Airservices Australia

Mackay Airport

Preliminary Sampling

February 2019

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Appendices

1. Introduction

GHD Pty Ltd (GHD) was engaged by Airservices Australia (Airservices) to complete a preliminary site investigation (PSI) at Mackay Airport (GHD, 2016a) (herein referred as 'the site').

A Sample Analysis and Quality Plan (SAQP) was subsequently prepared by GHD (GHD, 2016b) for a targeted Preliminary Sampling program which focused on the assessment of potential contamination from per and poly-fluoroalkyl substances (PFAS).

This report documents the methodology and findings of the Preliminary Sampling and provides supporting information to the PSI. The Site locality and investigation area are shown in Figure 1 of Appendix A.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.4. The report should also be read with reference to the PSI which contains further interpretation of the data, including a conceptual site model (CSM).

1.1 Objective of the preliminary sampling

The objective of the Preliminary Sampling was to validate and further investigate the desktop findings of the PSI through a preliminary and targeted soil, sediment, surface water and groundwater sampling program.

1.2 Scope of works

Based on the outcomes of the PSI, a Sampling Analysis and Quality Plan (SAQP) was developed for the investigation (GHD, 2016b).

The SAQP was prepared so that the field investigations and analyses were undertaken in a way that enabled the collection and reporting of reliable data on which to base any further soil, groundwater and surface water monitoring programs for specific areas of the site.

The GHD SAQP described drilling methods, sampling equipment, well development strategy, sample collection protocols, sample processing, field and laboratory sample analysis, equipment decontamination and quality-assurance and quality-control (QA / QC) procedures.

The scope of the Preliminary Sampling was as follows:

- Development of a Site Work Program including a Health Safety & Environment (HSE) Plan, and review of underground services plans and site plans
- Liaison and coordination of fieldwork with subcontractors, Airservices and Mackay Airport Pty Ltd
- Clearance of all sample locations by a Services Locator
- Drilling of soil bores MW01 to MW05 to a maximum depth of 5.0 metres below ground level (mbgl) and conversion of the bores to groundwater monitoring wells
- Collection of soil samples from soil boreholes at depths of 0.2, 0.5 and 1.0 mbgl and then every metre thereafter, with additional samples collected depending on ground conditions intercepted and contaminant indicators (i.e. lithology, staining/odours), to a maximum depth of 5.0 mbgl
- Collection of soil samples from three targeted soil bore locations (SB01 to SB03)

- Collection of three surface water samples (SW01 to SW03) and associated sediment samples (SS01 to SS03)
- Gauging of five newly installed monitoring wells (MW01 to MW05) and four existing wells (EW01, GMW2, GMW3, GMW6) using an oil/water interface probe to measure the depth to groundwater
- Groundwater sampling of all nine monitoring wells using low flow sampling techniques.
- Laboratory analysis of collected samples at Australian Laboratory Services (ALS) Environmental (primary lab) and Eurofins MGT (secondary lab)
- Collection of QA / QC samples for soil, surface water, sediment and groundwater including “Blind” and “Split” duplicate samples
- Laboratory analysis of soil, surface water/sediment and groundwater samples by ALS Environmental (primary laboratory) and Eurofins MGT (secondary laboratory)
- Surveying of the newly installed monitoring wells.
- Placement of all soil cuttings and purged groundwater in drums for storage (and ultimate off-site disposal to a licensed facility)
- Preparation of this Preliminary Sampling Report

1.3 Methodology references

This Preliminary Sampling report was undertaken with reference to the following:

- *Airports Act*, 1996
- *Airports (Environment Protection) Regulations* 1997
- Australian Standard AS 4482.1,2005. *Guide to the investigation and sampling of sites with potentially contaminated soil - Part 1: Non-volatile and semi-volatile compounds*
- Australian/New Zealand Standard (AS/NZ) 5667.1,1998. *Water Quality – Sampling. Standards Australia*
- DoH 2017, Health Based Guidance Values for PFAS for Use in Site Investigations in Australia, Department of Health
- *Environmental Protection Act* 1994 (EP Act)
- GHD, 2015. *Airservices Australia, Managing PFC Contamination at Airports, Interim Contamination Management Strategy and Decision Framework* (GHD Reference 31\32279\239419)
- GHD, 2016b. *Airservices Australia, Mackay Airport Sampling Analysis and Quality Plan* (GHD reference 31\34249\252994)
- GHD, 2017: PFAS Investigations – Derivation of PFAS soil and water criteria
- National Environment Protection Council (NEPC), *National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended by the National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 No. 1* (the ASC NEPM).
- Government of Western Australia, Department of Environmental Regulation (DER), 2016: Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS).

1.4 Limitations

This report has been prepared by GHD for Airservices Australia and may only be used and relied on by Airservices Australia for the purpose agreed between GHD and Airservices Australia as set out in Section 1 of this report. Reliance of other parties on this report is subject to agreement in writing by GHD.

GHD otherwise disclaims responsibility to any person other than Airservices Australia 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, partly on the basis of information provided by Airservices Australia, 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.

GHD has considered and/or tested for only those chemicals specifically referred to in this Report and makes no statement or representation as to the existence (or otherwise) of any other chemicals.

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.

These Limitations should be read in conjunction with the entire Report and no excerpts are taken to be representative of the findings of this Report.

2. Field investigations

2.1 Fieldwork methodology

2.1.1 Fieldwork program

The fieldwork program completed by GHD for the site is summarised in Table 1. It included the following:

- Drilling and installation of five groundwater monitoring wells to maximum 5.0 mbgl with collection of soil samples
- Drilling of bores at three targeted locations with collection of soil samples
- Collection of three surface water samples and sediment samples from open drainage channels on site
- Gauging and sampling of five new groundwater monitoring wells and four existing groundwater monitoring wells

The sampling locations are shown in Figure 2 of Appendix A.

Table 1 Summary of fieldwork program

Date	Activity
15 – 17 May 2017	Underground services location Drilling, sampling and conversion into groundwater monitoring wells for MW01 to MW05 Drilling and sampling of bores at three targeted locations (SB01-SB03) Development of newly installed groundwater monitoring wells.
25 – 26 May 2017	Gauging and sampling of all groundwater monitoring wells. Collection of surface water samples and sediment samples. Surveying of the five newly installed monitoring wells.

2.1.2 Soil Investigation

The soil sampling methodology is summarised in Table 2.

Table 2 Soil sampling methodology

Activity	Details
Underground services locating	A Telstra-accredited independent contractor cleared underground services using radio-detection and ground penetrating radar with reference to utility plans provided by Dial Before You Dig (DBYD), prior to any sub-surface works being undertaken
Sampling plan design	The objectives and rationale of the sampling locations were detailed in the SAQP (GHD, 2016b).
Soil borehole drilling	All eight soil boreholes sample locations were advanced with non-destructive drilling (NDD) to 1.0 mbgl to assist with clearance of underground services. The five monitoring well locations (MW01 to MW05) were drilled with solid flight auger to a depth of 4.0 to 5.0 mbgl. The three targeted locations were drilled with solid flight auger and split spoon. Decontamination of the solid flight auger was undertaken between each sampling location in accordance with the decontamination methodology outlined in the SAQP.

Activity	Details
Soil bore sampling	Soil samples were collected from each of the soil boreholes generally at the surface, 0.2 mbgl, 0.5 mbgl and 1 mbgl, and then at approximately 1 m intervals to a maximum depth of 5 m or where changes in lithology or potential contamination were observed, unless soil samples were too saturated to be recovered from the drilling. Soil samples were placed into laboratory-supplied glass and plastic jars. A total of 58 soil samples were collected. Five QA/QC samples were collected (QA-01 to QA-05). The records of the soils encountered, and the samples collected (including depths and related observations) are presented in the borehole records (Appendix B) and Laboratory reports (Appendix H). Samples were identified with a unique label, incorporating the sample location and depth (i.e. MW01-0.2 was collected from borehole MW01 at a depth of 0.2 mbgl). Care was taken during the sampling to obtain representative samples from each target level.
Sediment samples	Three sediment samples (SS01, SS02 and SS03) were collected from the site at the same locations as the surface water samples. Description of samples collected are provided in Appendix E. The sediment samples were collected by a trowel and placed into laboratory-supplied jars/containers. Sampling implements were decontaminated between sampling locations in accordance with the decontamination methodology outlined in the SAQP.
Soil logging	Soils encountered during drilling were described and logged by an environmental scientist. Borehole logs are presented in Appendix B.
QA/QC	Three quality control samples (QA-03, QA-04 and QA-05) were collected including two intra-laboratory (“blind”) samples and one inter-laboratory (“split”) sample. Refer to Appendix G for more details.
Sample preservation and transport	Samples were chilled upon collection, stored on ice in an insulated cooler box while on site and in transit to the laboratory. Samples were transferred to the laboratory under Chain of Custody (COC) documentation. COC documentation is presented in Appendix H.
Soil cuttings	NDD waste and soil cuttings from drilling activities were contained in 205 L sealed drums and placed at the current fire station (for ultimate disposal off site at a licensed facility)..

2.2 Groundwater monitoring and sampling methodology

2.2.1 Groundwater well installation

Soil bores were converted to groundwater monitoring wells as detailed in Table 2 and Table 3. Locations are shown in Figure 2 in Appendix A. Well construction details are provided in the bore logs contained in Appendix B.

Table 3 Groundwater well installation

Activity	Details
Well construction	The monitoring wells were installed in accordance with the *Minimum Construction Requirements for Water Bores in Australia, Edition 3* (2012) and were constructed using 50 mm ID uPVC, Class 18, acid washed threaded standpipe with machine slotted (0.4 mm) screened section. Graded and washed filter sand was installed in and slightly above (0.2 to 0.5 m) the screened interval, then a bentonite seal (0.5 m thick) and grout to the surface. Screened and installation depths varied according to strata, identified conductive horizons, areas of potential contamination and the need to minimise the risk of cross contamination between soil horizons/ units. All monitoring wells were completed with a flush mounted gatic cover concreted below the ground surface. Details of the monitoring wells construction are provided in the borehole logs in Appendix B.
Well development	The newly installed wells were developed following construction by Waterra foot valve. Around 40 L of groundwater was purged out at each monitoring well. GHD considers that the development procedure undertaken was adequate to prepare the wells for collection of representative groundwater samples.
Well Survey	The top of the well casings were surveyed to Australian Height Datum (AHD). In the instance where the top of the casing was not evenly cut, the highest point of the top of the casing was surveyed. The survey data (with reference level at top of casing) is presented in Appendix C.
Development water disposal	Purged water from the well development was placed into 205 L sealed drums or container and placed at the current fire station (for ultimate disposal off site to a licensed facility).

2.3 Groundwater monitoring and sampling methodology

Five newly installed monitoring wells (MW01 to MW05) and four pre-existing monitoring wells (EW01, GMW2, GMW3, GMW6) were gauged, purged and sampled.

Details of the groundwater monitoring and sampling methodologies are summarised in Table 4.

Table 4 Groundwater monitoring and sampling methodology

Activity	Details
Well gauging	Prior to the sampling of wells, groundwater standing water levels (SWL) were gauged using an interface probe measuring from the top of the bore casing (TOC). Standing water levels were recorded on field record sheets. The gauged groundwater levels for each well at the site are summarised in Appendix D. The calibration certificate of the interface probe is provided in Appendix I.
Groundwater sampling	All monitoring wells were purged and sampled through low-flow sampling methods using a Geopump® peristaltic pump. Groundwater field parameters were monitored during the purging process using a multi-probe water quality meter, reporting temperature, dissolved oxygen (DO), pH, oxidation-reduction potential (ORP) and electrical conductivity (EC). The calibration certificate of the water quality meter is provided in Appendix I. Groundwater samples were collected directly from the tubing into laboratory-supplied containers (pre-preserved where appropriate) and filled up to minimise headspace. A total of 11 groundwater samples were collected [including two quality assurance (QA)/quality control (QC) samples (QA01, QA02)]. All samples were stored on ice in an esky until delivered to the laboratory. Groundwater gauging and sampling records are provided in Appendix D.

Activity	Details
Decontamination	Decontamination of the interface probe was undertaken through a three stage approach. The first stage involved cleaning the equipment using a mixture of pH neutral phosphate free detergent (Decon® Neutracon) in water, followed by a deionised water wash and a final rinse stage Single-use tubing was used for sample collection to minimise potential for cross contamination.
QA/QC	Two quality control samples were collected including one intra-laboratory ("blind") samples and one inter-laboratory ("split") samples. Refer to Appendix G.
Purge water disposal	Purged water from the well development/sampling was placed into 205 L sealed drums or container and placed at the current fire station (for ultimate disposal off site at a licensed facility).

2.4 Surface water sampling methodology

The surface water sampling methodology is summarised in Table 5.

Table 5 Surface water sampling methodology

Activity	Details
Sampling plan design	The objectives and rationale of the sampling locations were detailed in the SAQP (GHD, 2016b).
Surface water sampling	Surface water samples were collected from four locations (refer to Figure 2 in Appendix A for the sample locations). A total of three surface water samples were submitted to the laboratory for analysis. Samples were collected directly from the surface water bodies using laboratory-supplied bottles.
Surface water logging	Field observations and physicochemical parameters (pH, EC, DO and ORP)) of the surface water were recorded by an environmental scientist and results presented in Appendix E.
Sample preservation and transport	Samples were chilled upon collection by storing on ice in an insulated cooler box while on site and in transit to the laboratory. Samples were transferred to the laboratory under Chain of Custody (COC) documentation. COC documentation is presented in Appendix H.

2.5 Work health and safety

GHD prepared a project-specific Job Safety and Environmental Analysis (JSEA) for the site works in accordance with Work Health and Safety (WHS) legislation and associated Codes of Practice. The JSEA consisted of a summary of relevant site activities and specific job-related tasks; a hazard register that identifies all foreseeable hazards; risk ranking and risk management measures for each identified hazard; and procedures for monitoring and / or implementing remedial actions to manage all project-based risks. Prior to undertaking the fieldworks, the GHD field representatives and all subcontractors held a pre-start meeting on site. Daily GHD WHS forms were completed before commencement of work each day.

2.6 Laboratory analysis program

2.6.1 Analytical laboratories

GHD consigned all primary soil, water and groundwater samples and intra-laboratory field duplicate (blind) samples to ALS for analysis. The analysis of inter-laboratory duplicate (split) samples, for QC purposes, was completed by Eurofins MGT.

Both the primary and secondary laboratories are National Association of Testing Authorities (NATA) registered for the analytical program undertaken.

Certified laboratory documentation including chain of custody records, sample receipt notifications, certificates of analysis and laboratory QA/QC reports are provided in Appendix H.

2.6.2 Sample analysis

The number of soil, groundwater and surface water samples collected at the site and the scheduled analyses are documented in Table 6. The list of PFASs analysed in the extended suite and their respective abbreviations is provided in Table 7.

Table 6 Laboratory analytical schedule

Sample type	No. primary samples		No. QC samples		Analytical suite
	Collected	Analysed	Collected	Analysed	
Soil					
Soil borehole	58	22	5	3	PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite Total organic carbon (TOC) Cation exchange capacity (CEC) pH Electrical Conductivity (EC) Metals [1] Potassium Silica
		5	0	0	Particle size distribution (PSD)
		9	0	0	Australian Standard Leaching Procedure (ASLP) – PFAS suite
Sediment	3	3	0	0	PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite Metals[1] Total organic carbon (TOC)
Water					
Groundwater	9	9	2	2	PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite Total Dissolved Solids (TDS) Major cations and anions
Surface water	3	3	0	0	PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite Total Dissolved Solids (TDS) Major cations and anions

[1] Metal analysis included aluminium, arsenic, cadmium, chromium (III+VI), copper, iron, manganese and zinc.

Table 7 PFASs analysed within the PFAS suite

Perfluoroalkyl Sulfonic Acids	Abbreviation
Perfluorobutane sulfonic acid	PFBS
Perfluoropentane sulfonic acid	PFPeS
Perfluorohexane sulfonic acid	PFHxS
Perfluoroheptane sulfonic acid	PFHpS
Perfluorooctane sulfonic acid	PFOS
Perfluorodecane sulfonic acid	PFDS
Perfluoroalkyl Carboxylic Acids	
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
Perfluoroalkyl Sulfonamides	
Perfluorooctane sulfonamide	FOSA
N-Methyl perfluorooctane sulfonamide	MeFOSA
N-Ethyl perfluorooctane sulfonamide	EtFOSA
N-Methyl perfluorooctane sulfonamidoethanol	MeFOSE
N-Ethyl perfluorooctane sulfonamidoethanol	EtFOSE
N-Methyl perfluorooctane sulfonamidoacetic acid	MeFOSAA
N-Ethyl perfluorooctane sulfonamidoacetic acid	EtFOSAA
Fluorotelomer Sulfonic Acids	
4:2 Fluorotelomer sulfonic acid	4:2 FTS
6:2 Fluorotelomer sulfonic acid	6:2 FTS
8:2 Fluorotelomer sulfonic acid	8:2 FTS
10:2 Fluorotelomer sulfonic acid	10:2 FTS

3. Assessment criteria

The focus of the Preliminary Sampling is on PFAS, which were the target contaminants for this investigation.

The following guidelines have been adopted for the soil, sediment, groundwater and surface water assessment for this Preliminary Sampling report:

- *Australian Department of Health 2017, Health Based Guidance Values for PFAS – For use in site investigations in Australia*. Human health screening levels were developed by Food Standards Australia New Zealand (FSANZ) on behalf of the Australian Government Department of Health for concentration of PFOS/PFHxS and PFOA in drinking water and recreational water.
- *GHD (2017).* PFAS Investigation – Derivation of PFAS soil and water criteria (GHD Reference 31\34249\256856). Based on the released interim national guidance on PFAS human health toxicity reference values by FSANZ, GHD derived PFAS soil criteria to be consistent with the FSANZ toxicity review for use in Airservices' site investigations of PFAS in Australia.
- *GHD (2015). Airservices Australia, Managing PFC Contamination at Airports, Interim Contamination Management Strategy and Decision Framework* (GHD Reference 31\32279\239419). GHD developed a set of interim screening levels (ISLs) for use at federally leased airport sites. The ISLs include criteria for soils, sediments, groundwater and surface water to assess protection of human health (HISLs) and ecosystems (EISLs).

The values for the adopted screening / investigation levels from these sources are summarised in Table 8 and Table 9.

Table 8 Adopted PFAS assessment screening criteria for soil/sediment

SOIL			
Exposure Scenario	PFOS	PFOA / 8:2FtS	Source
Ecological interim screening levels (EISLs) (terrestrial)	0.373 mg/kg (95% protection) 0.91 mg/kg (residential, 80% protection, low reliability) 4.71 mg/kg (commercial / industrial, 60% protection, low reliability)	3.73 mg/kg	GHD, 2015 [UK Environmental Agency 2009]
	PFOS + Perfluorohexane sulfonic acid (PFHxS)	PFOA	Source
Health-based screening criteria (HBSC) – Recreational Public Open Space	6.0 mg/kg	48 mg/kg	GHD, 2017
HBSC - Commercial/Industrial	81 mg/kg	680 mg/kg	GHD, 2017
SOIL (Leachate)			
Due to the absence of PFAS leachate criteria, the soil ASLP-PFAS results will be compared against the adopted surface water and groundwater screening criteria instead.			

Table 9 Adopted PFAS assessment screening criteria for surface water and groundwater

SURFACE WATER				
	PFOS	PFOA / 8:2FtS	6:2FtS	Source
EISLs (toxicity effects on aquatic organisms)	6.66 µg/L	2900 µg/L	NA	Qi et al 2011 Giesy et al 2010
	PFOS + PFHxS		PFOA	Source
Health screening levels (HSLs) (consumption of fish)	0.4 ng/L (fresh water) 1.0 ng/L (marine water)		2.9 ng/L (fresh water) 8.2 ng/L (marine water)	GHD 2017
Recreational water quality value	0.7 µg/L		5.6 µg/L µg/L	Australian Department of Health 2017
GROUNDWATER				
	PFOS	PFOA / 8:2FtS	6:2FtS	Source
EISLs (toxicity effects on aquatic organisms)	6.66 µg/L	2900 µg/L	NA	Qi et al 2011 Giesy et al 2010
	PFOS + PFHxS		PFOA	Source
Drinking water quality value	0.07 µg/L		0.56 µg/L	Australian Department of Health 2017

4. Results

The following sections summarise the field observations and analytical results of the Preliminary Sampling. Sample locations are shown in Figure 2 of Appendix A. Discussion of the results has been provided in Section 6.

4.1 Soil

4.1.1 Field observations

Soil conditions were variable across the site. The soil field observations are presented in the borehole logs contained in Appendix B.

4.1.2 Analytical results

The tabulated analytical results for soil are presented in Appendix F and laboratory reports are provided in Appendix H.

Fate and transport indicators

The results of particle size distribution (PSD), physico-chemical parameters, metal/metalloids and minerals provide a snapshot of the environmental mobility of PFAS in the soil.

Particle size distribution

Five soil samples collected at various depth were analysed for particle size distribution (PSD), including MW02-3.5, MW03-1.8, MW03-3.5, SB01-3.5 and SB03-3.0. The PSD results demonstrate varying compositions of clay silt, sand, and gravel material across the site, and sand content appeared to increase as depth increased. The PSD results were generally consistent with field observations of the soil bores, some differences were observed as reflected in the borehole logs presented in Appendix B. The PSD results are summarised below:

Table 10 Summary of PSD results

Sample ID	Depth	PSD Results
MW02-3.5	3.5 mbgl	Gravel = 20% Sand = 72% Silt = 4% Clay = 4%
MW03-1.8	1.8 mbgl	Gravel = 21% Sand = 38% Silt = 18% Clay = 23%
MW03-3.5	3.5 mbgl	Gravel = 4% Sand = 61% Silt = 13% Clay = 22%
SB01-3.5	3.5 mbgl	Gravel=1% Sand = 83% Silt =7% Clay = 9%
SB03-3.0	3.0 mbgl	Sand = 13% Silt =51% Clay = 36%

Physico-chemical parameters

15 soil samples were selected for the physico-chemical parameters analysis, and the results are summarised below:

- The soil pH results ranged between pH 6.9 (MW03-1.0) to pH 8.6 (MW05-3.0), indicating a mixture of neutral and alkaline soil.
- Electrical conductivity (EC) of the analysed soil samples generally ranged between 20 µS/cm (S) to 565 µS/cm (MW05-3.0), however, two soil samples were reported with EC at 2,860 µS/cm (SB01-4.0) and 4,010 µS/cm (SB01-2.0).
- The total organic carbon (TOC) results of the soil samples ranged from less than 0.02 % (MW02-3.0) to 1.45% (SB01-2.0).
- Cation Exchangeable Capacity (CEC) of the soil samples ranged from 1.2 meq/100g (MW02-3.0) to 23.8 meq/100g (SB03-3.0).

Metals/Metalloids and minerals

The concentrations of most metals in the analysed soil samples were less than or close to the laboratory limit of reporting (LOR), with the exception of the following:

- Aluminium results ranged from 5,290 (MW02-3.0) to 22,800 mg/kg (SB03-3.0).
- Iron concentrations ranged from 4,240 mg/kg (SB01-2.0) to 45,700 mg/kg (SB03-3.0).
- Manganese concentrations ranged from 31 mg/kg (SB01-2.0) to 450 mg/kg (SB03-3.0).
- Zinc concentrations ranged from 10 mg/kg (SB01-2.0) to 81 mg/kg (SB03-3.0).
- Silica (Silicon Dioxide) in the soil bore samples ranged from 569,000 mg/kg (SB03-3.0) to 819,000 mg/kg (MW02-3.0).
- Potassium concentrations in the soil samples ranged from less than 10 mg/kg (11 samples) to 380 mg/kg (SB01-2.0).

PFASs

16 soil samples were selected for PFAS analysis and the results are summarised below:

- All measured concentrations of PFASs in the analysed soil samples were less than the adopted screening criteria.
- Nine of the 16 soil samples analysed reported detectable PFHxS and PFOS (sum of total) concentrations. The results ranged from <0.0002 mg/kg to 0.0626 mg/kg (MW03-1.0).
- All analysed samples were reported less than the laboratory LOR for 8:2 Fluorotelomer sulfonic acid (FTS).
- Four soil samples from MW03 and SB02 were reported with detectable PFOA concentrations, ranging between 0.0002 mg/kg (SB02-0.5 and SB02-3.0) and 0.0022 mg/kg (MW03-1.0)
- Nine of the samples analysed were reported with detectable PFOS concentrations, ranging between <0.0002 mg/kg in various samples to 0.0409 mg/kg (MW03-1.0).

4.1.3 Leachate results

A total of nine samples were chosen for leachate analysis using the Australian Standard Leaching Procedure (ASLP) with samples from two monitoring wells and three soil bores chosen for analysis. Leachate analysis was undertaken for the extended PFAS suite. Four of the nine samples analysed reported detectable PFAS concentrations in leachate and these four

PFOS+PFHxS concentrations exceeded the adopted health screening criteria for the consumption of fish from fresh and marine water. It should be noted that the laboratory LOR was below the guideline criteria and it is therefore possible that all the PFOS+PFHxS leachate concentrations exceed the fish consumption criteria.

Three of the reported PFOA leachate concentrations also exceeded the adopted human health criteria for the consumption of fish from fresh and marine waters. Although the remaining six concentrations were below the laboratory LOR, the LOR was again higher than the guideline values so it is possible that all the PFOA concentrations exceed the freshwater and marine water criteria for fish consumption.

4.2 Groundwater

4.2.1 Field observations and parameters

During drilling of the soil boreholes, groundwater was encountered at depths ranging from 1.5 to 2.7 mbgl.

Groundwater field physicochemical parameters (i.e. temperature, DO, pH, ORP and EC) were recorded during the sampling process and results recorded on field purging sheets, which are presented in Appendix D. The groundwater field physicochemical results are also presented in Appendix D, and are summarised as follows:

- The groundwater pH results ranged between pH 3.99 (GMW2) to pH 7.38 (EW01) indicating extremely acidic to neutral groundwater conditions.
- Field EC measurements indicated fresh to very brackish conditions, ranging from 277.6 µS/cm (GMW6) to 27,479 µS/cm (GMW2).

4.2.2 Analytical results

The tabulated analytical results of groundwater samples are provided in Appendix F, and are summarised in the following sections.

Physico-chemical parameters

- The reported TDS results of the groundwater samples ranged from 185 mg/L (GMW6) to 18,100 mg/L (GMW2), which were slightly lower than the field EC measurements.

PFASs

All groundwater samples were selected for the PFAS analysis and the results are summarised below:

- Eight of the nine groundwater sample PFOS+PFHxS concentrations have exceeded the adopted Australian Department of Health PFAS drinking water guidelines criteria (0.07 µg/L), ranging between 0.19 µg/L (MW01) and 136 µg/L (GMW6).
- All analysed samples were reported less than both laboratory LOR for 8:2 Fluorotelomer sulfonic acid (FTS) (0.05 µg/L), with the exception of GMW3 with concentration of 0.08 µg/L.
- PFOA concentrations at GMW6 and MW03, reported at 1.19 µg/L and 3.75 µg/L respectively, have exceeded the adopted Australian Department of Health PFAS drinking water guidelines criteria (0.56 µg/L).
- PFOS concentrations at GMW3 and GMW6, reported at 67 µg/L and 87.5 µg/L respectively, have exceeded the adopted Airservices EISL (toxicity effects in aquatic organisms) criteria (6.66 µg/L).

4.2.3 Groundwater levels and flow direction

Standing water levels (SWL) in the groundwater monitoring wells during this GME ranged between 0.488 m (GMW3) and 2.375 m below top of casing (ToC) (MW01).

All new monitoring wells (MW01 to MW05) were surveyed to mAHD. The survey results were used to calculate groundwater elevations at each monitoring well during gauging. The groundwater elevations are summarised in Appendix D. Groundwater elevations were used for the preparation of an inferred groundwater contour plan (Figure 5 in Appendix A).

The surveyed groundwater elevations were calculated to be between 3.10 mAHD and 4.19 mAHD. Based on the groundwater contours, groundwater in the northern part of the site generally flows towards the north-east, while the central portion appears to flow to the east.

4.3 Surface water

4.3.1 Field observations and parameters

The three surface water samples (SW01 – SW03) collected from the open drains were typically pale yellow to pale brown in colour, with low to moderate turbidity and suspended solids.

Field physico-chemical measurements indicated the following:

- pH readings of the surface water samples ranged between pH 7.03 (SW01) and pH 7.30 (SW03), indicating a neutral environment.
- Field EC measurements of the surface water indicated fresh conditions, ranging from 451.4 µS/cm (SW03) to 1087 µS/cm (SW02).

4.3.2 Analytical results

The tabulated analytical results of surface water samples are provided in Appendix F, and are summarised in the following sections.

Physico-chemical parameters

- TDS results of the surface water samples ranged from 312 mg/L (SW03) to 511 mg/L (SW01) which were slightly lower than the field EC measurements.
- Elevated TDS results were generally accompanied by relatively high sodium, calcium, magnesium, sulphate and chloride results.

PFASs

All surface water samples were selected for PFAS analysis and the results are summarised below:

- PFOS+PFHxS concentrations in samples SW01 and SW02, were reported at 0.32 µg/L and 0.19 µg/L respectively, which exceed the adopted Airservices HSL guidelines for freshwater fish consumption (0.0004 µg/L) and marine water fish consumption (0.001 µg/L). The exceedances are shown on Figure 4 in Appendix A. The LOR for PFOS+PFHxS (<0.01 µg/L) was greater than the adopted HSLs for fresh water fish consumption and marine water fish consumption and consequently the result for SW03 (<0.01 µg/L) was also reported above the adopted PFOS+PFHxS guideline.
- All analysed samples were reported less than both laboratory LOR for 8:2 Fluorotelomer sulfonic acid (FTS).

- The LOR for PFOA (<0.01 µg/L) was greater than the adopted Airservices HSL guidelines for fresh water fish consumption and marine water fish consumption. Consequently, the results for all samples were reported above the adopted PFOA guideline.
- Two of the three samples analysed reported detectable concentrations of PFOS, however there were no exceedances of the adopted criteria. The range in concentrations varied from <0.01 µg/L (SW03) to 0.11 µg/L (SW02).
- All results were below the Airservices EISL (toxicity effects in aquatic organisms) and the Australian Department of Health PFAS recreational water quality guidelines.

5. Quality assurance and quality control

A summary of the Quality Assurance and Quality Control (QA/QC) Data Quality Indicators (DQIs) used for the Preliminary Sampling and an assessment of the compliance of the data set with these QA/QC DQIs is provided in Table 11. Appendix G of this report contains further details of the QA/QC assessment program.

Table 11 Summary of QA/QC Compliance

Item	Objective	Reference	Summary of Results	Compliance
Comparison of field and analytical data	Agreement between visual and olfactory evidence with laboratory results		Field observations correspond with the laboratory results	Yes
Calibration of field instruments	Meet calibration specifications	AS4482.1-2005	Calibration certificates included Refer to Appendix I	Yes
Chain of Custody documentation	Completed		Completed in full Refer to Appendix H	Yes
Sample analysis and extraction holding times	Comply with holding times	AS4482.1-2005/NEPM (2013)	All except pH and EC in soil samples due to short holding times. Refer to Appendix H	Yes
Sample Preservation	Samples are collected in appropriately preserved containers		All criteria met	Yes
Analysis of intra-laboratory duplicate samples	1 for every 20 samples RPD 30% - 50%	AS4482.1-2005	Refer to Appendix G	Yes. One groundwater exceedances due to different analytical machinery/ method used between the two laboratories
Analysis of inter-laboratory duplicate samples	1 for every 20 samples RPD 30% - 50%	AS4482.1-2005	Refer to Appendix G	Yes.

Item	Objective	Reference	Summary of Results	Compliance
Analysis of laboratory method blanks	No contamination of blanks	NEPM (2013)	All analytes were less than the laboratory LOR for ALS	Yes
Analysis of matrix and laboratory control spikes	Recoveries within the laboratory specified recovery limits	NEPM (2013)	Outliers reported for primary laboratory groundwater samples Refer to Appendix H	MS recovery not determined, background level greater than or equal to four times spike level in two instances. Recovery less than lower data quality objective in two instances.
Analysis of laboratory surrogates	No surrogate recovery outliers	NEPM (2013)	Refer to Appendix H	Yes.
Analysis of laboratory duplicates	Frequencies and Relative Percent Differences (RPDs) within guideline and internal laboratory limits	NEPM (2013)	Outliers reported for primary laboratory soil samples Refer to Appendix H	RPD exceeds LOR based limits.

Based on the field and laboratory QA/QC program undertaken, the results indicate that the data was considered to be reasonable and of sufficient quality to meet the data quality objectives for this investigation.

6. Discussion

6.1 Summary of results

The PFAS results reported in soils and sediments were either less than laboratory LOR or at low detectable levels. All groundwater and surface water samples reported exceedances of adopted criteria (or the criteria was below the laboratory limits of reporting) with the exception of the groundwater sample MW04, in the north-western section of the site.

6.2 Sources

Primary potential sources of PFASs include the current and former fire training areas. Other sources/uses may include releases of AFFF due to spills or crash incidents in other parts of the airport.

With the cessation of use of PFAS-containing AFFF, the primary source has been removed. Potential secondary sources of PFASs remaining at the site include contaminated infrastructure (e.g. concrete pads and drains) as well as residual surface water and groundwater contamination.

6.3 Migration

A summary of the PFASs (and their carbon chain length) found in each media analysed is provided in Table 12.

Table 12 Detectable PFASs in various media at Mackay Airport

Soil (total)	*C#	Soil (ASLP)	C#	Groundwater	C#	Sediment	#C	Surface water	#C
PFBS	4	PFBS	4	PFBS	4	EtFOSAA	12	PFBS	4
PFPeS	5	4:2 FTS	4	PFBA	4	EtFOSE	12	PFPeS	5
PFHxA	6	PFPeA	5	PFPeA	5			PFHxS	6
PFHxS	6	PFPeS	5	PFPeS	5			PFOS	8
PFHpS	7	PFHxA	6	PFHxA	6				
EtFOSE	8	PFHxS	6	PFHxS	6				
PFOA	8	PFHpS	7	6:2 FTS	6				
PFOS	8	PFHpA	7	PFHpA	7				
MeFOSAA	8	PFOA	8	PFHpS	7				
		PFOS	8	8:2 FTF	8				
				PFOA	8				
				PFOS	8				
				FOSA	8				
				PFNA	9				
				PFDS	10				

6.3.1 Soil and sediment

The PFASs present in the soil samples analysed ranged from short chain (four perfluorinated carbons) to medium chain (eight perfluorinated carbons), similar to the PFASs detected in the leachate testing. Longer chain PFASs were detected in two of three sediment samples analysed (ten perfluorinated carbons).

6.3.2 Surface water

Detectable PFASs were reported in two of the three surface water samples analysed for the Preliminary Sampling program. The PFASs reported in surface water were short to medium chain (four to eight perfluorinated carbons).

6.3.3 Groundwater

Detectable PFAS concentrations were reported in the nine groundwater samples analysed in the Preliminary Sampling program – the PFASs detected ranged from short to longer chain (four to twelve perfluorinated carbons).

7. Summary

Based on the data reviewed in this study, the following summary is made:

- The primary source (use of AFFF containing PFAS) no longer exists. Secondary sources include residual soil and groundwater contamination.
- Soil and sediment results reported PFAS concentrations were either below the laboratory LOR or adopted human health and ecological guidelines, indicating that in the areas sampled, soils and sediments do not present an unacceptable risk to human health and ecological receptors.
- PFOS+PFHxS concentrations in eight of the nine samples analysed exceeded the drinking water guidelines and the PFOA concentrations in two groundwater samples (GMW6 and MW03) also exceeded the drinking water guidelines. PFOS concentrations in two samples analysed (GMW3 and GMW6) exceeded the adopted ecological screening criteria. These results indicate that groundwater may pose a potential risk to human health and ecological receptors. However, given that the site is located in an urbanised setting where council water supply is available, it is unlikely that groundwater is extracted for potable purposes.
- PFOS+PFHxS concentrations in two of the three surface water samples analysed for the Preliminary Sampling program reported concentrations exceeding the adopted criteria for consumption of fish from fresh and marine water. It should be noted that the PFOS+PFHxS and the PFOA criteria for the consumption of fish from fresh and marine waters were lower than the laboratory limits of reporting.

8. References

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CRC Care, 2017 *(Draft) Assessment, management and remediation guidance for perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA*), Technical Report 38b, May 2017.

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Qi P, Wang Y, Mu J and Wang J 2011. Aquatic predicted no-effect-concentration derivation for Perfluorooctane sulfonic acid. *Environmental Toxicology and Chemistry*. 30(4):836-842

Appendices

Appendix A – Figures

LEGEND

Airport Site Boundary

Boundary - Airside and Non Airside Areas

Paper Size A3

0 50 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Airservices Australia
Preliminary Site Investigation

Mackay Airport Site Location

Job Number 31-34249
Revision A
Date 21 Feb 2019

Figure 1

G:\31\34249\GIS\Maps\Working\Mackay\Prelim Sampling Report\001_SiteLocation_Mackay_20170628_A3P_V3_JL.mxd

180 Lonsdale Street Melbourne VIC 3000 **T** 61 3 8687 8000 **F** 61 3 8687 8111 **E** melmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery: Google Earth Pro, Imagery Date: May 2015, Date Retrieved: July 2016; Site boundary from title information: GHD 2016. Created by: jmforster

LEGEND

- Airport Site Boundary
- Boundary - Airside & Non Airside Areas
- New groundwater well
- Surface water / Sediment
- Soil bore
- Existing well - installation date unknown
- Existing well - installed in 2008 by GHD

Paper Size A3

0 80,000 160,000 320,000 480,000 640,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Airservices Australia
Preliminary Site Investigation

Mackay Airport Sampling Locations

Job Number 31-34249
Revision B
Date 20 Feb 2019

Figure 2

G:\31\34249\GIS\Maps\Working\Mackay\2019 Airport Boundary Revision\002_SamplingLocations_Mackay_20190214_A3P_V3_JF.mxd

180 Lonsdale Street Melbourne VIC 3000 **T** 61 3 8687 8000 **F** 61 3 8687 8111 **E** melmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery: Google Earth Pro, Imagery Date: May 2015, Date Retrieved: July 2016; Site boundary: Airservices, 2019; Sampling locations: GHD 2017. Created by: jmforster

GMW3		
PFHxS and PFOS (µg/L)	PFOA (µg/L)	PFOS (µg/L)
85.2	0.41	67

GMW2		
PFHxS and PFOS (µg/L)	PFOA (µg/L)	PFOS (µg/L)
0.28	<0.05	<0.05

MW05		
PFHxS and PFOS (µg/L)	PFOA (µg/L)	PFOS (µg/L)
0.85	<0.01	0.22

MW03		
PFHxS and PFOS (µg/L)	PFOA (µg/L)	PFOS (µg/L)
11.4	3.75	0.9

MW02		
PFHxS and PFOS (µg/L)	PFOA (µg/L)	PFOS (µg/L)
0.49	<0.01	0.09

MW01		
PFHxS and PFOS (µg/L)	PFOA (µg/L)	PFOS (µg/L)
0.19	<0.01	0.09

GMW6		
PFHxS and PFOS (µg/L)	PFOA (µg/L)	PFOS (µg/L)
136	1.19	87.5

EW01		
PFHxS and PFOS (µg/L)	PFOA (µg/L)	PFOS (µg/L)
11.7	0.17	6.18

	PFHxS and PFOS (µg/L)	PFOA (µg/L)	PFOS (µg/L)
EQL	0.01	0.01	0.01
Airservices EISLs (toxicity effects on aquatic organisms)		2900	6.66
Australian Department of Health - Health Based Guidances values for PFAS in Drinking Water	0.07	0.56	

LEGEND

- Airport Site Boundary
- Boundary - Airside and Non Airside Areas
- Existing well - installation date unknown
- Existing well - installed in 2008 by GHD
- New groundwater well
- Surface water / Sediment
- Soil bore

Paper Size A3

0 80,000 160,000 320,000 480,000 640,000

Metres

Horizontal Datum: GDA 1994
Grid: GCS GDA 1994

N

Airservices Australia
Preliminary Site Investigation

Mackay Airport Groundwater Exceedances

Job Number 31-34249
Revision B
Date 21 Feb 2019

Figure 3

180 Lonsdale Street Melbourne VIC 3000 **T** 61 3 8687 8000 **F** 61 3 8687 8111 **E** melmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery: Google Earth Pro, Imagery Date: May 2015, Date Retrieved: July 2016; Site boundary: Airservices, 2019; Sampling locations: GHD 2017. Created by: jmforster

G:\31\34249\GIS\Maps\Working\Mackay\2019 Airport Boundary Revision\003_GroundwaterExceedances_Mackay_20190214_A3P_V3_JF.mxd

SW02	
PFHxS and PFOS (Sum of total) (µg/L)	PFOA (µg/L)
0.19	<0.01

SW03	
PFHxS and PFOS (Sum of total) (µg/L)	PFOA (µg/L)
<0.01	**<0.01**

SW01	
PFHxS and PFOS (Sum of total) (µg/L)	PFOA (µg/L)
0.32	**<0.01**

SW02/SS02
MW04
SW03/SS02
GMW3
SB03
MW05
GMW2
SB02
MW03
MW02
SW01/SS01
MW01
GMW6
EW01
SB01

	PFHxS and PFOS (Sum of Total) (µg/L)	PFOA (µg/L)
EQL	0.01	0.01
Airservices EISLs (toxicity effects on aquatic organisms)		2900
GHD 2017 Airservices PFAS HSLs FW Fish Consumpton	**0.0004**	**0.0029**
GHD 2017 Airservices PFAS HSLs MW Fish Consumption	0.001	0.0082
FSANZ - PFAS Recreational water quality guidelines	*0.7*	*5.6*

LEGEND

- Airport Site Boundary
- Boundary - Airside and Non Airside Areas
- New groundwater well
- Surface water / Sediment
- Soil bore
- Existing well - installation date unknown
- Existing well - installed in 2008 by GHD

Paper Size A3

0 50 100 200 300 400

Metres

Horizontal Datum: GDA 1994
Grid: GCS GDA 1994

N

Airservices Australia
Preliminary Site Investigation

Mackay Airport
Surface Water Exceedances

Job Number 31-34249
Revision B
Date 21 Feb 2019

Figure 4

G:\31\34249\GIS\Maps\Working\Mackay\2019 Airport Boundary Revision\004_SurfaceWaterExceedances_Mackay_20190214_A3P_V4_JF.mxd

180 Lonsdale Street Melbourne VIC 3000 **T** 61 3 8687 8000 **F** 61 3 8687 8111 **E** melmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery: Google Earth Pro, Imagery Date: May 2015, Date Retrieved: July 2016; Site boundary: Airservices 2019; Sampling locations: GHD 2017. Created by: jmforster

LEGEND

- Airport Site Boundary
- Boundary - Airside & Non-Airside Areas
- New groundwater well
- Surface water / Sediment
- Soil bore
- Existing well - installation date unknown
- Existing well - installed in 2008 by GHD
- Inferred Groundwater Contours
- Inferred Groundwater Flow Direction

Paper Size A3

0 80,000 160,000 320,000 480,000 640,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD airservices

Airservices Australia
Preliminary Site Investigation

Mackay Airport
Groundwater Contours May 2017

Job Number 31-34249
Revision B
Date 20 Feb 2019

Figure 5

G:\31\34249\GIS\Maps\Working\Mackay\2019 Airport Boundary Revision\005_Groundwater_Contours_Mackay_20190214_A3P_JF.mxd

180 Lonsdale Street Melbourne VIC 3000 **T** 61 3 8687 8000 **F** 61 3 8687 8111 **E** melmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery: Google Earth Pro, Imagery Date: May 2015, Date Retrieved: July 2016; Site boundary: Airservices, 2016; Sampling locations: GHD 2017. Created by: JMFORSTER

Appendix B – Borehole logs

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB01

Client Airservices Australia
Project ASA PFAS Investigation - Mackay
Project No. 313424901
Site Mackay Airport
Location Boundary Rd East
Date Drilled 15/05/2017 - 17/05/2017

Drill Co. Backyard Bores
Driller M. Vousnarki
Rig Type Gemco Auger Rig
Drill Method
Total Depth (m) 4
Diameter (mm) 50

Easting
Northing
Grid Ref GDA94_MGA_zone_48
Elevation
Logged By BN
Checked By TH

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	NDD		SB01-0.2			silty SAND, fine, tan brown				0
0.2						silty CLAY, medium plasticity, brown, trace fine subangular gravel	M	F		-0.2
0.4			SB01-0.5							-0.4
0.6						silty CLAY, low plasticity, brown, with fine sand	M	S		-0.6
0.8			SB01-1.0							-0.8
1	SFA					silty CLAY, medium plasticity, dark brown grey, with fine sand	M	S		-1
1.2										-1.2
1.4										-1.4
1.6										-1.6
1.8			SB01-2.0							-1.8
2										-2
2.2										-2.2
2.4										-2.4
2.6										-2.6
2.8			SB01-3.0							-2.8
3						sandy CLAY, grey - dark grey, fine to medium sand, with silt	W	S		-3
3.2										-3.2
3.4			SB01-3.5							-3.4
3.6										-3.6
3.8			SB01-4.0							-3.8
4						Termination Depth at: 4.00 m. Target depth achieved.				-4

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB02

Client Airservices Australia
Project ASA PFAS Investigation - Mackay
Project No. 313424901
Site Mackay Airport
Location Boundary Rd East
Date Drilled 15/05/2017 - 16/05/2017

Drill Co. Backyard Bores
Driller M. Vousnarki
Rig Type Gemco Auger Rig
Drill Method
Total Depth (m) 4
Diameter (mm) 50

Easting
Northing
Grid Ref GDA94_MGA_zone_48
Elevation
Logged By BN
Checked By TH

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	NDD		SB02-0.2			GRASS				0
0.2						sandy SILT	M	S		-0.2
			SB02-0.5			clayey SILT, brown, with fine sand and trace fine to medium subangular gravel				
0.4										-0.4
0.6						silty CLAY, medium plasticity, grey, trace fine sand	M	S/F		-0.6
0.8			SB02-1.0							-0.8
1	SS					silty CLAY, medium plasticity, grey, with fine sand	M/W	F		-1
1.2										-1.2
1.4			SB02-1.5							-1.4
				▽					some bubbles noted in the water when struck	
1.6						silty CLAY, medium plasticity, grey, with fine to medium sand	M/W	F		-1.6
1.8			SB02-2.0							-1.8
2	SFA					sandy CLAY, low plasticity, grey, fine to medium sand, with silt	W	S		-2
2.2										-2.2
2.4										-2.4
2.6										-2.6
2.8			SB02-3.0							-2.8
3										-3
3.2										-3.2
3.4			SB02-3.5							-3.4
3.6										-3.6
3.8			SB02-4.0							-3.8
4						Termination Depth at: 4.00 m. Target depth achieved.				-4

Notes Backfilled with cuttings of sand and Aglime

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB03

Client Airservices Australia
Project ASA PFAS Investigation - Mackay
Project No. 313424901
Site Mackay Airport
Location Boundary Rd East
Date Drilled 15/05/2017 - 17/05/2017

Drill Co. Backyard Bores
Driller M. Vousnarki
Rig Type Gemco Auger Rig
Drill Method
Total Depth (m) 4
Diameter (mm) 50

Easting
Northing
Grid Ref GDA94_MGA_zone_48
Elevation
Logged By BN
Checked By TH

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	NDD		SB03-0.2			GRASS				
0.2						clayey SILT, low plasticity, brown, with fine sand and trace medium subangular gravel	M	S		-0.2
0.4			SB03-0.5							-0.4
0.6										-0.6
0.8			SB03-1.0							-0.8
1			QA-04							-1
	SFA					sandy CLAY, medium plasticity, grey with orange mottling, very fine sand	M	S/F		
1.2										-1.2
1.4										-1.4
1.6						sandy CLAY, medium plasticity, grey with orange mottling, fine to coarse sand, with silt	M	S		-1.6
1.8			SB03-2.0							-1.8
2						sandy CLAY, grey with red/orange mottling	W	S		-2
2.2										-2.2
2.4										-2.4
2.6										-2.6
2.8			SB03-3.0			clayey SAND, low plasticity, coarse, grey, with silt	W	S		-2.8
3						silty CLAY, high plasticity, grey with brown mottling, trace fine sand	M	F		-3
3.2										-3.2
3.4										-3.4
3.6										-3.6
3.8			SB03-4.0			silty CLAY, high plasticity, grey with brown mottling, trace fine sand	M	St		-3.8
4						Termination Depth at: 4.00 m. Target depth achieved.				-4

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW01

Client Airservices Australia
Project ASA PFAS Investigation - Mackay
Project No. 313424901
Site Mackay Airport
Location Boundary Rd East
Date Drilled 16/05/2017 - 16/05/2017

Drill Co. Backyard Bores
Driller M. Vousnarki
Rig Type Gemco Auger Rig
Drill Method
Total Depth (m) 5
Diameter (mm) 50

Easting, Northing 726541, 7656850
Grid Ref GDA94_MGA_zone_48
Elevation
Collar RL -
Logged By BN
Checked By TH

B.C.L No. N/A **Casing** Class 18 uPVC **Screen** Machine Slotted **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	NDD		MW01-0.2				GRASS				-0
0.2					Grout		SILT, low plasticity, dark brown grey, with medium sand and trace fine subangular gravel	M	D		-0.2
0.4								M	D	no sample at 0.5 mbgl due to gravel	-0.4
0.6							silty GRAVEL, fine to medium, subangular, dark grey, trace coarse gravel, with fine sand				-0.6
0.8											-0.8
1					Bentonite		GRAVEL, fine to coarse, subangular, dark grey, with silt	M	D		-1
1.2	SFA		MW01-1.2								-1.2
1.4							silty CLAY, low plasticity, grey with orange mottling and black spots of organic matter, trace white calcite, with fine sand	M	St		-1.4
1.6											-1.6
1.8			MW01-2.0								-1.8
2											-2
2.2											-2.2
2.4											-2.4
2.6											-2.6
2.8			MW01-3.0								-2.8
3			QA-03		Sand						-3
3.2							CLAY, high plasticity, grey, with fine sand and trace silt	W	S/F		-3.2
3.4											-3.4
3.6											-3.6
3.8			MW01-4.0								-3.8
4							SAND, fine to coarse, brown grey, with silt and clay	W	L		-4
4.2							sandy CLAY, low plasticity, grey, fine to coarse sand	W	F/St		-4.2
4.4											-4.4
4.6										well infilled at 4.7 mbgl due to bottom collapse	-4.6
4.8			MW01-5.0								-4.8
5											-5
5.2							Termination Depth at: 5.00 m. Target depth achieved.				-5.2

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW02

Client Airservices Australia
Project ASA PFAS Investigation - Mackay
Project No. 313424901
Site Mackay Airport
Location Boundary Rd East
Date Drilled 15/05/2017 - 17/05/2017

Drill Co. Backyard Bores
Driller M. Vousnarki
Rig Type Gemco Auger Rig
Drill Method
Total Depth (m) 4
Diameter (mm) 50

Easting, Northing 725943, 7656851
Grid Ref GDA94_MGA_zone_48
Elevation
Collar RL -
Logged By BN
Checked By TH

B.C.L No. N/A **Casing** Class 18 uPVC **Screen** Machine Slotted **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	NDD		MW02-0.2		Grout		GRASS				0
0.2							silty SAND, fine to medium, brown, with fine to medium subangular gravel	M	L		-0.2
0.4			MW02-0.5								-0.4
0.6					Bentonite		silty CLAY, low plasticity, brown grey, with medium sand	M	St		-0.6
0.8			MW02-1.0								-0.8
1	SFA						silty CLAY, low plasticity, grey with orange mottling, with fine sand	M	St		-1
1.2											-1.2
1.4											-1.4
1.6							sandy CLAY, low plasticity, grey, fine sand and trace medium sand	M	S/F		-1.6
1.8			MW02-2.0								-1.8
2											-2
2.2				▽							-2.2
2.4					Sand		SAND, grey, with silt and trace clay	W	L		-2.4
2.6											-2.6
2.8			MW02-3.0								-2.8
3											-3
3.2											-3.2
3.4			MW02-3.5								-3.4
3.6											-3.6
3.8										no sample recovery for 4.0 mbgl	-3.8
4							Termination Depth at: 4.00 m. Target depth achieved.				-4

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW03

Client Airservices Australia
Project ASA PFAS Investigation - Mackay
Project No. 313424901
Site Mackay Airport
Location Boundary Rd East
Date Drilled 15/05/2017 - 16/05/2017

Drill Co. Backyard Bores
Driller M. Vousnarki
Rig Type Gemco Auger Rig
Drill Method
Total Depth (m) 5
Diameter (mm) 50

Easting, Northing 726114, 7657353
Grid Ref GDA94_MGA_zone_48
Elevation
Collar RL -
Logged By BN
Checked By TH

B.C.L No. N/A **Casing** Class 18 uPVC **Screen** Machine Slotted **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	NDD		MW03-0.2		Grout		GRASS, with medium gravel				0
0.2							sandy SILT	M	S		-0.2
0.4			MW03-0.5				clayey SILT, brown, with fine sand and trace fine to medium subangular gravel	M	S		-0.4
0.6							silty CLAY, medium plasticity, grey brown, with trace fine to medium sand, trace white calcite	M	F		-0.6
0.8			MW03-1.0								-0.8
1	SFA				Bentonite						-1
1.2											-1.2
1.4											-1.4
1.6			MW03-1.8								-1.6
1.8			MW03-2.0								-1.8
2			QA-01				silty sandy CLAY, medium plasticity, grey with orange/red/white mottling throughout, fine to medium sand	M	F/St		-2
2.2											-2.2
2.4				▽							-2.4
2.6											-2.6
2.8			MW03-3.0								-2.8
3							sandy CLAY, low plasticity, grey with white/red mottling, fine to medium sand, trace coarse sand, with silt	W	F		-3
3.2					Sand						-3.2
3.4											-3.4
3.6											-3.6
3.8			MW03-4.0								-3.8
4											-4
4.2											-4.2
4.4			MW03-4.5								-4.4
4.6											-4.6
4.8			MW03-5.0								-4.8
5							Termination Depth at: 5.00 m. Target depth achieved.				-5
5.2											-5.2

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW04

Client Airservices Australia
Project ASA PFAS Investigation - Mackay
Project No. 313424901
Site Mackay Airport
Location Boundary Rd East
Date Drilled 16/05/2017 - 16/05/2017

Drill Co. Backyard Bores
Driller M. Vousnarki
Rig Type Gemco Auger Rig
Drill Method
Total Depth (m) 4
Diameter (mm) 50

Easting, Northing 725848, 7658200
Grid Ref GDA94_MGA_zone_48
Elevation
Collar RL -
Logged By BN
Checked By TH

B.C.L No. N/A **Casing** Class 18 uPVC **Screen** Machine Slotted **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	SFA		MW04-0.2		Grout		GRASS				0
0.2							clayey SILT, low to medium plasticity, dark brown	M	S		-0.2
0.4			MW04-0.5				silty CLAY, medium plasticity, dark brown, with trace fine sand	M	F		-0.4
0.6					Bentonite						-0.6
0.8			MW04-1.0				silty CLAY, low plasticity, grey with orange mottling, with trace fine sand	M	F		-0.8
1											-1
1.2			MW04-1.3				silty CLAY, low plasticity, grey with orange mottling, with trace fine sand, dark brown band of organic matter	M	F		-1.2
1.4			MW04-1.5				silty CLAY, low plasticity, grey with orange mottling, with fine to medium sand	M	F/St		-1.4
1.6											-1.6
1.8			MW04-2.0				silty CLAY, low plasticity, grey brown with red/orange motling, with fine sand	W	S		-1.8
2			QA-02								-2
2.2											-2.2
2.4					Sand		silty CLAY, medium plasticity, dark brown, with fine sand	W	F		-2.4
2.6							sandy CLAY, light grey brown, fine to medium sand, with silt	W	L		-2.6
2.8			MW04-3.0				silty CLAY, medium to high plasticity, grey with red/orange mottling, with fine sand	M	F/St		-2.8
3											-3
3.2											-3.2
3.4											-3.4
3.6											-3.6
3.8			MW04-4.0								-3.8
4							Termination Depth at: 4.00 m. Target depth achieved.				-4

Notes

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Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW05

Client Airservices Australia
Project ASA PFAS Investigation - Mackay
Project No. 313424901
Site Mackay Airport
Location Boundary Rd East
Date Drilled 15/05/2017 - 17/05/2017

Drill Co. Backyard Bores
Driller M. Vousnarki
Rig Type Gemco Auger Rig
Drill Method
Total Depth (m) 4
Diameter (mm) 50

Easting, Northing 726890, 7657559
Grid Ref GDA94_MGA_zone_48
Elevation
Collar RL -
Logged By BN
Checked By TH

B.C.L No. N/A **Casing** Class 18 uPVC **Screen** Machine Slotted **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	NDD		MW05-0.2		Grout		GRASS				0
0.2							silty CLAY, low plasticity, brown, with fine sand	M	F	no odour, no staining	-0.2
0.4			MW05-0.5								-0.4
0.6					Bentonite						-0.6
0.8			MW05-1.0								-0.8
1	SFA						sandy CLAY, high plasticity, grey with orange mottling, fine sand with silt	M	F/St		-1
1.2											-1.2
1.4			MW05-1.5								-1.4
1.6							sandy CLAY, high plasticity, grey with orange mottling, fine to medium sand with silt	M/W	S/F		-1.6
1.8			MW05-2.0								-1.8
2				▽							-2
2.2											-2.2
2.4			MW05-2.5		Sand		silty CLAY, high plasticity, grey with red mottling	M	St		-2.4
2.6											-2.6
2.8			MW05-3.0								-2.8
3			QA-05								-3
3.2							sandy CLAY, low plasticity, grey with orange mottling, fine to medium sand and trace coarse sand	W	S		-3.2
3.4											-3.4
3.6							clayey SAND, medium plasticity, fine to coarse, grey	W	S		-3.6
3.8			MW05-4.0								-3.8
4							Termination Depth at: 4.00 m. Target depth achieved.				-4

Notes

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Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

Appendix C – Survey data

MGA ZONE 55, AHD				
POINT	**EASTING**	**NORTHING**	**WELL**	**PVC COLLAR**
			ELEVATION	**ELEVATION**
MW01	726542.843	7656850.784	5.626	5.550
MW02	725953.499	7656832.533	5.093	5.002
MW03	726109.803	7657349.953	5.377	5.306
MW04	725851.136	7658193.700	5.094	5.010
MW05	726895.523	7657565.225	4.219	4.152

Appendix D – Groundwater gauging and purging records

Groundwater Gauging Records

Client: Airservices Australia (ASA)	**SWL Meter Type: Interface Probe**
Project :Mackay Airport PFAS Investigation - Preliminary Sampling	**Date: 22/05/2017**
Job No.: 3134249	
Location: Mackay Airport	**Sampler: B. Ng**

Location / Bore ID	Stick up (m)	SWL (mbTOC)	Time	Comment (incl confimation LNAPL thickness with clear bailer)
EW01	0.50	2.302	8:50:00 AM	
GMW1			10:00:00 AM	Well flooded in water, cannot access area
GMW2		0.925	12:11:00 PM	
GMW3		0.488	9:18:00 AM	
GMW6		1.045	10:00:00 AM	
MW01		2.375	2:47:00 PM	
MW02		1.580	7:40:00 AM	
MW03		1.115	3:30:00 PM	
MW04		1.558	10:52:00 AM	
MW05		1.145	11:20:00 AM	

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: EW01
Project Number: 3134249	
Project Name: Mackay Airport PFAS PSI	Sample ID: EW01
Client: ASA	Date: 25/05/2017 Time: 09:00
Site: Mackay Airport	Sampler: B.N
Well Condition (i.e road box, locked etc): Well cap missing. Monument cover broken	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 2.360	Sample Method: Low Flow
Depth of PSH (from TOC): -	Casing Type: uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: 9.0	Well Diameter: 50 mm
Depth to Water Table Post - purge (from TOC): 2.825	QA Collected: -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
9:05	0.0	2.460	0.64	3231	7.38	-185.5	25.8	Clear - pale yellow, low turbidity/suspended sediments
9:10	0.5	2.612	0.17	3279	7.27	-224.0	26.5	" "
9:15	1.0	2.712	0.15	3350	7.23	-231.3	26.7	" "
9:20	1.5	2.765	0.08	3289	7.20	-233.6	26.7	" "
9:25	2.0	2.792	0.14	3267	7.15	-224.3	26.9	" "
9:30	2.5	2.802	0.08	3238	7.09	-226.2	27.1	" "
9:35	3.0	2.825	0.10	3228	7.09	-221.4	27.1	" " (Sample)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: GMW2
Project Number: 3134249	
Project Name: Mackay Airport PFAS PSI	Sample ID: GMW2
Client: ASA	Date: 25/05/2017 Time:
Site: Mackay Airport	Sampler: B.N
Well Condition (i.e road box, locked etc): Gatic, water inside well	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 0.925	Sample Method: Low Flow
Depth of PSH (from TOC): -	Casing Type: uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: -	Well Diameter: 50 mm
Depth to Water Table Post - purge (from TOC): 0.935	QA Collected: -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
12:17	0.0	0.930	0.56	27426	4.43	148.0	28.2	Pale yellow, moderate turbidity/suspended sediments
13:23	0.5	0.935	0.18	27479	4.03	200.4	27.9	" "
12:28	1.5	0.935	0.16	27428	4.03	203.3	27.9	" "
12:33	2.5	0.935	0.22	27309	4.03	198.7	27.9	" "
12:38	3.5	0.935	0.27	27255	4.02	196.7	28.0	" "
12:43	4.5	0.935	0.29	27049	3.99	192.5	27.9	" " (Sample)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	
Project Number: 3134249	Borehole ID: GMW3
Project Name: Mackay Airport PFAS PSI	Sample ID: GMW3
Client: ASA	Date: 26/05/2017 Time: 09:20
Site: Mackay Airport	Sampler: B.N
Well Condition (i.e road box, locked etc): Gatic	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 0.488	Sample Method: Low Flow
Depth of PSH (from TOC): -	Casing Type: uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: -	Well Diameter: 50 mm
Depth to Water Table Post - purge (from TOC): 0.525	QA Collected: -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
9:25	0.0	0.480	1.40	1594	7.34	-21.7	27.3	Clear, no turbidity/suspended sediments
9:30	0.5	0.510	0.18	2062	6.64	-0.6	28.1	" "
9:35	1.0	0.485	0.17	2028	6.64	-5.0	26.8	" "
9:40	1.5	0.520	0.11	2066	6.60	-17.3	28.4	" "
9:45	2.0	0.530	0.11	2040	6.60	-30.4	28.3	" "
9:50	2.5	0.525	0.11	2027	6.60	-34.6	28.4	" " (Sample)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: GMW6
Project Number: 3134249	
Project Name: Mackay Airport PFAS PSI	Sample ID: GMW6
Client: ASA	Date: 25/05/2017 Time:
Site: Mackay Airport	Sampler: B.N
Well Condition (i.e road box, locked etc): Gatic	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 1.065	Sample Method: Low Flow
Depth of PSH (from TOC): -	Casing Type: uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: -	Well Diameter: 50 mm
Depth to Water Table Post - purge (from TOC): 1.075	QA Collected: QA-01

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
10:23	0.2	1.070	1.38	308.5	6.13	-17.8	25.3	Pale yellow, moderate turbidity/suspended sediments
10:27	0.5	1.070	1.29	295.4	5.97	-10.2	25.2	Pale yellow, low turbidity/suspended sediments
10:32	1.0	1.080	1.28	285.6	6.91	-4.4	25.2	" "
10:38	2.0	1.080	1.22	278.9	5.87	1.6	25.2	" "
10:45	3.0	1.070	1.18	278.4	5.87	4.2	25.3	" "
10:50	4.0	1.075	1.17	277.6	5.86	6.2	25.2	" " (Sample)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW01
Project Number: 3134249	
Project Name: Mackay Airport PFAS PSI	Sample ID: MW01
Client: ASA	Date: 25/05/2017 Time:
Site: Mackay Airport	Sampler: B.N
Well Condition (i.e road box, locked etc): Gatic	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 2.375	Sample Method: Low Flow
Depth of PSH (from TOC): -	Casing Type: uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: -	Well Diameter: 50 mm
Depth to Water Table Post - purge (from TOC): 2.380	QA Collected: -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
12:24	0.0	2.385	0.95	1872	6.68	57.2	28.3	Pale yellow, low turbidity/suspended sediments
12:30	0.5	2.380	0.59	1769	0.67	113.8	28.1	" "
12:35	1.0	2.380	0.51	1761	6.73	146.1	28.0	" "
12:40	2.0	2.380	0.48	1759	6.73	151.2	28.1	" "
12:45	2.5	2.385	0.49	1759	6.74	147.4	28.2	" "
12:50	3.0	2.380	0.48	1751	6.73	139.5	28.2	" " (Sample)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW02
Project Number: 3134249	
Project Name: Mackay Airport PFAS PSI	Sample ID: MW02
Client: ASA	Date: 26/05/2017 Time: 07:40
Site: Mackay Airport	Sampler: B.N
Well Condition (i.e road box, locked etc): Gatic	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 1.580	Sample Method: Low Flow
Depth of PSH (from TOC): -	Casing Type: uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: -	Well Diameter: 50 mm
Depth to Water Table Post - purge (from TOC): 1.583	QA Collected: QA-02

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
7:40	0.0	1.585	1.17	1120	6.70	25.7	24.7	Pale yellow, low turbidity/suspended sediments
7:52	0.5	1.585	0.89	1140	6.53	23.4	25.6	" "
7:57	1.0	1.585	0.75	1229	6.49	24.3	25.7	" "
8:02	1.5	1.585	0.64	1279	6.48	24.7	26.0	" "
8:08	2.0	1.585	0.50	1303	6.47	23.9	26.4	" "
8:13	2.5	1.585	0.45	1300	6.47	23.2	26.5	" "
8:18	3.0	1.583	0.39	1276	6.47	21.7	26.7	" " (Sample)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW03
Project Number: 3134249	
Project Name: Mackay Airport PFAS PSI	Sample ID: MW03
Client: ASA	Date: 25/05/2017 Time: 15:30
Site: Mackay Airport	Sampler: B.N
Well Condition (i.e road box, locked etc):	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 1.115	Sample Method: Low Flow
Depth of PSH (from TOC): -	Casing Type: uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: -	Well Diameter: 50 mm
Depth to Water Table Post - purge (from TOC): 1.180	QA Collected: -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
15:38	0.0	1.140	1.16	1854	6.98	80.5	26.5	Pale yellow, low turbidity/suspended sediments
15:43	0.5	1.155	0.48	1809	6.84	905.0	26.9	" "
15:51	2.0	1.170	0.42	1799	6.81	88.6	26.2	" "
15:55	2.5	1.175	0.43	1795	6.79	86.3	26.2	" "
16:00	3.0	1.180	0.44	1792	6.80	84.0	26.1	" "
16:05	3.5	1.180	0.40	1778	6.76	78.0	26.1	" " (Sample)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW04
Project Number: 3134249	
Project Name: Mackay Airport PFAS PSI	Sample ID: MW04
Client: ASA	Date: 26/05/2017 Time: 10:46
Site: Mackay Airport	Sampler: B.N
Well Condition (i.e road box, locked etc): Gatic	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 1.558	Sample Method: Low Flow
Depth of PSH (from TOC): -	Casing Type: uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50 mm
Depth to Water Table Post - purge (from TOC): 1.655	QA Collected: -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
10:57	0	1.650	2.07	1824	6.68	37.0	25.6	Clear, no turbidity/suspended sediments
11:02	0.5	1.650	1.7	1857	6.66	33.9	25.6	" "
11:07	1	1.655	1.52	1839	6.64	33.3	25.8	" "
11:12	1.5	1.660	1.34	1797	6.63	33.7	25.7	" "
11:17	2	1.660	1.16	1763	6.60	33.5	25.7	" "
11:22	2.5	1.655	1.05	1744	6.59	33.2	25.7	" " (Sample)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	Borehole ID: MW05
Project Number: 3134249	
Project Name: Mackay Airport PFAS PSI	Sample ID: MW05
Client: ASA	Date: 25/05/2017 Time: 11:30
Site: Mackay Airport	Sampler: B.N
Well Condition (i.e road box, locked etc): Gatic	Purge Method: Low Flow
Depth to Water Table Pre-purge (from TOC): 1.145	Sample Method: Low Flow
Depth of PSH (from TOC): -	Casing Type: uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC:	Well Diameter: 50 mm
Depth to Water Table Post - purge (from TOC): 1.135	QA Collected: -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
11:33	0	1.130	0.75	9778	6.75	-27.3	26.3	Pale yellow, low turbidity/suspended sediments
11:38	0.5	1.130	0.12	9933	6.93	-56.5	26.4	" "
11:43	1	1.130	0.09	9733	6.93	-64.5	26.5	" "
11:48	1.5	1.130	0.07	9582	6.93	-64.8	26.5	" "
11:53	2	1.135	0.08	9407	6.93	-64.0	26.5	" " (Sample)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

Appendix E – Sediment and surface water observation notes

Sediment Samples

Site: Mackay Airport **Date:** 25/7/2016 - 26/7/2016

Monitoring Personnel: B.Ng

Field Observations

Location	Time/ date	Comments
SS01	26/05/2017	Sandy clay, grey, fine sand, with silt, wet, soft.
SS02	25/05/2017	Clayey silt, dark brown, trace fine sand/gravel, wet, soft.
SS03	26/05/2017	Silty clay, low plasticity, dark grey, trace fine sand, wet, soft.

Surface Water Samples

Site: Mackay Airport **Date:** 25/05/2017 - 26/05/2017 **Monitoring Personnel:** B.Ng

Field Measurements

Location	Time/ date	Sample ID	DO (mg/L)	EC (µS/cm)	pH	Redox (ORP or mV)	Temp (^{o}C)	Comments)
SW01	26/05/2017	SW01	12.59	910	7.03	43.7	26.6	Pale yellow, low turbidity/suspended solids.
SW02	25/05/2017	SW02	6.89	1087	7.12	31.8	31.4	Yellow - pale brown, moderate turbidity/suspended solids.
SW03	26/05/2017	SW03	4.48	451.4	7.3	22.7	25.1	Pale brown, moderate turbidity/suspended solids, algae in water.

Appendix F – Summary tabulated results

						Exchangeable Cations with pre-	Particle Size Analysis																TOC	Cations					Inorganics										
						Magnesium/Potassium Ratio	Clay (<2 µm)	Silt (2-60 µm)	Sand (0.06-2.00 mm)	Gravel (>2mm)	Cobbles (>6cm)	+75µm	+150µm	+300µm	+425µm	+600µm	+1180µm	+2.36mm	+4.75mm	+9.5mm	+19.0mm	+37.5mm	+75.0mm	Total Organic Carbon	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Calcium/Magnesium Ratio	Exchangeable Sodium Percent	DENSITY	Electrical conductivity (lab)	pH (Final)	Moisture	pH (Lab)	Silica	Aluminium	Arsenic
						-	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	-	%	g/cm3	µS/cm	pH Units	%	pH Units	mg/kg	mg/kg	mg/kg
EQL						0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.02	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.01	1	0.1	1	0.1	100	50	5
Airservices EISLs (terrestrial) - 95% protection																																						
Airservices EISLs (terrestrial) - com./ind., 60% protection, low reliability																																						
Airservices EISLs (terrestrial) - residential, 80% protection, low reliability																																						
Airservices HBSC - Commercial/Industrial																																						
Airservices HBSC - Recreational open space																																						
Site_ID	**Location_Code**	**Sample_Depth_Range**	**Field_ID**	**Sampled_Date_Time**																																		
Mackay Airport	MW01	1.8-2	MW01-2.0	16/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.08	1.2	4.4	<0.2	3.6	9.3	0.3	38.9	-	234	-	20.6	9	569,000	22,000	<5
		2.8-3	MW01-3.0	16/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15	1.2	1.5	<0.2	0.4	3.2	0.8	13.3	-	51	-	24.6	8.8	704,000	10,300	<5
	MW02	0.3-0.5	MW02-0.5	15/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.8	-	-	-	-
		0.8-1	MW02-1.0	17/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.08	1.5	3.6	<0.2	2.6	7.7	0.4	34.2	-	455	-	20.8	8.8	612,000	22,700	<5
		2.8-3	MW02-3.0	17/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.02	0.6	0.6	<0.2	<0.2	1.2	0.9	<0.2	-	55	-	26	8.3	819,000	5290	<5
		3.3-3.5	MW02-3.5	17/05/2017	-	4	4	72	20	<1	92	89	82	73	59	34	13	4	<1	<1	<1	<1	-	-	-	-	-	-	-	-	2.59	-	-	-	-	-	-	-
	MW03	0.8-1	MW03-1.0	16/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.85	4.2	2.5	<0.1	0.5	7.4	1.7	7.5	-	58	6.9	40.6	6.8	732,000	11,400	<5
		1.6-1.8	MW03-1.8	16/05/2017	-	23	18	38	21	<1	58	54	49	45	39	28	18	13	7	<1	<1	<1	-	-	-	-	-	-	-	-	2.47	-	-	-	-	-	-	-
		2.8-3	MW03-3.0	16/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	2.2	2.3	<0.2	0.8	5.3	1	14.5	-	89	8	37.4	8.8	740,000	12,500	<5
		3.3-3.5	MW03-3.5	16/05/2017	-	22	13	61	4	<1	63	53	44	38	28	9	2	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-	2.41	-	-	-	-	-	-	-
	MW04	0-0.2	MW04-0.2	16/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.2	-	-	-	-
		1.3-1.5	MW04-1.5	16/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07	3.2	2.3	<0.2	0.5	5.9	1.4	8.4	-	514	-	15.8	7.9	697,000	10,800	<5
	MW05	0.8-1	MW05-1.0	17/05/2017	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.32	3.8	6.5	0.2	3.7	14.4	0.6	26	-	128	7.9	16.5	6.9	704,000	17,400	13
		2.8-3	MW05-3.0	17/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07	0.9	2	<0.2	2	5	0.4	41.1	-	565	8.6	20.3	9.1	710,000	12,200	<5
	SB01	1.8-2	SB01-2.0	17/05/2017	5.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.45	0.6	2.3	0.4	1.5	4.9	0.2	30.6	-	4010	8	34.1	8.2	691,000	6630	6
		3.3-3.5	SB01-3.5	17/05/2017	-	9	7	83	1	<1	81	53	12	8	6	2	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-	2.69	-	-	-	-	-	-	-
		3.8-4	SB01-4.0	17/05/2017	5.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.45	0.4	2	0.4	1.4	4.2	0.2	33.1	-	2860	7.8	39.9	8.3	727,000	14,100	12
	SB02	0.3-0.5	SB02-0.5	15/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19.1	-	-	-	-
		0.8-1	SB02-1.0	16/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	3.7	3.7	<0.2	0.5	7.9	1	6.2	-	87	-	19.2	8.4	655,000	14,900	<5
		2.8-3	SB02-3.0	16/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15	2.6	2.4	<0.2	0.5	5.5	1	8.7	-	47	8.5	23.4	8.2	700,000	13,600	<5
	SB03	0.8-1	SB03-1.0	17/05/2017	28.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	4.3	6.6	0.2	0.3	11.5	0.6	2.8	-	20	8.4	21	6.6	687,000	14,500	<5
		2.8-3	SB03-3.0	17/05/2017	46	36	51	13	<1	<1	11	9	5	3	2	<1	<1	<1	<1	<1	<1	<1	0.3	6.9	12.8	0.3	3.7	23.8	0.5	15.6	2.35	437	7.9	21.7	7.2	569,000	22,800	<5
	SS01		SS01	26/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.51	-	-	-	-	-	-	-	-	-	-	26.4	-	-	11,600	<5
	SS02		SS02	25/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.57	-	-	-	-	-	-	-	-	-	-	25	-	-	10,600	<5
	SS03		SS03	26/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	28.5	-	-	14,800	<5

Env Stds Comments
#1:GHD 2017. PFAS Investigation - Derivation of PFAS soil criteria

					Metals						PFAS																					
					Cadmium	Chromium (III+VI)	Copper	Iron	Manganese	Zinc	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid
					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	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					1	2	5	50	5	5	0.0002	0.0002	0.0002	0.0005	0.0005	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.001	0.0002	0.0002	0.0002
Airservices EISLs (terrestrial) - 95% protection																					3.73						3.73					
Airservices EISLs (terrestrial) - com./ind., 60% protection, low reliability																					3.73						3.73					
Airservices EISLs (terrestrial) - residential, 80% protection, low reliability																					**3.73**						**3.73**					
Airservices HBSC - Commercial/Industrial																	*81* [#1]										*680* [#1]					
Airservices HBSC - Recreational open space																	6										48[#1]					
Site_ID	**Location_Code**	**Sample_Depth_Range**	**Field_ID**	**Sampled_Date_Time**																												
Mackay Airport	MW01	1.8-2	MW01-2.0	16/05/2017	<1	28	33	41,000	255	70	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
		2.8-3	MW01-3.0	16/05/2017	<1	13	11	16,200	119	35	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
	MW02	0.3-0.5	MW02-0.5	15/05/2017	-	-	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
		0.8-1	MW02-1.0	17/05/2017	<1	22	20	23,800	91	35	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
		2.8-3	MW02-3.0	17/05/2017	<1	6	5	6620	49	14	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
		3.3-3.5	MW02-3.5	17/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MW03	0.8-1	MW03-1.0	16/05/2017	<1	10	9	10,000	120	16	<0.0002	<0.0002	0.001	<0.0005	<0.0005	<0.0002	0.0626	0.0018	0.0217	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0022	0.0018	<0.001	<0.0002	<0.0002	0.0012
		1.6-1.8	MW03-1.8	16/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		2.8-3	MW03-3.0	16/05/2017	<1	12	13	17,100	145	23	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.004	0.0009	0.0028	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0013	0.0006	<0.001	<0.0002	<0.0002	0.0015
		3.3-3.5	MW03-3.5	16/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MW04	0-0.2	MW04-0.2	16/05/2017	-	-	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0012	<0.0002	0.0004	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
		1.3-1.5	MW04-1.5	16/05/2017	<1	13	10	18,300	74	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MW05	0.8-1	MW05-1.0	17/05/2017	<1	17	14	23,000	33	19	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
		2.8-3	MW05-3.0	17/05/2017	<1	17	15	22,300	101	37	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
	SB01	1.8-2	SB01-2.0	17/05/2017	<1	9	<5	4240	31	10	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
		3.3-3.5	SB01-3.5	17/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		3.8-4	SB01-4.0	17/05/2017	<1	20	15	22,800	154	38	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0007	0.0006	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
	SB02	0.3-0.5	SB02-0.5	15/05/2017	-	-	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0096	<0.0002	0.0003	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
		0.8-1	SB02-1.0	16/05/2017	<1	14	14	14,300	141	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		2.8-3	SB02-3.0	16/05/2017	<1	19	16	21,500	212	37	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0163	0.0003	0.0015	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
	SB03	0.8-1	SB03-1.0	17/05/2017	<1	13	8	14,700	71	20	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
		2.8-3	SB03-3.0	17/05/2017	<1	30	37	45,700	450	81	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
	SS01		SS01	26/05/2017	<1	13	16	19,500	147	40	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
	SS02		SS02	25/05/2017	<1	10	13	20,800	1360	28	0.0003	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0008	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002
	SS03		SS03	26/05/2017	<1	13	13	12,000	83	25	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002

Env Stds Comments

#1:GHD 2017. PFAS Investigation - Derivation of PFAS soil criteria

Appendix F
Table 1
Soil Results

													Major Ions
					Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)	Potassium
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0002	0.0002	0.0002	10
Airservices EISLs (terrestrial) - 95% protection							0.373							
Airservices EISLs (terrestrial) - com./ind., 60% protection, low reliability							4.71							
Airservices EISLs (terrestrial) - residential, 80% protection, low reliability							**0.91**							
Airservices HBSC - Commercial/Industrial														
Airservices HBSC - Recreational open space														
Site_ID	**Location_Code**	**Sample_Depth_Range**	**Field_ID**	**Sampled_Date_Time**										
Mackay Airport	MW01	1.8-2	MW01-2.0	16/05/2017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<10
		2.8-3	MW01-3.0	16/05/2017	<0.0002	<0.0002	0.0003	<0.0002	<0.0005	<0.0002	<0.0002	0.0003	0.0003	<10
	MW02	0.3-0.5	MW02-0.5	15/05/2017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	-
		0.8-1	MW02-1.0	17/05/2017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<10
		2.8-3	MW02-3.0	17/05/2017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<10
		3.3-3.5	MW02-3.5	17/05/2017	-	-	-	-	-	-	-	-	-	-
	MW03	0.8-1	MW03-1.0	16/05/2017	0.0043	<0.0002	0.0409	<0.0002	<0.0005	<0.0002	<0.0002	0.0749	0.0721	<10
		1.6-1.8	MW03-1.8	16/05/2017	-	-	-	-	-	-	-	-	-	-
		2.8-3	MW03-3.0	16/05/2017	0.0033	<0.0002	0.0012	<0.0002	<0.0005	<0.0002	<0.0002	0.0116	0.011	<10
		3.3-3.5	MW03-3.5	16/05/2017	-	-	-	-	-	-	-	-	-	-
	MW04	0-0.2	MW04-0.2	16/05/2017	<0.0002	<0.0002	0.0008	<0.0002	<0.0005	<0.0002	<0.0002	0.0012	0.0012	-
		1.3-1.5	MW04-1.5	16/05/2017	-	-	-	-	-	-	-	-	-	<10
	MW05	0.8-1	MW05-1.0	17/05/2017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<10
		2.8-3	MW05-3.0	17/05/2017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	20
	SB01	1.8-2	SB01-2.0	17/05/2017	<0.0002	<0.0002	0.0005	<0.0002	<0.0005	<0.0002	<0.0002	0.0005	0.0005	380
		3.3-3.5	SB01-3.5	17/05/2017	-	-	-	-	-	-	-	-	-	-
		3.8-4	SB01-4.0	17/05/2017	<0.0002	<0.0002	0.0007	<0.0002	<0.0005	<0.0002	<0.0002	0.0013	0.0013	290
	SB02	0.3-0.5	SB02-0.5	15/05/2017	0.0004	<0.0002	0.0093	<0.0002	<0.0005	<0.0002	<0.0002	0.0102	0.0102	-
		0.8-1	SB02-1.0	16/05/2017	-	-	-	-	-	-	-	-	-	<10
		2.8-3	SB02-3.0	16/05/2017	0.0014	<0.0002	0.0148	<0.0002	<0.0005	<0.0002	<0.0002	0.0182	0.0182	<10
	SB03	0.8-1	SB03-1.0	17/05/2017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<10
		2.8-3	SB03-3.0	17/05/2017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	10
	SS01		SS01	26/05/2017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0005	<0.0002	-
	SS02		SS02	25/05/2017	<0.0002	<0.0002	0.0008	<0.0002	<0.0005	<0.0002	<0.0002	0.0011	0.0008	-
	SS03		SS03	26/05/2017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0006	<0.0002	-

Env Stds Comments
#1:GHD 2017. PFAS Investigation - Derivation of PFAS soil criteria

Appendix F
Table 2
Groundwater Results

Airservices Australia
Mackay Airport
ASA PFAS Investigation

		Inorganics	PFAS																													Alkalinity								
		Total Dissolved Solids (Filtered)	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Bicarbonate Alkalinity as CaCO3	Sulfate as SO4 - Turbidimetric (Filtered)	Calcium (Filtered)	Chloride	Magnesium (Filtered)
		mg/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	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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL		10	0.02	0.02	0.02	0.05	0.05	0.02	0.01	0.02	0.02	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01	0.01	1	1	1	1	1	1	1	1
Airservices EISLs (toxicity effects on aquatic organisms)													2900						2900								6.66														
FSANZ - PFAS Drinking water quality guideline									0.07										0.56																						
Site_ID	**Location_Code**	**Well**	**Sampled_Date_Time**																																							
Mackay Airport	EW01	EW01	25/05/2017	1630	<0.02	<0.02	0.05	<0.05	<0.05	<0.02	11.7	1.18	5.55	0.24	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.17	1.07	0.4	<0.02	<0.02	0.05	1.08	0.02	6.18	<0.02	<0.05	<0.02	<0.02	16	14.8	<1	<1	487	487	38	12	753	33
	GMW 2	GMW 2	25/05/2017	18,100	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.28	0.08	0.28	<0.05	<0.05	<0.12	<0.12	<0.12	<0.12	<0.05	<0.05	0.06	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.05	0.42	0.36	<1	<1	<1	<1	2960	516	8020	800
	GMW 6	GMW 6	25/05/2017	185	<0.02	<0.02	0.5	<0.05	<0.05	<0.02	136	4	48.3	0.95	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1.19	5.04	1.5	<0.02	<0.02	0.33	5.25	0.11	87.5	<0.02	<0.05	<0.02	<0.02	155	149	<1	<1	45	45	6	3	49	5
	GMW3	GMW3	26/05/2017	1180	<0.02	0.02	0.13	<0.05	<0.05	<0.02	85.2	1.02	18.2	0.98	0.08	<0.05	<0.05	<0.05	<0.05	0.72	0.41	1.27	0.9	<0.02	<0.02	0.21	1.97	0.03	67	0.03	<0.05	<0.02	<0.02	93	91.5	8	<1	260	252	374	8	231	11
	MW01	-	25/05/2017	976	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.19	0.02	0.1	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.09	<0.02	<0.05	<0.02	<0.02	0.21	0.21	28	<1	492	463	34	21	274	20
	MW02	-	26/05/2017	657	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.49	0.03	0.4	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.04	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.09	<0.02	<0.05	<0.02	<0.02	0.56	0.52	9	<1	280	271	25	33	242	26
	MW03	-	25/05/2017	1030	<0.02	<0.02	0.03	<0.05	<0.05	<0.02	11.4	4.47	10.5	16.2	<0.05	<0.05	<0.05	<0.05	<0.05	1.18	3.75	3.71	18.4	<0.02	<0.02	4.29	13.6	0.26	0.9	<0.02	<0.05	<0.02	<0.02	77.3	73.3	56	<1	633	577	33	21	239	21
	MW04	-	26/05/2017	979	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.05	<0.02	<0.02	0.02	0.02	<1	<1	206	206	44	67	450	40
	MW05	-	25/05/2017	5480	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.85	0.13	0.63	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.13	<0.1	<0.02	<0.02	<0.02	0.05	<0.02	0.22	<0.02	<0.05	<0.02	<0.02	1.16	1.03	44	<1	596	551	447	69	2660	104

Env Stds Comments

Table 2. GW Results.xlsm , 21/07/2017
Location_Code In('EW01' , 'MW01' , 'MW02' , 'MW03' , 'MW04' , 'MW05' , 'GMW 2' , 'GMW 6' , 'GMW3') AND

Sample_Type = 'Normal'

Appendix F
Table 2
Groundwater Results

				Major Ions				
				Anions Total	Potassium (Filtered)	Sodium (Filtered)	Cations Total	Ionic Balance
				meq/L	mg/L	mg/L	meq/L	%
EQL				0.01	1	1	0.01	0.01
Airservices EISLs (toxicity effects on aquatic organisms)								
FSANZ - PFAS Drinking water quality guideline								
Site_ID	**Location_Code**	**Well**	**Sampled_Date_Time**					
Mackay Airport	EW01	EW01	25/05/2017	31.8	27	540	27.5	7.2
	GMW 2	GMW 2	25/05/2017	288	76	4270	279	1.52
	GMW 6	GMW 6	25/05/2017	2.41	<1	46	2.56	-
	GMW3	GMW3	26/05/2017	19.5	6	369	17.5	5.38
	MW01	-	25/05/2017	18.3	2	300	15.8	7.26
	MW02	-	26/05/2017	12.9	2	164	11	8.24
	MW03	-	25/05/2017	20.1	3	323	16.9	8.58
	MW04	-	26/05/2017	17.7	2	186	14.8	9.07
	MW05	-	25/05/2017	96.2	28	1730	88	4.5

Env Stds Comments

Table 2. GW Results.xlsm , 21/07/2017
Location_Code In('EW01' , 'MW01' , 'MW02' , 'MW03' , 'MW04' , 'MW05' , 'GMW 2' , 'GMW 6' , 'GMW3') AND

Sample_Type = 'Normal'

Appendix F
Table 3
Surface Water Results

Airservices Australia
Mackay Airport
ASA PFAS Investigation

			Inorganics	PFAS																													Alkalinity				Major Io				
			Total Dissolved Solids (Filtered)	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Bicarbonate Alkalinity as CaCO3	Sulfate as SO4 - Turbidimetric (Filtered)	Calcium (Filtered)	Chloride	Magnesium (Filtered)	Anions Total
			mg/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	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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L
EQL			10	0.02	0.02	0.02	0.05	0.05	0.02	0.01	0.02	0.02	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01	0.01	1	1	1	1	1	1	1	1	0.01
Airservices EISLs (toxicity effects on aquatic organisms)														2900	0.05	0.05	0.05	0.05	0.05	2900								6.66	0.02	0.05	0.02	0.02										
GHD 2017 Airservices PFAS HSLs FW Fish Consumption										**0.0004**										**0.0029**																							
GHD 2017 Airservices PFAS HSLs MW Fish Consumption										0.001										0.0082																							
FSANZ - PFAS Recreational water quality guideline										*0.7*										*5.6*																							
Site_ID	**Location_Code**	**Sampled_Date_Time**																																									
Mackay Airport	SW01	26/05/2017	511	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	**0.32**	0.03	0.28	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**<0.01**	0.04	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	<0.05	<0.02	<0.02	0.39	0.35	13	<1	220	207	51	42	136	21	9.29
	SW02	25/05/2017	379	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	**0.19**	0.03	0.08	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**<0.01**	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.11	<0.02	<0.05	<0.02	<0.02	0.22	0.22	<1	<1	42	42	<1	15	84	4	3.21
	SW03	26/05/2017	312	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	**<0.01**	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**<0.01**	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01	<1	<1	62	62	<1	10	100	9	4.06

Env Stds Comments

Appendix F
Table 3
Surface Water Results

			ns			
			Potassium (Filtered)	Sodium (Filtered)	Cations Total	Ionic Balance
			mg/L	mg/L	meq/L	%
EQL			1	1	0.01	0.01
Airservices EISLs (toxicity effects on aquatic organisms)						
GHD 2017 Airservices PFAS HSLs FW Fish Consumption						
GHD 2017 Airservices PFAS HSLs MW Fish Consumption						
FSANZ - PFAS Recreational water quality guideline						
Site_ID	**Location_Code**	**Sampled_Date_Time**				
Mackay Airport	SW01	26/05/2017	2	109	8.62	3.78
	SW02	25/05/2017	9	47	3.35	2.19
	SW03	26/05/2017	5	56	3.8	3.26

Env Stds Comments

Appendix F
Table 4
Leachate Results

	PFAS																														
	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	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	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	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	0.02	0.02	0.02	0.05	0.05	0.02	0.01	0.02	0.02	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01	0.01
Airservices - GHD 2017 Human Health Criteria - FW Fish Consumption							0.0004										0.0029														
Airservices - GHD 2017 Human Health Criteria - MW Fish Consumption							0.001										0.0082														
Airservices EISLs (toxicity effects on aquatic organisms)-Leach											**2900**						**2900**								**6.66**						
FSANZ - PFAS Drinking water quality guideline - Leachate							*0.07*										*0.56*														
FSANZ - PFAS Recreational water quality guideline - Leachate							0.7										5.6														
Site_ID	**Location_Code**	**Sample_Depth_Range**	**Field_ID**	**Sampled_Date_Time**																												
Mackay Airport	MW03	0.8-1	MW03-1.0	16/05/2017	<0.02	<0.02	0.03	<0.05	<0.05	<0.02	*1.84*	0.03	0.48	0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	0.04	<0.1	<0.02	<0.02	0.02	0.08	<0.02	1.36	<0.02	<0.05	<0.02	<0.02	2.1	2.03
		2.8-3	MW03-3.0	16/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	*0.14*	0.03	0.1	0.11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	0.02	<0.1	<0.02	<0.02	0.06	0.11	<0.02	0.04	<0.02	<0.05	<0.02	<0.02	0.51	0.49
	MW05	0.8-1	MW05-1.0	17/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.02	<0.02	0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	0.02	0.02
		2.8-3	MW05-3.0	17/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
	SB01	1.8-2	SB01-2.0	17/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
		3.8-4	SB01-4.0	17/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
	SB02	2.8-3	SB02-3.0	16/05/2017	<0.02	<0.02	0.03	<0.05	<0.05	<0.02	*2.59*	0.04	0.43	0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.03	0.04	<0.1	<0.02	<0.02	<0.02	0.2	<0.02	2.16	<0.02	<0.05	<0.02	<0.02	2.97	2.9
	SB03	0.8-1	SB03-1.0	17/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
		2.8-3	SB03-3.0	17/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01

Env Stds Comments

Appendix F
Table 5
Soil QAQC Results

Airservices Australia
Mackay Airport
ASA PFAS Investigation

	SDG	ALSE-Brisbane 19-May-17	ALSE-Brisbane 19-May-17		ALSE-Brisbane 19-May-17	ALSE-Brisbane 19-May-17		ALSE-Brisbane 19-May-17	23-May-17	
	Field ID	MW01-3.0	QA-03	RPD	MW05-3.0	QA-05	RPD	SB03-1.0	QA 04	RPD
	Sampled Date/Time	16/05/2017 10:00	16/05/2017 10:00		17/05/2017 10:00	17/05/2017 10:00		17/05/2017 10:00	17/05/2017 10:00	
ChemName	**Units**	**EQL**								
Inorganics										
Moisture	%	1	24.6	30.2	20	20.3	18.4	10			
PFAS										
N-Ethyl perfluorooctane sulfonamidoacetic acid	mg/kg	0.0002 : 0.01 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptane sulfonic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
10:2 Fluorotelomer sulfonic acid	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
4:2 Fluorotelomer sulfonic acid	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamidoacetic acid	mg/kg	0.0002 : 0.01 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
PFHxS and PFOS (Sum of Total) - Lab Calc	mg/kg	0.0002	0.0003	<0.0002	40	<0.0002	<0.0002	0			
Perfluorobutane sulfonic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
8:2 Fluorotelomer sulfonic acid	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamide	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamidoethanol	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamide	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamidoethanol	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
6:2 Fluorotelomer Sulfonate (6:2 FTS)	mg/kg	0.0005 : 0.01 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.01	0
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentane sulfonic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorobutanoic acid	mg/kg	0.001 : 0.005 (Interlab)	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.005	0
Perfluorodecanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorododecanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorononanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002 : 0.005 (Interlab)	0.0003	<0.0002	40	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorotetradecanoic acid	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
Perfluorotridecanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroundecanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
PFAS (Sum of Total)	mg/kg	0.0002	0.0003	<0.0002	40	<0.0002	<0.0002	0			
PFAS (Sum of Total)(WA DER List)	mg/kg	0.0002	0.0003	<0.0002	40	<0.0002	<0.0002	0			

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 200 (1-10 x EQL); 50 (10-30 x EQL); 50 (> 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 F
Table 6
Water QAQC Results

	SDG	ALSE-Brisbane 30-May-17	ALSE-Brisbane 30-May-17		ALSE-Brisbane 30-May-17	30-May-17	
	Field ID	GMW 6	QA-01	RPD	MW02	QA_02	RPD
	Sampled Date/Time	25/05/2017 15:08	25/05/2017 15:08		26/05/2017 15:08	26/05/2017 15:08	
ChemName	**Units**	**EQL**						
PFAS								
N-Ethyl perfluorooctane sulfonamidoacetic acid	µg/L	0.02 : 0.05 (Interlab)	<0.02	<0.02	0	<0.02	<0.05	0
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.02 : 0.01 (Interlab)	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptane sulfonic acid	µg/L	0.02 : 0.01 (Interlab)	**0.5**	**0.9**	**57**	<0.02	<0.01	0
10:2 Fluorotelomer sulfonic acid	µg/L	0.05 : 0.01 (Interlab)	<0.05	<0.05	0	<0.05	<0.01	0
4:2 Fluorotelomer sulfonic acid	µg/L	0.05 : 0.01 (Interlab)	<0.05	<0.05	0	<0.05	<0.01	0
N-Methyl perfluorooctane sulfonamidoacetic acid	µg/L	0.02 : 0.05 (Interlab)	<0.02	<0.02	0	<0.02	<0.05	0
PFHxS and PFOS (Sum of Total) - Lab Calc	µg/L	0.01	136	143	5			
Perfluorobutane sulfonic acid	µg/L	0.02 : 0.01 (Interlab)	4	4.37	9	0.03	0.02	40
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.02 : 0.01 (Interlab)	48.3	49.9	3	0.4	0.32	22
Perfluoropentanoic acid	µg/L	0.02 : 0.01 (Interlab)	0.95	1	5	<0.02	<0.01	0
8:2 Fluorotelomer sulfonic acid	µg/L	0.05 : 0.01 (Interlab)	<0.05	<0.05	0	<0.05	<0.01	0
N-Ethyl perfluorooctane sulfonamide	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoethanol	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamide	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoethanol	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	1.19	1.35	13	<0.01	<0.01	0
Perfluoropentane sulfonic acid	µg/L	0.02 : 0.01 (Interlab)	5.04	5.27	4	0.04	0.03	29
Perfluorobutanoic acid	µg/L	0.1 : 0.05 (Interlab)	1.5	1.4	7	<0.1	<0.05	0
Perfluorodecanoic acid	µg/L	0.02 : 0.01 (Interlab)	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid	µg/L	0.02 : 0.01 (Interlab)	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptanoic acid	µg/L	0.02 : 0.01 (Interlab)	0.33	0.42	24	<0.02	<0.01	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.02 : 0.01 (Interlab)	5.25	5.46	4	<0.02	<0.01	0
Perfluorononanoic acid	µg/L	0.02 : 0.01 (Interlab)	0.11	0.12	9	<0.02	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	87.5	93.5	7	0.09	0.08	12
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02 : 0.05 (Interlab)	<0.02	<0.02	0	<0.02	<0.05	0
Perfluorotetradecanoic acid	µg/L	0.05 : 0.01 (Interlab)	<0.05	<0.05	0	<0.05	<0.01	0
Perfluorotridecanoic acid	µg/L	0.02 : 0.01 (Interlab)	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid	µg/L	0.02 : 0.01 (Interlab)	<0.02	<0.02	0	<0.02	<0.01	0
PFAS (Sum of Total)	µg/L	0.01	155	164	6			
PFAS (Sum of Total)(WA DER List)	µg/L	0.01	149	157	5			
Alkalinity								
Alkalinity (total as CaCO3)	mg/l	1 : 20 (Interlab)				280	280	0
Bicarbonate Alkalinity as CaCO3	mg/l	1 : 20 (Interlab)				271	280	3
Major Ions								
Chloride	mg/l	1				242	220	10

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 200 (1-10 x EQL); 50 (10-30 x EQL); 50 (> 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 G – QA/QC report

G. Data quality objectives and quality assurance / quality control

G.1 Data quality objectives

The data quality objectives (DQOs) and investigation strategy have been developed using the methodology discussed in NEPM Schedule B (2) *Guideline on Data Collection, Sample Design and Reporting.* The guideline nominates the implementation of the DQO process in Section 5 of AS4482.1-2005. The purpose of the DQO process is to ensure that the data collection activities are focused on collecting the information needed to make decisions, and answering the relevant questions leading up to such decisions.

The Data Quality Objectives (DQOs) establish a framework for contamination investigations which incorporates a seven stepped continuum that defines the problem at the site. A series of stages then optimises the design of the investigation. These are summarised in Table G-1 below:

Table G-1 Data quality objectives

Step		Description
1	**State the problem to be resolved**	What is the likelihood that PFAS contamination has migrated off-site via groundwater or surface water?
2	**Identify the decision/s to be made**	To address the problem set out in Step 1, the following decisions are required to achieve the task objective and to identify data gaps and additional information that may be required: • What are the potential sources of PFAS contamination at the site? • Do the concentrations of PFAS in the samples collected exceed adopted guideline criteria? • Do the results of the groundwater, surface water and soil sampling and analysis indicate there is a potential for off-site PFAS which has originated from the MackayAirport?
3	**Identify the inputs to the decision**	To inform the decisions and identify key data gaps and needs, the following information is considered necessary: • The location of potential PFAS contamination sources. • The location of existing groundwater monitoring wells with respect to potential PFAS contamination sources. • Groundwater and surface water flow pathways. • The results of the laboratory analysis of groundwater samples. • The capacity of the aquifer to attenuate migration.
4	**Define the boundaries of the study**	The study boundary comprises groundwater within the upper (unconfined) aquifer and soil and surface water within the on-site areas in the vicinity of the identified potential PFAS sources as shown in Figure 1. Off-site assessment is not proposed.

Step		Description
5	**Develop a decision rule**	The key decision rules are: Are PFASs present at concentrations above laboratory level of reporting (LOR) in boundary wells, soil and in surface water? • If NO – there is less potential for PFAS contamination to migrate off-site and the priority for conducting off-site groundwater investigations may be reduced. • If YES – there is potential for PFAS contamination to migrate off-site and the priority for conducting off-site groundwater investigations is increased. AND: Do the concentrations of PFASs in on-site samples exceed the adopted guideline criteria? • If YES – groundwater and surface water off-site is more likely to be contaminated and the priority for conducting off-site groundwater investigations is increased. • If NO – groundwater and surface water *off-site* is less likely to be contaminated and the priority for conducting off-site groundwater investigations may be reduced.
6	**Specify the tolerable limits on decision errors**	A detailed assessment of potential for sampling and measurement errors will be undertaken based on investigation scope, methodology and results. Data quality will be assessed as detailed in Schedules B2 and B3 of the ASC NEPM. Implications for data quality with respect to the task objective will be identified and discussed. Due to the margin of error associated with analytical methods, any results close to the threshold (within the margin of error either over or under) are more likely to be incorrectly considered either “contaminated” or “uncontaminated”. As targeted samples are to be collected as part of a judgemental approach, greater confidence in results will be achieved through knowledge of the site and the likely location of PFAS sources. As such, the following tolerable limits on decision making are proposed for targeted sampling locations: • For results *within* the margin of error (either above or below the threshold) the initial classification would be considered valid (unless for a chemical not considered to be a contaminant of potential concern). • Any results *above* the threshold would require further investigation and delineation to determine the size of the impact identified.
7	**Optimise the design for obtaining the data**	The sample design was optimised through: • Identification of potential PFAS sources from existing information and investigations conducted by others. • A preliminary and high level review of the likely hydraulic characteristics of the upper aquifer to estimate the groundwater flow direction and seepage velocities at various locations of the site. • A review of the surface water pathways across and leaving the site. • Installation of targeted monitoring wells. • Collection of surface water samples. • Collection of soil samples from potentially impacted areas. Soils may have the potential to runoff into surface water drains in periods of high rainfall or inundation. • Appropriate laboratory analysis methodologies. • Evaluation and interpretation of results with respect to relevant guidelines.

G.2 Field QA/QC

A series of QA/QC procedures were implemented for the field investigation works, which included:

- Collection of QC Samples
- Use of standard sampling procedures
- Use of standard field sampling forms, including Chain of Custodies (COCs)
- Documenting the calibration and use of field equipment.

All field works were conducted by a GHD environmental scientist in accordance with GHD's *Standard Field Operating Procedures* (SFOP).

G.2.1 QA/QC sampling

Field QA/QC samples were collected and analysed. Field QC sampling was conducted in reference to AS 4482.1: 2005 and NEPM 2013 Schedule B (3) requirements and included the analyses of the following types of samples in Table G-2.

Table G-2 Field QA/QC sample details

Field QA/QC sample type	Details
Intra-Laboratory Duplicate (Blind)	Comprise a single sample that is divided into two separate sampling containers. Both samples are sent anonymously to the primary project laboratory. Blind duplicates provide an indication of the analytical precision of the laboratory, but are inherently influenced by other factors such as sampling techniques and sample media heterogeneity.
Inter-Laboratory Duplicate (Split)	Inter-Laboratory Duplicate (Split) samples are two separate samples collected at the same location and analysed by two separate laboratories to determine the analytical proficiency of the primary laboratory.

GHD adopts the AS4482.1 acceptance criteria of 30% and 50% RPD for field duplicates of inorganics and organics, respectively. Blind duplicate and split samples should have RPDs less than the criteria in each instance. However, it is noted that the criteria will not always be achieved, particularly in heterogeneous materials, or at low analyte concentrations.

In the instance where samples and their corresponding duplicates have concentrations of target analytes less than the laboratory LOR, no quantitative comparison can be carried out and therefore the RPD is undefined. This is also the case for situations where the sample result is less than ten times the laboratory LOR.

Duplicate and split sample results and Relative Percentage Difference (RPD) calculations are presented in Appendix F.

G.2.2 Sample handling and preservation

All soil samples were collected by hand, using single use nitrile gloves between each sample, and placed directly into pre-treated laboratory supplied jars and bags. The samples were placed immediately into a chilled esky for storage while on site and upon completion of site works the sealed esky was delivered, via courier, to the laboratory.

Groundwater samples were collected using disposable equipment and transferred to the laboratory-supplied applicable sample bottles. Surface water samples were collected using laboratory supplied applicable sample bottles. Samples were placed directly into the chilled esky and delivered upon return from site to the laboratory.

All samples were received intact as per the Sample Receipt Notification (included in Appendix H).

G.2.3 Holding Times

Most of the samples were analysed within the laboratory recommended holding times, except for the pH and EC of soil samples, where pH was overdue by 1 or 2 days, and EC by 1 or 2 days. This is due to the short holding times of the analyte.

G.2.3 Chain of custody

Unique Chain of Custody documentation and distinct batch numbers accompany all sample batches. This documentation is included in Appendix H.

G.3 Laboratory QA/QC

The laboratories subcontracted by GHD to analyse samples (ALS and Eurofins MGT) are certified by the NATA for the required analysis. NATA certification provides for laboratory QA procedures to be in place and to be carried out on an on-going basis.

As part of the NATA requirements, the laboratories carried out and reported analysis of laboratory quality control samples, such as:

- Duplicate samples (the same sample analysed more than once)
- Blanks (containing none of the analytes to be analysed)
- Spiked samples (containing known additions of the analytes to appropriate matrices)
- Standard samples (samples containing known concentrations of the analytes - also known as reference standards).

G.3.1 Laboratory QA/QC procedures

As part of NATA requirements, the laboratories incorporated a range of QA methods to ensure accuracy of data. This includes the analyses of internal laboratory QC samples, details of which have been provided in Table G-3.

Table G-3 Laboratory QC sample details

Laboratory QA/QC sample	Details
Laboratory (Method) Blank	Usually an organic or aqueous solution that is as free as possible of analytes of interest to which is added all the reagents, in the same volume, as used in the preparation and subsequent analysis of the samples. The reagent blank is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample.
Laboratory Control Sample	A reference standard of known concentration is analysed along with a batch of samples. The Laboratory Control Sample provides an indication of the analytical accuracy and the precision of the test method and is used for inorganic analyses.
Laboratory Spike	An authentic field sample is 'spiked' by adding an aliquot of known concentration of the target analyte(s) prior to sample extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques. Spiked samples will be analysed for each batch where samples are analysed for organic chemicals of concern.

Laboratory QA/QC sample	Details
Surrogate Samples	These are organic compounds which are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time), but which are not normally found in environmental samples. These surrogate compounds are 'spiked' into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques prior to sample extraction. Surrogate Standard / Spikes provide a means of checking that no gross errors have occurred during any stage of the test method leading to significant analyte loss.
Laboratory Duplicates	The analytical laboratory collects duplicate sub samples from one sample submitted for analytical testing at a rate equivalent to one in twenty samples per analytical batch, or one sample per batch if less than twenty samples are analysed in a batch. A laboratory duplicate provides data on the analytical precision and reproducibility of the test result. The precision of analysis performed by the laboratory is determined by the calculation of the relative percent difference (RPD). The RPD is calculated based on a comparison of an intra-laboratory split of the sample material with results representing the percent difference between the two sample concentrations for a specific contaminant. The RPD is calculated using the following formula: $RPD(\%) = \frac{\lvert C_o - C_d \rvert}{C_o + C_d} \times 200$ Where Co = Analyte concentration of the original sample Cd = Analyte concentration of the duplicate sample

The laboratory is required to provide this information to GHD. The individual analytical laboratories conduct an assessment of the laboratory QC program internally; however, the results are also reviewed and assessed by GHD.

G.4 Field QC results

The field QC results discussion below considered all the soil, groundwater and surface water samples collected as part of the investigation stage for the Mackay site.

G.4.1 Soil

A total of 58 soil samples were collected and 22 were analysed during the site sampling program. Three of five soil QC samples collected (including two intra-laboratory and one inter-laboratory samples) were analysed as part of the field work program. The target frequency for collection and analysis of field QC samples is 1 in 20 (5%). In this instance, this frequency was achieved for analysis (14%) and collection (9%).

Field QC samples collected are provided in the Table G-4.

Table H-4 Analysed field QC samples for soil

QA sample ID	QA/QC sample	Primary sample
QA-03	Intra-laboratory	MW01-3.0
QA-04	Inter-laboratory	SB03-1.0
QA-05	Intra-laboratory	MW05-3.0

RPDs were calculated between the duplicate results. All RPD results were within the adopted data quality objectives.

G.4.2 Groundwater/surface water

A total of 12 water samples (groundwater and surface water) were submitted as part of the groundwater and surface water investigations at Mackay Airport.

One field duplicate (intra-laboratory) and one split (inter-laboratory) samples were collected and analysed as part of the investigation. The target frequency for analysis of field QC samples is 1 in 20 (5%). In this instance, this frequency was achieved for analysis (17%).

The field QC sample collected are provided in the Table G-5.

Table G-5 Analysed field QC samples for groundwater/surface water

QA sample	QA/QC sample	Primary sample
QA-01	Intra-laboratory	GMW6
QA-02	Inter-laboratory	MW02

RPDs were calculated between the duplicate results. All RPD results were within the adopted data quality objectives, with the exception of the RPDs outlined in Table H-6.

Table G-6 RPD results outside of data quality limits

Primary & QA Pair	Analyte	Primary (µg/L)	QA/QC (µg/L)	RPD (%)
GMW6 & QA-01	Perfluoroheptane sulfonic acid	0.5	0.9	57

The primary and secondary laboratory results of the Perfluoroheptane sulfonic acid had different LORs, which could be due to the different methods and analytical equipment used for the analysis at both laboratories. As most PFAS results RPD are within the acceptable limits and both set of results were less than adopted criteria, the results are considered to be valid for this assessment.

G.5 Laboratory program

The NATA certified laboratories utilised for this assessment (ALS and Eurofins MGT) undertook their own internal quality assurance and quality control procedures for sample analysis. GHD has reviewed the internal laboratory control data provided within the laboratory reports, which are provided in Appendix H.

All of the internal laboratory QA QC analysis, including method blanks, control samples, laboratory spikes and surrogate's spikes was within the data quality criteria, with the exceptions summarised in the following Table G-7.

Table G-7 Laboratory QA/QC outlier's summary

Types	Laboratory Reports	Analytes	Reasons
Laboratory Duplicate RPDs	EB1710304 (Soil)	Iron	RPD exceeds LOR based limits.
		Manganese	
Matrix Spike	EB1710916 (Water)	Perfluorohexane sulfonic acid (PFHxS) Perfluorooctane sulfonic acid (PFOS)	MS recovery not determined, background level greater than or equal to four times spike level
		Perfluorotetradecanoic acid (PFTeDA) 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Recovery less than lower data quality objective
Holding Time	EB1710304 (Soil)	pH Conductivity	1 – 2 days overdue

G.6 Overall assessment of data quality

With the exception of the non-conformances listed above, the majority of the GHD QA/QC parameters were within the specified requirements, therefore the data is considered to be valid and of sufficient quality for the purposes of this Preliminary Sampling report.

Appendix H – Laboratory reports

Melbourne
3-5 Kingston Town Close
Oakleigh Vic 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 18217

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**GHD Pty Ltd QLD**
Contact name:	Therese. Hammond
Project name:	ASA MACKAY
Project ID:	313424901
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	May 23, 2017 10:15 AM
Eurofins | mgt reference:	**547161**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt Sample Receipt : 11.7 degrees Celsius.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Mary Makarios on Phone : +61 3 8564 5000 or by e.mail: MaryMakarios@eurofins.com

Results will be delivered electronically via e.mail to Therese. Hammond - Therese.Hammond@ghd.com.

eurofins | mgt

ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
2-5 Kingston Town Close
Oakleigh VIC 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 18217

Company Name:	GHD Pty Ltd QLD	**Order No.:**		**Received:**	May 23, 2017 10:15 AM
Address:	145 Ann Street Brisbane QLD 4000	**Report #:**	547161	**Due:**	May 30, 2017
		Phone:	07 3316 3000	**Priority:**	5 Day
		Fax:	07 3316 3333	**Contact Name:**	Therese. Hammond
Project Name:	ASA MACKAY				
Project ID:	313424901				

Eurofins | mgt Analytical Services Manager : Mary Makarios

Sample Detail						Moisture Set	Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 18217							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	QA_04	May 17, 2017		Soil	B17-My21476	X	X
Test Counts						1	1

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD Pty Ltd
OFFICE: Brisbane
PROJECT: ASA Mackay
ORDER NUMBER: 313424901
PROJECT MANAGER: Therese Hammond — **CONTACT PH:** 0481 715 953
SAMPLER: Bernice Ng — **SAMPLER MOBILE:** 0437 500 717
COC emailed to ALS? (YES / NO) — **EDD FORMAT (or default):** Esdat
Email Reports to (will default to PM if no other addresses are listed): Bernice.Ng@ghd.com; Therese.Hammond@ghd.com
Email Invoice to (will default to PM if no other addresses are listed): Therese.Hammond@ghd.com

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

ALS QUOTE NO.: GHD national quote 2016

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

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

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
[signature]	[signature]	[signature]	OTW
DATE/TIME: 18/5/17	DATE/TIME: 18/5/17 11.30	DATE/TIME: 18/5/17 15.30	DATE/TIME: 19/5/17 10:00

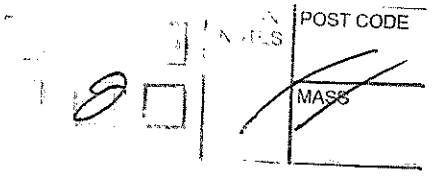
D.Brady 23/5/17 8:15

MAM 23/5/17

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS extended suite	Total Organic Carbon	Particle size distribution + Clay %	Cation Exchange Capacity (pH and EC depends)	Metals*	Potassium	Silica	ASLP - PFAS Suite	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
61	QA-03	16/5/17	S			✓								*Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
*	QA-04	17/5/17	S			✓								
62	QA-05	17/5/17	S			✓								
			S											*
			S											Forward
			S											QA-04 to
			S											Eurofins
			S											
			S											
			S											
			S											
			S											
				TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.



10 : 15 am

12.4
12.2
10.4
11.67

eurofins | mgt

Certificate of Analysis

GHD Pty Ltd QLD
145 Ann Street
Brisbane
QLD 4000

Attention: **Therese. Hammond**

Report **547161-S**
Project name ASA MACKAY
Project ID 313424901
Received Date May 23, 2017

Client Sample ID			**QA_04**
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**B17-My21476**
Date Sampled			**May 17, 2017**
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)	5	ug/kg	< 5
Perfluoropentanoic acid (PFPeA)	5	ug/kg	< 5
Perfluorohexanoic acid (PFHxA)	5	ug/kg	< 5
Perfluoroheptanoic acid (PFHpA)	5	ug/kg	< 5
Perfluorooctanoic acid (PFOA)	5	ug/kg	< 5
Perfluorononanoic acid (PFNA)	5	ug/kg	< 5
Perfluorodecanoic acid (PFDA)	5	ug/kg	< 5
Perfluoroundecanoic acid (PFUnA)	5	ug/kg	< 5
Perfluorododecanoic acid (PFDoA)	5	ug/kg	< 5
Perfluorotridecanoic acid (PFTrDA)	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA)	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	126
13C5-PFPeA (surr.)	1	%	138
13C5-PFHxA (surr.)	1	%	141
13C4-PFHpA (surr.)	1	%	130
13C8-PFOA (surr.)	1	%	132
13C5-PFNA (surr.)	1	%	131
13C6-PFDA (surr.)	1	%	134
13C2-PFUnDA (surr.)	1	%	135
13C2-PFDoDA (surr.)	1	%	140
13C2-PFTeDA (surr.)	1	%	126
Perfluoroalkane sulfonamides (PFASAs)			
Perfluorooctane sulfonamide (FOSA)	5	ug/kg	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	5	ug/kg	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	5	ug/kg	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	5	ug/kg	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	5	ug/kg	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	10	ug/kg	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	10	ug/kg	< 10
13C8-FOSA (surr.)	1	%	114
D3-N-MeFOSA (surr.)	1	%	131
D5-N-EtFOSA (surr.)	1	%	155
D7-N-MeFOSE (surr.)	1	%	111

Client Sample ID			QA_04
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**B17-My21476**
Date Sampled			**May 17, 2017**
Test/Reference	LOR	Unit	
Perfluoroalkane sulfonamides (PFASAs)			
D9-N-EtFOSE (surr.)	1	%	116
D5-N-EtFOSAA (surr.)	1	%	142
D3-N-MeFOSAA (surr.)	1	%	154
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)	5	ug/kg	< 5
Perfluoropentanesulfonic acid (PFPeS)	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS)	5	ug/kg	< 5
Perfluoroheptanesulfonic acid (PFHpS)	5	ug/kg	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	< 5
Perfluorodecanesulfonic acid (PFDS)	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	136
18O2-PFHxS (surr.)	1	%	128
13C8-PFOS (surr.)	1	%	141
n:2 Fluorotelomer sulfonic acids			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	5	ug/kg	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	10	ug/kg	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	5	ug/kg	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	5	ug/kg	< 5
13C2-4:2 FTS (surr.)	1	%	148
13C2-6:2 FTS (surr.)	1	%	135
13C2-8:2 FTS (surr.)	1	%	167
% Moisture	1	%	19

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluorinated Alkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	May 26, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonamides (PFASAs)	Brisbane	May 26, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)	Brisbane	May 26, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
n:2 Fluorotelomer sulfonic acids	Brisbane	May 26, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
% Moisture	Brisbane	May 23, 2017	14 Day
- Method: LTM-GEN-7080 Moisture			

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NATA # 1261 Site # 18217

Brisbane
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NATA # 1261 Site # 20794

Perth
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Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 18217

Company Name: GHD Pty Ltd QLD
Address: 145 Ann Street
Brisbane
QLD 4000

Project Name: ASA MACKAY
Project ID: 313424901

Order No.:
Report #: 547161
Phone: 07 3316 3000
Fax: 07 3316 3333

Received: May 23, 2017 10:15 AM
Due: May 30, 2017
Priority: 5 Day
Contact Name: Therese. Hammond

Eurofins | mgt Analytical Services Manager : Mary Makarios

Sample Detail						Moisture Set	Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 18217							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	QA_04	May 17, 2017		Soil	B17-My21476	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkane sulfonamides (PFASAs)							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	109			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	108			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	109			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	107			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	110			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	109			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	111			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	%	110			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	%	112			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	102			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	118			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonamides (PFASAs)							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorooctane sulfonamide (FOSA)	%	113			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	116			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	118			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	117			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	121			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	117			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	119			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	111			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	107			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	108			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	108			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	108			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	104			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	%	120			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	%	141			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	%	114			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	%	135			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M17-My20779	NCP	%	112			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M17-My20779	NCP	%	113			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M17-My20779	NCP	%	111			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M17-My20779	NCP	%	111			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M17-My20779	NCP	%	110			50-150	Pass	
Perfluorononanoic acid (PFNA)	M17-My20779	NCP	%	115			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M17-My20779	NCP	%	115			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	M17-My20779	NCP	%	117			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	M17-My20779	NCP	%	115			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M17-My20779	NCP	%	106			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M17-My20779	NCP	%	120			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonamides (PFASAs)				Result 1					
Perfluorooctane sulfonamide (FOSA)	M17-My20779	NCP	%	112			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M17-My20779	NCP	%	123			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M17-My20779	NCP	%	126			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M17-My20779	NCP	%	126			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M17-My20779	NCP	%	118			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M17-My20779	NCP	%	122			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M17-My20779	NCP	%	113			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorobutanesulfonic acid (PFBS)	M17-My20779	NCP	%	112			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M17-My20779	NCP	%	115			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M17-My20779	NCP	%	97			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M17-My20779	NCP	%	115			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M17-My20779	NCP	%	52			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M17-My20779	NCP	%	105			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	M17-My20779	NCP	%	119			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	M17-My20779	NCP	%	139			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	M17-My20779	NCP	%	120			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	S17-My18126	NCP	%	140			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M17-My23201	NCP	ug/kg	7.2	7.1	1.0	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M17-My23201	NCP	ug/kg	9.7	8.6	12	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnA)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoA)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkane sulfonamides (PFASAs)				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M17-My23201	NCP	ug/kg	< 5		4.0	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M17-My23201	NCP	ug/kg	< 5		<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M17-My23201	NCP	ug/kg	< 5		<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M17-My23201	NCP	ug/kg	< 5		<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M17-My23201	NCP	ug/kg	< 5		<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M17-My23201	NCP	ug/kg	< 10		<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M17-My23201	NCP	ug/kg	< 10		<1	30%	Pass	

Duplicate									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M17-My23201	NCP	ug/kg	6.2	6.0	3.0	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M17-My23201	NCP	ug/kg	30	29	4.0	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	M17-My23201	NCP	ug/kg	77	77	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	M17-My23201	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	P17-My19054	NCP	%	17	18	4.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds. Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Mary Makarios	Analytical Services Manager
Bryan Wilson	Senior Analyst-Metal (QLD)
Jonathon Angell	Senior Analyst-Inorganic (QLD)
Jonathon Angell	Senior Analyst-Organic (QLD)

Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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NATA # 1261 Site # 20794

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NATA # 1261 Site # 18217

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**GHD Pty Ltd QLD**
Contact name:	Therese. Hammond
Project name:	ASA
Project ID:	3134249
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	May 30, 2017 3:20 PM
Eurofins | mgt reference:	**548258**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt Sample Receipt : 11.3 degrees Celsius.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☑ Sample containers for volatile analysis received with zero headspace.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Mary Makarios on Phone : +61 3 8564 5000 or by e.mail: MaryMakarios@eurofins.com

Results will be delivered electronically via e.mail to Therese. Hammond - Therese.Hammond@ghd.com.

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Site # 1254 & 14271

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NATA # 1261 Site # 18217

Brisbane
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NATA # 1261 Site # 20794

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NATA # 1261
Site # 18217

Company Name: GHD Pty Ltd QLD
Address: 145 Ann Street
Brisbane
QLD 4000

Project Name: ASA
Project ID: 3134249

Order No.:
Report #: 548258
Phone: 07 3316 3000
Fax: 07 3316 3333

Received: May 30, 2017 3:20 PM
Due: Jun 6, 2017
Priority: 5 Day
Contact Name: Therese. Hammond

Eurofins | mgt Analytical Services Manager : Mary Makarios

Sample Detail						Total Alkalinity (as CaCO3)	Total Dissolved Solids	Major Anions	Major Cations	Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	
Sydney Laboratory - NATA Site # 18217										
Brisbane Laboratory - NATA Site # 20794										X
Perth Laboratory - NATA Site # 18217										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	QA_02	May 26, 2017		Water	B17-My30453	X	X	X	X	X
Test Counts						1	1	1	1	1

CHAIN OF CUSTODY

ALS Laboratory: please tick →

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENTS: ☑ Standard TAT (List due date):
OFFICE: Brisbane	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):
PROJECT: ASA	ALS QUOTE NO.: GHD national quote 2016
ORDER NUMBER: 3134249	
PROJECT MANAGER: Therese Hammond	CONTACT PH: 0481 715 953
SAMPLER: Bernice Ng	SAMPLER MOBILE: 0437 500 717
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat
Email Reports to (will default to PM if no other addresses are listed):	Bernice.Ng@ghd.com, Therese.Hammond@ghd.com
Email Invoice to (will default to PM if no other addresses are listed):	Therese.Hammond@ghd.com

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Bernice Ng	[signature]	[signature]	[signature]
DATE/TIME: 26/5/17	DATE/TIME: 26/5/17 13:50pm	DATE/TIME: 29/5/17 15:00pm	DATE/TIME: 30/5/17 3:20

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS Full Suite	Major Ions Alkalinity	Total Dissolved Solids	Total organic Carbon	8 Metals*				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	SS03	26/5/17	S			✓			✓	✓				*Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn.
14	SW01	26/5/17	W			✓	✓	✓						
15	SS01	26/5/17	S			✓			✓	✓				
16	QA-01	25/5/17	W			✓	✓	✓						→ Forward to Eurofins MGT.
17	QA-02	26/5/17	W			✓	✓	✓						
			S											
			S											
			S											
			S											
			S											
			S											
			S											
			S		TOTAL									

ORIGIN: MACKAY

7995

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

			# CON NOTES	POST CODE
	CN	HD		
AP				MASS

3:20pm

13.2
11.0
9.8
11.33

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Certificate of Analysis

GHD Pty Ltd QLD
145 Ann Street
Brisbane
QLD 4000

NATA Accredited
Accreditation Number 1261
Site Number 20794

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Therese. Hammond**

Report **548258-W**
Project name ASA
Project ID 3134249
Received Date May 30, 2017

Client Sample ID			**QA_02**
Sample Matrix			**Water**
Eurofins | mgt Sample No.			**B17-My30453**
Date Sampled			**May 26, 2017**
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)	0.05	ug/L	< 0.05
Perfluoropentanoic acid (PFPeA)	0.01	ug/L	< 0.01
Perfluorohexanoic acid (PFHxA)	0.01	ug/L	< 0.01
Perfluoroheptanoic acid (PFHpA)	0.01	ug/L	< 0.01
Perfluorooctanoic acid (PFOA)	0.01	ug/L	< 0.01
Perfluorononanoic acid (PFNA)	0.01	ug/L	< 0.01
Perfluorodecanoic acid (PFDA)	0.01	ug/L	< 0.01
Perfluoroundecanoic acid (PFUnA)	0.01	ug/L	< 0.01
Perfluorododecanoic acid (PFDoA)	0.01	ug/L	< 0.01
Perfluorotridecanoic acid (PFTrDA)	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTeDA)	0.01	ug/L	< 0.01
13C4-PFBA (surr.)	1	%	54
13C5-PFPeA (surr.)	1	%	55
13C5-PFHxA (surr.)	1	%	68
13C4-PFHpA (surr.)	1	%	69
13C8-PFOA (surr.)	1	%	68
13C5-PFNA (surr.)	1	%	58
13C6-PFDA (surr.)	1	%	43
13C2-PFUnDA (surr.)	1	%	33
13C2-PFDoDA (surr.)	1	%	31
13C2-PFTeDA (surr.)	1	%	22
Perfluoroalkane sulfonamides (PFASAs)			
Perfluorooctane sulfonamide (FOSA)	0.05	ug/L	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	0.05	ug/L	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	0.05	ug/L	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	0.05	ug/L	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	0.05	ug/L	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	33
D3-N-MeFOSA (surr.)	1	%	25
D5-N-EtFOSA (surr.)	1	%	26
D7-N-MeFOSE (surr.)	1	%	26

Client Sample ID			QA_02
Sample Matrix			**Water**
Eurofins | mgt Sample No.			**B17-My30453**
Date Sampled			**May 26, 2017**
Test/Reference	LOR	Unit	
Perfluoroalkane sulfonamides (PFASAs)			
D9-N-EtFOSE (surr.)	1	%	22
D5-N-EtFOSAA (surr.)	1	%	62
D3-N-MeFOSAA (surr.)	1	%	61
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)	0.01	ug/L	0.02
Perfluoropentanesulfonic acid (PFPeS)	0.01	ug/L	[N09]0.03
Perfluorohexanesulfonic acid (PFHxS)	0.01	ug/L	[N09]0.32
Perfluoroheptanesulfonic acid (PFHpS)	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]0.08
Perfluorodecanesulfonic acid (PFDS)	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	71
18O2-PFHxS (surr.)	1	%	69
13C8-PFOS (surr.)	1	%	43
n:2 Fluorotelomer sulfonic acids			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	0.05	ug/L	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	0.01	ug/L	< 0.01
13C2-4:2 FTS (surr.)	1	%	130
13C2-6:2 FTS (surr.)	1	%	119
13C2-8:2 FTS (surr.)	1	%	75
Ammonia (as N)	0.01	mg/L	0.01
Chloride	1	mg/L	220
Nitrate (as N)	0.02	mg/L	< 0.02
Sulphate (as S)	5	mg/L	8.1
Total Dissolved Solids	10	mg/L	590
Alkalinity (speciated)			
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	280
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10
Total Alkalinity (as CaCO3)	20	mg/L	280
Alkali Metals			
Calcium	0.5	mg/L	22
Magnesium	0.5	mg/L	18
Potassium	0.5	mg/L	2.5
Sodium	0.5	mg/L	140

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluorinated Alkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	May 30, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonamides (PFASAs)	Brisbane	May 30, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)	Brisbane	May 30, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
n:2 Fluorotelomer sulfonic acids	Brisbane	May 30, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Major Cations			
Ammonia (as N)	Melbourne	Jun 01, 2017	28 Day
- Method: APHA 4500-NH3 Ammonia Nitrogen by FIA			
Alkali Metals	Melbourne	Jun 01, 2017	180 Day
- Method: USEPA 6010 Alkali Metals			
Major Anions			
Chloride	Melbourne	Jun 01, 2017	28 Day
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Nitrate (as N)	Melbourne	Jun 01, 2017	7 Day
- Method: APHA 4500-NO3 Nitrate Nitrogen by FIA			
Sulphate (as S)	Melbourne	Jun 01, 2017	28 Day
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Melbourne	Jun 01, 2017	14 Day
- Method: APHA 2320 Alkalinity by Titration			
Total Dissolved Solids	Melbourne	Jun 01, 2017	7 Day
- Method: LM-LTM-INO-4110 (Total Dissolved Solids @ 178°C - 182°C)			

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NATA # 1261 Site # 18217

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NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
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Phone : +61 8 9251 9600
NATA # 1261
Site # 18217

Company Name: GHD Pty Ltd QLD
Address: 145 Ann Street
Brisbane
QLD 4000

Project Name: ASA
Project ID: 3134249

Order No.:
Report #: 548258
Phone: 07 3316 3000
Fax: 07 3316 3333

Received: May 30, 2017 3:20 PM
Due: Jun 6, 2017
Priority: 5 Day
Contact Name: Therese. Hammond

Eurofins | mgt Analytical Services Manager : Mary Makarios

Sample Detail						Total Alkalinity (as CaCO3)	Total Dissolved Solids	Major Anions	Major Cations	Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	
Sydney Laboratory - NATA Site # 18217										
Brisbane Laboratory - NATA Site # 20794										X
Perth Laboratory - NATA Site # 18217										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	QA_02	May 26, 2017		Water	B17-My30453	X	X	X	X	X
Test Counts						1	1	1	1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkane sulfonamides (PFASAs)							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Chloride	mg/L	< 1			1	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Sulphate (as S)	mg/L	< 5			5	Pass	
Total Dissolved Solids	mg/L	< 10			10	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO3)	mg/L	< 10			10	Pass	
Total Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	76			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	79			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	76			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	76			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	78			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	75			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	78			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	%	78			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	%	76			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	67			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	77			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonamides (PFASAs)							
Perfluorooctane sulfonamide (FOSA)	%	76			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	80			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	79			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	78			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	74			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	80			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	81			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	79			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	82			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	74			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	78			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	78			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	75			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	%	78			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	%	77			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	%	78			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	%	51			50-150	Pass	
LCS - % Recovery							
Ammonia (as N)	%	100			70-130	Pass	
Chloride	%	123			70-130	Pass	
Nitrate (as N)	%	94			70-130	Pass	
Sulphate (as S)	%	105			70-130	Pass	
Total Dissolved Solids	%	88			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO3)	%	101			70-130	Pass	
Total Alkalinity (as CaCO3)	%	105			70-130	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	113			70-130	Pass	
Magnesium	%	116			70-130	Pass	
Potassium	%	93			70-130	Pass	
Sodium	%	111			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	B17-My29956	NCP	%	99			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	B17-My29956	NCP	%	102			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	B17-My29956	NCP	%	102			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	B17-My29956	NCP	%	101			50-150	Pass	
Perfluorooctanoic acid (PFOA)	B17-My29956	NCP	%	102			50-150	Pass	
Perfluorononanoic acid (PFNA)	B17-My29956	NCP	%	99			50-150	Pass	
Perfluorodecanoic acid (PFDA)	B17-My29956	NCP	%	102			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	B17-My29956	NCP	%	102			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	B17-My29956	NCP	%	102			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	B17-My29956	NCP	%	91			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B17-My29956	NCP	%	105			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonamides (PFASAs)				Result 1					
Perfluorooctane sulfonamide (FOSA)	B17-My29956	NCP	%	99			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B17-My29956	NCP	%	108			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B17-My29956	NCP	%	110			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B17-My29956	NCP	%	110			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B17-My29956	NCP	%	100			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B17-My29956	NCP	%	107			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B17-My29956	NCP	%	110			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	B17-My29956	NCP	%	104			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B17-My29956	NCP	%	111			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B17-My29956	NCP	%	101			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B17-My29956	NCP	%	101			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B17-My29956	NCP	%	99			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	B17-My29956	NCP	%	99			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	B17-My29956	NCP	%	103			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	B17-My29956	NCP	%	102			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	B17-My29956	NCP	%	92			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	B17-My29956	NCP	%	51			50-150	Pass	
Spike - % Recovery									
				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Ammonia (as N)	M17-My31628	NCP	%	90			70-130	Pass	
Chloride	M17-My31077	NCP	%	107			70-130	Pass	
Nitrate (as N)	M17-My31628	NCP	%	91			70-130	Pass	
Sulphate (as S)	M17-Jn00191	NCP	%	103			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M17-My31633	NCP	%	122			70-130	Pass	
Magnesium	M17-My31633	NCP	%	112			70-130	Pass	
Potassium	M17-Jn01330	NCP	%	74			70-130	Pass	
Sodium	M17-My31633	NCP	%	123			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	B17-My29953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnA)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoA)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkane sulfonamides (PFASAs)				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	B17-My29953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B17-My29953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B17-My29953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B17-My29953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B17-My29953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B17-My29953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B17-My29953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
n:2 Fluorotelomer sulfonic acids				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	B17-My29953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	B17-My29953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	M17-My31628	NCP	mg/L	0.12	0.10	16	30%	Pass	
Chloride	M17-Jn00190	NCP	mg/L	45	47	4.3	30%	Pass	
Nitrate (as N)	M17-My31628	NCP	mg/L	1.0	1.0	1.0	30%	Pass	
Sulphate (as S)	M17-My31635	NCP	mg/L	< 5	< 5	<1	30%	Pass	
Total Dissolved Solids	M17-Jn00135	NCP	mg/L	4900	4400	10	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	M17-Jn01306	NCP	mg/L	110	110	4.0	30%	Pass	
Carbonate Alkalinity (as CaCO3)	M17-Jn01306	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Total Alkalinity (as CaCO3)	M17-Jn01306	NCP	mg/L	110	110	4.0	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M17-My31048	NCP	mg/L	1.7	1.7	<1	30%	Pass	
Magnesium	M17-My31048	NCP	mg/L	5.9	6.0	2.0	30%	Pass	
Potassium	M17-Jn01330	NCP	mg/L	30	24	25	30%	Pass	
Sodium	M17-My31048	NCP	mg/L	32	33	2.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds. Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Mary Makarios	Analytical Services Manager
Alex Petridis	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)
Jonathon Angell	Senior Analyst-Organic (QLD)

Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
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☐NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
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☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD Pty Ltd
OFFICE: Brisbane
PROJECT: ASA Mackay
ORDER NUMBER: 313424901
PROJECT MANAGER: Therese Hammond **CONTACT PH:** 0481 715 953
SAMPLER: Bernice Ng **SAMPLER MOBILE:** 0437 500 717
COC emailed to ALS? (YES / NO) **EDD FORMAT (or default):** Esdat
Email Reports to (will default to PM if no other addresses are listed): Bernice.Ng@ghd.com; Therese.Hammond@ghd.com
Email Invoice to (will default to PM if no other addresses are listed): Therese.Hammond@ghd.com

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

ALS QUOTE NO.: GHD national quote 2016

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

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact?
Free ice / frozen ice bricks present upon receipt?
Random Sample Temperature on Receipt
Other comment

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
[signature]	[signature]	[signature]	[signature]
DATE/TIME: 18/5/17.	DATE/TIME: 18/5/17 11.30	DATE/TIME: 18/5/17 15.00pm	DATE/TIME: 18/5/17 10:00

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS extended suite	Total Organic Carbon	Particle size distribution + Clay %	Cation Exchange Capacity (pH and EC depends)	Metals*	Potassium	Silica	ASLP - PFAS Suite	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	MW01-0.2	16/5/17	S											
2	MW01-1.2	16/5/17	S											*Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
3	MW01-2.0	16/5/17	S			✓	✓		✓	✓	✓	✓		
4	MW01-3.0	16/5/17	S			✓	✓		✓	✓	✓	✓		
5	MW01-4.0	16/5/17	S			~~✓~~								
6	MW01-5.0	16/5/17	S											
7	MW02-0.2	15/5/17	S											
8	MW02-0.5	15/5/17	S			✓	~~✓~~		~~✓~~	~~✓~~				
9	MW02-1.0	17/5/17	S			✓	✓		✓	✓	✓	✓		
10	MW02-2.0	17/5/17	S											
11	MW02-3.0	17/5/17	S			✓	✓		✓	✓	✓	✓		
12	MW02-3.5	17/5/17	S					✓						
					TOTAL									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = F
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Environmental Division
Brisbane
Work Order Reference
EB1710304

Telephone : + 61-7-3243 7222

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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Email Invoice to (will default to PM if no other addresses are listed): Therese.Hammond@ghd.com
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

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

ALS QUOTE NO.: GHD national quote 2016

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

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact?
Free ice / frozen ice bricks present upon receipt?
Random Sample Temperature on Receipt:
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
[signature]	[signature]	[signature]	[signature]
DATE/TIME: 18/5/17	DATE/TIME: 18/5/17 11.30am	DATE/TIME: 18/5/17 15.30pm	DATE/TIME: 19/5/17 10:00

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS extended suite	Total Organic Carbon	Particle size distribution + Clay %	Cation Exchange Capacity (pH and EC depends)	Metals*	Potassium	Silica	ASLP - PFAS Suite	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	MW03-0.2	15/5/17	S											
14	MW03-0.5	15/5/17	S											*Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
15	MW03-1.0	16/5/17	S			✓	✓		✓	✓	✓	✓	✓	
16	MW03-1.8	16/5/17	S					✓						
17	MW03-2.0	16/5/17	S											
18	MW03-3.0	16/5/17	S			✓	✓		✓	✓	✓	✓	✓	
19	MW03-4.0	16/5/17	S											
20	MW03-4.5	16/5/17	S					✓						
21	MW03-5.0	16/5/17	S											
22	MW04-0.2	16/5/17	S			✓	✓		✓	✓	✓	✓		
23	MW04-0.5	16/5/17	S											
24	MW04-1.0	16/5/17	S											
				TOTAL										

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CLIENT: GHD Pty Ltd
OFFICE: Brisbane
PROJECT: ASA Mackay
ORDER NUMBER: 313424901
PROJECT MANAGER: Therese Hammond **CONTACT PH:** 0481 715 953
SAMPLER: Bernice Ng **SAMPLER MOBILE:** 0437 500 717
COC emailed to ALS? (YES / NO) **EDD FORMAT (or default):** Esdat
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ALS QUOTE NO.: GHD national quote 2016

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OF: 1 2 3 4 ~~5~~ (6) 7

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Random Sample Temperature on Receipt:
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
[signature]	[signature]	[signature]	[signature]
DATE/TIME: 18/5/17	DATE/TIME: 18/5/17 11.30	DATE/TIME: 18/5/17 15.00	DATE/TIME: 19/5/17 10:00

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS extended suite	Total Organic Carbon	Particle size distribution + Clay %	Cation Exchange Capacity (pH and EC depends)	Metals*	Potassium	Silica	ASLP - PFAS Suite	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
25	MW04-1.3	16/5/17	S											
26	MW04-1.5	16/5/17	S			✓	✓	`	✓	✓	✓	✓		*Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
27	MW04-2.0	16/5/17	S											
28	MW04-3.0	16/5/17	S											
29	MW04-4.0	16/5/17	S											
30	MW05-0.2	15/5/17	S											
31	MW05-0.5	15/5/17	S											
32	MW05-1.0	~~17~~/5/17	S		[illegible]	✓	✓		✓	✓	✓	✓	✓	
33	MW05-1.5	17/5/17	S											
34	MW05-2.0	17/5/17	S											
35	MW05-2.5	17/5/17	S											
36.	MW05-3.0	17/5/17	S			✓	✓		✓	✓	✓	✓	✓	
				TOTAL										

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LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS extended suite	Total Organic Carbon	Particle size distribution + Clay %	Cation Exchange Capacity (pH and EC depends)	Metals*	Potassium	Silica	ASLP - PFAS Suite	Additional Information
														Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
37	MW05 - 4.0	17/5/17	S											
38	SB01-0.2	15/5/17	S											*Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
39	SB01-0.5	15/5/17	S											
40	SB01 - 1.0	17/5/17	S											
41	SB01-2.0	17/5/17	S			✓	✓		✓	✓	✓	✓	✓	
42	SB01-3.0	17/5/17	S											
43	SB01-3.5	17/5/17	S					✓						
44	SB01 - 4.0	17/5/17	S			✓	✓		✓	✓	✓	✓	✓	
45	SB02-0.2	15/5/17	S											
46	SB02-0.5	15/5/17	S			✓								
47	SB02-1.0	16/5/17	S				✓		✓	✓	✓	✓		
48	SB02-1.5	16/5/17	S											
				TOTAL										

ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).

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49	SB02-2.0	16/5/17	S											
50	SB02-3.0	16/5/17	S			✓	✓		✓	✓	✓	✓	✓	*Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
51	SB02-3.5	16/5/17	S											
52	SB02-4.0	16/5/17	S											
53	SB03-0.2	15/5/17	S											
54	SB03-0.5	15/5/17	S											
55	SB03-1.0	17/5/17	S			✓	✓		✓	✓	✓	✓	✓	
56	SB03-2.0	17/5/17	S											
57	SB03-3.0	17/5/17	S			✓	✓	✓	✓	✓	✓	✓	✓	
58	SB03-4.0	17/5/17	S											
59	QA-01	16/5/17	S											
60	QA-02	16/5/17	S											
				TOTAL										

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61	QA-03	16/5/17	S			✓								
*	QA-04	17/5/17	S			✓								*Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
62	QA-05	17/5/17	S			✓								
			S											* Forward QA-04 to Eurofins.
			S											
			S											
			S											
			S											
			S											
			S											
			S											
			S											
				TOTAL										

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ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1710304**	Page	: 1 of 25
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS THERESE HAMMOND	Contact	: Vanessa Mattes
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 03 8687 8000	Telephone	: +61-7-3243 7222
Project	: 313424901 ASA Mackay	Date Samples Received	: 19-May-2017 10:00
Order number	: 313424901	Date Analysis Commenced	: 22-May-2017
C-O-C number	: ----	Issue Date	: 30-May-2017 13:55
Sampler	: BERNICE NG		
Site	: ----		
Quote number	: EN/005/16		
No. of samples received	: 63		
No. of samples analysed	: 24		

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. 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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Greg Vogel	Laboratory Manager	Brisbane Acid Sulphate Soils, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - ST, Stafford, QLD
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

- ED006(Exchangeable Cations on Alkaline Soils): Unable to calculate Magnesium/Potassium Ratio for some samples as the required results for Magnesium/Potassium are below LOR.
- EG005T (Total Metals) Sample EB1710233-002 shows poor duplicate results due to sample heterogeneity. Confirmed by visual inspection.
- EG005T (Total Metals) Sample EB1710330-004 shows poor duplicate results due to sample heterogeneity. Confirmed by visual inspection.
- ED007 (Exchangeable Cations): Magnesium/Potassium ratio could not be determined as both the Magnesium and Potassium results were less than reportable limits for some samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)				Client sample ID	MW03-1.0	MW03-3.0	MW05-1.0	MW05-3.0	SB01-2.0
				Client sampling date / time	[16-May-2017]	[16-May-2017]	[17-May-2017]	[17-May-2017]	[17-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-015	EB1710304-018	EB1710304-032	EB1710304-036	EB1710304-041
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.03**	**0.03**	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.04**	**0.02**	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**0.48**	**0.10**	**0.02**	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.03**	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**1.36**	**0.04**	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.02**	**0.11**	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.08**	**0.11**	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.02**	**0.06**	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.04**	**0.04**	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)				Client sample ID	MW03-1.0	MW03-3.0	MW05-1.0	MW05-3.0	SB01-2.0
				Client sampling date / time	[16-May-2017]	[16-May-2017]	[17-May-2017]	[17-May-2017]	[17-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-015	EB1710304-018	EB1710304-032	EB1710304-036	EB1710304-041
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**2.10**	**0.51**	**0.02**	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**1.84**	**0.14**	**0.02**	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		**2.03**	**0.49**	**0.02**	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**113**	**116**	**112**	**109**	**101**

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)				Client sample ID	SB01-4.0	SB02-3.0	SB03-1.0	SB03-3.0	----
				Client sampling date / time	[17-May-2017]	[16-May-2017]	[17-May-2017]	[17-May-2017]	----
Compound	CAS Number	LOR	Unit		EB1710304-044	EB1710304-050	EB1710304-055	EB1710304-057	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	**0.04**	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	**0.04**	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	**0.43**	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	**0.03**	<0.02	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	**2.16**	<0.01	<0.01	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	**0.04**	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	**0.20**	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	**0.03**	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)				Client sample ID	SB01-4.0	SB02-3.0	SB03-1.0	SB03-3.0	----
				Client sampling date / time	[17-May-2017]	[16-May-2017]	[17-May-2017]	[17-May-2017]	----
Compound	CAS Number	LOR	Unit		EB1710304-044	EB1710304-050	EB1710304-055	EB1710304-057	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	**2.97**	<0.01	<0.01	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	**2.59**	<0.01	<0.01	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	**2.90**	<0.01	<0.01	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**108**	**101**	**111**	**102**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	MW01-2.0	MW01-3.0	MW02-0.5	MW02-1.0	MW02-3.0
			Client sampling date / time	[16-May-2017]	[16-May-2017]	[15-May-2017]	[17-May-2017]	[17-May-2017]
Compound	CAS Number	LOR	Unit	EB1710304-003	EB1710304-004	EB1710304-008	EB1710304-009	EB1710304-011
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	9.0	8.8	----	8.8	8.3
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	234	51	----	455	55
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	20.6	24.6	18.8	20.8	26.0
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	1.2	1.2	----	1.5	0.6
Exchangeable Magnesium	----	0.2	meq/100g	4.4	1.5	----	3.6	0.6
Exchangeable Potassium	----	0.2	meq/100g	<0.2	<0.2	----	<0.2	<0.2
Exchangeable Sodium	----	0.2	meq/100g	3.6	0.4	----	2.6	<0.2
Cation Exchange Capacity	----	0.2	meq/100g	9.3	3.2	----	7.7	1.2
Exchangeable Sodium Percent	----	0.2	%	38.9	13.3	----	34.2	<0.2
Calcium/Magnesium Ratio	----	0.2	-	0.3	0.8	----	0.4	0.9
ED093S: Soluble Major Cations								
Potassium	7440-09-7	10	mg/kg	<10	<10	----	<10	<10
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	22000	10300	----	22700	5290
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	<1	<1
Chromium	7440-47-3	2	mg/kg	28	13	----	22	6
Copper	7440-50-8	5	mg/kg	33	11	----	20	5
Iron	7439-89-6	50	mg/kg	41000	16200	----	23800	6620
Manganese	7439-96-5	5	mg/kg	255	119	----	91	49
Zinc	7440-66-6	5	mg/kg	70	35	----	35	14
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	0.08	0.15	----	0.08	<0.02
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

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW01-2.0	MW01-3.0	MW02-0.5	MW02-1.0	MW02-3.0
				Client sampling date / time	[16-May-2017]	[16-May-2017]	[15-May-2017]	[17-May-2017]	[17-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-003	EB1710304-004	EB1710304-008	EB1710304-009	EB1710304-011
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
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	**0.0003**	<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									
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)	2448-09-7	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

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW01-2.0	MW01-3.0	MW02-0.5	MW02-1.0	MW02-3.0
				Client sampling date / time	[16-May-2017]	[16-May-2017]	[15-May-2017]	[17-May-2017]	[17-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-003	EB1710304-004	EB1710304-008	EB1710304-009	EB1710304-011
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
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	**0.0003**	<0.0002	<0.0002	<0.0002
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	**0.0003**	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	**0.0003**	<0.0002	<0.0002	<0.0002
ME-ICP81: Silica and Metals Oxides by Peroxide Fusion									
Silica as SiO2	7631-86-9	0.01	%		**56.9**	**70.4**	**----**	**61.2**	**81.9**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**113**	**120**	**109**	**114**	**102**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	MW02-3.5	MW03-1.0	MW03-1.8	MW03-3.0	MW03-3.5
			Client sampling date / time	[17-May-2017]	[16-May-2017]	[16-May-2017]	[16-May-2017]	[16-May-2017]
Compound	CAS Number	LOR	Unit	EB1710304-012	EB1710304-015	EB1710304-016	EB1710304-018	EB1710304-020
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	----	6.8	----	8.8	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	58	----	89	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	----	40.6	----	37.4	----
EA150: Particle Sizing								
+75µm	----	1	%	92	----	58	----	63
+150µm	----	1	%	89	----	54	----	53
+300µm	----	1	%	82	----	49	----	44
+425µm	----	1	%	73	----	45	----	38
+600µm	----	1	%	59	----	39	----	28
+1180µm	----	1	%	34	----	28	----	9
+2.36mm	----	1	%	13	----	18	----	2
+4.75mm	----	1	%	4	----	13	----	<1
+9.5mm	----	1	%	<1	----	7	----	<1
+19.0mm	----	1	%	<1	----	<1	----	<1
+37.5mm	----	1	%	<1	----	<1	----	<1
+75.0mm	----	1	%	<1	----	<1	----	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	4	----	23	----	22
Silt (2-60 µm)	----	1	%	4	----	18	----	13
Sand (0.06-2.00 mm)	----	1	%	72	----	38	----	61
Gravel (>2mm)	----	1	%	20	----	21	----	4
Cobbles (>6cm)	----	1	%	<1	----	<1	----	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.59	----	2.47	----	2.41
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	----	----	----	2.2	----
Exchangeable Magnesium	----	0.2	meq/100g	----	----	----	2.3	----
Exchangeable Potassium	----	0.2	meq/100g	----	----	----	<0.2	----
Exchangeable Sodium	----	0.2	meq/100g	----	----	----	0.8	----
Cation Exchange Capacity	----	0.2	meq/100g	----	----	----	5.3	----
Exchangeable Sodium Percent	----	0.2	%	----	----	----	14.5	----
Calcium/Magnesium Ratio	----	0.2	-	----	----	----	1.0	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW02-3.5	MW03-1.0	MW03-1.8	MW03-3.0	MW03-3.5
				Client sampling date / time	[17-May-2017]	[16-May-2017]	[16-May-2017]	[16-May-2017]	[16-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-012	EB1710304-015	EB1710304-016	EB1710304-018	EB1710304-020
					Result	Result	Result	Result	Result
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	**4.2**	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		----	**2.5**	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		----	<0.1	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		----	**0.5**	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		----	**7.4**	----	----	----
Exchangeable Sodium Percent	----	0.1	%		----	**7.5**	----	----	----
Calcium/Magnesium Ratio	----	0.1	-		----	**1.7**	----	----	----
ED093S: Soluble Major Cations									
Potassium	7440-09-7	10	mg/kg		----	<10	----	<10	----
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		----	**11400**	----	**12500**	----
Arsenic	7440-38-2	5	mg/kg		----	<5	----	<5	----
Cadmium	7440-43-9	1	mg/kg		----	<1	----	<1	----
Chromium	7440-47-3	2	mg/kg		----	**10**	----	**12**	----
Copper	7440-50-8	5	mg/kg		----	**9**	----	**13**	----
Iron	7439-89-6	50	mg/kg		----	**10000**	----	**17100**	----
Manganese	7439-96-5	5	mg/kg		----	**120**	----	**145**	----
Zinc	7440-66-6	5	mg/kg		----	**16**	----	**23**	----
EN60: Bottle Leaching Procedure									
Final pH	----	0.1	pH Unit		----	**6.9**	----	**8.0**	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		----	**0.85**	----	**0.05**	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		----	**0.0018**	----	**0.0009**	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		----	**0.0018**	----	**0.0006**	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		----	**0.0217**	----	**0.0028**	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		----	**0.0010**	----	<0.0002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		----	**0.0409**	----	**0.0012**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		----	<0.0002	----	<0.0002	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW02-3.5	MW03-1.0	MW03-1.8	MW03-3.0	MW03-3.5
				Client sampling date / time	[17-May-2017]	[16-May-2017]	[16-May-2017]	[16-May-2017]	[16-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-012	EB1710304-015	EB1710304-016	EB1710304-018	EB1710304-020
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	----	<0.001	----	<0.001	----	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	----	<0.0002	----	<0.0002	----	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	----	**0.0043**	----	**0.0033**	----	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	----	**0.0012**	----	**0.0015**	----	
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	----	**0.0022**	----	**0.0013**	----	
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	----	<0.0002	----	<0.0002	----	
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	----	<0.0002	----	<0.0002	----	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	----	<0.0002	----	<0.0002	----	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	----	<0.0002	----	<0.0002	----	
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	----	<0.0002	----	<0.0002	----	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	----	<0.0005	----	<0.0005	----	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	----	<0.0002	----	<0.0002	----	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	----	<0.0005	----	<0.0005	----	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	----	<0.0005	----	<0.0005	----	
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	----	<0.0005	----	<0.0005	----	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	----	<0.0005	----	<0.0005	----	
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	----	<0.0002	----	<0.0002	----	
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	----	<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	----	

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW02-3.5	MW03-1.0	MW03-1.8	MW03-3.0	MW03-3.5
				Client sampling date / time	[17-May-2017]	[16-May-2017]	[16-May-2017]	[16-May-2017]	[16-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-012	EB1710304-015	EB1710304-016	EB1710304-018	EB1710304-020
					Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued									
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		----	<0.0005	----	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		----	<0.0005	----	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		----	<0.0005	----	<0.0005	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		----	**0.0749**	----	**0.0116**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		----	**0.0626**	----	**0.0040**	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		----	**0.0721**	----	**0.0110**	----
ME-ICP81: Silica and Metals Oxides by Peroxide Fusion									
Silica as SiO2	7631-86-9	0.01	%		----	**73.2**	----	**74.0**	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		----	**118**	----	**120**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	MW04-0.2	MW04-1.5	MW05-1.0	MW05-3.0	SB01-2.0
			Client sampling date / time	[16-May-2017]	[16-May-2017]	[17-May-2017]	[17-May-2017]	[17-May-2017]
Compound	CAS Number	LOR	Unit	EB1710304-022	EB1710304-026	EB1710304-032	EB1710304-036	EB1710304-041
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	----	7.9	6.9	9.1	8.2
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	514	128	565	4010
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	24.2	15.8	16.5	20.3	34.1
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	----	3.2	----	0.9	0.6
Exchangeable Magnesium	----	0.2	meq/100g	----	2.3	----	2.0	2.3
Exchangeable Potassium	----	0.2	meq/100g	----	<0.2	----	<0.2	0.4
Exchangeable Sodium	----	0.2	meq/100g	----	0.5	----	2.0	1.5
Cation Exchange Capacity	----	0.2	meq/100g	----	5.9	----	5.0	4.9
Exchangeable Sodium Percent	----	0.2	%	----	8.4	----	41.1	30.6
Calcium/Magnesium Ratio	----	0.2	-	----	1.4	----	0.4	0.2
Magnesium/Potassium Ratio	----	0.2	-	----	----	----	----	5.4
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	3.8	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	----	6.5	----	----
Exchangeable Potassium	----	0.1	meq/100g	----	----	0.2	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	----	3.7	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	----	14.4	----	----
Exchangeable Sodium Percent	----	0.1	%	----	----	26.0	----	----
Calcium/Magnesium Ratio	----	0.1	-	----	----	0.6	----	----
Magnesium/Potassium Ratio	----	0.1	-	----	----	28.0	----	----
ED093S: Soluble Major Cations								
Potassium	7440-09-7	10	mg/kg	----	<10	<10	20	380
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	----	10800	17400	12200	6630
Arsenic	7440-38-2	5	mg/kg	----	<5	13	<5	6
Cadmium	7440-43-9	1	mg/kg	----	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	----	13	17	17	9
Copper	7440-50-8	5	mg/kg	----	10	14	15	<5
Iron	7439-89-6	50	mg/kg	----	18300	23000	22300	4240
Manganese	7439-96-5	5	mg/kg	----	74	33	101	31
Zinc	7440-66-6	5	mg/kg	----	30	19	37	10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW04-0.2	MW04-1.5	MW05-1.0	MW05-3.0	SB01-2.0
				Client sampling date / time	[16-May-2017]	[16-May-2017]	[17-May-2017]	[17-May-2017]	[17-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-022	EB1710304-026	EB1710304-032	EB1710304-036	EB1710304-041
					Result	Result	Result	Result	Result
EN60: Bottle Leaching Procedure									
Final pH	----	0.1	pH Unit		**----**	**----**	**7.9**	**8.6**	**8.0**
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		**----**	**0.07**	**0.32**	**0.07**	**1.45**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<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
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0004**	**----**	<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
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0008**	**----**	<0.0002	<0.0002	**0.0005**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<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
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<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
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<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
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<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
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<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
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<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
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	**----**	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW04-0.2	MW04-1.5	MW05-1.0	MW05-3.0	SB01-2.0
				Client sampling date / time	[16-May-2017]	[16-May-2017]	[17-May-2017]	[17-May-2017]	[17-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-022	EB1710304-026	EB1710304-032	EB1710304-036	EB1710304-041
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<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
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg		<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
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<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
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
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<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
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	----	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0012**	----	<0.0002	<0.0002	**0.0005**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0012**	----	<0.0002	<0.0002	**0.0005**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0012**	----	<0.0002	<0.0002	**0.0005**
ME-ICP81: Silica and Metals Oxides by Peroxide Fusion									
Silica as SiO2	7631-86-9	0.01	%		----	**69.7**	**70.4**	**71.0**	**69.1**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**115**	----	**108**	**118**	**102**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB01-3.5	SB01-4.0	SB02-0.5	SB02-1.0	SB02-3.0
				Client sampling date / time	[17-May-2017]	[17-May-2017]	[15-May-2017]	[16-May-2017]	[16-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-043	EB1710304-044	EB1710304-046	EB1710304-047	EB1710304-050
					Result	Result	Result	Result	Result
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		----	8.3	----	8.4	8.2
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		----	2860	----	87	47
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		----	39.9	19.1	19.2	23.4
EA150: Particle Sizing									
+75µm	----	1	%		81	----	----	----	----
+150µm	----	1	%		53	----	----	----	----
+300µm	----	1	%		12	----	----	----	----
+425µm	----	1	%		8	----	----	----	----
+600µm	----	1	%		6	----	----	----	----
+1180µm	----	1	%		2	----	----	----	----
+2.36mm	----	1	%		<1	----	----	----	----
+4.75mm	----	1	%		<1	----	----	----	----
+9.5mm	----	1	%		<1	----	----	----	----
+19.0mm	----	1	%		<1	----	----	----	----
+37.5mm	----	1	%		<1	----	----	----	----
+75.0mm	----	1	%		<1	----	----	----	----
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%		9	----	----	----	----
Silt (2-60 µm)	----	1	%		7	----	----	----	----
Sand (0.06-2.00 mm)	----	1	%		83	----	----	----	----
Gravel (>2mm)	----	1	%		1	----	----	----	----
Cobbles (>6cm)	----	1	%		<1	----	----	----	----
EA152: Soil Particle Density									
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3		2.69	----	----	----	----
ED006: Exchangeable Cations on Alkaline Soils									
Exchangeable Calcium	----	0.2	meq/100g		----	0.4	----	3.7	2.6
Exchangeable Magnesium	----	0.2	meq/100g		----	2.0	----	3.7	2.4
Exchangeable Potassium	----	0.2	meq/100g		----	0.4	----	<0.2	<0.2
Exchangeable Sodium	----	0.2	meq/100g		----	1.4	----	0.5	0.5
Cation Exchange Capacity	----	0.2	meq/100g		----	4.2	----	7.9	5.5
Exchangeable Sodium Percent	----	0.2	%		----	33.1	----	6.2	8.7
Calcium/Magnesium Ratio	----	0.2	-		----	0.2	----	1.0	1.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB01-3.5	SB01-4.0	SB02-0.5	SB02-1.0	SB02-3.0
				Client sampling date / time	[17-May-2017]	[17-May-2017]	[15-May-2017]	[16-May-2017]	[16-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-043	EB1710304-044	EB1710304-046	EB1710304-047	EB1710304-050
					Result	Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued									
Magnesium/Potassium Ratio	----	0.2	-		----	5.2	----	----	----
ED093S: Soluble Major Cations									
Potassium	7440-09-7	10	mg/kg		----	290	----	<10	<10
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		----	14100	----	14900	13600
Arsenic	7440-38-2	5	mg/kg		----	12	----	<5	<5
Cadmium	7440-43-9	1	mg/kg		----	<1	----	<1	<1
Chromium	7440-47-3	2	mg/kg		----	20	----	14	19
Copper	7440-50-8	5	mg/kg		----	15	----	14	16
Iron	7439-89-6	50	mg/kg		----	22800	----	14300	21500
Manganese	7439-96-5	5	mg/kg		----	154	----	141	212
Zinc	7440-66-6	5	mg/kg		----	38	----	26	37
EN60: Bottle Leaching Procedure									
Final pH	----	0.1	pH Unit		----	7.8	----	----	8.5
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		----	0.45	----	0.50	0.15
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		----	0.0006	<0.0002	----	0.0003
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		----	<0.0002	<0.0002	----	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		----	<0.0002	0.0003	----	0.0015
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		----	<0.0002	<0.0002	----	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		----	0.0007	0.0093	----	0.0148
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		----	<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
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		----	<0.0002	<0.0002	----	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		----	<0.0002	0.0004	----	0.0014
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		----	<0.0002	<0.0002	----	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		----	<0.0002	0.0002	----	0.0002

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB01-3.5	SB01-4.0	SB02-0.5	SB02-1.0	SB02-3.0
				Client sampling date / time	[17-May-2017]	[17-May-2017]	[15-May-2017]	[16-May-2017]	[16-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-043	EB1710304-044	EB1710304-046	EB1710304-047	EB1710304-050
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	----	<0.0002	<0.0002	----	<0.0002	
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	----	<0.0002	<0.0002	----	<0.0002	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	----	<0.0002	<0.0002	----	<0.0002	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	----	<0.0002	<0.0002	----	<0.0002	
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	----	<0.0002	<0.0002	----	<0.0002	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	----	<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	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	----	<0.0005	<0.0005	----	<0.0005	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	----	<0.0005	<0.0005	----	<0.0005	
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	----	<0.0005	<0.0005	----	<0.0005	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	----	<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	
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	----	<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	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	----	<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	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	----	<0.0005	<0.0005	----	<0.0005	

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB01-3.5	SB01-4.0	SB02-0.5	SB02-1.0	SB02-3.0
				Client sampling date / time	[17-May-2017]	[17-May-2017]	[15-May-2017]	[16-May-2017]	[16-May-2017]
Compound	CAS Number	LOR	Unit		EB1710304-043	EB1710304-044	EB1710304-046	EB1710304-047	EB1710304-050
					Result	Result	Result	Result	Result
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		----	0.0013	0.0102	----	0.0182
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		----	0.0007	0.0096	----	0.0163
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		----	0.0013	0.0102	----	0.0182
ME-ICP81: Silica and Metals Oxides by Peroxide Fusion									
Silica as SiO2	7631-86-9	0.01	%		----	72.7	----	65.5	70.0
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		----	120	91.5	----	117

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SB03-1.0	SB03-3.0	QA-03	QA-05	----
			Client sampling date / time	[17-May-2017]	[17-May-2017]	[16-May-2017]	[17-May-2017]	----
Compound	CAS Number	LOR	Unit	EB1710304-055	EB1710304-057	EB1710304-061	EB1710304-062	--------
				Result	Result	Result	Result	----
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	6.6	7.2	----	----	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	20	437	----	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	21.0	21.7	30.2	18.4	----
EA150: Particle Sizing								
+75µm	----	1	%	----	11	----	----	----
+150µm	----	1	%	----	9	----	----	----
+300µm	----	1	%	----	5	----	----	----
+425µm	----	1	%	----	3	----	----	----
+600µm	----	1	%	----	2	----	----	----
+1180µm	----	1	%	----	<1	----	----	----
+2.36mm	----	1	%	----	<1	----	----	----
+4.75mm	----	1	%	----	<1	----	----	----
+9.5mm	----	1	%	----	<1	----	----	----
+19.0mm	----	1	%	----	<1	----	----	----
+37.5mm	----	1	%	----	<1	----	----	----
+75.0mm	----	1	%	----	<1	----	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	----	36	----	----	----
Silt (2-60 µm)	----	1	%	----	51	----	----	----
Sand (0.06-2.00 mm)	----	1	%	----	13	----	----	----
Gravel (>2mm)	----	1	%	----	<1	----	----	----
Cobbles (>6cm)	----	1	%	----	<1	----	----	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	2.35	----	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	4.3	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	6.6	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	0.2	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	0.3	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	11.5	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	2.8	----	----	----	----
Calcium/Magnesium Ratio	----	0.1	-	0.6	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB03-1.0	SB03-3.0	QA-03	QA-05	----
				Client sampling date / time	[17-May-2017]	[17-May-2017]	[16-May-2017]	[17-May-2017]	----
Compound	CAS Number	LOR	Unit		EB1710304-055	EB1710304-057	EB1710304-061	EB1710304-062	--------
					Result	Result	Result	Result	----
ED007: Exchangeable Cations - Continued									
Magnesium/Potassium Ratio	----	0.1	-		**28.5**	----	----	----	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	**6.9**	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		----	**12.8**	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		----	**0.3**	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		----	**3.7**	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		----	**23.8**	----	----	----
Exchangeable Sodium Percent	----	0.1	%		----	**15.6**	----	----	----
Calcium/Magnesium Ratio	----	0.1	-		----	**0.5**	----	----	----
Magnesium/Potassium Ratio	----	0.1	-		----	**46.0**	----	----	----
ED093S: Soluble Major Cations									
Potassium	7440-09-7	10	mg/kg		<10	**10**	----	----	----
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		**14500**	**22800**	----	----	----
Arsenic	7440-38-2	5	mg/kg		<5	<5	----	----	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg		**13**	**30**	----	----	----
Copper	7440-50-8	5	mg/kg		**8**	**37**	----	----	----
Iron	7439-89-6	50	mg/kg		**14700**	**45700**	----	----	----
Manganese	7439-96-5	5	mg/kg		**71**	**450**	----	----	----
Zinc	7440-66-6	5	mg/kg		**20**	**81**	----	----	----
EN60: Bottle Leaching Procedure									
Final pH	----	0.1	pH Unit		**8.4**	**7.9**	----	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		**0.10**	**0.30**	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<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	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<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	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB03-1.0	SB03-3.0	QA-03	QA-05	----
				Client sampling date / time	[17-May-2017]	[17-May-2017]	[16-May-2017]	[17-May-2017]	----
Compound	CAS Number	LOR	Unit		EB1710304-055	EB1710304-057	EB1710304-061	EB1710304-062	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<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	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<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	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<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	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<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	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<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	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<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	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<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	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<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	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg		<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	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SB03-1.0	SB03-3.0	QA-03	QA-05	----
				Client sampling date / time	[17-May-2017]	[17-May-2017]	[16-May-2017]	[17-May-2017]	----
Compound	CAS Number	LOR	Unit		EB1710304-055	EB1710304-057	EB1710304-061	EB1710304-062	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<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	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<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	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<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	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<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	----
ME-ICP81: Silica and Metals Oxides by Peroxide Fusion									
Silica as SiO2	7631-86-9	0.01	%		**68.7**	**56.9**	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**121**	**119**	**100**	**99.6**	----

Surrogate Control Limits

Sub-Matrix: **DI WATER LEACHATE**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	130

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130

Certificate of Analysis

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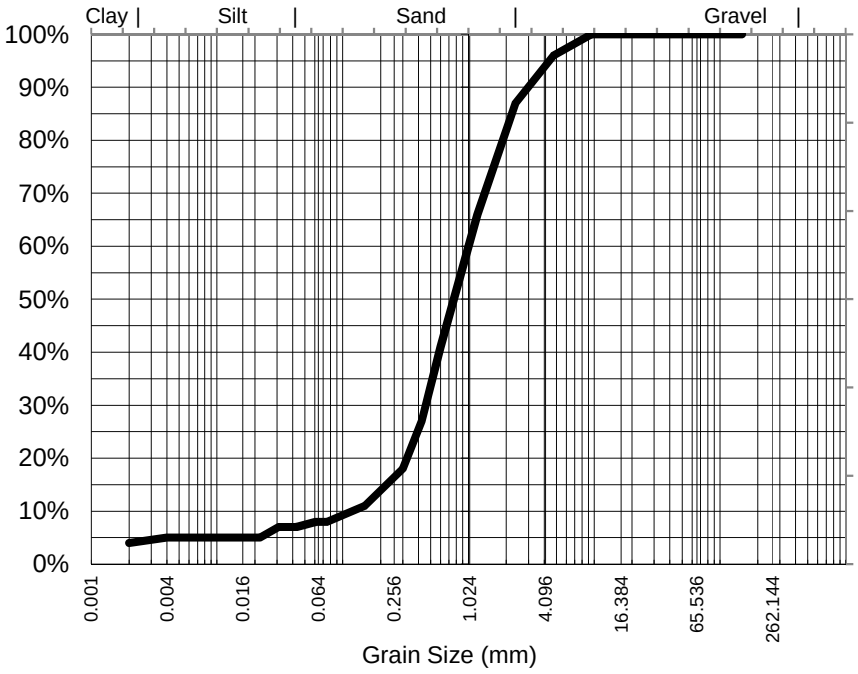
ALS Environmental

Brisbane, QLD

CLIENT:	MS THERESE HAMMOND	**DATE REPORTED:**	29-May-2017
COMPANY:	GHD PTY LTD	**DATE RECEIVED:**	19-May-2017
ADDRESS:	GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	**REPORT NO:**	EB1710304-012 / PSD
PROJECT:	313424901 ASA Mackay	**SAMPLE ID:**	MW02-3.5

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	96%
2.36	87%
1.18	66%
0.600	41%
0.425	27%
0.300	18%
0.150	11%
0.075	8%
Particle Size (microns)	
75	8%
61	8%
43	7%
22	5%
11	5%
6	5%
2	4%

Samples analysed as received.

Median Particle Size (mm)*	0.809

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:	AS1289.3.6.3 states that this method is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly	**Analysed:**	25-May-17
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:		**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.3 2003	**Hydrometer Type**	ASTM E100

Soil Particle Density (<2.36mm) 2.59 g/cm3

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

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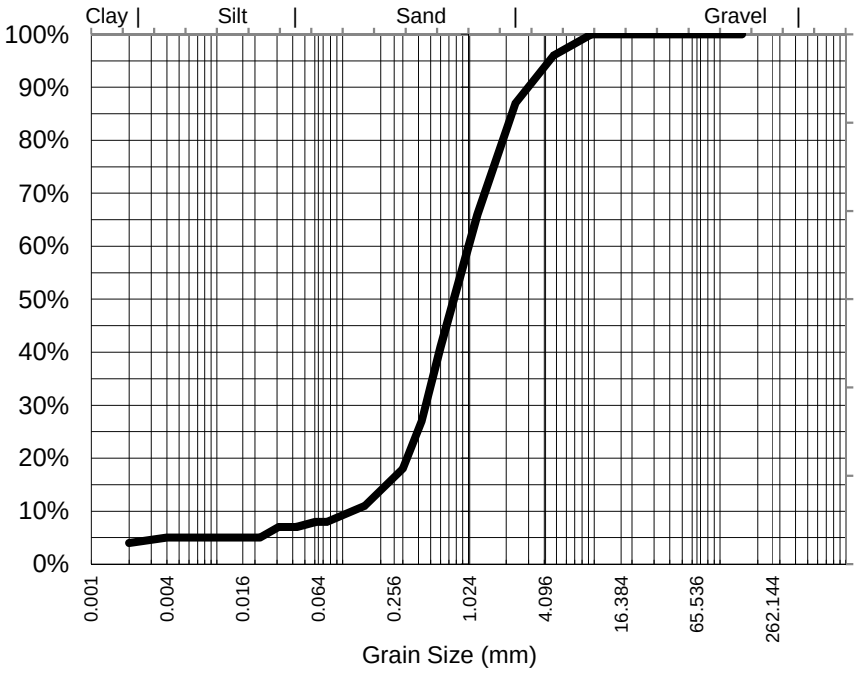
ALS Environmental

Brisbane, QLD

CLIENT:	MS THERESE HAMMOND	**DATE REPORTED:**	29-May-2017
COMPANY:	GHD PTY LTD	**DATE RECEIVED:**	19-May-2017
ADDRESS:	GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	**REPORT NO:**	EB1710304-012DUP / PSD
PROJECT:	313424901 ASA Mackay	**SAMPLE ID:**	MW02-3.5

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	96%
2.36	87%
1.18	66%
0.600	41%
0.425	27%
0.300	18%
0.150	11%
0.075	8%
Particle Size (microns)	
75	8%
61	8%
43	7%
22	5%
11	5%
6	5%
2	4%

Samples analysed as received.

Median Particle Size (mm)*	0.809

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:	AS1289.3.6.3 states that this method is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly	**Analysed:**	25-May-17
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:		**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.3 2003	**Hydrometer Type**	ASTM E100

Soil Particle Density (<2.36mm) 2.59 g/cm3

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

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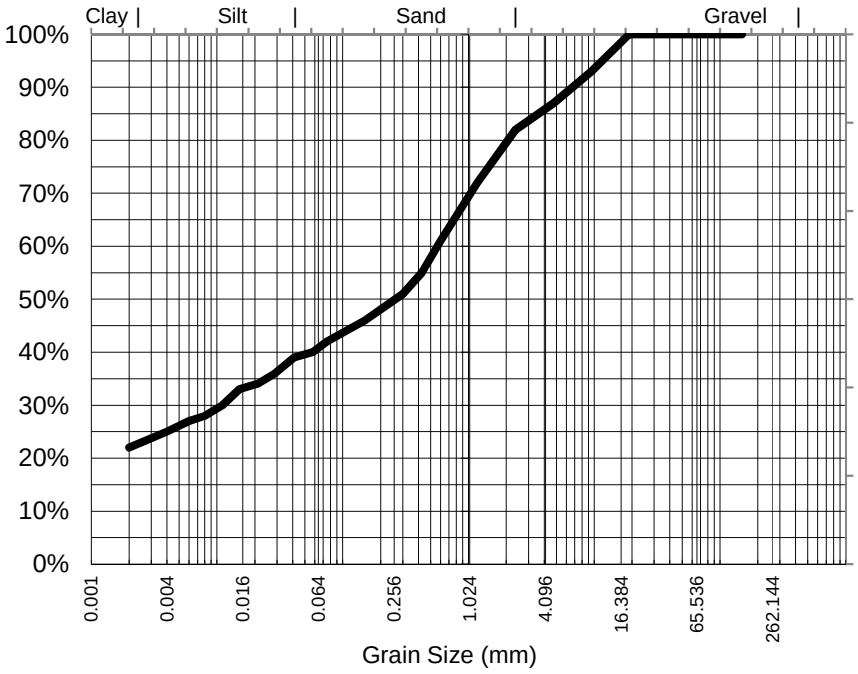
ALS Environmental

Brisbane, QLD

CLIENT:	MS THERESE HAMMOND	**DATE REPORTED:**	29-May-2017
COMPANY:	GHD PTY LTD	**DATE RECEIVED:**	19-May-2017
ADDRESS:	GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	**REPORT NO:**	EB1710304-016 / PSD
PROJECT:	313424901 ASA Mackay	**SAMPLE ID:**	MW03-1.8

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.50	93%
4.75	87%
2.36	82%
1.18	72%
0.600	61%
0.425	55%
0.300	51%
0.150	46%
0.075	42%
Particle Size (microns)	
75	42%
58	40%
41	39%
21	34%
11	30%
6	27%
2	22%

Samples analysed as received.

Median Particle Size (mm)*	0.270

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) 2.47 g/cm3

Analysed: 25-May-17

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

NATA Accreditation: 825 Site: Brisbane
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA
ACCREDITATION

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

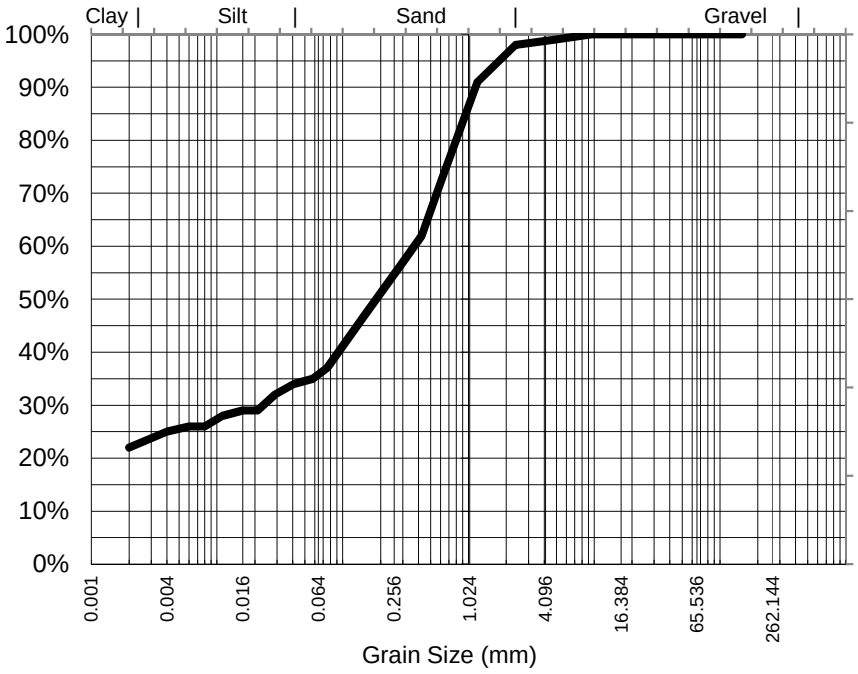
ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsglobal.com

ALS Environmental

Brisbane, QLD

CLIENT:	MS THERESE HAMMOND	**DATE REPORTED:**	29-May-2017
COMPANY:	GHD PTY LTD	**DATE RECEIVED:**	19-May-2017
ADDRESS:	GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	**REPORT NO:**	EB1710304-020 / PSD
PROJECT:	313424901 ASA Mackay	**SAMPLE ID:**	MW03-3.5

Particle Size Distribution



Particle Size (mm)	Percent Passing
9.50	100%
4.75	99%
2.36	98%
1.18	91%
0.600	72%
0.425	62%
0.300	57%
0.150	47%
0.075	37%
Particle Size (microns)	
75	37%
58	35%
41	34%
21	29%
11	28%
6	26%
2	22%

Median Particle Size (mm)*	0.195

Samples analysed as received.

** Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:		**Analysed:**	25-May-17
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:		**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.3 2003	**Hydrometer Type**	ASTM E100

Soil Particle Density (<2.36mm) 2.41 (2.45)* g/cm3

NATA Accreditation: 825 Site: Brisbane
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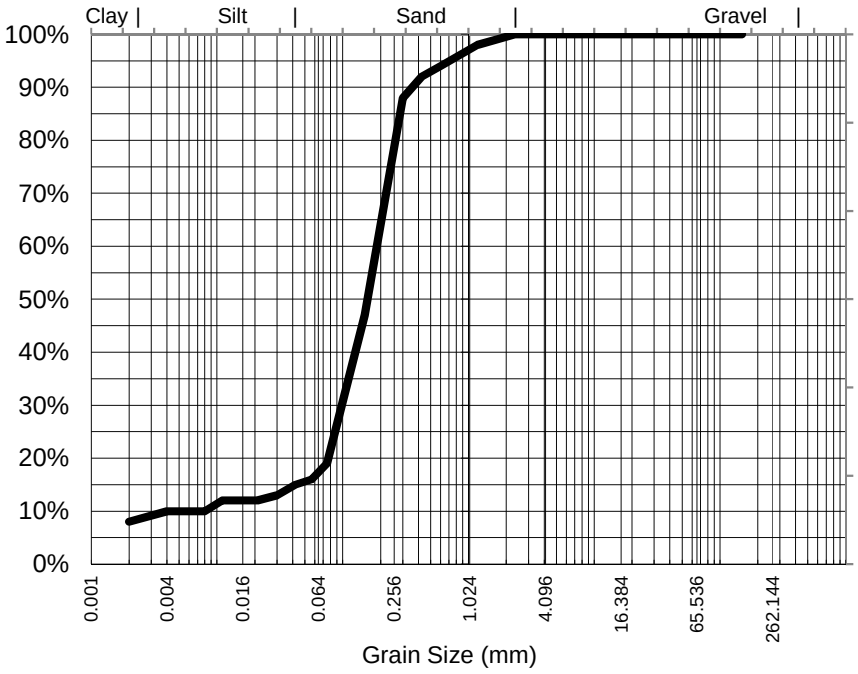
Brisbane, QLD

CLIENT:	MS THERESE HAMMOND	**DATE REPORTED:**	29-May-2017
COMPANY:	GHD PTY LTD	**DATE RECEIVED:**	19-May-2017
ADDRESS:	GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	**REPORT NO:**	EB1710304-043 / PSD
PROJECT:	313424901 ASA Mackay	**SAMPLE ID:**	SB01-3.5

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	98%
0.600	94%
0.425	92%
0.300	88%
0.150	47%
0.075	19%
Particle Size (microns)	
75	19%
57	16%
42	15%
21	12%
11	12%
5	10%
2	8%

Samples analysed as received.

Median Particle Size (mm)*	0.161

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) 2.69 g/cm3

Analysed: 25-May-17

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

NATA Accreditation: 825 Site: Brisbane
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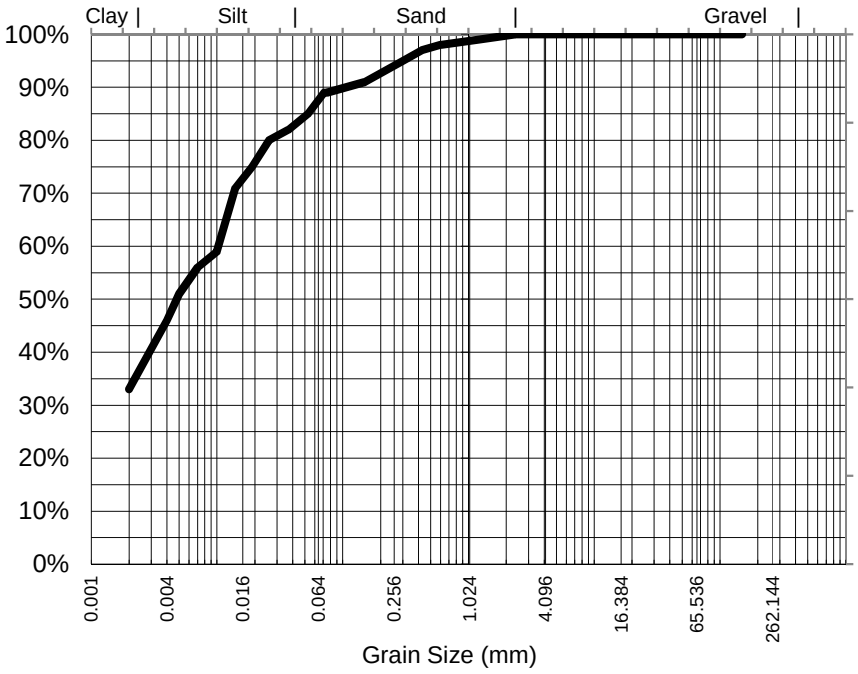
Brisbane, QLD

CLIENT:	MS THERESE HAMMOND	**DATE REPORTED:**	29-May-2017
COMPANY:	GHD PTY LTD	**DATE RECEIVED:**	19-May-2017
ADDRESS:	GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	**REPORT NO:**	EB1710304-057 / PSD
PROJECT:	313424901 ASA Mackay	**SAMPLE ID:**	SB03-3.0

Particle Size Distribution



Particle Size (mm)	Percent Passing
2.36	100%
1.18	99%
0.600	98%
0.425	97%
0.300	95%
0.150	91%
0.075	89%
Particle Size (microns)	
71	89%
53	85%
37	82%
19	75%
10	59%
5	51%
2	33%

Median Particle Size (mm)*	0.005

Samples analysed as received.

** Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:		**Analysed:**	25-May-17
Loss on Pretreatment	NA	**Limit of Reporting:**	1%
Sample Description:		**Dispersion Method**	Shaker
Test Method:	AS1289.3.6.3 2003	**Hydrometer Type**	ASTM E100

Soil Particle Density (<2.36mm) 2.35 (2.45)* g/cm3

NATA Accreditation: 825 Site: Brisbane
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Satish Trivedi
Soil Chemist
Authorised Signatory

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1710304**	Page	: 1 of 14
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS THERESE HAMMOND	Contact	: Vanessa Mattes
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 03 8687 8000	Telephone	: +61-7-3243 7222
Project	: 313424901 ASA Mackay	Date Samples Received	: 19-May-2017
Order number	: 313424901	Date Analysis Commenced	: 22-May-2017
C-O-C number	: ----	Issue Date	: 30-May-2017
Sampler	: BERNICE NG		
Site	: ----		
Quote number	: EN/005/16		
No. of samples received	: 63		
No. of samples analysed	: 24		

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. 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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Greg Vogel	Laboratory Manager	Brisbane Acid Sulphate Soils, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - ST, Stafford, QLD
Raymond Commodore	Instrument Chemist	Sydney Inorganics, Smithfield, NSW
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Inorganics, Stafford, QLD

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002 : pH (Soils) (QC Lot: 901180)									
EB1710304-044	SB01-4.0	EA002: pH Value	----	0.1	pH Unit	8.3	8.3	0.00	0% - 20%
EB1710304-003	MW01-2.0	EA002: pH Value	----	0.1	pH Unit	9.0	9.1	0.00	0% - 20%
EA010: Conductivity (QC Lot: 901178)									
EB1710304-044	SB01-4.0	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	2860	2890	1.25	0% - 20%
EB1710304-003	MW01-2.0	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	234	233	0.557	0% - 20%
EA055: Moisture Content (QC Lot: 901181)									
EB1710233-002	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	41.0	40.7	0.774	0% - 20%
EB1710330-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	9.9	10.1	1.89	0% - 50%
EA055: Moisture Content (QC Lot: 903986)									
EB1710297-044	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	12.1	11.4	5.85	0% - 50%
EB1710304-018	MW03-3.0	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	37.4	35.3	5.92	0% - 20%
EA055: Moisture Content (QC Lot: 903987)									
EB1710304-057	SB03-3.0	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	21.7	22.5	3.88	0% - 20%
EM1706316-047	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	17.0	17.6	3.50	0% - 50%
ED006: Exchangeable Cations on Alkaline Soils (QC Lot: 909645)									
EB1710304-003	MW01-2.0	ED006: Exchangeable Calcium	----	0.1	meq/100g	1.2	1.2	0.00	No Limit
		ED006: Exchangeable Magnesium	----	0.1	meq/100g	4.4	4.2	4.74	0% - 20%
		ED006: Exchangeable Potassium	----	0.1	meq/100g	<0.2	0.2	0.00	No Limit
		ED006: Exchangeable Sodium	----	0.1	meq/100g	3.6	3.6	0.00	0% - 50%
		ED006: Cation Exchange Capacity	----	0.1	meq/100g	9.3	9.1	2.70	0% - 20%
EB1710304-050	SB02-3.0	ED006: Exchangeable Calcium	----	0.1	meq/100g	2.6	2.3	12.2	0% - 50%
		ED006: Exchangeable Magnesium	----	0.1	meq/100g	2.4	2.2	11.5	0% - 50%
		ED006: Exchangeable Potassium	----	0.1	meq/100g	<0.2	<0.2	0.00	No Limit
		ED006: Exchangeable Sodium	----	0.1	meq/100g	0.5	0.4	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED006: Exchangeable Cations on Alkaline Soils (QC Lot: 909645) - continued									
EB1710304-050	SB02-3.0	ED006: Cation Exchange Capacity	----	0.1	meq/100g	5.5	4.9	11.8	0% - 20%
ED007: Exchangeable Cations (QC Lot: 909643)									
EB1710304-015	MW03-1.0	ED007: Exchangeable Calcium	----	0.1	meq/100g	4.2	4.1	2.99	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.5	2.4	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.5	0.5	0.00	No Limit
ED008: Exchangeable Cations (QC Lot: 909644)									
EB1710304-057	SB03-3.0	ED008: Exchangeable Calcium	----	0.1	meq/100g	6.9	6.4	6.51	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	12.8	12.0	6.38	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.2	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	3.7	3.5	5.46	0% - 20%
ED093S: Soluble Major Cations (QC Lot: 901179)									
EB1710304-041	SB01-2.0	ED093S: Potassium	7440-09-7	10	mg/kg	380	390	0.00	0% - 20%
EB1710304-003	MW01-2.0	ED093S: Potassium	7440-09-7	10	mg/kg	<10	<10	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 901174)									
EB1710235-005	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	18	16	15.8	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	12	12	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	9	<5	60.8	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	5810	5080	13.4	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	27500	23500	15.7	0% - 20%
EB1710233-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	78	81	3.70	0% - 20%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	27	27	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	1180	# 835	34.6	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	53	57	8.00	0% - 50%
		EG005T: Aluminium	7429-90-5	50	mg/kg	27500	28000	1.80	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	46800	53800	13.9	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 901175)									
EB1710304-036	MW05-3.0	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	17	17	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	15	16	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	101	105	4.47	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	37	39	4.79	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	12200	12500	1.74	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 901175) - continued									
EB1710304-036	MW05-3.0	EG005T: Iron	7439-89-6	50	mg/kg	22300	24600	9.95	0% - 20%
EB1710330-004	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	13	11	15.7	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	6	7	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	18	17	7.80	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	371	346	6.86	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	498	485	2.67	0% - 20%
		EG005T: Aluminium	7429-90-5	50	mg/kg	5760	5660	1.61	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	14100	# 11300	21.8	0% - 20%
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 908815)									
EB1710304-003	MW01-2.0	EP003: Total Organic Carbon	----	0.02	%	0.08	0.08	0.00	No Limit
EB1710304-044	SB01-4.0	EP003: Total Organic Carbon	----	0.02	%	0.45	0.46	0.00	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 904004)									
EB1710304-003	MW01-2.0	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EB1710304-041	SB01-2.0	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0005	0.0004	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 904004)									
EB1710304-003	MW01-2.0	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EB1710304-041	SB01-2.0	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 904004) - continued									
EB1710304-041	SB01-2.0	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 904004)									
EB1710304-003	MW01-2.0	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EB1710304-041	SB01-2.0	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 904004)									
EB1710304-003	MW01-2.0	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 904004) - continued									
EB1710304-003	MW01-2.0	EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EB1710304-041	SB01-2.0	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 911285)									
EB1710304-015	MW03-1.0	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	1.36	1.37	0.00	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.03	0.03	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.48	0.46	2.99	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.03	0.04	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP1705479-002	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.57	0.60	4.79	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.17	0.17	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.16	0.16	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.26	1.29	2.74	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.03	0.03	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 911285)									
EB1710304-015	MW03-1.0	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.02	0.03	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.08	0.08	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.02	0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP1705479-002	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.04	0.04	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 911285) - continued									
EP1705479-002	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.20	0.19	5.66	0% - 50%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.02	0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 911285)									
EB1710304-015	MW03-1.0	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP1705479-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 911285)									
EB1710304-015	MW03-1.0	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 911285) - continued									
EB1710304-015	MW03-1.0	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP1705479-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 911285)									
EB1710304-015	MW03-1.0	EP231X: Sum of PFAS	----	0.01	µg/L	2.10	2.11	0.475	0% - 20%
EP1705479-002	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	2.49	2.54	1.99	0% - 20%

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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002 : pH (Soils) (QCLot: 901180)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	98	102
				----	7 pH Unit	100	98	102
EA010: Conductivity (QCLot: 901178)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	101	97	103
ED006: Exchangeable Cations on Alkaline Soils (QCLot: 909645)								
ED006: Exchangeable Calcium	----	0.1	meq/100g	<0.1	4.7161 meq/100g	110	70	130
ED006: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.7407 meq/100g	116	70	130
ED006: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.2248 meq/100g	84.2	70	130
ED006: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.5971 meq/100g	124	70	130
ED006: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	7.2788 meq/100g	111	70	130
ED007: Exchangeable Cations (QCLot: 909643)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	15.5 meq/100g	102	79	113
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	9.87 meq/100g	101	85	115
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.561 meq/100g	97.7	70	122
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	11.2 meq/100g	91.7	76	112
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	37.131 meq/100g	98.5	82	112
ED008: Exchangeable Cations (QCLot: 909644)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	10.925 meq/100g	103	91	109
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	5.9518 meq/100g	104	89	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.4769 meq/100g	99.2	79	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.8718 meq/100g	90.3	75	118
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	18.2255 meq/100g	103	88	110
ED093S: Soluble Major Cations (QCLot: 901179)								
ED093S: Potassium	7440-09-7	10	mg/kg	<10	500 mg/kg	102	80	120
EG005T: Total Metals by ICP-AES (QCLot: 901174)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	118.9 mg/kg	93.5	84	123
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.87125 mg/kg	101	88	117
EG005T: Chromium	7440-47-3	2	mg/kg	<2	22.7 mg/kg	101	83	125
EG005T: Copper	7440-50-8	5	mg/kg	<5	55 mg/kg	106	86	122
EG005T: Iron	7439-89-6	50	mg/kg	<50	34900 mg/kg	98.0	70	120
EG005T: Manganese	7439-96-5	5	mg/kg	<5	604.6 mg/kg	101	84	113
EG005T: Zinc	7440-66-6	5	mg/kg	<5	182.3 mg/kg	102	87	127

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 901175)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	118.9 mg/kg	91.4	84	123
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.87125 mg/kg	113	88	117
EG005T: Chromium	7440-47-3	2	mg/kg	<2	22.7 mg/kg	103	83	125
EG005T: Copper	7440-50-8	5	mg/kg	<5	55 mg/kg	108	86	122
EG005T: Iron	7439-89-6	50	mg/kg	<50	34900 mg/kg	103	70	120
EG005T: Manganese	7439-96-5	5	mg/kg	<5	604.6 mg/kg	105	84	113
EG005T: Zinc	7440-66-6	5	mg/kg	<5	182.3 mg/kg	109	87	127
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 908815)								
EP003: Total Organic Carbon	----	0.02	%	<0.02	100 %	100	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 904004)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.1	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	99.0	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.3	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.0	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 904004)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	101	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.2	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.9	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	99.0	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.4	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	99.1	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.3	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	97.5	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 904004)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	98.2	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	76.9	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	105	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	103	58	125

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 904004) - continued								
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 904004)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	98.3	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	112	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	114	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	85.3	60	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 911285)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	83.4	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	96.0	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	111	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	99.4	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	87.0	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	109	70	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 911285)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	83.6	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	103	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	108	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	105	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	122	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	120	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	114	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	119	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	97.8	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	107	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	112	70	124
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 911285)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	80.4	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	80.2	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	80.2	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	105	70	129

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 911285) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	115	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	120	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	120	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 911285)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	113	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	119	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	110	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	106	70	130

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 901174)							
EB1710233-004	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	95.4	70	130
		EG005T: Cadmium	7440-43-9	25 mg/kg	108	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	106	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	109	70	130
		EG005T: Manganese	7439-96-5	50 mg/kg	110	70	130
		EG005T: Zinc	7440-66-6	50 mg/kg	107	70	130
EG005T: Total Metals by ICP-AES (QCLot: 901175)							
EB1710304-041	SB01-2.0	EG005T: Arsenic	7440-38-2	50 mg/kg	97.0	70	130
		EG005T: Cadmium	7440-43-9	25 mg/kg	110	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	110	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	114	70	130
		EG005T: Manganese	7439-96-5	50 mg/kg	104	70	130
		EG005T: Zinc	7440-66-6	50 mg/kg	111	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 904004)							
EB1710304-003	MW01-2.0	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	84.4	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	91.2	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	89.2	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	71.2	50	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 904004) - continued							
EB1710304-003	MW01-2.0	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	90.0	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	109	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 904004)							
EB1710304-003	MW01-2.0	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	81.0	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	101	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	103	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	86.0	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	118	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	107	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	93.2	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	100	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	74.0	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	98.4	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	95.2	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 904004)							
EB1710304-003	MW01-2.0	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	72.0	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	77.4	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	38.6	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.00312 mg/kg	81.9	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	84.1	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	92.8	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	108	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 904004)							
EB1710304-003	MW01-2.0	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	96.0	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	115	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	99.2	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	110	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 911285)							
EB1710304-015	MW03-1.0	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	87.0	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	97.6	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 911285) - continued							
EB1710304-015	MW03-1.0	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	112	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	102	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	93.8	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	111	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 911285)							
EB1710304-015	MW03-1.0	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	84.4	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	110	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	112	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	106	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	121	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	125	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	121	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	125	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	91.0	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	89.6	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	112	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 911285)							
EB1710304-015	MW03-1.0	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	81.4	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	107	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	79.1	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	86.3	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	117	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	113	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	101	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 911285)							
EB1710304-015	MW03-1.0	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	116	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	115	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	113	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	94.2	50	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1710304**	Page	: 1 of 13
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MS THERESE HAMMOND	Telephone	: +61-7-3243 7222
Project	: 313424901 ASA Mackay	Date Samples Received	: 19-May-2017
Site	: ----	Issue Date	: 30-May-2017
Sampler	: BERNICE NG	No. of samples received	: 63
Order number	: 313424901	No. of samples analysed	: 24

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 Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Duplicate 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

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005T: Total Metals by ICP-AES	EB1710330--004	Anonymous	**Iron**	7439-89-6	21.8 %	0% - 20%	**RPD exceeds LOR based limits**
EG005T: Total Metals by ICP-AES	EB1710233--002	Anonymous	**Manganese**	7439-96-5	34.6 %	0% - 20%	**RPD exceeds LOR based limits**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002 : pH (Soils)						
Pulp Bag						
MW04-1.5	25-May-2017	23-May-2017	**2**	----	----	----
Soil Glass Jar - Unpreserved						
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, SB02-1.0, SB02-3.0	25-May-2017	23-May-2017	**2**	----	----	----
Soil Glass Jar - Unpreserved						
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0	25-May-2017	24-May-2017	**1**	----	----	----
EA010: Conductivity						
Pulp Bag						
MW04-1.5	25-May-2017	23-May-2017	**2**	----	----	----
Soil Glass Jar - Unpreserved						
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, SB02-1.0, SB02-3.0	25-May-2017	23-May-2017	**2**	----	----	----
Soil Glass Jar - Unpreserved						
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0	25-May-2017	24-May-2017	**1**	----	----	----

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 / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002 : pH (Soils)							
Pulp Bag (EA002)							
MW04-1.5	**16-May-2017**	**25-May-2017**	23-May-2017	×	**25-May-2017**	25-May-2017	✓
Soil Glass Jar - Unpreserved (EA002)							
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, SB02-1.0, SB02-3.0	**16-May-2017**	**25-May-2017**	23-May-2017	×	**25-May-2017**	25-May-2017	✓
Soil Glass Jar - Unpreserved (EA002)							
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0	**17-May-2017**	**25-May-2017**	24-May-2017	×	**25-May-2017**	25-May-2017	✓
EA010: Conductivity							
Pulp Bag (EA010)							
MW04-1.5	**16-May-2017**	**25-May-2017**	23-May-2017	×	**25-May-2017**	22-Jun-2017	✓
Soil Glass Jar - Unpreserved (EA010)							
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, SB02-1.0, SB02-3.0	**16-May-2017**	**25-May-2017**	23-May-2017	×	**25-May-2017**	22-Jun-2017	✓
Soil Glass Jar - Unpreserved (EA010)							
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0	**17-May-2017**	**25-May-2017**	24-May-2017	×	**25-May-2017**	22-Jun-2017	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
HDPE Soil Jar (EA055-103)							
MW02-0.5, SB02-0.5	**15-May-2017**	**----**	----	----	**23-May-2017**	29-May-2017	✓
HDPE Soil Jar (EA055-103)							
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, MW04-0.2, SB02-3.0, QA-03	**16-May-2017**	**----**	----	----	**23-May-2017**	30-May-2017	✓
HDPE Soil Jar (EA055-103)							
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0, QA-05	**17-May-2017**	**----**	----	----	**23-May-2017**	31-May-2017	✓
Snap Lock Bag - Friable Asbestos/PSD Bag (EA055-103)							
MW04-1.5	**16-May-2017**	**----**	----	----	**22-May-2017**	30-May-2017	✓
Soil Glass Jar - Unpreserved (EA055-103)							
SB02-1.0	**16-May-2017**	**----**	----	----	**22-May-2017**	30-May-2017	✓
EA150: Particle Sizing							
Snap Lock Bag (EA150H)							
MW03-3.5	**16-May-2017**	**----**	----	----	**29-May-2017**	12-Nov-2017	✓
Snap Lock Bag (EA150H)							
MW02-3.5, SB01-3.5	**17-May-2017**	**----**	----	----	**29-May-2017**	13-Nov-2017	✓
Snap Lock Bag - Friable Asbestos/PSD Bag (EA150H)							
MW03-1.8	**16-May-2017**	**----**	----	----	**29-May-2017**	12-Nov-2017	✓
Snap Lock Bag - Friable Asbestos/PSD Bag (EA150H)							
SB03-3.0	**17-May-2017**	**----**	----	----	**29-May-2017**	13-Nov-2017	✓
EA150: Soil Classification based on Particle Size							
Snap Lock Bag (EA150H)							
MW03-3.5	**16-May-2017**	**----**	----	----	**29-May-2017**	12-Nov-2017	✓
Snap Lock Bag (EA150H)							
MW02-3.5, SB01-3.5	**17-May-2017**	**----**	----	----	**29-May-2017**	13-Nov-2017	✓
Snap Lock Bag - Friable Asbestos/PSD Bag (EA150H)							
MW03-1.8	**16-May-2017**	**----**	----	----	**29-May-2017**	12-Nov-2017	✓
Snap Lock Bag - Friable Asbestos/PSD Bag (EA150H)							
SB03-3.0	**17-May-2017**	**----**	----	----	**29-May-2017**	13-Nov-2017	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA152: Soil Particle Density							
Snap Lock Bag (EA152)							
MW03-3.5	**16-May-2017**	**----**	----	----	**29-May-2017**	12-Nov-2017	✓
Snap Lock Bag (EA152)							
MW02-3.5, SB01-3.5	**17-May-2017**	**----**	----	----	**29-May-2017**	13-Nov-2017	✓
Snap Lock Bag - Friable Asbestos/PSD Bag (EA152)							
MW03-1.8	**16-May-2017**	**----**	----	----	**29-May-2017**	12-Nov-2017	✓
Snap Lock Bag - Friable Asbestos/PSD Bag (EA152)							
SB03-3.0	**17-May-2017**	**----**	----	----	**29-May-2017**	13-Nov-2017	✓
ED006: Exchangeable Cations on Alkaline Soils							
Pulp Bag (ED006)							
MW04-1.5	**16-May-2017**	**26-May-2017**	13-Jun-2017	✓	**26-May-2017**	13-Jun-2017	✓
Soil Glass Jar - Unpreserved (ED006)							
MW01-2.0, MW01-3.0, MW03-3.0, SB02-1.0, SB02-3.0	**16-May-2017**	**26-May-2017**	13-Jun-2017	✓	**26-May-2017**	13-Jun-2017	✓
Soil Glass Jar - Unpreserved (ED006)							
MW02-1.0, MW02-3.0, MW05-3.0, SB01-2.0, SB01-4.0	**17-May-2017**	**26-May-2017**	14-Jun-2017	✓	**26-May-2017**	14-Jun-2017	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007)							
MW03-1.0	**16-May-2017**	**26-May-2017**	13-Jun-2017	✓	**26-May-2017**	13-Jun-2017	✓
Soil Glass Jar - Unpreserved (ED007)							
MW05-1.0, SB03-1.0	**17-May-2017**	**26-May-2017**	14-Jun-2017	✓	**26-May-2017**	14-Jun-2017	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008)							
SB03-3.0	**17-May-2017**	**26-May-2017**	14-Jun-2017	✓	**26-May-2017**	14-Jun-2017	✓
ED093S: Soluble Major Cations							
Pulp Bag (ED093S)							
MW04-1.5	**16-May-2017**	**25-May-2017**	12-Nov-2017	✓	**26-May-2017**	12-Nov-2017	✓
Soil Glass Jar - Unpreserved (ED093S)							
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, SB02-1.0, SB02-3.0	**16-May-2017**	**25-May-2017**	12-Nov-2017	✓	**26-May-2017**	12-Nov-2017	✓
Soil Glass Jar - Unpreserved (ED093S)							
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0	**17-May-2017**	**25-May-2017**	13-Nov-2017	✓	**26-May-2017**	13-Nov-2017	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES							
Pulp Bag (EG005T)							
MW04-1.5	**16-May-2017**	**24-May-2017**	12-Nov-2017	✓	**25-May-2017**	12-Nov-2017	✓
Soil Glass Jar - Unpreserved (EG005T)							
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, SB02-1.0, SB02-3.0	**16-May-2017**	**24-May-2017**	12-Nov-2017	✓	**25-May-2017**	12-Nov-2017	✓
Soil Glass Jar - Unpreserved (EG005T)							
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0	**17-May-2017**	**24-May-2017**	13-Nov-2017	✓	**25-May-2017**	13-Nov-2017	✓
EN60: Bottle Leaching Procedure							
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN60-Dla)							
MW03-1.0, MW03-3.0, SB02-3.0	**16-May-2017**	**24-May-2017**	30-May-2017	✓	**----**	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN60-Dla)							
MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0	**17-May-2017**	**24-May-2017**	31-May-2017	✓	**----**	----	----
EP003: Total Organic Carbon (TOC) in Soil							
Pulp Bag (EP003)							
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, MW04-1.5, SB02-1.0, SB02-3.0	**16-May-2017**	**25-May-2017**	13-Jun-2017	✓	**25-May-2017**	13-Jun-2017	✓
Pulp Bag (EP003)							
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0	**17-May-2017**	**25-May-2017**	14-Jun-2017	✓	**25-May-2017**	14-Jun-2017	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
MW02-0.5, SB02-0.5	**15-May-2017**	**24-May-2017**	11-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
HDPE Soil Jar (EP231X)							
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, MW04-0.2, SB02-3.0, QA-03	**16-May-2017**	**24-May-2017**	12-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
HDPE Soil Jar (EP231X)							
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0, QA-05	**17-May-2017**	**24-May-2017**	13-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
MW02-0.5, SB02-0.5	**15-May-2017**	**24-May-2017**	11-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
HDPE Soil Jar (EP231X)							
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, MW04-0.2, SB02-3.0, QA-03	**16-May-2017**	**24-May-2017**	12-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
HDPE Soil Jar (EP231X)							
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0, QA-05	**17-May-2017**	**24-May-2017**	13-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
MW02-0.5, SB02-0.5	**15-May-2017**	**24-May-2017**	11-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
HDPE Soil Jar (EP231X)							
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, MW04-0.2, SB02-3.0, QA-03	**16-May-2017**	**24-May-2017**	12-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
HDPE Soil Jar (EP231X)							
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0, QA-05	**17-May-2017**	**24-May-2017**	13-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
MW02-0.5, SB02-0.5	**15-May-2017**	**24-May-2017**	11-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
HDPE Soil Jar (EP231X)							
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, MW04-0.2, SB02-3.0, QA-03	**16-May-2017**	**24-May-2017**	12-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
HDPE Soil Jar (EP231X)							
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0, QA-05	**17-May-2017**	**24-May-2017**	13-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
MW02-0.5, SB02-0.5	**15-May-2017**	**24-May-2017**	11-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
HDPE Soil Jar (EP231X)							
MW01-2.0, MW01-3.0, MW03-1.0, MW03-3.0, MW04-0.2, SB02-3.0, QA-03	**16-May-2017**	**24-May-2017**	12-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓
HDPE Soil Jar (EP231X)							
MW02-1.0, MW02-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB03-1.0, SB03-3.0, QA-05	**17-May-2017**	**24-May-2017**	13-Nov-2017	✓	**24-May-2017**	03-Jul-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
MW03-1.0, MW03-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB02-3.0, SB03-1.0, SB03-3.0	**24-May-2017**	**----**	----	----	**29-May-2017**	20-Nov-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
MW03-1.0, MW03-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB02-3.0, SB03-1.0, SB03-3.0	**24-May-2017**	**----**	----	----	**29-May-2017**	20-Nov-2017	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
MW03-1.0, MW03-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB02-3.0, SB03-1.0, SB03-3.0	**24-May-2017**	**----**	----	----	**29-May-2017**	20-Nov-2017	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
MW03-1.0, MW03-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB02-3.0, SB03-1.0, SB03-3.0	**24-May-2017**	**----**	----	----	**29-May-2017**	20-Nov-2017	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
MW03-1.0, MW03-3.0, MW05-1.0, MW05-3.0, SB01-2.0, SB01-4.0, SB02-3.0, SB03-1.0, SB03-3.0	**24-May-2017**	**----**	----	----	**29-May-2017**	20-Nov-2017	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Cations - soluble by ICP-AES	ED093S	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055-103	2	20	**10.00**	**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	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	27	**14.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Cations - soluble by ICP-AES	ED093S	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	**100.00**	**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	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	27	**7.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Cations - soluble by ICP-AES	ED093S	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	**100.00**	**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
Total Metals by ICP-AES	EG005T	2	27	**7.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	27	**7.41**	**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		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	

Matrix: **WATER**

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)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	17	**5.88**	**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 (1:5)	EA002	SOIL	In house: Referenced to APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 104)
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Soil Particle Density	EA152	SOIL	Soil Particle Density by AS 1289.3.5.1-2006 : Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Exchangeable Cations on Alkaline Soils	ED006	SOIL	In house: Referenced to Soil Survey Test Method C5. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with alcoholic ammonium chloride at pH 8.5. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil.
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons (2011) Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Higginson (2011) Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Cations - soluble by ICP-AES	ED093S	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010 (ICPAES) Water extracts of the soil are analyzed for major cations by ICPAES. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP003	SOIL	In house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automaticaly measured by infra-red detector.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-House. A portion of soil is extracted with MTBE. The extract is taken to dryness, made up in mobile phase. Analysis is by LC/MSMS, ESI Negative Mode using MRM. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.
Sodium Peroxide fusion - ICPAES finish	ME-ICP81x	SOIL	Analysis conducted by ALS Minerals.

Preparation Methods	Method	Matrix	Method Descriptions

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method (Alkaline Soils)	ED006PR	SOIL	In house: Referenced to Rayment and Lyons 2011 method 15C1.
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Higginson (1992) method 15A1. A 1M NH4Cl 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.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled 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.
Deionised Water Leach	EN60-Dla	SOIL	In house QWI-EN/60 referenced to AS4439.3 Preparation of Leachates
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 (2013) Schedule B(3) (Method 202)
Sample Extraction for PFAS	EP231-PR	SOIL	In house
Dry and Pulverise (up to 100g)	GEO30	SOIL	#

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1710916**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: THERESE HAMMOND	Contact	: Vanessa Mattes
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: therese.hammond@ghd.com	E-mail	: ALSEnviro.Brisbane@alsglobal.com
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3316 3333	Facsimile	: +61-7-3243 7218
Project	: ASA Mackay	Page	: 1 of 3
Order number	: 3134249	Quote number	: ES2015GHDSER0820 (EN/005/15)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: BERNICE NG		

Dates

Date Samples Received	: 30-May-2017 09:00	Issue Date	: 30-May-2017
Client Requested Due Date	: 06-Jun-2017	Scheduled Reporting Date	: **06-Jun-2017**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 2	Temperature	: 1.8,0.8°C - Ice present
Receipt Detail	: MEDIUM ESKIES	No. of samples received / analysed	: 16 / 16

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- ***Samples were originally received by ALS MACKAY on 26/5/17 - 13.50 @ 3.0,3.1°C, and forwarded to ALS Brisbane for analysis.**
- **Please note for ALS #16 (QA-01) due to only receiving a HDPE (no PTFE bottle ALS Grey) that EP231X analysis have only been assigned.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- **EP231X analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**

Sample Container(s)/Preservation Non-Compliances

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

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

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - EG005T (solids) Total Metals by ICP-AES	SOIL - EP003 Total Organic Carbon (TOC) in Soil	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EB1710916-011	25-May-2017 00:00	SS02	✓	✓	✓	✓
EB1710916-013	26-May-2017 00:00	SS03	✓	✓	✓	✓
EB1710916-015	26-May-2017 00:00	SS01	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA015H Total Dissolved Solids - High Level	WATER - EP231X PFAS - Full Suite (28 analytes)	WATER - NT-01 & 02 Ca, Mg, Na, K, Cl, SO4, Alkalinity
EB1710916-001	25-May-2017 00:00	EW01	✓	✓	✓
EB1710916-002	25-May-2017 00:00	GMW 6	✓	✓	✓
EB1710916-003	25-May-2017 00:00	GMW 2	✓	✓	✓
EB1710916-004	25-May-2017 00:00	MW05	✓	✓	✓
EB1710916-005	25-May-2017 00:00	MW01	✓	✓	✓
EB1710916-006	25-May-2017 00:00	MW03	✓	✓	✓
EB1710916-007	26-May-2017 00:00	MW02	✓	✓	✓
EB1710916-008	26-May-2017 00:00	MW04	✓	✓	✓
EB1710916-009	26-May-2017 00:00	GMW3	✓	✓	✓
EB1710916-010	25-May-2017 00:00	SW02	✓	✓	✓
EB1710916-012	26-May-2017 00:00	SW03	✓	✓	✓
EB1710916-014	26-May-2017 00:00	SW01	✓	✓	✓
EB1710916-016	25-May-2017 00:00	QA-01		✓	

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE (Brisbane)

- A4 - AU Tax Invoice (INV)	Email	ap-fss@ghd.com

BERNICE NG

- *AU Certificate of Analysis - NATA (COA)	Email	bernice.ng@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	bernice.ng@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	bernice.ng@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	bernice.ng@ghd.com
- Chain of Custody (CoC) (COC)	Email	bernice.ng@ghd.com
- EDI Format - ENMRG (ENMRG)	Email	bernice.ng@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	bernice.ng@ghd.com
- EDI Format - XTab (XTAB)	Email	bernice.ng@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	bernice.ng@ghd.com

THERESE HAMMOND

- *AU Certificate of Analysis - NATA (COA)	Email	therese.hammond@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	therese.hammond@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	therese.hammond@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	therese.hammond@ghd.com
- A4 - AU Tax Invoice (INV)	Email	therese.hammond@ghd.com
- Chain of Custody (CoC) (COC)	Email	therese.hammond@ghd.com
- EDI Format - ENMRG (ENMRG)	Email	therese.hammond@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	therese.hammond@ghd.com
- EDI Format - XTab (XTAB)	Email	therese.hammond@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	therese.hammond@ghd.com

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com

NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 2125 E: portkembla@alsglobal.com

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Brisbane		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: ASA Mackay	ALS QUOTE NO.: GHD national quote 2016	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: 3134249		OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Therese Hammond	CONTACT PH: 0481 715 953		Other comment:
SAMPLER: Bernice Ng	SAMPLER MOBILE: 0437 500 717		
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat		
Email Reports to (will default to PM if no other addresses are listed): Bernice.Ng@ghd.com; Therese.Hammond@ghd.com			
Email Invoice to (will default to PM if no other addresses are listed): Therese.Hammond@ghd.com			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Bernice			Alison
DATE/TIME: 26/5/17 13:50pm	DATE/TIME: 26/5/17 13:50pm	DATE/TIME: 29/5/17 15.00pm	DATE/TIME: 30.05.17 09:00

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS Full Suite	Major Ions, Alkalinity	Total Dissolved Solids	Total organic Carbon	~~Dissolved~~ 8 metals				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	EW01	25/5/17	W			✓	✓	✓						* Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
2	GMW6	"	W			✓	✓	✓						
3	GMW2	"	W			✓	✓	✓						
4	MW05	"	W			✓	✓	✓						
5	~~GMW1~~ MW01	"	W			✓	✓	✓						
6	MW03	"	W			✓	✓	✓						
7	MW02	26/5/17	W			✓	✓	✓						
8	MW04	"	W			✓	✓	✓						
9	GMW3	"	W			✓	✓	✓						
10	SW02	25/5/17	W			✓	✓	✓						
11	SS02	25/5/17	S			✓			✓	✓				
12	SW03	26/5/17	W			✓	✓	✓						
				TOTAL										

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

Environmental Division
Brisbane
Work Order Reference
EB1710916

Telephone : +61-7-3243 7222

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

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WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Brisbane		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes / No / N/A
PROJECT: ASA	ALS QUOTE NO.: GHD national quote 2016	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Free ice / frozen ice bricks present upon receipt? Yes / No / N/A
ORDER NUMBER: 3134249		OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Therese Hammond	CONTACT PH: 0481 715 953		Other comment:
SAMPLER: Bernice Ng	SAMPLER MOBILE: 0437 500 717		
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat		
Email Reports to (will default to PM if no other addresses are listed): Bernice.Ng@ghd.com; Therese.Hammond@ghd.com			
Email Invoice to (will default to PM if no other addresses are listed): Therese.Hammond@ghd.com			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 26/5/17	DATE/TIME: 26/5/17 13:50pm	DATE/TIME: 29/5/17 15:00pm	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS Full Suite	Major Ions, Alkalinity	Total Dissolved Solids	Total organic carbon	8 Metals*			Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	SS03	26/5/17	S			✓			✓	✓			*Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn.
14	SW01	26/5/17	W			✓	✓	✓					
15	SS01	26/5/17	S			✓			✓	✓			
16	QA-01	25/5/17	W			✓	✓	✓					
17	QA-02	26/5/17	W			✓	✓	✓					→ Forward to Eurofins MGT.
			S										
			S										
			S										
			S										
			S										
			S										
			S										
			S										
					TOTAL								

ORIGIN: MACKAY

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; [illegible] Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1710916**	Page	: 1 of 15
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: THERESE HAMMOND	Contact	: Vanessa Mattes
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Project	: ASA Mackay	Date Samples Received	: 30-May-2017 09:00
Order number	: 3134249	Date Analysis Commenced	: 31-May-2017
C-O-C number	: ----	Issue Date	: 09-Jun-2017 15:52
Sampler	: BERNICE NG		
Site	: ----		
Quote number	: EN/005/16		
No. of samples received	: 16		
No. of samples analysed	: 16		

ilac-MRA NATA
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. 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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Andrew Epps	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Andrew Epps	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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

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

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

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

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

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

- EP231X: Poor Matrix Spike (MS) recoveries for analytes "PFTeDA" & "10:2 FTS" is due to sample matrix interferences. This was confirmed by re-preparation and re-analysis.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- **EP231X analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- EP231X: Sample "GMW 2" required dilution prior to extraction due to high conductivity. LOR values have been adjusted accordingly.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SS02	SS03	SS01	----	----
			Client sampling date / time	25-May-2017 00:00	26-May-2017 00:00	26-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit	EB1710916-011	EB1710916-013	EB1710916-015	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	**25.0**	**28.5**	**26.4**	----	----
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**10600**	**14800**	**11600**	----	----
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	**10**	**13**	**13**	----	----
Copper	7440-50-8	5	mg/kg	**13**	**13**	**16**	----	----
Iron	7439-89-6	50	mg/kg	**20800**	**12000**	**19500**	----	----
Manganese	7439-96-5	5	mg/kg	**1360**	**83**	**147**	----	----
Zinc	7440-66-6	5	mg/kg	**28**	**25**	**40**	----	----
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**0.57**	**1.10**	**0.51**	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0008**	<0.0002	<0.0002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<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	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SS02	SS03	SS01	----	----
				Client sampling date / time	25-May-2017 00:00	26-May-2017 00:00	26-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1710916-011	EB1710916-013	EB1710916-015	--------	--------
					Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<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	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	**0.0006**	**0.0005**	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		**0.0003**	<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	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<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	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0011**	**0.0006**	**0.0005**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0008**	<0.0002	<0.0002	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SS02	SS03	SS01	----	----
				Client sampling date / time	25-May-2017 00:00	26-May-2017 00:00	26-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1710916-011	EB1710916-013	EB1710916-015	--------	--------
					Result	Result	Result	----	----
EP231P: PFAS Sums - Continued									
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0008**	<0.0002	<0.0002	**----**	**----**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**120**	**100**	**101**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	EW01	GMW 6	GMW 2	MW05	MW01
			Client sampling date / time	25-May-2017 00:00	25-May-2017 00:00	25-May-2017 00:00	25-May-2017 00:00	25-May-2017 00:00
Compound	CAS Number	LOR	Unit	EB1710916-001	EB1710916-002	EB1710916-003	EB1710916-004	EB1710916-005
				Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	1630	185	18100	5480	976
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	44	28
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	487	45	<1	551	463
Total Alkalinity as CaCO3	----	1	mg/L	487	45	<1	596	492
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	38	6	2960	447	34
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	753	49	8020	2660	274
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	12	3	516	69	21
Magnesium	7439-95-4	1	mg/L	33	5	800	104	20
Sodium	7440-23-5	1	mg/L	540	46	4270	1730	300
Potassium	7440-09-7	1	mg/L	27	<1	76	28	2
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	31.8	2.41	288	96.2	18.3
Total Cations	----	0.01	meq/L	27.5	2.56	279	88.0	15.8
Ionic Balance	----	0.01	%	7.20	----	1.52	4.50	7.26
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	1.18	4.00	0.08	0.13	0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	1.07	5.04	0.06	0.13	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	5.55	48.3	0.28	0.63	0.10
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.05	0.50	<0.05	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	6.18	87.5	<0.05	0.22	0.09
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.05	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.4	1.5	<0.2	<0.1	<0.1

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	EW01	GMW 6	GMW 2	MW05	MW01
				Client sampling date / time	25-May-2017 00:00	25-May-2017 00:00	25-May-2017 00:00	25-May-2017 00:00	25-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1710916-001	EB1710916-002	EB1710916-003	EB1710916-004	EB1710916-005
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.24**	**0.95**	<0.05	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**1.08**	**5.25**	<0.05	**0.05**	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.05**	**0.33**	<0.05	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.17**	**1.19**	<0.05	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		**0.02**	**0.11**	<0.05	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.05	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.05	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.05	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.05	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.12	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.05	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.12	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.12	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.12	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.12	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.05	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.05	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	EW01	GMW 6	GMW 2	MW05	MW01
				Client sampling date / time	25-May-2017 00:00	25-May-2017 00:00	25-May-2017 00:00	25-May-2017 00:00	25-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1710916-001	EB1710916-002	EB1710916-003	EB1710916-004	EB1710916-005
					Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued									
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**16.0**	**155**	**0.42**	**1.16**	**0.21**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**11.7**	**136**	**0.28**	**0.85**	**0.19**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**14.8**	**149**	**0.36**	**1.03**	**0.21**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**79.2**	**88.2**	**70.0**	**61.0**	**79.2**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MW03	MW02	MW04	GMW3	SW02
			Client sampling date / time	25-May-2017 00:00	26-May-2017 00:00	26-May-2017 00:00	26-May-2017 00:00	25-May-2017 00:00
Compound	CAS Number	LOR	Unit	EB1710916-006	EB1710916-007	EB1710916-008	EB1710916-009	EB1710916-010
				Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	1030	657	979	1180	379
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	56	9	<1	8	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	577	271	206	252	42
Total Alkalinity as CaCO3	----	1	mg/L	633	280	206	260	42
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	33	25	44	374	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	239	242	450	231	84
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	21	33	67	8	15
Magnesium	7439-95-4	1	mg/L	21	26	40	11	4
Sodium	7440-23-5	1	mg/L	323	164	186	369	47
Potassium	7440-09-7	1	mg/L	3	2	2	6	9
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	20.1	12.9	17.7	19.5	3.21
Total Cations	----	0.01	meq/L	16.9	11.0	14.8	17.5	3.35
Ionic Balance	----	0.01	%	8.58	8.24	9.07	5.38	2.19
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	4.47	0.03	<0.02	1.02	0.03
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	3.71	0.04	<0.02	1.27	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	10.5	0.40	<0.02	18.2	0.08
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.03	<0.02	<0.02	0.13	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.90	0.09	0.02	67.0	0.11
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	18.4	<0.1	<0.1	0.9	<0.1

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW03	MW02	MW04	GMW3	SW02
				Client sampling date / time	25-May-2017 00:00	26-May-2017 00:00	26-May-2017 00:00	26-May-2017 00:00	25-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1710916-006	EB1710916-007	EB1710916-008	EB1710916-009	EB1710916-010
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**16.2**	<0.02	<0.02	**0.98**	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**13.6**	<0.02	<0.02	**1.97**	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**4.29**	<0.02	<0.02	**0.21**	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**3.75**	<0.01	<0.01	**0.41**	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		**0.26**	<0.02	<0.02	**0.03**	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	**0.03**	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**1.18**	<0.05	<0.05	**0.72**	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW03	MW02	MW04	GMW3	SW02
				Client sampling date / time	25-May-2017 00:00	26-May-2017 00:00	26-May-2017 00:00	26-May-2017 00:00	25-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1710916-006	EB1710916-007	EB1710916-008	EB1710916-009	EB1710916-010
					Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued									
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	**0.08**	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**77.3**	**0.56**	**0.02**	**93.0**	**0.22**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**11.4**	**0.49**	**0.02**	**85.2**	**0.19**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**73.3**	**0.52**	**0.02**	**91.5**	**0.22**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**80.4**	**87.0**	**82.6**	**85.5**	**86.1**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW03	SW01	QA-01	----	----
				Client sampling date / time	26-May-2017 00:00	26-May-2017 00:00	25-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1710916-012	EB1710916-014	EB1710916-016	--------	--------
					Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		312	511	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	13	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		62	207	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		62	220	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		<1	51	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		100	136	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		10	42	----	----	----
Magnesium	7439-95-4	1	mg/L		9	21	----	----	----
Sodium	7440-23-5	1	mg/L		56	109	----	----	----
Potassium	7440-09-7	1	mg/L		5	2	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		4.06	9.29	----	----	----
Total Cations	----	0.01	meq/L		3.80	8.62	----	----	----
Ionic Balance	----	0.01	%		3.26	3.78	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	0.03	4.37	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	0.04	5.27	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	0.28	49.9	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	0.90	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	0.04	93.5	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	1.4	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW03	SW01	QA-01	----	----
				Client sampling date / time	26-May-2017 00:00	26-May-2017 00:00	25-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1710916-012	EB1710916-014	EB1710916-016	--------	--------
					Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	**1.00**	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	**5.46**	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	**0.42**	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	**1.35**	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	**0.12**	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW03	SW01	QA-01	----	----
				Client sampling date / time	26-May-2017 00:00	26-May-2017 00:00	25-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1710916-012	EB1710916-014	EB1710916-016	--------	--------
					Result	Result	Result	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued									
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	**0.39**	**164**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	**0.32**	**143**	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	**0.35**	**157**	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**90.9**	**88.5**	**90.1**	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1710916**	Page	: 1 of 13
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: THERESE HAMMOND	Contact	: Vanessa Mattes
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3316 3000	Telephone	: +61-7-3243 7222
Project	: ASA Mackay	Date Samples Received	: 30-May-2017
Order number	: 3134249	Date Analysis Commenced	: 31-May-2017
C-O-C number	: ----	Issue Date	: 09-Jun-2017
Sampler	: BERNICE NG		
Site	: ----		
Quote number	: EN/005/16		
No. of samples received	: 16		
No. of samples analysed	: 16		

ilac-MRA NATA
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. 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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Andrew Epps	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Andrew Epps	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 918457)									
EB1710949-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	4.4	4.5	3.55	No Limit
EB1711030-008	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	11.0	11.4	3.45	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 918442)									
EB1710916-011	SS02	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	10	8	12.4	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	13	11	15.8	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	1360	1160	15.9	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	28	25	9.44	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	10600	9500	11.5	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	20800	20300	2.19	0% - 20%
EB1711030-010	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	9	13	38.5	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	18	18	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	22	29	27.2	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	66	70	7.29	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	61	86	34.0	0% - 50%
		EG005T: Aluminium	7429-90-5	50	mg/kg	11100	11200	0.724	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	23000	28000	19.6	0% - 20%
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 926347)									
EB1710916-011	SS02	EP003: Total Organic Carbon	----	0.02	%	0.57	0.57	0.00	0% - 20%
ES1712870-014	Anonymous	EP003: Total Organic Carbon	----	0.02	%	0.33	0.35	6.16	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 920201)									
EB1710916-011	SS02	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 920201) - continued									
EB1710916-011	SS02	EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0008	0.0011	26.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES1713227-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 920201)									
EB1710916-011	SS02	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES1713227-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.005	<0.005	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 920201)									
EB1710916-011	SS02	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	0.0003	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 920201) - continued									
EB1710916-011	SS02	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES1713227-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0100	<0.0100	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0100	<0.0100	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0100	<0.0100	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0050	<0.0050	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 920201)									
EB1710916-011	SS02	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES1713227-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0100	<0.0100	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0050	<0.0050	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0050	<0.0050	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 916496)									

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 916496) - continued									
EB1710916-001	EW01	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	1630	1620	0.164	0% - 20%
EB1710918-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	30	25	19.3	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 917909)									
EB1710916-001	EW01	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	487	490	0.551	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	487	490	0.551	0% - 20%
EB1710916-012	SW03	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	62	63	2.39	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	62	63	2.39	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 923321)									
EB1710916-009	GMW3	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	374	375	0.00	0% - 20%
EB1710682-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	2	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 923320)									
EB1710916-005	MW01	ED045G: Chloride	16887-00-6	1	mg/L	274	275	0.402	0% - 20%
EB1710682-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	840	840	0.00	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 917670)									
EB1710863-006	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	577	566	1.96	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	601	603	0.437	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	646	647	0.157	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	88	85	2.52	0% - 20%
EB1710682-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	7	6	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	1	1	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	989	925	6.74	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	46	43	7.13	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 917671)									
EB1710916-005	MW01	ED093F: Calcium	7440-70-2	1	mg/L	21	20	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	20	20	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	300	295	1.65	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
EB1710936-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	491	500	1.85	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	613	625	1.99	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	3230	3230	0.214	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	220	225	2.02	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 920192)									
EB1710916-001	EW01	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	6.18	7.43	18.4	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	1.18	1.31	11.0	0% - 20%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	1.07	1.22	13.4	0% - 20%

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 920192) - continued									
EB1710916-001	EW01	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	5.55	6.55	16.6	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.05	0.05	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EB1710916-012	SW03	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 920192)									
EB1710916-001	EW01	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.17	0.19	10.9	0% - 50%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.24	0.28	13.8	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	1.08	1.22	11.9	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.05	0.05	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.02	0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.4	0.5	0.00	No Limit
EB1710916-012	SW03	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 920192)									
EB1710916-001	EW01	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 920192) - continued									
EB1710916-001	EW01	EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EB1710916-012	SW03	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 920192)									
EB1710916-001	EW01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EB1710916-012	SW03	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 920192)									
EB1710916-001	EW01	EP231X: Sum of PFAS	----	0.01	µg/L	16.0	18.8	16.2	0% - 20%
EB1710916-012	SW03	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 918442)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	118.9 mg/kg	103	84	123
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.87125 mg/kg	116	88	117
EG005T: Chromium	7440-47-3	2	mg/kg	<2	22.7 mg/kg	101	83	125
EG005T: Copper	7440-50-8	5	mg/kg	<5	55 mg/kg	107	86	122
EG005T: Iron	7439-89-6	50	mg/kg	<50	34900 mg/kg	103	70	120
EG005T: Manganese	7439-96-5	5	mg/kg	<5	604.6 mg/kg	104	84	113
EG005T: Zinc	7440-66-6	5	mg/kg	<5	182.3 mg/kg	111	87	127
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 926347)								
EP003: Total Organic Carbon	----	0.02	%	<0.02	100 %	98.3	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 920201)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	108	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.5	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.1	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	109	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.9	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 920201)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	83.9	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.7	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	99.0	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.3	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	114	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	91.0	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	94.3	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 920201)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	110	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	97.2	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	68.9	64	126

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 920201) - continued								
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	106	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	106	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.9	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 920201)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	86.5	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	104	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	95.7	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	104	60	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 916496)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	293 mg/L	98.7	88	112
				<10	2000 mg/L	94.3	88	112
ED037P: Alkalinity by PC Titrator (QCLot: 917909)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	108	80	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 923321)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	103	85	118
				<1	100 mg/L	98.1	85	118
ED045G: Chloride by Discrete Analyser (QCLot: 923320)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	105	90	115
				<1	1000 mg/L	101	90	115
ED093F: Dissolved Major Cations (QCLot: 917670)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
ED093F: Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
ED093F: Sodium	7440-23-5	1	mg/L	<1	----	----	----	----
ED093F: Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
ED093F: Dissolved Major Cations (QCLot: 917671)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
ED093F: Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
ED093F: Sodium	7440-23-5	1	mg/L	<1	----	----	----	----
ED093F: Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 920192)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 920192) - continued								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	88.6	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	90.8	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	93.0	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	83.4	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	96.2	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	102	70	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 920192)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	93.4	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	101	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	99.2	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	96.8	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	97.2	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	109	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	112	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	127	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	113	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	123	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	123	70	124
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 920192)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	99.4	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	113	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	125	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	123	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	124	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	87.8	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	103	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 920192)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	93.4	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	82.4	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	80.4	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	77.4	70	130

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG005T: Total Metals by ICP-AES (QCLot: 918442)							
EB1710916-013	SS03	EG005T: Arsenic	7440-38-2	50 mg/kg	100	70	130
		EG005T: Cadmium	7440-43-9	25 mg/kg	107	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	108	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	115	70	130
		EG005T: Manganese	7439-96-5	50 mg/kg	97.2	70	130
		EG005T: Zinc	7440-66-6	50 mg/kg	109	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 920201)							
EB1710916-011	SS02	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	55.3	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	68.8	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	98.4	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	104	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	106	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	92.4	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 920201)							
EB1710916-011	SS02	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	87.7	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	106	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	84.0	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	108	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	118	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	119	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	106	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	110	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	109	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	79.2	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	99.4	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 920201)							
EB1710916-011	SS02	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	95.2	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	103	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	86.4	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.00312 mg/kg	72.0	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	74.8	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	108	30	130

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 920201) - continued							
EB1710916-011	SS02	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	102	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 920201)							
EB1710916-011	SS02	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	107	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	110	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	116	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	70.8	50	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 923321)							
EB1710916-001	EW01	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	83.8	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 923320)							
EB1710779-001	Anonymous	ED045G: Chloride	16887-00-6	400 mg/L	81.0	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 920192)							
EB1710916-001	EW01	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	62.8	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	79.4	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	# Not Determined	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	97.8	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	# Not Determined	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	126	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 920192)							
EB1710916-001	EW01	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	92.6	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	70.0	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	59.4	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	96.0	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	51.4	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	114	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	106	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	114	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	105	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	123	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	# 37.4	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 920192)							
EB1710916-001	EW01	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	66.8	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 920192) - continued							
EB1710916-001	EW01	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	125	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	126	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	111	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	119	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	110	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	83.8	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 920192)							
EB1710916-001	EW01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	65.8	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	66.8	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	60.4	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	# 38.0	50	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1710916**	Page	: 1 of 10
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: THERESE HAMMOND	Telephone	: +61-7-3243 7222
Project	: ASA Mackay	Date Samples Received	: 30-May-2017
Site	: ----	Issue Date	: 09-Jun-2017
Sampler	: BERNICE NG	No. of samples received	: 16
Order number	: 3134249	No. of samples analysed	: 16

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

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

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	EB1710916--001	EW01	**Perfluorohexane sulfonic acid (PFHxS)**	355-46-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EB1710916--001	EW01	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1710916--001	EW01	**Perfluorotetradecanoic acid (PFTeDA)**	376-06-7	37.4 %	50-130%	**Recovery less than lower data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EB1710916--001	EW01	**10:2 Fluorotelomer sulfonic acid (10:2 FTS)**	120226-60-0	38.0 %	50-130%	**Recovery less than lower data quality objective**

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 / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103) SS02	**25-May-2017**	**----**	----	----	**31-May-2017**	08-Jun-2017	✓
Soil Glass Jar - Unpreserved (EA055-103) SS03, SS01	**26-May-2017**	**----**	----	----	**31-May-2017**	09-Jun-2017	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) SS02	**25-May-2017**	**31-May-2017**	21-Nov-2017	✓	**31-May-2017**	21-Nov-2017	✓
Soil Glass Jar - Unpreserved (EG005T) SS03, SS01	**26-May-2017**	**31-May-2017**	22-Nov-2017	✓	**31-May-2017**	22-Nov-2017	✓
EP003: Total Organic Carbon (TOC) in Soil							
Pulp Bag (EP003) SS02	**25-May-2017**	**05-Jun-2017**	22-Jun-2017	✓	**05-Jun-2017**	22-Jun-2017	✓
Pulp Bag (EP003) SS03, SS01	**26-May-2017**	**05-Jun-2017**	23-Jun-2017	✓	**05-Jun-2017**	23-Jun-2017	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) SS02	**25-May-2017**	**01-Jun-2017**	21-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
HDPE Soil Jar (EP231X) SS03, SS01	**26-May-2017**	**01-Jun-2017**	22-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) SS02	**25-May-2017**	**01-Jun-2017**	21-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
HDPE Soil Jar (EP231X) SS03, SS01	**26-May-2017**	**01-Jun-2017**	22-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) SS02	**25-May-2017**	**01-Jun-2017**	21-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
HDPE Soil Jar (EP231X) SS03, SS01	**26-May-2017**	**01-Jun-2017**	22-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) SS02	**25-May-2017**	**01-Jun-2017**	21-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
HDPE Soil Jar (EP231X) SS03, SS01	**26-May-2017**	**01-Jun-2017**	22-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) SS02	**25-May-2017**	**01-Jun-2017**	21-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
HDPE Soil Jar (EP231X) SS03, SS01	**26-May-2017**	**01-Jun-2017**	22-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H) EW01, GMW 2, MW01, SW02, GMW 6, MW05, MW03,	**25-May-2017**	**----**	----	----	**31-May-2017**	01-Jun-2017	✓
Clear Plastic Bottle - Natural (EA015H) MW02, GMW3, SW01, MW04, SW03,	**26-May-2017**	**----**	----	----	**31-May-2017**	02-Jun-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) EW01, GMW 2, MW01, SW02, GMW 6, MW05, MW03,	**25-May-2017**	**----**	----	----	**02-Jun-2017**	08-Jun-2017	✓
Clear Plastic Bottle - Natural (ED037-P) MW02, GMW3, SW01, MW04, SW03,	**26-May-2017**	**----**	----	----	**02-Jun-2017**	09-Jun-2017	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) EW01, GMW 2, MW01, SW02, GMW 6, MW05, MW03,	**25-May-2017**	**----**	----	----	**02-Jun-2017**	22-Jun-2017	✓
Clear Plastic Bottle - Natural (ED041G) MW02, GMW3, SW01, MW04, SW03,	**26-May-2017**	**----**	----	----	**02-Jun-2017**	23-Jun-2017	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) EW01, GMW 2, MW01, SW02, GMW 6, MW05, MW03,	**25-May-2017**	**----**	----	----	**02-Jun-2017**	22-Jun-2017	✓
Clear Plastic Bottle - Natural (ED045G) MW02, GMW3, SW01, MW04, SW03,	**26-May-2017**	**----**	----	----	**02-Jun-2017**	23-Jun-2017	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) EW01, GMW 2, MW01, SW02, GMW 6, MW05, MW03,	**25-May-2017**	**----**	----	----	**01-Jun-2017**	01-Jun-2017	✓
Clear Plastic Bottle - Natural (ED093F) MW02, GMW3, SW01, MW04, SW03,	**26-May-2017**	**----**	----	----	**01-Jun-2017**	02-Jun-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X) EW01, GMW 2, MW01, SW02, GMW 6, MW05, MW03, QA-01	**25-May-2017**	**----**	----	----	**01-Jun-2017**	21-Nov-2017	✓
HDPE (no PTFE) (EP231X) MW02, GMW3, SW01, MW04, SW03,	**26-May-2017**	**----**	----	----	**01-Jun-2017**	22-Nov-2017	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) EW01, GMW 2, MW01, SW02, GMW 6, MW05, MW03, QA-01	**25-May-2017**	**----**	----	----	**01-Jun-2017**	21-Nov-2017	✓
HDPE (no PTFE) (EP231X) MW02, GMW3, SW01, MW04, SW03,	**26-May-2017**	**----**	----	----	**01-Jun-2017**	22-Nov-2017	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) EW01, GMW 2, MW01, SW02, GMW 6, MW05, MW03, QA-01	**25-May-2017**	**----**	----	----	**01-Jun-2017**	21-Nov-2017	✓
HDPE (no PTFE) (EP231X) MW02, GMW3, SW01, MW04, SW03,	**26-May-2017**	**----**	----	----	**01-Jun-2017**	22-Nov-2017	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) EW01, GMW 2, MW01, SW02, GMW 6, MW05, MW03, QA-01	**25-May-2017**	**----**	----	----	**01-Jun-2017**	21-Nov-2017	✓
HDPE (no PTFE) (EP231X) MW02, GMW3, SW01, MW04, SW03,	**26-May-2017**	**----**	----	----	**01-Jun-2017**	22-Nov-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
EW01, GMW 2, MW01, SW02, GMW 6, MW05, MW03, QA-01	**25-May-2017**	**----**	----	----	**01-Jun-2017**	21-Nov-2017	✓
HDPE (no PTFE) (EP231X)							
MW02, GMW3, SW01, MW04, SW03,	**26-May-2017**	**----**	----	----	**01-Jun-2017**	22-Nov-2017	✓

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)							
Moisture Content	EA055-103	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	5.26	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		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	34	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride by Discrete Analyser	ED045G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	34	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	14	7.14	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		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	13	**7.69**	**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
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP003	SOIL	In house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automaticaly measured by infra-red detector.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-House. A portion of soil is extracted with MTBE. The extract is taken to dryness, made up in mobile phase. Analysis is by LC/MSMS, ESI Negative Mode using MRM. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (2013) Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In house: Direct injection analysis of fresh waters after dilution (1:1) with methanol. Analysis by LC-Electrospray-MS-MS, Negative Mode using MRM. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.

Preparation Methods	Method	Matrix	Method Descriptions
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 (2013) Schedule B(3) (Method 202)
Sample Extraction for PFAS	EP231-PR	SOIL	In house
Dry and Pulverise (up to 100g)	GEO30	SOIL	#

Appendix I – Calibration certificates

Oil / Water Interface Meter

Instrument Geotech Interface Meter (30m)
Serial No. 4443

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	9v
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: Aaron Avenell

Calibration date: 20-Apr-17

Next calibration due: 19-Jun-17

AirMet Scientific P/L
7-11 Ceylon Street
Nunawading
Victoria 3131, Australia

Calibration Certificate

This document hereby certifies that this instrument detailed has been calibrated to the parameters listed below.

Certificate Print Date: 16 May, 2017
Calibration Date: 16 May, 2017
Next Calibration Due: 16 November, 2017

Call ID: **00206152**

Job / SO Number:

Customer: AMS BRISBANE RENTAL
Type: Water Meter
Model: WATERMETER
Serial No: 11K100830
Description: YSI Pro Plus

Sensor	Serial No	Standard Solutions	Certified	Solution # (Bottle #)	Instrument Reading	Units
Temp				Testo Mini	21.4	Degrees
Dissolved Oxygen				2920	0.1	%
Ph				ND2194	7.00	Ph
Ph				28770	4.00	Ph
EC				292705	2574	ms
Redox				OC1144/OC1145	236.6	mV

Completed by: *Justin Cleary*
Signed:

Australian Standard Alarm Levels ☐

Appendix J – Soil and water disposal dockets

Waste Transport Certificate

Queensland Government

Q 01107491

Part 1
This section is to be completed by the Generator or Storer of waste

Name, Description and Chemical Composition of the Waste: CONT SOIL

U.N. Class: . | Subsid Risk: . | U.N. Number:

Bulk/No of Packaging: 4 | Type of Packaging: BOXES | Packaging Grp:

Amount of Waste: 480 | ◉ Litres ○ Cubic Metres ○ Kilograms

Physical Nature: S | Waste Code No: J100

Name of Waste Generator: CHD MACKAY AIRPORT FIRE STATION

Address where waste was generated: 291 MILTON ST

PAGET QLD Postcode: 4740

Contact Name: BERNICE | Phone No.: (04) 37 50 07 17 | ABN/ACN: 39 008 48 8373

Environmental Authority No (if applicable): | Local Government Area: MACKAY

Nominated Disposal/Treatment/Storage Facility: NQ RESOURCE RECOVERY

Name of Transporter Company: NQ RESOURCE RECOVERY

Address: 3 CRICHTONS ROAD

PAGET QLD Postcode: 4740

Vehicle No 1 Rego No.: 317 KAA | Vehicle No/Trailer Rego No.: | ABN/ACN: 74 057 294 265

Environmental Authority No.: EPPR00979913 | Environmental Authority No.: | Mode of Transport: ☐ Road ☐ Rail ☐ Air ☐ Sea

I declare that to the best of my knowledge and belief the above information is true and correct (Name and Position): Luke

If applicable I am acting as an agent for the Receiver ☐

Signature: L. Scott | Date: 10 / 07 / 2017

Part 2
To be completed by the Waste Transporter

I acknowledge the receipt of the waste described in part 1. Discrepency: ☐ Waste Type ☐ Volume received ☐ Other

If applicable I am acting as an agent for: ☐ Generator ☐ Receiver

Name: S O'LOUGHLIN | Phone No.: (07) 4829 3100

Signature | Date: 10 / 07 / 2017

Part 3
To be completed by the Facility Receiving Waste

Name of Receiving Facility: NQ RESOURCE RECOVERY

Address: 3 CRICHTONS ROAD

PAGET QLD Postcode: 4740

ABN/ACN: 74 057 294 265 | Disposal/Treatment Code: D15 | Physical Nature: S | Waste Code No: J100

Environmental Authority No.: EPPR00979913 | Amount of Waste: 480 | ◉ Litres ○ Cubic Metres ○ Kilograms

Discrepancy: ☐ Waste Type ☐ Volume Received ☐ Transporter Details ☐ Other

If applicable I am acting as an agent for the Generator ☐

I acknowledge the receipt of the waste described in part 1.

(Name and Position): S O'LOUGHLIN | Phone No.: (07) 4829 3100

Signature | Date: 10 / 07 / 2017

WHITE COPY - TO BE FORWARDED TO EHP BY RECEIVER
PINK COPY - TO BE FORWARDED TO EHP WITH PARTS 1 & 2 COMPLETED, BY THE PERSON/COMPANY WHO COMPLETED PART 1
GREEN COPY - TO BE RETAINED BY THE PERSON/COMPANY WHO COMPLETED PART 1
YELLOW COPY - TO BE RETAINED BY THE PERSON/COMPANY WHO COMPLETED PART 3
BLUE COPY - TO BE RETAINED BY THE WASTE TRANSPORTER

PLEASE FORWARD EHP COPIES (WITHIN 7 DAYS) TO WASTE TRACKING, GPO BOX 2454, BRISBANE, QLD 4001. **Pollution Hotline No. 1300 130 372**

W 6894129537

GHD

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	B.Ng	T.Hammond		L.Gedge		21/02/2019

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