A	Residential B	Commercial Industrial D										
% Moisture	%w/w	1				4	7.2	5.2	5.3	2.7	19.2	7.2	8.8	6.2	7.2
Metals															
Arsenic	mg/kg	1	100	500	3,000	3	4	2	3	<1	8	4	4	2	2
Cadmium	mg/kg	0.3	20	150	900	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.8
Chromium (III+VI)	mg/kg	0.5				11	14	7.1	9.9	3.2	21	15	17	9.4	9.9
Copper	mg/kg	0.5	6,000	30,000	240,000	5.7	11	6.6	7.5	2.9	16	15	13	7.4	5.9
Lead	mg/kg	1	300	1,200	1,500	4	9	9	11	5	8	120	220	5	7
Mercury	mg/kg	0.05	40	120	730	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg	0.5	400	1,200	6,000	5.3	8.3	5	6	3.3	14	9.9	11	5.5	4.8
Thorium	mg/kg	0.5				2.7	3.4	2.2	2.5	1	6.3	3.9	4.6	2.3	2.3
Uranium	mg/kg	0.1				0.2	0.3	0.3	0.4	<0.1	1.4	0.5	0.6	0.2	0.2
Zinc	mg/kg	2	7,400	60,000	400,000	15	90	71	92	12	37	100	61	22	18

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

				Field ID	**S-R-B-5**	**S-R-B-200**	**S-R-C-5**	**S-R-C-200**	**S-R-D-5**	**S-R-D-200**	**S-R-E-5**	**S-R-E-200**	**W-0-A-5**	**W-0-A-200**
				Date	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**7/02/2018**	**7/02/2018**
	Unit	LOR	**NEPM 2013 Table 1A(1) HIL A Soil**	**NEPM 2013 Table 1A(1) HIL B Soil**	**NEPM 2013 Table 1A(1) HIL D Soil**									
Classification			**Low Density Residential**	**High Density Residential**	**Commercial Industrial**									
			Residential A	**Residential B**	**Commercial Industrial D**									
% Moisture	**%w/w**	1				5.6	6.7	8.2	9.1	7.6	10.2	6.7	8.7	7	5.8
Metals														
Arsenic	**mg/kg**	1	**100**	**500**	**3,000**	4	3	3	3	5	4	4	3	2	1
Cadmium	**mg/kg**	0.3	**20**	**150**	**900**	1	1	1.3	1.1	1.3	1.2	0.9	1.2	<0.3	<0.3
Chromium (III+VI)	**mg/kg**	0.5				11	12	13	13	14	18	11	16	11	9.4
Copper	**mg/kg**	0.5	**6,000**	**30,000**	**240,000**	12	10	12	13	14	17	11	13	5	6.9
Lead	**mg/kg**	1	**300**	**1,200**	**1,500**	13	8	16	29	16	10	14	12	4	3
Mercury	**mg/kg**	0.05	**40**	**120**	**730**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**400**	**1,200**	**6,000**	8.1	8.1	9.8	9.9	10	12	8.1	10	4.4	3
Thorium	**mg/kg**	0.5				3.2	3.6	4.9	5.2	4.9	5.2	4.3	5.2	2.3	1.7
Uranium	**mg/kg**	0.1				0.3	0.3	0.4	0.4	0.5	0.4	0.4	0.3	<0.1	<0.1
Zinc	**mg/kg**	2	**7,400**	**60,000**	**400,000**	96	50	40	46	37	40	36	42	15	11

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	W-0-B-5	W-0-B-200	W-0-C-5	W-0-C-200	W-0-D-5	W-0-D-200	W-0-E-5	W-0-E-200	W-10-A-5	W-10-A-200
					Date	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	7/02/2018	7/02/2018
	Unit	LOR	**NEPM 2013 Table 1A(1) HIL A Soil**	**NEPM 2013 Table 1A(1) HIL B Soil**	**NEPM 2013 Table 1A(1) HIL D Soil**										
Classification			**Low Density Residential**	**High Density Residential**	**Commercial Industrial**										
			Residential A	**Residential B**	**Commercial Industrial D**										
% Moisture	**%w/w**	1				8.6	6.7	7	7.7	8.1	7.6	8.1	11.8	4.3	5.2
Metals															
Arsenic	**mg/kg**	1	**100**	**500**	**3,000**	2	1	1	1	2	1	2	3	1	2
Cadmium	**mg/kg**	0.3	**20**	**150**	**900**	0.5	<0.3	0.3	<0.3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3
Chromium (III+VI)	**mg/kg**	0.5				13	10	13	12	12	11	12	15	9.3	10
Copper	**mg/kg**	0.5	**6,000**	**30,000**	**240,000**	5.7	3.5	5.4	5.1	5.6	4.4	5.8	8.6	2.4	4.5
Lead	**mg/kg**	1	**300**	**1,200**	**1,500**	4	3	4	4	4	4	9	15	2	3
Mercury	**mg/kg**	0.05	**40**	**120**	**730**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**400**	**1,200**	**6,000**	5.1	3.1	4.9	4.7	5.2	4.1	5.4	7.4	2.4	3.5
Thorium	**mg/kg**	0.5				2.6	1.8	2.4	2.3	2.5	2.3	2.5	3.1	1.5	2
Uranium	**mg/kg**	0.1				0.1	<0.1	0.1	0.1	0.1	0.1	0.1	0.4	<0.1	<0.1
Zinc	**mg/kg**	2	**7,400**	**60,000**	**400,000**	16	10	16	15	14	12	31	29	6	10

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	W-10-B-5	W-10-B-200	W-10-E-5	W-10-E-200	W-10-F-5	W-10-F-200	W-10-G-5	W-10-G-200	W-10-H-5	W-10-H-200
					Date	7/02/2018	7/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018
	Unit	LOR	NEPM 2013 Table 1A(1) HIL A Soil	NEPM 2013 Table 1A(1) HIL B Soil	NEPM 2013 Table 1A(1) HIL D Soil										
Classification			Low Density Residential	High Density Residential	Commercial Industrial										
			Residential A	Residential B	Commercial Industrial D										
% Moisture	%w/w	1				6.4	13.3	6.9	7.8	6.2	7	8.4	6.7	2	15.6
Metals															
Arsenic	mg/kg	1	**100**	**500**	**3,000**	2	5	<1	2	1	1	2	<1	2	4
Cadmium	mg/kg	0.3	**20**	**150**	**900**	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	0.4
Chromium (III+VI)	mg/kg	0.5				9.5	19	10	16	8.5	9.6	10	8.8	5.4	17
Copper	mg/kg	0.5	**6,000**	**30,000**	**240,000**	3.7	13	2.8	5.1	2.3	3.2	3.8	2.6	8.4	10
Lead	mg/kg	1	**300**	**1,200**	**1,500**	2	6	3	3	2	3	3	3	7	6
Mercury	mg/kg	0.05	**40**	**120**	**730**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg	0.5	**400**	**1,200**	**6,000**	3	9.9	2.6	6.3	2.4	2.9	3.2	4.4	5.5	8.3
Thorium	mg/kg	0.5				1.8	4.8	1.7	2.2	1.4	1.7	1.9	1.5	1.6	3.8
Uranium	mg/kg	0.1				<0.1	0.3	<0.1	0.1	<0.1	<0.1	<0.1	0.1	1.1	0.3
Zinc	mg/kg	2	**7,400**	**60,000**	**400,000**	8	28	7	13	6	8	9	7	63	24

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	W-30-A-5	W-30-A-200	W-30-B-5	W-30-B-200	W-30-C-5	W-30-C-200	W-30-D-5	W-30-D-200	W-30-E-5	W-30-E-200
					Date	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018
	Unit	LOR	NEPM 2013 Table 1A(1) HIL A Soil	NEPM 2013 Table 1A(1) HIL B Soil	NEPM 2013 Table 1A(1) HIL D Soil										
Classification			Low Density Residential	High Density Residential	Commercial Industrial										
			Residential A	Residential B	Commercial Industrial D										
% Moisture	%w/w	1				1.9	15.1	6	19.1	5.6	15	6.1	19.1	5.8	11.5
Metals															
Arsenic	mg/kg	1	100	500	3,000	2	3	2	3	2	5	<1	4	2	3
Cadmium	mg/kg	0.3	20	150	900	0.4	0.7	0.6	1.4	0.5	1	0.5	1.1	0.6	0.7
Chromium (III+VI)	mg/kg	0.5				<0.5	7.9	10	24	9.5	17	9.3	19	9.8	13
Copper	mg/kg	0.5	6,000	30,000	240,000	2	6.6	3.6	15	3.1	10	3.1	13	3.3	6.7
Lead	mg/kg	1	300	1,200	1,500	3	4	3	8	3	5	3	6	2	4
Mercury	mg/kg	0.05	40	120	730	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg	0.5	400	1,200	6,000	4.1	5.4	3.3	12	2.8	8	2.8	9.6	3	5.1
Thorium	mg/kg	0.5				1.9	3	1.6	6	1.6	3.7	1.4	4.6	1.6	2.7
Uranium	mg/kg	0.1				1.4	0.3	<0.1	0.3	0.1	0.4	0.1	0.4	<0.1	0.2
Zinc	mg/kg	2	7,400	60,000	400,000	21	16	9	39	9	23	8	28	8	15

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	W-30-F-5	W-30-F-200	WG-0-A-10	WG-0-A-200	WG-0-B-10	WG-0-C-10	WG-0-C-200	WG-0-E-10	WG-0-E-200	WG-1-B-10
					Date	29/05/2018	29/05/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018
	Unit	LOR	NEPM 2013 Table 1A(1) HIL A Soil	NEPM 2013 Table 1A(1) HIL B Soil	NEPM 2013 Table 1A(1) HIL D Soil										
Classification			Low Density Residential	High Density Residential	Commercial Industrial										
			Residential A	Residential B	Commercial Industrial D										
% Moisture	%w/w	1				5.7	11.6	8	8.4	10.1	9	8	8.4	23.8	9.3
Metals															
Arsenic	mg/kg	1	100	500	3,000	1	2	<1	2	2	1	2	1	6	2
Cadmium	mg/kg	0.3	20	150	900	0.6	0.8	0.4	0.4	0.9	<0.3	0.6	0.3	0.6	<0.3
Chromium (III+VI)	mg/kg	0.5				9.3	14	13	12	13	11	10	11	27	11
Copper	mg/kg	0.5	6,000	30,000	240,000	3.1	7.5	5.3	5	7.6	4.8	5.3	5.1	18	5.4
Lead	mg/kg	1	300	1,200	1,500	3	4	5	5	15	4	16	4	9	4
Mercury	mg/kg	0.05	40	120	730	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg	0.5	400	1,200	6,000	2.9	5.9	4.7	4.3	5.6	3.9	4.6	4.2	14	4.4
Thorium	mg/kg	0.5				1.5	2.9	2.1	2.9	3	2.8	2.7	3.5	3.3	2.6
Uranium	mg/kg	0.1				<0.1	0.2	<0.1	1.5	1.5	1.3	1.3	1.4	1.7	1.3
Zinc	mg/kg	2	7,400	60,000	400,000	8	18	66	68	380	24	170	40	49	20

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	WG-1-B-200	WG-1-D-10	WG-1-D-200	WG-2-A-10	WG-2-A-200	WG-2-C-10	WG-2-C-200	WG-2-E-10	WG-2-E-200	WG-3-B-10
					Date	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	7/02/2018
	Unit	LOR	NEPM 2013 Table 1A(1) HIL A Soil	NEPM 2013 Table 1A(1) HIL B Soil	NEPM 2013 Table 1A(1) HIL D Soil										
Classification			Low Density Residential	High Density Residential	Commercial Industrial										
			Residential A	Residential B	Commercial Industrial D										
% Moisture	**%w/w**	1				10	8.4	9.2	6.2	7.5	6.3	10.2	8.5	7.4	7
Metals															
Arsenic	**mg/kg**	1	**100**	**500**	**3,000**	2	3	1	2	1	4	2	2	1	1
Cadmium	**mg/kg**	0.3	**20**	**150**	**900**	<0.3	0.6	<0.3	<0.3	<0.3	0.4	<0.3	0.3	<0.3	<0.3
Chromium (III+VI)	**mg/kg**	0.5				11	11	9.3	9.9	9	17	11	12	9.4	10
Copper	**mg/kg**	0.5	**6,000**	**30,000**	**240,000**	4.9	6.1	3	5	2.6	11	4.3	5.2	2.9	3.6
Lead	**mg/kg**	1	**300**	**1,200**	**1,500**	4	8	3	4	3	9	3	4	3	3
Mercury	**mg/kg**	0.05	**40**	**120**	**730**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**400**	**1,200**	**6,000**	4	5	2.4	4.3	2.3	8.5	3.2	4.5	2.4	3.1
Thorium	**mg/kg**	0.5				2.6	2.4	2.9	2.7	2.5	2.8	2.7	2.9	2.8	1.8
Uranium	**mg/kg**	0.1				1.5	1.2	1.5	1.4	1.4	1.4	1.5	1.3	1.4	<0.1
Zinc	**mg/kg**	2	**7,400**	**60,000**	**400,000**	14	97	12	19	6	29	10	13	7	9

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	WG-3-B-200	WG-3-D-10	WG-3-D-200	W-D-B-5	W-D-B-200	W-D-A-5	W-D-A-200	W-P-A-5	W-P-A-200	W-P-B-5
					Date	7/02/2018	7/02/2018	7/02/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	30/05/2018	30/05/2018	30/05/2018
	Unit	LOR	NEPM 2013 Table 1A(1) HIL A Soil	NEPM 2013 Table 1A(1) HIL B Soil	NEPM 2013 Table 1A(1) HIL D Soil										
Classification			Low Density Residential	High Density Residential	Commercial Industrial										
			Residential A	Residential B	Commercial Industrial D										
% Moisture	%w/w	1				6.5	4	7.2	5.8	2.6	3.7	4.8	6.5	9.9	3.9
Metals															
Arsenic	mg/kg	1	100	500	3,000	3	<1	1	2	2	2	3	3	5	2
Cadmium	mg/kg	0.3	20	150	900	<0.3	<0.3	<0.3	1.2	0.8	1	1	<0.3	<0.3	<0.3
Chromium (III+VI)	mg/kg	0.5				13	9	10	17	13	14	15	20	24	15
Copper	mg/kg	0.5	6,000	30,000	240,000	7	2.7	4.1	10	6	8.7	8.6	12	17	10
Lead	mg/kg	1	300	1,200	1,500	4	2	2	8	4	17	11	10	9	28
Mercury	mg/kg	0.05	40	120	730	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg	0.5	400	1,200	6,000	5.7	2.3	3.3	7.8	4.9	6.4	6.5	9.9	13	7.6
Thorium	mg/kg	0.5				3	1.6	1.9	4	2.3	2.6	2.8	4.1	5.5	2.6
Uranium	mg/kg	0.1				0.2	<0.1	<0.1	0.2	<0.1	0.1	0.1	0.2	0.3	0.2
Zinc	mg/kg	2	7,400	60,000	400,000	16	6	9	34	17	120	69	44	38	81

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix G

Gridded Soil Samples - Comparison of Chemistry Results against Screening Criteria

					Field ID	W-P-B-200	W-P-C-5	W-P-C-200	W-P-D-5	W-P-D-200	W-P-E-5	W-P-E-200	
					Date	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	
	Unit	LOR	**NEPM 2013 Table 1A(1) HIL A Soil**	**NEPM 2013 Table 1A(1) HIL B Soil**	**NEPM 2013 Table 1A(1) HIL D Soil**								
Classification			**Low Density Residential**	**High Density Residential**	**Commercial Industrial**								
			Residential A	**Residential B**	**Commercial Industrial D**								
% Moisture	**%w/w**	1				13.1	7.7	9.5	7.6	10.6	8.3	13.3	
Metals													
Arsenic	**mg/kg**	1	**100**	**500**	**3,000**	4	1	2	19	5	8	13	19
Cadmium	**mg/kg**	0.3	**20**	**150**	**900**	<0.3	<0.3	<0.3	18	<0.3	<0.3	<0.3	18
Chromium (III+VI)	**mg/kg**	0.5				20	22	26	45	30	29	31	45
Copper	**mg/kg**	0.5	**6,000**	**30,000**	**240,000**	13	14	19	38	22	24	26	38
Lead	**mg/kg**	1	**300**	**1,200**	**1,500**	10	14	11	28	11	11	9	1200
Mercury	**mg/kg**	0.05	**40**	**120**	**730**	<0.05	<0.05	<0.05	0.36	<0.05	<0.05	<0.05	0.36
Nickel	**mg/kg**	0.5	**400**	**1,200**	**6,000**	11	12	14	33	15	15	17	33
Thorium	**mg/kg**	0.5				4.3	4.7	5.5	5	6.2	5.6	6.3	7.5
Uranium	**mg/kg**	0.1				0.3	0.1	0.2	0.2	0.2	0.2	0.4	1.7
Zinc	**mg/kg**	2	**7,400**	**60,000**	**400,000**	44	55	48	67	64	58	52	1800

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix H – Comparison of Gridded Samples vs. Natural Radiological Criteria

Appendix H

Gridded Soil Samples - Table of Radiological Analysis

	Sample Number	E-0-A-5 SOIL 7/2/2018 ME305752.071	E-0-A-200 SOIL 7/2/2018 ME305752.072	E-0-C-5 SOIL 7/2/2018 ME305752.075	E-0-C-5-DUP SOIL	E-0-C-200 SOIL 7/2/2018 ME305752.076	E-10-A-5 SOIL 29/5/2018 ME306928.027	E-10-A-200 SOIL 29/5/2018 ME306928.028	E-10-B-5 SOIL 29/5/2018 ME306928.029	E-10-C-5 SOIL 29/5/2018 ME306928.031	E-30-B-5 SOIL- 29/5/2018 ME306928.003	E-30-C-5 SOIL- 29/5/2018 ME306928.005	E-30-C-200 SOIL- 29/5/2018 ME306928.006
Radium-226	Bq/kg	14.7 ±1.3	22.7 ±2.0	20.5 ±2.0	12 ±10% (1)	13.8 ±1.6	18.2 ±1.8	21.7 ±2.4	13.2 ±1.2	13.5 ±1.6	17.9 ±1.9	46.5 ±3.9	17.2 ±1.9
					14 ±10% (2)								
Lead-210	Bq/kg	11.3 ±2.9	11.8 ±4.0	32.1 ±10.5	42 ±10%	26.6 ±5.3	17.1 ±4.2	22.8 ±5.6	12.2 ±2.9	12.8 ±4.2	25.9 ±5.2	167 ±20	54.5 ±8.6
Radium-228	Bq/kg	10.8 ±1.4	28.7 ±2.8	15.3 ±2.0	18 ±15% (3)	13.8 ±2.1	22.0 ±2.6	27.8 ±3.6	13.0 ±1.5	9.0 ±2.0	20.9 ±2.6	30.8 ±3.5	22.9 ±3.1
Thorium-228	Bq/kg	9.0 ±1.1	32.0 ±3.4	15.6 ±1.9	16 ±10% (4)	13.3 ±1.7	22.4 ±2.3	30.0 ±3.6	11.2 ±1.3	10.2 ±1.4	17.3 ±2.1	31.6 ±3.1	24.5 ±2.9

	Sample Number	E-P-B-5 SOIL 30/5/2018 ME306928.057	E-P-B-5-DUP (DUP07) SOIL	E-P-B-200 SOIL 30/5/2018 ME306928.058	N-0-A-5 SOIL 7/2/2018 ME305752.077	N-0-A-5-DUP SOIL	N-0-A-200 SOIL 7/2/2018 ME305752.078	N-10-B-5 SOIL 7/2/2018 ME305752.083	N-10-B-5-DUP SOIL	N-10-B-200 SOIL 7/2/2018 ME305752.084	N-10-D-5 SOIL 7/2/2018 ME305752.087	N-30-B-5 SOIL 6/2/2018 ME305752.109	N-30-B-5-DUP SOIL
Radium-226	Bq/kg	19.5 ±2.1	19 ±10% (1)	19.0 ±2.1	12.2 ±1.5	12 ±10% (1)	12.9 ±1.5	7.0 ±0.9	8.2 ±10% (1)	9.5 ±1.1	9.2 ±1.1	8.0 ±0.8	7.4 ±10% (1)
			20 ±10% (2)			11 ±10% (2)			8.5 ±10% (2)				7.5 ±11% (2)
Lead-210	Bq/kg	19.2 ±5.3	25 ±11%	17.8 ±4.9	13.0 ±3.9	20 ±10%	12.5 ±3.9	<22.0	10 ±20%	12.7 ±5.8	7.7 ±2.9	11.4 ±2.8	10 ±17%
Radium-228	Bq/kg	27.6 ±3.4	35 ±10% (3)	29.6 ±3.5	18.6 ±2.5	16 ±10% (3)	20.7 ±2.6	11.4 ±1.6	15 ±10% (3)	12.0 ±1.6	16.0 ±2.1	10.7 ±1.3	12 ±13% (3)
Thorium-228	Bq/kg	26.7 ±3.2	32 ±10% (4)	28.7 ±3.4	17.7 ±2.1	18 ±10% (4)	19.4 ±2.3	12.2 ±1.5	13 ±10% (4)	14.0 ±1.5	13.5 ±1.5	11.3 ±1.3	12 ±10% (4)

	Sample Number	N-30-B-200 SOIL 6/2/2018 ME305752.110	N-P-B-5 SOIL 30/5/2018 ME306928.051	N-P-B-5-DUP (DUP08) SOIL	N-P-B-200 SOIL 30/5/2018 ME306928.052	S-0-A-5 SOIL 7/2/2018 ME305752.061	S-0-A-200 SOIL 7/2/2018 ME305752.062	S-10-A-5 SOIL 7/2/2018 ME305752.063	S-10-A-200 SOIL 7/2/2018 ME305752.064	S-10-C-5 SOIL 7/2/2018 ME305752.067	S-10-C-5-DUP SOIL	S-10-C-200 SOIL 7/2/2018 ME305752.068	S-30-C-5 SOIL 29/5/2018 ME306928.011
Radium-226	Bq/kg	6.9 ±1.0	18.9 ±2.0	18 ±10% (1)	22.0 ±2.4	15.2 ±1.6	20.5 ±1.9	17.7 ±2.0	17.5 ±1.7	14.9 ±1.5	13 ±10% (1)	21.2 ±1.8	16.5 ±1.6
				20 ±10% (2)							13 ±10% (2)		
Lead-210	Bq/kg	15.1 ±3.8	44.5 ±7.4	42 ±10%	40.2 ±7.0	11.4 ±3.4	<28.0	32.3 ±5.8	21.9 ±9.2	14.9 ±5.5	21 ±12%	20.6 ±4.4	24.8 ±4.7
Radium-228	Bq/kg	9.1 ±1.7	27.9 ±3.3	34 ±10% (3)	35.1 ±4.0	12.4 ±1.9	28.9 ±3.0	22.3 ±2.8	25.5 ±2.7	10.8 ±1.5	15 ±12% (3)	29.9 ±2.7	21.9 ±2.5
Thorium-228	Bq/kg	10.4 ±1.4	28.0 ±3.3	38 ±10% (4)	36.1 ±4.3	10.8 ±1.3	32.1 ±3.2	23.8 ±2.9	25.1 ±2.9	13.1 ±1.4	15 ±10% (4)	27.0 ±2.5	20.6 ±2.2

	Sample Number	S-30-C-200 SOIL 29/5/2018 ME306928.012	S-30-E-5 SOIL 29/5/2018 ME306928.015	S-R-A-5 SOIL 29/5/2018 ME306928.017	S-R-A-200 SOIL 29/5/2018 ME306928.018	S-R-B-5 SOIL 29/5/2018 ME306928.019	S-R-C-5 SOIL 29/5/2018 ME306928.021	S-R-D-5 SOIL 29/5/2018 ME306928.023	S-R-E-5 SOIL 29/5/2018 ME306928.025	W-0-A-5 SOIL 7/2/2018 ME305752.047	W-0-A-5-DUP SOIL	W-0-A-200 SOIL 7/2/2018 ME305752.048
Radium-226	Bq/kg	16.2 ±1.8	21.4 ±2.0	13.1 ±1.6	10.3 ±1.1	16.2 ±1.6	18.3 ±1.6	21.4 ±1.8	20.6 ±1.8	8.2 ±0.9	7.5 ±11% (1)	6.6 ±0.7
											7.8 ±13% (2)	
Lead-210	Bq/kg	26.0 ±5.0	37.8 ±9.8	30.8 ±5.7	<20.0	32.5 ±7.5	36.2 ±5.9	29.9 ±5.2	54.8 ±8.1	7.9 ±2.6	12 ±20%	4.6 ±2.2
Radium-228	Bq/kg	21.5 ±2.8	27.5 ±2.8	20.0 ±2.6	13.5 ±1.7	21.6 ±2.2	29.5 ±2.7	29.9 ±2.8	28.5 ±2.7	13.1 ±1.5	15 ±13% (3)	9.3 ±1.2
Thorium-228	Bq/kg	20.8 ±2.5	26.6 ±3.1	17.4 ±2.2	15.0 ±1.8	22.9 ±2.3	27.0 ±2.6	29.0 ±3.1	29.6 ±3.1	11.6 ±1.3	13 ±10% (4)	9.8 ±1.1

	Sample Number	W-0-C-5 SOIL 6/2/2018 ME305752.101	W-0-C-5-DUP SOIL	W-0-C-200 SOIL 6/2/2018 ME305752.102	W-10-A-5 SOIL 7/2/2018 ME305752.115	W-10-A-200 SOIL 7/2/2018 ME305752.051	W-10-E-5 SOIL 6/2/2018 ME305752.103	W-10-E-200 SOIL 6/2/2018 ME305752.104	W-10-G-5 SOIL 6/2/2018 ME305752.095	W-10-G-200 SOIL 6/2/2018 ME305752.096	W-30-B-5 SOIL 29/5/18 8:46 ME306928.035	W-30-B-200 SOIL 29/5/2018 ME306928.036	W-30-C-5 SOIL 29/5/2018 ME306928.037
Radium-226	Bq/kg	8.2 ±1.1	8.1 ±11% (1)	8.2 ±1.1	6.6 ±1.0	6.6 ±0.9	6.8 ±0.7	7.2 ±1.0	7.4 ±1.0	5.7 ±0.9	8.0 ±1.0	23.4 ±2.1	7.9 ±1.1
			8.2 ±11% (2)										
Lead-210	Bq/kg	13.3 ±3.8	15 ±16%	8.2 ±3.2	8.2 ±3.1	<11.0	7.4 ±2.3	<8.7	7.9 ±3.3	10.0 ±3.3	8.2 ±2.8	21.9 ±7.3	11.2 ±3.2
Radium-228	Bq/kg	12.5 ±2.0	18 ±14% (3)	9.9 ±1.7	10.0 ±1.8	10.9 ±1.7	9.2 ±1.2	10.5 ±1.7	8.1 ±1.7	9.5 ±1.7	9.9 ±1.6	34.9 ±3.2	10.9 ±1.8
Thorium-228	Bq/kg	12.0 ±1.6	13 ±10% (4)	10.9 ±1.4	9.8 ±1.4	10.5 ±1.4	9.1 ±1.1	8.7 ±1.2	10.2 ±1.3	7.4 ±1.1	10.6 ±1.2	35.3 ±3.5	10.7 ±1.4

WG-0-B-10-DUP
SOIL

ANSTO Duplicate Radiological Analysis

Indictaive measurement of: [1] Lead-214 for Radium-226; [2] Bismuth-214 for Radium-226
[3] Actinium-228 for radium-228; [4] Lead-212 for thorium-228

Appendix H

Gridded Soil Samples - Table of Radiological Analysis

	Sample Number	W-30-C-200 SOIL 29/5/2018 ME306928.038	W-D-B-5 SOIL 29/5/2018 ME306928.045	W-D-B-200 SOIL 29/5/2018 ME306928.046	W-D-A-5 SOIL 29/5/2018 ME306928.047	W-D-A-200 SOIL 29/5/2018 ME306928.048	WG-0-A-10 SOIL 6/2/2018 ME305752.001	WG-0-A-200 SOIL 6/2/2018 ME305752.002	WG-0-B-10 SOIL 6/2/2018 ME305752.003	WG-0-B-10-DUP SOIL	WG-0-C-10 SOIL 6/2/2018 ME305752.004	WG-0-C-200 SOIL 6/2/2018 ME305752.005	WG-0-E-10 SOIL 6/2/2018 ME305752.008
Radium-226	Bq/kg	8.0 ±0.8	14.0 ±1.2	8.1 ±0.8	11.3 ±1.2	11.1 ±1.0	8.7 ±1.0	7.1 ±1.0	7.7 ±0.8	8.7 ±10% (1)	8.4 ±1.1	9.6 ±1.2	7.1 ±1.0
										9.2 ±11% (2)			
Lead-210	Bq/kg	8.6 ±2.5	29.9 ±4.8	14.2 ±3.0	20.7 ±8.3	10.1 ±2.7	13.0 ±5.6	13.2 ±3.7	10.5 ±2.7	31 ±10%	12.4 ±2.5	17.9 ±4.3	8.8 ±3.3
Radium-228	Bq/kg	13.3 ±1.5	23.2 ±2.2	11.6 ±1.4	15.7 ±1.9	17.0 ±1.8	10.2 ±1.2	10.4 ±1.7	11.6 ±1.4	12 ±10% (3)	11.0 ±1.9	11.7 ±2.1	9.7 ±1.7
Thorium-228	Bq/kg	10.4 ±1.2	22.9 ±2.2	11.1 ±1.3	16.7 ±2.0	15.4 ±1.7	10.8 ±1.3	11.0 ±1.4	10.8 ±1.2	13 ±10% (4)	11.9 ±1.5	9.5 ±1.3	10.7 ±1.4

	Sample Number	WG-0-E-200 SOIL 6/2/2018 ME305752.009	WG-1-B-10 SOIL 6/2/2018 ME305752.014	WG-1-B-200 SOIL 6/2/2018 ME305752.015	WG-1-D-10 SOIL 6/2/2018 ME305752.020	WG-1-D-200 SOIL 6/2/2018 ME305752.021	WG-2-A-10 SOIL 6/2/2018 ME305752.026	WG-2-A-200 SOIL 6/2/2018 ME305752.027	WG-2-C-10 SOIL 6/2/2018 ME305752.032	WG-2-C-200 SOIL 6/2/2018 ME305752.033	WG-2-E-10 SOIL 6/2/2018 ME305752.038	WG-2-E-200 SOIL 6/2/2018 ME305752.039	WG-3-B-10 SOIL 7/2/2018 ME305752.052
Radium-226	Bq/kg	8.1 ±1.0	8.2 ±1.0	7.1 ±0.7	7.6 ±1.0	5.9 ±0.9	8.5 ±1.0	7.4 ±1.0	7.8 ±0.9	6.1 ±0.8	9.3 ±1.2	7.2 ±0.8	8.4 ±1.2
Lead-210	Bq/kg	9.2 ±7.0	7.5 ±4.4	7.7 ±2.4	19.8 ±4.4	15.3 ±3.6	9.5 ±3.0	9.7 ±3.2	<22.0	<18.0	7.4 ±3.4	7.9 ±2.6	10.4 ±3.9
Radium-228	Bq/kg	11.9 ±1.7	11.5 ±1.6	9.9 ±1.2	13.2 ±2.0	8.6 ±1.6	13.3 ±1.8	12.7 ±1.9	11.9 ±1.6	10.6 ±1.4	11.1 ±2.0	10.4 ±1.2	10.5 ±2.0
Thorium-228	Bq/kg	11.0 ±1.4	12.6 ±1.4	10.2 ±1.2	11.6 ±1.5	9.1 ±1.2	12.2 ±1.4	11.9 ±1.6	12.7 ±1.6	9.2 ±1.1	12.2 ±1.6	10.4 ±1.1	12.7 ±1.7

	Sample Number	WG-3-B-200 SOIL 7/2/2018 ME305752.053	WG-3-D-10 SOIL 7/2/2018 ME305752.058	WG-3-D-200 SOIL 7/2/2018 ME305752.059	W-P-B-5 SOIL 30/5/2018 ME306928.067	W-P-B-5-DUP (DUP04) SOIL	W-P-B-200 SOIL 30/5/2018 ME306928.068	W-P-C-5 SOIL 30/5/2018 ME306928.069	W-P-C-5-DUP (DUP05) SOIL	W-P-C-200 SOIL 30/5/2018 ME306928.070
Radium-226	Bq/kg	6.1 ±0.7	9.8 ±1.3	5.5 ±0.8	15.8 ±1.6	14 ±10% (1)	17.0 ±1.8	19.8 ±1.9	17 ±10% (1)	19.0 ±1.9
						14 ±10% (2)			18 ±11% (2)	
Lead-210	Bq/kg	10.8 ±2.6	12.0 ±3.7	<25.0	49.1 ±7.3	31 ±10%	31.1 ±6.0	31.0 ±5.7	33 ±10%	24.3 ±5.1
Radium-228	Bq/kg	8.3 ±1.1	9.9 ±1.9	8.6 ±1.4	20.2 ±2.5	20 ±10% (3)	22.4 ±2.9	34.2 ±3.6	33 ±10% (3)	32.3 ±3.4
Thorium-228	Bq/kg	8.6 ±1.0	11.2 ±1.5	8.4 ±1.1	21.7 ±2.3	22 ±10% (4)	25.9 ±3.0	33.1 ±3.3	32 ±10% (4)	31.8 ±3.2

WG-0-B-10-DUP SOIL	ANSTO Duplicate Radiological Analysis

Indictaive measurement of: [1] Lead-214 for Radium-226; [2] Bismuth-214 for Radium-226
[3] Actinium-228 for radium-228; [4] Lead-212 for thorium-228

Appendix H

Gridded Soil Samples - Uranium and Thorium Chemisty converted to Bq/kg

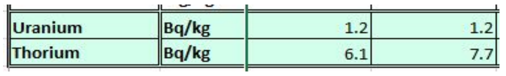
		Mean Distribution (UNCEAR 2000)												
	Field ID	Range	Range		Composite 01	Composite 02	Composite 03	Composite 04	E-0-A-5	E-0-A-200	E-0-B-5	E-0-B-200	E-0-C-5	E-0-C-200
	Date	Minumum	Maximum	Mean	6/02/2018	6/02/2018	6/02/2018	6/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018
Uranium	mg/kg	1.3	8.9	2.8	0.1	0.1	0.1	0.1	0.6	0.6	0.2	0.2	0.4	0.4
Thorium	mg/kg	2.7	15.7	7.4	1.5	1.9	1.8	2	7	6.8	2.2	1.8	2.8	2.2
Uranium	Bq/kg	16	110	35	1.2	1.2	1.2	1.2	7.4	7.4	2.5	2.5	4.9	4.9
Thorium	Bq/kg	11	64	30	6.1	7.7	7.3	8.1	28.5	27.6	8.9	7.3	11.4	8.9

		Mean Distribution (UNCEAR 2000)												
	Field ID	Range	Range		E-10-A-5	E-10-A-200	E-10-B-5	E-10-B-200	E-10-C-5	E-10-C-200	E-30-A-5	E-30-A-200	E-30-B-5	E-30-B-200
	Date	Minumum	Maximum	Mean	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018
Uranium	mg/kg	1.3	8.9	2.8	0.4	0.5	0.4	0.7	0.4	0.1	0.5	0.8	0.4	0.7
Thorium	mg/kg	2.7	15.7	7.4	2.2	5.7	1.5	5.6	1	0.5	5.1	5.1	3.4	3.7
Uranium	Bq/kg	16	110	35	4.9	6.2	4.9	8.6	4.9	1.2	6.2	9.9	4.9	8.6
Thorium	Bq/kg	11	64	30	8.9	23.2	6.1	22.8	4.1	2.0	20.7	20.7	13.8	15.0

		Mean Distribution (UNCEAR 2000)												
	Field ID	Range	Range		E-30-C-5	E-30-C-200	E-P-A-5	E-P-A-200	E-P-B-5	E-P-B-200	E-P-C-5	E-P-C-200	E-P-D-5	E-P-D-200
	Date	Minumum	Maximum	Mean	29/05/2018	29/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018
Uranium	mg/kg	1.3	8.9	2.8	0.4	0.4	0.4	0.4	0.5	0.3	0.4	0.4	0.3	0.3
Thorium	mg/kg	2.7	15.7	7.4	3.7	4.1	6.1	5.9	5.6	5.7	5.3	6	3.9	2.9
Uranium	Bq/kg	16	110	35	4.9	4.9	4.9	4.9	6.2	3.7	4.9	4.9	3.7	3.7
Thorium	Bq/kg	11	64	30	15.0	16.7	24.8	24.0	22.8	23.2	21.5	24.4	15.9	11.8

		Mean Distribution (UNCEAR 2000)												
	Field ID	Range	Range		E-P-E-5	E-P-E-200	N-0-A-200	N-0-B-5	N-0-B-200	N-10-A-5	N-10-A-200	N-10-B-5	N-10-B-200	N-10-C-5
	Date	Minumum	Maximum	Mean	30/05/2018	30/05/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018
Uranium	mg/kg	1.3	8.9	2.8	0.3	0.3	0.3	0.3	0.2	0.1	0.2	0.1	0.6	0.1
Thorium	mg/kg	2.7	15.7	7.4	5.5	5.2	3.2	2.4	2.2	2	2.3	2	6.5	3
Uranium	Bq/kg	16	110	35	3.7	3.7	3.7	3.7	2.5	1.2	2.5	1.2	7.4	1.2
Thorium	Bq/kg	11	64	30	22.4	21.1	13.0	9.8	8.9	8.1	9.3	8.1	26.4	12.2

LEGEND



Uranium	Bq/kg	1.2	1.2
Thorium	Bq/kg	6.1	7.7

- Converted results from mg/kg to Bq/kg

Appendix H

Gridded Soil Samples - Uranium and Thorium Chemisty converted to Bq/kg

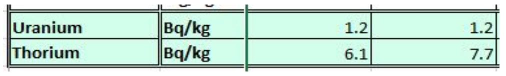
		Mean Distribution (UNCEAR 2000)												
	Field ID	Range	Range		N-10-C-200	N-10-D-5	N-10-D-200	N-30-A-5	N-30-A-200	N-30-B-5	N-30-B-200	N-30-C-5	N-30-C-200	N-30-D-200
	Date	Minumum	Maximum	Mean	8/02/2018	8/02/2018	8/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018
Uranium	mg/kg	1.3	8.9	2.8	0.3	0.4	0.4	0.1	0.2	0.1	0.1	0.1	0.1	0.5
Thorium	mg/kg	2.7	15.7	7.4	6.3	6.2	6.1	1.6	2.8	1.9	2.1	2	1.8	6.4
Uranium	Bq/kg	16	110	35	3.7	4.9	4.9	1.2	2.5	1.2	1.2	1.2	1.2	6.2
Thorium	Bq/kg	11	64	30	25.6	25.2	24.8	6.5	11.4	7.7	8.5	8.1	7.3	26.0

		Mean Distribution (UNCEAR 2000)												
	Field ID	Range	Range		N-P-A-5	N-P-A-200	N-P-B-5	N-P-B-200	N-P-C-5	N-P-C-200	S-0-A-5	S-0-A-200	S-10-A-5	S-10-A-200
	Date	Minumum	Maximum	Mean	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018
Uranium	mg/kg	1.3	8.9	2.8	0.2	0.2	0.2	0.9	0.2	0.4	0.4	0.6	0.3	0.2
Thorium	mg/kg	2.7	15.7	7.4	4.8	5.5	5.1	7	5.8	5.7	1.4	7.5	3.6	3.1
Uranium	Bq/kg	16	110	35	2.5	2.5	2.5	11.1	2.5	4.9	4.9	7.4	3.7	2.5
Thorium	Bq/kg	11	64	30	19.5	22.4	20.7	28.5	23.6	23.2	5.7	30.5	14.6	12.6

		Mean Distribution (UNCEAR 2000)												
	Field ID	Range	Range		S-10-B-5	S-10-B-200	S-10-C-5	S-10-C-200	S-10-D-5	S-10-D-200	S-30-A-5	S-30-A-200	S-30-B-5	S-30-B-200
	Date	Minumum	Maximum	Mean	7/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018
Uranium	mg/kg	1.3	8.9	2.8	0.6	0.5	0.5	0.6	0.5	0.5	0.1	0.2	0.2	0.3
Thorium	mg/kg	2.7	15.7	7.4	2.8	5.2	1.7	1.9	3.6	6.7	1.7	2.4	2.7	3.4
Uranium	Bq/kg	16	110	35	7.4	6.2	6.2	7.4	6.2	6.2	1.2	2.5	2.5	3.7
Thorium	Bq/kg	11	64	30	11.4	21.1	6.9	7.7	14.6	27.2	6.9	9.8	11.0	13.8

		Mean Distribution (UNCEAR 2000)												
	Field ID	Range	Range		S-30-C-5	S-30-C-200	S-30-D-5	S-30-D-200	S-30-E-5	S-30-E-200	S-R-A-5	S-R-A-200	S-R-B-5	S-R-B-200
	Date	Minumum	Maximum	Mean	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018
Uranium	mg/kg	1.3	8.9	2.8	0.3	0.4	0.1	1.4	0.5	0.6	0.2	0.2	0.3	0.3
Thorium	mg/kg	2.7	15.7	7.4	2.2	2.5	1	6.3	3.9	4.6	2.3	2.3	3.2	3.6
Uranium	Bq/kg	16	110	35	3.7	4.9	1.2	17.3	6.2	7.4	2.5	2.5	3.7	3.7
Thorium	Bq/kg	11	64	30	8.9	10.2	4.1	25.6	15.9	18.7	9.3	9.3	13.0	14.6

LEGEND



Uranium	Bq/kg	1.2	1.2
Thorium	Bq/kg	6.1	7.7

- Converted results from mg/kg to Bq/kg

JACOBS

Appendix H

Gridded Soil Samples - Uranium and Thorium Chemisty converted to Bq/kg

		Mean Distribution (UNCEAR 2000)												
	Field ID	**Range**	**Range**		**S-R-C-5**	**S-R-C-200**	**S-R-D-5**	**S-R-D-200**	**S-R-E-5**	**S-R-E-200**	**W-0-A-5**	**W-0-A-200**	**W-0-B-5**	**W-0-B-200**
	Date	**Minumum**	**Maximum**	**Mean**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**7/02/2018**	**7/02/2018**	**6/02/2018**	**6/02/2018**
Uranium	**mg/kg**	**1.3**	**8.9**	**2.8**	0.4	0.4	0.5	0.4	0.4	0.3	0.1	0.1	0.1	0.1
Thorium	**mg/kg**	**2.7**	**15.7**	**7.4**	4.9	5.2	4.9	5.2	4.3	5.2	2.3	1.7	2.6	1.8
Uranium	**Bq/kg**	**16**	**110**	**35**	4.9	4.9	6.2	4.9	4.9	3.7	1.2	1.2	1.2	1.2
Thorium	**Bq/kg**	**11**	**64**	**30**	19.9	21.1	19.9	21.1	17.5	21.1	9.3	6.9	10.6	7.3

		Mean Distribution (UNCEAR 2000)												
	Field ID	**Range**	**Range**		**W-0-C-5**	**W-0-C-200**	**W-0-D-5**	**W-0-D-200**	**W-0-E-5**	**W-0-E-200**	**W-10-A-5**	**W-10-A-200**	**W-10-B-5**	**W-10-B-200**
	Date	**Minumum**	**Maximum**	**Mean**	**6/02/2018**	**6/02/2018**	**6/02/2018**	**6/02/2018**	**6/02/2018**	**6/02/2018**	**7/02/2018**	**7/02/2018**	**7/02/2018**	**7/02/2018**
Uranium	**mg/kg**	**1.3**	**8.9**	**2.8**	0.1	0.1	0.1	0.1	0.1	0.4	0.1	0.1	0.1	0.3
Thorium	**mg/kg**	**2.7**	**15.7**	**7.4**	2.4	2.3	2.5	2.3	2.5	3.1	1.5	2	1.8	4.8
Uranium	**Bq/kg**	**16**	**110**	**35**	1.2	1.2	1.2	1.2	1.2	4.9	1.2	1.2	1.2	3.7
Thorium	**Bq/kg**	**11**	**64**	**30**	9.8	9.3	10.2	9.3	10.2	12.6	6.1	8.1	7.3	19.5

		Mean Distribution (UNCEAR 2000)												
	Field ID	**Range**	**Range**		**W-10-E-5**	**W-10-E-200**	**W-10-F-5**	**W-10-F-200**	**W-10-G-5**	**W-10-G-200**	**W-10-H-5**	**W-10-H-200**	**W-30-A-5**	**W-30-A-200**
	Date	**Minumum**	**Maximum**	**Mean**	**6/02/2018**	**6/02/2018**	**6/02/2018**	**6/02/2018**	**6/02/2018**	**6/02/2018**	**6/02/2018**	**6/02/2018**	**29/05/2018**	**29/05/2018**
Uranium	**mg/kg**	**1.3**	**8.9**	**2.8**	0.1	0.1	0.1	0.1	0.1	0.1	1.1	0.3	1.4	0.3
Thorium	**mg/kg**	**2.7**	**15.7**	**7.4**	1.7	2.2	1.4	1.7	1.9	1.5	1.6	3.8	1.9	3
Uranium	**Bq/kg**	**16**	**110**	**35**	1.2	1.2	1.2	1.2	1.2	1.2	13.6	3.7	17.3	3.7
Thorium	**Bq/kg**	**11**	**64**	**30**	6.9	8.9	5.7	6.9	7.7	6.1	6.5	15.4	7.7	12.2

		Mean Distribution (UNCEAR 2000)												
	Field ID	**Range**	**Range**		**W-30-B-5**	**W-30-B-200**	**W-30-C-5**	**W-30-C-200**	**W-30-D-5**	**W-30-D-200**	**W-30-E-5**	**W-30-E-200**	**W-30-F-5**	**W-30-F-200**
	Date	**Minumum**	**Maximum**	**Mean**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**	**29/05/2018**
Uranium	**mg/kg**	**1.3**	**8.9**	**2.8**	0.1	0.3	0.1	0.4	0.1	0.4	0.1	0.2	0.1	0.2
Thorium	**mg/kg**	**2.7**	**15.7**	**7.4**	1.6	6	1.6	3.7	1.4	4.6	1.6	2.7	1.5	2.9
Uranium	**Bq/kg**	**16**	**110**	**35**	1.2	3.7	1.2	4.9	1.2	4.9	1.2	2.5	1.2	2.5
Thorium	**Bq/kg**	**11**	**64**	**30**	6.5	24.4	6.5	15.0	5.7	18.7	6.5	11.0	6.1	11.8

LEGEND

Uranium	Bq/kg	1.2	1.2
Thorium	Bq/kg	6.1	7.7

- Converted results from mg/kg to Bq/kg

Appendix H

Gridded Soil Samples - Uranium and Thorium Chemisty converted to Bq/kg

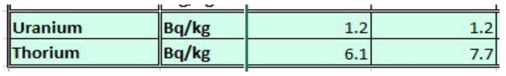
		Mean Distribution (UNCEAR 2000)												
	Field ID	Range	Range		WG-0-A-10	WG-0-A-200	WG-0-B-10	WG-0-C-10	WG-0-C-200	WG-0-E-10	WG-0-E-200	WG-1-B-10	WG-1-B-200	WG-1-D-10
	Date	Minumum	Maximum	Mean	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018
Uranium	mg/kg	**1.3**	**8.9**	**2.8**	0.1	1.5	1.5	1.3	1.3	1.4	1.7	1.3	1.5	1.2
Thorium	mg/kg	**2.7**	**15.7**	**7.4**	2.1	2.9	3	2.8	2.7	3.5	3.3	2.6	2.6	2.4
Uranium	**Bq/kg**	**16**	**110**	**35**	1.2	18.5	18.5	16.0	16.0	17.3	21.0	16.0	18.5	14.8
Thorium	**Bq/kg**	**11**	**64**	**30**	8.5	11.8	12.2	11.4	11.0	14.2	13.4	10.6	10.6	9.8

		Mean Distribution (UNCEAR 2000)												
	Field ID	Range	Range		WG-1-D-200	WG-2-A-10	WG-2-A-200	WG-2-C-10	WG-2-C-200	WG-2-E-10	WG-2-E-200	WG-3-B-10	WG-3-B-200	WG-3-D-10
	Date	Minumum	Maximum	Mean	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	7/02/2018	7/02/2018	7/02/2018
Uranium	mg/kg	**1.3**	**8.9**	**2.8**	1.5	1.4	1.4	1.4	1.5	1.3	1.4	0.1	0.2	0.1
Thorium	mg/kg	**2.7**	**15.7**	**7.4**	2.9	2.7	2.5	2.8	2.7	2.9	2.8	1.8	3	1.6
Uranium	**Bq/kg**	**16**	**110**	**35**	18.5	17.3	17.3	17.3	18.5	16.0	17.3	1.2	2.5	1.2
Thorium	**Bq/kg**	**11**	**64**	**30**	11.8	11.0	10.2	11.4	11.0	11.8	11.4	7.3	12.2	6.5

		Mean Distribution (UNCEAR 2000)												
	Field ID	Range	Range		WG-3-D-200	W-D-B-5	W-D-B-200	W-D-A-5	W-D-A-200	W-P-A-5	W-P-A-200	W-P-B-5	W-P-B-200	W-P-C-5
	Date	Minumum	Maximum	Mean	7/02/2018	29/05/2018	29/05/2018	29/05/2018	29/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018
Uranium	mg/kg	**1.3**	**8.9**	**2.8**	0.1	0.2	0.1	0.1	0.1	0.2	0.3	0.2	0.3	0.1
Thorium	mg/kg	**2.7**	**15.7**	**7.4**	1.9	4	2.3	2.6	2.8	4.1	5.5	2.6	4.3	4.7
Uranium	**Bq/kg**	**16**	**110**	**35**	1.2	2.5	1.2	1.2	1.2	2.5	3.7	2.5	3.7	1.2
Thorium	**Bq/kg**	**11**	**64**	**30**	7.7	16.3	9.3	10.6	11.4	16.7	22.4	10.6	17.5	19.1

		Mean Distribution (UNCEAR 2000)							
	Field ID	Range	Range		W-P-C-200	W-P-D-5	W-P-D-200	W-P-E-5	W-P-E-200
	Date	Minumum	Maximum	Mean	30/05/2018	30/05/2018	30/05/2018	30/05/2018	30/05/2018
Uranium	mg/kg	**1.3**	**8.9**	**2.8**	0.2	0.2	0.2	0.2	0.4
Thorium	mg/kg	**2.7**	**15.7**	**7.4**	5.5	5	6.2	5.6	6.3
Uranium	**Bq/kg**	**16**	**110**	**35**	2.5	2.5	2.5	2.5	4.9
Thorium	**Bq/kg**	**11**	**64**	**30**	22.4	20.3	25.2	22.8	25.6

LEGEND



Uranium	Bq/kg	1.2	1.2
Thorium	Bq/kg	6.1	7.7

- Converted results from mg/kg to Bq/kg

Appendix I – Data Validation and Quality Assessment

Appendix I - Quality Assurance and Quality Control

A review of the quality of data has been based on the following:

- Review of the findings of sample analyses against field observations and measurements
- Review of data quality based on the verification of field Quality Assurance / Quality Control (QA/QC) procedures, evidence of proper transference of samples and sample analysis
- Analysis of duplicate samples by an independent laboratory (split duplicate) for samples subjected to radiological analysis
- Internal laboratory QA/QC analyses including analysis of reagent blanks, spike recoveries and duplicates.

These requirements are defined in NEPM 1999 (2013 amendment) and relevant Australian Standards, as listed in the report body.

The radiological samples and QA/QC results were reported in laboratory reports from the primary lab (SGS) and from the secondary laboratory (ANSTO). The data quality assessment described herein is based upon the results reported in these laboratory certificates and associated QC reports.

A summary of the QC analyses from these reports completed as part of the study is provided in **Tables A** through **Table E** at the end of this appendix.

1 Data Quality Indicators

Data Quality Indicators (DQIs) are developed to provide goals for the quality of data required to sufficiently meet the site-specific objectives of Environmental Site Assessments. Precision, sensitivity, accuracy, representativeness, comparability and completeness (PSARCC) parameters are all indicators of data quality. The below points describe each PSARCC parameter in relation to assessment of data quality and the typical methods and assessment employed to verify the DQIs:

- Precision – measure of the variation in results from a laboratory method. Achieved through assessment of laboratory and field duplicate results
- Sensitivity – the ability of an analytical method or technology to reliably identify a compound in the sample medium at an appropriate level of interest. Achieved through ensuring that laboratory detection limits are below the adopted criteria
- Accuracy – measure of the closeness of the analytical result obtained by a method to the 'true' value. Assessed through laboratory QA/QC samples such as matrix spikes, laboratory control samples, method blanks and surrogate spikes;
- Representativeness – expresses the degree to which sample data accurately and precisely represents a characteristic of a population, parameter variations at a sample point, or an environmental condition. Achieved through assessment of trip spike, trip blank and rinsate sample results along with standard procedures for sample collection, transport and extraction and holding times
- Comparability – is a qualitative parameter expressing the confidence with which one data set can be compared with another. Achieved through undertaking fieldwork using standard operating procedures and consistent field personnel
- Completeness – defined as the percentage of measurements made which are judged to be valid measurements. Achieved through assessment of the percentage of data that passed the QA/QC assessment with a goal of 95%.

The typical DQIs used to assess the PSARCC parameters for this investigation are detailed in **Table A** below.

Table A – Summary of Typical Data Quality Indicators

Data Quality Indicator	Typical DQI Requirement
Precision	
Field Duplicate RPDs.	AS4482.1-2005 states that the RPDs of duplicates are typically 30-50%, however, variation can be expected to be higher for organic analyses than inorganic analyses and for low concentrations of analytes. CH2M has developed the following DQIs for field duplicates that are generally consistent with AS4482.1-2005: Less than 10 times LOR: no limit Between 10-20 times LOR: <50% RPD Greater than 20 times LOR: <20% RPD One intra-laboratory duplicate should be submitted to the primary laboratory every twenty samples. One inter-laboratory duplicate should be submitted to the secondary laboratory every twenty samples.

Data Quality Indicator	Typical DQI Requirement
Laboratory duplicate RPDs	Laboratory limits specified in ALS Method QWI-EN/38 (consistent with the field duplicate DQIs). Less than 10 times LOR: no limit Between 10-20 times LOR: <50% RPD Greater than 20 times LOR: <20% RPD One internal laboratory duplicate to be analysed by the primary and secondary laboratories, respectively, for every twenty samples analysed.
Sensitivity	
Laboratory detection limits	Laboratory achieved LORs to be appropriate for comparison to screening criteria, as detailed in **Tables C** to **G**, contained within this Appendix.
Accuracy	
Laboratory Control Samples (inorganics)	70% to 130% recovery for inorganics.
Laboratory Control Spikes (organics)	Dynamic recovery limits based on statistical evaluation of processed control spikes by the laboratory.
Matrix Spikes (organics)	70% to 130% recovery for inorganics, or as otherwise specified by the respective laboratory.
Method Blanks (organics)	Not detected above laboratory LOR.
Surrogate Spikes (organics)	Acceptable limits are determined by the laboratory based on the recoveries obtained for samples of similar matrix type analysed under the same analytical conditions.
Representativeness	
Trip Blanks (for volatiles and semi-volatiles in soil and water)	Not detected above laboratory LOR
Trip Spikes (for volatiles and semi-volatiles in soil and water) and Trip Spike Controls (for volatiles and semi-volatiles in soil)	The trip spikes are used to assess potential volatile losses during the handing and transport of the closed primary samples. Trip spikes are taken into the field and transported with the primary samples to the laboratory. Trip spikes are not opened in the field. The DQI for trip spikes is the percentage recovery and should be between 30% and 130%, which is generally consistent with AS4482.1-2005 for field duplicates.
Procedures	All fieldwork including decontamination procedures to be undertaken in general accordance with CH2M's Standard Operating Procedures (SOPs). In particular, reusable sampling equipment is decontaminated after each use as follows: 1. put on phthalate-free nitrile gloves 2. set up three buckets and: a) fill bucket 1 with 2-5% Decon 90 solution b) fill bucket 2 with potable water c) fill bucket 3 with potable water 3. wash all equipment surfaces that contacted potentially contaminated soil/water in bucket 1 4. rinse equipment in bucket 2 5. repeat rinse in bucket 2 6. air dry
Analysis	QAQC to be conducted in accordance with NEPM 1999 (2013 amendment).

Data Quality Indicator	Typical DQI Requirement
Handling and Transport	Sample handling, storage and transport to be in accordance with the requirements of NEPM 1999 (2013 amendment).
Holding Times	Samples to be extracted and analysed within appropriate holding times.
Chain of Custody	Samples to be transported under full chain of custody documentation (COC). The laboratory to return a copy of the signed COC acknowledging the receipt data and time and identity of samples included in the shipment.
Certificates of Analysis	Include Laboratory Certificates of Analysis which detail any standard and non-standard methods used.
Rinsate	The rinsate should be collected from re-useable equipment that was used at multiple sampling locations and decontaminated in between samples. The rinsate should be collected from decontaminated equipment using laboratory supplied rinsate water and collection bottles. The DQI for the rinsate is below detection limits or low concentrations of contaminants of concern.
Comparability	
Procedures	Samples to be collected in general accordance CH2M's SOPs and NEPM 1999 (2013 amendment). All field team members to be appropriately trained in these documents.
Logging of Sample Locations	Logs and field data to be recorded for each sample location noting any observed variations between conditions and signs of potential contamination.
Handling and Transport	Primary samples to be stored, handled and transported under the same conditions and analysed by the same laboratory using consistent methods.
	DQIs to indicate acceptable precision and accuracy.
Completeness	
Critical Samples	Data from all critical samples to be considered valid.
Dataset Evaluation	Overall dataset to be considered valid (>95% acceptable after data validation procedures).

The assessment of QA/QC against the typical requirements listed in **Table A,** including a data quality assessment of the laboratory data is provided in **Table B** below and in **Tables C to G** included in this Appendix**.** Included in **Table B** are the Data Quality Indicators (DQIs) used to measure the Precision, Accuracy, Representativeness, Completeness, Comparability and Sensitivity (PARCCS) parameters for the DSI field and analytical program.

Table B – Summary of Data Quality Indicators

Detailed Site Investigation

Data Quality Indicator	Data Quality Indicators	Summary of Results	Compliance
Precision			
Field Duplicate Relevant Percent Difference (RPD).	AS4482.1-2005 states that the RPDs of duplicates are typically 30-50%, however, variation can be expected to be higher for organic analyses than inorganic analyses and for low concentrations of analytes. CH2M has developed the following DQIs for field duplicates that are generally consistent with AS4482.1-2005: Less than 4 times limit of reporting (LOR): plus or minus 2 times LOR Between 4-10 times LOR: <50% RPD Greater than 10 times LOR: <30% RPD. One intra-laboratory and one inter-laboratory duplicate should be submitted to the laboratories every twenty samples.	5 inter-lab duplicates were collected for radiological samples, which were analysed at ANSTO. AS there is no standard LOR for radiological sample analysis, there is subsequently no DQIs for field duplicate RPDs. Additionally, radiological results are returned with unique confidence limits (95%) or standard error. If an RPD DQI of 50% is applied, without considering standard error or confidence limits for samples or LOR, three samples exceed this limit. Samples W-0-B-10 and N-10-B-5 returned RPDs of 99% and 75% respectively for Lead-210. Sample E-0-C-5 returned an RPD of 52% for Radium-226. As Lead-210 is not a radionuclide of concern, the RPD exceedances for samples W-0-B-10 and N-10-B-5 are not considered to impact the quality of the assessment. ANSTO used two daughter product surrogates to calculate Radium-226 activity (Bismuth-214 and Lead-214), while SGS has only used Lead-214. Comparison of the Bismuth-214 derived result to the SGS Lead-210 result, as well as comparison between the two calculation methods used by ANSTO, results in an RPD below 50%. ANSTO also notes that radiological measurements depend on several factors such as spectrometry equipment use, sample matrix and homogeneity, counting time and applied efficiency calibration and density correction. Additionally, as radiological results were below background levels, it is not considered that the RPD exceedance in this case impacts the quality of the assessment. No intra- or inter-lab duplicates were collected for metals or TRH/BTEXN/PAH. However, as these analytes were not the primary contaminant of concern, and all sample results were below the highly conservative criteria adopted, this is not considered to have impacted the quality of the assessment.	Yes
Laboratory Duplicate RPDs.	Laboratory specified limits	There was no laboratory duplicate RPD exceedances for non-radiological samples.	Yes

Data Quality Indicator	Data Quality Indicators	Summary of Results	Compliance
		For Radium-226 samples analysed by ANSTO, alternative daughter product surrogates used to estimate results did not result in RPD exceedances.	
Sensitivity			
Laboratory detection limits	Laboratory achieved Limit of Reporting (LOR) values to be appropriate for comparison to screening criteria.	Achieved LORs were below relevant screening criteria for heavy metals, metals, and TRH/BTEXN/PAH. Laboratory detection limits for radiological analysis are dependent on a range of factors and differ from sample to sample.	Yes
Accuracy			
Laboratory Control Samples (inorganics)	70% to 130% recovery for inorganics.		Yes
(Organics)	70% to 130% recovery for organics.		Yes
Matrix Spikes	Laboratory specified limits	SVOC matrix spikes were not reported for Composite 01 due to sample matrix interferences. All results were below laboratory detection limits.	Yes
		TRH matrix spikes could not be reported due to significant TRH within the sample. However, as these are not the primary contaminants of concern, this is not considered to have impacted the quality of the assessment.	No – non-conformance is not considered to impact quality of data assessment.
Method Blanks	Not detected above LOR		Yes
Surrogate Spikes	Laboratory specified limits		Yes
Representativeness			
Trip Spikes (soil) and Trip Spike Controls (soil)	The trip spikes are used to assess potential volatile losses during the handing and transport of the closed primary samples. The trip spikes were taken into the field and transported with the primary samples to the laboratory. The trip spikes were not opened in the field. The DQI for these trip spikes is percentage recovery between	Trip Spikes and Trip Spike Controls were not analysed for volatiles. It is noted that, in relation to the nature of contamination at the Site based on field screening and analytical results, volatiles are not considered a key contaminant of concern and were not analysed. As such, this DQI is not applicable to the data set.	Yes

Detailed Site Investigation

Data Quality Indicator	Data Quality Indicators	Summary of Results	Compliance
	70% and 130%, which is generally consistent with AS4482.1-2005 for field duplicates.		
	All fieldwork including decontamination procedures to be undertaken in general accordance with Jacobs' Standard Operating Procedures (SOPs).	Due to the homogeneity of the soil sampled, the auger was not cleaned with a decontaminant between samples. Fresh nitrate gloves were used at each sample location and the auger brushed clean prior to each sample being taken.	Yes
	QAQC to be conducted in accordance with NEPM 1999 (2013 amendment).	-	Yes
	Sample handling, storage and transport to be in accordance with the requirements of NEPM 1999 (2013 amendment).	-	Yes
	Samples to be extracted and analysed within appropriate holding times.	-	Yes
	Samples to be transported under full chain of custody documentation (COC). The laboratory to return a copy of the signed COC acknowledging the receipt data and time and identity of samples included in the shipment.	-	Yes
	Include Laboratory Certificates of Analysis which detail any standard and non-standard methods used.	-	Yes
Rinsate	The rinsate should be collected from re-useable equipment that was used at multiple sampling locations and decontaminated in between samples. The rinsate should be collected from decontaminated equipment using laboratory supplied rinsate water and collection bottles. The DQI for the rinsate is below detection limits or low concentrations of contaminants of concern	Rinsates were not collected during the field campaign for several reasons, including the homogeneity of the soil sampled and the indication of organics/inorganics analysis as secondary to the radiological component of the analysis. Additionally, the low results of the soils analysis indicated that any contamination at the site is low and, notwithstanding the lack of rinsate samples, the results are acceptable.	No – non-conformance is not considered to impact the quality of the data assessment.

Detailed Site Investigation

Data Quality Indicator	Data Quality Indicators	Summary of Results	Compliance
Comparability	Samples to be collected in general accordance CH2M's SOPs and NEPM 1999 (2013 amendment). All field team members to be appropriately trained in these documents.	-	Yes
	Logs and field data to be recorded for each sample location noting any observed variations between conditions and signs of potential contamination.	-	Yes
	Primary samples to be stored, handled and transported under the same conditions and analysed by the same laboratory using consistent methods.	-	Yes
	DQIs to indicate acceptable Precision and Accuracy.	-	Yes
Completeness	Data from all critical samples to be considered valid.	-	Yes
	Overall dataset to be considered valid (>95% acceptable after data validation procedures).	Non-conformances listed above are not considered to have impacted the quality of the data assessment and the dataset is considered to be valid.	Yes

Although there were some minor non-conformances, the majority of the PARCCS indicators were within the specified DQIs and therefore, overall, it is considered that the data is of sufficient quality to meet the objectives of the assessment.

Laboratory RPDs

		Metals									Inorganics		
		Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Uranium	Zinc	% Moisture	Thorium	Total Solids
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%w/w	mg/kg	mg/kg
EQL		1	0.3	0.5	0.5	1	0.05	0.5	0.1	2	1	0.5	0
Field ID	**Date**												
N-30-B-200	**06-02-18**	2	<0.3	11	4.5	3	<0.05	3.8	0.1	11	7.3	2.1	
	26-02-18	2	<0.3	11	4.3	3	<0.05	3.8		10			
RPD		0	0	0	5	0	0	0		10			
N-30-C-200	**06-02-18**	2	0.3	11	3.7	3	<0.05	3.2	<0.1	9	6.6	1.8	
											5.9		940,000
RPD											11		
W-0-C-200	**06-02-18**	1	<0.3	12	5.1	4	<0.05	4.7	0.1	15	7.7	2.3	
											7.5		930,000
RPD											3		
W-0-E-200	**06-02-18**	3	0.4	15	8.6	15	<0.05	7.4	0.4	29	11.8	3.1	
	26-02-18	4	0.3	15	8.7	13	<0.05	7.0		29			
RPD		29	29	0	1	14	0	6		0			
W-10-F-200	**06-02-18**	1	<0.3	9.6	3.2	3	<0.05	2.9	<0.1	8	7.0	1.7	
	26-02-18	1	<0.3	11	3.4	3	<0.05	3.4		9			
RPD		0	0	14	6	0	0	16		12			
W-10-H-200	**06-02-18**	4	0.4	17	10	6	<0.05	8.3	0.3	24	15.6	3.8	
											14.9		850,000
RPD											5		
WG-0-A-10	**06-02-18**	<1	0.4	13	5.3	5	<0.05	4.7	<0.1	66	8.0	2.1	
	22-02-18	1	0.5	12	5.3	5	<0.05	4.3		79			
RPD		0	22	8	0	0	0	9		18			
WG-1-D-10	**06-02-18**	3	0.6	11	6.1	8	<0.05	5.0	1.2	97	8.4	2.4	
											9.0		910,000
RPD											7		
WG-1-D-200	**06-02-18**	1	<0.3	9.3	3.0	3	<0.05	2.4	1.5	12	9.2	2.9	
	22-02-18	1	<0.3	9.4	3.2	3	<0.05	2.4		12			
RPD		0	0	1	6	0	0	0		0			
S-0-A-200	**07-02-18**	6	<0.3	28	19	9	<0.05	16	0.6	46	20.0	7.5	
	26-02-18	6	0.4	28	19	9	<0.05	16		47			
RPD		0	29	0	0	0	0	0		2			
S-10-A-200	**07-02-18**	4	0.5	14	11	11	<0.05	7.9	0.2	110	9.2	3.1	
											8.8		910,000
RPD											4		
S-10-D-5	**07-02-18**	6	0.5	17	13	12	<0.05	11	0.5	34	13.7	3.6	
	26-02-18	4	0.4	15	11	12	<0.05	9.1		32			
RPD		40	22	12	17	0	0	19		6			
W-0-A-5	**07-02-18**	2	<0.3	11	5.0	4	<0.05	4.4	<0.1	15	7.0	2.3	
	26-02-18	2	<0.3	12	4.9	3	<0.05	4.5		15			
RPD		0	0	9	2	29	0	2		0			
W-10-A-5	**07-02-18**	1	<0.3	9.3	2.4	2	<0.05	2.4	<0.1	6	4.3	1.5	
											4.8		950,000
RPD											11		
W-10-B-5	**07-02-18**	2	<0.3	9.5	3.7	2	<0.05	3.0	<0.1	8	6.4	1.8	
											7.7		920,000
RPD											18		
E-0-B-200	**08-02-18**	2	<0.3	10	6.0	4	<0.05	4.4	0.2	45	7.0	1.8	
											7.7		920,000
RPD											10		
N-0-B-5	**08-02-18**	3	<0.3	12	7.3	14	<0.05	5.4	0.3	76	3.9	2.4	
	26-02-18	3	0.4	11	7.4	16	<0.05	5.5		90			
RPD		0	29	9	1	13	0	2		17			
N-10-B-200	**08-02-18**	6	0.6	25	18	8	<0.05	15	0.6	40	19.2	6.5	
											20.2		800,000
RPD											5		
N-10-C-200	**08-02-18**	9	0.5	25	18	9	<0.05	14	0.3	37	20.0	6.3	
	26-02-18	8	0.5	26	19	9	<0.05	15		40			
RPD		12	0	4	5	0	0	7		8			
E-10-A-200	**29-05-18**	5	1.1	15	14	6	<0.05	11	0.5	34	20.8	5.7	
		6	1.3	18	16	7	<0.05	12		39			
RPD		18	17	18	13	15	0	9		14			
E-10-B-200	**29-05-18**	7	1.3	17	15	7	<0.05	12	0.7	35	21.1	5.6	
											19.7		800,000
RPD											7		
E-30-A-5	**29-05-18**	6	<0.3	20	14	12	<0.05	15	0.5	42	9.3	5.1	
		6	<0.3	21	15	12	<0.05	14		43			
RPD		0	0	5	7	0	0	7		2			
S-30-B-200	**29-05-18**	4	<0.3	14	11	9	<0.05	8.3	0.3	90	7.2	3.4	
											7.2		930,000
RPD											0		
S-30-C-5	**29-05-18**	2	<0.3	7.1	6.6	9	<0.05	5.0	0.3	71	5.2	2.2	
		3	<0.3	8.0	6.5	13	<0.05	5.3		57			
RPD		40	0	12	2	36	0	6		22			
S-R-A-200	**29-05-18**	2	0.8	9.9	5.9	7	<0.05	4.8	0.2	18	7.2	2.3	
		2	0.7	8.2	5.2	6	<0.05	4.5		16			
RPD		0	13	19	13	15	0	6		12			
S-R-B-200	**29-05-18**	3	1.0	12	10	8	<0.05	8.1	0.3	50	6.7	3.6	
											7.0		930,000
RPD											4		
W-30-B-5	**29-05-18**	2	0.6	10	3.6	3	<0.05	3.3	<0.1	9	6.0	1.6	
											5.5		950,000
RPD											9		
		<1	0.4	9.1	3.0	2	<0.05	2.8		8			
RPD		67	40	9	18	40	0	16		12			
W-D-B-5	**29-05-18**	2	1.2	17	10	8	<0.05	7.8	0.2	34	5.8	4.0	
											4.9		950,000
RPD											17		
		2	1.4	19	11	9	<0.05	9.1		37			
RPD		0	15	11	10	12	0	15		8			
E-P-A-5	**30-05-18**	7	<0.3	28	20	10	<0.05	15	0.4	48	7.7	6.1	
											6.9		930,000
RPD											11		
E-P-D-200	**30-05-18**	4	0.6	15	12	17	<0.05	8.7	0.3	42	3.4	2.9	
		3	0.8	14	11	12	<0.05	7.7		38			
RPD		29	29	7	9	34	0	12		10			
N-P-B-200	**30-05-18**	10	<0.3	32	23	10	<0.05	18	0.9	55	14.8	7.0	
		9	<0.3	31	22	10	<0.05	18		57			
RPD		11	0	3	4	0	0	0		4			
W-P-A-5	**30-05-18**	3	<0.3	20	12	10	<0.05	9.9	0.2	44	6.5	4.1	
											5.6		940,000
RPD											15		
W-P-C-5	**30-05-18**	1	<0.3	22	14	14	<0.05	12	0.1	55	7.7	4.7	
							<0.05						
RPD							0						
		2	<0.3	23	14	12		13		59			
RPD		67	0	4	0	15		8		7			
W-P-E-200	**30-05-18**	13	<0.3	31	26	9	<0.05	17	0.4	52	13.3	6.3	
											13.2		870,000
RPD											1		

Laboratory Control and Reference Material Samples

Lab Report Number	Sample Type	Matrix Type	Field ID	Sampled Date/Time	Chem Name	Result	Method Name	Sample Code
PE123413	LCS	soil		20-02-18 10:05	Ethylbenzene	101	VOC's in Soil	PE123413_LB142555-0003477497
PE123413	LCS	soil		20-02-18 10:05	Xylene (m & p)	104	VOC's in Soil	PE123413_LB142555-0003477497
PE123413	LCS	soil		20-02-18 10:05	Toluene	98	VOC's in Soil	PE123413_LB142555-0003477497
PE123413	LCS	soil			Pyrene	106	SVOC in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil			Benzo(a) pyrene	93	SVOC in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil			Benz(a)anthracene	117	SVOC in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil		20-02-18 10:05	Benzene	99	VOC's in Soil	PE123413_LB142555-0003477497
PE123413	LCS	soil		20-02-18 10:05	Benzene	99	Volatile Petroleum Hydrocarbons in Soil	PE123413_LB142555-0003477497
PE123413	LCS	soil		22-02-18 14:39	Lead	98	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481325
PE123413	LCS	soil		26-02-18 11:43	Lead	92	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484535
PE123413	LCS	soil		26-02-18 11:50	Lead	101	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484571
PE123413	LCS	soil		26-02-18 11:55	Lead	99	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484602
PE123413	LCS	soil		26-02-18 11:58	Lead	100	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484653
PE123413	LCS	soil		26-02-18 11:58	Mercury	97	Mercury in Soil	PE123413_LB142803-0003484653
PE123413	LCS	soil		26-02-18 11:55	Mercury	102	Mercury in Soil	PE123413_LB142801-0003484602
PE123413	LCS	soil		26-02-18 11:50	Mercury	103	Mercury in Soil	PE123413_LB142800-0003484571
PE123413	LCS	soil		26-02-18 11:43	Mercury	99	Mercury in Soil	PE123413_LB142799-0003484535
PE123413	LCS	soil		22-02-18 14:39	Mercury	100	Mercury in Soil	PE123413_LB142699-0003481325
PE123413	LCS	soil		22-02-18 14:39	Nickel	101	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481325
PE123413	LCS	soil		26-02-18 11:43	Nickel	102	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484535
PE123413	LCS	soil		26-02-18 11:50	Nickel	108	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484571
PE123413	LCS	soil		26-02-18 11:55	Nickel	108	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484602
PE123413	LCS	soil		26-02-18 11:58	Nickel	104	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484653
PE123413	LCS	soil		26-02-18 11:58	Arsenic	97	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484653
PE123413	LCS	soil		26-02-18 11:55	Arsenic	107	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484602
PE123413	LCS	soil		26-02-18 11:50	Arsenic	104	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484571
PE123413	LCS	soil		26-02-18 11:43	Arsenic	100	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484535
PE123413	LCS	soil		22-02-18 14:39	Arsenic	103	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481325
PE123413	LCS	soil		22-02-18 14:39	Cadmium	96	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481325
PE123413	LCS	soil		26-02-18 11:43	Cadmium	94	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484535
PE123413	LCS	soil		26-02-18 11:50	Cadmium	103	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484571
PE123413	LCS	soil		26-02-18 11:55	Cadmium	102	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484602
PE123413	LCS	soil		26-02-18 11:58	Cadmium	99	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484653
PE123413	LCS	soil		26-02-18 11:58	Chromium (III+VI)	99	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484653
PE123413	LCS	soil		26-02-18 11:55	Chromium (III+VI)	100	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484602
PE123413	LCS	soil		26-02-18 11:50	Chromium (III+VI)	100	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484571
PE123413	LCS	soil		26-02-18 11:43	Chromium (III+VI)	97	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484535
PE123413	LCS	soil		22-02-18 14:39	Chromium (III+VI)	99	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481325
PE123413	LCS	soil		22-02-18 14:39	Copper	98	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481325
PE123413	LCS	soil		26-02-18 11:43	Copper	96	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484535
PE123413	LCS	soil		26-02-18 11:50	Copper	101	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484571
PE123413	LCS	soil		26-02-18 11:55	Copper	102	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484602
PE123413	LCS	soil		26-02-18 11:58	Copper	99	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484653
PE123413	LCS	soil		26-02-18 11:58	Zinc	95	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484653
PE123413	LCS	soil		26-02-18 11:55	Zinc	96	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484602
PE123413	LCS	soil		26-02-18 11:50	Zinc	97	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484571
PE123413	LCS	soil		26-02-18 11:43	Zinc	92	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484535
PE123413	LCS	soil		22-02-18 14:39	Zinc	95	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481325
PE123413	LCS	soil			Phenanthrene	97	SVOC in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil			Fluorene	103	SVOC in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil			Naphthalene	94	SVOC in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil		20-02-18 10:05	Xylene (o)	102	VOC's in Soil	PE123413_LB142555-0003477497
PE123413	LCS	soil			TPH C10 - C14	112	TRH (Total Recoverable Hydrocarbons) in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil			TRH >C10 - C16	112	TRH (Total Recoverable Hydrocarbons) in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil			TPH C15 - C28	100	TRH (Total Recoverable Hydrocarbons) in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil			TRH >C16 - C34	100	TRH (Total Recoverable Hydrocarbons) in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil			TPH C29-C36	100	TRH (Total Recoverable Hydrocarbons) in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil			TRH >C34 - C40	100	TRH (Total Recoverable Hydrocarbons) in Soil	PE123413_LB142557-0003477527
PE123413	LCS	soil		20-02-18 10:05	TPH C6 - C9	100	Volatile Petroleum Hydrocarbons in Soil	PE123413_LB142555-0003477497
PE126215	LCS	soil			Zinc	90	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598827
PE126215	LCS	soil			Zinc	84	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595466
PE126215	LCS	soil			Zinc	100	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003605154
PE126215	LCS	soil			Copper	79	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595409
PE126215	LCS	soil			Copper	91	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595441
PE126215	LCS	soil			Zinc	95	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595441
PE126215	LCS	soil			Zinc	86	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595409
PE126215	LCS	soil			Chromium (III+VI)	98	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598827
PE126215	LCS	soil			Chromium (III+VI)	84	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595466
PE126215	LCS	soil			Chromium (III+VI)	105	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003605154
PE126215	LCS	soil			Copper	105	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003605154
PE126215	LCS	soil			Copper	75	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595466
PE126215	LCS	soil			Copper	94	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598827
PE126215	LCS	soil			Cadmium	92	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595409
PE126215	LCS	soil			Cadmium	86	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595441
PE126215	LCS	soil			Chromium (III+VI)	126	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595441
PE126215	LCS	soil			Chromium (III+VI)	88	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595409
PE126215	LCS	soil			Arsenic	93	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598827
PE126215	LCS	soil			Arsenic	89	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595466
PE126215	LCS	soil			Arsenic	102	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003605154
PE126215	LCS	soil			Cadmium	107	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003605154
PE126215	LCS	soil			Cadmium	78	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595466
PE126215	LCS	soil			Cadmium	96	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598827
PE126215	LCS	soil			Nickel	96	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595409
PE126215	LCS	soil			Nickel	91	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595441
PE126215	LCS	soil			Arsenic	100	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595441
PE126215	LCS	soil			Arsenic	95	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595409
PE126215	LCS	soil			Mercury	95	Mercury in Soil	PE126215_LB146729-0003598827
PE126215	LCS	soil			Mercury	95	Mercury in Soil	PE126215_LB146621-0003595466
PE126215	LCS	soil			Mercury	100	Mercury in Soil	PE126215_LB146835-0003607579
PE126215	LCS	soil			Nickel	108	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003605154
PE126215	LCS	soil			Nickel	82	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595466
PE126215	LCS	soil			Nickel	103	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598827
PE126215	LCS	soil			Lead	95	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595409
PE126215	LCS	soil			Lead	94	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595441
PE126215	LCS	soil			Mercury	95	Mercury in Soil	PE126215_LB146620-0003595441
PE126215	LCS	soil			Mercury	93	Mercury in Soil	PE126215_LB146619-0003595409
PE126215	LCS	soil			Lead	104	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003605154
PE126215	LCS	soil			Lead	83	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595466
PE126215	LCS	soil			Lead	95	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598827

Method Blanks

		Metals								TRH - NEPM 2013 Fractions				
		Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	TRH >C6 - C10	TRH >C10 - C16	TRH >C16 - C34	TRH >C34 - C40	TRH >C6 - C10 less BTEX (F1)
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Field ID	**Date**													
		<1	<0.3	<0.5	<0.5	<1	<0.05	<0.5	<2					
		<1	<0.3	<0.5	<0.5	<1	<0.05	<0.5	<2					
		<1	<0.3	<0.5	<0.5	<1	<0.05	<0.5	<2					
		<1	<0.3	<0.5	<0.5	<1	<0.05	<0.5	<2					
		<1	<0.3	<0.5	<0.5	<1		<0.5	<2					
											<25	<90	<120	
	20-02-18									<25				<25
	22-02-18	<1	<0.3	<0.5	<0.5	<1	<0.05	<0.5	<2					
	26-02-18	<1	<0.3	<0.5	<0.5	<1	<0.05	<0.5	<2					
	26-02-18	<1	<0.3	<0.5	<0.5	<1	<0.05	<0.5	<2					
	26-02-18	<1	<0.3	<0.5	<0.5	<1	<0.05	<0.5	<2					
	26-02-18	<1	<0.3	<0.5	<0.5	<1	<0.05	<0.5	<2					

		TPH - NEPM 1999 Fractions				BTEXN					
		TPH C6 - C9	TPH C10 - C14	TPH C15 - C28	TPH C29-C36	Benzene	Ethylbenzene	Naphthalene	Toluene	Xylene (m & p)	Xylene (o)
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Field ID	**Date**										
			<20	<45	<45			<0.1			
	20-02-18	<20				<0.1	<0.1	<0.1	<0.1	<0.2	<0.1
	22-02-18										
	26-02-18										
	26-02-18										
	26-02-18										
	26-02-18										

		PAHs																			
		Benzo(a)pyrene Total Potency Equivalent	1-Methylnaphthalene	2-methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Carcinogenic PAHs (as B(a)P TPE)	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Carcinogenic PAHs (as B(a)P TPE, PEFx3)	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene
		TEQ (mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	TEQ (mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	TEQ (mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Field ID	**Date**																				
		<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1
	20-02-18																				
	22-02-18																				
	26-02-18																				
	26-02-18																				
	26-02-18																				
	26-02-18																				

Matrix Spikes

Lab Report Number	Sample Type	Matrix Type	Field ID	Sampled Date/Time	Chem Name	Result	Method Name	Sample Code
PE123413	MS	soil			Mercury	100	Mercury in Soil	PE123413_LB142800-0003484580
PE123413	MS_D	soil			Mercury	100	Mercury in Soil	PE123413_LB142800-0003484581
PE123413	MS_D	soil			Mercury	102	Mercury in Soil	PE123413_LB142801-0003488873
PE123413	MS	soil			Mercury	100	Mercury in Soil	PE123413_LB142801-0003488874
PE123413	MS_D	soil			Mercury	100	Mercury in Soil	PE123413_LB142699-0003481333
PE123413	MS	soil			Mercury	99	Mercury in Soil	PE123413_LB142699-0003481334
PE123413	MS	soil			Mercury	102	Mercury in Soil	PE123413_LB142799-0003484541
PE123413	MS_D	soil			Mercury	100	Mercury in Soil	PE123413_LB142799-0003484542
PE123413	MS	soil		26-02-18 11:52	Nickel	104	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484578
PE123413	MS	soil		26-02-18 11:57	Nickel	94	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484606
PE123413	MS_D	soil		26-02-18 11:52	Nickel	102	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484579
PE123413	MS_D	soil		26-02-18 11:45	Nickel	120	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484540
PE123413	MS	soil		26-02-18 11:45	Nickel	108	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484539
PE123413	MS_D	soil		22-02-18 14:40	Nickel	106	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481332
PE123413	MS	soil		22-02-18 14:40	Nickel	98	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481329
PE123413	MS_D	soil		26-02-18 11:57	Nickel	79	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484607
PE123413	MS	soil		26-02-18 12:00	Nickel	123	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484688
PE123413	MS_D	soil		26-02-18 11:59	Nickel	107	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484687
PE123413	MS_D	soil		26-02-18 11:59	Arsenic	99	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484687
PE123413	MS	soil		26-02-18 12:00	Arsenic	98	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484688
PE123413	MS_D	soil		26-02-18 11:57	Arsenic	83	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484607
PE123413	MS	soil		22-02-18 14:40	Arsenic	89	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481329
PE123413	MS_D	soil		22-02-18 14:40	Arsenic	103	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481332
PE123413	MS	soil		26-02-18 11:45	Arsenic	95	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484539
PE123413	MS_D	soil		26-02-18 11:45	Arsenic	102	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484540
PE123413	MS_D	soil		26-02-18 11:52	Arsenic	98	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484579
PE123413	MS	soil		26-02-18 11:57	Arsenic	93	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484606
PE123413	MS	soil		26-02-18 11:52	Arsenic	94	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484578
PE123413	MS	soil		26-02-18 11:52	Cadmium	98	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484578
PE123413	MS	soil		26-02-18 11:57	Cadmium	97	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484606
PE123413	MS_D	soil		26-02-18 11:52	Cadmium	98	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484579
PE123413	MS_D	soil		26-02-18 11:45	Cadmium	97	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484540
PE123413	MS	soil		26-02-18 11:45	Cadmium	93	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484539
PE123413	MS_D	soil		22-02-18 14:40	Cadmium	103	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481332
PE123413	MS	soil		22-02-18 14:40	Cadmium	92	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481329
PE123413	MS_D	soil		26-02-18 11:57	Cadmium	100	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484607
PE123413	MS	soil		26-02-18 12:00	Cadmium	97	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484688
PE123413	MS_D	soil		26-02-18 11:59	Cadmium	98	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484687
PE123413	MS_D	soil		26-02-18 11:59	Chromium (III+VI)	102	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484687
PE123413	MS	soil		26-02-18 12:00	Chromium (III+VI)	139	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484688
PE123413	MS_D	soil		26-02-18 11:57	Chromium (III+VI)	62	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484607
PE123413	MS	soil		22-02-18 14:40	Chromium (III+VI)	93	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481329
PE123413	MS_D	soil		22-02-18 14:40	Chromium (III+VI)	110	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481332
PE123413	MS	soil		26-02-18 11:45	Chromium (III+VI)	104	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484539
PE123413	MS_D	soil		26-02-18 11:45	Chromium (III+VI)	113	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484540
PE123413	MS_D	soil		26-02-18 11:52	Chromium (III+VI)	99	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484579
PE123413	MS	soil		26-02-18 11:57	Chromium (III+VI)	85	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484606
PE123413	MS	soil		26-02-18 11:52	Chromium (III+VI)	101	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484578
PE123413	MS	soil		26-02-18 11:52	Copper	105	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484578
PE123413	MS	soil		26-02-18 11:57	Copper	90	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484606
PE123413	MS_D	soil		26-02-18 11:52	Copper	103	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484579
PE123413	MS_D	soil		26-02-18 11:45	Copper	97	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484540
PE123413	MS	soil		26-02-18 11:45	Copper	88	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484539
PE123413	MS_D	soil		22-02-18 14:40	Copper	109	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481332
PE123413	MS	soil		22-02-18 14:40	Copper	95	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481329
PE123413	MS_D	soil		26-02-18 11:57	Copper	67	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484607
PE123413	MS	soil		26-02-18 12:00	Copper	103	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484688
PE123413	MS_D	soil		26-02-18 11:59	Copper	96	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484687
PE123413	MS	soil		22-02-18 14:40	Lead	97	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481329
PE123413	MS_D	soil		22-02-18 14:40	Lead	110	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481332
PE123413	MS	soil		26-02-18 11:45	Lead	97	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484539
PE123413	MS_D	soil		26-02-18 11:45	Lead	113	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484540
PE123413	MS	soil		26-02-18 11:52	Lead	92	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484578
PE123413	MS_D	soil		26-02-18 11:52	Lead	95	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484579
PE123413	MS	soil		26-02-18 11:57	Lead	89	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484606
PE123413	MS_D	soil		26-02-18 11:57	Lead	83	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484607
PE123413	MS_D	soil		26-02-18 11:59	Lead	96	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484687
PE123413	MS	soil		26-02-18 12:00	Lead	95	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484688
PE123413	MS_D	soil		26-02-18 11:59	Zinc	92	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484687
PE123413	MS	soil		26-02-18 12:00	Zinc	99	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142803-0003484688
PE123413	MS_D	soil		26-02-18 11:57	Zinc	20	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484607
PE123413	MS	soil		22-02-18 14:40	Zinc	145	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481329
PE123413	MS_D	soil		22-02-18 14:40	Zinc	198	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142699-0003481332
PE123413	MS	soil		26-02-18 11:45	Zinc	96	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484539
PE123413	MS_D	soil		26-02-18 11:45	Zinc	119	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142799-0003484540
PE123413	MS_D	soil		26-02-18 11:52	Zinc	101	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484579
PE123413	MS	soil		26-02-18 11:57	Zinc	77	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142801-0003484606
PE123413	MS	soil		26-02-18 11:52	Zinc	104	Total Recoverable Elements in Soil by ICPOES	PE123413_LB142800-0003484578
PE123413	MS	soil			Mercury	99	Mercury in Soil	PE123413_LB142803-0003484689
PE123413	MS_D	soil			Mercury	101	Mercury in Soil	PE123413_LB142803-0003484690
PE126215	MS	soil			Mercury	94	Mercury in Soil	PE126215_LB146619-0003595477
PE126215	MS_D	soil			Mercury	95	Mercury in Soil	PE126215_LB146619-0003595478
PE126215	MS	soil			Lead	99	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595470
PE126215	MS_D	soil			Lead	108	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595471
PE126215	MS_D	soil			Lead	89	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595484
PE126215	MS	soil			Lead	118	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595485
PE126215	MS_D	soil			Lead	92	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595729

PE126215	MS	soil	Lead	82	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595730
PE126215	MS_D	soil	Lead	108	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598852
PE126215	MS	soil	Lead	97	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598853
PE126215	MS	soil	Lead	104	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601650
PE126215	MS_D	soil	Lead	110	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601852
PE126215	MS_D	soil	Mercury	94	Mercury in Soil	PE126215_LB146729-0003598860
PE126215	MS	soil	Mercury	92	Mercury in Soil	PE126215_LB146729-0003598861
PE126215	MS_D	soil	Mercury	101	Mercury in Soil	PE126215_LB146835-0003601995
PE126215	MS	soil	Mercury	103	Mercury in Soil	PE126215_LB146835-0003601650
PE126215	MS_D	soil	Mercury	86	Mercury in Soil	PE126215_LB146620-0003595486
PE126215	MS	soil	Mercury	91	Mercury in Soil	PE126215_LB146620-0003595487
PE126215	MS_D	soil	Mercury	95	Mercury in Soil	PE126215_LB146621-0003595731
PE126215	MS	soil	Mercury	95	Mercury in Soil	PE126215_LB146621-0003595732
PE126215	MS_D	soil	Copper	95	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595484
PE126215	MS_D	soil	Copper	107	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595471
PE126215	MS	soil	Copper	97	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595470
PE126215	MS	soil	Copper	77	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595730
PE126215	MS_D	soil	Copper	93	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595729
PE126215	MS	soil	Copper	95	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595485
PE126215	MS	soil	Copper	114	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601650
PE126215	MS	soil	Copper	101	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598853
PE126215	MS_D	soil	Copper	110	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598852
PE126215	MS_D	soil	Copper	121	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601852
PE126215	MS_D	soil	Zinc	130	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601852
PE126215	MS_D	soil	Zinc	103	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598852
PE126215	MS	soil	Zinc	85	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598853
PE126215	MS	soil	Zinc	119	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601650
PE126215	MS	soil	Zinc	142	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595485
PE126215	MS_D	soil	Zinc	121	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595729
PE126215	MS	soil	Zinc	94	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595730
PE126215	MS	soil	Zinc	120	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595470
PE126215	MS_D	soil	Zinc	130	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595471
PE126215	MS_D	soil	Zinc	174	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595484
PE126215	MS_D	soil	Cadmium	82	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595484
PE126215	MS_D	soil	Cadmium	94	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595471
PE126215	MS	soil	Cadmium	95	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595470
PE126215	MS	soil	Cadmium	74	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595730
PE126215	MS_D	soil	Cadmium	84	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595729
PE126215	MS	soil	Cadmium	85	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595485
PE126215	MS	soil	Cadmium	107	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601650
PE126215	MS	soil	Cadmium	97	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598853
PE126215	MS_D	soil	Cadmium	104	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598852
PE126215	MS_D	soil	Cadmium	109	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601852
PE126215	MS_D	soil	Chromium (III+VI)	125	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601852
PE126215	MS_D	soil	Chromium (III+VI)	116	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598852
PE126215	MS	soil	Chromium (III+VI)	106	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598853
PE126215	MS	soil	Chromium (III+VI)	116	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601650
PE126215	MS	soil	Chromium (III+VI)	102	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595485
PE126215	MS_D	soil	Chromium (III+VI)	98	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595729
PE126215	MS	soil	Chromium (III+VI)	82	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595730
PE126215	MS	soil	Chromium (III+VI)	105	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595470
PE126215	MS_D	soil	Chromium (III+VI)	112	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595471
PE126215	MS_D	soil	Chromium (III+VI)	92	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595484
PE126215	MS_D	soil	Nickel	85	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595484
PE126215	MS_D	soil	Nickel	120	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595471
PE126215	MS	soil	Nickel	117	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595470
PE126215	MS	soil	Nickel	78	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595730
PE126215	MS_D	soil	Nickel	94	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595729
PE126215	MS	soil	Nickel	85	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595485
PE126215	MS	soil	Nickel	111	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601650
PE126215	MS	soil	Nickel	107	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598853
PE126215	MS_D	soil	Nickel	114	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598852
PE126215	MS_D	soil	Nickel	118	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601852
PE126215	MS_D	soil	Arsenic	100	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601852
PE126215	MS_D	soil	Arsenic	99	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598852
PE126215	MS	soil	Arsenic	89	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146729-0003598853
PE126215	MS	soil	Arsenic	98	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146835-0003601650
PE126215	MS	soil	Arsenic	95	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595485
PE126215	MS_D	soil	Arsenic	78	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595729
PE126215	MS	soil	Arsenic	72	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146621-0003595730
PE126215	MS	soil	Arsenic	101	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595470
PE126215	MS_D	soil	Arsenic	102	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146619-0003595471
PE126215	MS_D	soil	Arsenic	97	Total Recoverable Elements in Soil by ICPOES	PE126215_LB146620-0003595484

Laboratory Surrogates

Lab Report Number	Sample Type	Matrix Type	Field ID	Depth	Sampled Date/Time	Compound	Result	LCL	UCL	Conforming	Lab Qualifier	Lab Comments
PE123413	LCS	soil			20/02/2018 10:05:00 AM	d4-1,2-dichloroethane (Surrogate)	110			NA		
PE123413	LCS	soil			20/02/2018 10:05:00 AM	d4-1,2-dichloroethane (Surrogate)	110			NA		
PE123413	LCS	soil			20/02/2018 10:05:00 AM	Dibromofluoromethane (Surrogate)	108			NA		
PE123413	LCS	soil			20/02/2018 10:05:00 AM	Dibromofluoromethane (Surrogate)	108			NA		
PE123413	LCS	soil			20/02/2018 10:05:00 AM	d8-toluene (Surrogate)	106			NA		
PE123413	LCS	soil			20/02/2018 10:05:00 AM	d8-toluene (Surrogate)	106			NA		
PE123413	LCS	soil			20/02/2018 10:05:00 AM	Bromofluorobenzene (Surrogate)	105			NA		
PE123413	LCS	soil			20/02/2018 10:05:00 AM	Bromofluorobenzene (Surrogate)	105			NA		
PE123413	MB	soil			20/02/2018 10:05:00 AM	d4-1,2-dichloroethane (Surrogate)	103			NA		
PE123413	MB	soil			20/02/2018 10:05:00 AM	d4-1,2-dichloroethane (Surrogate)	103			NA		
PE123413	MB	soil			20/02/2018 10:05:00 AM	Dibromofluoromethane (Surrogate)	104			NA		
PE123413	MB	soil			20/02/2018 10:05:00 AM	Dibromofluoromethane (Surrogate)	104			NA		
PE123413	MB	soil			20/02/2018 10:05:00 AM	d8-toluene (Surrogate)	95			NA		
PE123413	MB	soil			20/02/2018 10:05:00 AM	d8-toluene (Surrogate)	95			NA		
PE123413	MB	soil			20/02/2018 10:05:00 AM	Bromofluorobenzene (Surrogate)	89			NA		
PE123413	MB	soil			20/02/2018 10:05:00 AM	Bromofluorobenzene (Surrogate)	89			NA		
PE123413	LCS	soil				2-fluorobiphenyl (Surrogate)	90			NA		
PE123413	LCS	soil				d5-nitrobenzene (Surrogate)	94			NA		
PE123413	LCS	soil				d14-p-terphenyl (Surrogate)	124			NA		
PE123413	MB	soil				2-fluorobiphenyl (Surrogate)	90			NA		
PE123413	MB	soil				d5-nitrobenzene (Surrogate)	90			NA		
PE123413	MB	soil				d14-p-terphenyl (Surrogate)	124			NA		
PE123413	Normal	soil	Composite 01		6/02/2018	d4-1,2-dichloroethane (Surrogate)	64			NA		
PE123413	Normal	soil	Composite 01		6/02/2018	d4-1,2-dichloroethane (Surrogate)	64			NA		
PE123413	Normal	soil	Composite 01		6/02/2018	Dibromofluoromethane (Surrogate)	74			NA		
PE123413	Normal	soil	Composite 01		6/02/2018	Dibromofluoromethane (Surrogate)	74			NA		
PE123413	Normal	soil	Composite 01		6/02/2018	d8-toluene (Surrogate)	104			NA		
PE123413	Normal	soil	Composite 01		6/02/2018	d8-toluene (Surrogate)	104			NA		
PE123413	Normal	soil	Composite 01		6/02/2018	2-fluorobiphenyl (Surrogate)	90			NA		
PE123413	Normal	soil	Composite 01		6/02/2018	d5-nitrobenzene (Surrogate)	96			NA		
PE123413	Normal	soil	Composite 01		6/02/2018	Bromofluorobenzene (Surrogate)	78			NA		
PE123413	Normal	soil	Composite 01		6/02/2018	Bromofluorobenzene (Surrogate)	78			NA		
PE123413	Normal	soil	Composite 01		6/02/2018	d14-p-terphenyl (Surrogate)	126			NA		
PE123413	Normal	soil	Composite 02		6/02/2018	d4-1,2-dichloroethane (Surrogate)	108			NA		
PE123413	Normal	soil	Composite 02		6/02/2018	d4-1,2-dichloroethane (Surrogate)	108			NA		
PE123413	Normal	soil	Composite 02		6/02/2018	Dibromofluoromethane (Surrogate)	103			NA		
PE123413	Normal	soil	Composite 02		6/02/2018	Dibromofluoromethane (Surrogate)	103			NA		
PE123413	Normal	soil	Composite 02		6/02/2018	d8-toluene (Surrogate)	103			NA		
PE123413	Normal	soil	Composite 02		6/02/2018	d8-toluene (Surrogate)	103			NA		
PE123413	Normal	soil	Composite 02		6/02/2018	2-fluorobiphenyl (Surrogate)	92			NA		
PE123413	Normal	soil	Composite 02		6/02/2018	d5-nitrobenzene (Surrogate)	94			NA		
PE123413	Normal	soil	Composite 02		6/02/2018	Bromofluorobenzene (Surrogate)	103			NA		
PE123413	Normal	soil	Composite 02		6/02/2018	Bromofluorobenzene (Surrogate)	103			NA		
PE123413	Normal	soil	Composite 02		6/02/2018	d14-p-terphenyl (Surrogate)	128			NA		
PE123413	Normal	soil	Composite 03		6/02/2018	d4-1,2-dichloroethane (Surrogate)	113			NA		
PE123413	Normal	soil	Composite 03		6/02/2018	d4-1,2-dichloroethane (Surrogate)	113			NA		
PE123413	Normal	soil	Composite 03		6/02/2018	Dibromofluoromethane (Surrogate)	107			NA		
PE123413	Normal	soil	Composite 03		6/02/2018	Dibromofluoromethane (Surrogate)	107			NA		
PE123413	Normal	soil	Composite 03		6/02/2018	d8-toluene (Surrogate)	111			NA		
PE123413	Normal	soil	Composite 03		6/02/2018	d8-toluene (Surrogate)	111			NA		
PE123413	Normal	soil	Composite 03		6/02/2018	2-fluorobiphenyl (Surrogate)	92			NA		
PE123413	Normal	soil	Composite 03		6/02/2018	d5-nitrobenzene (Surrogate)	96			NA		
PE123413	Normal	soil	Composite 03		6/02/2018	Bromofluorobenzene (Surrogate)	114			NA		
PE123413	Normal	soil	Composite 03		6/02/2018	Bromofluorobenzene (Surrogate)	114			NA		
PE123413	Normal	soil	Composite 03		6/02/2018	d14-p-terphenyl (Surrogate)	128			NA		
PE123413	Normal	soil	Composite 04		6/02/2018	d4-1,2-dichloroethane (Surrogate)	103			NA		
PE123413	Normal	soil	Composite 04		6/02/2018	d4-1,2-dichloroethane (Surrogate)	103			NA		
PE123413	Normal	soil	Composite 04		6/02/2018	Dibromofluoromethane (Surrogate)	99			NA		
PE123413	Normal	soil	Composite 04		6/02/2018	Dibromofluoromethane (Surrogate)	99			NA		
PE123413	Normal	soil	Composite 04		6/02/2018	d8-toluene (Surrogate)	104			NA		
PE123413	Normal	soil	Composite 04		6/02/2018	d8-toluene (Surrogate)	104			NA		
PE123413	Normal	soil	Composite 04		6/02/2018	2-fluorobiphenyl (Surrogate)	92			NA		
PE123413	Normal	soil	Composite 04		6/02/2018	d5-nitrobenzene (Surrogate)	90			NA		
PE123413	Normal	soil	Composite 04		6/02/2018	Bromofluorobenzene (Surrogate)	106			NA		
PE123413	Normal	soil	Composite 04		6/02/2018	Bromofluorobenzene (Surrogate)	106			NA		
PE123413	Normal	soil	Composite 04		6/02/2018	d14-p-terphenyl (Surrogate)	126			NA		

Appendix J – Comparison of Soil Samples vs. EPA Waste Criteria

Appendix J

Comparison of Chemistry Results against South Australian EPA Waste Criteria

Samples Representing Soil going to Woomera West Landfill				Field ID	Composite 01	Composite 02	Composite 03	Composite 04	N-0-A-5	N-0-A-200	N-0-B-5	N-0-B-200	N-10-A-5	N-10-A-200
				Date	6/02/2018	6/02/2018	6/02/2018	6/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018
			South Australian EPA, Criteria for the classification of waste											
Classification	**Unit**	**LOR**	**Intermediate Waste**	**Waste Fill**										
% Moisture	**%w/w**	1			4.3	6.1	6.2	6.1	3.4	7.1	3.9	3.9	7.3	9.1
Arsenic	**mg/kg**	1	**200**	20	2	1	2	2	4	4	3	3	2	2
Cadmium	**mg/kg**	0.3	**30**	3	0.8	0.3	<0.3	<0.3	0.3	<0.3	<0.3	0.3	<0.3	<0.3
Chromium (III+VI)	**mg/kg**	0.5			8.6	9.9	10	10	14	15	12	12	11	12
Copper	**mg/kg**	0.5	**2,000**	60	7.2	4.1	4.4	4.3	10	9.6	7.3	7.4	4.4	5.8
Lead	**mg/kg**	1	**1,200**	300	13	4	6	3	12	7	14	15	3	3
Mercury	**mg/kg**	0.05	**30**	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**600**	60	5	3.8	4.4	4	7.3	7.5	5.4	5.2	3.7	4.8
Zinc	**mg/kg**	2	**14,000**	200	**240**	16	34	11	69	38	76	70	10	13
PAH (Total)	**mg/kg**		**40**	5	<LOR	<LOR	<LOR	<LOR						
TRH C10-C14	**mg/kg**	20			48	52	29	21						
TRH C15-C28	**mg/kg**	45			520	320	260	170						
TRH C29-C36	**mg/kg**	45			1900	810	920	400						
TPH > C9 (Adding TRH C10 - C36)	**mg/kg**		**1,000**	1,000	**2468**	**1182**	**1209**	591						

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix J

Comparison of Chemistry Results against South Australian EPA Waste Criteria

Samples Representing Soil going to Woomera West Landfill				Field ID	N-10-B-5	N-10-B-200	N-10-C-5	N-10-C-200	N-10-D-5	N-10-D-200	N-30-A-5	N-30-A-200	N-30-B-5	N-30-B-200
				Date	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	8/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018
			South Australian EPA, Criteria for the classification of waste											
Classification	**Unit**	**LOR**	**Intermediate Waste**	**Waste Fill**										
% Moisture	**%w/w**	1			7.9	19.2	12.2	20	16.9	17.6	5.5	9.4	6.3	7.3
Arsenic	**mg/kg**	1	**200**	20	2	6	3	9	7	7	2	3	2	2
Cadmium	**mg/kg**	0.3	**30**	3	<0.3	0.6	0.4	0.5	0.5	0.4	<0.3	0.4	<0.3	<0.3
Chromium (III+VI)	**mg/kg**	0.5			11	25	14	25	24	25	10	14	11	11
Copper	**mg/kg**	0.5	**2,000**	60	4.5	18	7.3	18	17	18	3.5	7.2	4.6	4.5
Lead	**mg/kg**	1	**1,200**	300	3	8	5	9	8	8	3	4	3	3
Mercury	**mg/kg**	0.05	**30**	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**600**	60	3.8	15	6.2	14	13	14	3	5.9	3.7	3.8
Zinc	**mg/kg**	2	**14,000**	200	10	40	16	37	36	38	9	17	11	11
PAH (Total)	**mg/kg**		**40**	5										
TRH C10-C14	**mg/kg**	20												
TRH C15-C28	**mg/kg**	45												
TRH C29-C36	**mg/kg**	45												
TPH > C9 (Adding TRH C10 - C36)	**mg/kg**		**1,000**	1,000										

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix J

Comparison of Chemistry Results against South Australian EPA Waste Criteria

Samples Representing Soil going to Woomera West Landfill				Field ID	N-30-C-5	N-30-C-200	N-30-D-5	N-30-D-200	S-0-A-5	S-0-A-200	S-10-A-5	S-10-A-200	S-10-B-5	S-10-B-200
				Date	6/02/2018	6/02/2018	7/02/2018	6/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018
			South Australian EPA, Criteria for the classification of waste											
Classification	**Unit**	**LOR**	**Intermediate Waste**	**Waste Fill**										
% Moisture	**%w/w**	1			6	6.6	2.7	19.8	13.9	20	13.3	9.2	13.9	18.3
Arsenic	**mg/kg**	1	**200**	20	1	2	2	6	4	6	4	4	5	6
Cadmium	**mg/kg**	0.3	**30**	3	<0.3	0.3	<0.3	0.7	<0.3	<0.3	0.6	0.5	<0.3	<0.3
Chromium (III+VI)	**mg/kg**	0.5			11	11	9.7	29	7.8	28	17	14	13	21
Copper	**mg/kg**	0.5	**2,000**	60	4.3	3.7	4.2	19	10	19	14	11	13	19
Lead	**mg/kg**	1	**1,200**	300	3	3	3	8	3	9	16	11	5	11
Mercury	**mg/kg**	0.05	**30**	1	<0.05	<0.05	<0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**600**	60	3.9	3.2	3.5	16	7.6	16	9.8	7.9	11	12
Zinc	**mg/kg**	2	**14,000**	200	11	9	12	45	11	46	160	110	23	47
PAH (Total)	**mg/kg**		**40**	5										
TRH C10-C14	**mg/kg**	20												
TRH C15-C28	**mg/kg**	45												
TRH C29-C36	**mg/kg**	45												
TPH > C9 (Adding TRH C10 - C36)	**mg/kg**		**1,000**	1,000										

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix J

Comparison of Chemistry Results against South Australian EPA Waste Criteria

Samples Representing Soil going to Woomera West Landfill				Field ID	S-10-C-5	S-10-C-200	S-10-D-5	S-10-D-200	W-0-A-5	W-0-A-200	W-0-B-5	W-0-B-200	W-0-C-5	W-0-C-200
				Date	7/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018
			South Australian EPA, Criteria for the classification of waste											
Classification	**Unit**	**LOR**	**Intermediate Waste**	**Waste Fill**										
% Moisture	**%w/w**	1			12.7	13.5	13.7	20.5	7	5.8	8.6	6.7	7	7.7
Arsenic	**mg/kg**	1	**200**	20	4	4	6	6	2	1	2	1	1	1
Cadmium	**mg/kg**	0.3	**30**	3	<0.3	<0.3	0.5	0.5	<0.3	<0.3	0.5	<0.3	0.3	<0.3
Chromium (III+VI)	**mg/kg**	0.5			9.1	9.3	17	28	11	9.4	13	10	13	12
Copper	**mg/kg**	0.5	**2,000**	60	10	11	13	20	5	6.9	5.7	3.5	5.4	5.1
Lead	**mg/kg**	1	**1,200**	300	3	3	12	9	4	3	4	3	4	4
Mercury	**mg/kg**	0.05	**30**	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**600**	60	9.3	9.4	11	16	4.4	3	5.1	3.1	4.9	4.7
Zinc	**mg/kg**	2	**14,000**	200	12	12	34	45	15	11	16	10	16	15
PAH (Total)	**mg/kg**		**40**	5										
TRH C10-C14	**mg/kg**	20												
TRH C15-C28	**mg/kg**	45												
TRH C29-C36	**mg/kg**	45												
TPH > C9 (Adding TRH C10 - C36)	**mg/kg**		**1,000**	1,000										

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix J

Comparison of Chemistry Results against South Australian EPA Waste Criteria

Samples Representing Soil going to Woomera West Landfill				Field ID	W-0-D-5	W-0-D-200	W-0-E-5	W-0-E-200	W-10-A-5	W-10-A-200	W-10-B-5	W-10-B-200	W-10-E-5	W-10-E-200
				Date	6/02/2018	6/02/2018	6/02/2018	6/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018	6/02/2018	6/02/2018
			South Australian EPA, Criteria for the classification of waste											
Classification	**Unit**	**LOR**	**Intermediate Waste**	**Waste Fill**										
% Moisture	%w/w	1			8.1	7.6	8.1	11.8	4.3	5.2	6.4	13.3	6.9	7.8
Arsenic	mg/kg	1	**200**	20	2	1	2	3	1	2	2	5	<1	2
Cadmium	mg/kg	0.3	**30**	3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium (III+VI)	mg/kg	0.5			12	11	12	15	9.3	10	9.5	19	10	16
Copper	mg/kg	0.5	**2,000**	60	5.6	4.4	5.8	8.6	2.4	4.5	3.7	13	2.8	5.1
Lead	mg/kg	1	**1,200**	300	4	4	9	15	2	3	2	6	3	3
Mercury	mg/kg	0.05	**30**	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg	0.5	**600**	60	5.2	4.1	5.4	7.4	2.4	3.5	3	9.9	2.6	6.3
Zinc	mg/kg	2	**14,000**	200	14	12	31	29	6	10	8	28	7	13
PAH (Total)	mg/kg		**40**	5										
TRH C10-C14	mg/kg	20												
TRH C15-C28	mg/kg	45												
TRH C29-C36	mg/kg	45												
TPH > C9 (Adding TRH C10 - C36)	mg/kg		**1,000**	1,000										

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix J

Comparison of Chemistry Results against South Australian EPA Waste Criteria

Samples Representing Soil going to Woomera West Landfill				Field ID	W-10-F-5	W-10-F-200	W-10-G-5	W-10-G-200	W-10-H-5	W-10-H-200	WG-0-A-10	WG-0-A-200	WG-0-B-10	WG-0-C-10
				Date	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018
			South Australian EPA, Criteria for the classification of waste											
Classification	**Unit**	**LOR**	**Intermediate Waste**	**Waste Fill**										
% Moisture	**%w/w**	1			6.2	7	8.4	6.7	2	15.6	8	8.4	10.1	9
Arsenic	**mg/kg**	1	**200**	20	1	1	2	<1	2	4	<1	2	2	1
Cadmium	**mg/kg**	0.3	**30**	3	<0.3	<0.3	<0.3	<0.3	0.3	0.4	0.4	0.4	0.9	<0.3
Chromium (III+VI)	**mg/kg**	0.5			8.5	9.6	10	8.8	5.4	17	13	12	13	11
Copper	**mg/kg**	0.5	**2,000**	60	2.3	3.2	3.8	2.6	8.4	10	5.3	5	7.6	4.8
Lead	**mg/kg**	1	**1,200**	300	2	3	3	3	7	6	5	5	15	4
Mercury	**mg/kg**	0.05	**30**	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**600**	60	2.4	2.9	3.2	4.4	5.5	8.3	4.7	4.3	5.6	3.9
Zinc	**mg/kg**	2	**14,000**	200	6	8	9	7	63	24	66	68	**380**	24
PAH (Total)	**mg/kg**		**40**	5										
TRH C10-C14	**mg/kg**	20												
TRH C15-C28	**mg/kg**	45												
TRH C29-C36	**mg/kg**	45												
TPH > C9 (Adding TRH C10 - C36)	**mg/kg**		**1,000**	1,000										

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix J

Comparison of Chemistry Results against South Australian EPA Waste Criteria

Samples Representing Soil going to Woomera West Landfill				Field ID	WG-0-C-200	WG-0-E-10	WG-0-E-200	WG-1-B-10	WG-1-B-200	WG-1-D-10	WG-1-D-200	WG-2-A-10	WG-2-A-200	WG-2-C-10
				Date	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018	6/02/2018
			South Australian EPA, Criteria for the classification of waste											
Classification	Unit	LOR	Intermediate Waste	Waste Fill										
% Moisture	%w/w	1			8	8.4	23.8	9.3	10	8.4	9.2	6.2	7.5	6.3
Arsenic	mg/kg	1	200	20	2	1	6	2	2	3	1	2	1	4
Cadmium	mg/kg	0.3	30	3	0.6	0.3	0.6	<0.3	<0.3	0.6	<0.3	<0.3	<0.3	0.4
Chromium (III+VI)	mg/kg	0.5			10	11	27	11	11	11	9.3	9.9	9	17
Copper	mg/kg	0.5	2,000	60	5.3	5.1	18	5.4	4.9	6.1	3	5	2.6	11
Lead	mg/kg	1	1,200	300	16	4	9	4	4	8	3	4	3	9
Mercury	mg/kg	0.05	30	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	mg/kg	0.5	600	60	4.6	4.2	14	4.4	4	5	2.4	4.3	2.3	8.5
Zinc	mg/kg	2	14,000	200	170	40	49	20	14	97	12	19	6	29
PAH (Total)	mg/kg		40	5										
TRH C10-C14	mg/kg	20												
TRH C15-C28	mg/kg	45												
TRH C29-C36	mg/kg	45												
TPH > C9 (Adding TRH C10 - C36)	mg/kg		1,000	1,000										

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix J

Comparison of Chemistry Results against South Australian EPA Waste Criteria

Samples Representing Soil going to Woomera West Landfill				Field ID	WG-2-C-200	WG-2-E-10	WG-2-E-200	WG-3-B-10	WG-3-B-200	WG-3-D-10	WG-3-D-200
				Date	6/02/2018	6/02/2018	6/02/2018	7/02/2018	7/02/2018	7/02/2018	7/02/2018
			South Australian EPA, Criteria for the classification of waste								
Classification	**Unit**	**LOR**	**Intermediate Waste**	**Waste Fill**							
% Moisture	**%w/w**	1			10.2	8.5	7.4	7	6.5	4	7.2
Arsenic	**mg/kg**	1	**200**	20	2	2	1	1	3	<1	1
Cadmium	**mg/kg**	0.3	**30**	3	<0.3	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium (III+VI)	**mg/kg**	0.5			11	12	9.4	10	13	9	10
Copper	**mg/kg**	0.5	**2,000**	60	4.3	5.2	2.9	3.6	7	2.7	4.1
Lead	**mg/kg**	1	**1,200**	300	3	4	3	3	4	2	2
Mercury	**mg/kg**	0.05	**30**	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	**mg/kg**	0.5	**600**	60	3.2	4.5	2.4	3.1	5.7	2.3	3.3
Zinc	**mg/kg**	2	**14,000**	200	10	13	7	9	16	6	9
PAH (Total)	**mg/kg**		**40**	5							
TRH C10-C14	**mg/kg**	20									
TRH C15-C28	**mg/kg**	45									
TRH C29-C36	**mg/kg**	45									
TPH > C9 (Adding TRH C10 - C36)	**mg/kg**		**1,000**	1,000							

Laboratory Analytical Results above
Screening Criteria are in
Bolt Font and High-lighted

Appendix J

1	UCL Statistics for Uncensored Full Data Sets			
2				
3	User Selected Options			
4	Date/Time of Computation	ProUCL 5.114-Aug-18 8:48:01 AM		
5	From File	WorkSheet.xls		
6	Full Precision	OFF		
7	Confidence Coefficient	95%		
8	Number of Bootstrap Operations	2000		
9				
10				
11	Zinc			
12				
13	General Statistics			
14	Total Number of Observations	77	Number of Distinct Observations	40
15			Number of Missing Observations	0
16	Minimum	6	Mean	36.38
17	Maximum	380	Median	16
18	SD	55.95	Std. Error of Mean	6.376
19	Coefficient of Variation	1.538	Skewness	4.118
20				
21	Normal GOF Test			
22	Shapiro Wilk Test Statistic	0.54	Shapiro Wilk GOF Test	
23	5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
24	Lilliefors Test Statistic	0.294	Lilliefors GOF Test	
25	5% Lilliefors Critical Value	0.101	Data Not Normal at 5% Significance Level	
26	Data Not Normal at 5% Significance Level			
27				
28	Assuming Normal Distribution			
29	95% Normal UCL		95% UCLs (Adjusted for Skewness)	
30	95% Student's-t UCL	46.99	95% Adjusted-CLT UCL (Chen-1995)	50.06
31			95% Modified-t UCL (Johnson-1978)	47.49
32				
33	Gamma GOF Test			
34	A-D Test Statistic	4.133	Anderson-Darling Gamma GOF Test	
35	5% A-D Critical Value	0.78	Data Not Gamma Distributed at 5% Significance Level	
36	K-S Test Statistic	0.2	Kolmogorov-Smirnov Gamma GOF Test	
37	5% K-S Critical Value	0.105	Data Not Gamma Distributed at 5% Significance Level	
38	Data Not Gamma Distributed at 5% Significance Level			
39				
40	Gamma Statistics			
41	k hat (MLE)	1.055	k star (bias corrected MLE)	1.022
42	Theta hat (MLE)	34.49	Theta star (bias corrected MLE)	35.59
43	nu hat (MLE)	162.4	nu star (bias corrected)	157.4
44	MLE Mean (bias corrected)	36.38	MLE Sd (bias corrected)	35.98
45			Approximate Chi Square Value (0.05)	129.4
46	Adjusted Level of Significance	0.0469	Adjusted Chi Square Value	128.9
47				
48	Assuming Gamma Distribution			
49	95% Approximate Gamma UCL (use when n>=50))	44.25	95% Adjusted Gamma UCL (use when n<50)	44.41
50				

Appendix J

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52					Shapiro Wilk Test Statistic	0.915	**Shapiro Wilk Lognormal GOF Test**					
53					5% Shapiro Wilk P Value	2.0551E-5	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.162	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.101	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	1.792					Mean of logged Data	3.05
60					Maximum of Logged Data	5.94					SD of logged Data	0.935
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	41.37					90% Chebyshev (MVUE) UCL	44.55
64					95% Chebyshev (MVUE) UCL	50.05					97.5% Chebyshev (MVUE) UCL	57.68
65					99% Chebyshev (MVUE) UCL	72.66						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data do not follow a Discernible Distribution (0.05)**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	46.86					95% Jackknife UCL	46.99
72					95% Standard Bootstrap UCL	46.67					95% Bootstrap-t UCL	54.32
73					95% Hall's Bootstrap UCL	59.07					95% Percentile Bootstrap UCL	47.12
74					95% BCA Bootstrap UCL	51.51						
75					90% Chebyshev(Mean, Sd) UCL	55.5					95% Chebyshev(Mean, Sd) UCL	64.17
76					97.5% Chebyshev(Mean, Sd) UCL	76.19					99% Chebyshev(Mean, Sd) UCL	99.82
77												
78	**Suggested UCL to Use**											
79					95% Chebyshev (Mean, Sd) UCL	64.17						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												