REMEDIAL ACTION PLAN

HORNBY LIGHTHOUSE, WATSONS BAY NSW 2030

PREPARED FOR THE
PORT AUTHORITY OF NEW SOUTH WALES
REPORT ID: E24017WB-R02F

Date: 3rd December 2024
Revision No.: 0

Client:
Port Authority of New South Wales
Level 4, 20 Windmill Street
Walsh Bay NSW 2000
Attention: Sam Isaacs
Email: sisaacs@portauthority.nsw.com.au

Author: S. McCormack (B.E – civil, hons) – CEnvP (#928), MIEAust, NER (geotechnical & environmental) (Contaminated Land Specialist No. SC40929)
Field Engineer/Scientist: S. McCormack

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

1 PROJECT INFORMATION

1.1 INTRODUCTION

Geo-Environmental Engineering Pty Ltd (GEE) was commissioned by Port Authority of New South Wales (NSW) to prepare this Remedial Action Plan (RAP) associated with the Hornby Lighthouse which is located at the northern end of the South Headland peninsula within the suburb of Watsons Bay NSW. A location map is provided for reference as **Figure 1**.

This RAP is based on information contained within a preliminary and detailed site (contamination) investigation report that was completed by GEE in October 2024 (reference 1) and relates to soil material surrounding the Lighthouse which was found to contain concentrations of metals (lead, copper and zinc) and to a lesser extent Total Recoverable Hydrocarbons (TRH), which could pose an unacceptable risk to current and future users of the site.

The investigation area for the preliminary and detailed site investigation covered an area of approximately 700m^2 and included readily accessible land around the Lighthouse which is partly within Lot 415 in Deposited Plan (DP) 752011 (in which the Lighthouse itself is located) and Part of the adjoining Lot 1 in DP605078. This investigation area is depicted in **Figure 2**. And is also herein referred to as the 'Site'.

The RAP was required to support the preparation of a Review of Environmental Factors (REF) under Part 5, Division 5.1, of the Environmental Planning and Assessment Act 1979 (NSW).

This RAP addresses the requirements for remediation and validation to ensure that the site will be suitable for the proposed use at the completion of the remedial works described in this RAP. The remediation strategy adopted in this RAP is the off-site removal and disposal of the contaminated soil followed by validation of the remaining surface.

Finally, the RAP has been prepared in accordance with the Contaminated Land Management Act 1997 (NSW) and its associated guidelines endorsed by the NSW Environment Protection Authority (EPA), including the NSW Environment Protection Authority (NSW EPA, 2020) NSW Environment Protection Authority (NSW EPA) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*

(reference 2) and NEPM (2013) Schedule B(2) *Guideline on Site Characterisation* (reference 3).

1.2 OBJECTIVES

The objectives of this RAP are to:

- ◊ Define the remedial goals that will ensure that the remediated site will be suitable for ongoing use of the site,
- ◊ Document the remediation strategy and describe the remediation procedures to be implemented to reduce the contamination risk to an acceptable level for the land-use, including requirements for validating the remedial works,
- ◊ Establish the necessary environmental management procedures to be implemented during the proposed remedial works, and
- ◊ Identify any regulatory approvals or licences required by the proposed works.

1.3 SCOPE OF WORKS

The scope of this RAP is as follows:

1. Provide an updated Conceptual Site Model for the site,
2. Definition of remediation goals and Remediation Acceptance Criteria (RAC),
3. Evaluate the feasible remediation strategies and options,
4. Detail the preferred remediation option for the site,
5. Preparation of a validation plan to ensure that the RAC are achieved,
6. Preparation of a preliminary Workplace Health & Safety (WHS) plan to minimise the risk of human exposure to contaminants, and
7. Preparation of an environmental management plan to minimise the impact of remediation works on the surrounding environment.

Following the execution of the remediation process, a validation report will be prepared. The objective of the validation report is to describe the completed remedial works and determine whether the site has been remediated to a standard that is suitable for the proposed land-use.

2 SITE IDENTIFICATION

A summary of the site location details is provided below, while a site location map is provided as **Figure 1**.

Street Address:	Hornby Lighthouse, South Head Heritage Trail, Watsons Bay NSW 2030
Legal Description:	Part of Lot 415 in Deposited Plan (DP) 752011 and Part of Lot 1 in DP605078
Coordinates (MGA 56):	-33.836330 Lat, 151.280500 Long
Local Government Area:	Woollahra Municipal Council
Site Area:	~700m^2 (Refer to Figure 2)
Current Zoning:	SP2 – Navigation & Emergency Response Facility[1]
Current Use:	Recreation / Public Open Space
Proposed Zoning:	SP2 – Navigation & Emergency Response Facility
Proposed Use:	Recreation / Public Open Space

[1] Woollahra Local Environment Plan 2014.

3 PREVIOUS INVESTIGATIONS

3.1 2023 TARGETED CONTAMINATION INVESTIGATION

In September 2023, JMB Environmental Consulting completed a Targeted Contamination Investigation for the site (reference 4) with the aim of identifying potential contamination (heavy metal and / or asbestos) prior to planned refurbishment works taking place. The scope of works for the investigation included:

- ◊ An inspection of the site and the lighthouse,
- ◊ The collection of five near-surface soil samples within 3m and surrounding the lighthouse (TP01 to TP05),
- ◊ Analysis of the five near-surface soil samples for asbestos and priority metals (i.e. arsenic, cadmium, chromium, copper, nickel, lead, mercury and zinc),
- ◊ Selective samples of building materials (e.g. mortar, paint) associated with the lighthouse as part of a limited Hazardous Materials Audit (HMA).
- ◊ Analysis of the material samples for either asbestos or metals (arsenic, chromium and lead).

In summary, there was no asbestos detected in each of the material and soil samples. With respect to the paint samples, some samples were confirmed to be lead based paint. Finally, three of the five soil samples (i.e. TP03, TP04 and TP05) had concentrations of Lead above the ecological and/or health-based criteria that is relevant for the site and the surrounding environment. Two of these samples (TP03 and TP05) also had concentrations of Zinc above the ecological based criteria.

The results of this investigation informed the subsequent preliminary and detailed site investigation completed by GEE and summarised below.

3.2 PRELIMINARY AND DETAILED SITE CONTAMINATION INVESTIGATION

In October 2024, GEE completed a preliminary and detailed site (contamination) investigation for the site (reference 1). The objective of the investigation was to better define the extent and type of contamination identified by the JMB assessment and to address the requirements of the *State Environmental Planning Policy (Resilience and Hazards) 2021* by determining the suitability of the site for the proposed land-use and possible constraints on the proposed development.

The scope of works for the investigation included:

- A review of the environmental and physical setting in which the site lies, including geology, hydrogeology and topography,
- A review of the history of the site and surrounding land,
- A site inspection for potential sources of contamination,
- Preparation of an initial Conceptual Site Model (CSM), and
- Field investigations including:
  - The excavation of twenty-one shallow testpits (TP1 to TP21) across the Site investigation area, subject to accessibility, and
  - The collection of a near-surface soil samples from each of the testpits.
- Laboratory analysis of the soil samples for a broad suite of potential contaminants.

A summary of the site history information obtained from this report is provided in Section 4 of this report, while a summary of the environmental and physical setting of the site is detailed in Section 5.

A summary of the subsurface conditions encountered is provided in Section 5.4.2 and 5.5.2, while the locations of the testpits are shown on **Figure 2** along with a recent aerial photograph. In summary, the sampling and analysis program revealed elevated metals (lead, copper and zinc), and to a lesser extent TRH, in the surface soils around the Lighthouse at concentrations deemed to be unacceptable for the current and proposed land-use.

4 SITE HISTORY

A summary of the site history information obtained from the previous investigation report (reference 1) is provided below:

The Site / Investigation Area

The historical information indicates that the Hornby Lighthouse was built in 1858 following the catastrophic wrecking of two ships (the Dunbar and Catherine Adamson) approximately two months apart, both attempting to enter Port Jackson in 1857. The name of the Lighthouse was derived from the name of the Commander-in-Chief of the British Pacific Fleet (and the father-in-law of Governor Denison), Sir Phipps Hornby.

The construction date of the Lighthouse pre-dates the use of Asbestos Containing Material (ACM), although lead based paints may have been used. Therefore, any renovations or maintenance of the Lighthouse may have resulted in near surface soils being impacted with lead.

Surrounding Land

The historical aerial photographs revealed that the surrounding land within ~150m of the site was predominantly undeveloped in the earliest available photograph from 1930. Notable exceptions were two Lightkeepers cottages located to the west of the site, with the cottage furthest to the west having been constructed at the same time as the Lighthouse in 1958. Extensions and repairs were carried out on this cottage in 1860 and at this time the second cottage located approximately 30m to the west of the Lighthouse was constructed. Further additions were made to these cottages in 1877, and each cottage had an underground tank stored water for general use. The cottages were not connected to mains city water until 1897.

Although only visible in the 1943 photograph, there were likely other smaller structures present pre-1930, including the small concrete enclosure / lookout located immediately to the north of the site and some circular fortification pits. Over time there was various changes to the built environment in the surrounding area, including alterations and additions to the houses west of the site, construction of new buildings to the south associated with the HMAS Watson Navy base, the sealing of roads and the construction of pedestrian trails. Additionally, vegetation cover (trees and shrubs) in the area west, south-west and south of the site noticeably increased between 1994 and 2006.

Surrounding land and land-use activities have the potential to cause contamination of the site via groundwater or vapour migration. However, the historical information did not reveal any evidence of significant contaminating activities associated with the surrounding land.

5 SITE CONDITION AND SURROUNDING ENVIRONMENT

This section describes the site and surrounding environment and is predominately a reiteration of the information provided in the previous contamination investigation report (reference 1).

5.1 SITE DESCRIPTION

The site is located on the north-eastern end of South Head peninsula (which is a part of Sydney Heads) and can be found along the South Head Heritage trail, a popular scenic and historical trail which provides views of Sydney Harbour to the west, Middle Head and North Head to the north, and the Tasman Sea (part of the South Pacific Ocean) to the east.

The lighthouse features distinctive red and white stripes and is situated close to the edge of the plateau, a few metres away from the eastern sandstone cliff line. There is an engineered sandstone wall surrounding the north-eastern part of the lighthouse, providing a barrier between the cliff edge and the lighthouse.

Gun emplacement pits can be seen in the immediate vicinity of the lighthouse (to the south), as well as the two lightkeepers' cottages to the west (separated from the main path by gardens). The concrete enclosure / lookout structure to the north of the lighthouse was present, however, access to the public had been prevented with fencing barriers and signage.

There was a concrete pavement (part of the South Head Heritage trail) to the west of the lighthouse (running in a North to South direction) and between the pavement and the fence of the lightkeepers' cottage there were garden beds comprising grasses, ground cover, shrubs and small trees (providing a barrier and privacy screening between the lightkeepers' cottage and public path).

At the time of our inspection, the ground surface comprised a mix of exposed sandstone bedrock, grass covered area, and exposed surface soils. In the immediate vicinity of the lighthouse, white flecks of paint (ranging from ~1 mm to ~15 mm) could be seen on the surface of exposed surface soils.

Importantly, during our site walkover inspection there was no unusual odours or surface staining that could be potentially associated with contamination. There was also no evidence of under-ground or above-ground, fuel or chemical, storage tanks observed

across the site. Additionally, there was no obvious evidence of Asbestos Containing Materials (ACM) on the surface of the site.

Photographs of the site are provided for reference in Plates 1 to 8.

Plate 1 – View towards the north showing the lighthouse (post-refurbishment) and general area south and west of the lighthouse.

Plate 2 – View towards the north, showing the lighthouse, concrete pavement, and garden bed.

Plate 3 – View towards the north-east, showing the rocky outcrops on the northern side of the lighthouse.

Plate 4 – View towards the north along South Head Heritage Trail, showing the concrete structure and garden beds to the west.

Plate 5 – View towards the south-east, showing the lighthouse, concrete structure, garden beds and the pavement.

Plate 6 – View towards the south-west, showing the rocky outcrop and sandstone wall immediately surrounding the lighthouse, and the gentle upward slope towards the south of the lighthouse.

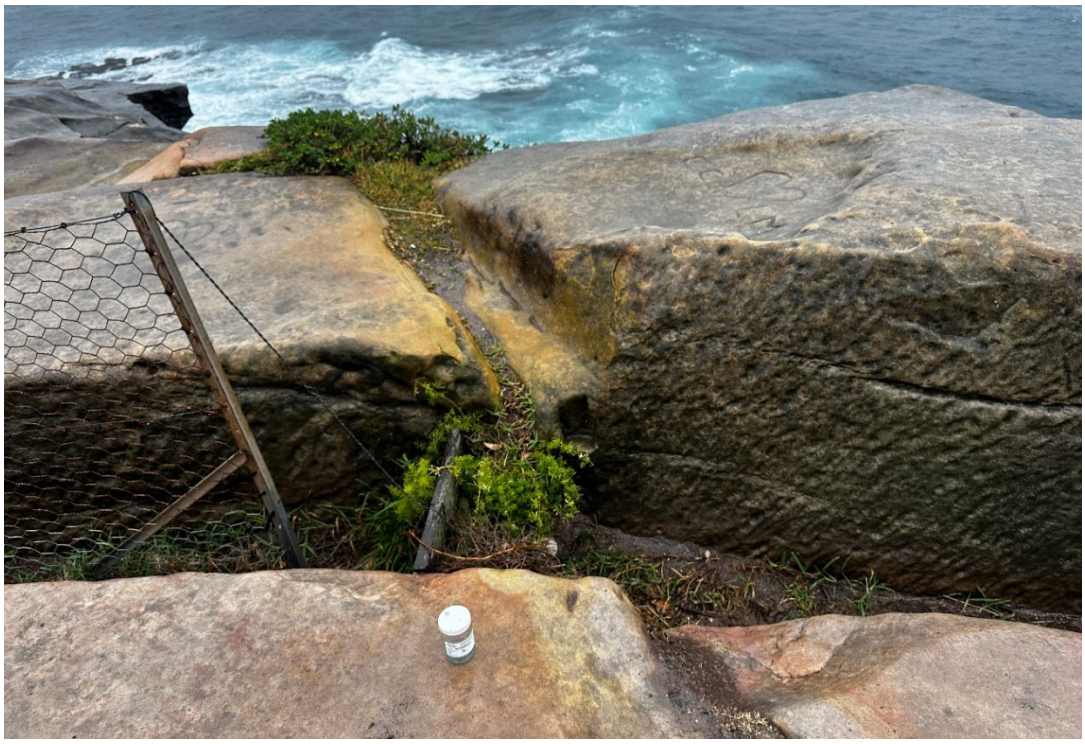


Plate 7 – View of the sandstone wall surrounding the lighthouse, showing the soils within the crevices.

Plate 8 – Example of a white paint fleck observed on the exposed surface soils.

5.2 SURROUNDING LAND USES AND ACTIVITIES

Immediate surrounding land uses observed from the aerial photographs and our site inspection is predominantly open space (zoned C1: National Parks and Nature Reserves), which is considered relatively benign from a contamination perspective. Further south is the Royal Australian Navy training base, HMAS Watson (zoned SP2: Defence).

5.3 TOPOGRAPHY

The site is located on a plateau at the top of a north-easterly facing cliff edge. The site itself has a relatively uneven surface due to exposed sandstone bedrock, and there is a slight uphill slope from the lighthouse towards the south. According to the elevation contour map in the Lotsearch report, the surface elevation is between approximately 18m and 20m above Australian Height Datum (AHD).

5.4 GEOLOGY AND SOILS

5.4.1 *Regional*

A review of the regional geological map (reference 5) indicates that the site is underlain by the Hawkesbury Sandstone formation, which typically consists of "*…medium to coarse-grained quartz sandstone, very minor shale and laminite lenses*".

A review of the regional soils map indicates that the site is located within the Gymea Soil Landscape Group (reference 6). The Hawkesbury Group of soil is associated with rolling to very steep hills on Hawkesbury Sandstone. Local reliefs are generally between 40-200m, slopes typically >25% in gradient, with rock outcrops (>50%). Soils of the Hawkesbury Group typically comprise erosional, loose sands and clays, have very low soil fertility and form a high soil erosion hazard.

5.4.2 *Site Specific*

The subsurface conditions, as observed in our testpits, typically comprised fine to coarse SAND (sometimes with or trace fine to coarse gravel/shell fragments, and sometimes trace paint flecks), silty SAND / sandy SILT (fine to coarse grained, sometimes with or trace fine to coarse gravel, trace fine to medium shell fragments, and sometimes trace paint flecks), and silty CLAY topsoil (TP16 and TP17 within the garden bed). The shallow soil profile was underlain by sandstone bedrock and as previously mentioned, sandstone bedrock was also visible at the surface in some parts of the site.

A summary of the subsurface conditions across the site is provided in **Table 1**.

Table 1: Summary of the Subsurface Conditions

Description	Location
Silty SAND / Sandy SILT: brown / dark brown, fine to coarse grained, sometimes with or trace rootlets, sometimes with or trace fine to coarse sandstone gravel and cobbles and trace paint flecks.	TP1 – TP11, TP13, TP14, TP18
SAND: yellow brown / brown, fine to coarse grained, sometimes trace rootlets, sometimes with or trace fine to coarse sandstone gravel and cobbles.	TP12, TP15, TP19-21
FILL/Topsoil – Silty CLAY: Dark brown, with rootlets and fine-grained sand, trace fine unknown gravel.	TP16 and TP17

Note 1: Bedrock was also visible at the surface across the site.

5.5 GROUNDWATER

5.5.1 *Regional*

The regional and permanent groundwater in the vicinity of the site is expected to be confined, or partly confined, within discrete water-bearing zones within the bedrock formation. However, intermittent 'perched' water seepage is likely to occur at the soil-bedrock interface following heavy and prolonged rainfall events.

Groundwater flow in bedrock is dominated by water movement through fractures (or joints), where stress has caused partial loss of cohesion in the rock and evidence of potential water bearing fractures is usually the presence of clay or iron-staining along the face of the joints.

5.5.2 *Site Specific*

Groundwater was not encountered by the GEE testpits and is expected to be wholly present within the underlying sandstone bedrock formation,

5.6 AREAS AND TYPE OF CONTAMINATION

As detailed in the preliminary and detailed site investigation report (reference 1), the surface soil surrounding the Lighthouse is contaminated with metals (lead, copper and zinc) and to a lesser extent TRH. The lateral extent of the remediation area is shown on **Figure 3** and covers an area of approximately 300m^2.

5.7 WASTE CLASSIFICATION

A waste classification of the contaminated soil material has been completed in accordance with the NSW EPA waste guidelines (reference 7) by using the analytical results from the preliminary and detailed site investigation (reference 1) and subsequent Toxicity Characteristic Leaching Procedure (TCLP) testing on selective samples.

5.7.1 Waste Classification Process

Under *the waste guidelines*, non-liquid waste may be classified in the following groups:

(i) General Solid Waste (Putrescibles),

(ii) General Solid Waste (Non-putrescibles),

(iii) Restricted Solid waste,

(iv) Hazardous Waste, and

(v) Special Waste (including asbestos waste).

The procedure for determining the type of waste and the classification is a six-step process as outlined in **Table 2** below.

Table 2: Six Step Waste Classification Procedure

Step	Comments	Rationale
1. Is the waste special waste?	NO	Asbestos Containing Material (ACM) was not observed during the drilling of our boreholes and was not detected in samples submitted for analysis. No clinical or related waste, or waste tyres were observed during the field assessment conducted as part of this assessment or during the earlier site contamination investigation.
2. Is the waste liquid waste	NO	The waste predominately comprises soil.
3. Is the waste pre-classified?	NO	The soil is not pre-classified.
4. Does the waste possess hazardous waste characteristics?	NO	The waste had no obvious hazardous waste characteristics such as explosives, gases, flammable solids, corrosive substances, coal tar, batteries, lead paint or dangerous goods containers.
5. Determining a wastes classification using chemical assessment.	YES	Refer to Section 5.7.2 below

6. Is the waste putrescible or non-putrescible?	Non-putrescible	The waste predominately comprises silty sand soil with some anthropogenic material, all of which is non-putrescible.

5.7.2 Chemical Assessment of the Waste

The chemical waste classification criteria have been adopted from *the NSW EPA waste guidelines* (reference 7). Part of the procedure includes the comparison of analytical data against contaminant threshold (CT) values specific to a waste category. The CT values are highly conservative and assume that all the contaminants present in a sample are leachable and would leach completely. Alternatively, the analytical data can be compared against specific contaminant concentration (SCC) thresholds when used in conjunction with toxicity characteristic leaching procedure (TCLP) thresholds. The relevant CT thresholds and SCC/TCLP thresholds from the waste guidelines are presented in **Table 3**.

A summary of the analytical results for the contaminated fill layer is provided in **Table 4A**, while a full copy of the relevant laboratory reports is provided for reference in **Appendix C**.

Table 3: Chemical Waste Classification Criteria [1]

Parameter	Maximum Values of Specific Contaminant concentrations for classification without TCLP		Maximum Values for Leachable (TCLP) Concentration and Specific Contaminant Concentration (SCC)			
	General Solid Waste	Restricted Solid Waste	General Solid Waste		Restricted Solid Waste	
	CT1 mg/kg	CT2 mg/kg	SCC1 mg/kg	TCLP1 mg/L	SCC2 mg/kg	TCLP2 mg/L
Metals						
Arsenic	100	400	500	5	2,000	20
Cadmium	20	80	100	1	400	4
Chromium (VI)	100	400	1,900	5	7,600	20
Lead	100	400	1,500	5	6,000	20
Mercury	4	16	50	0.2	200	0.8
Nickel	40	160	1,050	2	4,200	8
TPH						
TPH C_6-C_9	650	2,600	650	N/A [2]	N/A [2]	N/A [2]
TPH C_{10}-C_{36}	10,000	40,000	10,000	N/A [2]	N/A [2]	N/A [2]
BTEX						
Benzene	10	40	18	0.5	72	2
Toluene	288	1,152	518	14.4	2,073	57.6
Ethylbenzene	600	2,400	1,080	30	4,320	120
Total Xylenes	1,000	4,000	1,800	50	7,200	200
PAHs						
Benzo(a)pyrene	0.8	3.2	10	0.04	23	0.16
Total PAHs	200	800	200	N/A [2]	800	N/A [2]
Other Chemicals						
Scheduled Chemicals [3]	<50	<50	<50	N/A [2]	<50	N/A [2]
Moderately Harmful Pesticides [3]	250	1000	250	N/A [2]	1,000	N/A [2]
Endosulfan	60	240	108	3.0	432	12.0
Chlorpyrifos	4	16	7.5	0.2	30	0.8

Notes

Note 1: NSW EPA (2014) Waste Classification Guidelines (Part 1 - Tables 1, 2 and 3)

Note 2: TPH, Total PAHs, scheduled chemicals (SCC) and Moderately Harmful Pesticides (MHP) are evaluated on the basis of total contaminant concentrations (CT or SCC) only. No TCLP required

Note 3: The sum of the SCC and MHP must not exceed the criteria

TABLE 4A - Summary of the Waste Classification Analytical Results - Contaminated Soil Profile

Sample ID		SG260924-02	SG260924-03	SG260924-04	SG260924-05	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-18	SG260924-19	Maximum Result	95% UCL (Calculated using ProUCL Vers 5.1)	Waste Classification Criteria				
																			General Solid Waste			Restricted Solid Waste (With TCLP Data)	
Analyte	Location	TP2	TP3	TP4	TP5	TP6	TP7	TP8	TP9	TP10	TP11	TP12	TP13	TP14	TP18	TP19			(Without TCLP Data)	(With TCLP Data)		(With TCLP Data)	
	Depth	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15							
	Type	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	SAND	Silty SAND	Silty SAND	Silty SAND	SAND			CT1 (mg/kg)	SCC1 (mg/kg)	TCLP1 (mg/L)	SCC2 (mg/kg)	TCLP2 (mg/L)
Asbestos																							
Asbestos Detected	Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	-	-	Nil	-	-	-	-	--	--
Trace Analysis	Yes/No	No	No	No	No	No	No	No	No	No	No	No	No	No	-	-	Nil	-	-	-	-	--	--
Metals																							
Arsenic	mg/kg	<4	8	<4	<4	5	<4	<4	5	<4	<4	<4	7	<4	<4	<4	8	-	**100**	-	-	-	-
Cadmium	mg/kg	1	4	0.8	1	3	<0.4	1	0.8	<0.4	<0.4	<0.4	0.7	<0.4	<0.4	0.4	4	-	**20**	-	-	-	-
Chromium[1]	mg/kg	7	45	18	23	270	4	8	15	7	11	4	10	9	8	7	270	-	**100**	**1,900**	-	**7,600**	-
Chromium (TC:P)	mg/L	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	<0.01		-	-	**5**	-	**20**
Copper	mg/kg	97	440	270	200	420	42	110	180	41	57	35	1100	32	19	38	1100	-	-	-	-	-	-
Lead	mg/kg	1200	12000	2800	4100	14000	400	4100	2000	1100	920	610	2000	660	170	850	14000	6,019	**100**	**1,500**	-	**6,000**	-
Lead (TCLP)	mg/L	2.2	47	33	79	36	2.2	13	4.1	7.3	43	3.6	4.8	0.57	0.1	0.9	79	42.7	-	-	**5**	-	**20**
Mercury	mg/kg	0.3	2.6	0.7	3.8	6.8	<0.1	0.2	0.9	0.2	0.2	0.1	0.5	0.3	<0.1	0.3	6.8	-	**4**	**50**	-	**200**	-
Mercury (TCLP)	mg/L	-	-	-	-	<0.0005	-	-	-	-	-	-	-	-	-	-	<0.0005	-	-	-	**0.2**	-	**0.8**
Nickel	mg/kg	4	16	6	9	140	1	3	9	3	2	1	5	6	5	2	140	-	**40**	**1,050**	-	**4,200**	-
Nickel (TCLP)	mg/L	-	-	-	-	<0.02	-	-	-	-	-	-	-	-	-	-	<0.02	-	-	-	**2**	-	**8**
Zinc	mg/kg	730	11000	2400	2300	9600	180	2200	1300	470	750	370	1900	530	220	560	11000	-	-	-	-	-	-
BTEXN																							
Benzene	mg/kg	-	<0.2	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	-	<0.2	-	-	-	-	<0.2	-	**10**	-	-	-	-
Toluene	mg/kg	-	<0.5	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	-	-	-	<0.5	-	**288**	-	-	-	-
Ethylbenzene	mg/kg	-	<1	-	<1	-	<1	<1	<1	<1	-	<1	-	-	-	-	<1	-	**600**	-	-	-	-
Total Xylenes	mg/kg	-	<1	-	<1	-	<1	<1	<1	<1	-	<1	-	-	-	-	<3	-	**1,000**	-	-	-	-
Naphthalene	mg/kg	-	<1	-	<1	-	<1	<1	<1	<1	-	<1	-	-	-	-	<1	-	-	-	-	-	-
TRH																							
TRH C_6 - C_9	mg/kg	-	<25	-	<25	-	<25	<25	<25	<25	-	<25	-	-	-	-	<20	-	**650**	**650**	**N/A**	**2,600**	**N/A**
TRH $>C_{10}$-C_{36}	mg/kg	-	1,800	-	1,000	-	160	500	350	400	-	100	-	-	-	-	1800	-	**10,000**	**10,000**	**N/A**	**40,000**	**N/A**
PAHs																							
Benzo(a)pyrene	mg/kg	-	0.9	-	1.7	-	0.75	0.86	0.52	1	-	0.1	-	-	0.5	-	1.7	-	**0.8**	**10**	**-**	**23**	**-**
Benzo(a)pyrene TCLP	mg/L	-	<0.0001	-	<0.0001	-	<0.0001	<0.0001	-	<0.0001	-	-	-	-	-	-	<0.001	-	-	-	**0.04**	-	**0.16**
Total PAHs	mg/kg	-	12	-	23	-	10	12	6	16	-	1.5	-	-	6.4	-	23	-	**200**	**200**	**N/A**	**800**	**N/A**
PCBs																							
Total PCBs	mg/kg	-	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	-	-	-	<0.1	-	**50**	**50**	**-**	**50**	**-**
Scheduled Chemicals[2]																							
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Aldrin + Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Chlordane - Total	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
DDD+DDE+DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Hexachlorobenzene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-	**<50 [2]**	**<50 [2]**	-	**<50 [2]**	-
a-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
b-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
d-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
g-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Moderately Harmfull Pesticides																							
Dichlorvos	mg/kg	<0.1	-	<0.1	-	<0.1	-	-	-	-	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Dimethoate	mg/kg	<0.1	-	<0.1	-	<0.1	-	-	-	-	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Ethion	mg/kg	<0.1	-	<0.1	-	<0.1	-	-	-	-	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Fenitrothion	mg/kg	<0.1	-	<0.1	-	<0.1	-	-	-	-	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Malathion	mg/kg	<0.1	-	<0.1	-	<0.1	-	-	-	-	<0.1	-	<0.1	<0.1	-	-	<0.1	-	**250 [3]**	**250 [3]**	-	**1,000 [3]**	-
Fenthion	mg/kg	<0.1	-	<0.1	-	<0.1	-	-	-	-	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Methidathion	mg/kg	<0.1	-	<0.1	-	<0.1	-	-	-	-	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Parathion (Methyl)	mg/kg	<0.1	-	<0.1	-	<0.1	-	-	-	-	<0.1	-	<0.1	<0.1	-	-	<0.1	-					
Other Pesticides																							
Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-	**60**	-	**-**	-	**-**
Chlorpyrifos	mg/kg	<0.1	-	<0.1	-	<0.1	-	-	-	-	<0.1	-	<0.1	<0.1	-	-	<0.1	-	**4**	-	**-**	-	**-**

TABLE NOTES:

Analytical results which exceed any of the CT1 criteria **and** the SCC1/TCLP1 criteria is shown as **bold** text.

1 – Total Chromium analytical result includes chromium (III) and (VI).

2 - Scheduled chemical include some organochlorine pesticides, phenolics and SVOCs. The sum of the SCC for all scheduled chemicals must not exceed the criteria. Some scheduled chemicals were not analysed but they were not chemicals of concern for the site.

3 - the sum of Moderately Harmful Pesticides (MHP) must not exceed the criteria. Some MHP were not analysed but they were not chemicals of concern for the site.

Indicates result (when combined with TCLP data) exceed the RESTRICTED SOLID WASTE Threshold

Indicates a result (when combined with TCLP data) that exceeds the GENERAL SOLID WASTE THRESHOLD but are below the RESTRICTED SOLID WASTE Threshold

5.7.3 Final Waste Classification

As revealed in **Table 4A** above, the analytical results for all the soil samples within the remediation area were below the general solid waste CT1 threshold levels or the SCC1/TCLP1 threshold levels except for either total or leachable (TCLP) Lead at Testpits TP3, TP4, TP5, TP6, TP8, TP9, TP10, TP11 and TP13.

At TP8, TP9, TP10 and TP13 the total and/or leachable concentration of Lead exceeded the General Solid Waste SSC1/TCLP1 thresholds but were below the Restricted Solid Waste SSC2/TCLP2 thresholds. At the other locations (TP3, TP4, TP5, TP6, and TP11) the total and/or leachable concentration of Lead exceeded the Restricted Solid Waste SSC2/TCLP2 thresholds (i.e. Hazardous Waste).

As expected, the highest concentrations were within proximity of the lighthouse with the results reducing with distance.

To evaluate the results, the 95% Upper Confidence Limit of the data needs to be considered and if adopting all the results from the remediation area the 95% UCL concentration of total and leachable Lead is 6,019mg/kg and 42.7mg/L, respectively which would make it all 'Hazardous Waste'. However, if separating the highest results from within proximity to the Lighthouse (i.e. the results from TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10 and TP11) then the remaining soil would be classified as 'General Solid Waste (non-putrescible).

The delineation of each of the two waste streams are shown in **Figure 4** and the data from each of these areas are provided in **Table 4B** (Hazardous Waste) and **Table 4C** (General Solid Waste).

GEE acknowledges that there are some sample results within the Hazardous Waste area that were not at the Hazardous Waste level. However, with the source of the contamination attributed to paint flecks its presence is likely to be somewhat sporadic, albeit within a plume scenario. In this regard, it is possible that other paint impacted soils near these locations are high and isolated remediation is not considered to be viable.

TABLE 4B - Summary of the Waste Classification Analytical Results - Contaminated Soil Profile

Sample ID		SG260924-03	SG260924-04	SG260924-05	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10	SG260924-11	Maximum Result	95% UCL (Calculated using ProUCL Vers 5.1)	Waste Classification Criteria				
													General Solid Waste			Restricted Solid Waste (With TCLP Data)	
Analyte	Location	TP3	TP4	TP5	TP6	TP7	TP8	TP9	TP10	TP11			(Without TCLP Data)	(With TCLP Data)		(With TCLP Data)	
	Depth	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15	0.0 - 0.15							
	Type	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND	Silty SAND			CT1 (mg/kg)	SCC1 (mg/kg)	TCLP1 (mg/L)	SCC2 (mg/kg)	TCLP2 (mg/L)
Asbestos																	
Asbestos Detected	Yes/No	No	No	No	No	No	No	No	No	No	Nil	-	-	-	-	--	--
Trace Analysis	Yes/No	No	No	No	No	No	No	No	No	No	Nil	-	-	-	-	--	--
Metals																	
Arsenic	mg/kg	8	<4	<4	5	<4	<4	5	<4	<4	8	-	**100**	-	-	-	-
Cadmium	mg/kg	4	0.8	1	3	<0.4	1	0.8	<0.4	<0.4	4	-	**20**	-	-	-	-
Chromium[1]	mg/kg	45	18	23	270	4	8	15	7	11	270	-	**100**	**1,900**	-	**7,600**	-
Chromium (TC:P)	mg/L	-	-	-	<0.01	-	-	-	-	-	<0.01		-	-	**5**	-	**20**
Copper	mg/kg	440	270	200	420	42	110	180	41	57	440	-	-	-	-	-	-
Lead	mg/kg	12000	2800	4100	14000	400	4100	2000	1100	920	14000	11,733	**100**	**1,500**	-	**6,000**	-
Lead (TCLP)	mg/L	47	33	79	36	2.2	13	4.1	7.3	43	79	45.1	-	-	**5**	-	**20**
Mercury	mg/kg	2.6	0.7	3.8	6.8	<0.1	0.2	0.9	0.2	0.2	6.8	-	**4**	**50**	-	**200**	-
Mercury (TCLP)	mg/L	-	-	-	<0.0005	-	-	-	-	-	<0.0005	-	-	-	**0.2**	-	**0.8**
Nickel	mg/kg	16	6	9	140	1	3	9	3	2	140	-	**40**	**1,050**	-	**4,200**	-
Nickel (TCLP)	mg/L	-	-	-	<0.02	-	-	-	-	-	<0.02	-	-	-	**2**	-	**8**
Zinc	mg/kg	11000	2400	2300	9600	180	2200	1300	470	750	11000	-	-	-	-	-	-
BTEXN																	
Benzene	mg/kg	<0.2	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	-	<0.2	-	**10**	-	-	-	-
Toluene	mg/kg	<0.5	-	<0.5	-	<0.5	<0.5	<0.5	<0.5	-	<0.5	-	**288**	-	-	-	-
Ethylbenzene	mg/kg	<1	-	<1	-	<1	<1	<1	<1	-	<1	-	**600**	-	-	-	-
Total Xylenes	mg/kg	<1	-	<1	-	<1	<1	<1	<1	-	<3	-	**1,000**	-	-	-	-
Naphthalene	mg/kg	<1	-	<1	-	<1	<1	<1	<1	-	<1	-	-	-	-	-	-
TRH																	
TRH C_6 - C_9	mg/kg	<25	-	<25	-	<25	<25	<25	<25	-	<20	-	**650**	**650**	**N/A**	**2,600**	**N/A**
TRH >C_{10}-C_{36}	mg/kg	1,800	-	1,000	-	160	500	350	400	-	1800	-	**10,000**	**10,000**	**N/A**	**40,000**	**N/A**
PAHs																	
Benzo(a)pyrene	mg/kg	0.9	-	1.7	-	0.75	0.86	0.52	1	-	1.7	-	**0.8**	**10**	-	**23**	-
Benzo(a)pyrene TCLP	mg/L	<0.0001	-	<0.0001	-	<0.0001	<0.0001	-	<0.0001	-	<0.001	-	-	-	**0.04**	-	**0.16**
Total PAHs	mg/kg	12	-	23	-	10	12	6	16	-	23	-	**200**	**200**	**N/A**	**800**	**N/A**
PCBs																	
Total PCBs	mg/kg	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	**50**	**50**	-	**50**	-
Scheduled Chemicals[2]																	
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-			-		-
Aldrin + Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-			-		-
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-			-		-
Chlordane - Total	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-			-		-
DDD+DDE+DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-			-		-
Hexachlorobenzene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-			-		-
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	**<50 [2]**	**<50 [2]**	-	**<50 [2]**	-
a-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-			-		-
b-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-			-		-
d-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-			-		-
g-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-			-		-
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-			-		-
Moderately Harmfull Pesticides																	
Dichlorvos	mg/kg	-	<0.1	-	<0.1	-	-	-	-	<0.1	<0.1	-			-		-
Dimethoate	mg/kg	-	<0.1	-	<0.1	-	-	-	-	<0.1	<0.1	-			-		-
Ethion	mg/kg	-	<0.1	-	<0.1	-	-	-	-	<0.1	<0.1	-			-		-
Fenitrothion	mg/kg	-	<0.1	-	<0.1	-	-	-	-	<0.1	<0.1	-			-		-
Malathion	mg/kg	-	<0.1	-	<0.1	-	-	-	-	<0.1	<0.1	-	**250 [3]**	**250 [3]**	-	**1,000 [3]**	-
Fenthion	mg/kg	-	<0.1	-	<0.1	-	-	-	-	<0.1	<0.1	-			-		-
Methidathion	mg/kg	-	<0.1	-	<0.1	-	-	-	-	<0.1	<0.1	-			-		-
Parathion (Methyl)	mg/kg	-	<0.1	-	<0.1	-	-	-	-	<0.1	<0.1	-			-		-
Other Pesticides																	
Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	**60**	-	-	-	-
Chlorpyrifos	mg/kg	-	<0.1	-	<0.1	-	-	-	-	<0.1	<0.1	-	**4**	-	-	-	-

TABLE NOTES:

Analytical results which exceed any of the CT1 criteria **and** the SCC1/TCLP1 criteria is shown as **bold** text.

1 – Total Chromium analytical result includes chromium (III) and (VI).

2 - Scheduled chemical include some organochlorine pesticides, phenolics and SVOCs. The sum of the SCC for all scheduled chemicals must not exceed the criteria. Some scheduled chemicals were not analysed but they were not chemicals of concern for the site.

3 - the sum of Moderately Harmful Pesticides (MHP) must not exceed the criteria. Some MHP were not analysed but they were not chemicals of concern for the site.

Indicates result (when combined with TCLP data) exceed the RESTRICTED SOLID WASTE Threshold

Indicates a result (when combined with TCLP data) that exceeds the GENERAL SOLID WASTE THRESHOLD but are below the RESTRICTED SOLID WASTE Threshold

TABLE 4C - Summary of the Waste Classification Analytical Results - Contaminated Soil Profile

Sample ID		SG260924-02	SG260924-12	SG260924-13	SG260924-14	SG260924-18	SG260924-19	Maximum Result	95% UCL (Calculated using ProUCL Vers 5.1)	Waste Classification Criteria				
										General Solid Waste			Restricted Solid Waste (With TCLP Data)	
Analyte	Location	TP2	TP12	TP13	TP14	TP18	TP19			(Without TCLP Data)	(With TCLP Data)		(With TCLP Data)	
	Depth	0.0 - 0.15	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15	0 – 0.15							
	Type	Silty SAND	SAND	Silty SAND	Silty SAND	Silty SAND	SAND			CT1 (mg/kg)	SCC1 (mg/kg)	TCLP1 (mg/L)	SCC2 (mg/kg)	TCLP2 (mg/L)
Asbestos														
Asbestos Detected	Yes/No	No	No	No	No	-	-	Nil	-	-	-	-	--	--
Trace Analysis	Yes/No	No	No	No	No	-	-	Nil	-	-	-	-	--	--
Metals														
Arsenic	mg/kg	<4	<4	7	<4	<4	<4	7	-	**100**	-	-	-	-
Cadmium	mg/kg	1	<0.4	0.7	<0.4	<0.4	0.4	1	-	**20**	-	-	-	-
Chromium[1]	mg/kg	7	4	10	9	8	7	10	-	**100**	**1,900**	-	**7,600**	-
Chromium (TC:P)	mg/L	-	-	-	-	-	-	<0.01		-	-	**5**	-	**20**
Copper	mg/kg	97	35	1100	32	19	38	1100	-	-	-	-	-	-
Lead	mg/kg	1200	610	2000	660	170	850	2000	1,432	**100**	**1,500**	-	**6,000**	-
Lead (TCLP)	mg/L	2.2	3.6	4.8	0.57	0.1	0.9	4.8	3.6	-	-	**5**	-	**20**
Mercury	mg/kg	0.3	0.1	0.5	0.3	<0.1	0.3	0.5	-	**4**	**50**	-	**200**	-
Mercury (TCLP)	mg/L	-	-	-	-	-	-	<0.0005	-	-	-	**0.2**	-	**0.8**
Nickel	mg/kg	4	1	5	6	5	2	6	-	**40**	**1,050**	-	**4,200**	-
Nickel (TCLP)	mg/L	-	-	-	-	-	-	<0.02	-	-	-	**2**	-	**8**
Zinc	mg/kg	730	370	1900	530	220	560	1900	-	-	-	-	-	-
BTEXN														
Benzene	mg/kg	-	<0.2	-	-	-	-	<0.2	-	**10**	-	-	-	-
Toluene	mg/kg	-	<0.5	-	-	-	-	<0.5	-	**288**	-	-	-	-
Ethylbenzene	mg/kg	-	<1	-	-	-	-	<1	-	**600**	-	-	-	-
Total Xylenes	mg/kg	-	<1	-	-	-	-	<3	-	**1,000**	-	-	-	-
Naphthalene	mg/kg	-	<1	-	-	-	-	<1	-	-	-	-	-	-
TRH														
TRH C_6 - C_9	mg/kg	-	<25	-	-	-	-	<20	-	**650**	**650**	**N/A**	**2,600**	**N/A**
TRH >C_{10}-C_{36}	mg/kg	-	100	-	-	-	-	100	-	**10,000**	**10,000**	**N/A**	**40,000**	**N/A**
PAHs														
Benzo(a)pyrene	mg/kg	-	0.1	-	-	0.5	-	0.5	-	**0.8**	**10**	-	**23**	-
Benzo(a)pyrene TCLP	mg/L	-	-	-	-	-	-	<0.001	-	-	-	**0.04**	-	**0.16**
Total PAHs	mg/kg	-	1.5	-	-	6.4	-	6.4	-	**200**	**200**	**N/A**	**800**	**N/A**
PCBs														
Total PCBs	mg/kg	-	<0.1	-	-	-	-	<0.1	-	**50**	**50**	-	**50**	-
Scheduled Chemicals[2]														
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Aldrin + Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Chlordane - Total	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
DDD+DDE+DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Hexachlorobenzene	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-	**<50** [2]	**<50** [2]	-	**<50** [2]	-
a-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
b-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
d-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
g-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-			-		-
Moderately Harmfull Pesticides														
Dichlorvos	mg/kg	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Dimethoate	mg/kg	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Ethion	mg/kg	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Fenitrothion	mg/kg	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Malathion	mg/kg	<0.1	-	<0.1	<0.1	-	-	<0.1	-	**250** [3]	**250** [3]	-	**1,000** [3]	-
Fenthion	mg/kg	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Methidathion	mg/kg	<0.1	-	<0.1	<0.1	-	-	<0.1	-			-		-
Parathion (Methyl)	mg/kg	<0.1	-	<0.1	<0.1	-	-	<0.1	-					
Other Pesticides														
Endosulfan	mg/kg	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	-	**60**	-	-	-	-
Chlorpyrifos	mg/kg	<0.1	-	<0.1	<0.1	-	-	<0.1	-	**4**	-	-	-	-

TABLE NOTES:

Analytical results which exceed any of the CT1 criteria **and** the SCC1/TCLP1 criteria is shown as **bold** text.

1 – Total Chromium analytical result includes chromium (III) and (VI).

2 - Scheduled chemical include some organochlorine pesticides, phenolics and SVOCs. The sum of the SCC for all scheduled chemicals must not exceed the criteria. Some scheduled chemicals were not analysed but they were not chemicals of concern for the site.

3 - the sum of Moderately Harmful Pesticides (MHP) must not exceed the criteria. Some MHP were not analysed but they were not chemicals of concern for the site.

Indicates result (when combined with TCLP data) exceed the RESTRICTED SOLID WASTE Threshold

Indicates a result (when combined with TCLP data) that exceeds the GENERAL SOLID WASTE THRESHOLD but are below the RESTRICTED SOLID WASTE Threshold

6 CONCEPTUAL SITE MODEL

The conceptual site model (CSM) is a representation, or summary, of information obtained regarding potential contamination sources, receptors and exposure pathways between the sources and receptors. The key elements of a CSM include:

- ◊ known and potential sources of contamination, areas of environmental concern (AEC) and chemicals of potential concern (CoPC), including the mechanisms of contamination (such as 'top down' spills or sub-surface releases from corroded tanks or pipes),
- ◊ potentially affected media (such as soil, sediment, groundwater, surface water, indoor and ambient air),
- ◊ human and ecological receptors, and
- ◊ potential and complete exposure pathways.

GEE notes that this CSM is based on existing information and will require revision once more information is obtained.

6.1 KNOWN CONTAMINANTS OF CONCERN

The primary contaminant of concern is metals (lead, copper and zinc) while TRH were also noted.

6.2 CONTAMINANT SOURCES

The contamination in the soil is primarily attributed to impact from leaded paint from the Lighthouse. The source of the TRH is uncertain, although potentially from imported soils.

6.3 POTENTIAL OR KNOWN CONTAMINATED MEDIA

The media which has been found to be contaminated is the surface soil material extending to bedrock within the remediation area (**Figure 3**).

6.4 CONTAMINANT RECEPTORS

Considering the proposed development and layout, potential receptors to the any contamination would include:

Human Receptors

- ◊ Existing and future users of the site (adults and children).

Environmental Receptors

◊ Soil environments beneath the site and their associated ecosystems.

6.5 POTENTIAL EXPOSURE PATHWAYS

At this preliminary stage, potential exposure pathways include:

◊ Direct (dermal) contact for users of the site (via any unsealed areas).

◊ Ingestion of soil (adults and children) during use of the site.

7 REMEDIATION STRATEGY

This section provides the remediation goal, the extent of remediation required and discusses the remedial options to determine the preferred remedial option.

7.1 REMEDIATION GOAL

The goal of the remediation activities is to render the site suitable for the proposed land-use scenario as defined by NEPM 2013 – Schedule B7 Section 3 (reference 8). The appropriate land-use scenario for the site is "Public Space / Recreation".

7.2 REGULATORY POLICY OF REMEDIATION

According to the National Environment Protection (Assessment of Site Contamination) Measure (amended 2013) (reference 9 and herein referred to as '*ASC NEPM*'), which is endorsed by the NSW EPA and compatible with the CRC Care National Remediation Framework (reference 10), the preferred hierarchy of options for site remediation and management of soil contamination is:

i) On-site remediation of soil contamination, so that the risk associated with the contaminant is reduced to an acceptable level.

ii) Off-site remediation of excavated soil, so that the risk associated with the contaminant is reduced to an acceptable level, after which it is returned to the site.

If it is not possible for either of the above options to be implemented, then other options for consideration can include, for example:

i) Containment of the contamination on-site either in-situ with appropriate controls that reduce the risk to an acceptable level, or in an appropriately designed and managed containment facility.

ii) Removal of contaminated soil to an approved site or facility, and replacement with clean fill where necessary.

iii) Adoption of a less sensitive land use or controls on site activities that will reduce the need for remedial works.

As part of the identification and selection of remediation options, consideration should be given to the hierarchy above so that remedial options are selected that provide a permanent solution without the need for ongoing control, where feasible.

7.3 Assessment of Remediation Options

A summary of the soil remediation options and assessment of the suitability of each is provided in **Table 5**.

Table 5: Summary of the Soil Remedial Options

Remediation Option	Assessment	Conclusion
1. On-site treatment of the soil	Due to the relatively stubborn nature of the contaminants (particularly metals) there are no proven, cost effective or reliable treatment processes which are able to destroy the contaminants or reliably reduce the hazards to acceptable levels, particularly for the quantities involved.	Unfeasible
2. Off-site treatment of excavated soil.	As above.	Unfeasible
3. Containment of the contamination on-site either in-situ.	Metals are considered suitable for consolidation and isolation within an on-site containment structure, given that they are relatively immobile and not volatile. However, TRH is somewhat mobile. This strategy would require approval from the consent authority, a long-term management plan and long-term design integrity monitoring program. It is also not considered cost effective or appropriate given the relatively small volumes of soil that requires remediation	Possible but not preferred
4.Removal of contaminated soil to an approved site or facility.	There are currently suitably licensed waste facilities in the Sydney Metropolitan region capable of accepting the contaminated soil, although waste classification is required in accordance with NSW EPA (2014) *Waste Classification Guidelines (reference 7)*. Although this option has associated fuel/emissions over option 1 and option 3, it is less than option 2, since materials are not returned to site. This option also generates the highest quantity of waste, since the materials are disposed to landfill rather than treated and reused or retained on Site. However, for the small volumes involved, it is also an uncomplicated strategy that is time effective.	Feasible
5. Adoption of a less sensitive land use or controls on site activities that will reduce the need for remedial works.	This would require rezoning of the site and potentially the surrounding areas.	Unfeasible.

7.4 PREFERRED REMEDIATION OPTION

In consideration of the hierarchy for soil remediation options outlined above, the contaminants of concern, the quantities involved and the sensitive environment in which the site lies, the preferred remediation option is excavation of the contaminated soil and off-site disposal to a facility licensed to receive the waste.

7.5 EXTENT OF REMEDIATION REQUIRED

The lateral extent of the contaminated soil is depicted in **Figure 3** and covers an area of approximately 300m^2. Some of this area has no soil present, with bedrock exposed at the surface and the estimated surface area of the contaminated soil is 250m^2. If assuming an average depth of soil of 250mm then this equates to a volume of 62.5m^3 or approximately 100 tonnes[2]. Of this approximately half is considered to be Hazardous Waste for off-site disposal and the remaining half is considered to be General Solid Waste (non-putrescible).

NOTE: The soil volumes included above are estimates based on scaling from the site plan. A more accurate assessment by a quantity surveyor or earthworks contractor is recommended when budgeting the off-site landfill disposal costs.

[2] Assuming a bulk density of 1.7t/m^3

8 REMEDIATION METHODOLOGY

This section outlines the scope of the remediation works and provides detail of the proposed methodology of each of the required remediation tasks.

8.1 REMEDIATION SCOPE OF WORK

The scope of remediation works that is required to be undertaken on the site under this RAP comprises the following:

1. Assess the potential environmental impacts of the proposed remediation work.
2. Controlled excavation and disposal of the contaminated soil material.
3. Validation sampling and analysis.
4. Backfilling of the site with clean fill (as required).
5. Validation of imported materials.
6. Preparation of a validation report.

GEE understands that Council approval is not required for the remediation work as it will be assessed via a Review of Environmental Factors (REF) under Part 5, Division 5.1 of the EP&A Act. This document aids public authorities with assessing environmental impacts for activities classified as "development without consent" under the EPA&A Act.

8.2 REMEDIATION METHODOLOGY

The methodologies to be undertaken on the site for the various components of the remediation works are presented in detail in the sections below.

8.2.1 Task 1 - Assess the potential environmental impacts of the proposed remediation work

GEE understands that the remediation work does not require consent from local authorities because it would be considered environmental management works associated with a navigation facility (i.e., the Hornby Lighthouse) carried out by or on behalf of a public authority (i.e., Port Authority). As such, clauses 2.80(2)(a) and 2.80(7)(c) of Chapter 2 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 would apply:

"2.80 Development permitted without consent

(…)

(2) The following development may be carried out by or on behalf of a public authority without consent on any land—

(a) development for the purposes of navigation and emergency response facilities,

(…)

(7) In this section, a reference to development for the purpose of port facilities, navigation and emergency response facilities, wharf or boating facilities or associated public transport facilities for a public ferry wharf includes a reference to the operation of such a facility and to development for any of the following purposes if the development is in connection with such facilities—

(…)

(c) environmental management works,"

According to clause 2.3(2) of Chapter 2 of the State Environmental Planning Policy (Transport and Infrastructure) 2021, environmental management works are "works for the purpose of avoiding, reducing, minimising or managing the environmental effects of development (including effects on water, soil, air, biodiversity, traffic or amenity) (…)". Therefore, the proposed remediation work would be considered "environmental management works" under Chapter 2 of the State Environmental Planning Policy (Transport and Infrastructure) 2021.

In light of the above, the proposed remediation work would be classified as a "Category 2 Remediation Work" in accordance with clause 4.11(b)(ii) of the State Environmental Planning Policy (Resilience and Hazards) 2021 because it may be carried out without consent under another State Environmental Planning Policy—in this case, the State Environmental Planning Policy (Transport and Infrastructure) 2021.

Although consent would not be required for the proposed remediation work, Port Authority would have a duty to consider its environmental impacts in accordance with Part 5, Division 5.1 of the Environmental Planning and Assessment Act 1979 (NSW). As such this RAP will inform the preparation of a Review of Environmental Factors (REF) by Port Authority.

Port Authority would also be required to give notice to the Woollahra Municipal Council before the commencement of the proposed remediation work as per clause 4.13(2)(b) of the State Environmental Planning Policy (Resilience and Hazards) 2021.

8.2.2 Task 2 – Controlled Excavation and Disposal of Contaminated Material

The soil within the remediation area (Figure 3) should be excavated under the direction of an experienced environmental scientist or engineer with expertise in remediation or relevant environmental management experience. Full-time supervision is not expected to be warranted, although as a minimum an inspection should occur at the commencement of the excavation work to confirm with the contractor the remediation goals, extent and to reiterate the need to avoid any cross contamination through the cleaning of equipment, segregating waste materials and/or clearly marking out the clean zones. An inspection will also be required near completion of the work to confirm that the remediation has been successful.

Ideally the contaminated material is immediately placed in either a skip bin or truck for off-site disposal at a landfill licenced to accept the waste type.

As mentioned in Section 5.7, part of the soil is classified for off-site disposal as '*hazardous waste*' (Figure 4) and is therefore considered to be 'trackable waste'. In this regard, the transporter must be licensed for the transportation of the waste, and the transport of the waste is to be tracked in accordance with both NSW and the receiving jurisdictions waste tracking requirements.

8.2.3 Task 3 - Validation Sampling and Analysis of remaining in-situ natural soil profile

Following removal of the contaminated soil, a programme of soil validation will need to be implemented as described in Section 10. GEE expects that the soil will be excavated to bedrock and as such the soil validation program will be focused on surrounding soil beyond the remediation area. Within the remediation area an inspection will be required to ensure all the soil has been removed.

8.2.4 Task 4 - Backfilling of the site with clean fill

If backfilling of the remediation area is required, then this should be completed using validated imported fill comprising Virgin Excavated Natural Material (VENM). Excavations may also be reinstated using Excavated Natural Material (ENM), provided the material meets the requirements of the order and exemption issued by NSW EPA for the material. Details of any ENM used on the site, including to the requirements of the exemption and compliance with the exemption, are required to be contained in the Validation Report.

8.2.5 Task 5 - Validation of Imported Clean Fill

Imported fill will be validated as suitable for use on the site by application of the following methods:

- ◊ Imported fill material must be accompanied by documentation, which certifies that it is VENM or ENM. Unless the material is certified quarry material from a recognised provider, the documentation must include laboratory analysis. Additionally, appropriate Quality Assurance/Quality Control samples must be collected as part of the analysis program. VENM supplied material should include analytical results and a copy of the VENM certificate (refer to **Appendix B**). If not, then the material is to be sampled at the source site prior to delivery by GEE at a rate of one sample per 50m^3 provided the material is homogenous. Concentrations of contaminants must reflect background levels and be indicative of VENM. For ENM, sampling and analysis must be carried out in accordance with the ENM order 2014, a copy of which is provided in **Appendix C**.
- ◊ Documentation is required to demonstrate each truck load of fill is consistent with the source site and does not exhibit signs of potential contamination or anthropogenic materials. This will involve inspections and documentation of the material within each truck load by the remediation contractor and/or GEE (including the truck registration number; a description of the soil, including odour; time; date; who inspected the material; and whether the material is acceptable), and
- ◊ The material used to backfill the excavation should be compacted to a standard required for the proposed site development.

8.2.6 Task 6 - Preparation of a validation report.

At the completion of the remediation works, a validation report will need to be prepared in accordance with NSW EPA (reference 12) which outlines the results of the remediation works undertaken at the site (and off-site) and an assessment of the suitability of the site for the proposed use. All waste disposal receipts (or dockets) will need to be included in the validation report.

9 REMEDIATION WORKS CONTINGENCY PLAN

GEE anticipates that remediation methodology described above will ensure that the site is suitable for the proposed commercial land-use. However, the following potential issues and proposed actions will be taken:

Table 6: Contingencies

Issue	Action
1. Failure of the validation testing, indicating a greater amount of contamination than anticipated.	Additional excavation and validation sampling.
2. Generation of unacceptable odours from the excavation works.	Refer to section 13.2
3. The generation of unacceptable levels of dust during excavation and reinstatement works.	Refer to section 13.2
4. Generation of unacceptable noise during site works.	Refer to section 13.3
5. Unexpected find of asbestos containing material (ACM) and/or volatile contamination	Refer to section 9.1

9.1 UNEXPECTED FINDS PROTOCOL

During excavation work an experienced contaminated land consultant should be present to ensure that there is no evidence of other contaminants i.e. discolouration, staining, detectable organic odours, residues, asbestos containing material (e.g. fibrous cement sheeting) or underground storage tanks.

If evidence of contamination is observed, the following procedure should be adopted:

- ◊ Cease disturbance of the material.
- ◊ Contact the Site Foreman or appropriate Manager and their environmental consultant/representative.
- ◊ If the asbestos or tank/drum or volatile odour are suspected, then adopt the protocols in the following sub-sections. Otherwise, conduct a visual assessment of the potential contamination in the presence of the site foreman / sit manager and collected samples as necessary for analysis by a NATA accredited laboratory. This should include appropriate waste classification if it is to be removed from site,

- ◊ Define the location using a GPS, or measurements from the boundaries or existing structures, which are likely to remain in the long term.
- ◊ While waiting for the results of the assessment, arrange for the area to be barricaded to provide a ten (10) metre exclusion zone. Work can recommence in adjacent areas outside the exclusion zone.
- ◊ Once the results of the assessment are known then the waste material should be removed to a landfill facility licenced to accept the waste.

9.1.1 Asbestos

If Asbestos Containing Material (ACM) such as fibrous cement sheeting is detected beneath the surface slab prior to, or during, site development works the following 'Unexpected Finds Protocol' will apply:

1. Upon discovery of suspected ACM, the site manager is to be notified, and the affected area closed off by the use of barrier tape and warning signs. Warning signs shall be specific to Asbestos Hazards and shall comply with the Australian Standard 1319-1994 – *Safety Signs for the Occupational Environment*.
2. An Occupational Hygienist or licenced asbestos assessor is to be notified to inspect the area and confirm the presence of asbestos and to determine the extent of remediation works to be undertaken. A report detailing this information would be compiled by the Occupational Hygienist and provided to the Principal (or their representative) and the site manager.
3. The location of the ACM will be surveyed using a GPS or marked out using measurements from the boundaries or existing structures which are likely to remain in the long term. The asbestos waste will be classified in accordance with the NSW EPA's Waste Classification Guidelines (reference 7) and disposed of, as a minimum, as asbestos contaminated waste to a suitably licensed landfill. In dry and windy conditions, the stockpile would be lightly wetted and covered with plastic sheet whilst awaiting disposal.
4. All work associated with asbestos in soil would be undertaken by a contractor holding a class A Licence. Under this licence, the contractor is required to notify WorkCover NSW five working days before asbestos removal work is commenced.
5. Monitoring for airborne asbestos fibres is to be carried out during the removal of the asbestos waste.
6. Documentary evidence (weighbridge dockets) of correct disposal is to be provided to the Principal (or their representative).

7. At the completion of the excavation, a clearance inspection is to be carried out and written certification is to be provided by an Occupational Hygienist that the area is safe to be accessed and worked. If required, the filling material remaining in the inspected area can be covered/sealed by an appropriate physical barrier layer of non-asbestos containing material prior to sign–off.
8. Validation samples would be collected from the remedial excavation to confirm the complete removal of the asbestos containing materials. If the asbestos pipes/conduits are uncovered, then sampling density would typically comprise one sample per 10-20 linear meter (depending on the length of the pipe). If asbestos debris are found, then the sampling density would typically comprise 1 sample per 5 metre x 5 metre grid.
9. The sampling locations should be surveyed using a GPS or marked out using measurements from the boundaries or existing structures which are likely to remain in the long term.
10. Details are to be recorded in the site record system.
11. Following clearance by an Occupational Hygienist or licenced asbestos assessor, the area may be reopened for further excavation or construction work.

9.1.2 Volatile Contaminants

If significant quantities of volatile compounds are detected, then additional excavation or VOC appropriate gas mitigation strategies may be required.

If impacts due to volatile contaminants are detected in the area to be capped, the nature and extent of the impacts of the volatile contaminants should be established as a first step before an appropriate remedial strategy is to be established. If feasible the source material should be removed for off-site disposal.

10 VALIDATION PLAN

A validation plan will be implemented on the site to ensure that RAP has been followed and that the remediation goal has been achieved. The purpose of the validation plan is to develop a framework for the validation of the site to verify the suitability of the site for the proposed use. To ensure that the RAP is implemented, and the remediation goal is achieved, the following work will be completed:

- ◊ Supervision of remediation works by an experienced environmental engineer.
- ◊ Obtaining waste disposal dockets for material removed from site,
- ◊ Confirmation that any imported fill meets the VENM or ENM classification and therefore suitable for placement on the site (Refer to the sampling plan in Section 10.1 below),
- ◊ Provision of a validation report. The validation report, prepared in accordance with the requirements of EPA guidelines (reference 12), will outline the results of the remediation works undertaken at the site and an assessment of the suitability of the site for the proposed use.

Requirements for the sampling and analytical plan, sampling methodology and quality control/quality assurance procedures to be adopted for the validation works are presented below. Additionally, in accordance with NSW EPA *Contaminated Sites: Guidelines for NSW Site Auditor Scheme* (reference 13) and Appendix B of Schedule B2 of the NEPM (reference 3), the Data Quality Objectives (DQOs) process was used to define the type, quantity and quality of the data needed to support decisions relating to the contamination status of the site. Details of the DQO process adopted for the soil sampling and analysis program is provided in **Appendix D**.

10.1 SAMPLING PLAN

10.1.1 Sampling Locations and Frequency

Surrounding Soil Profile

Following removal of the soil from the remediation area, the area will need to be inspected for any evidence of remaining soil material or other potential contaminants. Validation samples will also need to be collected from the remaining soil surrounding the remediation area. The samples should be collected in a 'judgemental' manner as defined by the NSW EPA (2022) *Contaminated Land Guidelines: Sampling Design – Part 1* (reference 11) and given the contaminants of concern and potential for sporadic presence of former leaded paint within the soil, GEE proposes the following sampling frequency, depths and methodology:

- ◊ Frequency: 1 sample per 5 linear metres around the perimeter of the remediation area. Given that the eastern side of the remediation area is inaccessible, GEE expects that this will equate to the collection of 10 samples
- ◊ Depth: Near Surface (0 – 150mm) because the contaminant of concern if from a top-down source.
- ◊ Methodology: GEE expects that the samples can be taken by hand using disposable nitrile gloves and with the assistance of a shovel, taking care to ensure that the soil sampled had not been in contact with the shovel or excavator bucket.

Imported Fill

As previously mentioned, any imported fill material must be accompanied by documentation, which certifies that it is VENM or ENM. Unless the material is certified quarry material from a recognised provider, the documentation must include laboratory analysis. Additionally, appropriate Quality Assurance/Quality Control samples must be collected as part of the analysis program. VENM supplied material should include analytical results and a copy of the VENM certificate (refer to **Appendix B**). If not, then the material is to be sampled at the source site prior to delivery by GEE at a rate of one sample per 25m^3 provided the material is homogenous. Concentrations of contaminants must reflect background levels and be indicative of VENM. For ENM, sampling and analysis must be carried out in accordance with the ENM order 2014, a copy of which is provided in **Appendix C**.

10.1.2 Handling, Containment and Transport of Samples

The soil sample jars should comprise glass with a Teflon lined lid and be supplied by the laboratory. The jars are to be completely filled with soil, sealed, labelled with the job number, date, unique sampling point identification and depth.

The full soil jars should immediately be placed in a cool box in which ice has been added to keep the samples below a temperature of approximately 4^{o}C. At the completion of sampling the samples in the cool box will be transported directly to the laboratory or to the GEE office where more ice will be added until delivered to the laboratory (within one day). Transport of samples to the laboratory will be undertaken through chain-of-custody (COC) procedures. The COC form (provided by the laboratory) will demonstrate that the samples are properly received, documented, processed and stored.

10.1.3 Decontamination of Sampling Equipment

Considering that samples will be collected by hand using a new set of disposable nitrile gloves, decontamination will not be necessary as no re-useable equipment will be used. However, if sampling from an excavator bucket or shovel, care will be taken to ensure that the soil sampled did not come into contact with the excavator bucket.

However, if the assistance of a trowel is required to collect samples, in situations of hard or well compacted ground) then the trowel will be decontaminated by washing with a laboratory grade, biodegradable and phosphate-free detergent followed by rinsing with potable water.

10.2 ANALYTICAL PLAN

Surrounding Soil Profile

Each validation sample collected from the perimeter of the remediation area should be analysed for the contaminants of concern which are:

- ◊ Lead, Copper and Zinc, and
- ◊ Total Petroleum Hydrocarbons (TPH). Preferably using the silica-gel clean-up method.

The pH and Cation Exchange Capacity (CEC) of the validation samples should also be analysed (as a minimum) to optimise the validation criteria for copper and zinc.

Imported Fill

If required, every source of potential VENM will be analysed for:

- ◊ Metals (arsenic, cadmium, chromium, copper, nickel, lead, zinc and mercury);
- ◊ Polycyclic Aromatic Hydrocarbons (PAHs),
- ◊ Total Petroleum Hydrocarbons (TPH),
- ◊ Benzene, Toluene Ethylbenzene, Xylenes and Naphthalene (BTEXN),
- ◊ Organochlorine Pesticides (OCPs),
- ◊ Organophosphate Pesticides (OPPs)
- ◊ Poly Chlorinated Biphenyls (PCBs),
- ◊ Volatile Organic Compounds (VOCs), and
- ◊ Asbestos.

ENM material will require analysis in accordance with the ENM Order (**Appendix C**).

10.3 QUALITY ASSURANCE

Quality Assurance (QA) involves all the actions, procedures, checks and decisions undertaken to ensure the representativeness and integrity of samples and accuracy and reliability of analysis results (reference 3).

In accordance with AS4482.1 (reference 14), a series of QA procedures will be integrated within the sampling and analysis plan and include:

- ◊ The collection of Quality Control (QC) samples (i.e., blind replicates, split duplicates, trip blanks and trip spikes).
- ◊ The use of standardised field sampling forms developed by GEE.
- ◊ Documentation of calibration and use of field instruments.

To ensure QA in the field, samples will be collected by experienced and trained personnel using appropriate methods detailed herein, including appropriate sample handling, containment and transport, and calibrated equipment.

To ensure QA in the laboratory, GEE intend to use laboratories that are NATA accredited for the analytical tests carried out, therefore it is reasonable for GEE to rely on the laboratories to be proficient in all tests conducted. This encompasses all actions, procedures, checks and decisions undertaken, to ensure the accuracy and reliability of the analysis results.

To measure the effectiveness of the QA procedures Quality Control (QC) samples will be collected and analysed as described in Section 10.2.

10.3.1 Quality Control

QC involves those parts of QA which serve to monitor and measure the effectiveness of QA procedures. QC samples assess sample integrity, accuracy and precision and can be separated into field and laboratory QC. **Table 7** provides a description and objective of each of the field and laboratory QC samples to be used during the remediation program.

Table 7: QC Sample Types, Descriptions and Frequency of Analysis

Type	Description	Purpose	Recommended Frequency
	FIELD QC SAMPLES		
Blind Replicate	A sample collected at the same time and from the same sampling point as the corresponding primary sample[3], and analysed at the same laboratory. Blind replicates are collected, preserved, stored, transported and analysed in the same manner as the primary sample, with the laboratory having no knowledge of the source of the replicate sample. The assessment of blind replicates samples is undertaken by calculating the Relative Percent Difference (RPD) which is defined as: $RPD\ (\%) = 100 \times \frac{\text{Result No. 1} - \text{Result No. 2}}{\text{Mean Result}}$	Used to evaluate total sampling and analysis precision and, in the case of soil samples, sample variability.	In accordance with AS4482.1 (reference 14) and NEPM (reference 3) it is recommended that 1 blind replicate sample is collected for every 20 primary samples.
Split Duplicate	A sample collected at the same time and from the same sampling point as the corresponding primary sample, and analysed at a separate laboratory. Split duplicates are collected, preserved, stored, transported and analysed in the same manner as the primary sample, with the laboratories having no knowledge of the purpose of the sample. The assessment of split duplicates samples is undertaken by calculating the Relative Percent Difference (RPD) which is defined as: $RPD\ (\%) = 100 \times \frac{\text{Result No. 1} - \text{Result No. 2}}{\text{Mean Result}}$	Used to provide a check on the analytical proficiency of the laboratories and hence precision and comparability.	In accordance with AS4482.1 (reference 14) and NEPM (reference 3) it is recommended that 1 blind replicate sample is collected for every 20 primary samples.
Trip Blank	Trip blanks are laboratory supplied test samples of analyte-free media (either washed sand or de-ionised water) which remain in the sample storage eskies during sampling activities and returned to the laboratory unopened. For soil sampling programs, the trip blank consists of acid-washed quartz sand that has been heated to 400ºC. For water sampling programs trip blanks comprise pre-washed glass vials containing distilled or de-ionised water with appropriate preservatives. The USEPA has shown that cross-contamination only occurs with volatile organics (reference 15), therefore, trip blanks are only analysed for volatile organics.	Used to measure cross-contamination during sampling, transport, sample preparation and analysis.	Industry standard is 1 trip blank per batch of primary samples.

[3] Primary samples are the original representative samples of soil or groundwater collected for analysis to determine aspects of their chemical composition. Primary samples are the original sample taken from a particular location and other samples from the same location are duplicates, replicates or splits.

Table 7 (Continued)**:** QC Sample Types, Descriptions and Frequency of Analysis

Trip Spike	Trip spikes, like trip blanks, are supplied by the primary laboratory using analyte-free media (either washed sand or de-ionised water) and remain in the sample storage eskies during sampling activities and returned to the laboratory unopened. The sample media, however, is spiked with BTEX. For water sampling programs the BTEX concentration is known and standardised by each laboratory, while for soil sampling programs the exact spike concentration is not known, rather two identical jars of sand are spiked the same concentration with one sample becoming the trip-spike and the other becoming a control sample, which remains in a refrigerator at the laboratory. The trip spike is analysed after returning from the field and the % recovery of the known spike (for water sampling programs), or of the control sample (for soil sampling programs), is calculated.	Used to monitor VOC losses during transit.	Industry standard is 1 trip spike per batch of primary samples where volatile concentrations are being measured.
	LABORATORY QC SAMPLES		
Laboratory Duplicate	Laboratory duplicates are field samples which are prepared and analysed in the same manner twice. The assessment of laboratory duplicates is undertaken by calculating the (RPD) which is defined as: $RPD\ (\%) = 100 \times \frac{\text{Result No. 1 – Result No. 2}}{\text{Mean Result}}$	Determines analytical precision for a sample batch	NATA specifies 1 per 10 samples for trace element and inorganic analysis
Laboratory Control Sample (LCS)	Laboratory Control Samples (LCS) are analyte-free matrices (de-ionised water or clean sand) spiked with a known concentration of target analytes and carried through the entire preparation and analysis. Assessment of LCS is undertaken by calculating the percent recovery (%R) of the spike which is defined as: $\text{Percent Recovery (\%R)} = 100 \times \frac{\text{Spikes Sample Result (SSR) – Sample Result (SR)}}{\text{Concentration of Spike Added (SA)}}$	Determines analytical accuracy and precision for a batch of samples	NATA specifies 1 per batch of up to 20 samples
Surrogates	Surrogates are organic compounds added to field samples and laboratory QC samples prior to preparation. They are similar in chemical behavior to the target analytes and are not expected to be present in samples. They form part of the laboratory QC for organic analyses and are used to indicate the presence of sample specific interferences. The surrogate is added at the extraction stage then analysed with the batch of samples. Like LCSs, surrogates are assessed by calculating the percent recovery (%R), although the definition is slightly different as shown below: $\text{Percent Recovery (\%R)} = 100 \times \frac{\text{Spiked Sample Result (SSR)}}{\text{Concentration of Spike Added (SA)}}$	Used to demonstrate that the surrogate does not interfere with the target analytes, therefore determines analytical accuracy for each sample	Added to every blank, field and laboratory QC sample

Table 7 (Continued)**:** QC Sample Types, Descriptions and Recommended Frequency of Analysis

Type	Description	Purpose	Recommended Frequency
	LABORATORY QC SAMPLES		
Matrix Spikes	Field samples spiked with a known concentration of target analytes and carried through the entire preparation and analysis. Matrix spike samples are assessed by calculating the percent recovery (%R) of the spike which is defined as: Percent Recovery (%R) = 100 x (Spikes Sample Result (SSR) – Sample Result (SR)) / Concentration of Spike Added (SA)	Determine the effects of matrix interferences on analytical accuracy of a sample.	Performed at least 1 per batch of up to 20 samples.
Method Blank	Method blanks are analyte-free matrices (reagent water or clean sand) that is carried through the entire preparation and analysis.	Establishes that laboratory contamination does not cause false positives.	Prepared with every batch of up to 20 samples for all organic and inorganic analyses.

10.3.2 Evaluation of QC Sample Results

The QC Acceptance Criteria adopted for this investigation is provided in **Table 8** and is in general accordance with AS4482.1 (reference 14) and NEPM (reference 3).

Table 8: QC Sample Acceptance Criteria

QC Sample	Criteria / Acceptable Range
FIELD QC SAMPLES	
Blind Replicates & Split Duplicates	RPD < 50 % When average concentration is > 10 x LOR/PQL[4] RPD < 75 % When average concentration is 5 to 10 x LOR/PQL RPD < 150 % When average concentration is< 5 x LOR/PQL
Trip Blank	Analytical Result < LOR/PQL
Trip Spike	± 30%
LABORATORY QC SAMPLES	
Laboratory Duplicates	RPD < 30 % When average concentration is > 10 x LOR/PQL RPD < 50 % When average concentration is 4 to 10 x LOR/PQL RPD < 100 % When average concentration is< 4 x LOR/PQL
Laboratory Control Samples	%R of 70 – 130% (General analytes) %R of 50 – 130% (Phenols) %R of 60 – 130% (OCP/OPPs) %R of 62 – 130% (Chromium)
Surrogates	%R of 70 – 130% (General analytes) %R of 50 – 130% (Phenols) %R of 60 – 130% (OCP/OPPs)
Matrix Spikes	%R of 70 – 130% (General analytes) %R of 50 – 130% (Phenols) %R of 60 – 130% (OCP/OPPs) %R of 62 – 130% (Chromium)
Method Blanks	Analytical Results < LOR/PQL

If data does not meet the QC Acceptance Criteria, then a judgement is made as to whether the exceedance is critical in relation to the suitability of the data set. Otherwise, the following steps will be taken:

- ◊ Request that the laboratory re-check or even re-analyse the sample.
- ◊ Inspect the sample for anomalies which may be causing the failure.
- ◊ If necessary, undertake additional sampling and analyses.

[4] Both the LOR and PQL are interchangeable terms used by laboratories and is defined as the lowest concentration that can be reliably achieved within specific limits of precision and accuracy during routine laboratory operating conditions (Popek, 2003 – reference 17).

10.4 VALIDATION REPORT

Consistent with NSW EPA requirements, a validation report will be prepared at the conclusion of remediation works. The validation report, prepared in accordance with the requirements of EPA guidelines (reference 12), will outline the results of the remediation works undertaken at the site and an assessment of the suitability of the site for the proposed use.

11 REMEDIATION ASSESSMENT CRITERIA

To determine the success of the proposed remediation plan it is necessary to define appropriate Remediation Assessment Criteria (RAC).

11.1 SOIL REMAINING ON SITE

For the contaminants of concern, the validation analytical results will need to be compared against the Health Investigation Levels (HILs), Health Screening Levels (HSLs), Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) provided in NEPM (2013), *Schedule B(1) – Guidelines on Investigation Levels for Soil and Groundwater* (reference 17). A summary of the RAC for metals is provided in **Table 9.**

11.1.1 Application of Remediation Acceptance Criteria

In accordance with the NEPM (2013), *Schedule B(1) – Guidelines on Investigation Levels for Soil and Groundwater* (reference 17), no single summary statistic will fully characterise a site and appropriate consideration of relevant statistical measurements should be used in the data evaluation process.

For soil to be considered as uncontaminated (i.e. not posing an unacceptable risk) all reported concentrations must be below the site remediation criteria. For chemical analysis the following statistical criteria shall be adopted with respect to the health criteria:

- The upper 95% confidence limit on the average concentration for each analyte (calculated for samples collected from consistent soil horizons, stratigraphy or material types) must be below the adopted criterion,
- No single concentration shall exceed 250% of the adopted criterion, and
- The standard deviation of the results must be less than 50% of the criterion.

In addition to the numerical criteria, there should be no obvious asbestos containing material (ACM) or adverse aesthetics on the surface or within the subsurface fill/natural soils.

Table 9: Soil Site Assessment Criteria (SAC)

Analyte	**Health Investigation/Screening Levels (HILs/HSLs)** (mg/kg)	Reference	**Ecological Investigation/Screening Levels (EILs/ESLs)**	Reference
Total Metals				
Lead	600	(HIL-C) Table 1A – Reference 17	1,100	(EIL) Table 1B(5) – Reference 17
Copper	17,000	(HIL-C) Table 1A – Reference 17	TBA [1]	(EIL) Table 1B(5) – Reference 17
Zinc	30,000	(HIL-C) Table 1A – Reference 17	TBA [1]	(EIL) Table 1B(5) – Reference 17
Total Recoverable Hydrocarbons (TRH)				
(F1) C6 – C10	5,100	(HSL-C direct contact) Table A4 – Reference 18	180	(ESL) Table 1B(6) – Reference 17
(F2) >C10 - C16	3,800	(HSL-C direct contact) Table A4 – Reference 18	120	(ESL) Table 1B(6) – Reference 17
(F3) >C16 – C34	5,300	(HSL-C direct contact) Table A4 – Reference 18	300	(ESL) Table 1B(6) – Reference 17
(F4) >C34 – C40	7,400	(HSL-C direct contact) Table A4 – Reference 18	2,800	(ESL) Table 1B(6) – Reference 17

Note 1: TBA – To Be Advised. The Criteria will depend on the physicochemical properties of soil (e.g. Cation Exchange Capacity, pH and clay content)

11.2 Assessment of Imported Fill

Under the Protection of the Environment Operations (POEO) Act 1997 and the POEO (Waste) Regulation 2014 (specifically Part 9, Clauses 91, 92 and 93), only natural soil and bedrock material which has been classified as *Virgin Excavated Natural Material (VENM)*, or material granted appropriate Resource Recovery Exemptions by the NSW EPA (e.g. *Excavated Natural Material (ENM))* may be imported onto a site and used for earthworks or as engineered fill.

All imported fill materials will need to be assessed, and this should include:

- ◊ Review of documentation and approval prior to importation. Adequate detail and traceability of the material is important to verify its status and if it conforms to the exemption, it has been classified by.
- ◊ Inspection of all materials upon importation to confirm they are consistent with documentation provided and free from contamination.

If any gaps are identified in the supplied information, source site inspection or sampling will be completed. Specific requirements for VENM and ENM materials are provided below while other civil materials (e.g. road base and crushed aggregates) will be assessed in a similar manner to ENM by adopting sampling in accordance with the exemption the material is classified by.

11.2.1 VENM

The POEO Act defines VENM as:

'*natural material (such as clay, gravel, sand, soil or rock fines):*

a. that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities and

b. that does not contain any sulfidic ores or soils or any other waste

and includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved for the time being pursuant to an EPA Gazettal notice.'

Any VENM material accepted at the site will also require a VENM certificate, a copy of which is provided in **Appendix B**.

11.2.2 ENM

ENM is defined under the POEO Act as: "*naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:*

a) been excavated from the ground, and

b) contains at least 98% (by weight) natural material, and

c) does not meet the definition of Virgin Excavated Natural Material in the Act.

Excavated natural material does not include material located in a hotspot; that has been processed; or that contains asbestos, Acid Sulfate Soils (ASS), Potential Acid Sulfate soils (PASS) or sulfidic ores."

A copy of the order is provided in **Appendix C** along with the corresponding 'The excavated natural material exemption 2014' which was issued by the NSW EPA under clauses 91 and 92 of the Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation).

12 INTERIM SITE MANAGEMENT PLAN (SITE PREPARATION)

12.1 SERVICES AND UTILITIES

The location of buried services across the site should be identified and marked to ensure no damage occurs during the remediation work. It may also be specified in the Review of Environmental Factors (REF) to be prepared and determined by the Port Authority of NSW.

12.2 SITE SECURITY, RESTRICTED ACCESS AND SIGNAGE

Access to site will be restricted during site redevelopment works as required by the Port Authority of NSW and/or the NSW National Parks and Wildlife Service (NPWS).

12.3 STORMWATER CONTROL MEASURES

No stormwater control measures are proposed during the site preparation phase since it is expected that the transportation of contaminated soil will occur immediately after excavation and there will be no need to form stockpiles for any length of time.

12.4 OCCUPATIONAL HEALTH & SAFETY PLAN

All work associated with the decommissioning and remediation of the site would conform at a minimum, to the requirements of the NSW Occupational Health and Safety Act.

12.5 LICENCES AND APPROVALS

As mentioned above, a REF will be prepared by Port Authority to assess the potential environmental impacts associated with the proposed remediation work in accordance with Part 5, Division 5.1, of the Environmental Planning and Assessment Act 1979 (NSW). Additional licences and approvals, if required, will be identified in the REF. It is anticipated that the proposed remediation work will require approval under the Heritage Act 1977 (NSW) and an Aboriginal Heritage Impact Permit (AHIP) under the National Parks and Wildlife Act 1974 (NSW).

12.6 COMMUNITY RELATIONS PLAN

If necessary, the REF will define stakeholder engagement measures associated with the proposed remediation work.

13 SITE MANAGEMENT PHASE (OPERATIONAL PHASE)

Remediation works shall be conducted in a manner that minimises environmental impacts and that meets statutory requirements. Site works should comply with the following legislation:

- ◊ Environmental Planning and Assessment Act 1979 (NSW),
- ◊ Environmental Planning and Assessment Regulation 2021 (NSW),
- ◊ Heritage Act 1977 (NSW),
- ◊ National Parks and Wildlife Act 1974 (NSW)
- ◊ Contaminated Land Management Act (1997);
- ◊ Contaminated Land Management Amendment Act (2008);
- ◊ Protection of the Environment Operations Act (1997);
- ◊ Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation (2008);
- ◊ Environmentally Hazardous Chemicals Act (1985);
- ◊ Dangerous Goods Act (1975);
- ◊ Waste Avoidance and Resource Recovery Act (2001);
- ◊ Clean Air (Plant and Equipment) Regulation (1997);
- ◊ Occupational Health and Safety Act (2001); and
- ◊ Local Government Act (1993).

The contractor shall endeavour to:

1. Minimise fugitive dust emissions.
2. Minimise the volume of water containing suspended sediment leaving the site.
3. Prevent vehicles from tracking mud on local roads.
4. Ensure that noise and vibration levels conform to legislative requirements.
5. Comply with all mitigation measures to be defined in the Review of Environmental Factors (REF) and additional licences, approvals and permits, including, but not limited to, heritage and aboriginal heritage mitigation measures.

A preliminary site management plan is provided below.

13.1 STORMWATER MANAGEMENT

Stormwater management is not expected to be required as no excavation is proposed as part of the remediation works.

13.2 CONTROL OF DUST AND ODOUR

The remediation work will be undertaken in a manner that minimises fugitive dust and odour emissions.

Measures to control dust and odour will include:

- ◊ Careful handling of material in a manner that minimises dust emissions.
- ◊ Placement of screening material (*e.g.*, hessian) on perimeter fences adjacent to excavations.
- ◊ Water spraying across dusty areas of the site.
- ◊ Keeping excavations moist (where practical).
- ◊ The use of tarpaulins or similar to cover loads (incoming and outgoing).
- ◊ The restriction of stockpile heights to less than 2m.

Where visual inspection indicates that dust levels may be unacceptable, work will cease until measures are taken to reduce emissions or until weather conditions improve. The site supervisor will be responsible for dust management.

Local Government requirements state that no odours shall be detected at the site boundary during remedial works by an authorised Council officer relying solely on the sense of smell. The following procedures may be engaged to minimise odours:

- ◊ Covering of stockpiles (where practical);
- ◊ Use of fine mist sprays and hydrocarbon mitigating agent on impacted areas and materials; and
- ◊ Adequate maintenance of equipment and machinery to minimise exhaust emissions.

13.3 NOISE CONTROL

Minor increased noise levels may result from the use of machines on site during the course of the project, which is expected to take 1 to 2 weeks depending on the excavation methodology and need for traditional owner inspection.

To mitigate any noise which may arise as a result of site works, it is likely that most of the work will be completed with hand tools and not noise generating. Regardless, all works would be carried out in accordance the EPA NSW *Interim Construction Noise Guideline* (reference 19).

Working hours will be restricted to those specified in the REF for the works.

13.4 VIBRATION CONTROL

Excavation proposed as part of the remediation works is unlikely to cause any significant vibrations to be transmitted through the ground and potentially impact on adjoining structures.

13.5 TRAFFIC AND TRANSPORT

Traffic disruptions are unlikely to be an issue because of small volumes of contaminated soil involved.

All machinery will be transported to the site in accordance with regulatory requirements.

All haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site are to be selected to meet the following requirements:

- ◊ Comply with all road traffic rules.
- ◊ Minimise noise, vibration and odour to adjacent properties.
- ◊ Utilise State Roads and minimise the use of local roads.

The site supervisor shall ensure that all vehicles:

- ◊ Conduct deliveries of soil, materials, equipment of machinery during the allowed hours of remediation work.
- ◊ Securely cover all loads to prevent/minimise any dust or odour emissions during transport.
- ◊ Do not track soil, mud or sediment onto the roads and footpaths.

13.6 UNDERGROUND SERVICES

All underground services are to be located and either removed or avoided.

13.7 RESTRICTED ACCESS

Contractors only will be allowed on site whilst excavation and removal of soil to trucks is in progress. No members of the public will be allowed on site during this time.

During remediation works, the site will be designated as a construction area. Consequently, access will be restricted to authorised staff and contractors equipped with appropriate Personal Protective Equipment (PPE). The site supervisor will control site access. All visitors will report to the site supervisor to be inducted into the site safety programme and environmental protection programme prior to entering the site.

14 WORKPLACE HEALTH AND SAFETY PLAN

The purpose of the Workplace Health and Safety (WHS) plan is to ensure that the RAP is conducted in a controlled and safe manner with due regard for potential hazards and safe work practices. The OHS plan will be implemented and enforced by the appointed site supervisor following a brief induction by GEE. The following preliminary plan contains minimum OHS requirements at the site. Contractors must be required to produce their own project-specific Project Safety Plans prior to the commencement of any works at the site, under which their employees are to operate at all times whilst at the site.

14.1 PERSONNEL AND RESPONSIBILITY

All personnel will be made aware of the person responsible for implementing health and safety procedures. All personnel should read and understand the OHS plan prior to commencing work and have signed a statement to verify this understanding. Contractors shall be responsible for ensuring that their employees are aware of and comply with the Project Safety Plans developed for each task and with all relevant statutes and regulations.

14.2 IDENTIFICATION OF POTENTIAL HAZARDS

14.2.1 Contaminant Hazards

Contaminants that may be present at the site include, but are not limited to:

◊ Lead, Copper, Nickel and TRH.

Potential risks to personnel associated with these compounds, if present at the site, include:

1. Ingestion of soil or liquids,
2. Dermal (skin) contact with contaminated soil or liquids, and
3. Inhalation of dust, vapours or aerosols containing contaminants,

14.2.2 Physical Hazards

The following physical hazards may exist at the site:

◊ Heavy equipment (mobile and stationary),

◊ Light vehicles with associated traffic and vehicle hazards,

◊ Excavations,

◊ Heat exposure,

◊ Buried Services,

- ◊ Noise,
- ◊ Dust,
- ◊ Electrical equipment.

Personnel should also be aware of the necessary precautions with respect to hoisting of people, smoking, drugs and alcohol, first aid, privacy of information, environmental considerations, health surveillance, working alone, incident reporting, WHS consultation, discrimination and sexual harassment.

14.3 MEDICAL SURVEILLANCE

It is expected that all personnel on the site have undergone specific training for working on contaminated sites. A site-specific medical surveillance scheme is not considered necessary for this project.

14.4 SITE WORK PRACTICES

14.4.1 Personal hygiene

No smoking, eating or drinking will be permitted on site in areas where the possibility of contamination exists. Smoking will be prohibited in areas were volatile hydrocarbons or other inflammable materials have accumulated. In these areas, a designated clean location should be allocated for smoking and the consumption of food or drink. These areas should be equipped with hand washing facilities which must be used prior to engaging in these activities. Personnel should be made aware of the location of these facilities.

14.4.2 Decontamination

Contaminated equipment should not be removed from the work area to avoid contaminating other parts of the site.

14.4.3 Restricted Access

A perimeter fence exists and will remain during the remediation work. Signs should be erected to notify personnel of the presence of excavations on the site and signs indicating asbestos removal work. Site visitors must report to the site office prior to entering the site.

14.4.4 Personal protection

Personnel will take measures to avoid coming into direct contact with contaminated material. Workers are to ensure that soil, surface water or groundwater are not ingested or swallowed and that direct contact with skin is avoided. Personnel should wear the following Personal Protective Equipment (PPE):

- ◊ Steel-capped boots meeting AS2210.3 requirements (reference 20),
- ◊ Fluorescent safety vest or other high visibility clothing conforming to AS/NZS 4602:1999 (reference 21),
- ◊ Hard hat meeting AS1801-1981 (reference 22) requirements when working within close proximity to the excavator,
- ◊ Safety glasses or goggles with side shields meeting AS1337.6-2007 (reference 23) requirements as necessary, and
- ◊ Disposable latex gloves for personnel involved in soil or groundwater sampling.

In the unlikely event that personnel are required to work in areas with highly contaminated soil or other hazardous materials, the following additional protection will be required:

- ◊ Disposable coveralls (if necessary) to prevent contact with splashed soil or materials; and
- ◊ Nitrile gloves meeting AS2161-2000 (reference 24) requirements or heavy-duty gauntlet gloves.

14.5 EMERGENCY RESPONSE PLAN

14.5.1 Resources

The following emergency numbers can be called if medical or other emergency services are required:

Hospital: St Vincent's Hospital
390 Victoria Street, Darlinghurst NSW 2010
(02) 8382 1111

Police, fire, ambulance: 000

Electrical: Energy Australia
13 13 18

Council: Woollahra Council
536 New South Head Road, Double Bay NSW 2028
(02) 9392 5000

Water: Sydney Water
132 090

Gas: Jemena Gas
131 909

Utilities: Telstra
1800 653 935

14.5.2 Responsibilities

The site supervisor will be responsible for ensuring that site personnel are aware of emergency services available. A site safety officer must be available during remedial works.

15 REFERENCES

1. Geo-Environmental Engineering Pty Ltd (GEE), 2024: Preliminary and Detailed Site Contamination Investigation, Hornby Lighthouse, Watsons Bay NSW. Prepared for Port Authority of New South Wales. Report ID: E24017WB-R01F 3rd December 2024.
2. NSW EPA, 2020: Environment Protection Authority 2020: *Contaminated Land Guidelines: Consultants Reporting on Contaminated Land*. EPA NSW 5 May 2020.
3. NEPM, 2013: *National Environment Protection (Assessment of Site Contamination) Measure 1999 - Schedule B(2) Guideline of Site Characterisation.* As amended 16 May 2013.
4. JMB Environmental Consulting, 2023: Targeted Sampling Report, Hornby Lighthouse, Sydney Harbour National Park, Watsons Bay NSW. Prepared for Puch Construction and Building Steven Cliff. Document ID J23092914092023TSR, Dated 27/09/2023.
5. Department of Mineral Resources, 1983: Sydney 1:100,000 Geological Series Map Sheet 9130 (Edition 1).
6. Department of Land and Water Conservation (DLWC), 2004: Sydney 1:100 000 Soil Landscape Series Sheet 9130 (second edition).
7. New South Wales Environment Protection Authority (NSW EPA), 2014: Waste classification guidelines – Part 1 classifying waste.
8. NEPM, 2013: National Environment Protection (Assessment of Site Contamination) Measure 1999 - Schedule B(7) Derivation of Health-Based Investigation Levels. As amended 16 May 2013.
9. ASC NEPM 1999: National Environment Protection (Assessment of Site Contamination) Measure 1999, as varied, National Environment Protection Council, Australia.
10. CRC CARE National Remediation Framework, 2019: Guideline on Performing Remediation Options Assessment, August 2019.
11. NSW EPA, 2022: Environment Protection Authority NSW, 2022: Contaminated Land Guidelines: Sampling Design – Part 1. August 2022.
12. NSW EPA, 2020: Environment Protection Authority 2020: Contaminated Land Guidelines: Consultants Reporting on Contaminated Land. EPA NSW. April 2020.
13. NSW EPA, 2017: NSW Environment Protection Authority (2017): Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd edition).

14. Australian Standard AS4482.1 – 2005 Guide to the sampling and investigation of potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds.
15. Keith, 1991: Environmental sampling and Analysis, A practical guide. Lewis Publishers.
16. Popek (2003). Sampling and Analysis of Environmental Chemical Pollutants. Academic Press.
17. NEPC, 2013: National Environment Protection Council (1999). National Environment Protection (Assessment of Site Contamination) Measure. Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater.
18. Friebel & Nadebaum (2011): *Technical Report No. 10 - Health screening levels for petroleum hydrocarbons in soil and groundwater Part 1: Technical development document*. CRC for Contamination Assessment and Remediation of the Environment.
19. DECC, 2009: Department of Environment and Climate Change (DECC), 2009: Interim Construction Noise Guideline.
20. Australian / New Zealand Standard (AS/NZS) 4602 (2009): Occupational protective footwear Part 3: Specification for safety footwear (ISO 20345:2004, MOD).
21. Australian / New Zealand Standard (AS/NZS) 4602 (1999): High visibility safety garments.
22. Australian / New Zealand Standard (AS/NZS) 1801 (1997): Occupational protective helmets.
23. Australian / New Zealand Standard (AS/NZS) 1337.6 (2007): Personal eye protection Part 6: Prescription eye protectors against low and medium impact.
24. Australian / New Zealand Standard (AS/NZS) 2161.1 (2000): Occupational protective gloves - Selection, use and maintenance.

FIGURES

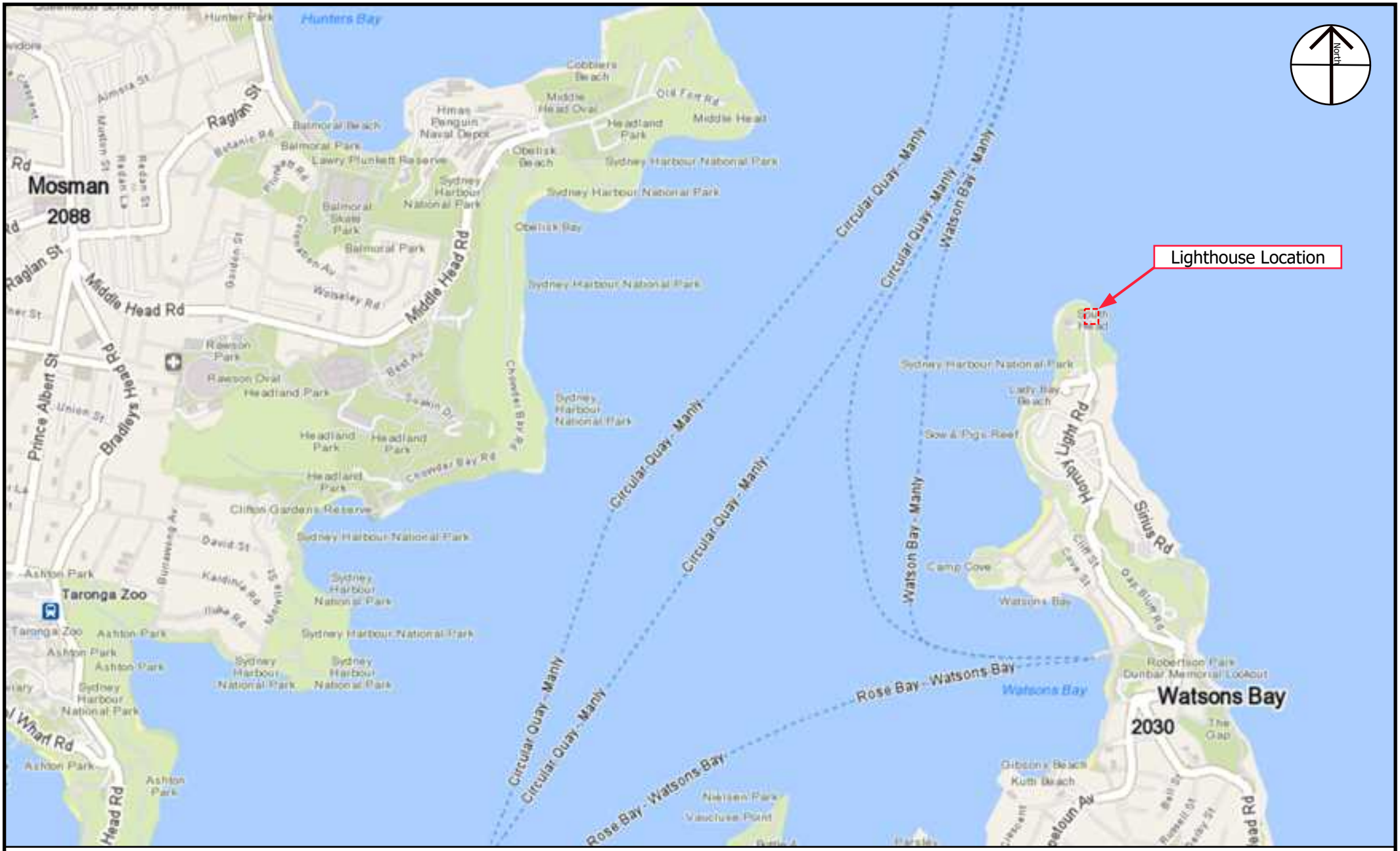
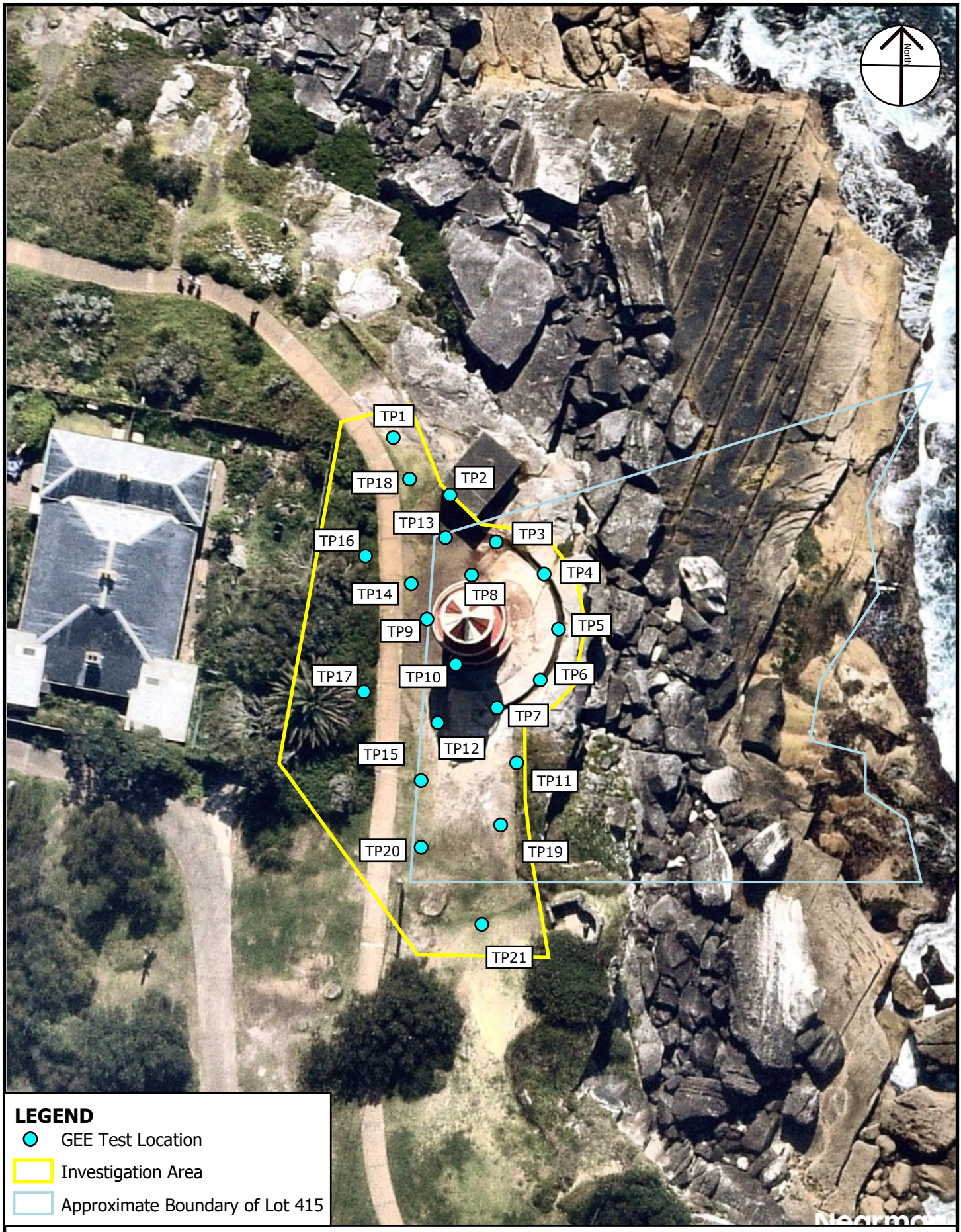


Image Source: www.whereis.com Map data © OpenStreetMap contributors

geo-environmental ENGINEERING
UNIT 2 / 5 - 7 MALTA STREET
FAIRFIELD EAST NSW 2165
P - 61 (2) 9420 3361
E - info@geoenvironmental.com.au
www.geoenvironmental.com.au

TITLE:	SCALE:	DATE:	FIGURE No.:
LOCATION MAP Hornby Lighthouse, Watsons Bay NSW	N.T.S	26 Sept 2024	1
	DRAWN: S. McC	JOB No.: G24017WB	REVISION: A



Aerial Image provided by Nearmap (https://www.nearmap.com/au/en) - Image Dated 14th September 2024

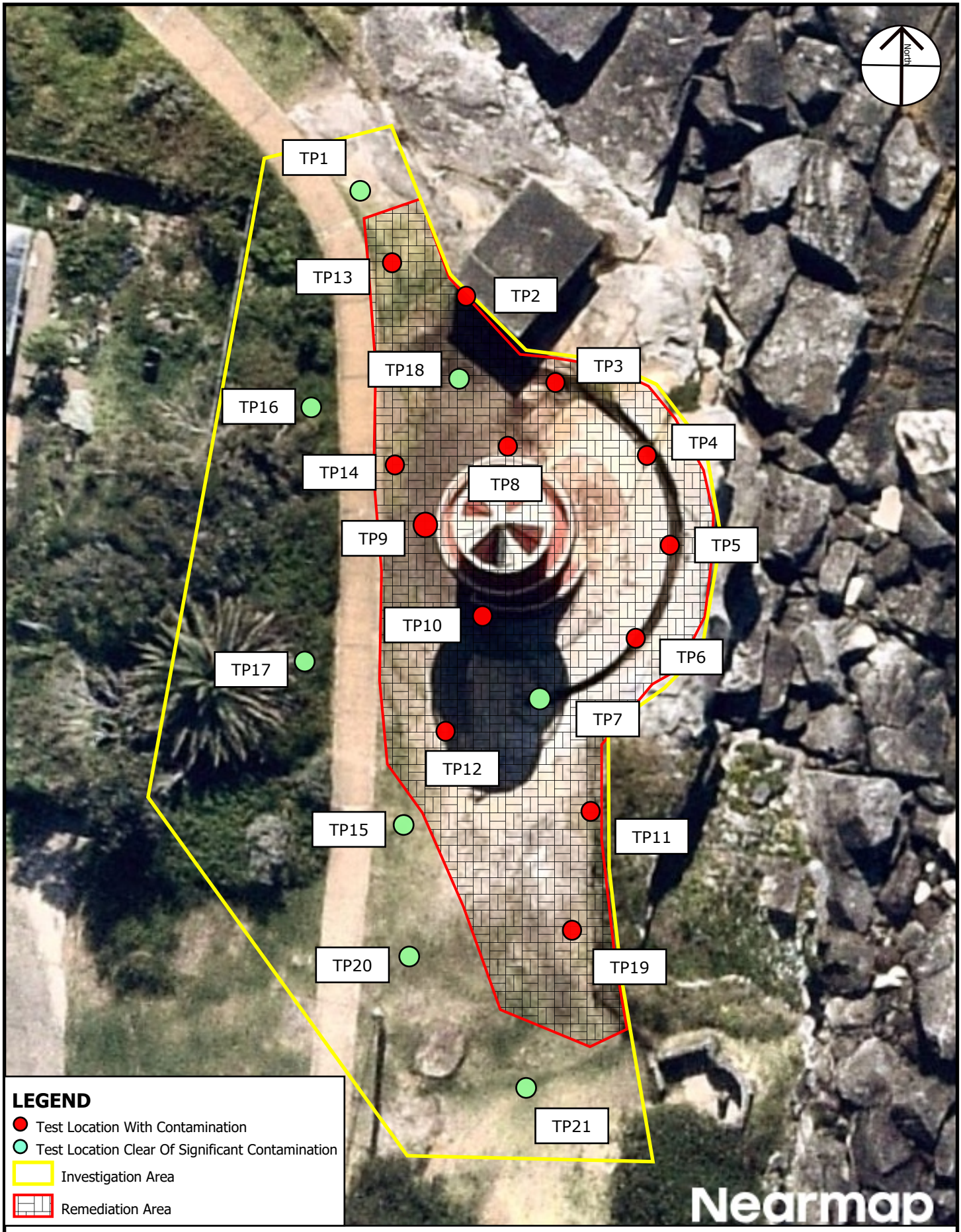
DRAWN:	SCALE:	JOB No.:	DATE:	REVISION:	FIGURE No.:
S. Gartland	N.T.S	E24017WB	23 Sept 2024	A	2

geo-environmental ENGINEERING
UNIT 2 / 5 - 7 MALTA STREET
FAIRFIELD EAST NSW 2165
P - 61 (2) 9420 3361
E - info@geoenvironmental.com.au
www.geoenvironmental.com.au

TITLE:

SITE PLAN

HORNBY LIGHTHOUSE
WATSONS BAY NSW



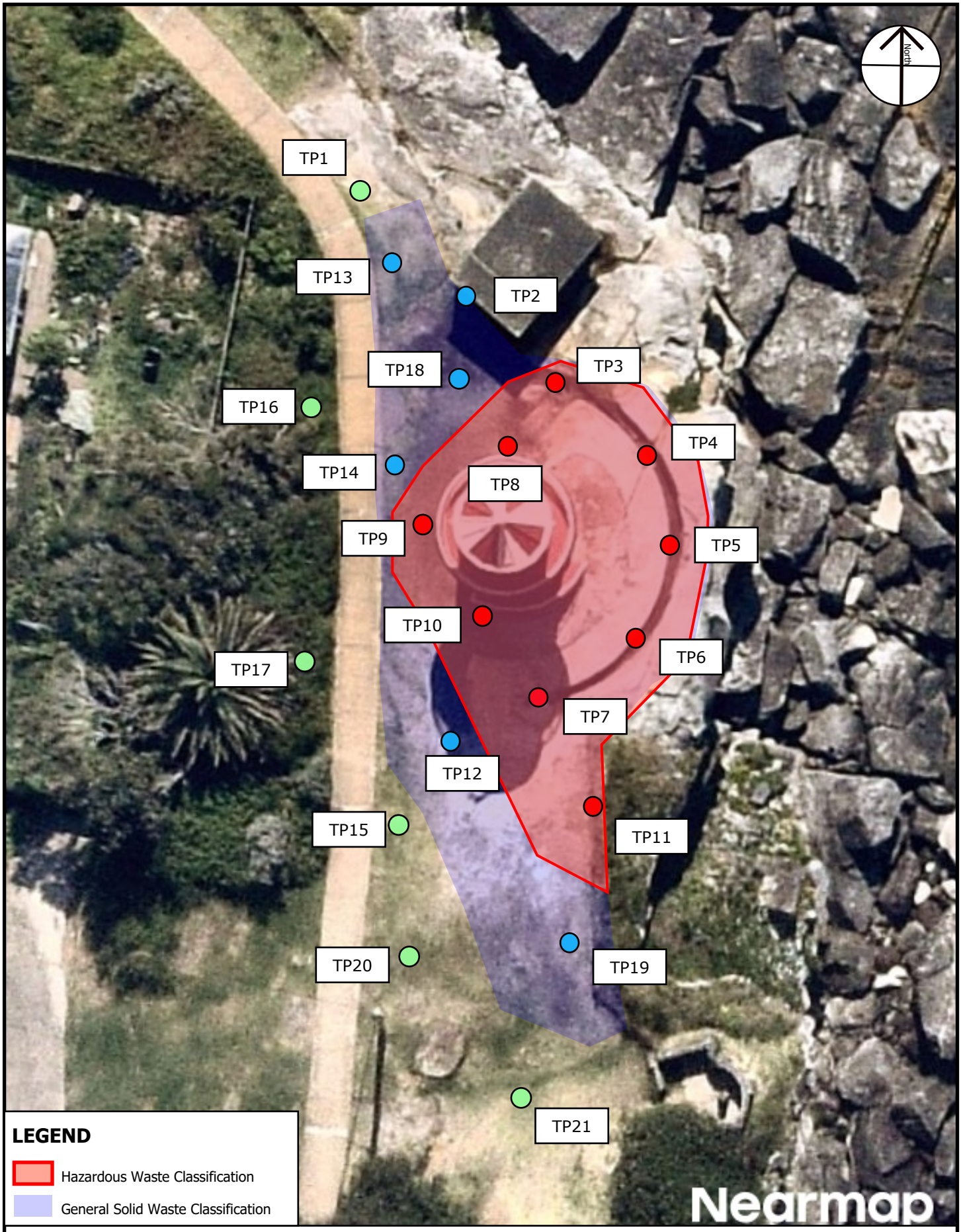
Aerial Image provided by Nearmap (https://www.nearmap.com/au/en) - Image Dated 14th September 2024

DRAWN:	SCALE:	JOB No.:	DATE:	REVISION:	FIGURE No.:
S. Gartland	**N.T.S**	**E24017WB**	**18 Oct 2024**	**A**	**3**

geo-environmental ENGINEERING
UNIT 2 / 5 - 7 MALTA STREET
FAIRFIELD EAST NSW 2165
P - 61 (2) 9420 3361
E - info@geoenvironmental.com.au
www.geoenvironmental.com.au

TITLE:

REMEDIATION AREA



Aerial Image provided by Nearmap (https://www.nearmap.com/au/en) - Image Dated 14th September 2024

DRAWN:	SCALE:	JOB No.:	DATE:	REVISION:	FIGURE No.:
S. Gartland	N.T.S	E24017WB	18 Oct 2024	A	4

geo-environmental ENGINEERING
UNIT 2 / 5 - 7 MALTA STREET
FAIRFIELD EAST NSW 2165
P - 61 (2) 9420 3361
E - info@geoenvironmental.com.au
www.geoenvironmental.com.au

TITLE:

WASTE CLASSIFICATIONS

APPENDIX A

Laboratory Reports (Waste Classification)

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

CERTIFICATE OF ANALYSIS 362821

Client Details

Client	Geo-Environmental Engineering
Attention	Stephen McCormack
Address	82 Bridge St, Lane Cove, NSW, 2066

Sample Details

Your Reference	**E24017WB**
Number of Samples	24 Soil, 1 Water
Date samples received	26/09/2024
Date completed instructions received	27/09/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	04/10/2024
Date of Issue	04/10/2024

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Asbestos Approved By
Analysed by Asbestos Approved Analyst: Amanda Lee
Authorised by Asbestos Approved Signatory: Nyovan Moonean

Results Approved By
Loren Bardwell, Development Chemist
Nyovan Moonean, Asbestos Approved Identifier/Counter
Tabitha Roberts, Senior Chemist
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		362821-1	362821-3	362821-5	362821-7	362821-8
Your Reference	UNITS	SG260924-01	SG260924-03	SG260924-05	SG260924-07	SG260924-08
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	02/10/2024	30/09/2024	30/09/2024
Date analysed	-	03/10/2024	03/10/2024	03/10/2024	03/10/2024	03/10/2024
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	92	80	75	86	92

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		362821-9	362821-10	362821-12	362821-15	362821-21
Your Reference	UNITS	SG260924-09	SG260924-10	SG260924-12	SG260924-15	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	03/10/2024	03/10/2024	03/10/2024	03/10/2024	03/10/2024
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	77	82	91	90	88

vTRH(C6-C10)/BTEXN in Soil			
Our Reference		362821-24	362821-25
Your Reference	UNITS	Trip Blank	Trip Spike
Date Sampled		23/09/2024	23/09/2024
Type of sample		Soil	Soil
Date extracted	-	30/09/2024	30/09/2024
Date analysed	-	03/10/2024	03/10/2024
TRH C_6 - C_9	mg/kg	<25	[NA]
TRH C_6 - C_{10}	mg/kg	<25	[NA]
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	[NA]
Benzene	mg/kg	<0.2	97%
Toluene	mg/kg	<0.5	97%
Ethylbenzene	mg/kg	<1	97%
m+p-xylene	mg/kg	<2	97%
o-Xylene	mg/kg	<1	97%
Naphthalene	mg/kg	<1	[NA]
Total +ve Xylenes	mg/kg	<1	[NA]
Surrogate aaa-Trifluorotoluene	%	102	98

svTRH (C10-C40) in Soil						
Our Reference		362821-1	362821-3	362821-5	362821-7	362821-8
Your Reference	UNITS	SG260924-01	SG260924-03	SG260924-05	SG260924-07	SG260924-08
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	02/10/2024	02/10/2024	02/10/2024	02/10/2024
TRH C_{10} - C_{14}	mg/kg	<50	310	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	150	580	370	<100	160
TRH C_{29} - C_{36}	mg/kg	140	700	420	<100	250
Total +ve TRH (C10-C36)	mg/kg	290	1,600	790	<50	410
TRH >C_{10} -C_{16}	mg/kg	<50	290	55	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	290	55	<50	<50
TRH >C_{16} -C_{34}	mg/kg	240	1,100	660	160	330
TRH >C_{34} -C_{40}	mg/kg	100	450	290	<100	160
Total +ve TRH (>C10-C40)	mg/kg	350	1,800	1,000	160	500
Surrogate o-Terphenyl	%	96	98	100	89	89

svTRH (C10-C40) in Soil						
Our Reference		362821-9	362821-10	362821-12	362821-15	362821-21
Your Reference	UNITS	SG260924-09	SG260924-10	SG260924-12	SG260924-15	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	02/10/2024	02/10/2024	02/10/2024	02/10/2024	02/10/2024
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	110	150	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	140	170	<100	<100	110
Total +ve TRH (C10-C36)	mg/kg	250	320	<50	<50	110
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	200	270	<100	140	150
TRH >C_{34} -C_{40}	mg/kg	140	130	100	<100	100
Total +ve TRH (>C10-C40)	mg/kg	350	400	100	140	250
Surrogate o-Terphenyl	%	92	91	84	85	86

PAHs in Soil						
Our Reference		362821-1	362821-3	362821-5	362821-7	362821-8
Your Reference	UNITS	SG260924-01	SG260924-03	SG260924-05	SG260924-07	SG260924-08
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	02/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Naphthalene	mg/kg	0.8	0.1	0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.9	0.2	0.3	0.2	0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.7	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	7.3	1	2.1	1.1	1.1
Anthracene	mg/kg	1.2	0.2	0.3	0.2	0.1
Fluoranthene	mg/kg	6.8	1.8	3.9	1.7	1.9
Pyrene	mg/kg	5.0	1.6	3.3	1.5	1.6
Benzo(a)anthracene	mg/kg	2.3	0.7	1.5	0.6	0.7
Chrysene	mg/kg	2.1	1.1	2.1	0.9	1.1
Benzo(b,j+k)fluoranthene	mg/kg	5.6	3.1	6.0	2.6	3.3
Benzo(a)pyrene	mg/kg	1.9	0.90	1.7	0.75	0.86
Indeno(1,2,3-c,d)pyrene	mg/kg	0.8	0.5	0.8	0.4	0.5
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	1	0.5	1.0	0.4	0.5
Total +ve PAH's	mg/kg	36	12	23	10	12
Benzo(a)pyrene TEQ calc (zero)	mg/kg	2.8	1.3	2.7	1.1	1.3
Benzo(a)pyrene TEQ calc(half)	mg/kg	2.8	1.4	2.7	1.2	1.4
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	2.9	1.4	2.7	1.2	1.4
Surrogate p-Terphenyl-d14	%	85	96	102	86	93

PAHs in Soil						
Our Reference		362821-9	362821-10	362821-12	362821-15	362821-21
Your Reference	UNITS	SG260924-09	SG260924-10	SG260924-12	SG260924-15	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.2	<0.1	<0.1	0.2
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.5	2.3	0.1	0.4	0.6
Anthracene	mg/kg	<0.1	0.3	0.2	0.1	0.2
Fluoranthene	mg/kg	0.9	3.0	0.2	1.6	1.4
Pyrene	mg/kg	0.8	2.4	0.2	1.6	1.3
Benzo(a)anthracene	mg/kg	0.4	0.9	0.1	1.0	0.8
Chrysene	mg/kg	0.6	1.3	0.1	1	0.8
Benzo(b,j+k)fluoranthene	mg/kg	2	3.5	0.4	3.4	2.4
Benzo(a)pyrene	mg/kg	0.52	1.0	0.1	1.1	0.77
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	0.5	<0.1	0.5	0.3
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.3	0.5	<0.1	0.6	0.4
Total +ve PAH's	mg/kg	6.0	16	1.5	11	9.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.8	1.5	<0.5	1.6	1.1
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.8	1.6	<0.5	1.7	1.2
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.9	1.6	<0.5	1.7	1.2
Surrogate p-Terphenyl-d14	%	92	91	91	96	91

PAHs in Soil		
Our Reference		362821-26
Your Reference	UNITS	SG260924-01 - [TRIPLICATE]
Date Sampled		26/09/2024
Type of sample		Soil
Date extracted	-	30/09/2024
Date analysed	-	01/10/2024
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	0.3
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	1.9
Anthracene	mg/kg	0.5
Fluoranthene	mg/kg	2.8
Pyrene	mg/kg	2.8
Benzo(a)anthracene	mg/kg	1.4
Chrysene	mg/kg	1.4
Benzo(b,j+k)fluoranthene	mg/kg	2
Benzo(a)pyrene	mg/kg	1.2
Indeno(1,2,3-c,d)pyrene	mg/kg	0.6
Dibenzo(a,h)anthracene	mg/kg	0.2
Benzo(g,h,i)perylene	mg/kg	0.7
Total +ve PAH's	mg/kg	16
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.8
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.8
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.8
Surrogate p-Terphenyl-d14	%	95

Organochlorine Pesticides in soil						
Our Reference		362821-1	362821-2	362821-3	362821-4	362821-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total Positive Aldrin+Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	80	92	97	98	106

Organochlorine Pesticides in soil						
Our Reference		362821-6	362821-7	362821-8	362821-9	362821-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total Positive Aldrin+Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	103	87	94	93	90

Organochlorine Pesticides in soil						
Our Reference		362821-11	362821-12	362821-13	362821-14	362821-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total Positive Aldrin+Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	91	92	94	87	86

Organochlorine Pesticides in soil				
Our Reference		362821-16	362821-17	362821-21
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1
Total Positive Aldrin+Dieldrin	mg/kg	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	91	96	94

Organophosphorus Pesticides in Soil						
Our Reference		362821-2	362821-4	362821-6	362821-11	362821-13
Your Reference	UNITS	SG260924-02	SG260924-04	SG260924-06	SG260924-11	SG260924-13
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	92	98	103	91	94

Organophosphorus Pesticides in Soil				
Our Reference		362821-14	362821-16	362821-17
Your Reference	UNITS	SG260924-14	SG260924-16	SG260924-17
Date Sampled		26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024
Dichlorvos	mg/kg	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	87	91	96

PCBs in Soil						
Our Reference		362821-1	362821-3	362821-5	362821-7	362821-8
Your Reference	UNITS	SG260924-01	SG260924-03	SG260924-05	SG260924-07	SG260924-08
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 2-Fluorobiphenyl	%	89	96	100	89	88

PCBs in Soil						
Our Reference		362821-9	362821-10	362821-12	362821-15	362821-21
Your Reference	UNITS	SG260924-09	SG260924-10	SG260924-12	SG260924-15	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 2-Fluorobiphenyl	%	95	94	87	91	89

Acid Extractable metals in soil						
Our Reference		362821-1	362821-2	362821-3	362821-4	362821-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Arsenic	mg/kg	<4	<4	8	<4	<4
Cadmium	mg/kg	<0.4	1	4	0.8	1
Chromium	mg/kg	7	7	45	18	23
Copper	mg/kg	24	97	440	270	200
Lead	mg/kg	190	1,200	12,000	2,800	4,100
Mercury	mg/kg	0.1	0.3	2.6	0.7	3.8
Nickel	mg/kg	6	4	16	6	9
Zinc	mg/kg	210	730	11,000	2,400	2,300

Acid Extractable metals in soil						
Our Reference		362821-6	362821-7	362821-8	362821-9	362821-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Arsenic	mg/kg	5	<4	<4	5	<4
Cadmium	mg/kg	3	<0.4	1	0.8	<0.4
Chromium	mg/kg	270	4	8	15	7
Copper	mg/kg	420	42	110	180	41
Lead	mg/kg	14,000	400	4,100	2,000	1,100
Mercury	mg/kg	6.8	<0.1	0.2	0.9	0.2
Nickel	mg/kg	140	1	3	9	3
Zinc	mg/kg	9,600	180	2,200	1,300	470

Acid Extractable metals in soil						
Our Reference		362821-11	362821-12	362821-13	362821-14	362821-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Arsenic	mg/kg	<4	<4	7	<4	<4
Cadmium	mg/kg	<0.4	<0.4	0.7	<0.4	<0.4
Chromium	mg/kg	11	4	10	9	7
Copper	mg/kg	57	35	1,100	32	13
Lead	mg/kg	920	610	2,000	660	88
Mercury	mg/kg	0.2	0.1	0.5	0.3	<0.1
Nickel	mg/kg	2	1	5	6	5
Zinc	mg/kg	750	370	1,900	530	110

Acid Extractable metals in soil						
Our Reference		362821-16	362821-17	362821-18	362821-19	362821-20
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-18	SG260924-19	SG260924-20
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	0.4	<0.4
Chromium	mg/kg	6	8	8	7	8
Copper	mg/kg	45	41	19	38	19
Lead	mg/kg	430	590	170	850	170
Mercury	mg/kg	0.2	0.3	<0.1	0.3	0.1
Nickel	mg/kg	4	4	5	2	9
Zinc	mg/kg	300	640	220	560	190

Acid Extractable metals in soil			
Our Reference		362821-21	362821-22
Your Reference	UNITS	SG260924-100	SG260924-21
Date Sampled		26/09/2024	26/09/2024
Type of sample		Soil	Soil
Date prepared	-	30/09/2024	30/09/2024
Date analysed	-	30/09/2024	30/09/2024
Arsenic	mg/kg	<4	<4
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	7	4
Copper	mg/kg	21	4
Lead	mg/kg	160	13
Mercury	mg/kg	0.1	<0.1
Nickel	mg/kg	6	<1
Zinc	mg/kg	190	8

Moisture						
Our Reference		362821-1	362821-2	362821-3	362821-4	362821-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Moisture	%	12	8.6	65	45	65

Moisture						
Our Reference		362821-6	362821-7	362821-8	362821-9	362821-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Moisture	%	49	16	22	33	20

Moisture						
Our Reference		362821-11	362821-12	362821-13	362821-14	362821-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Moisture	%	17	14	30	21	9.4

Moisture						
Our Reference		362821-16	362821-17	362821-18	362821-19	362821-20
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-18	SG260924-19	SG260924-20
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/09/2024	30/09/2024	30/09/2024	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024	01/10/2024	01/10/2024	01/10/2024
Moisture	%	22	20	14	28	16

Moisture			
Our Reference		362821-21	362821-22
Your Reference	UNITS	SG260924-100	SG260924-21
Date Sampled		26/09/2024	26/09/2024
Type of sample		Soil	Soil
Date prepared	-	30/09/2024	30/09/2024
Date analysed	-	01/10/2024	01/10/2024
Moisture	%	9.6	9.8

Asbestos ID - soils						
Our Reference		362821-1	362821-2	362821-3	362821-4	362821-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	04/10/2024	04/10/2024	04/10/2024	04/10/2024	04/10/2024
Sample mass tested	g	Approx. 95g	Approx. 20g	Approx. 40g	Approx. 25g	Approx. 20g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		362821-6	362821-7	362821-8	362821-9	362821-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	04/10/2024	04/10/2024	04/10/2024	04/10/2024	04/10/2024
Sample mass tested	g	Approx. 35g	Approx. 80g	Approx. 35g	Approx. 25g	Approx. 25g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		362821-11	362821-12	362821-13	362821-14	362821-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	04/10/2024	04/10/2024	04/10/2024	04/10/2024	04/10/2024
Sample mass tested	g	Approx. 130g	Approx. 35g	Approx. 45g	Approx. 115g	Approx. 145g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils				
Our Reference		362821-16	362821-17	362821-21
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-100
Date Sampled		26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil
Date analysed	-	04/10/2024	04/10/2024	04/10/2024
Sample mass tested	g	Approx. 105g	Approx. 135g	Approx. 35g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected

vTRH(C6-C10)/BTEXN in Water		
Our Reference	UNITS	362821-23
Your Reference		SG260924-R
Date Sampled		26/09/2024
Type of sample		Water
Date extracted	-	02/10/2024
Date analysed	-	02/10/2024
TRH C_6 - C_9	µg/L	<10
TRH C_6 - C_{10}	µg/L	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Surrogate Dibromofluoromethane	%	100
Surrogate Toluene-d8	%	99
Surrogate 4-Bromofluorobenzene	%	98

svTRH (C10-C40) in Water		
Our Reference	UNITS	362821-23
Your Reference		SG260924-R
Date Sampled		26/09/2024
Type of sample		Water
Date extracted	-	01/10/2024
Date analysed	-	01/10/2024
TRH C_{10} - C_{14}	µg/L	<50
TRH C_{15} - C_{28}	µg/L	<100
TRH C_{29} - C_{36}	µg/L	<100
Total +ve TRH (C10-C36)	µg/L	<50
TRH >C_{10} - C_{16}	µg/L	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50
TRH >C_{16} - C_{34}	µg/L	<100
TRH >C_{34} - C_{40}	µg/L	<100
Total +ve TRH (>C10-C40)	µg/L	<50
Surrogate o-Terphenyl	%	87

Metals in Waters - Acid extractable		
Our Reference		362821-23
Your Reference	UNITS	SG260924-R
Date Sampled		26/09/2024
Type of sample		Water
Date prepared	-	01/10/2024
Date analysed	-	01/10/2024
Arsenic - Total	mg/L	<0.05
Cadmium - Total	mg/L	<0.01
Chromium - Total	mg/L	<0.01
Copper - Total	mg/L	<0.01
Lead - Total	mg/L	<0.03
Mercury - Total	mg/L	<0.0005
Nickel - Total	mg/L	<0.02
Zinc - Total	mg/L	<0.02

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date extracted	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			03/10/2024	1	03/10/2024	03/10/2024		03/10/2024	03/10/2024
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	96	83
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	96	83
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	96	83
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	95	83
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	90	77
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	99	85
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	99	85
Naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	88	1	92	90	2	89	78

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	15	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	15	03/10/2024	03/10/2024		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	15	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	15	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	15	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	15	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	15	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	15	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	15	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	15	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	15	90	95	5	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date extracted	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			01/10/2024	1	01/10/2024	02/10/2024		01/10/2024	02/10/2024
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	87	81
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	150	<100	40	91	113
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	140	130	7	86	104
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	87	81
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	240	180	29	91	113
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	100	120	18	86	104
Surrogate o-Terphenyl	%		Org-020	87	1	96	88	9	89	103

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	15	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	15	02/10/2024	02/10/2024		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	15	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	15	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	15	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	15	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	15	140	<100	33	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	15	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	15	85	86	1	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date extracted	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			01/10/2024	1	02/10/2024	02/10/2024		01/10/2024	01/10/2024
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	0.8	<0.1	156	70	118
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	0.9	0.2	127	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	0.1	<0.1	0	72	120
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	0.7	<0.1	150	72	128
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	7.3	0.6	170	76	122
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	1.2	0.2	143	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	6.8	1.2	140	74	126
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	5.0	1.2	123	74	126
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	2.3	0.6	117	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	2.1	0.7	100	89	#
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	5.6	2.0	95	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	1.9	0.67	96	73	130
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	0.8	0.3	91	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	1	0.4	86	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	97	1	85	88	3	87	100

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	15	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	15	01/10/2024	01/10/2024		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	15	0.4	0.2	67	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	15	0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	15	1.6	0.4	120	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	15	1.6	0.4	120	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	15	1.0	0.2	133	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	15	1	0.3	108	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	15	3.4	0.8	124	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	15	1.1	0.2	138	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	15	0.5	0.1	133	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	15	0.6	0.1	143	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	15	96	97	1	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date extracted	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			01/10/2024	1	01/10/2024	01/10/2024		01/10/2024	01/10/2024
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	76	81
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	83
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	74	93
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	79	92
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	82	96
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	72	84
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	83	92
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	101
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	79	91
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	86
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	87	1	80	87	8	87	91

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	362821-4
Date extracted	-			[NT]	2	30/09/2024	30/09/2024		[NT]	30/09/2024
Date analysed	-			[NT]	2	01/10/2024	01/10/2024		[NT]	01/10/2024
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	87
HCB	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	90
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	100
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	102
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	101
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	96
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	102
Endrin	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	107
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	100
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	95
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	2	92	95	3	[NT]	102

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	15	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	15	01/10/2024	01/10/2024		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	15	86	95	10	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-4
Date extracted	-			30/09/2024	2	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			01/10/2024	2	01/10/2024	01/10/2024		01/10/2024	01/10/2024
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	72	91
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	65	85
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	77	115
Malathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	69	96
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	67	91
Fenthion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	72	102
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	77	98
Phosalone	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	87	2	92	95	3	87	102

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date extracted	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			01/10/2024	1	01/10/2024	01/10/2024		01/10/2024	01/10/2024
Aroclor 1016	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	88	112
Aroclor 1260	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	93	1	89	87	2	89	97

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	15	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	15	01/10/2024	01/10/2024		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021/022/025	[NT]	15	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	[NT]	15	91	87	4	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	362821-3
Date prepared	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			30/09/2024	1	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	111	102
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	102	89
Chromium	mg/kg	1	Metals-020	<1	1	7	8	13	101	97
Copper	mg/kg	1	Metals-020	<1	1	24	28	15	102	#
Lead	mg/kg	1	Metals-020	<1	1	190	200	5	103	##
Mercury	mg/kg	0.1	Metals-021	<0.1	1	0.1	0.1	0	91	#
Nickel	mg/kg	1	Metals-020	<1	1	6	8	29	100	91
Zinc	mg/kg	1	Metals-020	<1	1	210	220	5	101	##

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	362821-22
Date prepared	-			[NT]	15	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Date analysed	-			[NT]	15	30/09/2024	30/09/2024		30/09/2024	30/09/2024
Arsenic	mg/kg	4	Metals-020	[NT]	15	<4	<4	0	106	100
Cadmium	mg/kg	0.4	Metals-020	[NT]	15	<0.4	<0.4	0	99	93
Chromium	mg/kg	1	Metals-020	[NT]	15	7	7	0	98	93
Copper	mg/kg	1	Metals-020	[NT]	15	13	16	21	100	96
Lead	mg/kg	1	Metals-020	[NT]	15	88	94	7	100	95
Mercury	mg/kg	0.1	Metals-021	[NT]	15	<0.1	<0.1	0	99	90
Nickel	mg/kg	1	Metals-020	[NT]	15	5	7	33	97	92
Zinc	mg/kg	1	Metals-020	[NT]	15	110	120	9	98	91

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	30/09/2024	30/09/2024		[NT]	[NT]
Date analysed	-			[NT]	21	30/09/2024	30/09/2024		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	21	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	21	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	21	7	7	0	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	21	21	25	17	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	21	160	190	17	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	21	0.1	0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	21	6	6	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	21	190	210	10	[NT]	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			02/10/2024	[NT]	[NT]	[NT]	[NT]	02/10/2024	[NT]
Date analysed	-			02/10/2024	[NT]	[NT]	[NT]	[NT]	02/10/2024	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	114	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	114	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	113	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	115	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	115	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	116	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	101	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate Toluene-d8	%		Org-023	98	[NT]	[NT]	[NT]	[NT]	102	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	91	[NT]	[NT]	[NT]	[NT]	111	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			01/10/2024	[NT]	[NT]	[NT]	[NT]	01/10/2024	[NT]
Date analysed	-			01/10/2024	[NT]	[NT]	[NT]	[NT]	01/10/2024	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	96	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	93	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	96	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	93	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate o-Terphenyl	%		Org-020	76	[NT]	[NT]	[NT]	[NT]	117	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			01/10/2024	[NT]	[NT]	[NT]	[NT]	01/10/2024	[NT]
Date analysed	-			01/10/2024	[NT]	[NT]	[NT]	[NT]	01/10/2024	[NT]
Arsenic - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	106	[NT]
Cadmium - Total	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	102	[NT]
Chromium - Total	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	100	[NT]
Copper - Total	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	105	[NT]
Lead - Total	mg/L	0.03	Metals-020	<0.03	[NT]	[NT]	[NT]	[NT]	101	[NT]
Mercury - Total	mg/L	0.0005	Metals-021	<0.0005	[NT]	[NT]	[NT]	[NT]	107	[NT]
Nickel - Total	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	104	[NT]
Zinc - Total	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	99	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

8 metals in soil:
- # Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.
- ## Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

PAHs in Soil:
- # Percent recovery for the surrogate/matrix spike is not possible to report as the high concentration of analytes in sample/s 362821-3ms have caused interference.
- The laboratory RPD acceptance criteria has been exceeded for 362821-1. Therefore a triplicate result has been issued as laboratory sample number 362821-26.
- The RPD for duplicate results is accepted due to the non homogenous nature of sample s362821-1,1d 15,15d

Asbestos: A portion of the supplied sample was sub-sampled for asbestos according to ASB-001 asbestos subsampling procedure. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab/MPL recommends supplying 40-60g or 500ml of sample in its own container.
Note: Sample 362821-21 was sub-sampled from jar provided by the client.

COC 27/9/24 0912

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	Geo-Environmental Engineering Pty Ltd
Project Mgr:	Stephen McCormack
Sampler:	Stephen Mccormack
Address:	Unit 2, 5-7 Malta Street, Fairfield East
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au
Phone:	0458 550 257 (Sally) / 0431 480 980 (Stephen)

Client Project Name and Number: E24017WB

PO No.:

Envirolab Services Quote No. :

Date results required:

Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard**

Note: Inform lab in advance if urgent turnaround is required - surcharge applies

Envirolab Services
12 Ashley St, Chatswood, NSW, 2067

Phone: 02 9910 6200
Fax: 02 9910 6201

E-mail: ahie@envirolabservices.com.au

Contact: Aileen Hie / Simon Song

Sample information				Tests Required												Comments
Envirolab Sample ID	Client Sample ID	Date sampled	Type of sample	Combination 5a	Combination 5	Combination 3a	Combination 3	Metals Std 8	TRH (vol)/BTEXN	BTEXN	Asbestos ID	OCP/OPPs	Combination 1m				Hold	Provide as much information about the sample as you can
1	SG260924-01	26/09/2024	Soil	1														
2	SG260924-02	26/09/2024	Soil					1			1	1						
3	SG260924-03	26/09/2024	Soil	1														
4	SG260924-04	26/09/2024	Soil					1			1	1						
5	SG260924-05	26/09/2024	Soil	1														
6	SG260924-06	26/09/2024	Soil					1			1	1						
7	SG260924-07	26/09/2024	Soil	1														
8	SG260924-08	26/09/2024	Soil	1														
9	SG260924-09	26/09/2024	Soil	1														
10	SG260924-10	26/09/2024	Soil	1														
11	SG260924-11	26/09/2024	Soil					1			1	1						
12	SG260924-12	26/09/2024	Soil	1														
13	SG260924-13	26/09/2024	Soil					1			1	1						
14	SG260924-14	26/09/2024	Soil					1			1	1						

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 362821

Date Received: 26/9/24
Time Received: 1125
Received By: EW
Temp: Cool/Ambient
Cooling: Ice/Icepack 6°C
Security: Intact/Broken/None

Relinquished by (company):	Geo-Environmental Engineering	**Received by (company):**	ELS SYD
Print Name:	Sally Gartland	**Print Name:**	EMMA W
Date & Time:	26-Sep-24	**Date & Time:**	26/9/24 1125.
Signature:	SG	**Signature:**	EW

Samples Received: Cool or Ambient (circle one)
Temperature Recieved at: 6°C (if applicable)
Transported by: Hand delivered / courier

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	Geo-Environmental Engineering Pty Ltd	**Client Project Name and Number:** E24017WB	**Envirolab Services** 12 Ashley St, Chatswood, NSW, 2067
Project Mgr:	Stephen McCormack	**PO No.:**	**Phone: 02 9910 6200** **Fax: 02 9910 6201**
Sampler:	Stephen Mccormack	**Envirolab Services Quote No. :**	
Address:	Unit 2, 5-7 Malta Street, Fairfield East	**Date results required:**	**E-mail: ahie@envirolabservices.com.au**
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au	Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard** *Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	**Contact: Aileen Hie / Simon Song**
Phone:	0458 550 257 (Sally) / 0431 480 980 (Stephen)		

Sample information				Tests Required												Comments
Envirolab Sample ID	**Client Sample ID**	**Date sampled**	**Type of sample**	**Combination 5a**	**Combination 5**	**Combination 3a**	**Combination 3**	**Metals Std 8**	**TRH (vol)/BTEXN**	**BTEXN**	**Asbestos ID**	**OCP/OPPs**	**Combination 1m**			**Hold**	**Provide as much information about the sample as you can**
15	SG260924-15	26/09/2024	Soil	1													
16	SG260924-16	26/09/2024	Soil					1			1	1					
17	SG260924-17	26/09/2024	Soil					1			1	1					
18	SG260924-18	26/09/2024	Soil					1									
19	SG260924-19	26/09/2024	Soil					1									
20	SG260924-20	26/09/2024	Soil					1									
22 ~~NR~~ KW	SG260924-21	26/09/2024	Soil					1									
21	SG260924-100	26/09/2024	Soil	1													
24 ~~NR~~ SP	Trip Blank	26/09/2024	Soil						1								
25 ~~NR~~ SP	Trip Spike	26/09/2024	Soil							1							
23 ~~NR~~ KW	SG260924-R	26/09/2024	Water										1				
~~EW Extra 22~~	~~Unlabelled bag~~																

Relinquished by (company):	Geo-Environmental Engineering	**Received by (company):**	**Samples Received: Cool or Ambient (circle one)**
Print Name:	Sally Gartland	**Print Name:**	**Temperature Recieved at: (if applicable)**
Date & Time:	26-Sep-24	**Date & Time:** 26/9 1125	**Transported by: Hand delivered / courier**
Signature:	SG	**Signature:** EW	362821. **Page No: 2 of 2**

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	Geo-Environmental Engineering Pty Ltd	**Client Project Name and Number:** E24017WB	**Envirolab Services** 25 Research Dr, Croydon South VIC 3136
Project Mgr:	Stephen McCormack	**PO No.:**	**Phone: 02 9910 6200**
Sampler:	Stephen Mccormack	**Envirolab Services Quote No. :**	**Fax: 02 9910 6201**
Address:	Unit 2, 5-7 Malta Street, Fairfield East	**Date results required:**	**E-mail: ahie@envirolabservices.com.au**
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au	Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard** *Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	**Contact: Aileen Hie / Simon Song**
Phone:	0458 550 257 (Sally) / 0431 480 980 (Stephen)		

Sample information				Tests Required														Comments
Envirolab Sample ID	**Client Sample ID**	**Date sampled**	**Type of sample**	**Combination 5a**	**Combination 5**	**Combination 3a**	**Combination 3**	**Metals Std 8**	**TRH (vol)/BTEXN**	**BTEXN**	**Asbestos ID**	**OCP/OPPs**	**Combination 1m**					**Hold**	**Provide as much information about the sample as you can**
	SG260924-101	26/09/2024	Soil		1														

Relinquished by (company):	Geo-Environmental Engineering	**Received by (company):**	**Samples Received: Cool or Ambient (circle one)**
Print Name:	Sally Gartland	**Print Name:**	**Temperature Recieved at: (if applicable)**
Date & Time:	26-Sep-24	**Date & Time:**	**Transported by: Hand delivered / courier**
Signature:	SG	**Signature:**	**Page No: 1 of 1**

362821
26/9
GW

Follow us on: LinkedIn | Facebook | Twitter

Price Increase: We will be having a CPI increase July 2024. Your on-line price list will be updated automatically.

Please consider the environment before printing this email.

#362821
26/9 KW

Samples will be analysed per our T&C's.

From: Sally Gartland <sally@geoenvironmental.com.au>
Sent: Friday, September 27, 2024 9:11 AM
To: SydneyMailbox <Sydney@envirolab.com.au>; Login <Login@envirolab.com.au>
Cc: Stephen McCormack <stephen@geoenvironmental.com.au>
Subject: GEE: Sample CoC for soil samples

Hello Envirolab team,

I hope you are well! Please see attached the CoC's for the samples already at your lab.

Please note that the sample 'SG260924-R' will be arriving this afternoon.

If any questions or concerns, please let me know. ☺

All the best,

Sally Gartland
Environmental Scientist
Geo-Environmental Engineering
Unit 2 / 5-7 Malta Street
Fairfield East NSW 2165
T 02 9420 3361
M 0458 550 257

www.geoenvironmental.com.au

Kind regards,

Sally Gartland
Environmental Scientist
Geo-Environmental Engineering
Unit 2 / 5-7 Malta Street
Fairfield East NSW 2165
T 02 9420 3361
M 0458 550 257

www.geoenvironmental.com.au

#362821
26/9 KW

From: Sarah Park <SPark@envirolab.com.au>
Sent: Friday, September 27, 2024 4:36 PM
To: Sally Gartland <sally@geoenvironmental.com.au>
Cc: Stephen McCormack <stephen@geoenvironmental.com.au>; Envirolab Sydney Sample Receipt <Samplereceipt@envirolab.com.au>
Subject: RE: GEE: Sample CoC for soil samples

Hi Sally,

Thanks for the CoC for the sample.

Just double checking that we did not receive Trip Blank and Trip Spike for this batch – would you be sending them with the sample 'SG260924-R'?
Also, we received 1 x 500mL bag of soil sample that had no sample ID labelled on it. We have added onto the CoC as an extra sample #22.

Could you please confirm what this sample might be?

Please refer to the attached CoC for your reference.

Kind Regards,

Sarah Park | Customer Service | Envirolab Services

Great Science. Great Service.

12 Ashley Street Chatswood NSW 2067
T 612 9910 6200
E SPark@envirolab.com.au | **W** www.envirolab.com.au

Follow us on: LinkedIn | Facebook | Twitter

Samples will be analysed per our T&C's.

From: Joy Toh <JToh@envirolab.com.au>
Sent: Friday, 27 September 2024 9:14 AM
To: Login <Login@envirolab.com.au>; Envirolab Sydney Sample Receipt <Samplereceipt@envirolab.com.au>
Subject: Fw: GEE: Sample CoC for soil samples

Kind Regards,

Joy Toh | Reception | Envirolab Services

Great Science. Great Service.

Sarah Park

From: Sally Gartland <sally@geoenvironmental.com.au>
Sent: Friday, 27 September 2024 4:58 PM
To: Sarah Park
Cc: Stephen McCormack; Envirolab Sydney Sample Receipt
Subject: Re: GEE: Sample CoC for soil samples

Hi Sarah,

#362821
26/9 KW

Thank you very much for your email.

That blank bag would be sample SG260924-21 (I have a photo record of this taken at the time as I was sampling in the rain).

With the trip blank and spike I'm just checking something on my end and I'll get back to you about it.

Thank you for your help with this. ☺

Sarah Park

From: Sally Gartland <sally@geoenvironmental.com.au>
Sent: Friday, 27 September 2024 7:15 PM
To: Sarah Park
Cc: Stephen McCormack; Envirolab Sydney Sample Receipt
Subject: Re: GEE: Sample CoC for soil samples

Hi Sarah,

I think I know what's happened, the soil TS/TB may have been in the eskies containing groundwater samples that we dropped to you on the same day. I don't think I've received the sample receipt for those groundwater samples just yet so they must be at login still.

There's also a water trip blank in there which is listed on the groundwater CoC.

Hopefully this helps. 😊

Please let me know if there's any further issues. Thank you for your help. 😊

Kind regards,

Sally

Sent from my iPhone

> On 27 Sep 2024, at 5:55 pm, Sarah Park <SPark@envirolab.com.au> wrote:
>
> Hi Sally,
>
> Thanks for the email – will update the extra sample to be 'SG260924-21'.
> Will keep an eye out for any updates from you.
>
> Have a good weekend!
>
> **Kind Regards,**
>
> **Sarah Park | Customer Service | Envirolab Services**
>
> **Great Science. Great Service.**
>
> 12 Ashley Street Chatswood NSW 2067
> **T** 612 9910 6200
> **E** SPark@envirolab.com.au | **W** www.envirolab.com.au
>
> **Follow us on:** LinkedIn | Facebook | Twitter

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

CERTIFICATE OF ANALYSIS 362821-A

Client Details

Client	Geo-Environmental Engineering
Attention	Stephen McCormack
Address	82 Bridge St, Lane Cove, NSW, 2066

Sample Details

Your Reference	**E24017WB**
Number of Samples	Additional analysis
Date samples received	26/09/2024
Date completed instructions received	04/10/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	11/10/2024
Date of Issue	11/10/2024

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Results Approved By
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

PAHs in Soil						
Our Reference		362821-A-16	362821-A-17	362821-A-18	362821-A-20	362821-A-22
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-18	SG260924-20	SG260924-21
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	10/10/2024	10/10/2024	10/10/2024	10/10/2024	10/10/2024
Date analysed	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	0.5	0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.5	2.0	0.7	0.2	<0.1
Anthracene	mg/kg	0.1	0.5	0.1	<0.1	<0.1
Fluoranthene	mg/kg	1.1	4.7	1.3	0.4	<0.1
Pyrene	mg/kg	1.0	4.4	1.2	0.3	<0.1
Benzo(a)anthracene	mg/kg	0.5	2.4	0.6	0.2	<0.1
Chrysene	mg/kg	0.6	2.5	0.6	0.2	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.9	4.0	0.8	0.3	<0.2
Benzo(a)pyrene	mg/kg	0.52	2.5	0.5	0.2	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	1.2	0.2	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	0.1	0.4	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.4	1.5	0.3	0.1	<0.1
Total +ve PAH's	mg/kg	6.0	27	6.4	1.8	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.8	3.7	0.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.8	3.7	0.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.8	3.7	0.8	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	108	106	103	107	96

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	[NT]
Date extracted	-			10/10/2024	[NT]	[NT]	[NT]	[NT]	10/10/2024	[NT]
Date analysed	-			11/10/2024	[NT]	[NT]	[NT]	[NT]	11/10/2024	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	80	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	78	[NT]
Fluorene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	82	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	76	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	96	[NT]	[NT]	[NT]	[NT]	91	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Anna Bui

From: Stephen McCormack <stephen@geoenvironmental.com.au>
Sent: Friday, 4 October 2024 3:58 PM
To: Greta Petzold; Envirolab Sydney Sample Receipt; Simon Song
Subject: RE: Results for Registration 362821 E24017WB

Can you please test the following samples for PAHs. Std turnaround or 4days if you can
16 SG260924-16
17 SG260924-17
18 SG260924-18
20 SG260924-20
22 SG260924-21

ES REF: 362821-A
TAT: STANDARD
DUE: 11/10/24
AB.

Thanks

Stephen McCormack B. Eng (Civil) – MIEAust, CPEng, NER, CEnvP
Director
Geo-Environmental Engineering
Unit 2 / 5-7 Malta Street
Fairfield East NSW 2165
M 0431 480 980

www.geoenvironmental.com.au

From: Greta Petzold <GPetzold@envirolab.com.au>
Sent: Friday, 4 October 2024 2:49 PM
To: Sally Gartland <sally@geoenvironmental.com.au>; Stephen McCormack <stephen@geoenvironmental.com.au>
Subject: Results for Registration 362821 E24017WB

Please refer to attached for:
a copy of the Certificate of Analysis
a copy of the COC/paperwork received from you
an Excel or .csv file containing the results
a copy of the Invoice

Please note that a hard copy will not be posted.

Enquiries should be made directly to:
customerservice@envirolab.com.au

How did we do? Send Feedback

Kind Regards,

Greta Petzold | Operations Manager | Envirolab Services

Great Science. Great Service.

12 Ashley Street Chatswood NSW 2067
T 612 9910 6200
E GPetzold@envirolab.com.au | **W** www.envirolab.com.au

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

CERTIFICATE OF ANALYSIS 362821-B

Client Details

Client	Geo-Environmental Engineering
Attention	Sally Gartland
Address	82 Bridge St, Lane Cove, NSW, 2066

Sample Details

Your Reference	**E24017WB**
Number of Samples	Additional analysis
Date samples received	26/09/2024
Date completed instructions received	09/10/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	16/10/2024
Date of Issue	16/10/2024

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Results Approved By
Diego Bigolin, Inorganics Supervisor
Tabitha Roberts, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		362821-B-1	362821-B-2	362821-B-3	362821-B-4	362821-B-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
Date analysed	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
pH 1:5 soil:water	pH Units	6.9	7.1	8.1	7.9	8.1

Misc Inorg - Soil						
Our Reference		362821-B-6	362821-B-7	362821-B-8	362821-B-9	362821-B-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
Date analysed	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
pH 1:5 soil:water	pH Units	8.2	7.9	7.9	7.0	7.9

Misc Inorg - Soil						
Our Reference		362821-B-11	362821-B-12	362821-B-13	362821-B-14	362821-B-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
Date analysed	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
pH 1:5 soil:water	pH Units	7.9	8.1	7.3	6.9	6.5

Misc Inorg - Soil						
Our Reference		362821-B-16	362821-B-17	362821-B-18	362821-B-19	362821-B-20
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-18	SG260924-19	SG260924-20
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
Date analysed	-	11/10/2024	11/10/2024	11/10/2024	11/10/2024	11/10/2024
pH 1:5 soil:water	pH Units	7.8	7.2	6.7	6.4	6.4

Misc Inorg - Soil		
Our Reference		362821-B-22
Your Reference	UNITS	SG260924-21
Date Sampled		26/09/2024
Type of sample		Soil
Date prepared	-	11/10/2024
Date analysed	-	11/10/2024
pH 1:5 soil:water	pH Units	6.8

CEC						
Our Reference		362821-B-1	362821-B-2	362821-B-3	362821-B-4	362821-B-5
Your Reference	UNITS	SG260924-01	SG260924-02	SG260924-03	SG260924-04	SG260924-05
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Date analysed	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Exchangeable Ca	meq/100g	8.0	13	13	6.7	7.3
Exchangeable K	meq/100g	0.2	0.3	0.2	0.1	0.1
Exchangeable Mg	meq/100g	1.3	3.3	2.0	1.3	1.1
Exchangeable Na	meq/100g	<0.1	0.5	0.3	0.2	0.2
Cation Exchange Capacity	meq/100g	9.5	17	16	8.4	8.6

CEC						
Our Reference		362821-B-6	362821-B-7	362821-B-8	362821-B-9	362821-B-10
Your Reference	UNITS	SG260924-06	SG260924-07	SG260924-08	SG260924-09	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Date analysed	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Exchangeable Ca	meq/100g	9.9	1.0	4.7	6.2	2.7
Exchangeable K	meq/100g	0.2	<0.1	0.1	0.3	0.1
Exchangeable Mg	meq/100g	1.8	0.7	0.9	3.5	1.1
Exchangeable Na	meq/100g	0.3	<0.1	0.1	0.2	0.1
Cation Exchange Capacity	meq/100g	12	1.8	5.8	10	4.0

CEC						
Our Reference		362821-B-11	362821-B-12	362821-B-13	362821-B-14	362821-B-15
Your Reference	UNITS	SG260924-11	SG260924-12	SG260924-13	SG260924-14	SG260924-15
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Date analysed	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Exchangeable Ca	meq/100g	3.6	2.2	4.3	5.3	3.7
Exchangeable K	meq/100g	0.1	<0.1	<0.1	0.1	0.2
Exchangeable Mg	meq/100g	1.2	0.8	0.9	1.6	1.6
Exchangeable Na	meq/100g	<0.1	<0.1	<0.1	<0.1	<0.1
Cation Exchange Capacity	meq/100g	5.0	3.1	5.3	7.1	5.6

CEC						
Our Reference		362821-B-16	362821-B-17	362821-B-18	362821-B-19	362821-B-20
Your Reference	UNITS	SG260924-16	SG260924-17	SG260924-18	SG260924-19	SG260924-20
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Date analysed	-	15/10/2024	15/10/2024	15/10/2024	15/10/2024	15/10/2024
Exchangeable Ca	meq/100g	19	14	8.2	5.5	6.9
Exchangeable K	meq/100g	0.2	0.3	0.3	0.4	0.2
Exchangeable Mg	meq/100g	4.0	3.6	2.2	3.2	2.6
Exchangeable Na	meq/100g	0.1	0.2	<0.1	0.3	<0.1
Cation Exchange Capacity	meq/100g	23	18	11	9.4	9.8

CEC		
Our Reference		362821-B-22
Your Reference	UNITS	SG260924-21
Date Sampled		26/09/2024
Type of sample		Soil
Date prepared	-	15/10/2024
Date analysed	-	15/10/2024
Exchangeable Ca	meq/100g	0.6
Exchangeable K	meq/100g	<0.1
Exchangeable Mg	meq/100g	0.8
Exchangeable Na	meq/100g	0.1
Cation Exchange Capacity	meq/100g	1.5

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			11/10/2024	1	11/10/2024	11/10/2024		11/10/2024	[NT]
Date analysed	-			11/10/2024	1	11/10/2024	11/10/2024		11/10/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	6.9	6.8	1	100	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date prepared	-			[NT]	11	11/10/2024	11/10/2024		11/10/2024	[NT]
Date analysed	-			[NT]	11	11/10/2024	11/10/2024		11/10/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	11	7.9	8.0	1	100	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	22	11/10/2024	11/10/2024		[NT]	[NT]
Date analysed	-			[NT]	22	11/10/2024	11/10/2024		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	22	6.8	6.7	1	[NT]	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	362821-B-22
Date prepared	-			15/10/2024	2	15/10/2024	15/10/2024		15/10/2024	15/10/2024
Date analysed	-			15/10/2024	2	15/10/2024	15/10/2024		15/10/2024	15/10/2024
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	2	13	11	17	91	76
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	2	0.3	0.3	0	97	77
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	2	3.3	2.9	13	90	74
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	2	0.5	0.3	50	99	84

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	15/10/2024	15/10/2024		[NT]	[NT]
Date analysed	-			[NT]	11	15/10/2024	15/10/2024		[NT]	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	[NT]	11	3.6	3.4	6	[NT]	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	[NT]	11	0.1	0.1	0	[NT]	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	[NT]	11	1.2	1.2	0	[NT]	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	[NT]	11	<0.1	<0.1	0	[NT]	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	20	15/10/2024	15/10/2024		[NT]	[NT]
Date analysed	-			[NT]	20	15/10/2024	15/10/2024		[NT]	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	[NT]	20	6.9	7.1	3	[NT]	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	[NT]	20	0.2	0.2	0	[NT]	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	[NT]	20	2.6	2.6	0	[NT]	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	[NT]	20	<0.1	<0.1	0	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Samples received in good order: Holding time exceedance

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	**Geo-Environmental Engineering Pty Ltd**	**Client Project Name and Number:**	**Envirolab Services**
Project Mgr:	**Stephen McCormack**	E24017WB	**12 Ashley St, Chatswood, NSW, 2067**
Sampler:	**Stephen Mccormack**	**PO No.:**	**Phone: 02 9910 6200**
Address:	**Unit 2, 5-7 Malta Street, Fairfield East**	**Envirolab Services Quote No. :**	**Fax: 02 9910 6201**
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au	**Date results required:**	**E-mail: ahie@envirolabservices.com.au**
		Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard**	**Contact: Aileen Hie / Simon Song**
Phone:	**0458 550 257 (Sally) / 0431 480 980 (Stephen)**	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	

Sample information				Tests Required														Comments
Envirolab Sample ID	**Client Sample ID**	**Date sampled**	**Type of sample**	**pH**	**CeC**												**Hold**	**Provide as much information about the sample as you can**
1	SG260924-01	26/09/2024	Soil	1	1													
2	SG260924-02	26/09/2024	Soil	1	1													
3	SG260924-03	26/09/2024	Soil	1	1													
4	SG260924-04	26/09/2024	Soil	1	1													
5	SG260924-05	26/09/2024	Soil	1	1													
6	SG260924-06	26/09/2024	Soil	1	1													
7	SG260924-07	26/09/2024	Soil	1	1													
8	SG260924-08	26/09/2024	Soil	1	1													
9	SG260924-09	26/09/2024	Soil	1	1													
10	SG260924-10	26/09/2024	Soil	1	1													
11	SG260924-11	26/09/2024	Soil	1	1													
12	SG260924-12	26/09/2024	Soil	1	1													
13	SG260924-13	26/09/2024	Soil	1	1													
14	SG260924-14	26/09/2024	Soil	1	1													

Relinquished by (company):	Geo-Environmental Engineering	**Received by (company):**	ELS SYD	**Samples Received: Cool or Ambient (circle one)**
Print Name:	Sally Gartland	**Print Name:**	A. Bal	**Temperature Recieved at:** **(if applicable)**
Date & Time:	Requested digitally 9/10/24	**Date & Time:**	9/10/24 1153	**Transported by: Hand delivered / courier**
Signature:	SG	**Signature:**		**Page No: 1 of 2**

362821-B

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	**Geo-Environmental Engineering Pty Ltd**	**Client Project Name and Number:** E24017WB	**Envirolab Services** **12 Ashley St, Chatswood, NSW, 2067**
Project Mgr:	**Stephen McCormack**	**PO No.:**	**Phone: 02 9910 6200**
Sampler:	**Stephen Mccormack**	**Envirolab Services Quote No. :**	**Fax: 02 9910 6201**
Address:	**Unit 2, 5-7 Malta Street, Fairfield East**	**Date results required:**	**E-mail: ahie@envirolabservices.com.au**
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au	Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard** *Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	**Contact: Aileen Hie / Simon Song**
Phone:	**0458 550 257 (Sally) / 0431 480 980 (Stephen)**		

Sample information				Tests Required														Comments
Envirolab Sample ID	**Client Sample ID**	**Date sampled**	**Type of sample**	**pH**	**CeC**												**Hold**	**Provide as much information about the sample as you can**
15	SG260924-15	26/09/2024	Soil	1	1													
16	SG260924-16	26/09/2024	Soil	1	1													
17	SG260924-17	26/09/2024	Soil	1	1													
18	SG260924-18	26/09/2024	Soil	1	1													
19	SG260924-19	26/09/2024	Soil	1	1													
20	SG260924-20	26/09/2024	Soil	1	1													
22	SG260924-21	26/09/2024	Soil	1	1													
24	SG260924-100	26/09/2024	Soil														1	
	Trip Blank	26/09/2024	Soil														1	
	Trip Spike	26/09/2024	Soil														1	
	SG260924-R	26/09/2024	Water														1	

Relinquished by (company):	Geo-Environmental Engineering	**Received by (company):** ELS SMD	**Samples Received: Cool or Ambient (circle one)**	
Print Name:	Sally Gartland	**Print Name:** A.BU	**Temperature Recieved at:**	**(if applicable)**
Date & Time:	Requested digitally 9/10/24	**Date & Time:** 9/10/24 1153	**Transported by: Hand delivered / courier**	
Signature:	SG	**Signature:**	**Page No: 2 of 2**	

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph +61 3 9763 2500
melbourne@envirolab.com.au
www.envirolab.com.au

Certificate of Analysis MFJ0016

Client Details

Client	Geo-Environmental Engineering Pty Ltd
Contact	Stephen McCormack
Address	82 Bridge Street, LANE COVE, NSW, 2066

Sample Details

Your Reference	E24017WB
Number of Samples	1 Soil
Date Samples Received	01/10/2024
Date Instructions Received	01/10/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for soils and on an as received basis for other matrices.

Report Details

Date Results Requested by	07/10/2024
Date of Issue	04/10/2024

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

Authorisation Details

Results Approved By	Tara White, Metals Supervisor Tianna Milburn, Senior Chemist
Laboratory Manager	Pamela Adams

Certificate of Analysis MFJ0016

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
MFJ0016-01	SG260924-101	Soil	26/09/2024	01/10/2024

Volatile TRH and BTEX (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
TRH C6-C9	mg/kg	25	<25
TRH C6-C10	mg/kg	25	<25
TRH C6-C10 less BTEX (F1)	mg/kg	25	<25
Methyl tert butyl ether (MTBE)	mg/kg	0.50	<0.50
Benzene	mg/kg	0.20	<0.20
Toluene	mg/kg	0.50	<0.50
Ethylbenzene	mg/kg	1.0	<1.0
meta+para Xylene	mg/kg	2.0	<2.0
ortho-Xylene	mg/kg	1.0	<1.0
Total Xylene	mg/kg	3.0	<3.0
Naphthalene (value used in F2 calc)	mg/kg	1.0	<1.0
Surrogate aaa-Trifluorotoluene	%		*82.6*

Semi-volatile TRH (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
TRH C10-C14	mg/kg	50	<50
TRH C15-C28	mg/kg	100	<100
TRH C29-C36	mg/kg	100	<100
Total +ve TRH C10-C36	mg/kg	50	<50
TRH >C10-C16	mg/kg	50	<50
TRH >C10-C16 less Naphthalene F2	mg/kg	50	<50
TRH >C16-C34 (F3)	mg/kg	100	<100
TRH >C34-C40 (F4)	mg/kg	100	<100
Total +ve TRH >C10-C40	mg/kg	50	<50
Surrogate o-Terphenyl	%		*84.1*

Polycyclic Aromatic Hydrocarbons (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
Naphthalene	mg/kg	0.10	<0.10
Acenaphthylene	mg/kg	0.10	0.13
Acenaphthene	mg/kg	0.10	<0.10
Fluorene	mg/kg	0.10	<0.10
Phenanthrene	mg/kg	0.10	0.64
Anthracene	mg/kg	0.10	0.15
Fluoranthene	mg/kg	0.10	1.1
Pyrene	mg/kg	0.10	1.0
Benzo(a)anthracene	mg/kg	0.10	0.36
Chrysene	mg/kg	0.10	0.45
Benzo(b,j,k)fluoranthene	mg/kg	0.20	0.82
Benzo(a)pyrene	mg/kg	0.050	0.48
Indeno(1,2,3-c,d)pyrene	mg/kg	0.10	0.32
Dibenzo(a,h)anthracene	mg/kg	0.10	<0.10
Benzo(g,h,i)perylene	mg/kg	0.10	0.31
Total +ve PAH	mg/kg	0.050	5.8
Benzo(a)pyrene TEQ calc zero	mg/kg	0.50	0.64
Benzo(a)pyrene TEQ calc Half	mg/kg	0.50	0.69
Benzo(a)pyrene TEQ calc PQL	mg/kg	0.50	0.74
Surrogate p-Terphenyl-D14	%		*110*

Organochlorine Pesticides (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
alpha-BHC	mg/kg	0.10	<0.10
Hexachlorobenzene	mg/kg	0.10	<0.10
beta-BHC	mg/kg	0.10	<0.10
gamma-BHC	mg/kg	0.10	<0.10
delta-BHC	mg/kg	0.10	<0.10
Heptachlor	mg/kg	0.10	<0.10
Aldrin	mg/kg	0.10	<0.10
Heptachlor epoxide	mg/kg	0.10	<0.10
trans-Chlordane	mg/kg	0.10	<0.10
cis-Chlordane	mg/kg	0.10	<0.10
Endosulfan I	mg/kg	0.10	<0.10
4,4'-DDE	mg/kg	0.10	<0.10
Dieldrin	mg/kg	0.10	<0.10
Endrin	mg/kg	0.10	<0.10
4,4'-DDD	mg/kg	0.10	<0.10
Endosulfan II	mg/kg	0.10	<0.10
Endrin aldehyde	mg/kg	0.10	<0.10
4,4'-DDT	mg/kg	0.10	<0.10
Endosulfan sulfate	mg/kg	0.10	<0.10
Endrin ketone	mg/kg	0.10	<0.10
Methoxychlor	mg/kg	0.10	<0.10
Mirex	mg/kg	0.10	<0.10
Total +ve DDT+DDD+DDE	mg/kg	0.10	<0.10
Total +ve Aldrin + Dieldrin	mg/kg	0.10	<0.10
Total +ve OCP	mg/kg	0.10	<0.10
Surrogate 4-chloro-3-nitrobenzotrifluoride	%		*87.9*

Polychlorinated Biphenyls (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
Aroclor 1016	mg/kg	0.10	<0.10
Aroclor 1221	mg/kg	0.10	<0.10
Aroclor 1232	mg/kg	0.10	<0.10
Aroclor 1242	mg/kg	0.10	<0.10
Aroclor 1248	mg/kg	0.10	<0.10
Aroclor 1254	mg/kg	0.10	<0.10
Aroclor 1260	mg/kg	0.10	<0.10
Total +ve PCB (1016-1260)	mg/kg	0.10	<0.10
Surrogate 2-Fluorobiphenyl	%		*104*

Certificate of Analysis MFJ0016

Acid Extractable Metals (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
Arsenic	mg/kg	4.0	<4.0
Cadmium	mg/kg	0.40	<0.40
Chromium	mg/kg	1.0	5.1
Copper	mg/kg	1.0	30
Mercury	mg/kg	0.10	<0.10
Nickel	mg/kg	1.0	3.4
Lead	mg/kg	1.0	270
Zinc	mg/kg	1.0	230

Certificate of Analysis MFJ0016

Inorganics - Moisture (Soil)

Envirolab ID	Units	PQL	MFJ0016-01
Your Reference			SG260924-101
Date Sampled			26/09/2024
Moisture	%	0.10	13

Method Summary

Method ID	Methodology Summary
INORG-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
METALS-020	Determination of various metals by ICP-OES.
METALS-021	Determination of Mercury by Cold Vapour AAS.
ORG-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
ORG-021/022/025_PCB	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS.
ORG-022_OC	Determination of semi-volatile organic compounds (SVOCs) by GC-MS. Water samples are extracted by LLE and soils using DCM/Acetone/Methanol.
ORG-022_PAH	Determination of semi-volatile organic compounds (SVOCs) by GC-MS. Water samples are extracted by LLE and solids using DCM/Acetone/Methanol. For PAHs:- Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, for Total +ve calculations, the PQL is reflective of the lowest individual PQL and therefore, for example, "Total +ve PAHs" is simply a sum of the positive individual PAHs.
ORG-023_F1_TOT	Determination of volatile organic compounds (VOCs) by P&T-GC-MS. Water samples are analysed directly by purge and trap GC-MS. Solids are extracted with Methanol, diluted and analysed by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

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

Surrogate Spike

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

LCS (Laboratory Control Sample)

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

Matrix Spike

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

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

Miscellaneous Information

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

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary MFJ0016

Client Details

Client	Geo-Environmental Engineering Pty Ltd
Your Reference	E24017WB
Date Issued	04/10/2024

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	No	Duplicate Outliers Exist - See detailed list below
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary MFJ0016

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
vTRH&MBTEXN | Soil	1	26/09/2024	02/10/2024	04/10/2024	Yes
sTRH | Soil	1	26/09/2024	02/10/2024	02/10/2024	Yes
PAH | Soil	1	26/09/2024	02/10/2024	03/10/2024	Yes
OCP | Soil	1	26/09/2024	02/10/2024	03/10/2024	Yes
PCB | Soil	1	26/09/2024	02/10/2024	03/10/2024	Yes
Metals | Soil	1	26/09/2024	02/10/2024	02/10/2024	Yes
Metals-Hg | Soil	1	26/09/2024	02/10/2024	02/10/2024	Yes
Moisture | Soil	1	26/09/2024	02/10/2024	03/10/2024	Yes

Outliers: Duplicates

METALS-020|Acid Extractable Metals (Soil)| Batch BFJ0271

Sample ID	Duplicate ID	Analyte	% Limits	RPD
BFJ0271-DUP1#	DUP1	Lead	40.00	81.3[1]

Quality Control MFJ0016

ORG-023_F1_TOT|Volatile TRH and BTEX (Soil) | Batch BFJ0272

Analyte	Units	PQL	Blank	DUP1 BFJ0272-DUP1# Samp | QC | RPD %	LCS %	Spike % BFJ0272-MS2#
TRH C6-C9	mg/kg	25	<25	<25 | <25 | [NA]	85.2	64.8
TRH C6-C10	mg/kg	25	<25	<25 | <25 | [NA]	87.5	69.1
TRH C6-C10 less BTEX (F1)	mg/kg	25	<25	<25 | <25 | [NA]	[NA]	[NA]
Methyl tert butyl ether (MTBE)	mg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	[NA]	[NA]
Benzene	mg/kg	0.20	<0.20	<0.20 | <0.20 | [NA]	95.8	81.7
Toluene	mg/kg	0.50	<0.50	<0.50 | <0.50 | [NA]	104	88.8
Ethylbenzene	mg/kg	1.0	<1.0	<1.0 | <1.0 | [NA]	102	88.7
meta+para Xylene	mg/kg	2.0	<2.0	<2.0 | <2.0 | [NA]	114	98.7
ortho-Xylene	mg/kg	1.0	<1.0	<1.0 | <1.0 | [NA]	105	90.9
Total Xylene	mg/kg	3.0	<3.0	<3.0 | <3.0 | [NA]	[NA]	[NA]
Naphthalene (value used in F2 calc)	mg/kg	1.0	<1.0	<1.0 | <1.0 | [NA]	[NA]	[NA]
Surrogate aaa-Trifluorotoluene	*%*		*98.8*	*96.0 | 100*	*101*	*82.1*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

ORG-020|Semi-volatile TRH (Soil) | Batch BFJ0273

Analyte	Units	PQL	Blank	DUP1 BFJ0273-DUP1# Samp | QC | RPD %	DUP2 BFJ0273-DUP2# Samp | QC | RPD %	LCS %	Spike % BFJ0273-MS1#
TRH C10-C14	mg/kg	50	<50	<50 | <50 | [NA]		123	91.3
TRH C15-C28	mg/kg	100	<100	<100 | <100 | [NA]		91.6	69.1
TRH C29-C36	mg/kg	100	<100	122 | 106 | [NA]		89.4	76.8
TRH >C10-C16	mg/kg	50	<50	<50 | <50 | [NA]		96.1	70.7
TRH >C16-C34 (F3)	mg/kg	100	<100	151 | <100 | [NA]		92.5	70.0
TRH >C34-C40 (F4)	mg/kg	100	<100	<100 | 148 | [NA]		84.7	84.7
Surrogate o-Terphenyl	*%*		*85.5*	*86.1 | 84.5*		*102*	*90.2*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

ORG-022_PAH|Polycyclic Aromatic Hydrocarbons (Soil) | Batch BFJ0273

Analyte	Units	PQL	Blank	DUP1 BFJ0273-DUP1# Samp | QC | RPD %	DUP2 BFJ0273-DUP2# Samp | QC | RPD %	LCS %	Spike % BFJ0273-MS2#
Naphthalene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		101	99.9
Acenaphthylene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Acenaphthene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		98.3	101
Fluorene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		91.3	101
Phenanthrene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		83.9	97.6
Anthracene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Fluoranthene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		103	99.9
Pyrene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		110	103
Benzo(a)anthracene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Chrysene	mg/kg	0.10	<0.10	0.196 | <0.10 | [NA]		127	98.8
Benzo(b,j,k)fluoranthene	mg/kg	0.20	<0.20	<0.20 | <0.20 | [NA]		[NA]	[NA]
Benzo(a)pyrene	mg/kg	0.050	<0.050	0.125 | <0.050 | [NA]		98.5	97.5
Indeno(1,2,3-c,d)pyrene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Dibenzo(a,h)anthracene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Benzo(g,h,i)perylene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Surrogate p-Terphenyl-D14	*%*		*110*	*104 | 111*		*99.8*	*106*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

Quality Control MFJ0016

ORG-022_OC|Organochlorine Pesticides (Soil) | Batch BFJ0273

Analyte	Units	PQL	Blank	DUP1 BFJ0273-DUP1# Samp | QC | RPD %	DUP2 BFJ0273-DUP2# Samp | QC | RPD %	LCS %	Spike % BFJ0273-MS2#
alpha-BHC	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		87.6	90.1
Hexachlorobenzene	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
beta-BHC	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		89.9	94.4
gamma-BHC	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
delta-BHC	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Heptachlor	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		88.6	96.4
Aldrin	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		95.7	97.6
Heptachlor epoxide	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		88.1	91.1
trans-Chlordane	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
cis-Chlordane	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Endosulfan I	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
4,4'-DDE	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		96.6	97.8
Dieldrin	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		86.1	92.2
Endrin	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		76.0	88.6
4,4'-DDD	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		113	110
Endosulfan II	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Endrin aldehyde	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
4,4'-DDT	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Endosulfan sulfate	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		66.8	81.7
Endrin ketone	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Methoxychlor	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Mirex	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Surrogate 4-chloro-3-nitrobenzotrifluoride	*%*		*85.7*	*86.0 | 88.4*		*86.4*	*88.8*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

ORG-021/022/025_PCB|Polychlorinated Biphenyls (Soil) | Batch BFJ0273

Analyte	Units	PQL	Blank	DUP1 BFJ0273-DUP1# Samp | QC | RPD %	DUP2 BFJ0273-DUP2# Samp | QC | RPD %	LCS %	Spike % BFJ0273-MS2#
Aroclor 1016	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1221	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1232	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1242	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1248	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1254	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
Aroclor 1260	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		[NA]	[NA]
PCB C103	mg/kg			0.00 | 0.00 | [NA]		102	102
Surrogate 2-Fluorobiphenyl	*%*		*102*	*103 | 104*		*102*	*104*

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

Quality Control MFJ0016

METALS-020|Acid Extractable Metals (Soil) | Batch BFJ0271

Analyte	Units	PQL	Blank	DUP1 BFJ0271-DUP1# Samp | QC | RPD %	DUP2 BFJ0271-DUP2# Samp | QC | RPD %	LCS %	Spike % BFJ0271-MS1#
Arsenic	mg/kg	4.0	<4.0	4.73 | 6.05 | [NA]		109	105
Cadmium	mg/kg	0.40	<0.40	<0.40 | <0.40 | [NA]		108	90.1
Chromium	mg/kg	1.0	<1.0	16.5 | 19.5 | 17.1		106	102
Copper	mg/kg	1.0	<1.0	15.2 | 16.8 | 10.2		109	110
Lead	mg/kg	1.0	<1.0	16.5 | 39.0 | 81.3 [1]		104	89.6
Mercury	mg/kg	0.10	<0.10	<0.10 | <0.10 | [NA]		97.6	93.6
Nickel	mg/kg	1.0	<1.0	7.01 | 7.28 | 3.87		106	93.5
Zinc	mg/kg	1.0	<1.0	39.9 | 54.5 | 30.8		115	89.2

Analyte	Units	PQL	Blank	DUP3 BFJ0271-DUP3# Samp | QC | RPD %	DUP4 BFJ0271-DUP4# Samp | QC | RPD %	LCS %
Arsenic	mg/kg	4		4.39 | <4.0 | [NA]		[NA]
Cadmium	mg/kg	0.4		<0.40 | <0.40 | [NA]		[NA]
Chromium	mg/kg	1		14.3 | 15.9 | 11.1		[NA]
Copper	mg/kg	1		16.8 | 15.8 | 6.15		[NA]
Lead	mg/kg	1		29.6 | 24.8 | 17.7		[NA]
Mercury	mg/kg	0.1		<0.10 | <0.10 | [NA]		[NA]
Nickel	mg/kg	1		9.94 | 10.9 | 9.34		[NA]
Zinc	mg/kg	1		126 | 107 | 15.8		[NA]

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-008|Inorganics - Moisture (Soil) | Batch BFJ0264

Analyte	Units	PQL	Blank	DUP1 BFJ0264-DUP1# Samp | QC | RPD %	DUP2 BFJ0264-DUP2# Samp | QC | RPD %	LCS %
Moisture	%	0.1		5.85 | 6.87 | 16.0	11.4 | 12.0 | 5.57	[NA]

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

QC Comments

Identifier	Description
[1]	Duplicate analysis precision is/are outside acceptable %RPD, re-analysis indicates possible sample heterogeneity.

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	Geo-Environmental Engineering Pty Ltd
Project Mgr:	Stephen McCormack
Sampler:	Stephen Mccormack
Address:	Unit 2, 5-7 Malta Street, Fairfield East
Email:	stephen@geoenvironmental.com.au, sally@geoenvironmental.com.au
Phone:	0458 550 257 (Sally) / 0431 480 980 (Stephen)

Client Project Name and Number: E24017WB

PO No.:

Envirolab Services Quote No. :

Date results required:

Or choose: standard / 1 day / 2 day / 3 day / 5 day **Standard**

Note: Inform lab in advance if urgent turnaround is required - surcharge applies

Envirolab Services
25 Research Dr, Croydon South VIC 3136

Phone: 02 9910 6200
Fax: 02 9910 6201

E-mail: ahie@envirolabservices.com.au

Contact: Aileen Hie / Simon Song

Sample information | **Tests Required** | **Comments**

Envirolab Sample ID	Client Sample ID	Date sampled	Type of sample	Combination 5a	Combination 5	Combination 3a	Combination 3	Metals Std 8	TRH (vol)/BTEXN	BTEXN	Asbestos ID	OCP/OPPs	Combination 1m					Hold	Provide as much information about the sample as you can
1	SG260924-101	26/09/2024	Soil		1														

Relinquished by (company):	Geo-Environmental Engineering
Print Name:	Sally Gartland
Date & Time:	26-Sep-24
Signature:	SG

Received by (company):	ELS MDL
Print Name:	JS
Date & Time:	1/10/24 1:30pm
Signature:	JS

Samples Received: Cool or Ambient (circle one)
Temperature Recieved at: 14°C (if applicable)
Transported by: Hand delivered / courier
Icepack Seal

Relinquished by: ELS SYD Shona Tolk 30/9/24 1125

MFJ0016

362821 2819 EW

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

CERTIFICATE OF ANALYSIS 362821-C

Client Details

Client	Geo-Environmental Engineering
Attention	Stephen McCormack
Address	82 Bridge St, Lane Cove, NSW, 2066

Sample Details

Your Reference	**E24017WB**
Number of Samples	Additional analysis
Date samples received	26/09/2024
Date completed instructions received	23/10/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	30/10/2024
Date of Issue	30/10/2024

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Results Approved By
Jack Wallis, Senior Chemist
Tabitha Roberts, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

PAHs in TCLP (USEPA 1311)						
Our Reference		362821-C-3	362821-C-5	362821-C-7	362821-C-8	362821-C-10
Your Reference	UNITS	SG260924-03	SG260924-05	SG260924-07	SG260924-08	SG260924-10
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024
Date analysed	-	30/10/2024	30/10/2024	30/10/2024	30/10/2024	30/10/2024
Naphthalene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Acenaphthylene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Acenaphthene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fluorene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Phenanthrene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Anthracene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fluoranthene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pyrene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzo(a)anthracene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chrysene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Benzo(a)pyrene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total +ve PAH's	mg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	96	97	96	81	91

Metals from Leaching Fluid pH 2.9 or 5						
Our Reference		362821-C-2	362821-C-3	362821-C-4	362821-C-5	362821-C-6
Your Reference	UNITS	SG260924-02	SG260924-03	SG260924-04	SG260924-05	SG260924-06
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024
Date analysed	-	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024
pH of soil for fluid# determ.	pH units	5.5	6.3	6.4	6.4	6.7
pH of soil TCLP (after HCl)	pH units	1.6	1.5	1.5	1.4	1.4
Extraction fluid used		1	1	1	1	1
pH of final Leachate	pH units	5.1	5.6	5.2	5.1	5.2
Chromium	mg/L	[NA]	[NA]	[NA]	[NA]	<0.01
Lead	mg/L	2.2	47	33	79	36
Nickel	mg/L	[NA]	[NA]	[NA]	[NA]	<0.02

Metals from Leaching Fluid pH 2.9 or 5						
Our Reference		362821-C-7	362821-C-8	362821-C-9	362821-C-10	362821-C-11
Your Reference	UNITS	SG260924-07	SG260924-08	SG260924-09	SG260924-10	SG260924-11
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024
Date analysed	-	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024
pH of soil for fluid# determ.	pH units	7.1	6.6	6.7	7.0	7.3
pH of soil TCLP (after HCl)	pH units	1.3	1.3	1.2	1.4	1.3
Extraction fluid used		1	1	1	1	1
pH of final Leachate	pH units	5.0	5.1	5.0	5.0	5.1
Lead	mg/L	2.2	13	4.1	7.3	43

Metals from Leaching Fluid pH 2.9 or 5						
Our Reference		362821-C-12	362821-C-13	362821-C-14	362821-C-18	362821-C-19
Your Reference	UNITS	SG260924-12	SG260924-13	SG260924-14	SG260924-18	SG260924-19
Date Sampled		26/09/2024	26/09/2024	26/09/2024	26/09/2024	26/09/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024
Date analysed	-	28/10/2024	28/10/2024	28/10/2024	28/10/2024	28/10/2024
pH of soil for fluid# determ.	pH units	7.5	7.2	7.3	7.2	7.0
pH of soil TCLP (after HCl)	pH units	1.3	1.3	1.2	1.2	1.2
Extraction fluid used		1	1	1	1	1
pH of final Leachate	pH units	5.1	5.1	5.0	5.0	5.1
Lead	mg/L	3.6	4.8	0.57	0.1	0.90

Method ID	Methodology Summary
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using AS 4439. Please note that the mass used may be scaled down from default based on sample mass available. Samples are stored at 2-6oC before and after leachate preparation.
Metals-020	Determination of various metals by ICP-AES following buffer determination as per USEPA 1311 and hence AS 4439.3. Extraction Fluid 1 refers to the pH 5.0 buffer and Extraction Fluid 2 is the pH 2.9 buffer.
Org-022/025	Leachates are extracted with Dichloromethane and analysed by GC-MS/GC-MSMS.

QUALITY CONTROL: PAHs in TCLP (USEPA 1311)					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			28/10/2024	[NT]	[NT]	[NT]	[NT]	28/10/2024	[NT]
Date analysed	-			30/10/2024	[NT]	[NT]	[NT]	[NT]	30/10/2024	[NT]
Naphthalene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	104	[NT]
Acenaphthylene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	124	[NT]
Fluorene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	126	[NT]
Phenanthrene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	128	[NT]
Anthracene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	132	[NT]
Pyrene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	132	[NT]
Benzo(a)anthracene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	120	[NT]
Benzo(bjk)fluoranthene in TCLP	mg/L	0.0002	Org-022/025	<0.0002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	122	[NT]
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene in TCLP	mg/L	0.0001	Org-022/025	<0.0001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	92	[NT]	[NT]	[NT]	[NT]	108	[NT]

QUALITY CONTROL: Metals from Leaching Fluid pH 2.9 or 5					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	362821-C-5
Date extracted	-			28/10/2024	3	28/10/2024	28/10/2024		28/10/2024	28/10/2024
Date analysed	-			28/10/2024	3	28/10/2024	28/10/2024		28/10/2024	28/10/2024
Chromium	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	103	96
Lead	mg/L	0.03	Metals-020	<0.03	3	47	46	2	105	#
Nickel	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	106	95

QUALITY CONTROL: Metals from Leaching Fluid pH 2.9 or 5					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	13	28/10/2024	28/10/2024		[NT]	[NT]
Date analysed	-			[NT]	13	28/10/2024	28/10/2024		[NT]	[NT]
Lead	mg/L	0.03	Metals-020	[NT]	13	4.8	4.9	2	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Holding time exceedance for PAH in TCLP.

Metals in TCLP USEPA1311 - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Anna Bui

From: Stephen McCormack <stephen@geoenvironmental.com.au>
Sent: Tuesday, 22 October 2024 7:16 PM
To: Greta Petzold; Sally Gartland; Aileen Hie; Simon Song; Envirolab Sydney Sample Receipt
Subject: RE: Results for Registration 362821 E24017WB

Can I please order the following tests from this batch of soil samples:

TCLP Lead
2 SG260924-02 – TCLP Pb
3 SG260924-03 – TCLP Pb & PAH
4 SG260924-04 – TCLP Pb
5 SG260924-05 – TCLP Pb & PAH
6 SG260924-06 – TCLP Pb, Ni & Cr
7 SG260924-07 – TCLP Pb & PAH
8 SG260924-08 – TCLP Pb & PAH
9 SG260924-09 – TCLP Pb
10 SG260924-10 – TCLP Pb & PAH
11 SG260924-11 – TCLP Pb
12 SG260924-12 – TCLP Pb
13 SG260924-13 – TCLP Pb
14 SG260924-14 – TCLP Pb
18 SG260924-18 – TCLP Pb
19 SG260924-19 – TCLP Pb

ELS REF: 362821-E
TAT: STANDARD
DUE: 30/10/24
AB.

Stephen McCormack B. Eng (Civil) – MIEAust, CPEng, NER, CEnvP
Director
Geo-Environmental Engineering
Unit 2 / 5-7 Malta Street
Fairfield East NSW 2165
M 0431 480 980

www.geoenvironmental.com.au

From: Greta Petzold <GPetzold@envirolab.com.au>
Sent: Friday, 4 October 2024 2:49 PM
To: Sally Gartland <sally@geoenvironmental.com.au>; Stephen McCormack <stephen@geoenvironmental.com.au>
Subject: Results for Registration 362821 E24017WB

Please refer to attached for:
a copy of the Certificate of Analysis
a copy of the COC/paperwork received from you
an Excel or .csv file containing the results
a copy of the Invoice

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

CERTIFICATE OF ANALYSIS 362821-D

Client Details

Client	Geo-Environmental Engineering
Attention	Stephen McCormack
Address	82 Bridge St, Lane Cove, NSW, 2066

Sample Details

Your Reference	**E24017WB**
Number of Samples	Additional analysis 1 sample
Date samples received	26/09/2024
Date completed instructions received	01/11/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	01/11/2024
Date of Issue	01/11/2024

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Results Approved By
Giovanni Agosti, Group Technical Manager

Authorised By
Nancy Zhang, Laboratory Manager

Metals from Leaching Fluid pH 2.9 or 5		
Our Reference		362821-D-6
Your Reference	UNITS	SG260924-06
Date Sampled		26/09/2024
Type of sample		Soil
Date extracted	-	01/11/2024
Date analysed	-	01/11/2024
Mercury	mg/L	<0.0005

Method ID	Methodology Summary
Metals-021	Determination of Mercury by Cold Vapour AAS following buffer determination as per USEPA 1311 and hence AS 4439.3. Extraction Fluid 1 refers to the pH 5.0 buffer and Extraction Fluid 2 is the pH 2.9 buffer.

QUALITY CONTROL: Metals from Leaching Fluid pH 2.9 or 5					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			01/11/2024	[NT]	[NT]	[NT]	[NT]	01/11/2024	[NT]
Date analysed	-			01/11/2024	[NT]	[NT]	[NT]	[NT]	01/11/2024	[NT]
Mercury	mg/L	0.0005	Metals-021	<0.0005	[NT]	[NT]	[NT]	[NT]	118	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

APPENDIX B

VENM Certificate

Certification:
Virgin excavated natural material

1. I *[full name]*

   of *[organisation and address]*

   certify that the waste as set out in section 2 of this notice is Virgin Excavated Natural Material (VENM) as defined in Schedule 1 of the *Protection of the Environment Operations Act 1997*.

   This certification is made on behalf of the waste generator *[fill out if applicable]*

   being *[full name]*

   of *[organisation and address]*

2. The waste was generated at:

   Street address:

   Title reference (Lot/DP, etc.):

   The amount of waste (by volume or weight) is:

3. I have made the determination that the waste is VENM because:

   - ☐ I have assessed the historical and current land use of the site at which the waste was generated.
   - ☐ The waste is not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities.
   - ☐ The waste does not contain any sulfidic ores or soils.
   - ☐ The waste does not contain any other waste.
   - ☐ The waste does not contain asbestos in any form.

Note: that all sections of this form must be completed including all boxes checked in Section 3 above and signed below for any material to be certified as VENM.

Signature(s) . . . . . .

Name(s) (printed)

Date

Warning: There are significant penalties under s.144AA of the *Protection of the Environment Operations Act 1997* for a person who supplies (whether knowingly or not) information that is false or misleading in a material respect about waste.

This certificate is intended to assist waste generators, contractors and/or receivers of VENM to have confidence that a range of relevant factors have been considered in the classification of a waste material as VENM.

Published by:
Environment Protection Authority, 59–61 Goulburn Street, Sydney South 1232
Ph: 131 555. TTY users: phone 133 677, then ask for 131 555
Speak and listen users: phone 1300 555 727, then ask for 131 555
Email: info@environment.nsw.gov.au; Web: www.epa.nsw.gov.au
Report pollution and environmental incidents: Environment Line: 131 555 (NSW only)
EPA 2013/0693; September 2013

APPENDIX C

ENM Order and Exemption

Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A

The excavated natural material exemption 2012

Name

1. This exemption is to be known as 'The excavated natural material exemption 2012'.

Commencement

2. This exemption commences on 19 October 2012. 'The excavated natural material exemption 2008' which commenced 25 July 2008 is revoked from 19 October 2012.

Duration

3. This exemption is valid until revoked by the Environment Protection Authority (EPA) by notice published in the Government Gazette.

Legislation

4. Under the *Protection of the Environment Operations (Waste) Regulation 2005* (the Regulation):

4.1. Clause 51 (2) authorises the EPA to grant an exemption in relation to any matter or thing including an activity or class of activities, and

4.2. Clause 51A authorises the EPA to exempt a person from any of the following provisions in relation to an activity or class of activities relating to certain waste that is to be land applied or used as a fuel:

- the provisions of sections 47 to 49 and 88 of the *Protection of the Environment Operations Act 1997* (the Act),
- the provisions of Schedule 1 to the Act, either in total or as they apply to a particular activity, and
- the provisions of Part 3 and clauses 45 and 47 of the Regulation.

Exemption

5. In this Notice of Exemption:

5.1. The responsible person listed in Column 1 of Table 1 is exempt from the provision/s listed in Column 2 of that table but only:

- in relation to activities involving the relevant waste, and
- where the responsible person complies with the conditions referred to in Column 3 of the table, and
- in the case of a consumer, in relation to the premises where the waste is applied to land as permitted by clause 7.2.

However, this Notice of Exemption does not exempt the responsible person from the provisions specified in Column 2 where the relevant waste is received at premises that are, despite this exemption, required to be licensed for waste disposal (application to land) activities under the provisions of the Act.

5.2. Where a responsible person complies with the conditions of this Notice of Exemption, the activity referred to in Schedule 1 from which that person is exempt is taken to be a non-scheduled activity for the purposes of the Act.

Table 1

Column 1	Column 2	Column 3
Responsible person	**Provisions from which the responsible person is exempt**	**Conditions to be met by the responsible person**
Generator	section 48 of the Act in respect of clause 39 of Schedule 1 to the Act	all requirements specified in section 7 and 8
Consumer	section 48 of the Act in respect of clauses 39 and 42 of Schedule 1 to the Act section 88 of the Act clause 47 of the Regulation	all requirements specified in section 7 and 9

This Notice of Exemption is a general exemption for the purposes of clause 51(3) of the Regulation.

Definitions

6. In this Notice of Exemption:

Bgl means below ground level, referring to soil at depth beneath the ground surface.
Characterisation means sampling and testing that must be conducted on the material for the range of chemicals and other attributes listed in Column 1 of Table 2.
Composite sample means a sample that combines 5 sub-samples of equal size into a single sample for the purpose of analysis.
Consumer means a person who applies, causes, or permits the application to land of excavated natural material within the definitions of "application to land" in accordance with the Act. The consumer may be the landholder responsible for the land to which excavated natural material is applied.
Discrete sample means a sample collected and analysed individually that will not be composited.
Excavated natural material is naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

a) been excavated from the ground, and
b) contains at least 98% (by weight) natural material, and
c) does not meet the definition of Virgin Excavated Natural Material in the Act.

Excavated natural material does not include material located in a hotspot; that has been processed; or that contains asbestos, Acid Sulfate Soils (ASS), Potential Acid Sulfate soils (PASS) or sulfidic ores.
Generator means a person who generates excavated natural material for supply to a consumer.
Hotspot means a cylindrical volume which extends through the soil profile from the ground surface to the proposed depth of excavation, where the level of any contaminant listed in Column 1 of Table 2 is greater than the absolute maximum concentration in Column 3 of Table 2.
***In situ* material** means material that exists on or below the ground level. It does not include stockpiled material.
***In situ* sampling** means sampling undertaken on *in situ* material.
Relevant waste means excavated natural material that meets the requirements of Section 7.
Stockpiled material means material that has been excavated from the ground and temporarily stored on the ground prior to use.

Systematic sampling means sampling at points that are selected at even intervals and are statistically unbiased.
Validation means ensuring that test results comply with the conditions of this exemption prior to material being supplied to a consumer.

General conditions

7. This Notice of Exemption is subject to the following conditions:

7.1. The chemical concentration or other attribute of the excavated natural material listed in Column 1 of Table 2 must not exceed any of the following:
  7.1.1. For characterisation tests, the maximum average (based on the arithmetic mean) concentration or value listed in Column 2 of Table 2, and
  7.1.2. The absolute maximum concentration or value listed in Column 3 of Table 2.
7.2. The excavated natural material can only be applied to land as engineering fill or used in earthworks.

Generator responsibilities

8. The following conditions must be met by the generator for this exemption to apply:

8.1. The generator must prepare a written sampling plan which includes information on sample preparation and storage. The plan must be kept for a period of three years;
8.2. The generator must undertake sampling and analysis of the material for Acid Sulfate Soil (ASS) and Potential Acid Sulfate Soil (PASS), in accordance with the *NSW Acid Sulfate Soil Manual*, Acid Sulfate Soils Management Advisory Council, 1998 and the updated *Laboratory Methods Guidelines version 2.1 – June 2004* where:
  8.2.1. the pH measured in the material is below 5, and/or
  8.2.2. the review of the applicable Acid Sulfate Soil Risk Maps (published by the former Department of Land and Water Conservation and available at http://www.environment.nsw.gov.au/acidsulfatesoil/riskmaps.htm) indicates the potential presence of Acid Sulfate Soils (ASS).
8.3. For stockpiled material, the generator must:
  8.3.1. undertake sampling in accordance with Australian Standard 1141.3.1-1996 *Methods for sampling and testing aggregates* – Sampling – Aggregates (or equivalent);
  8.3.2. undertake characterisation according to the requirements listed in Columns 1 and 2 of Table 3 for the range of chemicals and other attributes listed in Column 1 of Table 2; and
  8.3.3. store the excavated natural material appropriately until the characterisation test results are validated (i.e. obtained and assessed as compliant with this exemption).
8.4. For *in situ* material, the generator must:
  8.4.1. undertake characterisation for the range of chemicals and other attributes listed in Column 1 of Table 2 according to the requirements listed in Columns 1, 2, and 3 of Table 4. When the ground surface is not comprised of soil (e.g. concrete slab), samples must be taken at the depth at which the soil commences.
  8.4.2. undertake sampling at depth according to Column 1 of Table 5.
  8.4.3. collect additional soil samples (and analyse them for the range of chemicals and other attributes listed in Column 1 of Table 2), at any

depth exhibiting discolouration, staining, odour or other indicators of contamination inconsistent with soil samples collected at the depth intervals indicated in Table 5.

8.4.4. segregate and exclude hotspots identified in accordance with Table 4, from material excavated for reuse under this exemption.

8.5. For both stockpiled and *in situ* material the generator must:

8.5.1. keep a written record of all characterisation test results, volume of excavated material, and detected hotspot material for a period of three years; and

8.5.2. provide a written statement of compliance to the consumer with each transaction, certifying that the excavated natural material complies with the relevant conditions of this exemption.

Consumer responsibilities

9. The following conditions must be met by the consumer for this exemption to apply:

9.1. The consumer must ensure that the excavated natural material is fit for purpose and poses minimal risk of harm to human health or the environment.

9.2. The consumer must keep records of the quantity of the excavated natural material received as well as the suppliers' name and address, for a period of three years.

9.3. The consumer must land apply the relevant waste within a reasonable period of time.

Chemical and other material property requirements

10. This Notice of Exemption only applies to excavated natural material where the chemical and other attributes listed in Column 1 of Table 2 comply with the chemical concentrations and other values listed in Column 2 and Column 3 of Table 2, when analysed according to test methods specified in Column 4 of Table 2.

Table 2

Column 1	**Column 2**	**Column 3**	**Column 4**
Chemicals and other attributes	**Maximum average concentration for characterisation** (mg/kg 'dry weight' unless otherwise specified)	**Absolute maximum concentration** (mg/kg 'dry weight' unless otherwise specified)	**Test method specified within Section**
1. Mercury	0.5	1	12.1
2. Cadmium	0.5	1	12.2
3. Lead	50	100	12.2
4. Arsenic	20	40	12.2
5. Chromium (total)	75	150	12.2
6. Copper	100	200	12.2
7. Nickel	30	60	12.2
8. Zinc	150	300	12.2
9. Electrical Conductivity	1.5 dS/m	3 dS/m	12.3
10. pH *	5 to 9	4.5 to 10	12.3
11. Total Polycyclic Aromatic Hydrocarbons	20	40	12.4

Column 1	Column 2	Column 3	Column 4
Chemicals and other attributes	**Maximum average concentration for characterisation** (mg/kg 'dry weight' unless otherwise specified)	**Absolute maximum concentration** (mg/kg 'dry weight' unless otherwise specified)	**Test method specified within Section**
(PAHs)			
12. Benzo(a)pyrene	0.5	1	12.4
13. Benzene	NA	0.5	12.5
14. Toluene	NA	65	12.5
15. Ethyl-benzene	NA	25	12.5
16. Xylene	NA	15	12.5
17. Total Petroleum Hydrocarbons C_{10}-C_{36}	250	500	12.6
18. Rubber, plastic, bitumen, paper, cloth, paint and wood	0.05%	0.10%	12.7

* The ranges given for pH are for the minimum and maximum acceptable pH values in the excavated natural material.

Sampling requirements

11. This Notice of Exemption only applies to excavated natural material sampled according to the requirements in Tables 3, 4 and 5.

11.1. Stockpiled excavated natural material must be sampled as per the requirements in Table 3.

11.1.1. Composite sampling must be undertaken for analysis of attributes 1 to 10 and 18 in Column 1 of Table 2. Discrete sampling must be undertaken for analysis of attributes 11 to 17 in Column 1 of Table 2.

11.1.2. Sampling must be undertaken in a manner that ensures all parts of the stockpile are equally accessible for representative sampling.

11.1.3. For stockpiles greater than 4,000 tonnes the number of samples described in Table 3 must be repeated.

Table 3

Sampling of Stockpiled Material		
Column 1	**Column 2**	**Column 3**
Quantity (tonnes)	**Number of samples**	**Validation**
<500	3	Required
500 – 1,000	4	
1,000 – 2,000	5	
2,000 – 3,000	7	
3,000 – 4,000	10	

11.2. *In situ* material must be sampled by collecting discrete samples as per the requirements of Tables 4 and 5.

11.2.1. Sites larger than 50,000 m^2 should be subdivided into smaller areas and sampled as per Table 4.

Table 4

***In Situ* Sampling at surface**				
Column 1	**Column 2**	**Column 3**	**Column 4**	**Column 5**
Size of *in situ* area (m^2)	**Number of systematic sampling points recommended**	**Distance between two sampling points** (m)	**Diameter of the hot spot that can be detected with 95% confidence** (m)	**Validation**
500	5	10.0	11.8	Required
1000	6	12.9	15.2	
2000	7	16.9	19.9	
3000	9	18.2	21.5	
4000	11	19.1	22.5	
5000	13	19.6	23.1	
6000	15	20.0	23.6	
7000	17	20.3	23.9	
8000	19	20.5	24.2	
9000	20	21.2	25.0	
10,000	21	21.8	25.7	
15,000	25	25.0	28.9	
20,000	30	25.8	30.5	
25,000	35	26.7	31.5	
30,000	40	27.5	32.4	
35,000	45	27.9	32.9	
40,000	50	28.3	33.4	
45,000	52	29.3	34.6	
50,000	55	30.2	35.6	

Table 4 has been taken from NSW EPA 1995, *Contaminated Sites Sampling Design Guidelines*, NSW Environment Protection Authority.

Table 5

***In Situ* Sampling at Depth**	
Column 1	**Column 2**
Sampling Requirements *	**Validation**
1 soil sample at 1.0 m bgl from each surface sampling point followed by 1 soil sample for every metre thereafter. From 1.0 m bgl, sample at the next metre interval until the proposed depth of excavation of the material is reached. If the proposed depth of excavation is between 0.5 to 0.9 m after the last metre interval, sample at the base of the proposed depth of excavation.	Required if the depth of excavation is equal to or greater than 1.0 m bgl

* Refer to Notes for examples

Test method

12. All testing must be undertaken by analytical laboratories accredited by the National Association of Testing Authorities (NATA), or equivalent. All chemicals and other attributes listed in Column 1 of Table 2 must be measured in accordance with the test methods specified below:

12.1. Test methods for measuring the mercury concentration.
- 12.1.1. Particle size reduction & sample splitting may be required.
- 12.1.2. Analysis using USEPA SW-846 Method 7471B Mercury in solid or semisolid waste (manual cold vapour technique), or an equivalent analytical method with a detection limit < 20% of the stated absolute maximum concentration in Column 3 of Table 2 (i.e. 0.20 mg/kg dry weight).
- 12.1.3. Report as mg/kg dry weight.

12.2. Test methods for measuring chemicals 2 to 8 in Column 1 of Table 2.
- 12.2.1. Particle size reduction & sample splitting may be required.
- 12.2.2. Sample preparation by digesting using USEPA SW-846 Method 3051A Microwave assisted acid digestion of sediments, sludges, soils, and oils (or an equivalent analytical method).
- 12.2.3. Analysis using USEPA SW-846 Method 6010C Inductively coupled plasma - atomic emission spectrometry, or an equivalent analytical method with a detection limit < 10% of the stated absolute maximum concentration in Column 3 of Table 2, (e.g. 10 mg/kg dry weight for lead).
- 12.2.4. Report as mg/kg dry weight.

12.3. Test methods for measuring electrical conductivity and pH.
- 12.3.1. Sample preparation by mixing 1 part excavated natural material with 5 parts distilled water.
- 12.3.2. Analysis using Method 103 (pH) and 104 (Electrical Conductivity). *In* Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).
- 12.3.3. Report electrical conductivity in deciSiemens per metre (dS/m).

12.4. Test method for measuring Polynuclear Aromatic Hydrocarbons (PAHs) and benzo(a)pyrene.
- 12.4.1. Analysis using USEPA SW-846 Method 8100 Polynuclear Aromatic Hydrocarbons (or an equivalent analytical method).
- 12.4.2. Calculate the sum of all 16 PAHs for total PAHs.
- 12.4.3. Report total PAHs as mg/kg dry weight.
- 12.4.4. Report benzo(a)pyrene as mg/kg.

12.5. Test method for measuring benzene, toluene, ethylbenzene and xylenes (BTEX).
- 12.5.1. Method 501 (Volatile Alkanes and Monocyclic Aromatic Hydrocarbons). In Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).
- 12.5.2. Report BTEX as mg/kg.

12.6. Test method for measuring Total Petroleum Hydrocarbons (TPH).

12.6.1. Method 506 (Petroleum Hydrocarbons). In Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).

12.6.2. Report as mg/kg dry weight.

12.7. Test method for measuring rubber, plastic, bitumen, paper, cloth, paint and wood.

12.7.1. NSW Roads & Traffic Authority Test Method T276 Foreign Materials Content of Recycled Crushed Concrete (or an equivalent method).

12.7.2. Report as percent.

Exemption Granted

Christopher McElwain
Manager Waste and Resource Strategy
Environment Protection Authority
by delegation

Notes

The EPA may amend or revoke this exemption at any time. It is the responsibility of the generator and the consumer to ensure that they comply with all relevant requirements of the most current exemption. The current version of an exemption will be available on the EPA website: www.epa.nsw.gov.au.

In gazetting this general exemption, the EPA is exempting the relevant waste from the specific requirements of the Act and Regulations as stated in this exemption. The EPA is not in any way endorsing the use of this substance or guaranteeing that the substance will confer benefit.

The use of exempted material remains subject to other relevant environmental regulations within the Act and Regulations. For example, a person who pollutes land (s142A) or water (s120), or does not meet the special requirements for asbestos waste (clause 42), regardless of having an exemption, is guilty of an offence and subject to prosecution.

For the purposes of arrangements between a generator and a consumer, a 'transaction' is taken to mean the contractual agreement between the two parties which specifies the exchange of waste material from one party to another. A 'statement of compliance' must be in writing and be provided with each transaction.

The conditions set out in this exemption are designed to minimise the risk of potential harm to the environment, human health or agriculture, however, neither this exemption nor these conditions guarantee that the environment, human health or agriculture will not be harmed.

The consumer should assess whether or not the exempted material is fit for the purpose for which the material is proposed to be used and whether this use will cause harm. The consumer may need to seek expert engineering or technical advice.

This exemption does not apply to any material received at premises that are required to be licensed for waste disposal (application to land) activities under the provisions of the Act. This exemption does not remove the need for a site at which processing occurs to be licensed, if required under Schedule 1 of the Act.

This exemption does not alter the requirements of any other relevant legislation that must be met in utilising this material, including for example, the need to prepare a Material Safety Data Sheet (MSDS).

Regardless of any exemption provided by the EPA, the person who causes or permits the application of the substance to land must ensure that the action is lawful and consistent with the development consent requirements of the land.
All records required to be kept under this exemption must be made available to authorised officers of the EPA upon request.

Failure to comply with the conditions of this Notice of Exemption may constitute an offence under clause 51 of the Regulation and the responsible person will be required to comply with the normal regulatory provisions.

Examples

In situ sampling at depth

Example 1.
If the proposed depth of ENM excavation is between 1 m bgl and 1.4 m bgl, then:

- 1 sample on surface (as per the requirements of Table 4).
- 1 sample at 1 m bgl.
- No further depth sampling after 1 m bgl, unless required under section 8.4.3.

Example 2.
If the proposed depth of ENM excavation is at 1.75 m bgl, then:

- 1 sample on surface (as per the requirements of Table 4).
- 1 sample at 1 m bgl.
- 1 sample at 1.75 m bgl.
- No further depth sampling after 1.75 m bgl, unless required under section 8.4.3.

Example 3.
If the proposed depth of ENM excavation is at 2.25 m bgl, then:

- 1 sample on surface (as per the requirements of Table 4).
- 1 sample at 1 m bgl.
- 1 sample at 2 m bgl.
- No further depth sampling after 2 m bgl, unless required under section 8.4.3.

Resource Recovery Exemption under Part 9, Clauses 91 and 92 of the Protection of the Environment Operations (Waste) Regulation 2014

The excavated natural material exemption 2014

Introduction

This exemption:

- is issued by the Environment Protection Authority (EPA) under clauses 91 and 92 of the Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation); and
- exempts a consumer of excavated natural material from certain requirements under the *Protection of the Environment Operations Act 1997* (POEO Act) and the Waste Regulation in relation to the application of that waste to land, provided the consumer complies with the conditions of this exemption.

This exemption should be read in conjunction with 'the excavated natural material order 2014'.

1. Waste to which this exemption applies

1.1. This exemption applies to excavated natural material that is, or is intended to be, applied to land as engineering fill or for use in earthworks.

1.2. Excavated natural material is naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

a) been excavated from the ground, and
b) contains at least 98% (by weight) natural material, and
c) does not meet the definition of Virgin Excavated Natural Material in the Act.

Excavated natural material does not include material located in a hotspot; that has been processed; or that contains asbestos, Acid Sulfate Soils (ASS), Potential Acid Sulfate soils (PASS) or sulfidic ores.

2. Persons to whom this exemption applies

2.1. This exemption applies to any person who applies or intends to apply excavated natural material to land as set out in 1.1.

3. Duration

3.1. This exemption commences on 24 November 2014 and is valid until revoked by the EPA by notice published in the Government Gazette.

4. Premises to which this exemption applies

4.1. This exemption applies to the premises at which the consumer's actual or intended application of excavated natural material is carried out.

5. Revocation

5.1. 'The excavated natural material exemption 2012' which commenced 19 October 2012 is revoked from 24 November 2014.

6. Exemption

6.1. Subject to the conditions of this exemption, the EPA exempts each consumer from the following provisions of the POEO Act and the Waste Regulation in relation to the consumer's actual or intended application of excavated natural material to land as engineering fill or for use in earthworks at the premises:

- section 48 of the POEO Act in respect of the scheduled activities described in clauses 39 of Schedule 1 of the POEO Act;
- Part 4 of the Waste Regulation;
- section 88 of the POEO Act; and
- clause 109 and 110 of the Waste Regulation.

6.2. The exemption does not apply in circumstances where excavated natural material is received at the premises for which the consumer holds a licence under the POEO Act that authorises the carrying out of the scheduled activities on the premises under clause 39 'waste disposal (application to land) or clause 40 'waste disposal' (thermal treatment) of Schedule 1 of the POEO Act.

7. Conditions of exemption

The exemption is subject to the following conditions:

7.1. At the time the excavated natural material is received at the premises, the material must meet all chemical and other material requirements for excavated natural material which are required on or before the supply of excavated natural material under 'the excavated natural material order 2014'.

7.2. The excavated natural material can only be applied to land as engineering fill or for use in earthworks.

7.3. The consumer must keep a written record of the following for a period of six years:

- the quantity of any excavated natural material received; and
- the name and address of the supplier of the excavated natural material received.

7.4. The consumer must make any records required to be kept under this exemption available to authorised officers of the EPA on request.

7.5. The consumer must ensure that any application of excavated natural material to land must occur within a reasonable period of time after its receipt.

8. Definitions

In this exemption:

application or apply to land means applying to land by:

- spraying, spreading or depositing on the land; or
- ploughing, injecting or mixing into the land; or
- filling, raising, reclaiming or contouring the land.

consumer means a person who applies, or intends to apply excavated natural material to land.

Manager Waste Strategy and Innovation

Environment Protection Authority

(by delegation)

Notes

The EPA may amend or revoke this exemption at any time. It is the responsibility of the consumer to ensure they comply with all relevant requirements of the most current exemption The current version of this exemption will be available on www.epa.nsw.gov.au

In gazetting or otherwise issuing this exemption, the EPA is not in any way endorsing the use of this substance or guaranteeing that the substance will confer benefit.

The conditions set out in this exemption are designed to minimise the risk of potential harm to the environment, human health or agriculture, although neither this exemption nor the accompanying order guarantee that the environment, human health or agriculture will not be harmed.

The consumer should assess whether or not the excavated natural material is fit for the purpose the material is proposed to be used for, and whether this use will cause harm. The consumer may need to seek expert engineering or technical advice.

Regardless of any exemption provided by the EPA, the person who causes or permits the application of the substance to land must ensure that the action is lawful and consistent with any other legislative requirements including, if applicable, any development consent(s) for managing operations on the site(s).

The receipt of excavated natural material remains subject to other relevant environmental regulations in the POEO Act and the Waste Regulation. For example, a person who pollutes land (s. 142A) or water (s. 120), or causes air pollution through the emission of odours (s. 126), or does not meet the special requirements for asbestos waste (Part 7 of the Waste Regulation), regardless of having an exemption, is guilty of an offence and subject to prosecution.

This exemption does not alter the requirements of any other relevant legislation that must be met in utilising this material, including for example, the need to prepare a Safety Data Sheet (SDS).

Failure to comply with the conditions of this exemption constitutes an offence under clause 91 of the Waste Regulation.

APPENDIX D

Data Quality Objectives (Validation Program)

INTRODUCTION

The Data Quality Objectives (DQOs) process was used to define the type, quantity and quality of the data needed to support decisions relating to the environmental condition of a site (reference 1). The process consists of seven steps, with the output from each step influencing the choices that will be made later in the process.

According to USEPA (reference 2), DQOs are qualitative and quantitative statements, derived from the first six steps of the process, that:

- ◊ Clarify the study objective.
- ◊ Define the most appropriate type of data to collect.
- ◊ Determine the most appropriate conditions from which to collect the data. and
- ◊ Specify tolerable limits on decision errors which will be used as the basis for establishing the quantity and quality of data needed to support the decision.

The DQOs are then used to develop a scientific and resource-effective data collection design.

STEP 1 - STATE THE PROBLEM

The soil within the 'remediation area' of the site, which is shown on Figure 3 in the main body of the report, has been found to be contaminated with Lead and to a lesser extent TRH and PAHs at concentrations in excess of those permissible for the current and ongoing land-use, and which could impact upon anticipated receiving environments and the future users of the site. This soil layer will be excavated from site and validation sampling is required to confirm that the remaining soil and any imported soil is not contaminated.

STEP 2 - IDENTIFY THE DECISION STATEMENT

The following decision were required to be made:

- ◊ Has all the soil within the remediation area been adequately removed?
- ◊ Do the concentrations of contaminants in the remaining soil profile (following remediation works) that lies beyond the remediation area, exceed acceptable levels for the proposed land-use?

STEP 3 - IDENTIFY INPUTS TO THE DECISION

The following information inputs are required to resolve the decision statement:

- ◊ Site inspection following removal of the fill to assess any aesthetic issues.
- ◊ Collection of validation soil samples from the surface of remaining natural soil profile after remediation works using appropriate methods,
- ◊ Analysis of the validation samples from contaminants of concern,
- ◊ Comparison of the results with relevant Remediation Assessment Criteria (RAC) as defined in the main body of the RAP, and
- ◊ Accurate measurements of sample locations to allow for accurate mapping and contouring of contamination (if identified).

STEP 4 - DEFINE THE BOUNDARIES OF THE STUDY

The original investigation area for the preliminary and detailed site investigation covered an area of approximately 700m^2 and included readily accessible land around the Lighthouse which is partly within Lot 415 in Deposited Plan (DP) 752011 (in which the Lighthouse itself is located) and Part of the adjoining Lot 1 in DP605078. This investigation area is depicted in **Figure 2**.

The lateral extent of the contamination is the 'remediation area' depicted in **Figure 3.** However, if the validation samples identify contamination, then more excavation will need to occur, and new validation samples will need to be collected until the contamination has been successfully removed. The vertical extent of the contamination is the entire shallow soil profile over sandstone bedrock.

STEP 5 - DEVELOP A DECISION RULE

The purpose of this step is to define the parameter of interest, specify the action level, and integrate previous DQO outputs into a single "if…then…" statement that describes a logical basis for choosing among alternative actions.

The parameters of interest (or contaminants of concern) are metals as detailed in the Stage 2 DSI and the RAP.

The action level or Site Assessment Criteria (SAC) will be used to decide if the parameter represents an unacceptable risk for residential land-use and/or the receiving environment. If the measured concentration of a parameter or compound exceeds the action levels (SAC) in soils, then this is deemed to present an unacceptable risk if the site is developed for the proposed land-use or to environmental receptors.

If the concentrations of a parameter or compound, whichever is representative for of the site, are above the nominated action levels, then further sampling may be proposed to determine the extent of contamination.

Step 6 - Specify Acceptable Limits on Decision Errors

There are two types of errors:

1) Deciding that the site is acceptable for the proposed land-use and that there is a low risk to receiving environments when it actually is not. The consequence of this error may be unacceptable health risk for current and future users of the sites.

2) Deciding that the site is unacceptable for the proposed land-use and that there is a risk to receiving environments when it is acceptable. The consequence of this error is that the client will pay for further investigation / remediation that are not necessary.

The more severe consequences are with decision error (1) since the risk of jeopardising human health outweighs the consequences of paying more for remediation. It will not be possible to conduct statistical hypothesis tests as the proposed sampling programme consists of the collection of one round of samples only.

Step 7 - Optimising the Design for Obtaining Data

The purpose of this step is to identify a resource-effective data collection design for generating data that are expected to satisfy the DQOs.

The resource effective data collection design that is expected to satisfy the DQOs is described in detail in Section 10 of the RAP. To ensure the design satisfies the DQOs a comprehensive Quality Assurance and Quality Control Plan will be implemented.

References

1. NSW EPA (2017) *Contaminated Land Management: Guidelines for NSW Site Auditor Scheme (3rd Edition).*
2. USEPA, 2000: *Guidance for Data Quality Objectives Process*. EPA QA/G-4.