



Darwin Turf Club EPL Monitoring

Soil Monitoring Report

Darwin Turf Club Inc

18 October 2023

→ **The Power of Commitment**



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Contents

1.	Introduction	1
1.1	Background	1
1.2	Purpose of this report	1
1.3	Scope	2
1.3.1	July 2023 soil monitoring event	2
1.3.2	Legislative Framework	2
1.4	Limitations	2
2.	Site details	3
2.1	Site location and setting	3
2.2	Climate	3
2.3	Geology and hydrogeology	3
2.4	Topography and hydrology	4
3.	Investigation methodology	4
3.1	Frequency and timing	4
3.2	Sampling locations	4
3.3	Soil sampling	5
4.	Assessment criteria (Trigger Values)	6
4.1	Non-compliance	8
5.	Quality assurance and control	9
5.1	Quality control procedures	9
5.2	Summary of QA/QC compliance	9
5.2.1	Sample handling and preservation	10
5.2.2	Decontamination protocols	10
5.2.3	Chain of custody	10
5.2.4	Holding times	10
5.2.5	Blind duplicate and split duplicate samples	11
5.2.6	Rinsate sample	12
5.2.7	Trip blank	12
5.2.8	Laboratory control outliers	12
5.3	QAQC conclusions	14
6.	Soil monitoring results	15
6.1	Field observations	15
6.2	Laboratory results	15
6.2.1	Physical characteristics	15
6.2.2	Heavy metals	16
6.2.3	TRH, BTEXN & PCBs	16
6.2.4	PFAS	16
6.3	Leachability – ASLP	17
6.3.1	ASLP – Metals	17
6.3.2	ASLP – PFAS	17
6.4	Discussion	18
6.4.1	Metals	18
	Leachability	18

6.4.2	Hydrocarbons	18
6.4.3	PFAS and PCBs	18
7.	Conclusions	19
8.	Recommendations	19
9.	References	21

Table index

Table 3.1	Sampling location rationale	4
Table 3.2	Investigation methodology	5
Table 4.1	Trigger Values	6
Table 4.2	ASLP trigger values	7
Table 5.1	Summary of QAQC compliance	9
Table 5.2	Summary of Holding Time Outliers	11
Table 5.3	RPD exceedances	12
Table 5.4	Laboratory QA outliers	13
Table 6.1	Physical characteristics	15
Table 6.2	Heavy metals results summary	16
Table 6.3	ASLP metal exceedances	17

Figure index

Figure 1	Rainfall data from Darwin Airport (BOM, 2023)	3
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Appendices

Appendix A	Figures
Appendix B	Environment Protection Licence (EPL) 218-02
Appendix C	Analytical Tables
Appendix D	Field Documentation
Appendix E	Laboratory Reports

1. Introduction

1.1 Background

Darwin Turf Club Incorporated (DTC) engaged GHD Pty Ltd (GHD) to undertake soil monitoring at the Darwin Turf Club Fannie Bay Racecourse ('the Site'). This is the first soil monitoring event undertaken by GHD for DTC.

The monitoring of soil is a requirement of the Site's Environment Protection Licence (EPL), which was updated and issued to DTC by the Northern Territory Environment Protection Authority (NT EPA) on 1 September 2022. The EPL has been provided in **Error! Reference source not found.**

EPL 218-02 permits the application of oil to the racecourse surface, as part of soil conditioning and track maintenance works. NT EPA conditions contained within the EPL require DTC to undertake routine environmental monitoring of groundwater and air quality before, during, and after the application of oil to the track surface. In addition, oil sampling is now a requirement of the EPL 218-02 and is taken 10 days prior to the application event and on the day of the application event. In addition, routine soil and surface water monitoring is now a requirement of the EPL.

Measures associated with environmental protection are presented in the Fannie Bay Racecourse Environmental Management Plan (EMP) prepared by GHD in 2022 (GHD, 2022).

The EPL includes specific clauses relating to monitoring specifications, control measures, reporting and non-compliance notification requirements.

The environmental monitoring requirements documented in the EPL prescribe the following:

- A soil monitoring event (SME) to be conducted in accordance with clause 33 of EPL 218-02.
- Additional specifications on the monitoring requirements including monitoring locations are documented in the EMP (GHD, 2023).

1.2 Purpose of this report

The purpose of this report is to document the soil monitoring undertaken as part of the SME conducted by GHD during the July 2023 monitoring period on behalf of DTC. This report fulfils, in part, the requirements of the EMP and EPL under which DTC operates the racecourse facility.

Specifically, in fulfilment of EPL 218-02 Clause 50 relating to monitoring reporting requirements, this report was prepared in accordance with the requirements of the Northern Territory Contaminated Land Guideline (NT EPA, 2017), and therefore includes:

- Project background and site details
- Details on the adopted methodologies for the soil monitoring event
- Assessment criteria adopted for evaluation of monitoring results
- Laboratory and field data obtained from the recent investigations
- A comparison of the historical and recent results against the relevant assessment criteria
- Summary conclusions of monitoring results, including a brief evaluation of the reported exceedances to the assessment criteria
- Includes an assessment of environmental impact from the activity as per EPL 218-02 Clause 50.4.
- Recommendations based on the results from this monitoring period.

1.3 Scope

1.3.1 July 2023 soil monitoring event

The following scope of work was undertaken:

- Service location was conducted to ensure sampling locations were clear of underground services.
- One SME, with soil samples taken at six locations across the Site using hand sampling equipment (i.e., hand auger). Sampling locations are displayed in **Error! Reference source not found..**
- Laboratory analysis of the collected soil samples.
- Preparation of a Soil Monitoring Report (this report)

1.3.2 Legislative Framework

The environmental monitoring works were carried out in general accordance with:

- National Environment Protection Council (NEPC), 1999. National Environment Protection (Assessment of Site Contamination) Measure (NEPM), Assessment of Site Contamination, as amended April 2013 (ASC NEPM).
- Heads of EPAs Australian and New Zealand (HEPA), PFAS National Management Plan 2.0, January 2020 (PFAS NEMP).

1.4 Limitations

This report: has been prepared by GHD for Darwin Turf Club Incorporated (DTC) and may only be used and relied on by Darwin Turf Club Incorporated (DTC) for the purpose agreed between GHD and Darwin Turf Club Incorporated (DTC) as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Darwin Turf Club Incorporated (DTC) arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this report on the basis of information provided by Darwin Turf Club Incorporated (DTC) and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Site details

2.1 Site location and setting

Fannie Bay Racecourse covers an area of approximately 47 ha and is situated around 4 km north of Darwin CBD. The site is located off Dick Ward Drive.

The site is bound by Dick Ward Drive to the north, stables and Douglas Street to the east and Playford and Wells Street to the south and west. Residential properties bound Douglas Street, Playford Street and Wells Street.

The racecourse is located in close proximity to Ludmilla Primary School, residential areas of Fannie Bay and Ludmilla, and coastal areas. The activities undertaken at these sites are sensitive receptors to potential impacts from the application of waste oil to the racetrack.

A general layout of the site is provided in Figure 1, **Error! Reference source not found..**

2.2 Climate

The site is located in the wet/dry tropics and is subject to annual periods of flood and drought. The dry season extends from approximately March to September, displaying moderate temperatures, low humidity and winds predominately from the east. The wet season occurs for the remaining months and tropical cyclones, thunderstorms and monsoon rain (with winds predominately from the northwest) are common, in association with high temperatures and humidity.

The climate statistics for the site are shown in Figure 1 **Error! Reference source not found.** and are taken from the Darwin Airport weather station, located 4.6 km from the site.

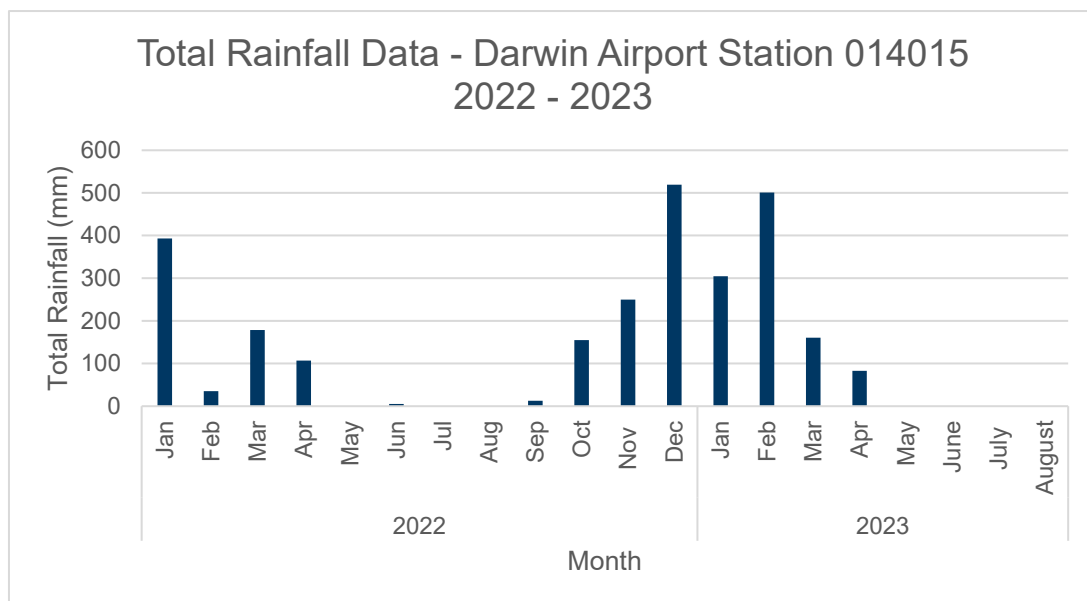


Figure 1 Rainfall data from Darwin Airport (BOM, 2023)

2.3 Geology and hydrogeology

The superficial geology underlying the site comprises unconsolidated sand, ferruginous and clayey, sandy and gravelly soils underlain by kaolinitic claystone (NTGS, 1985). Soils at depths of 0.1 to 0.5 m across the site, generally consisted of clayey sand with gravel.

DEPWS (2000) indicated the southern portion of the site is underlain by a shallow freshwater aquifer, potentially suitable for human consumption and garden watering. The groundwater yield is less than 0.5 L/s. However, the

map indicates that the northernmost 200 m of the site is likely to be underlain by shallow groundwater which is brackish to saline and unsuitable for most extractive uses, with a yield less than 0.5 L/s. It is likely that the groundwater towards the north is subject to saline influence from the Ludmilla Creek estuary (GHD, 2022)

Interpretation of groundwater standing water levels (SWLs) from previous groundwater sampling, indicated a generally northerly groundwater flow direction towards Ludmilla Creek wetland area (refer to Figure 3, **Error! Reference source not found.**) Based on the contours, the hydraulic gradient is approximately 0.007 m/m (GHD, 2022).

2.4 Topography and hydrology

The site is relatively flat with the track approximately 0.5m above the surrounding ground level. Surface water drainage at the site generally flows from south to north.

The closest surface water feature is Ludmilla Creek and associated mangrove wetlands, situated approximately 500 m to the northeast of the site. It is assumed the surface water on the site ultimately drains into Ludmilla Creek which discharges into the Beagle Gulf.

A drainage culvert is present within the northern portion of the site. Surface water runoff from the grassed central area and the racetrack are likely to flow into this drainage culvert under Dick Ward Drive and into Ludmilla Creek which discharges into the Beagle Gulf.

3. Investigation methodology

This section describes the methodology adopted during soil sample collection and handling, laboratory analysis and the quality assurance and quality control (QA/QC) assessment and procedures.

3.1 Frequency and timing

Based on the wet/dry tropics climate of Darwin and that the majority of rainfall occurs between November and March, runoff of potentially contaminated surface water and sediment from the racetrack is expected during this period. Therefore, soil sampling is expected to occur annually immediately following the wet season (March-April). Samples were collected slightly out of this range for the 2023 monitoring round (July) due to a project hold point restricting sampling. Annual soil sampling is also considered sufficient to identify potential wind-blown dust contamination originating from track conditioning activities and comply with EPL 218-02.

3.2 Sampling locations

The locations for soil sampling and rationale for sampling locations are described in Table 3.1. The exact location of boreholes was subject to the location of underground services.

Table 3.1 Sampling location rationale

Bore ID	Location	Rationale
BH01	North boundary of the site, adjacent the culvert which runs underneath Dick Ward Drive.	Targeting potential soil impacts by sediment and surface water runoff from the racetrack across the site.
BH02	Northern portion of the site, south of the culvert running underneath the racetrack.	Targeting potential soil impacts by sediment and surface water runoff from the racetrack across the site.
BH03	Adjacent west boundary of racetrack.	Targeting potential soil impacts by sediment and surface water runoff from the west racetrack.
BH04	Adjacent east boundary of racetrack.	Targeting potential soil impacts by sediment and surface water runoff from the east racetrack.
BH05	Adjacent south boundary of racetrack.	Targeting potential soil impacts by sediment and surface water runoff from the west racetrack and potential windblown dust impacting soils in this area.

Bore ID	Location	Rationale
BH06	Adjacent southeast boundary of racetrack.	Targeting potential soil impacts by sediment and surface water runoff from the west racetrack and potential windblown dust impacting soils in this area.

3.3 Soil sampling

The detailed investigation methodology completed for this investigation is provided in Table 3.2.

Table 3.2 Investigation methodology

Task	Method
General	Design and implementation of task specific Job Safety and Environmental Assessment (JSEA). Logistical organisation including obtaining the relevant permits and access requirements. Engagement of appropriate service locator to clear underground services surrounding the sampling location.
Intrusive Soil Investigations	The consultant/contractor undertook intrusive soil investigations, including: – Implementation of requirements of JSEA and permits. – Liaison and coordination of fieldwork with subcontractors and stakeholders or stake holder representative. – Clearance of all sample locations by a Services Locator, prior to ground penetration. – Bores were advanced using hand sampling equipment (i.e. hand auger). – Collection of soil samples from soil bores. Samples were collected with a trowel or spatula or by hand with a pair of clean nitrile gloves. Stainless steel hand tools were used. – Logging of the boreholes was undertaken by an environmental scientist to assess the underlying geology and contaminant indicators. – Laboratory analysis of primary and duplicate soil samples by selected NATA-accredited primary and secondary laboratories. – Collection of QA/QC samples included duplicate, split, rinsate and blanks as described in Section 5. – Soil boreholes were back filled with excavated material (boreholes were not compacted to any engineering standard).
Decontamination	General guidance Samples can be contaminated with PFAS from a range of products, including new clothing, footwear, PPE and treated fabrics stain and water- resistant products, sunscreen, moisturisers, cosmetics, fast food wrappers, polytetrafluoroethylene (PTFE) materials (such as Teflon®), sampling containers with PTFE-lined lids, foil, glazed ceramics, stickers and labels, inks, sticky notes, waterproof papers, drilling fluids, decontamination solutions and reusable freezer blocks. These were not worn or used during any stage of sampling (at site, during transport etc.). Handling The following was applied: – Sampling personnel washed their hands with plain soap and rinse thoroughly in tap water – Laboratory supplied sample containers suitable for requested analysis LOR requirements, typically polypropylene or HDPE were used – Avoided using sampling and monitoring equipment that may contain PTFE (PTFE based compositions include Teflon®) – Ensured that Teflon®-coated materials and aluminium foil did not come into contact with the sample – Chemical or gel-based coolant products to keep samples cool were not used – Consumable sampling equipment was not reused (i.e. gloves) – Wash water used for decontamination was discharged to ground following sampling

4. Assessment criteria (Trigger Values)

The DTC Environmental Management Plan (GHD, 2023) documents assessment criteria for soil which are based on the following technical guidance:

- National Environment Protection (Assessment of Site Contamination) Measure, 1999 as amended n 2013 (ASC NEPM).
- Heads of EPAs, Australia and New Zealand, PFAS National Environmental Management Plan V2 2020 (PFAS NEMP).

These criteria are referred to as Trigger Values in the EPL and provide the basis upon which non-conformances with the EPL are assessed.

The adopted assessment criteria (trigger values) are summarised in Table 4.1.

Table 4.1 *Trigger Values*

Parameter	Units	Assessment criteria							
		EIL	ESL	HIL D	HSL D	HSL D (Direct Contact)	Management Limit D	EDE	EIE
NEPM 2013									
Metals									
Arsenic	mg/kg	160	-	3000	-		-	-	-
Cadmium	mg/kg	-	-	900	-		-	-	-
Chromium (III+VI)	mg/kg	750	-	3,600	-		-	-	-
Copper	mg/kg	65	-	240,000	-		-	-	-
Lead	mg/kg	1800	-	1,500	-		-	-	-
Mercury	mg/kg	-	-	730	-		-	-	-
Nickel	mg/kg	9	-	6,000	-		-	-	-
Zinc	mg/kg	320	-	400,000	-		-	-	-
BTEX									
Benzene	mg/kg	-	75	-	3	430		-	-
Toluene	mg/kg	-	135	-	-	99,000		-	-
Ethylbenzene	mg/kg	-	165	-	-	27,000		-	-
Xylenes	mg/kg	-	180	-	230	81,000		-	-
TRH									
F1 (C ₆ -C ₁₀ minus BTEX)	mg/kg	-	215	-	260		-	-	-
C ₆ -C ₁₀ Fraction						26,000	700		
F2 (>C ₁₀ -C ₁₆ minus Naphthalene)	mg/kg	-		-	NL	-	-	-	-
>C ₁₀ -C ₁₆ Fraction	mg/kg	-	170	-	-	20,000	1000	-	-
F3 (>C ₁₆ -C ₃₄ Fraction)	mg/kg	-	1,700	-	-	27,000	3,500	-	-
F4 (>C ₃₄ -C ₄₀ Fraction)	mg/kg	-	3,300	-	-	38,000	10,000	-	-
PCBs									

Parameter	Units	Assessment criteria							
		EIL	ESL	HIL D	HSL D	HSL D (Direct Contact)	Management Limit D	EDE	EIE
Total PCBs	mg/kg	-	-	7	-	-	-	-	-
NEMP 2.0									
PFAS									
Perfluorooctane sulfonic acid (PFOS)	mg/kg		-	20	-	-	-	1	0.01
Perfluorooctanoic acid (PFOA)	mg/kg		-	50	-	-	-	10	-
Perfluorohexane sulfonic acid (PFHxS)	mg/kg		-	20	-	-	-	-	-
Sum of PFHxS and PFOS	mg/kg			20					
Notes: EIL – NEPM Ecological Investigation Levels (Commercial/Industrial) ESL – NEPM Ecological Screening Levels (Commercial/Industrial) HIL D – NEPM Human Health Investigation Levels (Commercial/Industrial) NL non limiting HSL D – NEPM Human Health Screening Levels (Commercial/Industrial) HSL D (direct contact) – NEPM Human Health Screening Levels (Commercial/Industrial) Direct contact Management limit D – NEPM Management limits (Commercial/Industrial) EDE – NEMP Ecological Direct Exposure EDI – NEMP Ecological Indirect Exposure									

Table 4.2 summarises the trigger values applied to the Australian Standard Leachate Procedure (ASLP) analysis results. These values are derived from the ANZG (2018) Marine water (leached) 95% level of species protection. There are no criteria specifically used for ASLP testing, this guideline has been assigned as it best fits the situation of the site.

Table 4.2 ASLP trigger values

Analyte	Trigger value (µg/L)
Cadmium	0.7 ¹
Chromium (VI)	4.4
Chromium (III)	27
Copper	1.3
Lead	4.4
Mercury	0.1 ¹
Nickel	70
Zinc	8
Notes: ¹ 99% level of species protection adopted due to potential for bioaccumulation and secondary poisoning effects.	

4.1 Non-compliance

Clause 46 of the EPL states that a non-compliance with the EPL includes:

- 46.1 an exceedance of a trigger value specified in Attachment 1 on three consecutive sampling occasions:
or
- 46.2 an exceedance of a trigger value specified in Attachment 1 on a single occasion where the parameter measures greater than or equal to three times or more the trigger value.

DTC must notify the EPA when a non-compliance has occurred, as detailed in the Clause 45 of the EPL.

Notification must include:

- 45.1 when the non-compliance was detected and by whom;
- 45.2 the date and time of the non-compliance;
- 45.3 the actual and potential causes and contributing factors to the non-compliance;
- 45.4 the risk of environmental harm arising from the non-compliance;
- 45.5 the action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance;
- 45.6 corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur;
and
- 45.7 if no action was taken, why no action was taken
- 45.8 a date when an incident investigation report will be submitted to the NT EPA

5. Quality assurance and control

5.1 Quality control procedures

Established quality assurance/quality control (QA/QC) procedures to assess data quality were maintained throughout the project. The QA/QC program undertaken as part of the assessment by GHD included the following:

- Use of appropriately qualified and trained staff
- Calibration of field instruments
- Preservation of samples with ice during transport from the field to the laboratory
- Transportation of samples with accompanying chain-of-custody documentation
- Compliance with sample holding times
- Review of results of blind duplicate and split duplicate samples
- Review of results of rinsate blank and trip blank samples
- Review of laboratory QA/QC procedures (including analytical results of method blanks, spike recoveries and laboratory duplicates).

The QC program employed during this investigation was in accordance with the general requirements set out in the Australian Standard AS4482.1 (2005, Withdrawn 10 Feb 2022¹). QC samples provide information that discounts or potentially identifies errors due to possible sources of cross contamination, inconsistencies in sampling techniques and analytical methods/procedures employed.

5.2 Summary of QA/QC compliance

Table 5.1 Summary of QA/QC compliance

Item	Objective	Outcome	Reference
GHD External Procedures			
Comparison of field and analytical data	Agreement between visual and olfactory evidence with laboratory results	Completed. Analytical results were consistent with field observations.	Analytical Results Tables (Appendix C). Laboratory Certificates of Analysis (Appendix E) Field Observations Summary - (Appendix D).
Calibration of field instruments	Meet calibration specifications	Not Applicable	AS4482.1-2005
Chain of Custody documentation	Supply Chain of Custody Documentation with all samples	Completed	Copies of Chain of Custody Documentation (Appendix E). Refer to section 5.2.3.
Sample analysis and extraction holding times	Comply with holding times.	Completed. Some holding time outliers occurred.	AS4482.1-2005 Laboratory Quality Control Reports (Appendix E). Refer to section 5.2.4.
Laboratory LORs	Laboratory LORs below adopted screening criteria	Completed. Laboratory LORs were below the adopted screening criteria.	Laboratory Certificates of Analysis (Appendix E)
Analysis of blind and split duplicate samples	Analysis of duplicate samples in 5% of primary samples	Completed. Duplicate samples were collected. Split samples were not	AS4482.1-2005 ASC NEPM

¹ Standard withdrawn February 2022. According to Standards Online Australia, for a document due for revision, if “no project proposal, meeting the quality criteria, is received within the 12 month timeframe, the document shall be withdrawn”. Standards Online currently does not provide a standard which supersedes AS4482.1 (2005), therefore GHD continues to use this method.

Item	Objective	Outcome	Reference
		collected for this investigation.	Laboratory Certificates of Analysis (Appendix E) Analytical Results Tables (Appendix C) Refer to section 5.2.5.
Analysis of rinsate and trip blank samples	Analysis of one rinsate sample per sampling equipment per day and one trip blank sample per day. Reported concentrations to be below the laboratory LOR.	Completed	AS4482.1-2005 ASC NEPM Laboratory Certificates of Analysis (Appendix E) Analytical Results Tables (Appendix C). Refer to sections 5.2.6 and 5.2.7.
Internal Laboratory Procedures			
Analysis of laboratory method blanks	No contamination of blanks.	Completed. No method blank outliers occurred.	Laboratory Quality Control Reports (Appendix E)
Analysis of laboratory internal duplicates	Frequencies and RPDs within guideline and internal laboratory limits (RPD of 0-30%)	Completed. No duplicate outliers occurred.	ASC NEPM Laboratory Quality Control Reports (Appendix E)
Analysis of laboratory spike recoveries	Recoveries within the laboratory specified recovery limits.	Completed	Laboratory Quality Control Reports (Appendix E). Refer to

5.2.1 Sample handling and preservation

Soil samples were collected in pre-cleaned laboratory supplied jars and water samples were collected in laboratory supplied containers with preservatives for certain analytes. Samples were collected using a new pair of Nitrile disposable gloves for each sample.

Samples were placed immediately on ice in chilled eskies upon collection. Samples were dispatched to the designated laboratories on a one- to two-day basis to ensure that all samples remain chilled, and analysis was completed within designated holding times. All sample consignments were accompanied by appropriately completed chain of custody (CoC) documentation.

5.2.2 Decontamination protocols

Decontamination protocols consistent with the methods recommended by the NSW EPA contaminated land sampling design guidelines part 1 and 2, were followed throughout the soil sampling to reduce the risk of cross contamination between samples and sample locations.

All relevant sampling and monitoring equipment (i.e., hand auger) was decontaminated between sampling locations using a phosphate free detergent (e.g., 'Liquinox') and final rinse with potable water.

5.2.3 Chain of custody

This process details the links in the transfer of samples between the time of collection and arrival at the laboratory. Sample custody procedures provide a system for documentation of information related to sample collection and handling to achieve the objectives.

Field data sheets and chain of custody forms were used as the primary documentation to ensure that relevant information for each sample was recorded. Chain of custody forms are provided in Appendix E.

5.2.4 Holding times

Holding times were exceeded for sample BH03_0.1-0.2 (for pH analysis) and for sample 'Trip Blank_01' for TPH, TRH and BTEXN analyses. Holding times were exceeded by 1 day (for sample BH03_0.1-0.2) and over 2 weeks

(16 days) for the trip blank respectively. The results for the trip blank reported concentrations for volatiles (TRH / BTEXN) below laboratory detection limits. The holding time exceedance is significant and therefore these results may be of limited reliability, however given that all samples reported TRH / BTEXN concentrations below laboratory detection limits, the need for a reliable trip blank sample is diminished in this case.

Table 5.2 *Summary of Holding Time Outliers*

Sample ID	Analyte	Comment
Holding time outliers		
BH03_0.1-0.2	pH in soil using 0.01M CaCl extract	Extraction date overdue by 1 day
Trip Blank_01	Total Petroleum Hydrocarbons	Extraction date overdue by 16 days
Trip Blank_01	Total Recoverable Hydrocarbons - NEPM 2013 Fractions	Extraction date overdue by 16 days
Trip Blank_01	BTEXN	Extraction date overdue by 16 days

5.2.5 Blind duplicate and split duplicate samples

For a total of 8 samples, two duplicate samples (FD_01 and FD_02) were collected during the field works, exceeding the minimum duplicate ratio of 5%. A split sample was not collected; however given the small number of samples overall, and that two blind duplicates were analysed, this is not expected to impact the overall quality of the data.

A quantitative measure of the duplicate sample results was made using calculated relative percentage difference (RPD) values for each chemical. The RPD values were calculated using the following equation.

$$RPD(\%) = \frac{(C_o - C_s)}{\left(\frac{C_o + C_s}{2}\right)} \times 100$$

where C_o = reported concentration of the chemical of interest from the original parent sample

C_s = reported concentration of the chemical of interest from the duplicate sample

The following acceptance criteria outlined in Table 5.3 was used.

Table 5.3 Duplicate and split sample acceptance criteria

Sample type	Acceptance criteria
Duplicate (blind) samples	Result <10 x LOR – no RPD % limit Result >10 x LOR – RPD 30 – 50% 30% for inorganic compounds 50% for organic compounds
Triplicate (split) samples	Result <10 x LOR – no RPD % limit Result >10 x LOR – RPD 30 – 50% 30% for inorganic compounds 50% for organic compounds

The RPD outliers are presented in Table 5.4 below.

Table 5.4 RPD exceedances

Duplicate sample	Primary sample	Analyte	Primary concentration (mg/kg)	Duplicate concentration (mg/kg)	RPD (%)
FD_01	BH06_0.1-0.2	arsenic	17	12	34
FD_01	BH06_0.1-0.2	copper	9	6	40
FD_01	BH06_0.1-0.2	lead	42	23	58
FD_01	BH06_0.1-0.2	zinc	39	16	84
FD_02	BH05_0.1-0.2	chromium (III+VI)	100	57	55
FD_02	BH05_0.1-0.2	nickel	9	5	57

Sample FD_01 reported RPD exceedances for arsenic, copper, lead and zinc. Sample FD_02 reported RPD exceedances for chromium (III+VI) and nickel. Such exceedances are not uncommon and are likely due to the heterogeneity of the soils provided to the laboratory. The exceedances are not expected to affect the overall reliability of the dataset.

5.2.6 Rinsate sample

One rinsate sample was collected during the field works. Analysis of the rinsate sample RN_01 did not identify any analyte concentrations greater than the laboratory LOR, indicating that no cross-contamination occurred during the sample collection and handling, or through the use of multi-use (non-disposable) equipment between sample locations.

5.2.7 Trip blank

One trip blank per batch of samples was prepared by the laboratory, taken to the Site during the sampling process and subsequently submitted to the laboratory for analysis. The trip blank sample did not identify concentrations above the laboratory LOR for BTEX and TRH, indicating no cross-contamination from volatiles is likely to have occurred during the transportation of samples in eskies to the laboratory.

5.2.8 Laboratory control outliers

The laboratory QA report (Appendix E) reported the following:

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control outliers occur.

- For all regular sample matrices, no surrogate recovery outliers exist.
- Matrix Spike Outliers exist.
- Analysis Holding Time outliers exist, refer to section 5.2.4.
- Quality Control Sample Frequency outliers exist.

A summary of the laboratory quality outliers is provided in Table 5.5

Table 5.5 *Laboratory QA outliers*

Sample ID	Analyte	Comment	
Quality control outliers – Matrix Spike (MS) Recoveries – Matrix WATER			
Anonymous	Perfluorodecane sulfonic acid (PFDS)	Recovery less than lower data quality objective.	
Anonymous	Perfluoropentanoic acid (PFPeA)	Recovery less than lower data quality objective.	
Anonymous	Perfluoroheptanoic acid (PFHpA)	Recovery less than lower data quality objective.	
Anonymous	Perfluorononanoic acid (PFNA)	Recovery less than lower data quality objective.	
Anonymous	Perfluorodecanoic acid (PFDA)	Recovery less than lower data quality objective.	
Anonymous	Perfluoroundecanoic acid (PFUnDA)	Recovery less than lower data quality objective.	
Anonymous	Perfluorododecanoic acid (PFDoDA)	Recovery less than lower data quality objective.	
Anonymous	Perfluorotridecanoic acid (PFTrDA)	Recovery less than lower data quality objective.	
Anonymous	Perfluorotetradecanoic acid (PFTeDA)	Recovery less than lower data quality objective.	
Anonymous	Perfluorooctane sulfonamide (FOSA)	Recovery less than lower data quality objective.	
Anonymous	N-Methyl perfluorooctane sulfonamide (MeFOSA)	Recovery less than lower data quality objective.	
Anonymous	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	Recovery less than lower data quality objective.	
Anonymous	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	Recovery less than lower data quality objective.	
Anonymous	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Recovery less than lower data quality objective.	
Anonymous	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	Recovery less than lower data quality objective.	
Frequency of quality control samples outliers – Matrix WATER			
Quality control sample type	Actual (Rate %)	Expected (Rate %)	Quality Control Specification
Lab Duplicate – PCB	0	10	NEPM 2013 B3 & ALS QC Standard
Lap Duplicate – TRH (Semi volatile Fraction)	0	10	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes - PCB	0	5	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes - TRH (Semi volatile Fraction)	0	5	NEPM 2013 B3 & ALS QC Standard

5.3 QAQC conclusions

Several non-conformances of RPDs for blind duplicates, holding times, laboratory internal duplicates, laboratory control spikes and matrix spikes were identified in the QA/QC process. These are discussed in the sections above and are not considered to have impacted the overall outcome of the investigation. The results of the QA/QC program are considered to provide an acceptable degree of confidence in the analytical program completed.

6. Soil monitoring results

A GHD Environmental Scientist conducted the soil sampling on 27 July 2023. The following sections detail the results of the SME.

6.1 Field observations

Soils encountered on Site generally consisted of dry clayey sand with gravel and sandy clay with gravel, organic matter (grass) was present at all sampling locations, with the exception of BH05.

As recorded on the field sheet presented in, BH01a and BH01b are the same borehole location, but represent different depths (a = 0.1 – 0.2, b = 0.4 - 0.5).

The ground was very hard in the majority of locations, resulting in the target depth of 0.4 to 0.5 mbgl being unreachable at locations BH01, BH02, BH03 and BH04.

In addition, adjustments in sampling location were needed in order to maximise the depth the hand auger could reach. Generally, the adjustments consisted of moving the borehole location within 1 to 1.5 m of the initial proposed borehole location.

The maximum depths reached for each test pit and which locations were adjusted are identified below:

- BH01 – 0.2 m refusal, location adjusted.
- BH02 – 0.2 m refusal, location adjusted.
- BH03 – 0.2 m refusal
- BH04 – 0.2 m refusal, location adjusted.
- BH05 – 0.5 m refusal
- BH06 – 0.5 m refusal

The service locator identified the ground surrounding BH02 was very hard and likely consisted of 'coffee rock'².

No groundwater was encountered at any of the six of the sampling locations, this is likely due to the shallow depth of the soil bores and lack of rain during the dry season.

No visual indicators of contamination were present during sampling. A hydrocarbon odour was detected at BH02 and BH04 however, this could have been originating from the racetrack where the waste oil had been applied.

6.2 Laboratory results

6.2.1 Physical characteristics

Laboratory testing provided the physical characteristics of the soil sampled, with a sample from BH03 selected as the representative sample. The physical characteristics of the soil are listed in Table 6.1 below.

Table 6.1 *Physical characteristics*

Characteristics	Laboratory result
pH	6.0 pH
Cation Exchange Capacity (CEC)	1.8 meq/100g
Electrical conductivity	14 µS/cm
Particle size analysis (Clay)	14 %
Soil bulk density	0.01 g/cm ³
Total Organic Carbon (TOC)	1.2 %

² 'Coffee rock' is a common term used to describe indurated or heavily cemented (i.e. very hard) sands

Characteristics	Laboratory result
Organic matter	2.1 %

6.2.2 Heavy metals

Eight samples were collected across the site and analysed for heavy metals, including arsenic, cadmium, chromium (III+VI), copper, iron, lead, mercury, nickel and zinc.

Metal concentrations were reported across the site, detections of chromium (III+VI), copper, lead, nickel and zinc were above laboratory LOR. The majority of these detections did not exceed the applicable trigger values outlined in Section 1.

Table 6.2 provides a summary of the heavy metals results.

Table 6.2 Heavy metals results summary

Analyte	LOR (mg/kg)	Detection Range
Arsenic	5	8 mg/kg (BH05_0.1-0.2) to 25 mg/kg (BH03_0.1-0.2). All results below adopted trigger levels.
Cadmium	1	All results below laboratory detection limits.
Chromium (III+VI)	2	51 mg/kg (BH02_0.1-0.2) to 135 mg/kg (BH03_0.1-0.2). All results below adopted trigger levels.
Copper	5	6 mg/kg (BH06_0.4-0.5) to 19 mg/kg (BH03_0.1-0.2). All results below adopted trigger levels.
Lead	5	9 mg/kg (BH05_0.4-0.5) to 42 mg/kg (BH06_0.1-0.2). All results below adopted trigger levels.
Nickel	2	4 mg/kg (BH04_0.1-0.2, BH05_0.4-0.5, BH06_0.1-0.2) to 10 mg/kg (BH02_0.1-0.2). Two samples marginally exceeded the trigger level concentration of 9 mg/kg, BH02_0.1-0.2 (with a concentration of 10 mg/kg) and BH05_0.1-0.2 (with a concentration of 9 mg/kg).
Zinc	5	20 mg/kg (BH05_0.1-0.2) to 63 mg/kg (BH01_0.1-0.2). All results below adopted trigger levels.

ASLP leachability analysis was undertaken on the samples listed below; these samples were selected as they represented a good mix of mid to high detects among the metal concentrations within the analysed samples.

- BH01_0.1-0.2
- BH02_0.1-0.2
- BH03_0.1-0.2
- BH06_0.1-0.2

Refer to section 6.3.1 for further detail on leachability results.

6.2.3 TRH, BTEXN & PCBs

Concentrations of TRH, BTEXN and PCBs were below the laboratory LOR in all samples submitted for analysis.

6.2.4 PFAS

All eight samples were analysed for PFAS. Low level detections of Perfluorooctane sulfonic acid (PFOS) concentrations were identified in samples BH01_0.1-0.2 (0.005 mg/kg), BH02_0.1-0.2 (0.004 mg/kg) and BH03_0.1-0.2 (0.003 mg/kg). These concentrations were below adopted trigger levels.

Concentrations of PFAS were below the laboratory LOR for all other samples analysed.

Leachability analysis was performed on the following samples, as they represented the only PFAS detections across the eight sample locations.

- BH01, at depth range 0.1 – 0.2 m
- BH02, at depth range 0.1 – 0.2 m
- BH03, at depth range 0.1 – 0.2 m

Refer to section 6.3.2 for further detail on leachability results.

6.3 Leachability – ASLP

6.3.1 ASLP – Metals

Australian Standard Leaching Procedure (ASLP) for metals was undertaken on the four selected primary samples:

- BH01_0.1-0.2
- BH02_0.1-0.2
- BH03_0.1-0.2
- BH06_0.1-0.2

All samples analysed for ASLP metals recorded exceedances against the applicable ANZG 2018 guidelines for 95% marine water protection level. The exceedances have been identified in Table 6.3.

Table 6.3 ASLP metal exceedances

Location	Analyte	Trigger Value (mg/L)	Concentration (mg/L)
BH01_0.1-0.2	Chromium (III) / (VI)	0.027 / 0.0044	0.082
	Copper	0.0013	0.014
	Lead	0.0044	0.040
	Nickel	0.07	0.019
	Zinc	0.008	0.130
BH02_0.1-0.2	Chromium (III) / (VI)	0.027 / 0.0044	0.048
	Copper	0.0013	0.006
	Lead	0.0044	0.025
	Nickel	0.07	0.016
	Zinc	0.008	0.043
BH03_0.1-0.2	Chromium (III) / (VI)	0.027 / 0.0044	0.040
	Copper	0.0013	0.032
	Lead	0.0044	0.015
	Nickel	0.07	0.012
	Zinc	0.008	0.026
BH04_0.1-0.2	Chromium (III) / (VI)	0.027 / 0.0044	0.036
	Copper	0.0013	0.010
	Lead	0.0044	0.038
	Nickel	0.07	0.010
	Zinc	0.008	0.081

6.3.2 ASLP – PFAS

ASLP for PFAS was undertaken on the three selected primary samples:

- BH01, at depth range 0.1 – 0.2 m
- BH02, at depth range 0.1 – 0.2 m
- BH03, at depth range 0.1 – 0.2 m

ASLP concentrations for PFAS did not exceed the laboratory LOR for all samples analysed.

6.4 Discussion

6.4.1 Metals

Results for metals in soil were below adopted trigger levels for all metals except for nickel. In the case of nickel, two samples (BH02_0.1-0.2 and BH05_0.1-0.2) met or marginally exceeded the trigger level concentration of 9 mg/kg, which is based on the Environmental Investigation Level (EIL) for nickel.

It is noted that the EILs for metals were calculated in the absence of background concentrations (refer to section 4) and are therefore likely to be overly conservative. Further to this, with the exception of lead, metals are not expected to be associated with the application of refined waste oil to the track and therefore concentrations detected in soil are unlikely to be related. Given the metal concentrations in soil at the Site overall are generally low, it is more likely they are associated with natural background concentrations.

Leachability

Several soil samples underwent leachability testing with all results exceeding the nominated trigger levels. This result is not unexpected given the sandy nature of the soil at the Site and its low organic carbon and clay content, both of which would provide more opportunities for metal adsorption into the soil matrix (i.e. soils with low clay and organic content are typically more leachable).

Exceedances of nominated trigger levels as specified in the EMP constitute a 'non-compliance' event in accordance with Clause 45 of the EPL 218-02 and requires notification in writing to the NT EPA. A letter was issued by GHD to NT EPA on 19 September 2023³, regarding this non-compliance event. The letter concluded the leachability trigger level exceedances constituted a low risk with regard to the mobilisation of metals offsite to nearby receptors such as Ludmilla Creek. Further to this, the following should be noted:

- The leachability 'trigger levels' were adopted from the ANZG (2018) Marine water 95% (or in some cases 99%) level of species protection. These guidelines were developed for groundwater and apply 'at the point of discharge' (i.e. the nearest applicable surface water body). These guidelines have been adopted for leachability at the Site for the purpose of providing a point of reference only for assessment of results.
- Further to this, it is noted that metals (with the exception of lead) are not expected to be associated with the application of refined waste oil at the track. The metal concentrations are considered more likely to be associated with natural background concentrations. Therefore, an exceedance of the adopted trigger levels for metals leachability is not an indication that application of refined waste oil to the track is impacting the condition of soil and/or groundwater at the Site or nearby receptors.

6.4.2 Hydrocarbons

Soil samples were analysed for TRH and BTEXN with all results below laboratory detection limits. As these analytes are the primary contaminants of concern associated with the application of refined waste oil to the racetrack, this would indicate that the surrounding soil has not been impacted.

6.4.3 PFAS and PCBs

Soil samples were also analysed for PFAS and PCBs as required by EPL 218-02. Results for PCBs were all below laboratory detection limits. Perfluorooctane sulfonic acid (PFOS) concentrations were identified in three samples, however concentrations were below adopted trigger levels. Leachability testing on these samples reported non-detects also.

³ Our Ref: RE: Darwin Turf Club Fannie Bay Racecourse – EPL 218-02 Monitoring Report – July 2023, Non-Compliance Notification' dated 19 September 2023

7. Conclusions

In July 2023, GHD completed a Soil Monitoring Event (SME) at the Darwin Turf Club. A total of 8 hand auger boreholes were advanced to a maximum depth of 0.5 m bgl to monitor the soil quality in accordance with the requirements outlined in Environment Protection Licence EPL 218-02.

Based on the scope of works completed and the limitations described in Section 1.4, the following are the key findings of the SME:

- The soils encountered on the site primarily consist of clayey sand with gravel at depths of 0.1 to 0.5 m bgl. Several sample locations (BH01, BH02, BH03 and BH04) experienced refusal on hard rock at 0.2 m bgl and so the target depth of 0.5 m bgl was not reached at these locations.
- No visual observations of contamination were made throughout the sampling process, this includes no indications of asbestos containing materials (ACM). Hydrocarbon odours were detected at BH02 and BH04, however these were considered likely to be from the nearby racetrack.
- A total of 12 primary samples were collected from the six bore hole test pits, with all samples analysed for a range of analytes including TRH, BTEX, metals, PCBs and PFAS.
- Concentrations of TRH, BTEXN and PCBs were below laboratory detection limits for all samples analysed and therefore the adopted trigger levels, based on a commercial / industrial land use setting, were not exceeded.
- Metal concentrations, with the exception of nickel, did not exceed adopted trigger values. Given that the EILs calculated for the Site are considered conservative, and metal concentrations in soil overall are generally low, they are considered likely to be indicative of natural background conditions.
- Results for the leachability testing of metals triggered a 'non-compliance' event in accordance with Clause 45 of the EPL 218-02. It is noted however, that given the sandy nature of the soil at the Site and its low organic carbon and clay content, higher leachability concentrations would be expected. Further to this, as metals (with the exception of lead) are not expected to be associated with refined waste oil, the exceedance of the adopted trigger levels for metals leachability is not an indication that application of refined waste oil to the track is impacting the condition of soil and/or groundwater at the Site or nearby receptors.
- Soil results for TRH and BTEXN were below laboratory detection limits. As these analytes are the primary contaminants of concern associated with the application of refined waste oil to the racetrack, this would indicate that the surrounding soil has not been impacted.
- Soil results for PCBs were all below laboratory detection limits. Perfluorooctane sulfonic acid (PFOS) concentrations were identified in three samples, however concentrations were below adopted trigger levels.

8. Recommendations

The continuation of the soil monitoring program is recommended in order to develop a quality data set that can be used to establish the condition of soil at the site over time.

It is recommended that several background samples are collected at the site (and if possible, immediately offsite) to facilitate the development of site-specific environmental investigation levels (for metals in particular), but also for other analytes required for testing, as part of the environmental protection licence, so that feasible 'background conditions' can be established, and trigger levels modified accordingly (where required). Analysis of background samples should also include leachability analysis and physical properties (pH, CEC, % Clay) where appropriate.

The requirement for leachability testing of contaminants of potential concern should be undertaken with consideration of background conditions and those contaminants identified during the analysis of the refined waste oil before application to the racetrack.

Where contaminants of concern associated with the refined waste oil are identified in soil, leachability testing should be undertaken and consideration given to the location of the Site in relation to sensitive receptors, the presence of barriers or containment that prevents or minimizes contaminant migration. This could be facilitated by the review of the site conceptual model to assist with understanding source-migration-receptor pathways and providing a framework upon which to assess potential offsite migration risks where impacts are identified.

9. References

Bureau of Meteorology (2022). Latest weather observations for Darwin Airport. Available from Daily Rainfall - 014015 - Bureau of Meteorology (bom.gov.au)

GHD (2022) *Soil Monitoring Program*.

GHD (2023) *Environmental Management Plan for the Application of Used Oil*.

Heads of EPAs Australia and New Zealand (HEPA)(2020) *PFAS National Environmental Management Plan 2.0*. Accessed 27 July 2023. Available from **<https://www.dcceew.gov.au/sites/default/files/documents/pfas-nemp-2.pdf>**

Northern Territory Geological Survey (1988) *Australia 1:250 000 geological series*. Department of Mines and Energy in collaboration with the Bureau of Mineral Resources, Geology and Geophysics, Department of Resources and Energy

NSW Environmental Protection Authority (2022) *Contaminated Land sampling design guidelines part 1 – application*. Accessed 27 July 2023. Available from **[Sampling design part 1 - application \(nsw.gov.au\)](#)**.

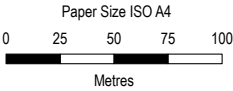
NSW Environmental Protection Authority (2022) *Contaminated Land sampling design guidelines part 2 – interpretation*. Accessed 27 July 2023. Available from **[Sampling design part 2 - interpretation \(nsw.gov.au\)](#)**

Appendices

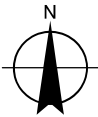
Appendix A

Figures

Legend
 Surface soil sampling
 Road



Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 52



Darwin Turf Club Inc
EPL Monitoring

Project No. 12618429
Revision No. A
Date 04/09/2023

Soil Monitoring Locations

FIGURE 1

Appendix B

Environment Protection Licence (EPL)

218-02

ENVIRONMENT PROTECTION LICENCE(Pursuant to section 34 of the *Waste Management and Pollution Control Act*)

Licensee	Darwin Turf Club Inc.
Licence Number	EPL218 - 02
Registered Business Address	Darwin Turf Club Inc. 20 Dick Ward Drive Fannie Bay NT 0820
ABN	21 373 066 193
Premises Address	Lot 05298 Town of Darwin plan(s) S 79/109 20 DICK WARD DR, FANNIE BAY
Anniversary Date:	01 September
Commencement Date:	01/09/2022
Expiry Date:	31/08/2024
Scheduled Activity	Collecting, transporting, storing, re-cycling, treating or disposing of a listed waste (as per Table 1) on a commercial or fee for service basis, other than in or for the purpose of a sewage treatment plant. Operating premises, other than a sewage treatment plant, associated with collecting, transporting, storing, re-cycling, treating or disposing of a listed waste (as per Table 1) on a commercial or fee for service basis.
Description	Application of <i>waste mixtures</i> , or <i>waste emulsions</i> , of <i>oil and water or hydrocarbon and water</i> by disposal to Darwin Turf Club, Fannie Bay Racecourse for the purpose of conditioning the track twice yearly.

Table 1 - Listed Wastes Authorised to be Handled

Listed Waste	Collection	Transport	Storage	Treatment	Recycling	Disposal
Waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water	✗	✗	✗	✗	✗	✓

✓ Activity authorised by this licence

✗ Activity not authorised by this licence

ENVIRONMENT PROTECTION LICENCE 218 - 02

TABLE OF CONTENTS

INFORMATION ABOUT THIS LICENCE	4
RULES FOR INTERPRETING THE CONDITIONS OF THIS LICENCE	6
LICENCE CONDITIONS	7
GENERAL	7
EARLY SURRENDER OF LICENCE	8
OPERATIONAL	8
DISCHARGES AND EMISSIONS	9
MONITORING	9
RECORDING AND REPORTING	10
DEFINITIONS	14

ATTACHMENTS

- 1 12526136-REP-0_Environmental Management Plan for the Application of Used Oil.pdf_11568393.pdf

ENVIRONMENT PROTECTION LICENCE 218 - 02

INFORMATION ABOUT THIS LICENCE

- This licence does not in any way relieve the licence holder from its obligations to comply with the *Waste Management and Pollution Control Act* (WMPC Act), including the general environmental duty in section 12 of the WMPC Act and the duty to notify of incidents causing or threatening to cause pollution under section 14 of the WMPC Act.

Duration of a licence (section 40, 43 and 45 of the WMPC Act)

- A licence will remain in force until its expiry date or until it is surrendered by the licensee or is suspended or cancelled in accordance with the WMPC Act.
- The licensee must notify the Northern Territory Environment Protection Authority (NT EPA) within 14 days after ceasing to conduct the activity.
- The licensee may, with the approval of the NT EPA, surrender the licence to the NT EPA.

Amendment or Revocation of a licence (section 37 of the WMPC Act)

- The licensee may apply to amend or revoke a condition of this licence.
- A fee applies and the application must be made using the designated form via NT EPA Online.
- The NT EPA may also amend or revoke a condition of this licence as set out in section 38 of the WMPC Act.

Transfer of a licence (section 46 of the WMPC Act)

- The licensee can apply to transfer their licence to another person.

Renewal of a licence (section 40 of the WMPC Act and section 3 of the Regulations)

- The licensee may apply for the renewal of their licence not earlier than 90 days, and not later than 30 days, before their licence expires.
- A fee applies and the application must be made via NT EPA Online.

Public Register

- A copy of environment protection licences and any plans for environmental management, reports, submissions or documents required as a condition of an environment protection licence, will be placed on a register in accordance with section 9 of the WMPC Act.
- A copy of the Annual Return will be placed on the register.
- The NT EPA makes this register freely available from the NT EPA website.

Environment Protection Objectives (Part 4 of the WMPC Act), and Water Quality Standards (section 73 of the *Water Act*)

- An Environment Protection Objective (EPO) is a statutory instrument to establish principles on which:
 - a. environmental quality is to be maintained, enhanced, managed or protected;
 - b. pollution, or environmental harm resulting from pollution, is to be assessed, prevented, reduced, controlled, rectified or cleaned up; and
 - c. effective waste management is to be implemented or evaluated.
- In accordance with section 18 of the WMPC Act a beneficial use, quality standard, criteria or objective declared under section 73 of the *Water Act* and in force is an environment protection objective for the purposes of the WMPC Act.

ENVIRONMENT PROTECTION LICENCE 218 - 02

- The following EPOs and Beneficial Use Declarations (BUDs) are relevant to this licence:
 - Darwin Harbour Region: Aquaculture, environment, cultural, rural stock and domestic

Environmental Interests

- This section highlights sensitivity of the surrounding land use and environment associated with the location of the approved activity.
- Sites of Conservation Significance
- Ramsar Wetland

Cultural Interests

- It is the licensee's responsibility to contact the Aboriginal Areas Protection Authority, appropriate land council or other governing body and ensure that any Authority Certificates required as a result of conducting the licenced activity are obtained and complied with.

ENVIRONMENT PROTECTION LICENCE 218 - 02

RULES FOR INTERPRETING THE CONDITIONS OF THIS LICENCE

- Where there is a discrepancy between the conditions of this licence and any plan, standard, guideline or other document referred to in this licence, the conditions of this licence prevail to the extent of the inconsistency.
- Any reference to any standard (Australian or international) in this licence means the relevant parts of the current version of that standard.
- A reference to any guideline or code of practice (or to the relevant parts of any guideline or code of practice) in this licence means the current version of the guideline or code of practice.
- Under section 39 of the WMPC Act, any contravention of or failure to comply with this licence by the licensee may be an offence.
- In determining whether the licensee has committed an offence, the licensee may be liable for the conduct of its directors, employees or agents.
- The licensee should ensure that each of its directors, employees, contractors or agents are aware of, and comply with, this licence.
- In this licence, unless the contrary intention appears, words that are defined in the WMPC Act are intended to have the meaning given to them in that Act.

ENVIRONMENT PROTECTION LICENCE 218 - 02

LICENCE CONDITIONS

GENERAL

- 1 The licensee must ensure the contact details recorded in NT EPA Online for this licence are correct at all times.
- 2 The licensee must at all times have a 24 hour emergency contact.
- 3 The licensee must notify the NT EPA prior to making any operational change that will cause, or is likely to cause, an increase in the potential for environmental harm.
- 4 The licensee must pay via NT EPA Online the annual fee calculated in accordance with the method prescribed in the Regulations within 10 business days of the anniversary date of this licence, for each year or part of a year that this licence is in force.
- 5 The licensee must cause clear and legible signage, in English, to be displayed in a prominent location at each public entrance to the premises that includes the following details:
 - 5.1 environment protection licence number issued under the WMPC Act; and
 - 5.2 24 hour emergency contact details.
- 6 The licensee must cause a copy of this licence to be available for inspection by any person, in hard copy form, at the premises.
- 7 The licensee must provide to the NT EPA, within 10 business days of a request, a copy of any document, monitoring data or other information in relation to the activity, in the format requested by the NT EPA.
- 8 All notices, reports, documents or other correspondence required to be provided as a condition of this licence, unless otherwise specified as a condition of this licence, must be provided in electronic form by uploading the document via NT EPA Online (or by emailing waste@nt.gov.au).
- 9 The licensee must implement, maintain and follow the documents listed in Table 2.
Table 2 - Documents Relevant to the Licenced Activity

Document Ref.	Document Name
12526136	Fannie Bay Racecourse Environmental Management Plan (EMP) for the Application of Used Oil, Rev 0, 21 January 2022
- 10 Within 10 business days of any amendment being made to a document listed in Table 2 the licensee must provide the amended document to the NT EPA, along with:
 - 10.1 a tabulated summary of the amendment(s) with document references;
 - 10.2 reasons for the amendment(s); and
 - 10.3 an assessment of environmental risk associated with the amendment(s).
- 11 The NT EPA may require the licensee to revise or amend and resubmit any amended document. Where the NT EPA requires a document to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.
- 12 The licensee must, for the duration of this licence, implement, maintain and follow a Consultation and Communication Plan which includes a strategy for communicating with persons who are likely to have a real interest in, or be affected by, the activity.

ENVIRONMENT PROTECTION LICENCE 218 - 02

- 13 The licensee must operate and maintain a community feedback number.
- 14 The licensee must display the community feedback number:
 - 14.1 where the licensee has a website, in a prominent location on the licensees website;
 - 14.2 in the Consultation and Communication Plan; and
 - 14.3 in other publicly available documents relating to the activity.
- 15 The licensee must maintain a Complaint Log for all complaints received by the licensee in relation to the activity.
- 16 The licensee must ensure that the Complaint Log includes, for each complaint received by the licensee, the following information:
 - 16.1 the person to whom the complaint was made;
 - 16.2 the person responsible for managing the complaint;
 - 16.3 the date and time the complaint was reported;
 - 16.4 the date and time of the event(s) that led to the complaint;
 - 16.5 the contact details of the complainant if known, or where no details are provided a note to that effect;
 - 16.6 the nature of the complaint;
 - 16.7 the nature of event(s) giving rise to the complaint;
 - 16.8 prevailing weather conditions at the time (where relevant to the complaint);
 - 16.9 the action taken in relation to the complaint, including any follow-up contact with the complainant; and
 - 16.10 if no action was taken, why no action was taken.
- 17 The licensee must implement, maintain and follow an Emergency Response Plan that addresses procedures for responding to emergencies associated with the activity that may cause environmental harm.

EARLY SURRENDER OF LICENCE

- 18 Any reports, records or other information required or able to be provided by the licensee under this licence must be submitted to the NT EPA prior to the licensee surrendering the licence. If the date on which a report, record or other information is required falls after the date the licensee requests to surrender this licence, the licensee must provide the report, record or information as far as possible using data available to the licensee up to and including the date the request to surrender the licence is made.

OPERATIONAL

- 19 The licensee must, without limiting any other condition of this licence, in conducting the activity, do all things reasonable and practicable to ensure the activity does not adversely affect the Declared Beneficial Uses and Objectives as declared from time to time, including those applying to:
- *Darwin Harbour Region*

ENVIRONMENT PROTECTION LICENCE 218 - 02

- 20 The licensee must not collect, transport, store, recycle, treat or dispose of listed waste other than the listed waste specified in Table 1.
- 21 The licensee must ensure any plant and equipment used by the licensee in conducting the activity:
- 21.1 is reasonably fit for the purpose and use to which it is put;
 - 21.2 is maintained;
 - 21.3 is operated by a person trained to use the plant and equipment; and
- 22 The licensee must ensure that wastewater generated from washing plant and equipment associated with the activity does not cause pollution.
- 23 The licensee must ensure that all listed waste being transported to the premises is transported by a person licenced under section 30 of the WMPC Act to transport the listed waste.
- 24 The licensee must notify the NT EPA, two weeks in advance, of the proposed dates for the application of listed waste to the track at the premises.

DISCHARGES AND EMISSIONS

- 25 The licensee must not allow a contaminant or waste, which causes or may cause environmental harm, to enter water.
- 26 The licensee must ensure there is no migration or overflow of a contaminant or waste, which causes or may cause environmental harm, beyond the boundary of the land on which the premises are located. (For the avoidance of doubt, this condition is not intended to authorise the discharge of a contaminant or waste to any land or water which discharge has not been specifically authorised by another condition of this licence.)
- 27 The licensee must ensure that stormwater does not come into contact with a contaminant or waste, which causes or may cause environmental harm.
- 28 The licensee must ensure that discharges from the premises do not:
- 28.1 contain any floating debris, oil, grease, petroleum hydrocarbon sheen, scum, litter or other objectionable matter;
 - 28.2 cause or generate odours which would adversely affect the use of surrounding waters;
 - 28.3 cause visible change in the behaviour of fish or other aquatic organisms in the receiving water;
 - 28.4 cause algal blooms in the receiving water;
 - 28.5 cause mortality of fish or other aquatic organisms; or
 - 28.6 cause adverse impacts on plants.
- 29 The activity must not cause or release, beyond the boundary of the premises offensive odour.

MONITORING

- 30 The licensee must conduct air and groundwater monitoring in accordance with section 9 of the EMP referred to in Table 2.

ENVIRONMENT PROTECTION LICENCE 218 - 02

- 31 The licensee must conduct surface water and soil monitoring in accordance with the programs developed under conditions 32 and 33.
- 32 The licensee must develop a surface water quality monitoring program to monitor for total recoverable hydrocarbons and benzene, toluene, ethylbenzene and xylene (BTEX) in surface water leaving the premises. A copy of the surface water quality program must be submitted to the NT EPA by 30 September 2022.
- 33 The licensee must develop a soil monitoring program and provide it to the NT EPA by 30 September 2022.
- 34 Prior to the application of listed waste (per Table 1) to the Fannie Bay Racecourse, the licensee must analyse a representative sample of the listed waste to be applied. The sample must:
- 34.1 be representative to the extent practicable; and
 - 34.2 test for other listed waste, including polychlorinated biphenyls (PCBs) and per-and polyfluoroalkyl substances (PFAS).
- 35 The licensee must provide the results of the sampling taken under condition 34 to the NT EPA within two business days of receipt.
- 36 The licensee must ensure any samples collected in accordance with the Monitoring Plan or in connection with the activity or this licence, are obtained by, or under the supervision of a qualified sampler.
- 37 The licensee must ensure that all monitoring samples are analysed at a laboratory with current NATA accreditation or equivalent, for the parameters to be measured.
- 38 The licensee must ensure that, for each sample collected in accordance with the Monitoring Plan or the activity the following information must be recorded and retained:
- 38.1 the date on which the sample was collected;
 - 38.2 the time at which the sample was collected;
 - 38.3 the location at which the sample was collected;
 - 38.4 the name of the person who collected the sample;
 - 38.5 the chain of custody forms relating to the sample;
 - 38.6 the field measurements (if any) and analytical results (if any) relating to the sample; and
 - 38.7 laboratory quality assurance and quality control documentation.
- 39 The NT EPA may require the licensee to revise or amend and resubmit the Monitoring Plan. Where the NT EPA requires the Monitoring Plan to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.
- 40 The licensee must ensure that any proposed revisions to the Monitoring Plan (other than typographical changes or revisions to formatting or referencing) are:
- 40.1 reviewed by a suitably qualified professional;
 - 40.2 submitted to the NT EPA with justification for revisions; and
 - 40.3 submitted to the NT EPA, in electronic form (with a complete copy of the qualified professional's written review), 20 business days prior to the proposed implementation date.

ENVIRONMENT PROTECTION LICENCE 218 - 02

RECORDING AND REPORTING

- 41 The licensee must keep and maintain records relating to the activity undertaken and the listed waste handled by the licensee in each successive 12 month period following the commencement of this licence, which include:
- 41.1 the date of collection;
 - 41.2 the source of the listed waste;
 - 41.3 the name of the transport company, if not the licensee;
 - 41.4 the vehicle registration;
 - 41.5 a description of the listed waste;
 - 41.6 the quantity of the listed waste;
 - 41.7 the final destination of the listed waste; and
 - 41.8 whether the listed waste was stored, recycled, treated or disposed of.
- 42 The licensee must retain records relating to waste, including listed waste, as required by the conditions of this licence, for a period of 2 years after the end of the 12 month period to which the record relates.
- 43 The licensee must keep records of all non-compliances with this licence. These records must be adequate to enable the licensee to comply with the non-compliance notification conditions of this licence.
- 44 The licensee must notify the NT EPA of any non-compliance with this licence by completing the Non-Compliance Notification via NT EPA Online (or by emailing waste@nt.gov.au), as soon as practicable after (and in any case within 24 hours after) first becoming aware of the non-compliance.
- 45 The licensee must include in the notification of non-compliance the following information:
- 45.1 when the non-compliance was detected and by whom;
 - 45.2 the date and time of the non-compliance;
 - 45.3 the actual and potential causes and contributing factors to the non-compliance;
 - 45.4 the risk of environmental harm arising from the non-compliance;
 - 45.5 the action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance;
 - 45.6 corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur;
 - 45.7 if no action was taken, why no action was taken; and
 - 45.8 a date when an incident investigation report will be submitted to the NT EPA.
- 46 A non-compliance with this licence includes:
- 46.1 an exceedance of a trigger value specified in Attachment 1 on three consecutive sampling occasions; or
 - 46.2 an exceedance of a trigger value specified in Attachment 1 on a single occasion where the parameter measures greater than or equal to three times or more the trigger value.

ENVIRONMENT PROTECTION LICENCE 218 - 02

- 47 The licensee must keep records of all exceedances of trigger values specified in Attachment 1. These records must be adequate to enable the licensee to comply with the exceedance notification conditions of this licence.
- 48 The licensee must submit a completed Annual Return form to waste@nt.gov.au within 10 business days after each anniversary date of this licence, which relates to the preceding 12 month period.
- 49 The licensee must complete and provide to the NT EPA a Monitoring Report, as prescribed by this licence, within 10 business days after each anniversary date of this licence.
- 50 The licensee must ensure that each Monitoring Report:
- 50.1 is prepared in accordance with the requirements of the NT EPA 'Guideline for Reporting on Environmental Monitoring';
 - 50.2 includes a tabulation of all monitoring data required as a condition of this licence and any additional data used as part of the analysis and interpretation undertaken in the report, to be submitted in electronic Microsoft® Excel® format;
 - 50.3 includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the activity over a minimum period of three years (where the data is available). Data used in this analysis must be provided electronically in Microsoft® Excel® format; and
 - 50.4 includes an assessment of environmental impact from the activity.
- 51 The NT EPA may require the licensee to revise or amend and resubmit any Monitoring Report. Where the NT EPA requires the Monitoring Report to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.

END OF LICENCE CONDITIONS

This licence is not valid unless signed below:



Peter Vasel
Director Environmental Operations
Delegate of the Northern Territory
Environment Protection Authority
Dated: 23/08/2022

ENVIRONMENT PROTECTION LICENCE 218 - 02

DEFINITIONS

All terms in the Licence which are defined in the *Waste Management and Pollution Control Act* have the meaning given in that Act unless otherwise or further defined in this section.

DEFINITION	In this licence, unless a contrary intention appears:
24 hour emergency contact	the phone number of a person who can be contacted at any time and be capable of responding to and providing information about any incident associated with the activity.
Activity	the Scheduled activity as described on the covering page of this licence.
Air	includes any layer of the atmosphere.
Annual fee	yearly fee payable in respect of the activity as specified in the WMPC Act and the Regulations.
Annual Return	an NT EPA prescribed format for demonstrating and reporting compliance with the conditions of this licence and providing information on waste volumes for the preceding 12 month period.
ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, 2000: National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting.
Asbestos containing material	any material that contains asbestos.
Business days	a day not Saturday, Sunday or a public holiday, in the Northern Territory.
Community feedback number	a telephone number enabling members of the public to contact, at any time, a person or voice mail system that can accept, on behalf of the licensee, enquiries or complaints about the activity, and to which the licensee must respond.
Complaint Log	a register of complaints to be maintained by the Licensee that records the details of each complaint received in relation to the activity.
Consultation and Communication Plan	a written plan documenting proposed consultation and communications for the activity before, during and after the activity which includes a strategy for communicating with members of the public who are likely to have a real interest in, or be affected by, the activity.
Contact details	includes the 24 hour emergency contact, and name, position title and phone number of a representative of the licensee who can be contacted about the licence and activity.
Contaminant	a solid, liquid or gas or any combination of such substances and includes: (a) noise, odour, heat and electromagnetic radiation; (b) a prescribed substance or prescribed class of substances; and (c) a substance having a prescribed property or prescribed class of properties.
Discharges	allow a liquid, gas or other substance to flow out from where it has been confined.
Disposal schedule	a plan for disposing of asbestos containing material such that asbestos containing material is not stored in perpetuity.

ENVIRONMENT PROTECTION LICENCE 218 - 02

Emergency Response Plan	a written plan documenting the licensee's procedures for responding to emergencies caused by, resulting from or associated with the activity and that may cause environmental harm.
Environmental audit	has the meaning given in section 47 of the WMPC Act.
Environmental harm	(a) any harm to or adverse effect on the environment; or (b) any potential harm (including the risk of harm and future harm) to or potential adverse effect on the environment, of any degree or duration and includes environmental nuisance.
Environmental nuisance	means: (a) an adverse effect on the amenity of an area that: (i) is caused by noise, smoke, dust, fumes or odour; and (ii) unreasonably interferes with or is likely to unreasonably interfere with the enjoyment of the area by persons who occupy a place within the area or are otherwise lawfully in the area; or (b) an unsightly or offensive condition caused by contaminants or waste.
Incident	includes: (a) an accident, emergency or malfunction; and (b) a deliberate action, whether or not that action was taken by the person conducting the activity in the course of which the incident occurred.
Land	includes water and air on, above or under land.
Landfill cell	a purpose built area for the disposal of waste within a landfill.
Landfill Closure and Post Closure Plan	a written plan which specifies the landfill closure and post-closure activities as set out in the NT EPA Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites in the Northern Territory.
Leachate	any liquid produced by the action of water percolating through waste, and that contains contaminants.
Listed waste	a waste included under Schedule 2 of the Regulations.
Litter	litter, garbage, rubbish, refuse or waste matter, and includes the body of a dead animal.
Maintain	kept in a manner that it does not present or cause a risk of environmental harm or a hazard to persons or property or, for the purposes of documents including plans, a process of reviewing and amending documentation to ensure it is relevant.
Material environmental harm	environmental harm that: (a) is not trivial or negligible in nature; (b) consists of an environmental nuisance of a high impact or on a wide scale; (c) results, or is likely to result, in not more than \$50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment; or (d) results in actual or potential loss or damage to the value of not more than \$50,000 or the prescribed amount (whichever is greater).
Monitoring Plan	the monitoring programs required by conditions 30 and 31.
NATA	National Association of Testing Authorities, Australia.
Non-compliance	failure or refusal to comply, whether by act or omission, with obligations or requirements and includes any exceedance of a licence limit.

ENVIRONMENT PROTECTION LICENCE 218 - 02

Non-compliance notification	an NT EPA prescribed format for notifying the NT EPA of a non-compliance.
NT EPA Online	online system for Environment Protection Licence (EPL), Environment Protection Approval (EPA) and Waste Discharge Licence (WDL) lodgement and maintenance.
NT EPA Online Vehicle Register	the vehicle register found at NT EPA Online.
Plant and equipment	all material items used in association with the activity, including (but not limited to) storage vessels and containers, pipe work and hosing, vehicles (including vessels), tools, and measuring equipment.
Point source discharge	means any discernible, confined or discrete conveyance from which contaminants or waste are or may be discharged.
Pollute	(a) emit, discharge, deposit, or disturb, directly or indirectly, a contaminant or waste; or (b) cause, permit, or fail to prevent, directly or indirectly, the emission, discharge, deposition, disturbance or escape of a contaminant or waste.
Pollution	(a) a contaminant or waste that is emitted, discharged, deposited or disturbed or that escapes; or (b) a contaminant or waste, effect or phenomenon, that is present in the environment as a consequence of an emission, discharge, deposition, escape or disturbance or a contaminant or waste.
Premises	the premises identified in this licence which includes equipment, plant and structures, whether stationary or portable, and the land on which premises are situated.
Public entrance	access to the premises that is utilised by the public.
Putrescible waste	the component of the waste stream liable to become putrid. For example, organic matter that has the potential to decompose with the formation of malodorous substances, usually refers to vegetative, food and animal products.
Qualified person	a person registered under Section 68 of the WMPC Act.
Qualified sampler	a person who has training and experience in obtaining samples from the relevant environmental medium.
Regulations	<i>Waste Management and Pollution Control (Administration) Regulations.</i>
Rehabilitation Plan	a written plan to ensure that the objectives of rehabilitation are achieved as set out in the NT EPA Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites in the Northern Territory.
Serious environmental harm	environmental harm that is more serious than material environmental harm and includes environmental harm that: (a) is irreversible or otherwise of a high impact or on a wide scale; (b) damages an aspect of the environment that is of a high conservation value, high cultural value or high community value or is of special significance; (c) results or is likely to result in more than \$50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment; or (d) results in actual or potential loss or damage to the value of more than \$50,000 or the prescribed amount (whichever is greater).

ENVIRONMENT PROTECTION LICENCE 218 - 02

Solid inert waste	solid waste that has no active chemical or biological properties. These wastes do not undergo environmentally significant physical, chemical or biological transformation.
Stormwater	water flowing over ground surfaces, in natural streams and drains as a direct result of rainfall over a catchment and consists primarily of rainfall runoff.
Trigger values	assigned value for each indicator used to assess the risk to an environmental value, a value that initiates some type of pre-defined management action.
Waste	(a) a solid, a liquid or a gas; or (b) a mixture of such substances, that is or are left over, surplus or an unwanted by-product from any activity (whether or not the substance is of value) and includes a prescribed substance or class of substances.
Waste transport certificate	the NT EPA waste tracking documentation used to track listed waste being transported interstate as required in accordance with the National Environment Protection (Movement of Controlled Waste Between States and Territories) Measure.
Wastewater	water that contains a contaminant or waste.
Water	includes: (a) surface water, ground water and tidal waters; (b) coastal waters of the Territory, within the meaning of the <i>Coastal Waters (Northern Territory Powers) Act 1980</i> of the Commonwealth; and (c) water containing an impurity.
WMPC Act	the Northern Territory <i>Waste Management and Pollution Control Act</i> .

Appendix C

Analytical Tables



Appendix C
Table 1
Soil Results - Human Health Criteria

	Metals									BTEXN						
	Arsenic	Cadmium	Chromium (II+VI)	Copper	Iron	Lead	Mercury	Nickel	Zinc	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc
EQL	mg/kg 5	mg/kg 1	mg/kg 2	mg/kg 5	mg/kg 50	mg/kg 5	mg/kg 0.1	mg/kg 2	mg/kg 5	mg/kg 0.2	mg/kg 0.5	mg/kg 0.5	mg/kg 0.5	mg/kg 0.5	mg/kg 0.5	mg/kg 0.2
NEPM 2013 Table 1A(1) HIL D Comm/Ind																
NEPM 2013 Table 1A(1) HIL D Comm/Ind	3,000 ^{#1}	900	3,600 ^{#2}	240,000		1,500 ^{#3}	730 ^{#4}	6,000	400,000							
NEPM 2013 Table 1A(3) HSL D Comm/Ind Soil for Vapour Intrusion, Sand >=0m, <1m										3	NL#6	NL#6			230	
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil																

Location Code	Date	Field ID	Lab Report Number	Depth															
BH01	27 Jul 2023	BH01 0.1-0.2	ES2325116	0.1 - 0.2	23	<1	61	8	-	28	<0.1	8	63	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2
BH02	27 Jul 2023	BH02 0.1-0.2	ES2325116	0.1 - 0.2	10	<1	51	8	-	32	<0.1	10	32	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2
BH03	27 Jul 2023	BH03 0.1-0.2	ES2325116	0.1 - 0.2	25	<1	135	19	67,700	19	<0.1	5	22	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2
BH04	27 Jul 2023	BH04 0.1-0.2	ES2325116	0.1 - 0.2	17	<1	52	12	-	32	<0.1	4	33	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2
BH05	27 Jul 2023	BH05 0.1-0.2	ES2325116	0.1 - 0.2	8	<1	100	11	-	18	<0.1	9	20	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2
		BH05 0.4-0.5	ES2325116	0.4 - 0.5	10	<1	134	<5	-	9	<0.1	4	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2
		BH06 0.1-0.2	ES2325116	0.1 - 0.2	17	<1	67	9	-	42	<0.1	4	39	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2
BH06	27 Jul 2023	BH06_0.4-0.5	ES2325116	0.4 - 0.5	16	<1	77	6	-	11	<0.1	5	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2

Statistics																			
Number of Results	8	8	8	8	1	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Number of Detects	8	0	8	7	1	8	0	8	6	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	8	<1	51	<5	67,700	9	<0.1	4	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2
Minimum Detect	8	ND	51	6	67,700	9	ND	4	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	25	<1	135	19	67,700	42	<0.1	10	63	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2
Maximum Detect	25	ND	135	19	67,700	42	ND	10	63	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	16	0.5	85	9.4		24	0.05	6.1	27	0.1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1	0.1
Geometric Average *	15	0.5	79	8.3	67,700	21	0.05	5.7	17	0.1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1	0.1
Median Concentration *	16.5	0.5	72	8.5	67,700	23.5	0.05	5	27	0.1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1	0.1
Standard Deviation *	6.2	0	35	4.9		11	0	2.5	20	0	0	0	0	0	0	0	0	0	0
Geometric Standard Deviation *	1.5	1	1.5	1.8		1.7	1	1.5	3.4	1	1	1	1	1	1	1	1	1	1
95% UCL (Student's-t) *	19.89	0.5	107.7	12.69		31.57	0.05	7.783	40.09	0.1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1	0.1
% of Detects	100	0	100	88	100	100	0	100	75	0	0	0	0	0	0	0	0	0	0
% of Non-Detects	0	100	0	12	0	0	100	0	25	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.

Comments

- #1 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropriate (refer Schedule B7).
- #2 In the absence of a guideline value for total chromium, chromium VI value adopted
- #3 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specific bioavailability should be considered where appropriate.
- #4 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is present, or suspected to be present.
- #5 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposure to all PCBs (inc dioxin like PCBs) should be undertaken
- #6 Not limiting: Derived soil HSL exceeds soil saturation concentration
- #7 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
- #8 Separate management limits for BTEX & naphthalene are not available hence should not be subtracted from the relevant fractions to obtain F1 & F2



Appendix C
Table 1
Soil Results - Human Health Criteria

EQL	TRH - NEPM 2013							TRH - NEPM 1999					PCBs	
	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	PCBs (Total)	
	mg/kg 10	mg/kg 10	mg/kg 50	mg/kg 50	mg/kg 100	mg/kg 100	mg/kg 50	mg/kg 10	mg/kg 50	mg/kg 100	mg/kg 100	mg/kg 50	µg/kg 100	
NEPM 2013 Table 1A(1) HIL D Comm/Ind														
NEPM 2013 Table 1A(1) HIL D Comm/Ind													7,000 ^{#5}	
NEPM 2013 Table 1A(3) HSL D Comm/Ind Soil for Vapour Intrusion, Sand >=0m, <1m	260 ^{#7}		NL#6											
NEPM 2013 Table 1B(7) Management Limits Comm / Ind, Coarse Soil		700 ^{#8}		1,000 ^{#8}	3,500	10,000								

Location Code	Date	Field ID	Lab Report Number	Depth													
BH01	27 Jul 2023	BH01_0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<100
BH02	27 Jul 2023	BH02_0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<100
BH03	27 Jul 2023	BH03_0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<100
BH04	27 Jul 2023	BH04_0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<100
BH05	27 Jul 2023	BH05_0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<100
		BH05_0.4-0.5	ES2325116	0.4 - 0.5	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<100
BH06	27 Jul 2023	BH06_0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<100
		BH06_0.4-0.5	ES2325116	0.4 - 0.5	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<100

Statistics																	
Number of Results	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<10	<50	<100	<100	<50
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<10	<10	<50	<50	<100	<100	<50	<10	<50	<100	<100	<50	<10	<50	<100	<100	<50
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	5	5	25	25	50	50	25	5	25	50	50	25	5	25	50	50	25
Geometric Average *	5	5	25	25	50	50	25	5	25	50	50	25	5	25	50	50	25
Median Concentration *	5	5	25	25	50	50	25	5	25	50	50	25	5	25	50	50	25
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geometric Standard Deviation *	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
95% UCL (Student's-t) *	5	5	25	25	50	50	25	5	25	50	50	25	5	25	50	50	25
% of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Non-Detects	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.

Comments

#1 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered

#2 In the absence of a guideline value for total chromium, chromium VI value adopted

#3 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability consi

#4 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elem

#5 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific ass

#6 Not limiting: Derived soil HSL exceeds soil saturation concentration

#7 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

#8 Separate management limits for BTEX & naphthalene are not available hence should not be subtracted from the relev



Appendix C
Table 2
Soil Results - Ecological Criteria

	Metals									BTEXN						
	Arsenic	Cadmium	Chromium (III+VI)	Copper	Iron	Lead	Mercury	Nickel	Zinc	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	5	1	2	5	50	5	0.1	2	5	0.2	0.5	0.5	0.5	0.5	0.5	0.2
NEPM 2013 EIL-Commercial/Industrial	160		310 ^{#1}	85 ^{#2}		1,800		55 ^{#3}	110 ^{#4}	95	135	185			95	
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Fine Soil																

Location Code	Date	Field ID	Lab Report Number	Depth																
BH01	27 Jul 2023	BH01 0.1-0.2	ES2325116	0.1 - 0.2	23	<1	61	8	-	28	<0.1	8	63	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
BH02	27 Jul 2023	BH02 0.1-0.2	ES2325116	0.1 - 0.2	10	<1	51	8	-	32	<0.1	10	32	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
BH03	27 Jul 2023	BH03 0.1-0.2	ES2325116	0.1 - 0.2	25	<1	135	19	67,700	19	<0.1	5	22	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
BH04	27 Jul 2023	BH04 0.1-0.2	ES2325116	0.1 - 0.2	17	<1	52	12	-	32	<0.1	4	33	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
BH05	27 Jul 2023	BH05 0.1-0.2	ES2325116	0.1 - 0.2	8	<1	100	11	-	18	<0.1	9	20	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
		BH05 0.4-0.5	ES2325116	0.4 - 0.5	10	<1	134	<5	-	9	<0.1	4	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
BH06	27 Jul 2023	BH06 0.1-0.2	ES2325116	0.1 - 0.2	17	<1	67	9	-	42	<0.1	4	39	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
		BH06 0.4-0.5	ES2325116	0.4 - 0.5	16	<1	77	6	-	11	<0.1	5	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2

Statistics																			
Number of Results	8	8	8	8	1	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Number of Detects	8	0	8	7	1	8	0	8	6	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	8	<1	51	<5	67,700	9	<0.1	4	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Minimum Detect	8	ND	51	6	67,700	9	ND	4	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	25	<1	135	19	67,700	42	<0.1	10	63	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2
Maximum Detect	25	ND	135	19	67,700	42	ND	10	63	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	16	0.5	85	9.4		24	0.05	6.1	27	0.1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1
Geometric Average *	15	0.5	79	8.3	67,700	21	0.05	5.7	17	0.1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1
Median Concentration *	16.5	0.5	72	8.5	67,700	23.5	0.05	5	27	0.1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1
Standard Deviation *	6.2	0	35	4.9		11	0	2.5	20	0	0	0	0	0	0	0	0	0	0
Geometric Standard Deviation *	1.5	1	1.5	1.8		1.7	1	1.5	3.4	1	1	1	1	1	1	1	1	1	1
95% UCL (Student's-t) *	19.89	0.5	107.7	12.69		31.57	0.05	7.783	40.09	0.1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1
% of Detects	100	0	100	88	100	100	0	100	75	0	0	0	0	0	0	0	0	0	0
% of Non-Detects	0	100	0	12	0	0	100	0	25	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.

Comments

- #1 Generic - based on 1% clay content
#2 Generic - based on pH 4.5
#3 Generic - based on CEC = 5 cmol/kg
#4 Generic - based on CEC = 5 cmol/kg and pH 4.0
#5 Moderate reliability. To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
#6 Errata 30 April 2014 - Naphthalene should not be subtracted from >C10-C16 (as there is no separate ESL for naphthalene)



Appendix C
Table 2
Soil Results - Ecological Criteria

TRH - NEPM 2013						
F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
10	10	50	50	100	100	50
EQL						
NEPM 2013 EIL-Commercial/Industrial						
NEPM 2013 Table 1B(6) ESLs for Comm/Ind, Fine Soil						
215 ^{#5}			170 ^{#6}	2,500	6,600	

Location Code	Date	Field ID	Lab Report Number	Depth							
BH01	27 Jul 2023	BH01 0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50
BH02	27 Jul 2023	BH02 0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50
BH03	27 Jul 2023	BH03 0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50
BH04	27 Jul 2023	BH04 0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50
BH05	27 Jul 2023	BH05 0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50
		BH05 0.4-0.5	ES2325116	0.4 - 0.5	<10	<10	<50	<50	<100	<100	<50
BH06	27 Jul 2023	BH06 0.1-0.2	ES2325116	0.1 - 0.2	<10	<10	<50	<50	<100	<100	<50
		BH06 0.4-0.5	ES2325116	0.4 - 0.5	<10	<10	<50	<50	<100	<100	<50

Statistics							
Number of Results	8	8	8	8	8	8	8
Number of Detects	0	0	0	0	0	0	0
Minimum Concentration	<10	<10	<50	<50	<100	<100	<50
Minimum Detect	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<10	<10	<50	<50	<100	<100	<50
Maximum Detect	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	5	5	25	25	50	50	25
Geometric Average *	5	5	25	25	50	50	25
Median Concentration *	5	5	25	25	50	50	25
Standard Deviation *	0	0	0	0	0	0	0
Geometric Standard Deviation *	1	1	1	1	1	1	1
95% UCL (Student's-t) *	5	5	25	25	50	50	25
% of Detects	0	0	0	0	0	0	0
% of Non-Detects	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.

- Comments
- #1 Generic - based on 1% clay content
 - #2 Generic - based on pH 4.5
 - #3 Generic - based on CEC = 5 cmol/kg
 - #4 Generic - based on CEC = 5 cmol/kg and pH 4.0
 - #5 Moderate reliability. To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.
 - #6 Errata 30 April 2014 - Naphthalene should not be subtracted from >C10-C16 (as there is no separate ESL for naphthal)



Appendix C
Table 3
Soil Results - PFAS

EQL	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluorotetradecanoic acid (PFTeDA)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005
PFAS NEMP 2.0 2020 Ecological direct exposure					1						10						
PFAS NEMP 2.0 2020 Ecological indirect exposure					0.01												
PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)			20		20						50						

Location Code	Date	Field ID	Lab Report Number	Depth																	
BH01	27 Jul 2023	BH01 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0002	<0.0002	<0.0002	0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	
BH02	27 Jul 2023	BH02 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	
BH03	27 Jul 2023	BH03 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	
BH04	27 Jul 2023	BH04 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	
BH05	27 Jul 2023	BH05 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	
		BH05 0.4-0.5	ES2325116	0.4 - 0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	
BH06	27 Jul 2023	BH06 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	
		BH06 0.4-0.5	ES2325116	0.4 - 0.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	

Statistics																				
Number of Results	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Number of Detects	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005
Minimum Detect	ND	ND	ND	ND	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.0002	<0.0002	<0.0002	<0.0002	0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005
Maximum Detect	ND	ND	ND	ND	0.0005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.0001	0.0001	0.0001	0.0001	0.00021	0.0001	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00025
Geometric Average *	0.0001	0.0001	0.0001	0.0001	0.00017	0.0001	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00025
Median Concentration *	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00025
Standard Deviation *	0	0	0	0	0.00016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geometric Standard Deviation *	1	1	1	1	2.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
95% UCL (Student's-t) *	0.0001	0.0001	0.0001	0.0001	0.00032249	0.0001	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00025
% of Detects	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Non-Detects	100	100	100	100	62	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological direct exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)



Appendix C
Table 3
Soil Results - PFAS

	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.0002	0.0005	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002
PFAS NEMP 2.0 2020 Ecological direct exposure														
PFAS NEMP 2.0 2020 Ecological indirect exposure														
PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)												20		

Location Code	Date	Field ID	Lab Report Number	Depth													
BH01	27 Jul 2023	BH01 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.0005
BH02	27 Jul 2023	BH02 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0004	0.0004
BH03	27 Jul 2023	BH03 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0003	0.0003
BH04	27 Jul 2023	BH04 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
BH05	27 Jul 2023	BH05 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
		BH05 0.4-0.5	ES2325116	0.4 - 0.5	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
BH06	27 Jul 2023	BH06 0.1-0.2	ES2325116	0.1 - 0.2	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
		BH06 0.4-0.5	ES2325116	0.4 - 0.5	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002

Statistics																	
Number of Results					8	8	8	8	8	8	8	8	8	8	8	8	8
Number of Detects					0	0	0	0	0	0	0	0	0	0	3	3	3
Minimum Concentration					<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0003	0.0003	0.0003
Maximum Concentration					<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	0.0005	0.0005	0.0005
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0005	0.0005	0.0005
Average Concentration *					0.0001	0.00025	0.00025	0.0001	0.00025	0.00025	0.0001	0.00025	0.00025	0.00025	0.00021	0.00021	0.00021
Geometric Average *					0.0001	0.00025	0.00025	0.0001	0.00025	0.00025	0.0001	0.00025	0.00025	0.00025	0.00017	0.00017	0.00017
Median Concentration *					0.0001	0.00025	0.00025	0.0001	0.00025	0.00025	0.0001	0.00025	0.00025	0.00025	0.0001	0.0001	0.0001
Standard Deviation *					0	0	0	0	0	0	0	0	0	0	0.00016	0.00016	0.00016
Geometric Standard Deviation *					1	1	1	1	1	1	1	1	1	1	2.1	2.1	2.1
95% UCL (Student's-t) *					0.0001	0.00025	0.00025	0.0001	0.00025	0.00025	0.0001	0.00025	0.00025	0.00025	0.00032249	0.00032249	0.00032249
% of Detects					0	0	0	0	0	0	0	0	0	0	38	38	38
% of Non-Detects					100	100	100	100	100	100	100	100	100	100	62	62	62

* A Non Detect Multiplier of 0.5 has been applied.

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological direct exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)



Appendix C
Table 4
Soil Results - ASLP

	Leach Preparation	Metals								PFAS - Perfluoroalkyl Sulfonic Acids					
	pH (Final)	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecanesulfonic acid (PFDS)
EQL	pH units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
	0.1	0.001	0.0001	0.001	0.001	0.001	0.0001	0.001	0.005	0.02	0.02	0.01	0.02	0.01	0.02
ANZG (2018) - Marine water (leached) - 95% level of species protection			0.0055 ^{#1}	0.0044 ^{#2}	0.0013	0.0044	0.0004	0.07	0.015						
ANZG (2018) - Marine water (leached) - 99% level of species protection			0.0007	0.00014 ^{#2}	0.0003	0.0022	0.0001	0.007	0.007						

Location Code	Date	Field ID	Lab Report Number	Depth												
BH01	27 Jul 2023	BH01 0.1-0.2	ES2327573	0.1 - 0.2	6.0	0.009	0.0001	0.082	0.014	0.040	<0.0001	0.019	0.130	<0.02	<0.02	<0.01
BH02	27 Jul 2023	BH02 0.1-0.2	ES2327573	0.1 - 0.2	5.3	0.006	<0.0001	0.048	0.006	0.025	<0.0001	0.016	0.043	<0.02	<0.02	<0.01
BH03	27 Jul 2023	BH03 0.1-0.2	ES2327573	0.1 - 0.2	5.8	0.006	<0.0001	0.040	0.032	0.015	<0.0001	0.012	0.026	<0.02	<0.02	<0.01
BH06	27 Jul 2023	BH06 0.1-0.2	ES2327573	0.1 - 0.2	5.0	0.009	<0.0001	0.036	0.010	0.038	<0.0001	0.010	0.081	-	-	-

Statistics																
Number of Results			4	4	4	4	4	4	4	4	4	4	3	3	3	3
Number of Detects			4	4	1	4	4	4	0	4	4	4	0	0	0	0
Minimum Concentration			5	0.006	0.0001	0.036	0.006	0.015	<0.0001	0.01	0.026	<0.02	<0.02	<0.01	<0.02	<0.01
Minimum Detect			5	0.006	0.0001	0.036	0.006	0.015	ND	0.01	0.026	ND	ND	ND	ND	ND
Maximum Concentration			6	0.009	0.0001	0.082	0.032	0.04	<0.0001	0.019	0.13	<0.02	<0.02	<0.01	<0.02	<0.01
Maximum Detect			6	0.009	0.0001	0.082	0.032	0.04	ND	0.019	0.13	ND	ND	ND	ND	ND
Average Concentration *			5.5	0.0075	0.000062	0.052	0.016	0.03	0.00005	0.014	0.07	0.01	0.01	0.005	0.01	0.005
Geometric Average *			5.5	0.0073	0.000059	0.049	0.013	0.027	0.00005	0.014	0.059	0.01	0.01	0.005	0.01	0.005
Median Concentration *			5.55	0.0075	0.00005	0.044	0.012	0.0315	0.00005	0.014	0.062	0.01	0.01	0.005	0.01	0.005
Standard Deviation *			0.46	0.0017	0.000025	0.021	0.011	0.012	0	0.004	0.046	0	0	0	0	0
Geometric Standard Deviation *			1.1	1.3	1.4	1.4	2	1.6	1	1.3	2	1	1	1	1	1
95% UCL (Student's-t) *			6.063	0.00954	0.000091917	0.0761	0.029	0.0433	0.00005	0.019	0.124	0.01	0.01	0.005	0.01	0.005
% of Detects			100	100	25	100	100	100	0	100	100	0	0	0	0	0
% of Non-Detects			0	0	75	0	0	0	100	0	0	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.

Comments

#1 DGV may not protect key test species from chronic toxicity (this refers to experimental chronic values or geometric mean for species). Check toxicant DGV technical brief for spread of data and its significance.
#2 In absence of total Cr guideline, Cr (VI) guideline has been adopted.

Environmental Standards

Department of Agriculture and Water Resources, August 2018, ANZG (2018) - Marine water (leached) - 95% level of species protection
Department of Agriculture and Water Resources, August 2018, ANZG (2018) - Marine water (leached) - 99% level of species protection



Appendix C
Table 4
Soil Results - ASLP

	PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Perfluoroalkyl Sulfonamide							
	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
EQL	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.05	0.02	
ANZG (2018) - Marine water (leached) - 95% level of species protection																			
ANZG (2018) - Marine water (leached) - 99% level of species protection																			

Location Code	Date	Field ID	Lab Report Number	Depth																			
BH01	27 Jul 2023	BH01 0.1-0.2	ES2327573	0.1 - 0.2	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
BH02	27 Jul 2023	BH02 0.1-0.2	ES2327573	0.1 - 0.2	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
BH03	27 Jul 2023	BH03 0.1-0.2	ES2327573	0.1 - 0.2	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
BH06	27 Jul 2023	BH06 0.1-0.2	ES2327573	0.1 - 0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistics																					
Number of Results	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.05	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.025	0.01	0.025	0.025	0.01	0.025	0.025	0.01
Geometric Average *	0.05	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.025	0.01	0.025	0.025	0.01	0.025	0.025	0.01
Median Concentration *	0.05	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.025	0.01	0.025	0.025	0.01	0.025	0.025	0.01
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geometric Standard Deviation *	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
95% UCL (Student's-t) *	0.05	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.025	0.01	0.025	0.025	0.01	0.025	0.025	0.01
% of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Non-Detects	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.

Comments

- #1 DGV may not protect key test species from chronic toxicity (this refers to experimental chronic values or geometric n
- #2 In absence of total Cr guideline, Cr (VI) guideline has been adopted.

Environmental Standards

Department of Agriculture and Water Resources, August 2018, ANZG (2018) - Marine water (leached) - 95% level of spec

Department of Agriculture and Water Resources, August 2018, ANZG (2018) - Marine water (leached) - 99% level of spec



Appendix C
Table 4
Soil Results - ASLP

					PFAS - Fluorotelomer Sulfonic Acids				PFAS - Sums		
					4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.05	0.05	0.05	0.05	0.01	0.01	0.01
ANZG (2018) - Marine water (leached) - 95% level of species protection											
ANZG (2018) - Marine water (leached) - 99% level of species protection											

Location Code	Date	Field ID	Lab Report Number	Depth							
BH01	27 Jul 2023	BH01 0.1-0.2	ES2327573	0.1 - 0.2	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
BH02	27 Jul 2023	BH02 0.1-0.2	ES2327573	0.1 - 0.2	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
BH03	27 Jul 2023	BH03 0.1-0.2	ES2327573	0.1 - 0.2	<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
BH06	27 Jul 2023	BH06 0.1-0.2	ES2327573	0.1 - 0.2	-	-	-	-	-	-	-

Statistics											
Number of Results					3	3	3	3	3	3	3
Number of Detects					0	0	0	0	0	0	0
Minimum Concentration					<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Minimum Detect					ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<0.05	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01
Maximum Detect					ND	ND	ND	ND	ND	ND	ND
Average Concentration *					0.025	0.025	0.025	0.025	0.005	0.005	0.005
Geometric Average *					0.025	0.025	0.025	0.025	0.005	0.005	0.005
Median Concentration *					0.025	0.025	0.025	0.025	0.005	0.005	0.005
Standard Deviation *					0	0	0	0	0	0	0
Geometric Standard Deviation *					1	1	1	1	1	1	1
95% UCL (Student's-t) *					0.025	0.025	0.025	0.025	0.005	0.005	0.005
% of Detects					0	0	0	0	0	0	0
% of Non-Detects					100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.

Comments

- #1 DGV may not protect key test species from chronic toxicity (this refers to experimental chronic values or geometric n
- #2 In absence of total Cr guideline, Cr (VI) guideline has been adopted.

Environmental Standards

Department of Agriculture and Water Resources, August 2018, ANZG (2018) - Marine water (leached) - 95% level of spec

Department of Agriculture and Water Resources, August 2018, ANZG (2018) - Marine water (leached) - 99% level of spec



Appendix C
Table 5
QAQC - Soil RPDs

Darwin Turf Club
Darwin Turf Club EPL Management
Soil Monitoring Report

Location Code Date Field ID Matrix Type Sample Type			27 Jul 2023		RPD	27 Jul 2023		RPD
			BH06_0.1-0.2	FD_01		BH05_0.1-0.2	FD_02	
			Soil	Soil		Soil	Soil	
			Normal	Field_D		Normal	Field_D	
			Unit	EQL				
Misc.								
Naphthalene (value used in F2 calc)	mg/kg	1	<1	<1	0	<1	<1	0
Inorganics								
Moisture (%)	%	1	8.5	10.8	24	3.6	3.8	5
Metals								
Arsenic	mg/kg	5	17	12	34	8	7	13
Cadmium	mg/kg	1	<1	<1	0	<1	<1	0
Chromium (III+VI)	mg/kg	2	67	60	11	100	57	55
Copper	mg/kg	5	9	6	40	11	14	24
Lead	mg/kg	5	42	23	58	18	22	20
Mercury	mg/kg	0.1	<0.1	<0.1	0	<0.1	<0.1	0
Nickel	mg/kg	2	4	4	0	9	5	57
Zinc	mg/kg	5	39	16	84	20	25	22
BTEXN								
Benzene	mg/kg	0.2	<0.2	<0.2	0	<0.2	<0.2	0
Toluene	mg/kg	0.5	<0.5	<0.5	0	<0.5	<0.5	0
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	0	<0.5	<0.5	0
Xylene (o)	mg/kg	0.5	<0.5	<0.5	0	<0.5	<0.5	0
Xylene (m & p)	mg/kg	0.5	<0.5	<0.5	0	<0.5	<0.5	0
Xylene Total	mg/kg	0.5	<0.5	<0.5	0	<0.5	<0.5	0
BTEX (Sum of Total) - Lab Calc	mg/kg	0.2	<0.2	<0.2	0	<0.2	<0.2	0
TRH - NEPM 2013								
F1 (C6-C10 minus BTEX)	mg/kg	10	<10	<10	0	<10	<10	0
C6-C10 Fraction	mg/kg	10	<10	<10	0	<10	<10	0
F2 (>C10-C16 minus Naphthalene)	mg/kg	50	<50	<50	0	<50	<50	0
>C10-C16 Fraction	mg/kg	50	<50	<50	0	<50	<50	0
F3 (>C16-C34 Fraction)	mg/kg	100	<100	<100	0	<100	<100	0
F4 (>C34-C40 Fraction)	mg/kg	100	<100	<100	0	<100	<100	0
>C10-C40 (Sum of Total)	mg/kg	50	<50	<50	0	<50	<50	0
TRH - NEPM 1999								
C6-C9 Fraction	mg/kg	10	<10	<10	0	<10	<10	0
C10-C14 Fraction	mg/kg	50	<50	<50	0	<50	<50	0
C15-C28 Fraction	mg/kg	100	<100	<100	0	<100	<100	0
C29-C36 Fraction	mg/kg	100	<100	<100	0	<100	<100	0
C10-C36 (Sum of Total)	mg/kg	50	<50	<50	0	<50	<50	0
PCBs								
PCBs (Total)	µg/kg	100	<100	<100	0	<100	<100	0
PFAS - Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
PFAS - Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	mg/kg	0.001	<0.001	<0.001	0	<0.001	<0.001	0
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluorononanoic acid (PFNA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluorotridecanoic acid (PFTTrDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0
PFAS - Perfluoroalkyl Sulfonamide								
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
PFAS - Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0
6:2 Fluorotelomer Sulfonate (6:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0
PFAS - Sums								
Sum of PFHxS and PFOS	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
PFAS (Sum of Total)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0
PFAS (Sum of Total)(WA DER List)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 30 (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Appendix D

Field Documentation

Sample ID	Sample Depth (mbgl)	Sample Description
		- Soil Description [Soil Type; Particle Size; Colour; Secondary / Minor Components] - Moisture / Consistency. - Comments / Contaminant Indicators. - List collection of any QA samples
BH01_A	0.0-0.2	Clayey SAND, fine grain, brown with gravel. Dry, loose. Organic matter (grass) present in the top 10 cm No visual or olfactory indicators of contamination
BH01_B	0.4-0.5	Could not sample - refusal at 0.2 mbgl
BH02_A	0.0-0.2	Clayey SAND, fine grain, light brown, with gravel. Dry loose. Organic matter (dead grass and roots) present in the top 10cm No visual or olfactory indicators of contamination Small adjustment to the initial sampling location was made as the surface was too hard to sample. Service locator identified coffee rock in this area.
BH02_B	0.4-0.5	Could not sample – refusal at 0.2 mbgl
BH03_A	0.0-0.2	Sandy CLAY, fine grain, brown, with gravel. Dry, loose. Organic matter (grass and roots) present in the top 10-15 cm No visual or olfactory indicators of contamination QA Collected RN_01 Soil bag taken here
BH03_B	0.4-0.5	Not sampled – refusal at 0.2 mbgl
BH04_A	0.0-0.2	Clayey SAND, fine grain, light brown, with gravel. Dry, loose. Organic matter present in the top 10cm No visual or olfactory indicators of contamination
BH04_B	0.4-0.5	Could not sample – refusal at 0.2 mbgl
BH05_A	0.0-0.2	Sandy CLAY, fine grain, light brown, with gravel. Dry loose, No visual or olfactory indicators of contamination QA Collected FD_02 and FS_02
BH05_B	0.4-0.5	Sandy CLAY, fine grain, orange-brown, with gravel. Dry, loose. No visual or olfactory indicators of contamination
BH06_A	0.0-0.2	Sandy CLAY, fine grain, brown, with gravel. Dry, loose. No visual or olfactory indicators of contamination QA Collected FD_01 and FS_01

BH06_B	0.4-0.5	As BH06_A
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Appendix E

Laboratory Reports



CHAIN OF
CUSTODY

ALS Laboratory
Phone 06 939 3939

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENTS:		☐ Standard (TAT list due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE: Level 7, 24 Mitchell St	(Standard TAT may be longer for some tests e.g., Ultra Trace)		☐ Non Standard or urgent TAT (List due date):		Custody Seal intact?	
PROJECT: 12616429	ALS QUOTE NO.: ES23GHDSE0005	COC SEQUENCE NUMBER (Circle)		Free Ice frozen ice bricks present upon receipt?		Yes No N/A
ORDER NUMBER: 12616429	PROJECT MANAGER: Jo Lavers		COC: 1 2 3 4 5 6 7		Random Sample Temperature on Receipt:	
SAMPLER: Kieran Guring	CONTACT PH: +61 457 472 439	SAMPLER MOBILE: 0431311229	OF: 1 2 3 4 5 6 7		Other comment:	
COC emailed to ALS? YES	EDD FORMAT (or default):	RELINQUISHED BY: Kieran G	RECEIVED BY: [Signature]		DATE/TIME: 31/1/23 14:25	
Email Reports to (will default to PM if no other addresses are listed): jo.lavers@ghd.com, messiah.als@ghd.com, ghdlabreport@ghd.com	DATE/TIME: 27/1/23	DATE/TIME:	DATE/TIME:		DATE/TIME:	
Email invoice to (will default to PM if no other addresses are listed): jo.lavers@ghd.com, messiah.als@ghd.com, accounts payable@ghd.com	All metals containers were field filtered					
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:						

SAMPLE DETAILS			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB: Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (acid filtered bottle required).					Additional Information										
ALS USE	MTRK: SOLID (S) WATER (W)																			
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (below)	(refer to codes)	TOTAL CONTAINERS	EP231X (solids) PFAS - Full Suite (28 analytes)	S-05 - TRH/BTEXN/8 Metals - As, Cd, Cr, Cu, Ni, Pb, Zn, Hg	EP066 (solids) - Polychlorinated Biphenyls by GCMS	P-22 (WA/SYD) - NEPM Screen for Soil Classification WA - includes Fe, CEC, pH(CaCl ₂), TQC, Clay Content + pH(1.5), EC(1.5)	Subcon / Forward Lab / Split WO Lab / Analysis: <i>ALS Newcastle</i>	Organised By / Date:	Relinquished By / Date:	Connote / Courier: <i>CC</i>	WO No: <i>ES2325116</i>	Attached By: <i>HO / Internal Sheet</i>				
							X	X	X											
1	BH01_0.1-0.2	27/1/23 12:54	Soil	Ice			X	X	X											Not Sampled.
2	BH01_0.4-0.5		Soil	Ice			X	X	X											
	BH02_0.1-0.2	27/1/23 12:05	Soil	Ice			X	X	X											Not Sampled.
	BH02_0.4-0.5	27/1/23	Soil	Ice			X	X	X											
3	BH03_0.1-0.2	27/1/23 13:20	Soil	Ice			X	X	X	X										Not Sampled.
	BH03_0.4-0.5		Soil	Ice			X	X	X											Not Sampled.
5	BH04_0.1-0.2	27/1/23 12:58	Soil	Ice			X	X	X	X										Not Sampled.
	BH04_0.4-0.5		Soil	Ice			X	X	X	X										Not Sampled.
6	BH05_0.1-0.2	27/1/23 11:35	Soil	Ice			X	X	X	X										Not Sampled.
	BH05_0.4-0.5	27/1/23 11:45	Soil	Ice			X	X	X	X										Not Sampled.
7	BH06_0.1-0.2	27/1/23 11:00	Soil	Ice			X	X	X	X										Not Sampled.
	BH06_0.4-0.5	27/1/23 11:17	Soil	Ice			X	X	X	X										Not Sampled.
TOTAL																				
										Environmental Division Sydney Work Order Reference ES2325116										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide Preserved Plastic; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airtight Unpreserved Plastic

V = VOA Vial (IC) Preserved; VB = VOA Vial Sodium Bisphosphate Preserved; VS = VOA Vial Sulfate Preserved; AV = Airtight Unpreserved Vial; SG = Sulfate Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Specimen bottle; SP = Sulfate Preserved Plastic; F = Fomuldehyde Preserved Glass

Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottle; ST = Sterile Bottle; ASS = Plastic Bag for Acid Soluble Solids; B = Unpreserved Bag



Environmental Division
Sydney
Work Order Reference
ES2325116

Telephone : + 61-2-6784 9655



CERTIFICATE OF ANALYSIS

Work Order : **ES2325116**

Client : **GHD PTY LTD**

Contact : **JO LAVERS**

Address : Level 7 24 Mitchell Street
DARWIN NT, AUSTRALIA 0800

Telephone : ----

Project : 12618429

Order number : 12618429

C-O-C number : ----

Sampler : KIERAN GURUNG

Site : ----

Quote number : ES23GHDSE0005

No. of samples received : 12

No. of samples analysed : 12

Page : 1 of 16

Laboratory : Environmental Division Sydney

Contact : Sarah Mathew

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61-2-8784 8555

Date Samples Received : 31-Jul-2023 12:30

Date Analysis Commenced : 02-Aug-2023

Issue Date : 08-Aug-2023 12:51



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Evie Sidarta	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
John Williams	Lab Technician	Newcastle - Inorganics, Mayfield West, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP231X-SUT: Matrix spike recoveries were biased low or could not be determined due to matrix interferences and dilution.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH01_0.1-0.2	BH02_0.1-0.2	BH03_0.1-0.2	BH04_0.1-0.2	BH05_0.1-0.2
Sampling date / time					27-Jul-2023 12:54	27-Jul-2023 12:00	27-Jul-2023 14:20	27-Jul-2023 12:38	27-Jul-2023 11:35
Compound	CAS Number	LOR	Unit		ES2325116-001	ES2325116-002	ES2325116-003	ES2325116-004	ES2325116-005
					Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract									
pH (CaCl2)	----	0.1	pH Unit		----	----	5.4	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		----	----	6.0	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		----	----	14	----	----
EA055: Moisture Content									
Moisture Content	----	1.0	%		5.3	2.9	3.9	1.6	3.6
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%		----	----	14	----	----
EA152: Soil Particle Density									
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3		----	----	2.46	----	----
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	----	1.1	----	----
Exchangeable Magnesium	----	0.1	meq/100g		----	----	0.6	----	----
Exchangeable Potassium	----	0.1	meq/100g		----	----	<0.1	----	----
Exchangeable Sodium	----	0.1	meq/100g		----	----	<0.1	----	----
Cation Exchange Capacity	----	0.1	meq/100g		----	----	1.8	----	----
EG005(ED093)T: Total Metals by ICP-AES									
Iron	7439-89-6	0.005	%		----	----	6.77	----	----
Arsenic	7440-38-2	5	mg/kg		23	10	25	17	8
Cadmium	7440-43-9	1	mg/kg		<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		61	51	135	52	100
Copper	7440-50-8	5	mg/kg		8	8	19	12	11
Lead	7439-92-1	5	mg/kg		28	32	19	32	18
Nickel	7440-02-0	2	mg/kg		8	10	5	4	9
Zinc	7440-66-6	5	mg/kg		63	32	22	33	20
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EP004: Organic Matter									
Organic Matter	----	0.5	%		----	----	2.1	----	----
Total Organic Carbon	----	0.5	%		----	----	1.2	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH01_0.1-0.2	BH02_0.1-0.2	BH03_0.1-0.2	BH04_0.1-0.2	BH05_0.1-0.2
Sampling date / time					27-Jul-2023 12:54	27-Jul-2023 12:00	27-Jul-2023 14:20	27-Jul-2023 12:38	27-Jul-2023 11:35
Compound	CAS Number	LOR	Unit		ES2325116-001	ES2325116-002	ES2325116-003	ES2325116-004	ES2325116-005
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	-----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	-----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	-----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	-----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	-----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	-----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	-----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	-----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	-----	50	mg/kg		<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	-----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	-----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	-----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0005	0.0004	0.0003	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				BH01_0.1-0.2	BH02_0.1-0.2	BH03_0.1-0.2	BH04_0.1-0.2	BH05_0.1-0.2
Sampling date / time				27-Jul-2023 12:54	27-Jul-2023 12:00	27-Jul-2023 14:20	27-Jul-2023 12:38	27-Jul-2023 11:35
Compound	CAS Number	LOR	Unit	ES2325116-001	ES2325116-002	ES2325116-003	ES2325116-004	ES2325116-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH01_0.1-0.2	BH02_0.1-0.2	BH03_0.1-0.2	BH04_0.1-0.2	BH05_0.1-0.2
Sampling date / time					27-Jul-2023 12:54	27-Jul-2023 12:00	27-Jul-2023 14:20	27-Jul-2023 12:38	27-Jul-2023 11:35
Compound	CAS Number	LOR	Unit		ES2325116-001	ES2325116-002	ES2325116-003	ES2325116-004	ES2325116-005
					Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		0.0005	0.0004	0.0003	<0.0002	<0.0002
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.0005	0.0004	0.0003	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.0005	0.0004	0.0003	<0.0002	<0.0002
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		76.0	76.0	63.7	103	78.2
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		110	109	109	103	104
Toluene-D8	2037-26-5	0.2	%		92.2	102	102	108	97.6
4-Bromofluorobenzene	460-00-4	0.2	%		100	109	102	103	100
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		95.7	108	99.0	101	99.4
13C8-PFOA	----	0.0002	%		92.8	98.2	97.7	102	101



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				BH05_0.4-0.5	BH06_0.1-0.2	BH06_0.4-0.5	FD_01	FD_02
Sampling date / time				27-Jul-2023 11:45	27-Jul-2023 11:00	27-Jul-2023 11:17	27-Jul-2023 11:05	27-Jul-2023 11:40
Compound	CAS Number	LOR	Unit	ES2325116-006	ES2325116-007	ES2325116-008	ES2325116-009	ES2325116-010
				Result	Result	Result	Result	Result
EA055: Moisture Content								
Moisture Content	----	1.0	%	6.7	8.5	10.3	10.8	3.8
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	10	17	16	12	7
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	134	67	77	60	57
Copper	7440-50-8	5	mg/kg	<5	9	6	6	14
Lead	7439-92-1	5	mg/kg	9	42	11	23	22
Nickel	7440-02-0	2	mg/kg	4	4	5	4	5
Zinc	7440-66-6	5	mg/kg	<5	39	<5	16	25
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH05_0.4-0.5	BH06_0.1-0.2	BH06_0.4-0.5	FD_01	FD_02
Sampling date / time				27-Jul-2023 11:45	27-Jul-2023 11:00	27-Jul-2023 11:17	27-Jul-2023 11:05	27-Jul-2023 11:40	
Compound	CAS Number	LOR	Unit	ES2325116-006	ES2325116-007	ES2325116-008	ES2325116-009	ES2325116-010	
				Result	Result	Result	Result	Result	
EP080: BTEXN - Continued									
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1	
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
EP231C: Perfluoroalkyl Sulfonamides									



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				BH05_0.4-0.5	BH06_0.1-0.2	BH06_0.4-0.5	FD_01	FD_02
Sampling date / time				27-Jul-2023 11:45	27-Jul-2023 11:00	27-Jul-2023 11:17	27-Jul-2023 11:05	27-Jul-2023 11:40
Compound	CAS Number	LOR	Unit	ES2325116-006	ES2325116-007	ES2325116-008	ES2325116-009	ES2325116-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	83.8	75.7	73.9	74.4	73.7
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.2	%	94.9	91.5	93.6	95.6	94.1
Toluene-D8	2037-26-5	0.2	%	89.1	90.7	86.1	82.2	94.1



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH05_0.4-0.5	BH06_0.1-0.2	BH06_0.4-0.5	FD_01	FD_02
Sampling date / time					27-Jul-2023 11:45	27-Jul-2023 11:00	27-Jul-2023 11:17	27-Jul-2023 11:05	27-Jul-2023 11:40
Compound	CAS Number	LOR	Unit		ES2325116-006	ES2325116-007	ES2325116-008	ES2325116-009	ES2325116-010
					Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued									
4-Bromofluorobenzene	460-00-4	0.2	%		86.0	88.6	83.2	85.4	93.3
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		101	104	102	101	102
13C8-PFOA	----	0.0002	%		101	102	102	99.8	101



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	Trip Blank_01	----	----	----	----
Sampling date / time					03-Jul-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2325116-011	-----	-----	-----	-----
				Result	----	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		115	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		102	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		102	----	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				RN_01	----	----	----	----
Sampling date / time				27-Jul-2023 13:30	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2325116-012	-----	-----	-----	-----
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
^ Total Polychlorinated biphenyls	----	1	µg/L	<1	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				RN_01	----	----	----	----
Sampling date / time				27-Jul-2023 13:30	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2325116-012	-----	-----	-----	-----
Result					----	----	----	----
EP080: BTEXN - Continued								
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0005	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	µg/L	<0.0002	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.0020	µg/L	<0.0020	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0005	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	----	----	----	----

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN_01	----	----	----	----
Sampling date / time				27-Jul-2023 13:30	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES2325116-012	-----	-----	-----	-----	
				Result	----	----	----	----	
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	----	----	----	----	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	----	----	----	----	
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	----	----	----	----	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	----	----	----	----	
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	----	----	----	----	
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	----	----	----	----	
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	----	----	----	----	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.001	----	----	----	----	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.001	----	----	----	----	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	----	----	----	----	
EP231P: PFAS Sums									
^ Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	µg/L	<0.0002	----	----	----	----	
^ Sum of PFAS (WA DER List)	----	0.0002	µg/L	<0.0002	----	----	----	----	
^ Sum of PFAS	----	0.0002	µg/L	<0.0002	----	----	----	----	
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	1	%	69.6	----	----	----	----	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%	83.6	----	----	----	----	
Toluene-D8	2037-26-5	2	%	95.2	----	----	----	----	
4-Bromofluorobenzene	460-00-4	2	%	123	----	----	----	----	
EP231S: PFAS Surrogate									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	RN_01	----	----	----	----
				Sampling date / time	27-Jul-2023 13:30	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2325116-012	-----	-----	-----	-----	
					Result	----	----	----	----
EP231S: PFAS Surrogate - Continued									
13C4-PFOS	----	0.0005	%	113	----	----	----	----	
13C8-PFOA	----	0.0005	%	117	----	----	----	----	



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	63	125
Toluene-D8	2037-26-5	67	124
4-Bromofluorobenzene	460-00-4	66	131
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	45	134
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(SOIL) EA150: Soil Classification based on Particle Size

(SOIL) EA152: Soil Particle Density



QUALITY CONTROL REPORT

Work Order : **ES2325116**

Page : 1 of 20

Client : **GHD PTY LTD**

Contact : **JO LAVERS**

Address : Level 7 24 Mitchell Street
DARWIN NT, AUSTRALIA 0800

Telephone : ----

Project : 12618429

Order number : 12618429

C-O-C number : ----

Sampler : **KIERAN GURUNG**

Site : ----

Quote number : ES23GHDSE0005

No. of samples received : 12

No. of samples analysed : 12

Laboratory : Environmental Division Sydney

Contact : Sarah Mathew

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61-2-8784 8555

Date Samples Received : 31-Jul-2023

Date Analysis Commenced : 02-Aug-2023

Issue Date : 08-Aug-2023



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Evie Sidarta	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
John Williams	Lab Technician	Newcastle - Inorganics, Mayfield West, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5208731)									
ES2324785-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	28	31	8.6	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	11	13	21.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	6	8	28.2	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	15	19	22.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	20	25	20.9	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	27	34	22.4	No Limit
		EG005T: Iron	7439-89-6	50	mg/kg	34700	32800	5.4	0% - 20%
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5212668)									
ES2324541-110	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	13	14	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	3	3	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	14	11	20.8	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Iron	7439-89-6	50	mg/kg	14700	13200	10.9	0% - 20%
ES2325097-052	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	171	176	3.1	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	5	6	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	12	15	24.1	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	9	7	17.4	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5212668) - continued									
ES2325097-052	Anonymous	EG005T: Iron	7439-89-6	50	mg/kg	71300	75700	5.9	0% - 20%
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5212670)									
ES2325116-009	FD_01	EG005T: Chromium	7440-47-3	2	mg/kg	60	69	13.7	0% - 20%
ES2325116-009	FD_01	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	4	5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	12	15	18.2	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	6	5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	23	20	13.9	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	16	12	31.6	No Limit
ES2325379-004	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	15	13	15.7	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	11	11	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	7	6	21.9	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	22	20	9.3	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	16	14	13.4	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	32	26	21.0	No Limit
EG005T: Iron	7439-89-6	50	mg/kg	33500	30800	8.2	0% - 20%		
EA001: pH in soil using 0.01M CaCl extract (QC Lot: 5214496)									
ES2325488-004	Anonymous	EA001: pH (CaCl2)	----	0.1	pH Unit	6.7	6.7	0.0	0% - 20%
ES2325488-013	Anonymous	EA001: pH (CaCl2)	----	0.1	pH Unit	6.5	6.7	2.9	0% - 20%
EA002: pH 1:5 (Soils) (QC Lot: 5208735)									
ES2325093-041	Anonymous	EA002: pH Value	----	0.1	pH Unit	7.7	7.7	0.0	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 5208736)									
ES2325093-041	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	27	31	15.8	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5208737)									
ES2324785-060	Anonymous	EA055: Moisture Content	----	0.1	%	24.7	28.6	14.6	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5210938)									
ES2325601-022	Anonymous	EA055: Moisture Content	----	0.1	%	9.8	10.0	1.8	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5212673)									
ES2324541-120	Anonymous	EA055: Moisture Content	----	0.1	%	4.1	4.3	5.2	No Limit
ES2325116-002	BH02_0.1-0.2	EA055: Moisture Content	----	0.1	%	2.9	2.7	6.1	No Limit
ED007: Exchangeable Cations (QC Lot: 5218147)									
ES2325116-003	BH03_0.1-0.2	ED007: Exchangeable Calcium	----	0.1	meq/100g	1.1	1.0	0.0	0% - 50%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.6	0.6	0.0	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	1.8	1.8	0.0	0% - 50%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5208732)									



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5208732) - continued									
ES2324785-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5212669)									
ES2324541-120	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2325116-009	FD_01	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP004: Organic Matter (QC Lot: 5212763)									
ES2325116-003	BH03_0.1-0.2	EP004: Organic Matter	----	0.5	%	2.1	2.8	29.1	No Limit
		EP004: Total Organic Carbon	----	0.5	%	1.2	1.6	29.1	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 5208873)									
ES2325116-007	BH06_0.1-0.2	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2325370-001	Anonymous	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5208871)									
ES2325116-007	BH06_0.1-0.2	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2325370-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	200	230	13.8	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5210266)									
ES2325116-001	BH01_0.1-0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2325116-008	BH06_0.4-0.5	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5208871)									
ES2325116-007	BH06_0.1-0.2	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2325370-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	190	210	8.8	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	270	270	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5210266)									
ES2325116-001	BH01_0.1-0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2325116-008	BH06_0.4-0.5	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080: BTEXN (QC Lot: 5210266)									
ES2325116-001	BH01_0.1-0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080: BTEXN (QC Lot: 5210266) - continued									
ES2325116-008	BH06_0.4-0.5	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5208431)									
ES2325116-001	BH01_0.1-0.2	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0005	0.0004	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
ES2325370-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0002	0.0003	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0036	0.0043	18.8	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5208431)									
ES2325116-001	BH01_0.1-0.2	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
ES2325370-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5208431) - continued									
ES2325370-001	Anonymous	EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5208431)									
ES2325116-001	BH01_0.1-0.2	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
ES2325370-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5208431)									
ES2325116-001	BH01_0.1-0.2	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
ES2325370-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5208431) - continued									
ES2325370-001	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5209940)									
ES2325441-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0027	0.0028	0.0	0% - 20%
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.117	0.122	4.3	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.398	0.412	3.2	0% - 20%
WN2309335-004	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5209941)									
ES2325440-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.1 ug/L	<0.0001	0.0	No Limit
WN2309335-005	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5210196)									
ES2325384-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2325439-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5210196)									
ES2325384-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2325439-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5210196)									
ES2325384-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	106-42-3	2	µg/L	<2	<2	0.0	No Limit



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080: BTEXN (QC Lot: 5210196) - continued									
ES2325384-001	Anonymous	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2325439-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5209044)									
EM2313542-001	Anonymous	EP231X-SUT: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
EM2313542-043	Anonymous	EP231X-SUT: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5209044)									
EM2313542-001	Anonymous	EP231X-SUT: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5209044) - continued									
EM2313542-001	Anonymous	EP231X-SUT: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0040	<0.0040	0.0	No Limit
		EP231X-SUT: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	<0.0080	<0.0080	0.0	No Limit
EM2313542-043	Anonymous	EP231X-SUT: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0040	<0.0040	0.0	No Limit
		EP231X-SUT: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	<0.0080	<0.0080	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5209044)									
EM2313542-001	Anonymous	EP231X-SUT: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-SUT: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.004	<0.004	0.0	No Limit
EM2313542-043	Anonymous	EP231X-SUT: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5209044) - continued									
EM2313542-043	Anonymous	EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-SUT: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.004	<0.004	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5209044)									
EM2313542-001	Anonymous	EP231X-SUT: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-SUT: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-SUT: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-SUT: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.002	<0.002	0.0	No Limit
EM2313542-043	Anonymous	EP231X-SUT: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-SUT: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-SUT: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-SUT: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.002	<0.002	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 5209044)									
EM2313542-001	Anonymous	EP231X-SUT: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Sum of PFAS (WA DER List)	----	0.0002	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Sum of PFAS	----	0.0002	µg/L	<0.0016	<0.0016	0.0	No Limit
EM2313542-043	Anonymous	EP231X-SUT: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Sum of PFAS (WA DER List)	----	0.0002	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-SUT: Sum of PFAS	----	0.0002	µg/L	<0.0016	<0.0016	0.0	No Limit

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

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5208731)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	92.4	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	74.4	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	112	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	102	89.0	111
EG005T: Iron	7439-89-6	50	mg/kg	<50	31660 mg/kg	99.0	89.0	112
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	98.5	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	97.6	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	85.9	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5212668)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	89.0	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	89.1	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	97.4	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	97.2	89.0	111
EG005T: Iron	7439-89-6	50	mg/kg	<50	31660 mg/kg	95.0	89.0	112
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	87.3	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	89.5	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	85.5	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5212670)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	91.9	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	75.8	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	98.2	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	93.4	89.0	111
EG005T: Iron	7439-89-6	50	mg/kg	<50	31660 mg/kg	94.4	89.0	112
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	90.1	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	88.7	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	81.1	66.0	133
EA002: pH 1:5 (Soils) (QCLot: 5208735)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	99.8	98.8	101
				----	7 pH Unit	99.0	98.8	101
EA010: Conductivity (1:5) (QCLot: 5208736)								



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA010: Conductivity (1:5) (QCLot: 5208736) - continued								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	102	92.0	108
ED007: Exchangeable Cations (QCLot: 5218147)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	1 meq/100g	99.4	75.8	120
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.67 meq/100g	100	74.9	115
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.51 meq/100g	103	80.0	120
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.87 meq/100g	103	80.0	120
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5208732)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	95.8	70.0	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5212669)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	96.6	70.0	125
EP004: Organic Matter (QCLot: 5212763)								
EP004: Organic Matter	----	0.5	%	<0.5	2.53 %	86.6	82.0	98.0
EP004: Total Organic Carbon	----	0.5	%	<0.5	1.46 %	87.0	81.0	99.0
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 5208873)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	88.3	62.0	126
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5208871)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	90.8	75.0	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	91.3	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	114	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5210266)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	98.7	72.2	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5208871)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	94.8	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	92.6	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	98.2	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5210266)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	98.2	72.4	133
EP080: BTEXN (QCLot: 5210266)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	105	76.0	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	101	78.5	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	108	77.4	121
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	102	78.2	121



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP080: BTEXN (QCLot: 5210266) - continued								
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	100.0	81.3	121
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	108	78.8	122
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5208431)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.6	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.0	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.0	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	102	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5208431)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	92.8	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	99.1	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.5	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	99.1	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	108	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	105	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	114	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5208431)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.9	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	111	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	93.5	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	102	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	99.5	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.7	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5208431)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	83.6	62.0	145



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5208431) - continued								
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	106	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	103	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	97.3	69.2	143
Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EG020F: Dissolved Metals by ICP-MS (QCLot: 5209940)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	99.7	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	96.4	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	96.6	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	98.2	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	94.2	83.0	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	96.6	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.8	81.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 5209941)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	97.0	83.0	105
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 5207313)								
EP066: Total Polychlorinated biphenyls	----	1	µg/L	<1	10 µg/L	109	68.9	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5207314)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	68.8	53.7	97.0
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	81.7	63.3	107
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	98.1	58.3	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5210196)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	81.9	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5207314)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	83.3	53.9	95.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	92.8	57.8	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	92.5	50.5	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5210196)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	82.5	75.0	127
EP080: BTEXN (QCLot: 5210196)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	90.9	68.3	119
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	96.2	73.5	120
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	92.7	73.8	122



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP080: BTEXN (QCLot: 5210196) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	101	73.0	122
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	107	76.4	123
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	92.3	75.5	124
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5209044)								
EP231X-SUT: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0005	0.004 µg/L	84.9	72.0	130
EP231X-SUT: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	0.004 µg/L	93.6	71.0	127
EP231X-SUT: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	0.004 µg/L	91.1	68.0	131
EP231X-SUT: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	0.004 µg/L	123	69.0	134
EP231X-SUT: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	µg/L	<0.0002	0.004 µg/L	113	65.0	140
EP231X-SUT: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	0.004 µg/L	105	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5209044)								
EP231X-SUT: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	<0.0020	0.02 µg/L	89.6	73.0	129
EP231X-SUT: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0005	0.004 µg/L	91.5	72.0	129
EP231X-SUT: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0005	0.004 µg/L	98.7	72.0	129
EP231X-SUT: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0005	0.004 µg/L	89.0	72.0	130
EP231X-SUT: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	0.004 µg/L	102	71.0	133
EP231X-SUT: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	0.004 µg/L	90.2	69.0	130
EP231X-SUT: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	0.004 µg/L	84.5	71.0	129
EP231X-SUT: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	0.004 µg/L	93.4	69.0	133
EP231X-SUT: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	0.004 µg/L	115	72.0	134
EP231X-SUT: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0005	µg/L	<0.0005	0.004 µg/L	130	65.0	144
EP231X-SUT: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	0.01 µg/L	112	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5209044)								
EP231X-SUT: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	0.004 µg/L	93.3	67.0	137
EP231X-SUT: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	0.01 µg/L	116	68.0	141
EP231X-SUT: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	0.01 µg/L	103	56.6	136
EP231X-SUT: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	0.01 µg/L	109	61.9	129
EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	0.01 µg/L	101	52.8	135
EP231X-SUT: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	0.004 µg/L	86.7	65.0	136

Matrix Spike (MS) Report

Sub-Matrix: SOIL

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5208731)							
ES2324785-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	95.0	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	93.4	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	111	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	98.2	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	94.8	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	97.9	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	96.3	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5212668)							
ES2324541-110	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	101	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	102	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	108	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	109	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	102	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	107	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	102	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5212670)							



Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5212670) - continued							
ES2325116-009	FD_01	EG005T: Arsenic	7440-38-2	50 mg/kg	97.6	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	99.8	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	86.3	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	103	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	101	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	101	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	100	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5208732)							
ES2324785-001	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	86.4	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5212669)							
ES2324541-120	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	110	70.0	130
EP004: Organic Matter (QCLot: 5212763)							
ES2325116-003	BH03_0.1-0.2	EP004: Organic Matter	----	1.67 %	97.2	70.0	130
		EP004: Total Organic Carbon	----	0.97 %	97.4	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 5208873)							
ES2325370-001	Anonymous	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	72.9	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5208871)							
ES2325370-001	Anonymous	EP071: C10 - C14 Fraction	----	480 mg/kg	113	73.0	137
		EP071: C15 - C28 Fraction	----	3100 mg/kg	106	53.0	131
		EP071: C29 - C36 Fraction	----	2060 mg/kg	105	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5210266)							
ES2325116-001	BH01_0.1-0.2	EP080: C6 - C9 Fraction	----	32.5 mg/kg	87.8	60.4	142
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5208871)							
ES2325370-001	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	105	73.0	137
		EP071: >C16 - C34 Fraction	----	4320 mg/kg	107	53.0	131
		EP071: >C34 - C40 Fraction	----	890 mg/kg	104	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5210266)							
ES2325116-001	BH01_0.1-0.2	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	88.3	61.1	142
EP080: BTEXN (QCLot: 5210266)							
ES2325116-001	BH01_0.1-0.2	EP080: Benzene	71-43-2	2.5 mg/kg	95.0	62.1	122
		EP080: Toluene	108-88-3	2.5 mg/kg	103	66.6	119
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	94.6	67.4	123
		EP080: meta- & para-Xylene	108-38-3	2.5 mg/kg	99.6	66.4	121
			106-42-3				
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	102	70.7	121
	EP080: Naphthalene	91-20-3	2.5 mg/kg	103	61.1	115	



Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5208431)							
ES2325116-001	BH01_0.1-0.2	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	90.0	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	103	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	97.8	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	88.6	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	96.2	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	97.5	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5208431)							
ES2325116-001	BH01_0.1-0.2	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	93.4	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	99.0	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	101	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	95.6	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	102	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	96.7	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	100	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	103	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	106	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	106	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	115	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5208431)							
ES2325116-001	BH01_0.1-0.2	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	98.1	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	116	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	97.1	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	114	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	101	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	89.0	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	88.5	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5208431)							
ES2325116-001	BH01_0.1-0.2	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	86.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	104	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	98.9	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	72.8	69.2	143

Sub-Matrix: WATER				Matrix Spike (MS) Report			
Spike		SpikeRecovery(%)		Acceptable Limits (%)			



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5209940)							
ES2325116-012	RN_01	EG020A-F: Arsenic	7440-38-2	1 mg/L	97.7	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	97.9	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	80.7	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	87.7	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	91.0	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	97.4	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	99.0	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5209941)							
ES2325440-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	79.1	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5210196)							
ES2325384-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	89.6	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5210196)							
ES2325384-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	92.0	70.0	130
EP080: BTEXN (QCLot: 5210196)							
ES2325384-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	86.4	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	116	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	110	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	120	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	125	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	111	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5209044)							
EM2313542-002	Anonymous	EP231X-SUT: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.004 µg/L	98.8	72.0	130
		EP231X-SUT: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.004 µg/L	72.4	71.0	127
		EP231X-SUT: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.004 µg/L	102	68.0	131
		EP231X-SUT: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.004 µg/L	111	69.0	134
		EP231X-SUT: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.004 µg/L	80.8	65.0	140
		EP231X-SUT: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.004 µg/L	# 0.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5209044)							
EM2313542-002	Anonymous	EP231X-SUT: Perfluorobutanoic acid (PFBA)	375-22-4	0.02 µg/L	109	73.0	129
		EP231X-SUT: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.004 µg/L	# 59.6	72.0	129
		EP231X-SUT: Perfluorohexanoic acid (PFHxA)	307-24-4	0.004 µg/L	108	72.0	129
		EP231X-SUT: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.004 µg/L	# 36.8	72.0	130
		EP231X-SUT: Perfluorooctanoic acid (PFOA)	335-67-1	0.004 µg/L	98.4	71.0	133
		EP231X-SUT: Perfluorononanoic acid (PFNA)	375-95-1	0.004 µg/L	# 59.2	69.0	130
		EP231X-SUT: Perfluorodecanoic acid (PFDA)	335-76-2	0.004 µg/L	# 38.0	71.0	129
		EP231X-SUT: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.004 µg/L	# 27.2	69.0	133



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5209044) - continued							
EM2313542-002	Anonymous	EP231X-SUT: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.004 µg/L	# 0.0	72.0	134
		EP231X-SUT: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.004 µg/L	# 0.0	65.0	144
		EP231X-SUT: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.01 µg/L	# 0.0	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5209044)							
EM2313542-002	Anonymous	EP231X-SUT: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.004 µg/L	# 12.4	67.0	137
		EP231X-SUT: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.01 µg/L	# 0.0	68.0	141
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.01 µg/L	# 0.0	56.6	136
		EP231X-SUT: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.01 µg/L	# 0.0	61.9	129
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.01 µg/L	# 11.4	52.8	135
		EP231X-SUT: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.004 µg/L	# 2.8	65.0	136
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.004 µg/L	# Not Determined	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5209044)							
EM2313542-002	Anonymous	EP231X-SUT: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.004 µg/L	74.4	63.0	143
		EP231X-SUT: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.004 µg/L	75.6	64.0	140
		EP231X-SUT: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.004 µg/L	# 56.4	67.0	138
		EP231X-SUT: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.004 µg/L	# 7.6	60.9	136



QA/QC Compliance Assessment to assist with Quality Review

Work Order : ES2325116

Page : 1 of 13

Client : GHD PTY LTD
Contact : JO LAVERS
Project : 12618429
Site : ----
Sampler : KIERAN GURUNG
Order number : 12618429

Laboratory : Environmental Division Sydney
Telephone : +61-2-8784 8555
Date Samples Received : 31-Jul-2023
Issue Date : 08-Aug-2023
No. of samples received : 12
No. of samples analysed : 12

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: WATER

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EM2313542--002	Anonymous	Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0 %	53.0-142%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EM2313542--002	Anonymous	Perfluoropentanoic acid (PFPeA)	2706-90-3	59.6 %	72.0-129%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EM2313542--002	Anonymous	Perfluoroheptanoic acid (PFHpA)	375-85-9	36.8 %	72.0-130%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EM2313542--002	Anonymous	Perfluorononanoic acid (PFNA)	375-95-1	59.2 %	69.0-130%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EM2313542--002	Anonymous	Perfluorodecanoic acid (PFDA)	335-76-2	38.0 %	71.0-129%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EM2313542--002	Anonymous	Perfluoroundecanoic acid (PFUnDA)	2058-94-8	27.2 %	69.0-133%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EM2313542--002	Anonymous	Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0 %	72.0-134%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EM2313542--002	Anonymous	Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0 %	65.0-144%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EM2313542--002	Anonymous	Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0 %	71.0-132%	Recovery less than lower data quality objective
EP231C: Perfluoroalkyl Sulfonamides	EM2313542--002	Anonymous	Perfluorooctane sulfonamide (FOSA)	754-91-6	12.4 %	67.0-137%	Recovery less than lower data quality objective
EP231C: Perfluoroalkyl Sulfonamides	EM2313542--002	Anonymous	N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0 %	68.0-141%	Recovery less than lower data quality objective
EP231C: Perfluoroalkyl Sulfonamides	EM2313542--002	Anonymous	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0 %	56.6-136%	Recovery less than lower data quality objective
EP231C: Perfluoroalkyl Sulfonamides	EM2313542--002	Anonymous	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0 %	61.9-129%	Recovery less than lower data quality objective
EP231C: Perfluoroalkyl Sulfonamides	EM2313542--002	Anonymous	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	11.4 %	52.8-135%	Recovery less than lower data quality objective
EP231C: Perfluoroalkyl Sulfonamides	EM2313542--002	Anonymous	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	2.8 %	65.0-136%	Recovery less than lower data quality objective



Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries - Continued							
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EM2313542--002	Anonymous	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	56.4 %	67.0-138%	Recovery less than lower data quality objective
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EM2313542--002	Anonymous	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	7.6 %	60.9-136%	Recovery less than lower data quality objective

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA001: pH in soil using 0.01M CaCl extract						
Soil Glass Jar - Unpreserved BH03_0.1-0.2	04-Aug-2023	03-Aug-2023	1	----	----	----
EP080/071: Total Petroleum Hydrocarbons						
Soil Glass Jar - Unpreserved Trip Blank_01	02-Aug-2023	17-Jul-2023	16	03-Aug-2023	17-Jul-2023	17
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions						
Soil Glass Jar - Unpreserved Trip Blank_01	02-Aug-2023	17-Jul-2023	16	03-Aug-2023	17-Jul-2023	17
EP080: BTEXN						
Soil Glass Jar - Unpreserved Trip Blank_01	02-Aug-2023	17-Jul-2023	16	03-Aug-2023	17-Jul-2023	17

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
	0				
Laboratory Duplicates (DUP)					
Polychlorinated Biphenyls (PCB)	0	1	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	7	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Polychlorinated Biphenyls (PCB)	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	7	0.00	5.00	NEPM 2013 B3 & ALS QC Standard



Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

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

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

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

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA001: pH in soil using 0.01M CaCl extract								
Soil Glass Jar - Unpreserved (EA001) BH03_0.1-0.2	27-Jul-2023	04-Aug-2023	03-Aug-2023	✖	04-Aug-2023	04-Aug-2023	✓	
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002) BH03_0.1-0.2	27-Jul-2023	03-Aug-2023	03-Aug-2023	✓	03-Aug-2023	03-Aug-2023	✓	
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010) BH03_0.1-0.2	27-Jul-2023	03-Aug-2023	03-Aug-2023	✓	03-Aug-2023	31-Aug-2023	✓	
EA055: Moisture Content								
Soil Glass Jar - Unpreserved (EA055) BH01_0.1-0.2, BH06_0.4-0.5	BH03_0.1-0.2, BH06_0.4-0.5	27-Jul-2023	----	----	----	02-Aug-2023	10-Aug-2023	✓
Soil Glass Jar - Unpreserved (EA055) BH02_0.1-0.2, BH05_0.1-0.2, BH06_0.1-0.2, FD_02	BH04_0.1-0.2, BH05_0.4-0.5, FD_01,	27-Jul-2023	----	----	----	03-Aug-2023	10-Aug-2023	✓
EA150: Soil Classification based on Particle Size								
Snap Lock Bag - Friable Asbestos/PSD Bag (EA150H) BH03_0.1-0.2		27-Jul-2023	----	----	----	08-Aug-2023	23-Jan-2024	✓
EA152: Soil Particle Density								
Snap Lock Bag - Friable Asbestos/PSD Bag (EA152) BH03_0.1-0.2		27-Jul-2023	----	----	----	08-Aug-2023	23-Jan-2024	✓
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007) BH03_0.1-0.2		27-Jul-2023	07-Aug-2023	24-Aug-2023	✓	07-Aug-2023	24-Aug-2023	✓



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) BH03_0.1-0.2	27-Jul-2023	02-Aug-2023	23-Jan-2024	✓	03-Aug-2023	23-Jan-2024	✓
Soil Glass Jar - Unpreserved (EG005T) BH01_0.1-0.2, BH04_0.1-0.2, BH05_0.4-0.5, BH06_0.4-0.5, FD_02 BH02_0.1-0.2, BH05_0.1-0.2, BH06_0.1-0.2, FD_01,	27-Jul-2023	03-Aug-2023	23-Jan-2024	✓	03-Aug-2023	23-Jan-2024	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) BH03_0.1-0.2	27-Jul-2023	02-Aug-2023	24-Aug-2023	✓	04-Aug-2023	24-Aug-2023	✓
Soil Glass Jar - Unpreserved (EG035T) BH01_0.1-0.2, BH04_0.1-0.2, BH05_0.4-0.5, BH06_0.4-0.5, FD_02 BH02_0.1-0.2, BH05_0.1-0.2, BH06_0.1-0.2, FD_01,	27-Jul-2023	03-Aug-2023	24-Aug-2023	✓	06-Aug-2023	24-Aug-2023	✓
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004) BH03_0.1-0.2	27-Jul-2023	07-Aug-2023	24-Aug-2023	✓	07-Aug-2023	24-Aug-2023	✓
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066) BH01_0.1-0.2, BH03_0.1-0.2, BH05_0.1-0.2, BH06_0.1-0.2, FD_01 BH02_0.1-0.2, BH04_0.1-0.2, BH05_0.4-0.5, BH06_0.4-0.5,	27-Jul-2023	03-Aug-2023	10-Aug-2023	✓	04-Aug-2023	12-Sep-2023	✓
Soil Glass Jar - Unpreserved (EP066) FD_02	27-Jul-2023	03-Aug-2023	10-Aug-2023	✓	05-Aug-2023	12-Sep-2023	✓



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080) Trip Blank_01		03-Jul-2023	02-Aug-2023	17-Jul-2023	✖	03-Aug-2023	17-Jul-2023	✖
Soil Glass Jar - Unpreserved (EP080) BH01_0.1-0.2, BH03_0.1-0.2, BH05_0.1-0.2, BH06_0.1-0.2, FD_01, BH02_0.1-0.2, BH04_0.1-0.2, BH05_0.4-0.5, BH06_0.4-0.5, FD_02		27-Jul-2023	02-Aug-2023	10-Aug-2023	✔	03-Aug-2023	10-Aug-2023	✔
Soil Glass Jar - Unpreserved (EP071) BH01_0.1-0.2, BH03_0.1-0.2, BH05_0.1-0.2, BH06_0.1-0.2, FD_01, BH02_0.1-0.2, BH04_0.1-0.2, BH05_0.4-0.5, BH06_0.4-0.5, FD_02		27-Jul-2023	03-Aug-2023	10-Aug-2023	✔	05-Aug-2023	12-Sep-2023	✔
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080) Trip Blank_01		03-Jul-2023	02-Aug-2023	17-Jul-2023	✖	03-Aug-2023	17-Jul-2023	✖
Soil Glass Jar - Unpreserved (EP080) BH01_0.1-0.2, BH03_0.1-0.2, BH05_0.1-0.2, BH06_0.1-0.2, FD_01, BH02_0.1-0.2, BH04_0.1-0.2, BH05_0.4-0.5, BH06_0.4-0.5, FD_02		27-Jul-2023	02-Aug-2023	10-Aug-2023	✔	03-Aug-2023	10-Aug-2023	✔
Soil Glass Jar - Unpreserved (EP071) BH01_0.1-0.2, BH03_0.1-0.2, BH05_0.1-0.2, BH06_0.1-0.2, FD_01, BH02_0.1-0.2, BH04_0.1-0.2, BH05_0.4-0.5, BH06_0.4-0.5, FD_02		27-Jul-2023	03-Aug-2023	10-Aug-2023	✔	05-Aug-2023	12-Sep-2023	✔
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080) Trip Blank_01		03-Jul-2023	02-Aug-2023	17-Jul-2023	✖	03-Aug-2023	17-Jul-2023	✖
Soil Glass Jar - Unpreserved (EP080) BH01_0.1-0.2, BH03_0.1-0.2, BH05_0.1-0.2, BH06_0.1-0.2, FD_01, BH02_0.1-0.2, BH04_0.1-0.2, BH05_0.4-0.5, BH06_0.4-0.5, FD_02		27-Jul-2023	02-Aug-2023	10-Aug-2023	✔	03-Aug-2023	10-Aug-2023	✔

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Matrix: **WATER** Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) RN 01	27-Jul-2023	----	----	----	02-Aug-2023	23-Jan-2024	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) RN_01	27-Jul-2023	----	----	----	03-Aug-2023	24-Aug-2023	✓
EP066: Polychlorinated Biphenyls (PCB)							
Amber Glass Bottle - Unpreserved (EP066) RN_01	27-Jul-2023	03-Aug-2023	03-Aug-2023	✓	04-Aug-2023	12-Sep-2023	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) RN_01	27-Jul-2023	03-Aug-2023	03-Aug-2023	✓	04-Aug-2023	12-Sep-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) RN_01	27-Jul-2023	03-Aug-2023	10-Aug-2023	✓	03-Aug-2023	10-Aug-2023	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) RN_01	27-Jul-2023	03-Aug-2023	03-Aug-2023	✓	04-Aug-2023	12-Sep-2023	✓
Amber VOC Vial - Sulfuric Acid (EP080) RN_01	27-Jul-2023	03-Aug-2023	10-Aug-2023	✓	03-Aug-2023	10-Aug-2023	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) RN_01	27-Jul-2023	03-Aug-2023	10-Aug-2023	✓	03-Aug-2023	10-Aug-2023	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X-SUT) RN_01	27-Jul-2023	03-Aug-2023	23-Jan-2024	✓	07-Aug-2023	23-Jan-2024	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X-SUT) RN_01	27-Jul-2023	03-Aug-2023	23-Jan-2024	✓	07-Aug-2023	23-Jan-2024	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X-SUT) RN_01	27-Jul-2023	03-Aug-2023	23-Jan-2024	✓	07-Aug-2023	23-Jan-2024	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X-SUT) RN_01	27-Jul-2023	03-Aug-2023	23-Jan-2024	✓	07-Aug-2023	23-Jan-2024	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X-SUT) RN_01	27-Jul-2023	03-Aug-2023	23-Jan-2024	✓	07-Aug-2023	23-Jan-2024	✓



Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	3	33.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	4	30	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH in soil using a 0.01M CaCl2 extract	EA001	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	30	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	6	50	12.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	7	28.57	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	50	6.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	50	6.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Organic Matter	EP004	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
Analytical Methods		QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS) - Continued							
Polychlorinated Biphenyls (PCB)	EP066	1	12	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	30	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	50	6.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
Analytical Methods		QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	11	18.18	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	10	20.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-SUT	2	15	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	0	1	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	7	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	11	9.09	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-SUT	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	1	100.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	14.29	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	11	9.09	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-SUT	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	1	100.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	14.29	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	11	9.09	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-SUT	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	0	1	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	7	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH in soil using a 0.01M CaCl ₂ extract	EA001	SOIL	In house: Referenced to Rayment and Lyons 4B3 (mod.) or 4B4 (mod.) 10 g of soil is mixed with 50 mL of 0.01M CaCl ₂ and tumbled end over end for 1 hour. pH is measured from the continuous suspension. This method is compliant with NEPM Schedule B(3).
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3
Soil Particle Density	EA152	SOIL	Soil Particle Density by AS 1289.3.5.1: Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Polychlorinated Biphenyls (PCB)	EP066	WATER	In house: Referenced to USEPA SW 846 - 8270 Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-SUT	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is concentrated, combined with an equal volume of reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
pH in soil using a 0.01M CaCl ₂ extract	EA001-PR	SOIL	In house: Referenced to Rayment and Lyons 4B1, 10 g of soil is mixed with 50 mL of 0.01M CaCl ₂ and tumbled end over end for 1 hour. pH is measured from the continuous suspension. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH ₄ Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.



Preparation Methods	Method	Matrix	Method Descriptions
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na ₂ SO ₄ and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
QuEChERS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



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