PFAS Detailed Site Investigation

Proserpine Fire Station, 102 Main Street, Proserpine, Queensland

Queensland Fire and Emergency Services

16 December 2019

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Revision 0 - Final

PFAS Detailed Site Investigation

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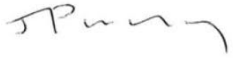
0	16-Dec-2019	Final	James Peachey Project Manager	

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Abbreviations

AFFF	Aqueous film forming foam
AHD	Australian height datum
ASC NEPM	Assessment of Site Contamination National Environment Protection Measure 1999 (as amended 2013)
ASRIS	Australian Soil Resources Information System
ASS	Acid sulfate soil
CLA	Contaminated Land Auditor
CLID	Contaminated land investigation document
CLR	Contaminated Land Register
COPC	Contaminants of potential concern
CSM	Conceptual site model
DES	Department of Environment and Science
DO	Dissolved oxygen
DQO	Data quality objectives
DQI	Data quality indicator
DSI	Detailed site investigation
EC	Electrical Conductivity
EMR	Environmental Management Register
EPP	Environmental Protection Policy
ESA	Environmentally Sensitive Areas
EV	Environmental Values
GDE	Groundwater Dependent Ecosystems
HEPA	Heads of Environmental Protection Agencies Australia and New Zealand
LOR	Limits of reporting
mbgl	Metres below ground level
mbtoc	Metres below top of casing
NATA	National Association of Testing Authorities
NDD	Non-destructive drilling
NEMP	National Environmental Management Plan
NEPC	National Environment Protection Council
NMI	National Measurement Institute
NRME	[Department of] Natural Resourcing, Mining and Energy
ORP	Oxidation reduction potential
PFAS	Per- and poly-fluoroalkyl substances
PFHxS	Perfluorohexanesulfonic acid
PFOA	Perfluorooctanoic acid

PFOS	Perfluorooctanesulfonic acid
PSI	Preliminary site investigation
QA/QC	Quality assurance / quality control
QFES	Queensland Fire and Emergency Services
SAQP	Sampling analysis and quality plan
SIR	Site investigation report
SOP	Standard operating procedure
SWL	Static water level
TDS	Total dissolved solids
TOPA	Total oxidisable precursor assay
USCS	Unified soil classification system
USEPA	United States Environmental Protection Agency
WRC	Whitsundays Regional Council

Glossary of Terms

Term	Definition
Aquifer	Geologic formation, group of formations, or part of a formation capable of transmitting and yielding economic or significant quantities of water.
Bore	A cylindrical drill hole sunk into the ground from which water is pumped for use or monitoring.
Borehole	A hole produced in the ground by drilling for the investigation and assessment of soil and rock profiles.
Discharge	A release of water from a particular source.
Drainage	Natural or artificial means for the interception and removal of surface or subsurface water.
Finished Foam	Finshed foam is formed following aeration of the foam concentrate.
Groundwater	Water located within an aquifer; that is, held in the rocks and soil beneath the earth's surface.
Groundwater monitoring well	A bore which has been specifically constructed to allow groundwater measurements to be taken and groundwater samples to be collected.
Groundwater recharge	A hydrologic process by which water enters the aquifer by moving downwards from surface water to groundwater.
Hydrogeology	The study of subsurface water in its geological context.
Hydrology	The study of rainfall and surface water runoff processes.
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment.
Pollutant / contaminant	Any matter that is not naturally present in the environment.
Runoff	The portion of water that drains away as surface flow.
Saturated zone	This portion of the subsurface below the groundwater table in which all pores in the soil and rock are completely filled with water.
Stormwater	Water that travels through drains following precipitation events.
Surface water	Water flowing or held in streams, rivers and other wetlands in the landscape.
Tributary	A river or stream flowing into a larger river or lake.
Unsaturated zone	The portion of the subsurface above the groundwater table. The soil and rock in this zone contain air as well as water in its pores.
Water table	The surface of saturation in an unconfined aquifer at which the pressure of the water is equal to that of the atmosphere.

Executive Summary

Background

AECOM Australia Pty Ltd (AECOM) was engaged by Queensland Fire and Emergency Services (QFES) to undertake an evaluation of the concentration and distribution of per- and poly- fluoroalkyl substances (PFAS) at Proserpine Fire Station, located at 102 Main Street, Proserpine, Queensland (the site). The location of the site is shown in **Figure 1** in **Appendix A**.

QFES is conducting the PFAS environmental investigation at Proserpine Fire Station using a staged approach. Stage 1 consisted of a preliminary site investigation (PSI) and sampling, analysis and quality plan (SAQP), which was completed in April 2019 (AECOM, 2019). Under Stage 2 of the project, a Queensland Contaminated Land Auditor (CLA) reviewed and endorsed the works completed in Stage 1. Following completion of Stages 1 and 2, QFES has engaged AECOM to undertake Stage 3 of the project, which is the delivery of the PFAS detailed site investigation (DSI) to implement the scope of work identified in the SAQP.

This report forms the Site Investigation Report (SIR) for the DSI and is consistent with the requirements of a Contaminated Land Investigation Document (CLID).

Key Findings of the PSI

The PSI (AECOM, 2019) was completed to understand the potential for PFAS contamination to be present at the fire station based on a review of site and environmental setting and historical operations and practices. The PSI identified that firefighting training using aqueous film forming foams (AFFF) containing PFAS occurred infrequently at the fire station between the 1990s and 2003. Based on the findings of a site inspection and anecdotal information from site staff, firefighting training using AFFFs took place in the open area in the central portion of the site, which is presently sealed with concrete. Historically, this area was unpaved. The volume of foam used was not able to be identified, however its use was noted to be limited. Historically, drums of foam were stored in the main fire station building and in the workshop. The areas formerly used for firefighting training exercises and foam storage areas were identified as potential PFAS source areas.

Objectives

The objectives of the works were to characterise potential PFAS impacts in soil and groundwater, including concentration and distribution, within and at the boundaries of the Proserpine Fire Station to assess the potential risks to human health and the environment and to update the PFAS conceptual site model for the site.

Investigation Scope

The DSI was completed between July and September 2019. The DSI scope of works were completed in accordance with the SAQP (AECOM, 2019) and included the drilling of four soil bores on the site that were converted to groundwater monitoring wells (drilled to approximately six metres below ground level, mbgl), advancement of one soil bore to 0.5 mbgl, collection of soil and groundwater samples from the bores and wells with laboratory analysis for PFAS and preparation of this interpretative report.

Key Findings of the DSI

The key findings of the DSI are presented below.

- Groundwater elevations in August 2019 indicated a shallow aquifer is present beneath the site. Depth to groundwater was approximately 3.5 mbgl. In the former firefighting training area in the eastern central portion of the site, groundwater was inferred to flow locally in a north westly to south westly direction. The potential for groundwater to flow towards the east was uncertain. The regional groundwater flow direction is likely to be to the north, towards the Proserpine River, which is the main hydrological feature of the area.

- The main PFAS compounds present in the soil samples analysed were perfluorohexanesulfonic acid (PFHxS) and perfluorooctanesulfonic acid (PFOS). ∑(PFHxS+PFOS) and perfluorooctanoic acid (PFOA) concentrations in the 14 soil samples analysed from five soil bores did not exceed National Environmental Management Plan (NEMP) (HEPA, 2018) health guideline values for commercial landuse. The concentration of PFOS in one soil sample (PR_BH03 at 0.5 mbgl at 0.2 mg/kg) exceeded the NEMP (HEPA, 2018) interim soil ecological PFOS guideline value for indirect exposure for commercial landuse. The maximum PFOS concentration was detected in a sample of fill from the area formerly used for firefighting training in the central portion of the site. As the majority of the site is covered by concrete, the potential for ecological receptors to be exposed to PFOS in the site soil is considered to be low. The soil samples analysed indicated that soil PFAS concentrations decreased with increased depth, with higher PFAS concentrations in the near-surface fill material.
- The main PFAS compounds detected in groundwater were PFHxS and PFOS. Elevated ∑(PFHxS+PFOS) concentrations (i.e. exceeding NEMP (HEPA, 2018) drinking water and recreational water quality guideline values) were detected in groundwater samples from all four newly installed monitoring wells. The monitoring well with the highest ∑(PFHxS+PFOS) concentrations (49.0 µg/L, PR_MW02), is located in the southeastern portion of the area previously used for firefighting training exercises.
- The laboratory analytical technique for total oxidisable precursor assay (TOPA) is used to detect certain harder to analyse PFAS precursor compounds that may be present. The results of TOPA analysis on one soil and one groundwater sample did not indicate the presence of PFAS precursors. The results indicated a degraded PFAS product that is unlikely to significantly increase or alter through biotransformation or oxidation processes.
- The lateral extent of the area of groundwater with elevated concentrations of PFHxS and PFOS is uncertain and potentially extends off-site in all directions at concentrations in excess of human health and ecological guideline values. Commercial property is present adjacent to the site to the south. Residential properties are located beyond the commercial property, approximately 100 m south of the southern site boundary. The Proserpine River is located approximately 850 m to the north of the site.
- Information on the Queensland Government website indicates that water supply bores across Proserpine were sampled and analysed for PFAS in 2018. Concentrations in one bore located 1.6 km southwest of the site (at Proserpine Showgrounds) exceeded drinking water guidelines for PFAS, however concentrations in samples from 23 other bores in Proserpine did not exceed drinking water guideline values. Although it is not known how close the bores that were sampled are to the site, these results provide information on PFAS concentrations in the wider Proserpine area. PFAS was not detected in surface water samples from the Proserpine River and Lagoon Creek. This suggests source areas of PFAS at the site are unlikely to impact the Proserpine River.
- Based on information provided as part of the PSI, the source of the PFAS detected in soil and groundwater samples is considered likely to be related to the historical firefighting training practices at the fire station, and/or spills from storage containers, product transfer and other maintenance activities.

Based on these key findings, the PFAS conceptual site model developed for the PSI has been updated. A number of possibly complete exposure pathways for PFAS sourced from the fire station to impact off-site human and ecological receptors have been identified. The significance of these potentially complete source-pathway-receptor linkages is uncertain and further investigation is required to understand the potential risks to off-site receptors.

1.0 Introduction

1.1 General

AECOM Australia Pty Ltd (AECOM) was engaged by Queensland Fire and Emergency Services (QFES) to undertake an evaluation of the concentration and distribution of per- and poly- fluoroalkyl substances (PFAS) at Proserpine Fire Station, located at 102 Main Street, Proserpine, Queensland (the site). The location of the site is shown in **Figure 1** in **Appendix A**.

Historical practices and operations at QFES facilities including Proserpine Fire Station may have involved using firefighting foam containing PFAS. PFAS are an emerging family of compounds that are highly soluble, persistent and bioaccumulative in the environment. Following release to ground, they can be readily mobilised from soil source zones, and migrate significant distances in surface water and groundwater.

1.2 Background

QFES is conducting the environmental investigation at Proserpine Fire Station using the following staged approach:

- Stage 1: Development of the preliminary site investigation (PSI) and sampling, analysis and quality plan (SAQP). This stage was completed in April 2019 (AECOM, 2019).
- Stage 2: Review and endorsement of the PSI and SAQP by a Queensland Contaminated Land Auditor (CLA). This stage was completed in April 2019.
- Stage 3: Implementation of the scope of works identified in the SAQP by conducting a detailed site investigation (DSI) and completion of a draft site investigation report (SIR).
- Stage 4: Review and endorsement of the SIR report by a CLA.
- Stage 5: Provide the final SIR to the regulator (DES) and subject to any further requirements, procure a suitable environmental consultant to design an investigation plan to measure and assess off-site impacts.
- Stage 6: Engage an appropriately qualified third party CLA to audit the suitability of any offsite investigation plan to meet the requirements of DES prior to implementation.

This report forms the SIR for the Stage 3 DSI and has been prepared to meet the requirements of a Contaminated Land Investigation Document (CLID).

1.3 Objectives

The objectives of the works were to characterise potential PFAS impacts in soil and groundwater, at Proserpine Fire Station, to assess the potential risks to human health and the environment and to update the PFAS conceptual site model for the site.

The key outcomes / deliverables of the Stage 3 works were as follows:

- Undertaking soil and groundwater sampling at Proserpine Fire Station, in accordance with the SAQP.
- Preparation of a draft SIR detailing the implementation of the DSI, in accordance with Australian guidance for investigation of sites potentially impacted by PFAS including the National Environmental Protection Council (NEPC), National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) (1999, as amended 2013) (NEPC, 2013) and the PFAS National Environmental Management Plan (Heads of Environmental Protection Agencies (HEPA), 2018).

  The stage 4 deliverable will be a final SIR that incorporates any comments/ corrections from the QFES review and inclusion of all the requirements of the audit by the CLA.

1.4 Scope of Works

The scope of work undertaken to meet the objectives of the PFAS DSI were as follows:

- Completion of fieldwork in accordance with the CLA-endorsed SAQP (AECOM, 2019) which included the following activities:
    - Drilling of four soil bores (PR_BH01-PR_BH04) to approximately 6 metres below ground level (mbgl), which were converted to groundwater monitoring wells (PR_MW01-PR_MW04). Collection of soil samples at approximately 1.0m intervals. Development of groundwater monitoring wells.
    - Collection of soil samples from a shallow soil bore (SS1) to 0.5 mbgl advanced in an unsealed area adjacent to the southern site boundary.
    - Collection of groundwater samples from the four new groundwater monitoring wells.
    - Surveying of the top of the casing at each monitoring well to MGA94 coordinates and Australian Height Datum (AHD).
    - Laboratory analysis of soil and groundwater for PFAS, with groundwater analysed for trace level concentrations.
- Preparation of a SIR (this report), which includes an update of the PFAS conceptual site model (CSM).

1.5 PFAS Analysis

Aqueous film forming foam (AFFF) manufactured over the last 50 years are estimated to contain between 200 and 600 possible PFAS compounds of varying signatures / composition (PFAS National Environmental Management Plan [NEMP, Heads of EPA [HEPA] 2018[1]). However, at present, Australian commercial analytical laboratories, using National Association of Testing Authority (NATA) accredited methods, are currently able to analyse for around 28 PFAS (see **Table 1**). This analytical limitation is not considered significantly influential as the current PFAS laboratory analytical schedule includes the compounds that have guidelines available. These compounds were also the primary ingredients of AFFF and are more likely to be encountered where AFFF was used, stored and/or discharged.

[1] Noting that the NEMP Version 2.0 is expected to be published in 2020.

Table 1 Compounds analysed in the PFAS suite

PFAS Group	Compound	Abbreviation	CAS No.
Perfluoroalkyl Sulfonic Acids	Perfluorobutane sulfonic acid	PFBS	375-73-5
	Perfluoropentane sulfonic acid	PFPeS	2706-91-4
	Perfluorohexane sulfonic acid	PFHxS	355-46-4
	Perfluoroheptane sulfonic acid	PFHpS	375-92-8
	Perfluorooctane sulfonic acid	PFOS	1763-23-1
	Perfluorodecane sulfonic acid	PFDS	335-77-3
Perfluoroalkyl Carboxylic Acids	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUnDA	2058-94-8
	Perfluorododecanoic acid	PFDoDA	307-55-1
	Perfluorotridecanoic acid	PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTeDA	376-06-7
Perfluoroalkyl Sulfonamides	Perfluorooctane sulphonamide	FOSA	754-91-6
	N-Methyl perfluorooctane sulfonamide	MeFOSA	31506-32-8
	N-Ethyl perfluorooctane sulfonamide	EtFOSA	4151-50-2
	N-Methyl perfluorooctane sulfonamidoethanol	MeFOSE	2448-09-7
	N-Ethyl perfluorooctane sulfonamidoethanol	EtFOSE	1691-99-2
	N-Methyl perfluorooctane sulfonamidoacetic acid	MeFOSAA	2355-31-9
	N-Ethyl perfluorooctane sulfonamidoacetic acid	EtFOSAA	2991-50-6
Fluorotelomer Sulfonic Acids	4:2 Fluorotelomer sulfonic acid	4:2 FTS	757124-72-4
	6:2 Fluorotelomer sulfonic acid	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonic acid	8:2 FTS	39108-34-4
	10:2 Fluorotelomer sulfonic acid	10:2 FTS	120226-60-0

1.6 Relevant Regulation and Guidance

This PFAS DSI has been developed considering the following legislation and guidance.

- *DES, Queensland Auditor Handbook for Contaminated Land, Module 6: Content requirements for contaminated land investigation documents, certifications and audit reports (2018)*
- *Environmental Protection Act, 1994.*
- HEPA (2018) *PFAS National Environmental Management Plan (NEMP)*
- NEPC (1999) *National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013) (ASC NEPM 2013):*
  - *Schedule A- Recommended general process for assessment of site contamination*
  - *Schedule B1 Guideline on Investigation Levels for Soil and Groundwater*
  - *Schedule B2 Guideline on Site Characterisation*
  - *Schedule B3 Guideline on Laboratory Analysis of Potentially Contaminated Soils*
- Standards Australia (AS4482.1-2005) *Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds*
- Standards Australia (AS 4482.2-1999) *Guide to the sampling and investigation of potentially contaminated soil, Part 2: Volatile Substances*

A summary of guideline values adopted for this investigation is presented in **Section 5.0**.

2.0 Site Setting

2.1 Site Identification

Proserpine Fire Station is located in central Proserpine and is accessed via Main Street. Site identification details as identified in the PSI (AECOM, 2019) are shown in **Table 2**.

Table 2 Proserpine Fire Station site identification

Item	Details
Site Address	102 Main Street, Proserpine, 4800
Registered Site Owner	State of Queensland (Represented by Public Safety Business Agency)
Registered Address of Site Owner	Public Safety Business Agency, L13 Makerston House, 30 Makerston Street, Brisbane, Queensland, 4000
Site Occupier	QFES
Local Government Area	Whitsundays Regional Council
Zoning	Major Centre
Future Zoning	No change
Lot and Plan	Lot 1 / RP706146
Tenure	Freehold
Latitude / Longitude	-20.402313, 148.584109
Site Area	2,023m^2
Current / Future Site Use	The site is currently a commercial/industrial property (fire station) but has not been operational since 2017. The future site use is not known but considered likely to be commercial/industrial.
Environmental Management Register (EMR) / Contaminated Land Register (CLR)	A search of the DES EMR and CLR for Lot 1 / RP706146 as part of the PSI (AECOM, 2019) indicated that the site is not included on either the EMR or CLR.
Environmentally relevant activities or notifiable activities	The PSI did not identify any environmentally relevant activities or notifiable activities at the site.

2.2 Site Layout and Features

The site layout is detailed on **Figure 2**, **Appendix A**. Site features include a two-storey building in the northern portion of the fire station with the ground floor containing several interconnected rooms (training room, changing rooms and storage areas) on either side of the Engine Room. The second floor contains a desk-based training area. At the rear (south) of the site is a workshop which also contains an in-ground truck pit used for vehicle inspections.

Training activities were historically conducted on the large open space concreted yard located between the fire station and workshop. The PSI (AECOM, 2019) identified that this area was formerly grassed.

A concrete in-ground water tank (Case 4 Pit), with dimensions of 1060 mm diameter x 3840 mm deep and a capacity of 3,390 L, was located in the central area of the site and used for pump testing and water drafting training. The tank has been decommissioned by filling with sand and capped with concrete.

A perimeter concrete stormwater drain is located on the north-eastern boundary of the site and a concrete spoon drain bisects through the centre of the fire station building in the north of the site. No stormwater drainage was noted in the centre or southern portions of the site. The surface water flow direction is towards Main Street, to the north of the site.

Underground services including an electrical line and sewer run with a north-south orientation through the approximate area formerly used for foam training exercises, refer to **Figure 2**, **Appendix A**. A vent line was identified along the eastern boundary of the site, however, an underground storage tank was not identified during the service clearance survey. The material used to infill around these services is likely to consist of bedding sands which have the potential to act as preferential pathways for contaminant migration in the unsaturated zone. Backfill around the Case 4 Pit also has the potential to act as a preferential pathway.

There is minimal vegetation on the site, with a small landscaped area adjacent to the north of the workshop and an open grassed area between the workshop and the southern site boundary.

No information was identified in the PSI (AECOM, 2019) on the emplacement of fill at the fire station.

2.3 Surrounding Land Use

The site is surrounded by commercial and industrial businesses. Main Street is located on the northern site boundary. Details of surrounding land uses are provided in **Table 3** below.

Table 3 Proserpine Fire Station surrounding land use

Direction	Land Use
West	Commercial businesses are present adjacent to the western boundary of the site extending to the west of Chapman Street. The nearest residential properties are located approximately 200m west on Dobbins Lane. A rail corridor is located 550m to the west traversing north to south.
Southwest	The Proserpine Ex-Services Club is adjacent to the site, to the southwest. The nearest residential property is approximately 120 m southwest on the corner of Chapman and Marathon Streets. Residential properties are also present at a similar distance from the site on the western side of Chapman Street.
South	A commercial property is adjacent to the southern boundary of the site with residential properties beyond, adjoining Marathon Street.
East	A car dealership is present adjacent to the eastern boundary of the site with other commercial properties, residential dwellings and a church further beyond. A service station is present approximately 300 m to the east of the site.
Northeast	The site is bounded by Main Street to the northeast, beyond are commercial buildings including the Whitsundays Regional Council and a shopping plaza.
North / Northwest	Main Street is present to the north and northwest of the site, beyond which are commercial businesses. Approximately 350 m northwest is the Proserpine Sugar Mill (Wilmar Sugar), with the Proserpine River approximately 850 m north of the site.

2.4 Previous Environmental Investigation

A PFAS PSI was completed in March 2019 (AECOM, 2019). The key findings of this investigation are summarised below.

- Based on historical aerial photographs, the site has been in use since at least the 1940s and the fire station has been present since about 1962 (approximately 57 years). The site had undergone some development prior to this time, however, the previous landuse is not known. The area surrounding the site was progressively developed with commercial and residential properties and recreational landuse.

- Use of the fire station ceased in February 2017 and operations were transferred to a new fire station located in Proserpine. Based on the interview information, firefighting foam was used at the site since at least the late 1980s. Firefighting foam containing PFAS (3M Lightwater) and protein foam was used between the 1990s and approximately 2003. The type of protein foam has not been identified and the potential for this foam to have contained PFAS was uncertain. Since 2003, Solberg foam has been used, which is PFAS-free[2]. There was no information on the types of foam used prior to the late 1980s and the potential for use of other types of foam concentrates containing PFAS cannot be discounted.
- The site is currently vacant and no foams are currently stored. Historically, foams were stored in 20 L drums from the supplier in the southern portion of the main fire station building and occasionally in the workshop at the southern portion of the site. There was no information suggesting that infrastructure (e.g. tanks) storing foam have been present at the site historically.
- Firefighting training using foam was reported to occur historically on-site in the open area in the central portion of the site. This area is now sealed with concrete. The period of the training is not known. Based on anecdotal evidence, foam training exercises may have occurred to unsealed surfaces prior to the placement of concrete and likely continued following hardstand placement. The volume of foam used was not identified, however its use was noted to be limited. There was no information available on the disposal of out of date foam concentrate. No inadvertent releases of foam concentrate were identified.
- PFAS was identified in two water samples collected in 2016 from the Case 4 Pit with concentrations of ∑(PFHxS+PFOS) (0.90 µg/L) and PFOA (0.011 µg/L) detected. Two samples of tap water were also analysed and PFAS was not detected.
- Information on the Queensland Government website[3] (dated 4 July 2019) indicates that PFAS was detected in April 2018 in groundwater in one bore used for drinking water purposes, at a concentration that marginally exceeded the drinking water guidelines. This bore was located near Proserpine Showgrounds, approximately 1.6 km southwest from the site. The information on the website stated that a total of 23 other bores were sampled with none of the results exceeding drinking water guidelines for PFAS. The locations of these bores were not known. Information on the Queensland Government website also indicated that PFAS was not detected in surface water samples from the Proserpine River and Lagoon Creek. PFAS was detected in eight samples from stormwater drains but results did not exceed drinking water guideline values.

  The website also identifies that the Queensland Government and Council have undertaken direct engagement with residents within the vicinity of the original detection of PFAS. Groundwater use surveys and sampling and analysis of private groundwater bores have been conducted. The website reported 'the results of analysis of private bores showed no results of concern'. The website identifies that bore water from urban areas should not be used unless testing has been undertaken to assess the microbiological and chemical quality of the water.
- A review of the area within 4 km of the site identified the potential for off-site sources of PFAS including a sugar mill, water treatment / treatment plants, service station, bulk fuel storage and other industrial facilities.

[2] Reported by the manufacturer at https://www.solbergfoam.com/Foam-Concentrates/RE-HEALING-Foam.aspx
[3] https://www.qld.gov.au/environment/pollution/management/disasters/investigation-pfas/sites/proserpine

3.0 Environmental Setting

3.1 Climate

A summary of the monthly climate statistics is presented in **Table 4** below, based on information available on the Australian Government Bureau of Meteorology website[4] for Proserpine Airport for the period 1988 to 2019. Proserpine has a tropical climate, characterised by distinct wet and dry seasons. The wet season occurs between December and April. Mean annual rainfall is 1,426 mm.

Table 4 Summary of Monthly Climate at Proserpine Airport 1988 to 2019

Month	Mean maximum temperature (ºC)	Mean minimum temperature (ºC)	Mean rainfall (mm)
January	31.5	22.6	297.2
February	31.1	22.8	359.4
March	30.2	21.7	216.5
April	28.7	19.2	120.6
May	26.6	15.9	64.9
June	24.7	12.8	39.4
July	24.5	11.2	23.8
August	25.8	11.5	24.1
September	28.5	14.5	18.4
October	30.3	17.4	36.6
November	31.7	19.8	83.7
December	32.2	21.7	165.0

3.2 Site Topography

Whitsunday Regional Council (WRC) online mapping indicates the site slopes gently down towards the north / north-west, sloping down from an elevation of 13 m to 12.5 mAHD.

Stormwater drainage on the site consists of a perimeter drain on the eastern side of the site and a concrete spoon drain bisecting through the centre of the Fire Station. The surface water flow direction is towards the Main Street in the north.

3.3 Soil Type and Acid Sulfate Soils

Mapping from the ASRIS indicated the soil types underlying the site and surrounding area are Rudosols. Rudosols are usually young soils in the sense that soil forming factors have had little time to pedologically modify parent rocks or sediments. The component soils can vary widely in terms of texture and depth.

Mapping from ASRIS indicated the site is situated within an area where there is a high probability of ASS occurrence. The WRC online mapping indicates the site is classed as 'Land above 5m AHD and below 20m AHD', indicating that ASS may be present at the site. The presence of acidic soil conditions may inhibit the sorption of PFAS onto organic matter, thus increasing mobility (CRC CARE 2018).

[4] http://www.bom.gov.au/climate/averages/tables/cw_033247.shtml

3.4 Geology

Geological mapping indicates that site is underlain by the Quaternary flood plain alluvium, which comprises clay, silt, sand and gravel.

3.5 Hydrology

Chapman's Lagoon is located approximately 670 m to the east of the site boundary; it appears to drain to the east into a tributary to the Proserpine River. The Proserpine River is located approximately 850 m north of the site boundary and flows in an easterly direction into Repulse Bay. There are no other surface water features within 1 km of the site. Lagoon Creek is located approximately 1.9 km to the west and southwest.

WRC online interactive mapping[5] indicates the site and adjacent land is not within a flood risk area.

3.6 Hydrogeology

The Groundwater Resources of Queensland 1:2,500,000 mapping indicates the aquifer beneath the site to comprise sedimentary strata, with a yield of 5-15 L/s and salinity of <500 mg/L, the groundwater is noted to be suitable for most purposes. As the main hydrological feature of the area is the Proserpine River located 850 m north of the site, it is considered likely that the regional groundwater flow direction is towards the north.

A search of the NRME registered groundwater bore database was completed in February 2019 (AECOM, 2019) and identified 47 bores within 1 km of the site with 14 bores within 500 m of the site. The registered bore locations are shown on **Figure 2, Appendix A**. Borelogs were included in Appendix G of the PSI report (AECOM, 2019). Of the 14 registered bores identified within 500 m of the site, at least seven of these are potentially used for water supply, see **Table 5**.

Table 5 Registered groundwater bores within 500m of Proserpine Fire Station

Bore ID	Distance and Direction	Screened Depth	Additional Comments / Use if Known
RN141173	175m east	11.2 – 12.2m within Proserpine River Alluvium (clayey sand and sand)	For water supply, SWL recorded as 2 mbgl, quality 397 µs/cm.
RN85023	205m south-west	Unclear – however, appears to be 18 – 24m within the Edgecumbe Beds (conglomerate and sandstone)	None provided
RN131776	225m south	11.5 – 13.5m within the Proserpine Alluvium (coarse gravel).	For water supply, quality listed as potable, SWL 2 mbgl
RN63163	270m south-east	6 – 9.5m within the Proserpine Alluvium (sand).	SWL listed as 3.0m BGL
RB131618	320m south-west	7 – 11m within the Proserpine Alluvium (sand and gravel).	For water supply, SWL listed as 5 mbgl
RN131790	430m south-east	9 – 15 within the Proserpine Alluvium (sand and gravel).	For water supply, SWL listed as 4.5 mbgl
RN131792	460m southwest	9 – 12m within the Proserpine Alluvium (sand).	For water supply, quality listed as potable
RN12200050	380m north-east	Unclear but appears to be 24 – 27.7m within alluvium	Noted as abandoned but still useable. Groundwater chemistry marked on card.
RN12200225	380m north-east	9.7 – 14.7m alluvium (sand and gravel)	Groundwater chemistry marked on card.

[5] https://mapping.whitsundayrc.qld.gov.au/connect/analyst/

Bore ID	Distance and Direction	Screened Depth	Additional Comments / Use if Known
RN105587	470m southeast	7.0 – 13.0m sandstone	Role listed as water supply
RN182094	440m north	3.4 – 6.5m within Proserpine River Alluvium (sand)	Role listed as monitoring. SWL 3.2 mbgl
RN81863	460m north	14 – 22m, aquifer not listed	Role listed as water supply. SWL 3.05 mbgl
RN182097	500m north-west	6.4 – 9.4m within Proserpine River Alluvium (clay and sand)	Role listed as monitoring. SWL 6.7 mbgl
RN141103	500m south-west	15.5 – 17.0m with Proserpine River Alluvium (sandy clay)	Role listed as water supply. SWL 15.5 mbgl

Due to the shallow groundwater table (<6 mbgl) there is the potential for unregistered bores to be present in the area. Bores that are less than 6m deep do not need to be registered.

3.7 Environmental Values

The site is present within the Proserpine River fresh water catchment of the Proserpine River Basin. EPP Water defines the Proserpine River fresh waters as an aquatic ecosystem with high ecological value and outlines environmental values (EVs) associated with the catchment area (DEHP, 2013). The identified EVs for Proserpine River fresh waters include aquatic ecosystems, irrigation, farm supply, stockwater, human consumer, primary recreation, visual recreation, drinking water, industrial use and cultural and spiritual values.

3.8 Groundwater Dependent Ecosystems (GDE) and Environmentally Sensitive Areas

A search of the GDE database indicated the following aquatic ecosystems are present within 4 km of the site: Wetland at Proserpine River – moderate potential GDE. No subterranean and terrestrial GDEs were identified.

4.0 Fieldwork- DSI

4.1 Overview

Fieldwork was completed between July and August 2019 in accordance with the scope and methodology outlined in the SAQP dated 2 April 2019 (AECOM, 2019). The tasks completed are summarised in **Table 6**.

Table 6 Summary of fieldwork

Activity	Dates
Service clearance and drilling of four soil bores (PR_BH01-PR_BH04), collection of soil samples, conversion to groundwater monitoring wells (PR_MW01-PR_MW04), well development	26- 27 July 2019
Advancement of one shallow soil bore (PR_SS01) and collection of soil samples	26 July 2019
Recording of groundwater elevation and collection of groundwater samples from the four newly installed wells (PR_BH01-PR_BH04)	07 August 2019
Surveying of the groundwater wells	07 August 2019

4.2 Sampling Rationale

An overview of the rationale for sampling locations is presented in **Table 7**. The sampling locations are shown on **Figure 2**, **Appendix A**. The coordinates of sampling positions are shown in **Table T1**, **Appendix B**. Photographs taken during the fieldworks are shown in **Appendix C**.

Table 7 Sampling rationale

Location ID	Location/Rationale
PR_BH01 / PR_MW01	Adjacent to the Case 4 Pit and potentially within the area used for training exercises using foam. Along central western portion of the site.
PR_BH02 / PR_MW02	In former grassed area potentially within the area used for training exercises using foam. Located in the central portion of the site.
PR_BH03 / PR_MW03	In former grassed area potentially within the area used for training exercises using foam adjacent to the fire station building. Along the central eastern portion of the site.
PR_BH04 / PR_MW04	In grassed area to the south of the workshop potentially providing hydraulically up-gradient background groundwater quality.
PR_SS1	Shallow soil bore to 0.5 mbgl in grassed area within the area potentially used for foam training exercises using foam.

Due to the ubiquity of PFAS used in a variety of everyday products and the potential for cross contamination during sampling activities, the recommended mitigation practices identified in the NEMP (2018) and Western Australia's Department of Environmental Regulation (2017) were implemented during the sampling program as stipulated in the SAQP (AECOM, 2019). Further details on the QA/QC practices employed are provided in **Appendix G**.

4.2.1 Soil Investigation

Sampling methodologies and details relating to laboratory analysis of samples are described in the SAQP (AECOM, 2019). The soil investigation methodology is described in **Table 8**.

Table 8 Soil investigation methodology

Activity/Item	Details
Service location	AECOM obtained on-site utility plans and Dial-Before-You-Dig service before the start of the works. A contractor (Copp and Co) conducted service location and cleared proposed bore locations for services. Concrete coring was conducted at three of the locations (PR_MW01, PR_MW02, PR_MW03). All soil bores were advanced by non-destructive digging (vacuum extraction using a water lance) to 1.5 mbgl to confirm the absence / presence of underground utilities.
Drilling method and target depth	Soil bores (for conversion to groundwater monitoring wells) were advanced with a Geoprobe drilling rig using solid stem augers to the target depth (approximately 6 mbgl). The single shallow soil bore was advanced using a hand auger to the target depth of 0.5 mbgl.
Soil logging	Soil logging was in accordance with the unified soil classification system (USCS) and AS1726-2016. The soil profile(s) encountered are provided in bore logs in **Appendix D**.
Soil sampling	During drilling, samples were obtained at the depths specified in the SAQP. To reduce the likelihood of cross contamination, soil samples were collected using new nitrile gloves and placed into laboratory prepared PFAS sample containers. Sample jars were filled to the top and securely sealed. The field quality assurance / quality control (QA/QC) samples comprised intra-laboratory duplicate samples, inter-laboratory duplicate samples and rinsate blank samples.
Soil sample preservation	During collection in the field, soil samples were placed in eskies kept cool with bagged ice prior to air transport to the laboratory. Samples were submitted with chain of custody documentation to an accredited laboratory.
Decontamination procedures	The decontamination procedures were performed before initial use of re-useable equipment and after each subsequent use. All reusable sampling equipment was decontaminated between each sample by scrubbing in a solution of Liquinox[6] and potable water before being rinsed in PFAS free distilled water. For each day of sampling, following decontamination procedures, a rinsate blank was completed by running laboratory prepared rinsate water over the reusable sampling equipment for collection directly into laboratory prepared sampling containers for analysis. At each sample location, a new set of disposable nitrile gloves was used to directly collect soil samples from the re-useable sampling equipment for placement into the laboratory prepared sampling containers.
Disposal of waste	Waste soil generated during the drilling was disposed of into 205 L drums for temporarily storage in an area nominated by QFES.

[6] Further information on PFAS-free status of Liquinox is provided at http://technotes.alconox.com/industry/laboratory/manual-lab-cleaning/pfoa-pfos-pfas-alconox-cleaners/

4.2.2 Groundwater Investigation

The groundwater investigation methodology is described in **Table 9**.

Table 9 Groundwater investigation methodology

Activity	Details
Monitoring well installation	Monitoring well construction comprised a 50 mm diameter uPVC screen and casing with screw fittings, installed in an approximately 150 mm diameter bore. Wells were installed to depths between 5.0 and 6.0 mbgl. Screen length varied between wells dependent on water strike. Screened sections were installed in a gravel filter pack to 0.5 m above the top of the screen and isolated with a 1 m thick bentonite seal. Each well was fitted with a flush mounted gatic and secured into position with concrete. A water tight enviro-cap was installed on the top of each well casing to prevent accidental blockage of the well.
Well development	Wells were developed following installation using a foot pump. The wells were purged until the extracted water was 'clearing' and field parameters were stabilised. Monitoring well construction details can be found in **Table T1, Appendix B**.
Well gauging	Monitoring wells were gauged using an oil/water interface probe. The results of groundwater level gauging are presented in **Table T2, Appendix B**. The field sheets and calibration certificates are provided in **Appendix E**.
Field Parameters	Groundwater physicochemical properties were measured in the field prior to sample collection using a calibrated YSI water quality meter. Groundwater pH, temperature, electrical conductivity, redox potential and dissolved oxygen concentrations were measured. Groundwater physicochemical parameters are presented in **Table T3, Appendix B**. Water quality meter calibration certificates are presented in **Appendix E**.
Groundwater sampling	The groundwater sampling procedure is described in detail in the SAQP (AECOM, 2019). Groundwater samples were collected from each monitoring well using a low flow peristaltic pump in accordance with Australian Standard AS5667.11 (1998) and the AECOM Standard Operating Procedure (SOP). Samples were obtained following stabilisation of field parameters and standing water level. The field QA/QC samples comprised intra-laboratory duplicate samples, inter-laboratory duplicate samples, rinsate blanks and trip blanks.
Sample preservation	During collection in the field, samples were placed into the appropriate laboratory-supplied containers and placed in an esky, which was kept cool with bagged ice. Samples were transferred to a clean fridge before being delivered to the lab via air freight. Samples were submitted with chain of custody documentation to a laboratory NATA accredited for the analysis requested.
Decon-tamination procedures	The oil/water interface probe and peristaltic pump were decontaminated by scrubbing in a solution of Liquinox[7] and potable water before rinsing with PFAS-free distilled water between each groundwater well. A rinsate sample was collected from either the interface probe or peristaltic pump each day of sampling. Dedicated tubing was used for during the monitoring of each well to minimise the potential for cross-contamination and appropriate silicone and HDPE tubing was used which is PFAS-free. A new pair of nitrile gloves were used for each well sampled.
Disposal of waste	Purged groundwater was disposed of into a 205 L waste drum, which was temporarily stored in an area nominated by QFES.
Surveying	Surveying of newly installed groundwater wells was completed by Veris. The surveying report is presented in **Appendix F**.

[7] Further information on PFAS-free status of Liquinox is provided at http://technotes.alconox.com/industry/laboratory/manual-lab-cleaning/pfoa-pfos-pfas-alconox-cleaners/

4.3 Laboratory Analysis and Quality Assurance / Quality Control

A summary of samples analysed for this Investigation are shown in **Table 10**. The laboratory analysis was conducted by Australian Laboratory Services (ALS) (primary laboratory) and National Measurement Institute (NMI) (secondary laboratory).

Table 10 Summary of laboratory analyses

Sample Media	Number of primary samples analysed for PFAS	No of duplicate samples	No of triplicate samples	No of rinsate samples
Soil	14	2	2	3
Groundwater	4	1	1	1

4.3.1 Data Quality Objectives and Analytical Data Validation

The *National Environment Protection (Assessment of Site Contamination) Measure (*as amended 2013) (ASC NEPM) Schedule B2 Guideline on-Site Characterisation specifies that the nature and quality of the data produced in an investigation should be determined by the data quality objectives (DQO). As referenced by the ASC NEPM, the DQO process is detailed in the United States Environmental Protection Agency (US EPA, 2006) *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4 : EPA/240/B-06/001),* February 2006. The DQOs were specified within the SAQP and are presented in **Appendix G**.

AECOM has undertaken a review of the laboratory analytical results for quality control purposes; the results of the data validation process are presented in **Appendix G** and the laboratory quality control reports are included in **Appendix H**. In summary, while some non-conformances have been identified, these are considered of minor importance and it is concluded that the dataset presented in this report is suitable for use.

5.0 Assessment Criteria

Section 3.7 identified the Proserpine River Basin (fresh water) has the following EVs: aquatic ecosystems, irrigation, farm supply, stockwater, human consumer, primary recreation, visual recreation, drinking water, industrial use and cultural and spiritual values. Guidelines values need to be suitably protection of the above EVs. The guideline values relevant for the site that have been adopted for this investigation are identified in **Table 11**. The guideline values are considered to provide a suitable level of protection for all EVs identified (refer to **Section 3.7**).

Table 11 Adopted investigation levels for PFAS

Media	Environmental Value	PFAS	Guideline Value
Soil	Human health- industrial / commercial landuse	∑(PFHxS+PFOS)	20 mg/kg[A]
		PFOA	50 mg/kg[A]
	Ecosystems- interim soil – ecological indirect exposure (residential) Ecosystems- interim soil – ecological indirect exposure (commercial)	PFOS	0.01 mg/kg[A] 0.140 mg/kg[A]
Groundwater	Human health- drinking water	∑(PFHxS+PFOS)	0.07 µg/L[A]
		PFOA	0.56 µg/L[A]
Groundwater discharging to surface water / surface water	Aquatic ecosystem protection (99% species protection)	PFOS	0.00023 µg/L[A]
			0.051 µg/L[B]
		PFOA	19 µg/L[A]
	Human health- recreational contact with waters	∑(PFHxS+PFOS)	2.0 µg/L[C]
		PFOA	10 µg/L[C]

Notes:

A - NEMP (HEPA, 2018)

B-It is noted, that the NEMP (HEPA, 2018) 99% species protection guideline value for PFOS (0.00023 µg/L) is below the laboratory limit of reporting (LOR) and that the CSIRO has undertaken work to further review the draft freshwater criteria presented in the HEPA (2018) NEMP. The revised draft guideline values for PFOS were presented in Batley et al., 2018, Application of revised methodologies for default guideline value derivations: PFOS in freshwater at the Society of Environmental Toxicology and Chemistry (SETAC) North America scientific conference in November 2018. AECOM understands, through discussions with CSIRO, that these values are currently being further revised to consider more recent ecotoxicity testing results and the updated statistical interpretation methodology recommended in ANZG (2018). In the interim, both the draft freshwater criteria from the HEPA (2018) NEMP and the draft revised criteria proposed by Batley et al (2018) will be used to evaluate the data.

C- Australian Government National Health and Medical Research Council (2019), Guidance on Per and Polyfluoroalkyl substances in Recreational Water. Values are for recreational activities in natural waters only and not applicable for water extracted to fill swimming pools.

6.0 Results

6.1 Soil Conditions

The bore logs for the four new soil bores (PR_BH01 to PR_BH04 and PR_SS01) drilled in July 2019 are shown in **Appendix D**. Soil bores PR_BH01 to PR_BH04 were drilled to between 5.0 and 6.0 mbgl, with PR_SS01 drilled to 0.5m. Underlying the concrete (where present), the soil conditions consisted of clay fill to approximately 0.8 mbgl, underlain by natural soil consisting of brown firm to stiff sandy or silty clay and silty sand to maximum depth of investigation. The natural soil is considered to be Quaternary Flood Plain Alluvium.

There was no visual or olfactory indication of contamination in the soil samples during the drilling.

6.2 Hydrogeology

6.2.1 Observations during Drilling

Groundwater was encountered within sand horizons in the natural soil in soil bores PR_BH01 to PR_BH04. The depths of the groundwater strikes were between 3.7 and 4.6 mbgl as shown on the bore logs in **Appendix D** and in **Table T1**, **Appendix B**.

6.2.2 Groundwater Elevations and Groundwater Flow Direction

The four groundwater monitoring wells sampled during this investigation were gauged before groundwater samples were collected. The standing water levels (SWLs in metres below top of casing [mbtoc]) were between 3.43 and 3.63 mbtoc. The groundwater elevations were between 9.34 and 9.43 m AHD. The SWLs and groundwater elevations are presented in **Table T2**, **Appendix B**.

The inferred groundwater contours and local groundwater flow direction at the fire station are shown on **Figure 3**, **Appendix A**. Based on the available data, groundwater is inferred to locally flow towards the northwest, west and southwest. The potential for flow towards the east is uncertain as no groundwater elevation data are available.

6.2.3 Water Quality Parameters

Table T3, **Appendix B** presents the field water quality parameter results for groundwater collected during the groundwater monitoring event. The raw data were recorded on the field sheets presented in **Appendix E**. A summary of the water quality results is presented in **Table 12**.

Table 12 Summary of groundwater quality parameter results

Parameter	Units	No of samples	Minimum	Maximum
pH	-	4	6.22	6.43
Temperature	^{o}C	4	26.0	28.4
Dissolved oxygen	mg/L	4	2.29	4.33
Oxidation reduction potential	mV	4	130.5	162.8
Electrical conductivity	µS/cm	4	195.7	292.6
Total dissolved solids	mg/L	4	127.2	190.2

The results indicate that the groundwater is slightly acidic, fresh, moderately oxygenated with mildly reducing conditions.

6.2.4 Groundwater Field Observations

There was no visual or olfactory indication of contamination in the monitoring wells during the groundwater monitoring, including no identification of non-aqueous phase liquids, foaming or odours.

6.3 Analytical Results

6.3.1 Soil

The soil analytical results are presented in **Table T4**, **Appendix B** and on **Figure 4, Appendix A**. The laboratory analytical reports are presented in **Appendix H**. PFAS was detected in all 14 soil samples analysed.

There were no exceedances of the human health guideline values for commercial land use in the soil samples analysed. A summary is presented in **Table 13.**

Table 13 Summary of PFAS soil analytical results and assessment with human health guideline values

Com-pound	No. of samples analysed	No. of samples >LOR*	Max. concen-tration (mg/kg)	Human health guideline value (mg/kg)	No. of samples exceeding human health guideline value
∑(PFHxS +PFOS)	14	14	0.201	20	0
PFOS	14	14	0.196	No guideline value	
PFOA	14	7	0.0032	50	0
Sum of PFAS	14	14	0.228	No guideline value	

*LOR = limit of reporting

There was one exceedance of the ecological guideline value for PFOS for indirect exposure for commercial land use. The exceedance occurred in the soil sample from PR_BH03 at 0.5 mbgl (0.196 mg/kg), located in the northeastern portion of the former foam training area. A summary is presented in **Table 14**.

A comparison of the PFAS concentrations to the residential land use ecological guidelines for indirect exposure was also performed, as the southern portion of the site contain open ground/landscaped areas where secondary consumers such as insectivorous birds and mammals may forage. This is a conservative approach, as it is considered that the wildlife would be transient in nature due to the urbanised setting of the site. There were ten exceedances of the ecological guideline value for PFOS for indirect exposure for residential landuse. The exceedances occurred for soil samples from all five soil bores.

Table 14 Summary of PFAS soil analytical results and assessment with ecological guideline values

Com-pound	No. of samples analysed	No. of samples >LOR*	Max. concen-tration (mg/kg)	Ecological guideline value commercial / residential (mg/kg)	No. of samples exceeding of commercial guideline value	No. of samples exceeding of residential guideline value
∑(PFHxS + PFOS)	14	14	0.201	No guideline value	No guideline value	No guideline value
PFOS	14	14	0.196	0.14 / 0.01	1	10
PFOA	14	7	0.0032	No guideline value	No guideline value	No guideline value
Sum of PFAS	14	14	0.228	No guideline value	No guideline value	No guideline value

*LOR = limit of reporting

6.3.2 Groundwater

The groundwater analytical results for samples collected from monitoring wells are presented in **Table T5**, **Appendix B**. The laboratory analytical reports are presented in **Appendix H**. A summary of the assessment of the results with human health guideline values is presented in **Table 15** below.

Table 15 Assessment of groundwater results with human health guideline values

Compound	No. of samples analysed	No. of samples >LOR	Maximum concentration (µg/L)	No. of samples exceeding drinking water guideline value	No. of samples exceeding recreational water guideline value
∑(PFHxS+PFOS)	4	4	49.0	4	4
PFOA	4	4	0.55	0	0
Sum of PFAS	4	4	54.1	No guideline	No guideline

The groundwater analytical results for ∑(PFHxS+PFOS) and PFOA concentrations are presented on **Figure 5, Appendix A**. Groundwater samples from all four monitoring wells exceeded the human health guideline values for drinking water for ∑(PFHxS+PFOS), with the maximum ∑(PFHxS+PFOS) concentration (49.0 µg/L) detected in PR_MW02, located within the former foam training area.

All four of these samples also exceeded the recreational water guideline value.

There was no exceedance of the human health guideline value for drinking water for PFOA concentrations in the groundwater samples from the four new monitoring wells, although one of the samples (PR_MW02 had 0.55 µg/L) was close to the guideline value (0.56 µg/L).

There were exceedances of the ecological guideline values for 99% species protection for fresh water for PFOS in all four samples. There were no exceedances of the adopted ecological guideline values for PFOA.

6.3.3 TOPA

TOPA is used to detect certain harder to analyse PFAS precursor compounds that may be present. One soil sample and one groundwater sample were analysed for TOPA with the results summarised in **Table 16**.

Table 16 Summary of TOPA analysis (soil and groundwater)

Sample	Units	Sum of 28 PFAS (standard analysis)	Sum of 28 PFAS (TOPA)	Sum of TOP C4-C14 Carboxylates and C4-C8 Sulfonates	% of Sum of 28 TOPA to 28 PFAS standard analysis
PR_BH03_0.5_190727	mg/kg	0.228	0.135	0.088	-41%
PR_MW02_190807	µg/L	54.1	53.7	53.7	-1%

Comparison of the results for the groundwater sample indicates the sum of 28 PFAS by TOPA was 1% lower than the sum of 28 PFAS by standard analysis, which also indicates minor depletion of oxidation by compounds other than PFAS. The result is however within the expected variability range and the comparable results are indicative of a degraded PFAS product that is unlikely to significantly increase or alter through biotransformation or oxidation processes.

7.0 Discussion

7.1 Geological and Hydrogeological Conditions

7.1.1 Soil Conditions

Based on the soil conditions recorded in the bore logs, the subsurface lithology beneath the site generally comprises a shallow layer of fill consisting of reworked natural deposits, underlain by natural sandy or silty clays and silty sand to the maximum depth of the investigation (6.0 mbgl).

7.1.2 Hydrogeology

Measured groundwater elevations indicate the presence of a shallow aquifer, approximately 3.5 mbgl. Based on the limited groundwater elevation data (four locations), the inferred contours indicate groundwater in the central portion of the site could potential locally flow to the northwest, west or southwest. Due to the limited data and the shape and orientation of the site (rectangular shaped with long axis orientated north-south), the potential for groundwater flow to be towards the east is uncertain. As the main hydrological feature is the Proserpine River to the north of the site, the regional groundwater flow direction is considered to be towards the north. Clay is the more dominant soil type present and is likely to have a low hydraulic conductivity that may limit (retard) vertical and lateral migration of PFAS from the unsaturated zone.

The site is mainly paved with concrete at surface. Prior to the paving, AFFF may have directly infiltrated to the subsurface following direct application during training exercises. Since the placement of concrete, the application of AFFF to surface has the potential to impregnate concrete or seep through joints and cracks in the concrete cover to the underlying fill and natural soil below. The presence of underground services present beneath the concrete and presence of the Case 4 Pit may create preferential pathways through coarse backfill materials for contaminant migration in areas where clay is the main soil type present.

7.2 Soil Analytical Results

Four of the five soil bores drilled as part of this PFAS DSI (PR_BH01, PR_BH02, PR_BH03, PR_SS01) were located in a potential source area (the area formerly used for foam training exercises). The fifth location was a background bore located along the southern site boundary (PR_MW04).

The sample with the highest PFAS concentration (0.20 mg/kg ∑(PFHxS+PFOS)) was collected in the fill material beneath the concrete at 0.5 mbgl at PR_BH03, located in the northern portion of the former foam training area. PFAS concentration in deeper samples from 1.0 mbgl and 5.0 mbgl were an order of magnitude lower (0.02 mg/kg ∑(PFHxS+PFOS)) indicating attenuation with depth.

Table 17 below provides the soil analytical results for ∑(PFHxS+PFOS) for different sample depths. This is shown graphically in **Chart 1**. ∑(PFHxS+PFOS) concentrations in saturated samples collected from 5.0 mbgl are within a similar range, between 0.006 – 0.018 mg/kg. This may reflect PFAS in groundwater adsorbing onto soil within the saturated zone. PFAS is understood to readily adsorb to organic material in an aquifer, and further investigation of the organic carbon content of saturated zone would be required to understanding the potential for sorption by organic material.

Review of the distribution of PFAS concentrations in soil samples indicates concentrations at PR_BH03 were slightly higher compared to other sampling locations, the other samples are considered to be in a similar range at the locations sampled.

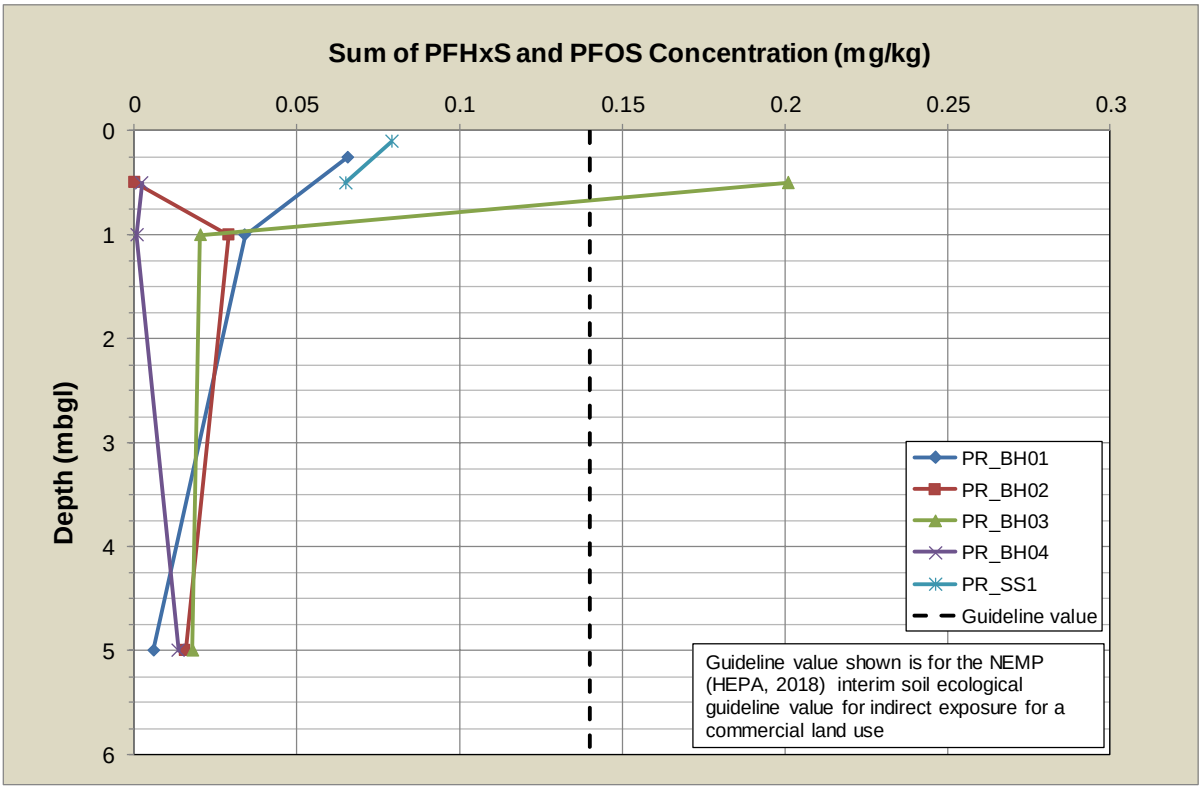
The maximum soil ∑(PFHxS+PFOS) concentration detected is two orders of magnitude lower than the guideline value for human health for commercial / industrial landuse. One soil sample had a PFOS concentration (PR_BH03 at 0.5m) that exceeded the guideline level for ecological indirect exposure for commercial / industrial landuse (exceedance by 40%), however, it is noted that this soil sample is located beneath concrete and is unlikely to be accessible to potential ecological receptors. The concentration of PFOS in the deeper sample from 1.0 mbgl was below the commercial/industrial landuse guideline value indicating the PFOS impact is localised to an area near the soil below the concrete.

Table 17 Soil analytical results for ∑(PFHxS+PFOS)

Depth (mbgl)	∑(PFHxS+PFOS) (mg/kg)					
	PR_BH01	PR_BH02	PR_BH03	PR_BH04	PR_SS1	Range
	Near southern boundary	Within area formerly used for firefighting training using foams				
0.1, 0.25	0.066	N/A	N/A	N/A	0.079	0.066-0.079
0.5	0.034	0.0003	0.201	0.002	0.065	0.002 – 0.201
1.0	N/A	0.029	0.020	0.0008	N/A	0.0008 -0.029
5.0	0.006	0.016	0.018	0.014	N/A	0.006 – 0.018

Notes: Samples from 5.0 mbgl are from the saturated zone. All results in mg/kg, N/A No sample analysed.

Chart 1 Concentration of ∑(PFHxS+PFOS) with depth in soil bores at Proserpine Fire Station



Some localised areas of excavations and infilling have been identified in the vicinity of the foam training area including underground structures such as the Case 4 Pit and underground services such as electrical and sewer lines. An underground storage tank may also have been present historically in the eastern portion of the site. The presence of these areas, which are likely to contain coarser material such as sand, may create preferential pathways for the migration of PFAS within the unsaturated zone. The Case 4 Pit and underground storage tank (if present) may extend to the groundwater table at 3.5 mbgl. Backfill around tanks/pits has the potential to form a preferential pathway for the vertical migration of PFAS to groundwater.

7.3 Groundwater Analytical Results

PFAS concentrations in groundwater have been detected in all four groundwater monitoring wells (PR_MW01 to PR_MW04) with the highest concentrations detected at PR_MW02 (49.0 µg/L ∑(PFHxS+PFOS)) located within the southeastern portion of the former area used for foam training exercises in the central part of the site (refer to **Figure 2**). This suggests a secondary source of PFAS is present in the soil in this area.

As all monitoring wells are located close to site boundaries, there is the potential for PFAS contaminants to migrate off-site at concentrations that exceed human health and ecological guideline values. The extent of PFAS in groundwater has not been established in any direction. Groundwater elevation data indicate that flow in the central portion of the site is likely to be towards the northwest, west and southwest. The potential for PFAS to migrate off-site to the east is uncertain as no groundwater elevation data are available. As the nearest surface water body (Proserpine River) is located to the north and north east of the site, the regional groundwater flow direction is likely to be towards the north.

The Queensland Government website[8] has reported that in 2018, 24 groundwater samples from bores around Proserpine (locations not known) have been collected and analysed for PFAS with all samples (except one- see **Section 2.4**) reporting PFAS concentrations that did not exceed drinking water guideline values. Although it is not known how close the bores that were sampled are to the site, these results provide information on PFAS concentrations in the wider Proserpine area. The Queensland Government website also indicates analytical results for water samples from the Proserpine River did not detect PFAS above the laboratory limit of reporting. This suggests source areas of PFAS at the site are unlikely to impact the Proserpine River.

7.4 Comparison of PFAS composition in soil and groundwater samples

Table 18 presents a comparison of the compounds detected in soil and groundwater samples.

[8] https://www.qld.gov.au/environment/pollution/management/disasters/investigation-pfas/sites/proserpine

Table 18 Average PFAS composition in soil and groundwater samples

PFAS	Carbon chain length	Average soil ratios for different depth intervals			Average groundwater ratios (n=4)
		0.1-0.5 mbgl (n = 6)	1.0 mbgl (n = 4)	5.0 mbgl (n = 4)	
PFBA	4	0.2%	0%	0%	0.1%
PFBS	4	8.7%	1.3%	0%	1.2%
PFPeS	5	3.9%	1.8%	0%	2.0%
PFPeA	5	1.0%	1.0%	0%	0.4%
PFHxS	6	12.9%	48.6%	5.5%	21.4%
PFHxA	6	4.4%	3.4%	0%	1.6%
6:2 FTS	6	0.1%	0%	0%	0.1%
PFHpS	7	0.3%	4.0%	0%	1.4%
PFHpA	7	0.7%	0.4%	0%	0.4%
PFOS	8	55.9%	32.7%	88.2%	69.2%
PFOA	8	0.9%	2.4%	0%	0.9%
PFNA	8	2.0%	4.4%	1.0%	1.0%
FOSA	8	0.6%	0%	0%	0%
8:2 FTS	8	0.1%	0%	0%	0%
PFDS	10	0.1%	0%	0%	0%
PFDcA	10	0.1%	0%	0%	0%
PFUnDA	11	1.7%	0%	5.3%	0.3%
PFDoDA	12	0.1%	0%	0%	0%
PFTrDA	12	6.2%	0%	0%	0%
PFTeDA	14	0.1%	0%	0%	0%

7.4.1 Soil Profile

The PFAS present in soil samples ranged from short (four perfluorinated carbons) to long chain (14 perfluorinated carbons). The groundwater samples had a smaller range of chain lengths, between four and eleven perfluorinated carbons. The smaller number of chain lengths may be due to the longer chain PFAS having a greater potential to sorb to soil particles compared to shorter chain PFAS, or due to longer chain PFAS having lower solubilities than shorter chain compounds. This indicates the longer chain PFAS have less mobility compared to shorter chain compounds.

Table 18 shows the composition of PFAS in the soil samples from three depth intervals, 0.1 to 0.5 mbgl, 1.0 mbgl and 5.0 mbgl. Comparison of the compounds detected and weighted averages indicates a larger range of compounds are detected in the shallower depth interval (0.1 to 0.5 mbgl) compared to the deeper intervals. For example, no compounds with more than eight perfluorinated carbons were detected in the samples from 1.0 mbgl and only one compound was detected in the samples from 5.0 mbgl.

For the 0.1 to 0.5 m depth interval, PFOS is the main compound present (56%) followed by PFHxS (13%), PFBS (9%) and PFTrDA (6%). At the 1 mbgl depth interval, PFHxS (49%) and PFOS (33%) are the main compounds present while in the deeper soil samples from 5.0 mbgl, PFOS is the main compound (88%) with minor amounts of PFHxS (6%) and PFUnDA (5%). The range in compounds may relate to the use of different types of firefighting foam with different compositions at the site.

7.4.2 Groundwater profile

Table 18 shows the composition of PFAS in the groundwater samples. The composition of PFAS in groundwater is dominated by PFOS (average 69%) and PFHxS (average of 21%), with five other compounds present above 1%.

7.4.3 Summary

Based on **Table 18**, approximately 91% of the mass of PFAS in the soil (based on the sum of 28 PFAS analysed) is comprised of longer chain with more than six perfluorinated carbons. Approximately 96% of the mass of PFAS in groundwater is comprised of longer chain length with more than six perfluorinated carbons.

8.0 Conceptual Site Model - PFAS

8.1 Introduction

8.1.1 Purpose

The purpose of the CSM is to provide an understanding of the nature and extent of contamination impacts and the migration mechanisms, and the exposure pathways by which identified receptors may be exposed to contamination from the Investigation areas. The CSM also serves as a framework to assess risks to human health and ecological receptors, and assists in identifying uncertainties and data gaps. A preliminary CSM was developed as part of the PSI (AECOM, 2019). The CSM has been updated based on the findings of this PFAS DSI.

8.1.2 Definition of source-pathway-receptor linkages

In accordance with national guidance on assessment of contamination (NEPM, 2013), potential risks to receptors are evaluated based on three components:

- **Source**: A potentially hazardous substance that has been released into the environment
- **Receptors**: A person, ecosystem or ecological member potentially at risk of experiencing an adverse response following exposure to the source or derivatives of the source
- **Pathway**: A mechanism by which receptors can become exposed to the source or derivatives of the source.

If all three components are present at an exposure scenario, the source-pathway-receptor linkage is considered complete and a receptor is exposed to a hazard. The risk to the receptor will be based on the consequence of the exposure. However, if one of these three components is missing, there is no direct risk to receptors.

8.1.3 Definition of exposure pathways

In order for a human receptor to be exposed to a chemical contaminant derived from the site, a complete exposure pathway must exist. An exposure pathway describes the course a chemical or physical agent takes from the source to the exposed individual and generally includes the following elements (USEPA, 1989):

- A source and mechanism of chemical release
- A retention or transport medium (or media where chemicals are transferred between media)
- A point of potential human contact with the contaminated media
- An exposure route (e.g. ingestion, inhalation) at the point of exposure.

8.2 Contaminants of Potential Concern

The main contaminants of concern are those with guideline values in the NEMP (HEPA, 2018), PFHxS, PFOS and PFOA.

8.3 Sources

The main source areas of PFAS contamination at the site are summarised below.

8.3.1 Primary Sources

The following activities on the site are considered to have resulted in PFAS impacts to soil, and groundwater:

- Firefighting training activities using AFFF containing PFAS at the former foam training area (see **Figure 2**)
- Leaks and spills of AFFF containing PFAS from storage areas, during product transfer and vehicle maintenance.

8.3.2 Secondary Sources

The following secondary sources were identified could potentially lead to PFAS impacts:

- Surface soil where AFFF containing PFAS was historically discharged to surface
- Unsaturated zone soil beneath potential source zones
- Concrete infrastructure that has been in contact with AFFF or other PFAS
- Sediment in stormwater perimeter and spoon drains.

8.3.3 Off-Site

The following off-site sources have the potential to affect groundwater quality beneath the site:

- Potential for use of AFFF at a service station, approximately 300 m to the east of the site
- Potential for use of AFFF at the sugar mill, approximately 350 m to the north of the site
- Potential for use of AFFF in an industrial area 850 m southwest of the site
- Potential for use of AFFF at a bulk fuel facility 730m to the southwest of the site
- Water treatment plant 950 m to the southwest of the site
- Proserpine sewage treatment plant 1 km to the north of the site.

8.4 Migration Mechanisms

The mechanisms which may have contributed to the migration of PFAS across and from the site include:

- Historical discharge of AFFF containing PFAS to ground surface or leakage from storage infrastructure
- Spilling of AFFF containing PFAS to ground surface during filling and decanting operations
- Sorption of PFAS to soil in areas where AFFFs were historically used, particularly in the firefighting training area in the central area of the site which was previously unpaved
- Localised dispersion of firefighting foams with wind during historical application
- Surface water run-off containing PFAS flowing into surface water and off-site migration within the drainage system
- Leaching of PFAS from soil and infiltration to groundwater in areas where AFFFs were historically used
- Leaching of PFAS from concrete pavements and infiltration to surface water or groundwater
- Lateral and vertical migration of PFAS in groundwater under the influence of groundwater flow and PFAS dispersion
- Migration within backfill to underground services which may act as preferential pathways for PFAS in the unsaturated zone.
- Use of groundwater off-site for irrigation of parks and gardens
- Sorption of PFAS to soil below the groundwater table during migration with groundwater. Sorption to soil slows down the migration of PFAS, but sorbed PFAS may continue to diffuse back into groundwater and act as a secondary source, if conditions are suitable
- Excavation of soil containing PFAS and relocation to other areas on site
- Transport of sediment along stormwater drains and discharging into waterways.

8.5 Receptors and Exposure Pathways

The following potential human and ecological receptors have been identified:

- Personnel who may work at the site in the future, including intrusive construction workers (noting that the site is not currently occupied) and site visitors
- Persons exposed to groundwater extracted from offsite bores for industrial activities, recreational activities, irrigation for parks and gardens and domestic activities
- Recreational users of surface water off-site
- The terrestrial ecosystem (flora and fauna)
- The aquatic ecosystems of nearby waterways (Proserpine River).

The following potential exposure pathways have been identified for human receptors:

- Dermal contact and/or incidental ingestion of PFAS impacted soil, including dust inhalation
- Persons drinking PFAS impacted groundwater
- Dermal contact and/or incidental ingestion of PFAS impacted groundwater, surface water and sediment (in drains)

The following potential exposure pathways have been identified for ecological receptors:

- Ecological receptors in direct contact with PFAS impacted soil, sediment and surface water.

8.6 Assessment of Exposure Pathways

An assessment of the exposure pathways for the site is presented in **Table 19**. A figure showing the key features of the CSM is presented as **Figure 6**.

Table 19 Proserpine Fire Station PFAS CSM

Primary Source	Secondary Sources	Transport Mechanism	Exposure Pathways	Receptor	Likelihood of complete linkage	Comments
On-Site areas where firefighting foams have been discharged or spilt to the environment. Off-Site areas where firefighting foams have been discharged or spilt to the environment	PFAS in soil	Excavation of soil during construction / maintenance activities	Human health: incidental ingestion of soil, direct contact with soil (dermal contact and dust inhalation)	Intrusive maintenance / landscaping workers	Unlikely	Considered unlikely due to use of occupational health and safety controls and non-exceedance of health guideline values for PFAS in soil for a commercial landuse.
			Ecological: ingestion of plants and terrestrial biota by higher order ecological receptors	Terrestrial ecosystem	Unlikely	Considered unlikely due to rare exceedance of indirect ecological guideline value for commercial land use. Mitigated by the lack of open space / landscaped areas. The majority of the fire station is paved which prevents access to the subsurface soils. Additionally, mitigated by minimal vegetation to be ingested and subsequently consumed by higher order predators.
		General QFES activities	Human health: incidental ingestion of soil, direct contact with soil (dermal contact and dust inhalation)	Site workers[9] and visitors	Unlikely	Considered unlikely due to non-exceedance of health guideline values for PFAS in soil for commercial landuse.
	PFAS in concrete lined pits and drains	Leaching of PFAS within concrete structures to soil,	Human health - Incidental ingestion or contact with soil, groundwater or surface water.	Site workers	Unlikely	Considered unlikely due to use of occupational health and safety controls and as soil and groundwater below concrete is not likely to be accessible.

[9] It should be noted that the fire station is not currently occupied.

Primary Source	Secondary Sources	Transport Mechanism	Exposure Pathways	Receptor	Likelihood of complete linkage	Comments
		groundwater and surface water.	Ecological – uptake and bioaccumulation.	Terrestrial ecosystem	Unlikely	Considered unlikely as soil below the concrete is not likely to be used by ecological receptors. There is a lack of open space / landscaped areas across the site and minimal vegetation to be ingested.
	PFAS in groundwater	Groundwater transport in aquifer followed by extraction and use for domestic, recreational, industrial uses and irrigation (parks and gardens)	Human health: direct ingestion or incidental ingestion or direct contact with groundwater (off-Site)	Off-Site groundwater users	Possible	Considered possible because the PSI identified 47 registered abstraction bores surrounding the site, which includes bores used for water supply. Groundwater beneath the site is fresh and suitable as a potable water source. The nearest known bore used for water supply is located 175 m east of the site and is screened in the shallow aquifer. The potential for groundwater to flow towards the east is uncertain. The groundwater beneath the site is fresh. Additional unregistered bores may also be present in the surrounding area. In 2018 the Queensland Government and the Council tested private bores across Proserpine and reported that the results showed 'no results of concern'. The locations of the bores that were sampled are not known.
			Uptake and bioaccumulation in terrestrial biota	Flora and fauna	Possible	
		Groundwater transport in aquifer followed by extraction for stockwatering	Livestock: direct ingestion or incidental ingestion or direct contact with groundwater (off-site)	Livestock	Unlikely	Considered unlikely as the fire station is located in an urban areas and groundwater in the vicinity of the sites is unlikely to be used for stock watering purposes

Primary Source	Secondary Sources	Transport Mechanism	Exposure Pathways	Receptor	Likelihood of complete linkage	Comments
	PFAS in surface water	Surface water transport via overland flow into on- and off-site drains that discharge into channels and potentially the Proserpine River	Human health: direct or incidental ingestion or direct contact with off-site surface water (i.e. surface water, drainage overland flow water).	Recreational users	Unlikely	Considered unlikely as the results of a 2018 investigation by Queensland Government and Council did not detect PFAS in samples collected from the Proserpine River. PFAS concentrations in stormwater drain samples did not exceed drinking water guideline values. However, it is noted these sampling locations are not known.
			Ecological: direct exposure as well as ingestion of biota by higher order ecological receptors	Aquatic ecosystem	Unlikely	
	Accumulation of PFAS in creek sediment	Dispersion via surface water	Human health: incidental ingestion or direct contact with sediment (off-site). Direct ingestion of aquatic biota	Recreational users	Possible	Considered possible as runoff from the site will enter surrounding stormwater channels which drain to Proserpine River. However, the results of a 2018 investigation by Queensland Government and Council did not detect PFAS in samples collected from the Proserpine River.
			Ecological: direct exposure, as well as ingestion of biota by higher order ecological receptors	Aquatic ecosystem	Possible	

9.0 Conclusions

The key findings of the PFAS DSI are presented below.

- Groundwater elevations in August 2019 indicated a shallow aquifer is present beneath the site. Depth to groundwater was approximately 3.5 mbgl. In the former firefighting training area in the eastern central portion of the site, groundwater was inferred to flow locally in a north westly to south westly direction. The potential for groundwater to flow towards the east was uncertain. The regional groundwater flow direction is likely to be to the north, towards the Proserpine River, which is the main hydrological feature of the area.
- The main PFAS compounds present in the soil samples analysed were PFHxS and PFOS. ∑(PFHxS+PFOS) and PFOA concentrations in 14 soil samples analysed from the five soil bores did not exceed NEMP (HEPA, 2018) health guideline values for commercial landuse. The concentration of PFOS in one soil sample (PR_BH03 at 0.5 mbgl at 0.2 mg/kg) exceeded the NEMP (HEPA, 2018) interim soil ecological PFOS guideline value for indirect exposure for commercial landuse. The maximum PFOS concentration was detected in a sample of fill from the area formerly used for firefighting training in the central portion of the site. As the majority of the site is covered by concrete, the potential for ecological receptors to be exposed to PFOS in the site soil is considered to be low. The soil samples analysed indicated that soil PFAS concentrations decreased with increased depth, with higher PFAS concentrations in the near-surface fill material.
- The main PFAS compounds detected in groundwater were PFHxS and PFOS. Elevated ∑(PFHxS+PFOS) concentrations (i.e. exceeding NEMP (HEPA, 2018) drinking water and recreational water quality guideline values) were detected in groundwater samples from all four newly installed monitoring wells. The monitoring well with the highest ∑(PFHxS+PFOS) concentrations (49.0 µg/L, PR_MW02), is located in the southeastern portion of the area previously used for firefighting training exercises.
- The laboratory analytical technique for TOPA is used to detect certain harder to analyse PFAS precursor compounds that may be present. The results of TOPA analysis on one soil and one groundwater sample did not indicate the presence of PFAS precursors. The results indicated a degraded PFAS product that is unlikely to significantly increase or alter through biotransformation or oxidation processes.
- The lateral extent of the area of groundwater with elevated concentrations of PFHxS and PFOS is uncertain and potentially extends off-site in all directions at concentrations in excess of human health and ecological guideline values. Commercial property is present adjacent to the site to the south. Residential properties are located beyond the commercial property, approximately 100 m south of the southern site boundary. The Proserpine River is located approximately 850 m to the north of the site.
- Information on the Queensland Government website indicates that water supply bores across Proserpine were sampled and analysed for PFAS in 2018. Concentrations in one bore located 1.6 km southwest of the site (at Proserpine Showgrounds) exceeded drinking water guidelines for PFAS, however concentrations in samples from 23 other bores in Proserpine did not exceed drinking water guideline values. Although it is not known how close the bores that were sampled are to the site, these results provide information on PFAS concentrations in the wider Proserpine area. PFAS was not detected in surface water samples from the Proserpine River and Lagoon Creek. This suggests source areas of PFAS at the site are unlikely to impact the Proserpine River.
- Based on information provided as part of the PSI, the source of the PFAS detected in soil and groundwater samples is considered likely to be related to the historical firefighting training practices at the fire station, and spills from storage containers, product transfer and other maintenance activities.

Based on these key findings, the PFAS conceptual site model developed for the PSI has been updated. A number of possibly complete exposure pathways for PFAS sourced from the fire station to impact off-site human and ecological receptors have been identified. The significance of these

potentially complete source-pathway-receptor linkages is uncertain and further investigation is required to understand the potential risks to off-site receptors.

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11.0 Limitations

AECOM Australia Pty Ltd has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Queensland Fire and Emergency Services and only those third parties who have been authorised in writing by AECOM to rely on the report.

The report is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

The report is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 23 May 2019.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

The methodology adopted and sources of information used by AECOM are outlined in the report.

Where this report indicates that information has been provided to AECOM by third parties, AECOM has made no independent verification of this information unless required as part of the agreed scope of work. AECOM assumes no liability for any inaccuracies in or omissions to that information.

This report was prepared between 19 August 2019 and 23 October 2019. The information in this report is considered to be accurate at the date of issue and is in accordance with conditions at the Site and surrounding areas at the dates sampled. Opinions and recommendations presented herein apply to the Site and surrounding areas existing at the time of our investigation and cannot necessarily apply to changes to Site and surrounding areas of which AECOM is not aware and has not had the opportunity to evaluate. This document and the information contained herein should only be regarded as validly representing the Site and surrounding area conditions at the time of the investigation unless otherwise explicitly stated in a preceding section of this report. AECOM disclaims responsibility for any changes that may have occurred after this time.

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List of Appendices

Appendix A

Figures

Appendix A Figures

AECOM

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0 200 400

Meters

Legend

- Registered Groundwater Bores
- Streams
- Lakes
- 1km Site Radius
- 500m Site Radius
- Site Boundary
- Cadastre

Queensland Fire and Emergency Services (QFES)

FIGURE 1
Site Location

PFAS Detailed Site Investigation at Proserpine Fire Station

Source: State of Queensland, 2019. World Imagery - ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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AECOM

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0 5 10 15

Meters

Legend

- Montioring Well Sampling Location
- Surface Soil Sampling Location
- Hydrant
- Approximate area used for foam training excercises
- Site Boundary
- Cadastre
- Contours - 1m *(due to negligible slope there is only 1 height shown over site)*
- Main Water
- Drainage Line
- Electrical Line
- Comms Line
- Hydrant Water Mains
- Sewer
- Unknown

Queensland Fire and Emergency Services (QFES)

FIGURE 2
Site Layout and Sampling Locations

PFAS Detailed Site Investigation at Proserpine Fire Station

Source: State of Queensland, 2019. World Imagery - ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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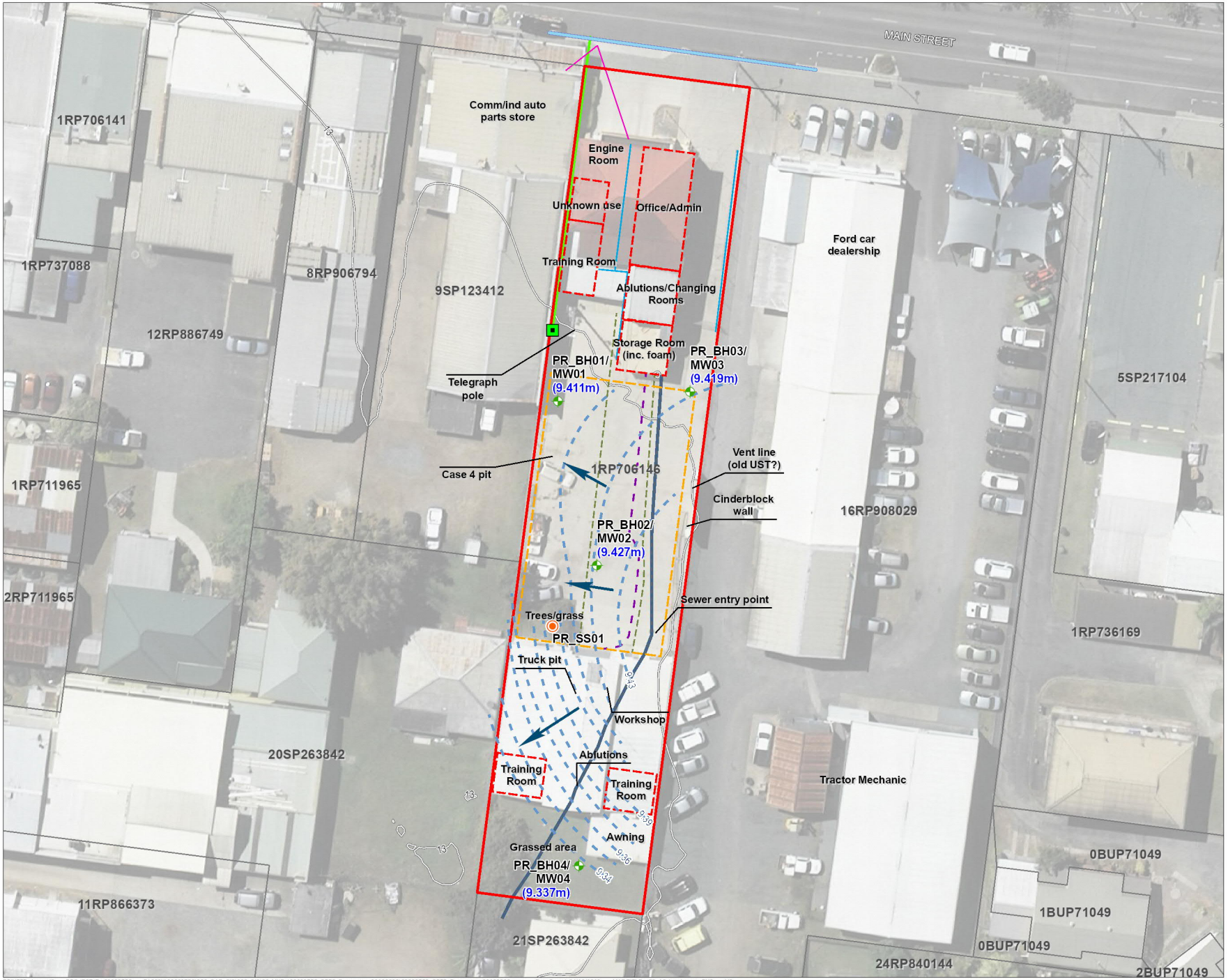

AECOM

N

0 5 10 15

Meters

Legend

- Montioring Well Sampling Location
- Surface Soil Sampling Location
- Hydrant
- **Inferred groundwater contours (mAHD)***
- Approximate area used for foam training excercises
- Site Boundary
- Cadastre
- Contours - 1m *(due to negligible slope there is only 1 height shown over site)*
- Main Water
- Drainage Line
- Electrical Line
- Comms Line
- Hydrant Water Mains
- Sewer
- Unknown
- Inferred Groundwater flow direction

* Groundwater elevations shown on map are in mAHD

Queensland Fire and Emergency Services (QFES)

FIGURE 3

Inferred Groundwater Contours: 6 August 2019

PFAS Detailed Site Investigation at Proserpine Fire Station

Source: State of Queensland, 2019. AECOM 2019. World Imagery - ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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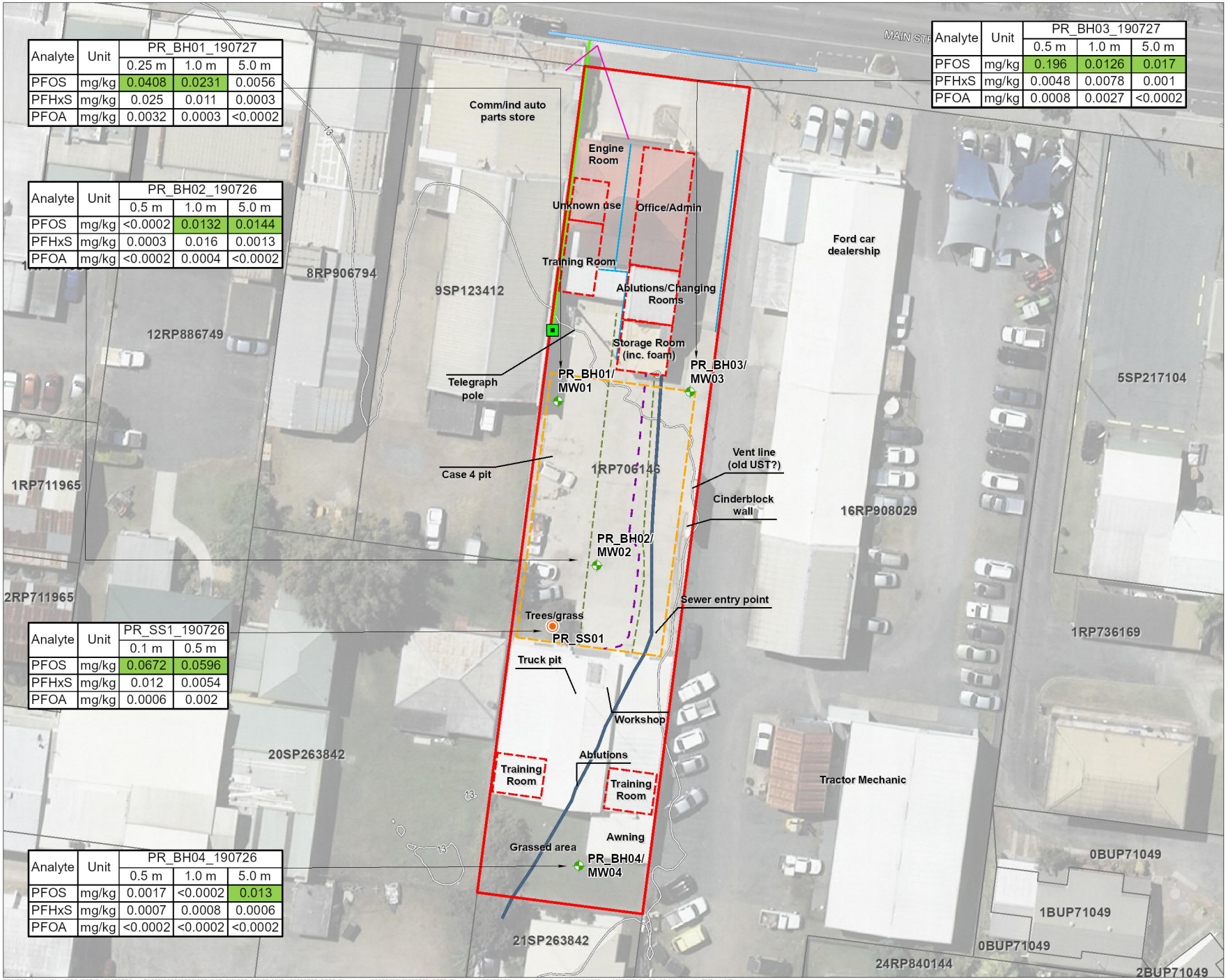

Analyte	Unit	PR_BH01_190727		
		0.25 m	1.0 m	5.0 m
PFOS	mg/kg	0.0408	0.0231	0.0056
PFHxS	mg/kg	0.025	0.011	0.0003
PFOA	mg/kg	0.0032	0.0003	<0.0002

Analyte	Unit	PR_BH02_190726		
		0.5 m	1.0 m	5.0 m
PFOS	mg/kg	<0.0002	0.0132	0.0144
PFHxS	mg/kg	0.0003	0.016	0.0013
PFOA	mg/kg	<0.0002	0.0004	<0.0002

Analyte	Unit	PR_SS1_190726	
		0.1 m	0.5 m
PFOS	mg/kg	0.0672	0.0596
PFHxS	mg/kg	0.012	0.0054
PFOA	mg/kg	0.0006	0.002

Analyte	Unit	PR_BH04_190726		
		0.5 m	1.0 m	5.0 m
PFOS	mg/kg	0.0017	<0.0002	0.013
PFHxS	mg/kg	0.0007	0.0008	0.0006
PFOA	mg/kg	<0.0002	<0.0002	<0.0002

Analyte	Unit	PR_BH03_190727		
		0.5 m	1.0 m	5.0 m
PFOS	mg/kg	0.196	0.0126	0.017
PFHxS	mg/kg	0.0048	0.0078	0.001
PFOA	mg/kg	0.0008	0.0027	<0.0002

AECOM

0 5 10 15
Meters

Legend

- Montioring Well Sampling Location
- Surface Soil Sampling Location
- Hydrant
- Approximate area used for foam training excercises
- Site Boundary
- Cadastre
- Contours - 1m *(due to negligible slope there is only 1 height shown over site)*
- Main Water
- Drainage Line
- Electrical Line
- Comms Line
- Hydrant Water Mains
- Sewer
- Unknown

Exceedance of NEMP (HEPA, 2018) guidance value for human health for commercial / industrial landuse.
Exceedance of NEMP (HEPA, 2018) guideline value for ecological indirect exposure for residential landuse.

Queensland Fire and Emergency Services (QFES)

FIGURE 4
Soil PFAS Analytical Results

PFAS Detailed Site Investigation at Proserpine Fire Station

Source: State of Queensland, 2019. AECOM 2019. World Imagery - ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Analyte	Unit	PR_MW01 7/08/2019
PFOS	µg/L	4.1
PFHxS+PFOS	µg/L	5.56
PFOA	µg/L	0.063

Analyte	Unit	PR_MW02 7/08/2019
PFOS	µg/L	37.6
PFHxS+PFOS	µg/L	49
PFOA	µg/L	0.55

Analyte	Unit	PR_MW03 7/08/2019
PFOS	µg/L	7.92
PFHxS+PFOS	µg/L	9.74
PFOA	µg/L	0.073

Analyte	Unit	PR_MW04 7/08/2019
PFOS	µg/L	6.96
PFHxS+PFOS	µg/L	9.46
PFOA	µg/L	0.076

AECOM

0 5 10 15
Meters

Legend

- Montioring Well Sampling Location
- Surface Soil Sampling Location
- Hydrant
- Approximate area used for foam training excercises
- Site Boundary
- Cadastre
- Contours - 1m *(due to negligible slope there is only 1 height shown over site)*
- Main Water
- Drainage Line
- Electrical Line
- Comms Line
- Hydrant Water Mains
- Sewer
- Unknown

Exceedance of NEMP (HEPA, 2018) guidance value for human health (drinking water and recreational water)
Exceedance of NEMP (HEPA, 2018) guideline value for protection of aquatic ecosystem (99%)

Queensland Fire and Emergency Services (QFES)

FIGURE 5
Groundwater PFAS Analytical Results

PFAS Detailed Site Investigation at Proserpine Fire Station

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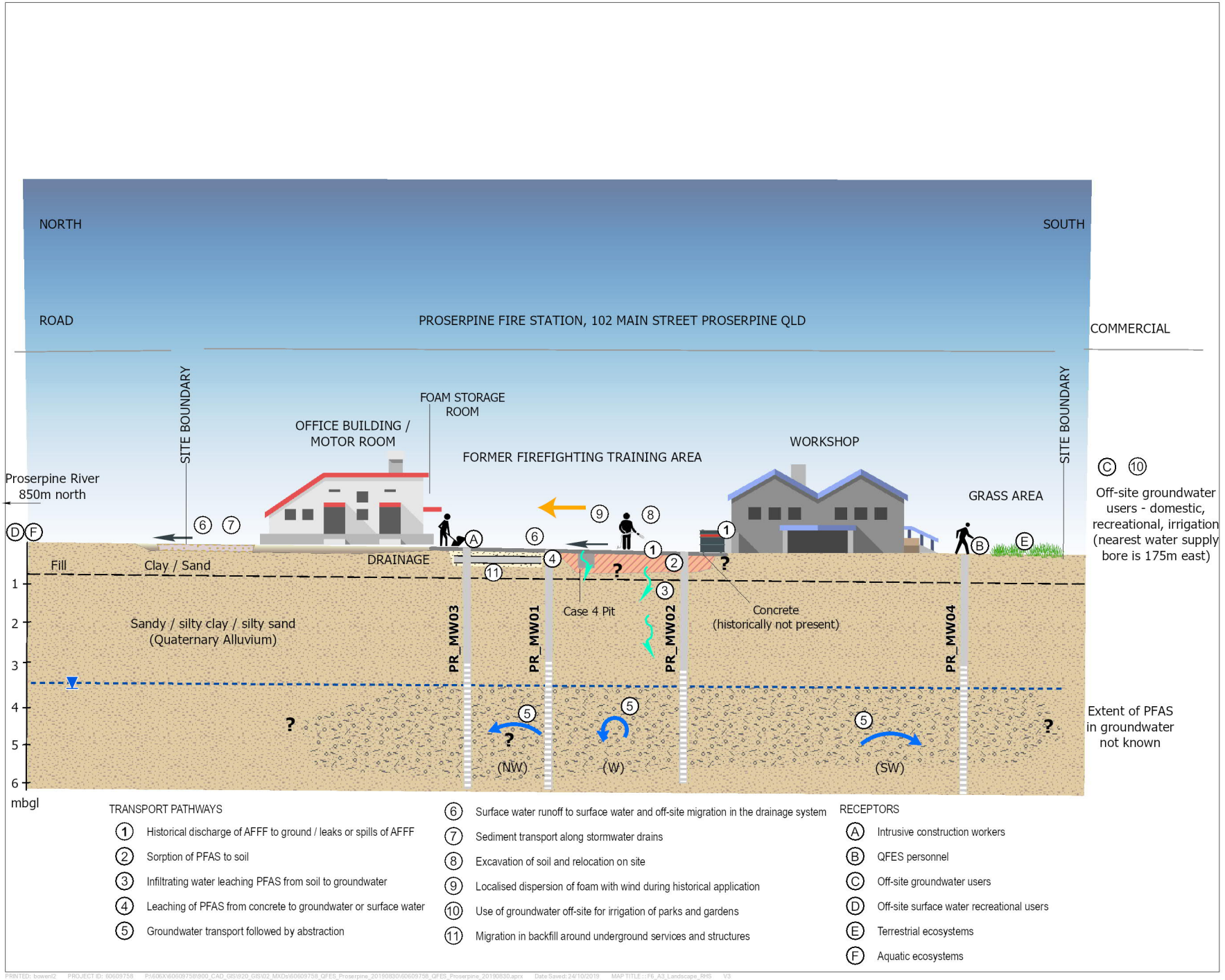

TRANSPORT PATHWAYS

1. Historical discharge of AFFF to ground / leaks or spills of AFFF
2. Sorption of PFAS to soil
3. Infiltrating water leaching PFAS from soil to groundwater
4. Leaching of PFAS from concrete to groundwater or surface water
5. Groundwater transport followed by abstraction
6. Surface water runoff to surface water and off-site migration in the drainage system
7. Sediment transport along stormwater drains
8. Excavation of soil and relocation on site
9. Localised dispersion of foam with wind during historical application
10. Use of groundwater off-site for irrigation of parks and gardens
11. Migration in backfill around underground services and structures

RECEPTORS

- A Intrusive construction workers
- B QFES personnel
- C Off-site groundwater users
- D Off-site surface water recreational users
- E Terrestrial ecosystems
- F Aquatic ecosystems

AECOM

NOT TO SCALE

Legend

- PFAS in soil
- PFAS in groundwater
- Sediment in drainage
- Backfill around underground services
- Groundwater table
- Inferred groundwater flow direction
- Infiltration / Leaching
- Migration in stormwater drains
- Wind dispersion of foam
- Underground service (eg electrical / sewer line)
- Inferred groundwater depth

Queensland Fire and Emergency Services (QFES)

FIGURE 6
PFAS Conceptual Site Model

PFAS Detailed Site Investigation at Proserpine Fire Station

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Appendix B

Tables

Appendix B Tables

Location ID Area	Date of Installation	Easting	Northing	Top of Casing Elevation (mAHD)	Cover	Top of Casing Elevation (m AHD)	Drilled Depth (m)	Top of screen (mbgs)	Water Strike (mbgs)	Lithology of screened section
PR_BH01/MW01	27/07/2019	665286.4	7743196.3	12.999	Gatic	13.056	5.0	3.0	3.9	SAND to CLAY
PR_BH02/MW02	26/07/2019	665291.1	7743176.4	13.059	Gatic	13.152	6.0	3.0	3.7	Sandy CLAY to Silty SAND
PR_BH03/MW03	27/07/2019	665302.4	7743197.4	12.851	Gatic	12.918	5.7	3.7	3.7	Silty SAND
PR_BH04/MW04	26/07/2019	665288.9	7743140.2	12.955	Gatic	12.992	5.6	4.0	4.6	Silty SAND to Silty CLAY

m' is metres
mAHD' is metres above Australian height datum
mbgs' is metres below ground surface

Well ID	Easting	Northing	Top of Casing Elevation (mAHD)	Gauging Date	Total Depth (mbtoc)	Depth to Water (mbtoc)	Corrected Groundwater Elevation (mAHD)
PR_MW01	665286.4	7743196.3	12.999	6/08/2019	4.7	3.588	9.411
PR_MW02	665291.1	7743176.4	13.059	6/08/2019	4.9	3.632	9.427
PR_MW03	665302.4	7743197.4	12.851	6/08/2019	5.8	3.432	9.419
PR_MW04	665288.9	7743140.2	12.955	6/08/2019	5.4	3.618	9.337

m' is metres
mAHD' is metres above Australian height datum
mbtoc' is metres below top of casing

Well ID	Date	pH	Temperature (°C)	Electrical Conductivity (µS/cm)	Total Dissolved Solids (mg/L)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)*
PR_MW01	6/08/2019	6.43	26.7	195.7	127.2	4.27	146.9
PR_MW02	6/08/2019	6.41	28.4	239.1	155.4	4.33	134.1
PR_MW03	6/08/2019	6.28	27.6	254.8	165.6	3.26	130.5
PR_MW04	6/08/2019	6.22	26	292.6	190.2	2.29	162.8

°C is degrees Celsius
µS/cm is microsiemens per centimetre
mg/L is milligrams per litre
mV is millvolt

		Sum (PFHxS + PFOS)	PFOS	PFHxS	PFHxA	PFOA	PFBS	PFPeS	PFHpS	PFDS	PFBA	PFPeA	PFHpA	PFNA	PFDcA	PFUnA	PFDoA	PFTrDA	PFTeDA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	MeFOSAA	EtFOSAA	FOSA	N-EtFOSA	N-MeFOSA	N-EtFOSE	N-MeFOSE	Sum of PFAS	Sum of TOP C4 - C14 Carboxylates and C4-C8 Sulfonates
	Units	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	mg/kg	mg/kg	mg/kg
	LOR	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002
PFAS NEMP Human Health Industrial/Commercial		20				50																										
PFAS NEMP Interim Soil Ecological Residential			0.01																													
PFAS NEMP Interim Soil Ecological Commercial/Industrial			**0.14**																													
Sample ID	**Date**	**Lab Report**	**Type**																														
PFAS by Standard Analysis																																	
PR_SS1_0.1_190726	26/07/2019	EB1919842	Normal	0.0792	0.0672	0.012	0.0012	0.0006	<0.0002	0.0004	0.0003	0.0003	<0.001	0.0004	<0.0002	<0.0002	<0.0002	0.0008	<0.0002	0.0018	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	0.0024	<0.0005	<0.0005	<0.0005	<0.0005	0.0874	-
PR_SS1_0.5_190726	26/07/2019	EB1919842	Normal	0.065	0.0596	0.0054	0.0037	0.002	<0.0002	0.0002	<0.0002	<0.0002	<0.001	0.0012	0.0013	0.0008	<0.0002	0.001	<0.0002	0.0004	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0756	-
PR_BH01_0.25_190727	27/07/2019	EB1919842	Normal	0.0658	0.0408	0.025	0.0085	0.0032	0.0004	0.0008	0.0009	0.0004	0.002	0.0079	0.0038	0.0026	0.001	0.0139	0.0011	0.0616	0.0008	<0.0005	0.0012	0.001	<0.0005	<0.0002	<0.0002	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	0.178	-
PR_BH01_1.0_190727	27/07/2019	EB1919842	Normal	0.0341	0.0231	0.011	0.0022	0.0003	0.0003	0.0006	0.0008	<0.0002	<0.001	0.0013	0.0002	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0403	-
PR_BH01_5.0_190727	27/07/2019	EB1919842	Normal	0.0059	0.0056	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	0.0015	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005		-
PR_BH02_0.5_190726	26/07/2019	EB1919842	Normal	0.0003	<0.0002	0.0003	0.0004	<0.0002	0.0014	0.0006	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005		-
PR_BH02_1.0_190726	26/07/2019	EB1919842	Normal	0.0292	0.0132	0.016	0.0012	0.0004	0.0014	0.0016	0.0008	<0.0002	<0.001	<0.0002	<0.0002	0.0011	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0357	-
PR_QC101_190726	26/07/2019	EB1919842	Duplicate	0.0298	0.0142	0.0156	0.001	0.0004	0.0012	0.0016	0.0008	<0.0002	<0.001	<0.0002	<0.0002	0.0012	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.036	-
PR_QC201_190726	26/07/2019	RN1242617	Triplicate	0.031	0.015	0.016	0.0012	<0.001	0.0014	0.0013	<0.001	<0.001	<0.002	<0.002	<0.001	0.0012	<0.001	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.005	<0.005	0.0361	-
PR_BH02_5.0_190726	26/07/2019	EB1919842	Normal	0.0157	0.0144	0.0013	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0161	-
PR_BH03_0.5_190727	27/07/2019	EB1919842	Normal	0.201	**0.196**	0.0048	0.0017	0.0008	<0.0002	0.0003	0.0018	<0.0002	<0.001	0.0004	0.0002	0.022	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.228	-
PR_BH03_1.0_190727	27/07/2019	EB1919842	Normal	0.0204	0.0126	0.0078	0.0016	0.0027	0.0002	0.0004	0.0041	<0.0002	<0.001	0.0003	0.0004	0.0046	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0347	-
PR_BH03_5.0_190727	27/07/2019	EB1919842	Normal	0.018	0.017	0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	0.0003	<0.0002	0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0185	-
PR_BH04_0.5_190726	26/07/2019	EB1919842	Normal	0.0024	0.0017	0.0007	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005		-
PR_QC100_190726	26/07/2019	EB1919842	Duplicate	0.0026	0.0016	0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005		-
PR_QC200_190726	26/07/2019	RN1242617	Triplicate	0.0044	0.0029	0.0015	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.005	<0.005		-
PR_BH04_1.0_190726	26/07/2019	EB1919842	Normal	0.0008	<0.0002	0.0008	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005		-
PR_BH04_5.0_190726	26/07/2019	EB1919842	Normal	0.0136	0.013	0.0006	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0136	-
PFAS by TOPA																																
PR_BH03_190727	27/07/2019	EB1921187	Normal	0.112	0.108	0.0038	0.0046	0.0007	<0.0002	<0.0002	0.0015	<0.0002	<0.001	0.001	0.0002	0.0152	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.135	0.135

mg/kg' is milligrams per kilogram
'<' is less than limit of reporting
'-' not analysed

		Sum (PFHxS + PFOS)	PFOS	PFHxS	PFHxA	PFOA	PFBS	PFPeS	PFHpS	PFDS	PFBA	PFPeA	PFHpA	PFNA	PFDcA	PFUnA	PFDoA	PFTrDA	PFTeDA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	MeFOSAA	EtFOSAA	FOSA	N-Et-FOSA	N-Me-FOSA	N-Et-FOSE	N-MeFOSE	Sum of PFAS	Sum of TOP C4-C14 Carboxylates and C4-C8 Sulfonates
	Units	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
	LOR	0.0003	0.0003	0.0005	0.0005	0.0005	0.0005	0.0005	5E-04	0.0005	0.002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.001	0.0005	0.0005	5E-04	0.001	0.001	0.001	0.001	0.0003	0.01
NEMP Human Health Drinking Water		0.07				0.56																										
NHMRC Human Health Recreational Water		**2.0**				**10.0**																										
NEMP Ecological Freshwater 99% Species Protection			0.00023			19.0																										
Batley et al (2018) Ecological 99% Species Protection			**0.051**																													
Sample ID	**Date**	**Lab Report**	**Type**																													
PFAS by Standard Analysis																																
PR_MW01_190807	7/08/2019	EB1921176	Normal	**5.56**	**4.1**	1.46	0.128	0.063	0.096	0.134	0.119	<0.01	<0.05	0.036	0.026	0.018	<0.01	0.037	<0.01	<0.01	<0.025	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.025	<0.025	<0.025	<0.025	6.23	-
PR_MW02_190807	7/08/2019	EB1921176	Normal	**49**	**37.6**	11.4	0.99	0.55	0.68	1.09	0.8	<0.1	<0.5	0.26	0.23	0.35	<0.1	0.15	<0.1	<0.1	<0.25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	54.1	-
PR_QC104_190807	7/08/2019	EB1921176	Duplicate	**45.8**	**34.9**	10.9	0.981	0.557	0.68	1.01	0.713	<0.01	0.12	0.252	0.241	0.386	0.017	0.111	<0.01	<0.01	<0.025	<0.01	0.045	0.017	<0.01	<0.01	<0.01	<0.01	<0.025	<0.025	<0.025	<0.025	50.9	-
PR_QC204_190807	7/08/2019	RN1244319	Triplicate	**34.8**	**25**	9.8	0.92	0.34	0.5	0.68	0.36	<0.001	0.15	0.23	0.22	0.3	0.027	0.12	<0.001	<0.002	<0.002	<0.001	0.034	0.028	<0.001	<0.002	<0.002	0.0016	<0.002	<0.002	<0.005	<0.005	38.7	-
PR_MW03_190807	7/08/2019	EB1921176	Normal	**9.74**	**7.92**	1.82	0.171	0.073	0.091	0.151	0.103	<0.01	0.02	0.031	0.026	0.148	<0.01	0.031	<0.01	<0.01	<0.025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.025	<0.025	<0.025	<0.025	10.6	-
PR_MW04_190807	7/08/2019	EB1921176	Normal	**9.46**	**6.96**	2.5	0.101	0.076	0.122	0.234	0.149	<0.01	0.02	0.041	0.034	0.153	<0.01	<0.01	<0.01	<0.01	<0.025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.025	<0.025	<0.025	<0.025	10.4	-
PFAS by TOPA																																
PR_MW02_190807	7/08/2019	EB1922105	Normal	**39.3**	**28.0**	11.3	8.87	0.61	0.64	0.69	0.6	<0.02	1.0	1.21	0.32	0.37	<0.02	0.09	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	53.7	53.7

µg/L' micrograms per litre
'<' less than the limit of reporting
'-' not analysed

Appendix C

Photographs

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Proserpine Fire Station	102 Main Street, Proserpine, Queensland	60609758

Plate No.	Date:
1	13/02/2019

Direction Photo Taken:
North

Description:
Interior of shed historically used for foam storage.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Proserpine Fire Station	102 Main Street, Proserpine, Queensland	60609758

Plate No.	Date:
2	13/02/2019

Direction Photo Taken:
North

Description:
The rear of the Fire Station, showing the various extensions and multi-level use.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Proserpine Fire Station	102 Main Street, Proserpine, Queensland	60609758

Plate No.	Date:
3	13/02/2019

Direction Photo Taken:
North

Description:
Site hardstand area in foreground and Fire Station in the background. Concrete hardstand was gradually sealed over time.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Proserpine Fire Station	102 Main Street, Proserpine, Queensland	60609758

Plate No.	Date:
4	13/02/2019

Direction Photo Taken:
East

Description:
Remnants of a lean-to shelter which may have previously contained a fuel bowser and possibly an underground storage tank. No UST was identified during the service location survey.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Proserpine Fire Station	102 Main Street, Proserpine, Queensland	60609758

Plate No.	Date:
5	13/02/2019

Direction Photo Taken:
South-east

Description:
Exterior of workshop at the rear of the site. A hose drying rack is visible on the left of the photograph.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Proserpine Fire Station	102 Main Street, Proserpine, Queensland	60609758

Plate No.	Date:
6	13/07/2019

Direction Photo Taken:
South

Description:
Exterior frontage to Main Street. The two roller doors provide access to the historical Engine Room and the upstairs area was historically used for training purposes.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Proserpine Fire Station	102 Main Street, Proserpine, Queensland	60609758

Plate No.	Date:
7	27/07/2019

Direction Photo Taken: North-west

Description: Example of installed flush gatic well at PR_MW01

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Proserpine Fire Station	102 Main Street, Proserpine, Queensland	60609758

Plate No.	Date:
8	07/08/2019

Direction Photo Taken: North-east

Description: Flush gatic well installed at PR_MW04

Appendix D

Bore Logs

MONITORING WELL LOG PR_BH01 / PR_MW01

ENSR Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2073

PROJECT NUMBER 60609758
PROJECT NAME QFES PFAS DSI - Proserpine
LOCATION 102 Main St, Proserpine, 4800
DRILLING METHOD Hand Auger, Push tube & Solid Stem Auger
SAMPLING METHOD Grab & Push tube
SURFACE ELEVATION 12.999 m AHD
WELL HEAD/TOC
LOGGED BY C. McCosker
COMMENTS

DATE 27/7/2019
BLANK 0.0 - 3.0 m bgl
SCREEN 3.0 - 5.0 m bgl
GRAVEL PACK 2.5 - 5.0 m bgl
SANITARY SEAL/BENTONITE 0.3 - 2.5 m bgl
NORTHING 7743196.3
EASTING 665286.4

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
							CONCRETE	0.20
0.0			PR_BH01_0.25_ 190727				FILL: Sandy CLAY, black, dry, firm, no plasticity, trace of fine angular gravels.	0.40
0.0			PR_BH01_0.5_ 190727				FILL: CLAY, Black, dry, soft-firm, no plasticity.	0.70
0.0			PR_BH01_1.0_ 190727		1.0		DISTURBED NATURAL: Clayey SAND, brown, dry, medium dense, medium grained.	1.20
0.0			PR_BH01_1.5_ 190727				Silty SAND, light brown, dry, medium dense, medium-coarse grained.	
0.0			PR_BH01_2.0_ 190727		2.0		Trace of sub-rounded medium gravels @ 2.10m bgl.	
							Moist @ 2.60m bgl.	
0.0			PR_BH01_3.0_ 190727		3.0		SAND, light brown, dry, loose, coarse grained, with fine rounded gravels.	3.20
							Moist @ 3.80m bgl.	
0.0			PR_BH01_4.0_ 190727		4.0		Wet @ 3.90m bgl.	4.00
							CLAY, brown, grey mottle, moist, stiff, low-medium plasticity.	4.80
0.0			PR_BH01_5.0_ 190727		5.0		SAND, light brown, wet, loose, coarse grained, with fine rounded gravels.	5.00
							End of hole at target depth. Total Depth: 5.00 m	

WELL DIAGRAM: Grout; Bentonite; Casing; Filter Sands; Screen

PR_BORELOGS_DRAFT.GPJ 16/12/19

MONITORING WELL LOG PR_BH02 / PR_MW02

ENSR Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2073

PROJECT NUMBER 60609758
PROJECT NAME QFES PFAS DSI - Proserpine
LOCATION 102 Main St, Proserpine, 4800
DRILLING METHOD Hand Auger, Push tube & Solid Stem Auger
SAMPLING METHOD Grab & Push tube
SURFACE ELEVATION 13.059 m AHD
WELL HEAD/TOC
LOGGED BY C. McCosker
COMMENTS

DATE 26/7/2019
BLANK 0.0 - 2.4 m bgl
SCREEN 2.4 - 5.2 m bgl
GRAVEL PACK 1.9 - 5.2 m bgl
SANITARY SEAL/BENTONITE 0.3 - 1.9 m bgl
NORTHING 7743176.4
EASTING 665291.1

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
							CONCRETE	
0.1			PR_BH02_0.3_190726					0.30
0.0			PR_BH02_0.5_190726	✳			FILL: Sandy CLAY, black, dry, stiff, no plasticity.	
								0.80
0.0			PR_BH02_1.0_190726	✳	1.0		Silty CLAY, brown, dry, stiff, low plasticity.	
								1.35
0.0			PR_BH02_1.5_190726				SAND, light brown, dry, medium dense, medium-coarse grained. Loose @ 1.60m bgl.	
0.0			PR_BH02_2.0_190726		2.0			2.10
							Sandy CLAY, brown, grey mottle, moist, firm, low plasticity, trace of silt. Stiff, medium plasticity @2.50m bgl.	
0.0			PR_BH02_3.0_190726		3.0		Very moist @ 2.90m bgl.	
								3.20
							Silty SAND, brown, moist, medium dense, medium-coarse grained. Medium grained @ 3.60m bgl. Wet @ 3.70m bgl.	
0.0			PR_BH02_4.0_190726		4.0		Increasing silt content from 4.40m bgl.	
0.0			PR_BH02_5.0_190726	✳	5.0			
0.0			PR_BH02_6.0_190726		6.0		End of hole at target depth. Collapse to 5.20m bgl. Total Depth: 6.00 m	6.00

WELL DIAGRAM: Grout; Bentonite; Casing; Filter Sands; Screen

PR_BORELOGS_DRAFT.GPJ 16/12/19

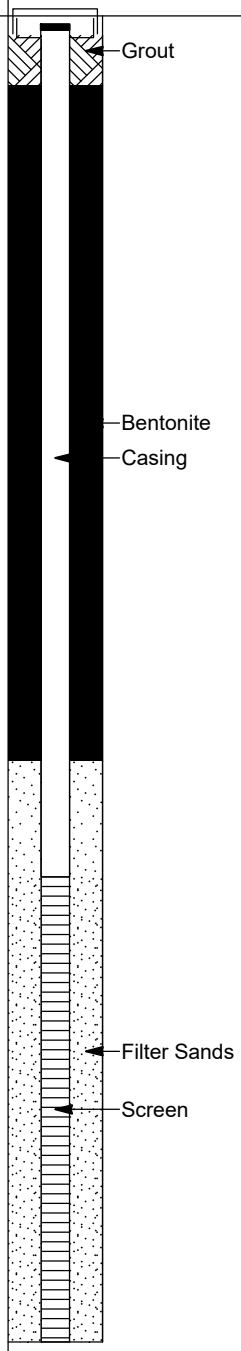
MONITORING WELL LOG PR_BH03 / PR_MW03

ENSR Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2073

PROJECT NUMBER 60609758
PROJECT NAME QFES PFAS DSI - Proserpine
LOCATION 102 Main St, Proserpine, 4800
DRILLING METHOD Hand Auger, Push tube & Solid Stem Auger
SAMPLING METHOD Grab & Push tube
SURFACE ELEVATION 12.851 m AHD
WELL HEAD/TOC
LOGGED BY C. McCosker
COMMENTS

DATE 27/7/2019
BLANK 0.0 - 3.7 m bgl
SCREEN 3.7 - 5.7 m bgl
GRAVEL PACK 3.2 - 5.7 m bgl
SANITARY SEAL/BENTONITE 0.3 - 3.2 m bgl
NORTHING 7743197.4
EASTING 665302.4

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
							CONCRETE	0.30
0.0			PR_BH03_0.3_190727				FILL: Sandy CLAY, black, dry, stiff, no plasticity.	
0.0			PR_BH03_0.5_190727	✳				0.90
0.0			PR_BH03_1.0_190727	✳	1.0		Silty CLAY, brown, dry, stiff, low plasticity.	1.30
0.0			PR_BH03_1.5_190727				SAND, brown, loose, medium-coarse grained, trace of silt.	1.90
0.0			PR_BH03_2.0_190727		2.0		CLAY, brown/black, minor grey mottle, moist, stiff, low-medium plasticity.	2.80
0.0			PR_BH03_3.0_190727		3.0		CLAY, brown, grey mottle, moist, firm, medium plasticity.	3.70
0.0			PR_BH03_4.0_190727		4.0		Silty SAND, brown, wet, medium dense, medium grained.	
0.0			PR_BH03_5.0_190727	✳	5.0		Medium-coarse grained from 4.60m bgl.	5.70
							End of hole at target depth. Total Depth: 5.70 m	



PR_BORELOGS_DRAFT.GPJ 16/12/19

MONITORING WELL LOG PR_BH04 / PR_MW04

ENSR Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2073

PROJECT NUMBER 60609758
PROJECT NAME QFES PFAS DSI - Proserpine
LOCATION 102 Main St, Proserpine, 4800
DRILLING METHOD Hand Auger, Push tube & Solid Stem Auger
SAMPLING METHOD Grab & Push tube
SURFACE ELEVATION 12.955 m AHD
WELL HEAD/TOC
LOGGED BY C. McCosker
COMMENTS

DATE 26/7/2019
BLANK 0.0 - 4.0 m bgl
SCREEN 4.0 - 5.5 m bgl
GRAVEL PACK 3.5 - 5.5 m bgl
SANITARY SEAL/BENTONITE 0.3 - 3.5 m bgl
NORTHING 7743140.2
EASTING 665288.9

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.0			PR_BH04_0.1_190726				FILL: Silty CLAY, dark brown, dry firm, low plasticity.	
								0.40
0.0			PR_BH04_0.5_190726				FILL: CLAY, brown, orange mottle, slightly moist, firm, medium plasticity, with charcoal.	
								0.80
0.0			PR_BH04_1.0_190726		1.0		CLAY, light brown, minor orange mottle, slightly moist, firm, low-medium plasticity.	
							No mottling from 1.30m bgl.	
0.0			PR_BH04_1.5_190726					
								1.90
0.0			PR_BH04_2.0_190726		2.0		Silty CLAY, grey, light brown mottle, slightly moist, soft-firm, medium plasticity.	
							Moist @ 2.50m bgl.	
0.0			PR_BH04_3.0_190726		3.0		Grey/light brown @ 3.00m bgl.	
							With medium grained sand @ 3.30m bgl.	
							Silty SAND, brown, moist, medium dense, medium grained.	3.60
0.0			PR_BH04_4.0_190726		4.0			
								4.10
							Silty CLAY, brown, grey mottle, wet, firm, medium plasticity.	
0.0			PR_BH04_4.5_190726					
								4.80
							Silty SAND, brown, wet, medium dense, medium grained.	
0.0			PR_BH04_5.0_190726		5.0			
								5.50
							End of hole at target depth. Total Depth: 5.50 m	

WELL DIAGRAM: Grout; Bentonite; Casing; Filter Sands; Screen

PR_BORELOGS_DRAFT.GPJ 16/12/19

AECOM Australia Pty Ltd
Level 8, 540 Wickham Street
Fortitude Valley, QLD 4006

BOREHOLE LOG PR_SS1

PROJECT NUMBER 60609758
PROJECT NAME QFES PFAS DSI - Proserpine
LOCATION 102 Main St, Proserpine, 4800
DRILLING METHOD Hand Auger
SAMPLING METHOD Grab

DATE 26/07/2019

LOGGED BY C. McCosker
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.0		PR_SS1_0.1_190726	✳			CL-ML	TOPSOIL: Silty CLAY loam, dark brown, dry, medium dense, fine grained.	0.40
0.0		PR_SS1_0.5_190726	✳			CL	FILL: CLAY, black, dry, stiff, no plasticity, trace of silt.	0.50
							End of hole at target depth. Total Depth: 0.50 m	

PR_BORELOGS_DRAFT.GPJ 16/12/19

Appendix E

Fieldsheets and Calibration Certificates

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

Pump

Project Name:	QFES GW Monitoring	**Project Number:**	60609758	**PM Name:**	James Peachey	**Bore ID:**	MW01
Client:	QFES	**Project Location:**	Brownspine.	**Fieldwork Staff:**	NK	**Sample Date:**	7/8/19
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 7/8/19 ~1530	Bore Radius (mm): 200	Chem Kit Serial No.: 19L1011/2	☐ Decontaminated	☐ **Low Flow** Pump rate: 1/2	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 3.588	Screen Interval (m): Bottom 0.5m	Chem Kit Model: YSI ProPlus.	☐ Dedicated	Intake depth: 4.25	Hydrasleeve Type:	
Bore Depth (m-pvc): 4.730	Casing Radius (mm): 50	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc): -	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m): -	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): -	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1540	0	3.600	1/2	-	-	-	-	-	Brown/orange, High turbidity.
1543	0.5	3.600	"	4.57	203.6	6.59	141.3	26.8	"
1546	1.0	3.600	"	4.32	202.7	6.54	142.6	26.8	"
1549	1.5	~~3.600~~	"	4.39	201.5	6.52	143.6	26.7	
1552	2.0	3.596	"	4.17	199.7	~~6.52~~ 6.46	145.4	26.8	
		"							
			Sampled		@ 1000	@ 2.			
1555	2.5	3.596	"	4.16	~~199.5~~ 196.3	6.43	145.7	26.2	
1558	3.0	"	"	4.27	195.7	6.43	146.9	26.7	
				Near					
			-	Sampled	@ 1000	@ 3L.			
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	//	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
//	//		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		//

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	**Date**	**Distribution:** Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW02
Project Name:	QFES GW Monitoring	**Project Number:**	60609758	**PM Name:**	James Peachey	**Sample Date:**	7/8/19
Client:	QFES	**Project Location:**	Proserpine	**Fieldwork Staff:**	NK	**Well Development or Well Sampling Event? (circle)**	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level:	Bore Radius (mm): 200	Chem Kit Serial No.: 19C101112	☐ Decontaminated	☑ Low Flow Pump rate: 2/3	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.632	Screen Interval (m): Bottom	Chem Kit Model: YSI Pro plus	☐ Dedicated	Intake depth: 4.5	Hydrasleeve Type:	
Bore Depth (m-pvc): 4.925	Casing Radius (mm): 50	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc): -	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m): -	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): -	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
14:54	0	3.642	@ 2/3	-	-	-	-	-	
14:57	0.5	"	"	4.89	269.9	6.50	127.0	28.5	Brown/orange, med-turbidity.
15:00	1.25	3.671	"	4.83	268.3	6.50	126.1	28.5	
15:03	2.0	3.671	"	4.65	244.5	6.47	125.6	28.4	Med-High turbidity.
15:06	2.5	"	"	4.21	241.4	6.44	128.8	28.4	
15:09	3.0	"	"	4.13	241.1	6.42	132.1	28.4	
15:12	3.5	"	"	4.33	239.1	6.41	134.1	28.4	
				↓ Near					
				Sampled @ 4.5L		@ 1515			
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	~~PR_QC104_190807~~	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	✓		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	3	x 250 mL Plastic	PR_QC204_190807	

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	**Distribution:** Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

Turn

Project Name:	QFES GW Monitoring	**Project Number:**	60609758	**PM Name:**	James Peachey	**Bore ID:**	MW03
Client:	QFES	**Project Location:**	Proserpine	**Fieldwork Staff:**	NK	**Sample Date:**	7/8/19
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level:	Bore Radius (mm): 200mm	Chem Kit Serial No.: 19C101112	☑ Decontaminated	☑ **Low Flow** Pump rate: 1/2	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 3.432	Screen Interval (m): Bottom	Chem Kit Model: YSI ProPlus	☐ Dedicated	Intake depth: 5.0m	Hydrasleeve Type:	
Bore Depth (m-pvc): 5.778	Casing Radius (mm): 50mm	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc): –	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m): –	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): –	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
12:08	0	3.432	–	–	–	–	–	–	
13:26	0.25	3.736	1/2	3.27	235.4	6.40	139.1	27.5	pale brown, no odour/sheen, clear
13:29	0.75	3.831	"	3.33	235.4	6.40	139.0	27.6	"
13:32	1.25	3.888	"	3.54	234.0	6.37	139.7	27.3	"
13:35	1.75	3.943	"	3.60	235.2	6.36	140.2	27.5	"
13:38	2.25	3.981	"	3.70	236.1	6.33	140.9	27.5	"
13:41	2.50	4.031	"	3.67	236.8	6.31	141.3	27.5	"
13:46	3.25	4.099	"	3.76	236.3	6.32	139.7	27.7	"
13:51	4.0	4.221	"	3.87	233.2	6.32	136.6	27.7	
13:56	5.0	4.298	"	3.73	232.4	6.32	137.1	27.6	
14:01	5.5	4.351	"	3.67	233.3	6.32	138.0	27.8	
14:12	6.5	4.154	1/3	2.84	265.0	6.32	119.9	27.7	slowed pump down
14:17	7.0	4.171	"	2.88	261.0	6.31	120.7	27.7	
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	
//	//		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	//

Field Commets

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Drop water level to 4.2m to stabalise

Approval and Distribution

Fieldwork Staff Signature	**Date**	**Checker Name and Signature**	**Date**
Project Manager Signature	**Date**	**Distribution:** Project Central File	

AECOM

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW03
Project Name:	QFES GW Monitoring	**Project Number:**	60609758	**PM Name:**	James Peachey	**Sample Date:**	
Client:	QFES	**Project Location:**	Proserpine	**Fieldwork Staff:**	NK	**Well Development or Well Sampling Event? (circle)**	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level:	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc):	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
				Continued					
14:22	7.5	4.191	M/3	3.08	259.3	6.30	123.4	27.8	
14:27	8.5	4.250	"	2.82	257.3	6.31	126.1	27.6	- slowed down abit more.
14:32	9.0	4.244	"	3.12	254.9	6.29	128.3	27.5	
14:37	9.5	4.245	"	3.26	254.8	6.28	130.5	27.6	
				Clear					
				— Sampled @ 14	40 @			9.5L	
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	//	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
//	//		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	**Distribution:** Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

Peri pump / Turn

Project Name:	QFES GW Monitoring	**Project Number:**	60609758	**PM Name:**	James Peachey	**Bore ID:**	mw04
Client:	QFES	**Project Location:**	Proserpine	**Fieldwork Staff:**	NK	**Sample Date:**	7/8/19

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level:	Bore Radius (mm): 200	Chem Kit Serial No.: 19C10112	☑ Decontaminated	☑ **Low Flow** Pump rate: 1/2	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 3.618	Screen Interval (m): Bottom	Chem Kit Model: YSI ProPlus	☐ Dedicated	Intake depth: 5m	Hydrasleeve Type:	
Bore Depth (m-pvc): 5.401	Casing Radius (mm): 50mm	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc): –	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m): –	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): –	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
12:31	0	3.684	1/2	~	~	–	–	–	
12:36	0.5	3.922	1/3	2.50	322.8	6.33	138.4	26.4	Orange/Brown, Med-High turbidity, no sheen
12:41	0.75	4.083	"	2.28	318.0	6.31	137.8	26.4	Slowed pump down to lowest speed. SWL still dropping.
12:46	1.75	4.077	1/2	2.23	314	6.28	137.6	26.2	Will purge & leave to recharge.
12:49	2.25	4.149	"	2.15	315	6.27	137.4	26.2	"
12:52	2.75	4.231	"	2.20	315.4	6.26	136.8	26.3	" High turbidity.
12:55	3.00	4.315	"	1.99	312.3	6.24	137.2	26.3	
12:58	3.50	4.424	"	1.90	309.7	6.24	137.2	26.4	
13:01	4.0	4.491	"	2.08	305.2	6.23	137.2	26.3	
13:04	4.5	4.575	"	2.03	295.3	6.22	137.6	26.3	
13:07	5.0	4.631	"	2.26	290.0	6.22	138.1	26.3	(Purged down to 4.75 & leave to recharge)
13:12	5.75	4.750	2/3	2.30	287.9	6.21	139.0	26.3	Left to recharge
1620		3.571		2.29	292.6	6.22	162.8	26.0	(Grab sample with peri pump)
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	//
//	//		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	

Field Commets

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

//

Approval and Distribution

Fieldwork Staff Signature	**Date**	**Checker Name and Signature**	**Date**
Project Manager Signature	**Date**	**Distribution:** Project Central File	

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus
Serial No. 11K100830

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH 7.00	NIST	320613	pH 7.00
2. pH 4.00		pH 4.00	NIST	307927	pH 4.00
3. mV		240mV	NIST	325420/325421	240mV
4. EC		2.76mS	NIST	304153	2.76mS
6. D.O		0 ppm	NIST	5928	0 ppm
7. Temp		24.oC	NIST	MultiTherm 09000528	24.oC

Calibrated by: **Nikhil Mruthyunjayappa**

Calibration date: **15/07/2019**

Next calibration due: **11/01/2020**

Oil / Water Interface Meter

Instrument Interface Meter (30M)
Serial No. 224606

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
	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: Nikhil Mruthyunjayappa

Calibration date: 15/07/2019

Next calibration due: 13/09/2019

Gas Detection Air Sampling & Monitoring Environmental & Water Quality Monitoring

airmet

Air-Met Scientific Pty Ltd

ABN 73 006 849 949

Ph 1300 137 067

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus
Serial No. 11K100831

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
	Seal	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC/Temp.	✓	
	4. D.O	✓	
Alarms	Beeper	✓	
	Settings	✓	
Software	Version	✓	
Data logger	Operation	✓	
Download	Operation	✓	
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH 7.00	NIST	320613	pH 7.00
2. pH 4.00		pH 4.00	NIST	320612	pH 4.00
3. mV		240mV	NIST	325420/325421	240mV
4. EC		2.76mS	NIST	304153	2.76mS
6. D.O		0 ppm	NIST	5928	0 ppm
7. Temp		22.6oC	NIST	MultiTherm 09000528	22.6oC

Calibrated by: Nikhil Mruthyunjayappa

Calibration date: 15-Jul-19

Next calibration due: 11-Jan-20

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-114169

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
Pump	Operation	✓	
	Filter	✓	
	Flow	✓	
	Valves, Diaphragm	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	PID	✓	10.6 ev
Alarms	Beeper	✓	
	Settings	✓	
Software	Version	✓	
Data logger	Operation	✓	
Download	Operation	✓	
Other tests:			

Low	High	TWA	STEL
50ppm	100ppm		

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		93ppm Isobutylene	NIST	BR100		93.0ppm

Calibrated by: Nikhil Mruthyunjayappa

Calibration date: 15/07/2019

Next calibration due: 14/08/2019

Gas Calibration Certificate

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument MX4
Serial No. 13054CJ-002
Sensors CO, H2S, O2, LEL

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
			Low	**High**	**TWA**	**STEL**
Sensor	Oxygen	✓	19.50%	23.50%	N/A	N/A
	Pentane	✓	5% LEL	10% LEL	N/A	N/A
	CO	✓	30 ppm	60 ppm	30ppm	60ppm
	H2S	✓	10 ppm	15 ppm	10ppm	15ppm
Alarms	Beeper	✓				
	Settings	✓				
Software	Version					
Datalogger	Operation					
Download	Operation					
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No	Instrument Reading
O2		Fresh Air		Fresh Air	20.90%
LEL		25% LEL Pentane	NIST	BR133	25% LEL Pentane
CO		100ppm	NIST	BR133	100ppm
H2S		25ppm	NIST	BR133	25ppm

Calibrated by: **Braeden Curtis**

Calibration date: **16/07/19**

Next calibration due: **15/01/2020 0:00**

3.432
5.778

AECOM

ANZ

FQM - Water Quality Meter Calibration Record

Q4AN(EV)-410-FM1

Project Name:	~~Arrow Q3 GME~~ QFES	**Project Number:**	~~60603041, 2.3~~ 60609758
Project Location:	~~Surat~~ Proserpine	**Client:**	~~Arrow Energy~~ QFES
PM Name:	~~Robert Bartlett~~ James. P.	**Fieldwork Staff Name:**	Nem Krco

This calibration record is intended to prompt fieldwork staff to calibrate water quality meter (WQM) daily before the start of fieldworks.

INSTRUMENT DETAILS

Supplier:	Aquaread
Make and Model:	YSI Proplus
Serial Number:	19C101112

CALIBRATION

CALIBRATE WITH CALIBRATION SOLUTIONS

Date and Time:	7/8/19 11:45				
Parameter	Acidity		Conductivity	Dissolved Oxygen	
Units	pH	pH	µS/cm	ppm	ppm
Calibration Standard Concentration:	4.0	7.0			
Calibration Reading:	4.01	7.0			
Calibration Temperature:	22.6	23.1			

ONGOING CHECKS

BUMP TEST WITH CALIBRATION SOLUTION

Date and Time:	7/8/19 11:45				
Parameter	Acidity		Conductivity	Dissolved Oxygen	
Units	pH	pH	µS/cm	ppm	ppm
Calibration Standard Concentration:	4.0	7.0	2531	Ø Zero	
Bump Test Reading:	3.87	7.08	2531	0.03	
Bump Test Temperature:	22.5	22.49	22.6	22.9	
	x	x	✓	✓	

ORP
234.9
234.6
22.9

COMMENTS

Detail any equipment faults, minor maintenance performed, change of batteries or technical support provided.

Approval and Distribution

☐ Each individual instrument has been inspected and calibrated daily and bump tested as required by fieldwork staff.

Fieldwork Staff Signature

7/8/19
Date

Distribution: Project Central File

Appendix F

Surveying Report

Our Ref: 400571
Surveyed - Veris
Date of Survey 8/8/19
Site Address: 102 Main St Proserpine

Origin of Coordinates

Projection	MGA Zone 55
Coordinate Datum	GDA94
Height Datum	AHD

Coordinate Origin PM 10008 E 665 016.404m, N 7 743 294.885m, Z 13.487m

Point ID	Easting (m)	Northing(m)	Elevation (m)
MW01 CASING	665286.415	7743196.255	12.999
MW01 Natural Surface Level	665286.230	7743196.267	13.056
MW02 Natural Surface Level	665291.176	7743176.557	13.152
MW02 CASING	665291.110	7743176.415	13.059
MW03 CASING	665302.356	7743197.362	12.851
MW03 Natural Surface Level	665302.481	7743197.363	12.918
MW04 CASING	665288.943	7743140.165	12.955
MW04 Natural Surface Level	665289.213	7743140.155	12.992

Appendix G

Analytical Data Validation

Appendix G - Analytical Data Validation

G1.0 Introduction

The amended NEPM, Schedule B [2]) Guideline on Site Characterisation (2013) specifies that the nature and quality of the data produced in an investigation should be determined by the data quality objectives (DQOs). As referenced by the NEPM, the DQO process is detailed in the United States Environmental Protection Agency (US EPA) *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4 : EPA/240/B-06/001), February 2006.*

The US EPA defines the process as *'a strategic planning approach based on the Scientific Method that is used to prepare for a data collection activity. It provides a systematic procedure for defining the criteria that a data collection design should satisfy, including when to collect samples, where to collect samples, the tolerable level of decision errors for the study, and how many samples to collect'.*

The process of establishing appropriate DQOs is defined by the US EPA (2006) according to the following seven steps:

The seven steps in defining DQOs

Step	Data Quality Objective Step
1	***State the problem*** – Define the problem that necessitates the study; identify the planning team, examine budget, schedule.
2	***Identify the goal of the study –*** State how environmental data will be used in meeting objectives and solving the problem, identify study questions, define alternative outcomes.
3	***Identify information inputs*** – Identify data & information needed to answer study questions.
4	***Define the boundaries of the study*** – Specify the target population & characteristics of interest, define spatial & temporal limits, scale of inference.
5	***Develop the analytic approach*** – Define the parameter of interest, specify the type of inference, and develop the logic for drawing conclusions from findings.
6	***Specify performance or acceptance criteria*** – Develop performance criteria for new data being collected or acceptable criteria for existing data being considered for use.
7	***Develop the plan for obtaining data*** – Select the resource-effective sampling and analysis plan that meets the performance criteria.

The approach adopted relative to the seven steps presented above is discussed below.

G1.1 Step 1 – State the Problem

A report prepared by QFES in November 2018 indicated that PFAS was detected in water held within the Case 4 Pit at the fire station.

The findings of a review of the historical use of firefighting foams containing PFAS at the site have been documented in the PSI report (AECOM, 2019) and it was identified that there was the potential for PFAS to have been released to ground. The extent of the potential presence of PFAS in the different environmental media (soil, groundwater, surface water and sediment) was not known and characterisation of potential source areas, boundary locations and downstream (for surface water) and down-gradient (for groundwater) was required to inform the potential presence of complete source-pathway-receptor linkages at the site.

G1.2 Step 2 – Identify the Goal of the Study

The overarching purpose of the works is to characterise the potential for PFAS impacts, including concentration and distribution in environmental media (soil, groundwater, surface water and sediment), within and at the boundary of the site.

G1.3 Step 3 – Identify Information Inputs

To allow assessment of the data against the study goal listed in step 2 above, the following inputs have been considered:

- Anecdotal information on historical operations provided from interviews with personnel familiar with the fire stations
- Observations made during the site inspections completed in January and February 2019
- The data review information (site and environmental setting) presented in the PSI report (AECOM, 2019) including:
    - Quantitative site characterisation data including visual observations, laboratory analytical data from field samples (samples of water from the Case 4 pit, comparison of analytical data with screening criteria appropriate for the land use
    - Hydrogeological and hydrological data for each of the six sites including inferred groundwater and surface water flow direction
    - The potential for preferential pathways e.g. stormwater drains.
- Tier 1 health and ecological investigation and screening levels of each protected beneficial use applicable within the boundary of the study area
- Soil and groundwater analytical results collected between July and August 2019 as presented in this DSI report.

G1.4 Step 4 – Define the Boundaries of the Study

The lateral extent of the study area defined for decision making is the physical area of the fire station (Lot on Plan boundaries) is outlined in figures in **Appendix A**. The vertical extent of the investigation is the depth to the shallow aquifer system – up to approximately 5m below ground level based on the available data..

The temporal boundary of the study is the current conditions at the time of the fieldwork in July – August 2019.

G1.5 Step 5 – Develop the Analytical Approach

The decision rules can be defined as:

- If the laboratory quality assurance/quality control data are within the acceptable ranges, the data should be considered suitable for use.
- If the PFAS concentrations are reported above the laboratory LOR or risk-based screening levels in one or more samples, then it should be considered whether further assessment is required.

The decision on the acceptance of the analytical data should be made on the basis of the Data Quality Indicators (DQIs) as follows:

- **Precision:** A quantitative measure of the variability (or reproducibility) of data.
- **Accuracy**: A quantitative measure of the closeness of reported data to the “true” value.
- **Representativeness**: The confidence (expressed qualitatively) that data are representative of each media present at each fire station.
- **Completeness**: A measure of the amount of useable data from a data collection activity.
- **Comparability**: The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event.

G1.5.1 Precision

Suitable criteria and/or performance indicators for assessment of precision include:

- Performance of intra-laboratory duplicate sample sets through calculation of relative percentage differences (RPDs).
- Performance of inter-laboratory duplicate sample sets through calculation of RPDs.
- The RPDs should be assessed as acceptable if less than or equal to 30% as per the NEPM Schedule B3. Where the results shows greater than 30% difference a review of the cause should be conducted (NEPC, 2013). It is noted that RPDs that exceed this range may be considered acceptable where:
  - results are less than 10 times the LOR (80%)
  - results are less than 20 times the LOR and the RPD is less than 50%
  - heterogeneous materials are encountered.

G1.5.2 Accuracy (Bias)

The closeness of the reported data to the “true” value is assessed through review of performance of:

- method blanks, which are analysed for the analytes targeted in the primary samples
- Matrix spikes and surrogate recoveries
- Laboratory control samples.

G1.5.3 Representativeness

To ensure the data produced by the laboratory is representative of conditions encountered in the field, the following steps are taken by the laboratory and subsequently reviewed by the Consultant:

- Blank samples should be run in parallel with field samples to confirm there are no unacceptable instances of laboratory cross contamination.
- Review of RPD values for field and laboratory duplicates to provide an indication that the samples are generally homogeneous, with no unacceptable instances of significant sample matrix heterogeneities.
- The appropriateness of collection methodologies, handling, storage and preservation techniques should be assessed to ensure/confirm there was minimal opportunity for sample interference or degradation (i.e. volatile loss during transport due to incorrect preservation / transport methods).

G1.5.4 Completeness

In validating the degree of completeness of the analytical data sets acquired during the program the following is considered:

- Whether standard operating procedures (SOPs) for sampling protocols have been adhered to.
- Copies of all chain of custody (CoC) documentation are reviewed and presented.

It can therefore be considered whether the proportion of “useable data” generated in the data collection activities is sufficient for the purposes of assessing the problem as stated in Step 1 above.

G1.5.5 Comparability

Given that assessment data can comprise several data sets from separate sampling episodes, issues of comparability between data sets are reduced through adherence to SOPs and regulator endorsed or made guidelines and standards on each data gathering activity.

In addition, the data should be collected by experienced field staff familiar with PFAS contamination investigations and National Association of Testing Authorities (NATA) accredited laboratories should be employed in all laboratory programs for soil, sediment and water analysis.

G1.5.6 Step 6 – Specify Performance or Acceptance Criteria

Specific limits for this project are in accordance with the appropriate guidance made or endorsed by state and national regulations, appropriate indicators of data quality, and standard procedures for field sampling and handling.

This step also examines the certainty of conclusive statements based on the available new site data collected. This should include the following points to quantify tolerable limits:

- A decision can be made based on a certainty assumption of 95% confidence in any given data set. A limit on the decision error should be 5% that a conclusive statement may be a false positive or false negative.
- A decision error in the context of the decision rule presented above would lead to either underestimation or overestimation of the risk level associated with a particular sampling area.

Sampling errors may occur when the sampling program does not adequately detect the variability of a contaminant from point to point across the site. To address this, the SAQP presented in the PSI (AECOM, 2019) outlined minimum numbers of samples proposed to be collected from each media.

- As such, there may be limitations in the data if aspects of the SAQP cannot be implemented. Some examples of this scenario include but are not limited to:
    - Proposed surface water sample locations may be dry at the time of sampling; and
    - Proposed samples are not collected due to access being restricted to a given location.
- Limitations in ability to acquire useful and representative information from the data collected. The data are proposed to be collected from multiple locations and sample media. Some examples of this scenario include:
    - Measurement errors can occur during sample collection, handling, preparation, analysis and data reduction. To address this the following measures are proposed:
        - Collection of sufficient sample mass to facilitate analysis reported to standard laboratory detections limits. Collection of insufficient sample mass may result in raised detection limits.
        - Field staff to follow a standard procedure when collecting samples, including decontamination of tools, removal of adhered soil to avoid false positives in results, and use of appropriate sample containers and preservation methods.
        - Laboratories to follow a standard procedure when preparing samples for analysis and undertaking analysis.
- Laboratories to report quality assurance/ quality control data for comparison with the DQIs established for the project.

G1.5.7 Step 7 – Optimise the Design for Obtaining Data

The methodology is designed to meet the objectives described in **Section 1.3** of the main body of the report and to achieve the nominated DQOs. Optimisation of the data collection process should be achieved by:

- Working closely with the analytical laboratories and sampling equipment suppliers to ensure that appropriate procedures and processes are developed and implemented prior to and during the fieldwork, to ensure that sample handling, and transport to and processing by the analytical laboratories is as smooth as possible; and
- Conducting sampling according to the environmental consultant's SOPs for the type of sampling being conducted.

The scope of works should be carried out to a level of accuracy and confidence presented in the NEPM (NEPC, 2013).

G2.0 Assessment of Data Quality

The quality of the data collected as part of the investigations was assessed on a range of factors including:

- Documentation and data completeness
- Data quality – comparability, representativeness, and precision and accuracy for sampling. Assessment criteria for data quality indicators for samples are listed below in the table below.

Acceptance Criteria for Data Quality Indicators in Laboratory Analysis

Data Quality Indicator	Acceptance Criteria
Rinsate Blanks	Less than the laboratory LOR
Intra laboratory field duplicates (1) (3)	RPD less than ± 30-50% (where results > 10 x LOR) (2)
Laboratory Duplicates (1) (2) (3)	RPDs in conformance with criteria in the laboratory QC report
Matrix Spikes (3) (4)	Recoveries between 70-130% of the theoretical recovery or as nominated in the laboratory's QC report
Method Blanks	Less than the laboratory LOR
Laboratory Control Samples (5)	Recoveries between laboratory-specified range for each particular analyte / analytical suite.
Surrogate Spikes	Recoveries for surrogates are test dependent and are based on USEPA Method SW846. Control limits are dynamic and vary for individual tests but are within the criteria described in USEPA Method SW846.

Notes:

1. Potential exceptions to this criterion may occur where sample variation or heterogeneity, rather than poor laboratory performance, is accountable for the poor reproducibility, or where the results are close to the LOR. This typical RPD range is obtained from AS 4482.1-2005 Guide to the investigation and sampling of sites with potentially contaminated soil.
2. If the results are close to the LOR, then higher results will be accepted.
3. Criteria for sample duplicate and matrix spike results assume no sample heterogeneity. If samples are found to be heterogeneous with respect to a particular analyte the above criteria does not apply.
4. Assumes that samples are homogeneous and the background analyte level is less than 20% of the spike level (refer to USEPA Method 8000B). Note that there is no requirement for matrix spikes to pass as certain matrices may preclude recovery of spiked compounds. In this case, data will be accepted if LCS data meets the acceptance criteria.

   5.80% of the compounds tested must fall within the control limits. Control limits are dynamic and vary for individual tests as per USEPA Method 8000B.

5. Decision errors may include collecting samples that are not representative of the contamination status of the material and/or analytical errors.

G3.0 Field QA/QC Data Assessment

G3.1 General

All work completed as part of the project was conducted in accordance with standard AECOM environmental sampling protocols. The essential elements of the QA/QC program are presented in the table below.

Essential Elements of the Field QA/QC Program

Action	Description
Use of Experienced Personnel	Fieldwork was undertaken by trained AECOM engineers/scientists with previous experience in contaminated site assessment, field sampling techniques and health and safety issues.
Record Keeping	Full records of all field activities including sample collection and photo log are maintained on standard field activity sheets.
Sample Collection	New nitrile gloves were worn during soil and groundwater sampling and were replaced between each sample collection.
Sample Labelling	A unique sample number was used for each sample to specify the sample origin (soil bore/monitoring well number and date), preservation standards and analytical requirements.
Chain of Custody	Chain of Custody procedures are required for all sample transfers. Custody sheets list sample numbers; date of collection and analyses required and are signed by each individual transferring and accepting custody.
Sample Storage	The collected samples were transferred to laboratory supplied sampling containers with appropriate preservation as required and then placed in cool storage prior to transfer to a NATA accredited laboratory (ALS and NMI).
Decontamination	All non-dedicated field equipment used in the sampling process was decontaminated using de-ionised water prior to mobilisation and between sampling locations to reduce the risks of cross contamination.

In addition to the primary samples, quality control field duplicate samples were collected to assess aspects of field protocols and laboratory performance and to classify the validity of the laboratory data. Field duplicates were collected in general accordance with AS 4482.1-2005 *Guide to the investigation and sampling of sites with potentially contaminated soil* (Standards Australia 2005).

G3.2 Handling and Sample Preservation

The laboratories reported that all samples were received in appropriately pre-treated and preserved containers

Samples were received preserved and chilled at the laboratory. The sample temperature readings recorded on the Sample Receipt Notification (SRN) ranged from 1.2°C and 1.4°C with ice present.

G3.3 Frequency of Field Quality Control Samples

Field duplicate samples (intra-laboratory duplicates) and field triplicate samples (inter-laboratory duplicates) were collected and labelled so that they could not be linked to their respective primary samples.

Field duplicate and triplicate samples were collected as 1 duplicate and triplicate sample per 10 primary samples (10%) prepared in the field by equally splitting the primary field samples. A summary of the actual duplicate and triplicate analysis frequency undertaken during this investigation is presented in the table below. The table shows that the sufficient number of field QC samples was collected.

Summary of Duplicate and Triplicate Samples

Media	No of Primary Samples	No of Duplicate Samples	% Duplicate Samples	No of Triplicate Samples	% Triplicate Samples
Soil Samples	14	2	14	2	14
Groundwater Samples	4	1	25	1	25

Relative Percentage Difference (RPD) Calculations

A RPD analysis of primary and duplicate/triplicate samples is used to measure the representativeness and/or precision of duplicate samples. The RPD is calculated from the absolute difference between results of the duplicate pair divided by the mean value of the duplicate pair.

RPD (%) = 100 x (D1-D2) / ((D1+D2) / 2)

Where: D1 = primary sample analysis, D2 = duplicate sample analysis

AS 4482.1-2005 states that the typical RPD which can be expected from acceptable field duplicates is < ± 30- 50% of the mean concentration of the analyte, where the results are greater than ten times the limit of reporting (LOR).

The acceptable ranges adopted are:

- 80% for laboratory duplicates between 0-10 x LOR.
- 50% for laboratory duplicates between 10-30 x LOR.
- 30% for laboratory duplicates greater than 30 x LOR.
- All other RPD calculations were either not calculable, due to the primary or duplicate sample reporting concentrations of COPC less than the LOR or within the expected range of 0- 30% for all other analytes reported.

Evaluation of the soil dataset is presented in **Table G1**. There were no non-conformances identified. The RPD results for water samples are provided in **Table G2** with the RPD non-conformances summarised in the table below.

Summary of key PFAS RPD non-conformances

Primary Sample ID	QC sample ID	Type	RPD (%)				
			PFBS	PFPeS	PFHpS	PFOS	PFOA
PR_MW02_190807	PR_QC204_190807	Water	31%	46%	76%	40%	47%

The RPD non-conformance for the water samples may be attributed to the different extraction methodologies by different laboratories. Conservatively, where significant differences between the primary and duplicate samples have been recorded, the highest concentration has been considered in the assessment of groundwater results.

The RPD results are not considered to impact on data interpretation for this investigation but do demonstrate that difference in laboratory analysis and extraction methods in groundwater samples should be considered in assessing the contamination status of the site.

G3.4 Rinsate Blank Samples

To assess the effectiveness of sampling procedures, four rinsate blank samples were collected, on days when sampling equipment was used. Rinsate blanks were collected from sampling equipment which was decontaminated and re-used by passing laboratory supplied deionised water over the sampling equipment following decontamination procedures. The rinsate samples were analysed for PFAS.

The analytical results for PFAS compounds recorded for the rinsate blank samples are presented in **Table G3**, attached. All results for the rinsate samples were below the LOR. The data are deemed acceptable for interpretative use and not considered to impact on data interpretation for this investigation.

G4.0 Laboratory QA/QC

The analytical data was received from the laboratories as the following laboratory batches:

ALS- EB1919842, EB1921187, EB1921176, EB1922105

NMI- AECO06_190802, AECO06_190816.

G4.1 Extraction and Analysis Holding Time

All samples were analysed within the holding times with the exception of EB1921187 where four samples exceeded the hold time for moisture content. As the samples were received within the recommended holding time for PFAS, the data quality is considered acceptable for the purpose of this investigation.

G4.2 Laboratory QA/QC

The laboratories used in the investigation (ALS for primary and duplicate samples and NMI for triplicate samples) are National Association of Testing Authorities (NATA) approved for the analyses required. Quality assurance procedures adopted by both primary and secondary analytical laboratories included analysis of blanks, duplicates, laboratory control samples, matrix spikes and surrogate spikes (for organics).

For this investigation, 18 primary and field quality control samples were submitted in two laboratory batches. The different types of laboratory QC samples and batches where one or more laboratory control samples were outside the limits are discussed below.

G4.2.1 Laboratory/Method Blanks

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 type is to monitor potential laboratory contamination.

All the laboratory blanks were within the DQO limits for this investigation. Method blank concentrations were not detected above the LOR for all analytes.

G4.2.2 Laboratory Control Sample (LCS)

The quality control term Laboratory Control Sample (LCS) refers to a known, interference free matrix spiked with target analytes or certified reference material. The purpose of this QC type is to monitor method precision and accuracy independent of sample matrix. Accepted frequency of LCS samples is 1 in 20. With the exception of one batch (EB1921176) LCS recoveries were within the adopted DQO limits. Recoveries on five analytes (PFBA, MeFOSA, EtFOSA, MeFOSE, EtFOSE) were less than the lower control limit.

G4.2.3 Laboratory Duplicates

The quality control term laboratory duplicate refers to an intra-laboratory split sample randomly selected from the sample batch. Laboratory duplicates provide information on method precision and sample heterogeneity. Relative percentage differences (RPDs) are used to assess precision. Frequency of laboratory duplicate samples 1 in 10.

The RPDs for laboratory duplicate samples were within the limits for all analytes for all batches.

G4.2.4 Matrix Spikes

The quality control term Matrix Spike (MS) refers to an intra-laboratory split sample spiked with a representative set of target analytes. The purpose of this QC type is to monitor potential matrix effects on analyte recoveries. The samples undergo the same extraction and analysis procedures and the results are used to assess the method precision and bias. Spike recoveries are reported as a percent recovery. Frequency of MS samples is 1 in 20. With the exception of two batches (EB1919842 and EB1921176) all RPDs were within the limits for the analytes. The non-conformances included:

- EB1919842- anonymous soil sample with PFOS recovery not determined and PFTeDA and MeFOSE recovery were less than the lower data quality objectives.

- EB1921176- anonymous water sample with three analytes (PFUnDA, 6:2 FtS, 10:2 FtS) recovered greater than the upper data quality objective and one analyte (EtFOSAA) recovered less than the lower data quality objective.

G4.2.5 Surrogate Spikes

The quality control term Surrogate Spike (SS) refers to a compound added to a sample aliquot in known amounts before extraction and analysis. The compound should be similar in composition and behaviour to the target analyte but not naturally occurring in the sample. A surrogate is used to monitor the method performance for analysis of organic compounds. Spike recoveries are reported as a percent recovery.

All the SS recoveries were within the adopted DQO limits for all batches except for the two rinsate samples where recovery was less than the lower data quality objective. This is potentially due to the matrix of the particular sample rather than the surrogate recovery and as such does not affect the quality of the data for interpretative use.

G4.2.6 Frequency of Laboratory QC samples

The laboratory reported a sufficient frequency of quality control samples to assess whether the results have been reported to an acceptable accuracy and precision for all the batches.

G5.0 Conclusions

While non-conformances with the laboratory QA/QC have been identified, these non-conformances are not considered to adversely impact the purpose of the investigation with respect to comparison against the adopted assessment criteria. It is concluded that, for the purposes of this investigation, the data are suitable for interpretation and acceptable for use in this assessment.

Table G1 Soil Duplicate and Triplicate Analytical Results
PFAS DSI
QFES- Prosperine Fire Station

AECOM

				PFAS																											
				PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFDS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDcA	PFUnA	PFDoA	PFTrDA	PFTeDA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	MeFOSAA	EtFOSAA	FOSA	N-Et-FOSA	N-Me-FOSA	N-Et-FOSE	N-MeFOSE
				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	mg/kg
	EQL			0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005
Report Number	Field ID	Type	Date																												
EB1919842	PR_BH04_0.5 _190726	soil	26/07/2019	<0.0002	<0.0002	0.0007	<0.0002	0.0017	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EB1919842	PR_QC100 _190726	soil	26/07/2019	<0.0002	<0.0002	0.001	<0.0002	0.0016	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<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	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
RPD				0	0	35	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EB1919842	PR_BH04_0.5 _190726	soil	26/07/2019	<0.0002	<0.0002	0.0007	<0.0002	0.0017	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<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	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
RN1242617	PR_QC200_190726	soil	26/07/2019	<0.001	<0.001	0.0015	<0.001	0.0029	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.005	<0.005
RPD				0	0	73	0	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EB1919842	PR_BH02_1.0 _190726	soil	26/07/2019	0.0014	0.0016	0.016	0.0008	0.0132	<0.0002	<0.001	<0.0002	0.0012	<0.0002	0.0004	0.0011	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EB1919842	PR_QC101 _190726	soil	26/07/2019	0.0012	0.0016	0.0156	0.0008	0.0142	<0.0002	<0.001	<0.0002	0.001	<0.0002	0.0004	0.0012	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
RPD				15	0	3	0	7	0	0	0	18	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EB1919842	PR_BH02_1.0 _190726	soil	26/07/2019	0.0014	0.0016	0.016	0.0008	0.0132	<0.0002	<0.001	<0.0002	0.0012	<0.0002	0.0004	0.0011	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
RN1242617	PR_QC201_190726	soil	26/07/2019	0.0014	0.0013	0.016	<0.001	0.015	<0.001	<0.002	<0.002	0.0012	<0.001	<0.001	0.0012	<0.001	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.005	<0.005
RPD				0	21	0	0	13	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 81 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Table G2 Water Duplicate and Triplicate Analytical Results
PFAS DSI
QFES- Prosperine Fire Station

AECOM

		PFAS																												
		PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFDS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDcA	PFUnA	PFDoA	PFTrDA	PFTeDA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	MeFOSAA	EtFOSAA	FOSA	N-Et-FOSA	N-Me-FOSA	N-Et-FOSE	N-MeFOSE
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L
	EQL	0.002	0.002	0.002	0.002	0.002	0.002	0.01	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.005	0.005	0.005	0.005	0.005	0.002	0.002	0.002	0.005	0.005	0.005	0.005
Report Number	Field ID	Type	Date																											
EB1921176035	PR_MW02_190807	water	7/08/2019	0.68	1.09	11.4	0.8	37.6	<0.1	<0.5	0.26	0.99	0.23	0.55	0.35	<0.1	0.15	<0.1	<0.1	<0.25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25
EB1921176038	PR_QC104_190807	water	7/08/2019	0.68	1.01	10.9	0.713	34.9	<0.01	0.12	0.252	0.981	0.241	0.557	0.386	0.017	0.111	<0.01	<0.01	<0.025	<0.01	0.045	0.017	<0.01	<0.01	<0.025	<0.01	<0.025	<0.025	<0.025	<0.025
RPD				0	8	5	12	7	0	0	4	1	4	1	10	0	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EB1921176035	PR_MW02_190807	water	7/08/2019	0.68	1.09	11.4	0.8	37.6	<0.1	<0.5	0.26	0.99	0.23	0.55	0.35	<0.1	0.15	<0.1	<0.1	<0.25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25
RN1244319	PR_QC204_190807	water	7/08/2019	0.5	0.68	9.8	0.36	25	<0.001	0.15	0.23	0.92	0.22	0.34	0.3	0.027	0.12	<0.001	<0.002	<0.002	<0.001	0.034	0.028	<0.001	<0.002	<0.002	0.0016	<0.002	<0.002	<0.005	<0.005
RPD				31	46	15	76	40	0	0	12	7	4	47	15	0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 81 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Table G3 Rinsate Analytical Results
PFAS DSI
QFES- Prosperine Fire Station

		PFAS																													
		PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFDS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDcA	PFUnA	PFDoA	PFTrDA	PFTeDA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	MeFOSAA	EtFOSAA	FOSA	N-Et-FOSA	N-Me-FOSA	N-Et-FOSE	N-MeFOSE	Sum of PFAS
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	µg/L
	EQL	0.002	0.002	0.002	0.002	0.002	0.002	0.01	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.005	0.005	0.005	0.005	0.005	0.002	0.002	0.002	0.005	0.005	0.005	0.005	0.002
EB1919842038	PR_QC300_190726	Rinsate	26/07/2019	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005	<0.002
EB1919842039	PR_QC301_190726	Rinsate	26/07/2019	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005	<0.002
EB1919842041	PR_QC302_190727	Rinsate	27/07/2019	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005	<0.002
EB1921176039	PR_QC303_190807	Rinsate	7/08/2019	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005	<0.002

Appendix H

Analytical Laboratory Reports

ALSCompass
SAMPLING *Intelligence*

ALS

Environmental Division
Brisbane
Work Order Reference
EB1919842

Telephone : +61-7-3243 7222

Custody Document for Submissions via ALS Compass App

Project: 606909758 2.0 -> Pr **Client:** AECOM Pty Ltd **Project Manager:** James Peachey
Phone: (0425 206 362

ALS Compass COC Reference: 2657 **# Samples:** **Sampler:** Camden McCosker
Phone: (0499 990 214

Turnaround Requirements: Standard 5 Day Urgent

Special Instructions:

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
Camden	KSchafer	KSchafer	M.Binat
Date / Time:	Date / Time: 31.7.19 0945	Date / Time: 31.7.19 1600	Date / Time: 1/8/19 9.40

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1919842**

Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: camden.mccosker@aecom.com	E-mail	: carsten.emrich@alsglobal.com
Telephone	: ----	Telephone	: +61 7 3552 8616
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: 6060958_PR	Page	: 1 of 4
Order number	: 60609758 2.0	Quote number	: EB2019AECOMAU0002 (BN/112/19)
C-O-C number	: 2657	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: CAMDEN McCOSKER		

Dates

Date Samples Received	: 01-Aug-2019 09:40	Issue Date	: 01-Aug-2019
Client Requested Due Date	: 08-Aug-2019	Scheduled Reporting Date	: **08-Aug-2019**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 3	Temperature	: 1.2°C; 0.1°C; 1.5°C - Ice present
Receipt Detail	: MEDIUM ESKY	No. of samples received / analysed	: 43 / 19

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please be advised, samples have been fowarded to NMI as requested on the Chain of Custody. This will incur a freight fowarding fee.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

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

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

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

EB1919842-021 : 27-Jul-2019 07:59 : PR_BH01_0.25 _190727

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	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EB1919842-001	26-Jul-2019 11:19	PR_BH04_0.1_190726	✓		
EB1919842-002	26-Jul-2019 11:19	PR_BH04_0.5 _190726		✓	✓
EB1919842-003	26-Jul-2019 11:20	PR_BH04_1.0 _190726		✓	✓
EB1919842-004	26-Jul-2019 11:20	PR_BH04_1.5 _190726	✓		
EB1919842-005	26-Jul-2019 13:21	PR_BH04_2.0 _190726	✓		
EB1919842-006	26-Jul-2019 13:22	PR_BH04_3.0 _190726	✓		
EB1919842-007	26-Jul-2019 13:22	PR_BH04_4.0 _190726	✓		
EB1919842-008	26-Jul-2019 13:23	PR_BH04_4.5 _190726	✓		
EB1919842-009	26-Jul-2019 13:23	PR_BH04_5.0 _190726		✓	✓
EB1919842-010	26-Jul-2019 13:44	PR_SS1_0.1 _190726		✓	✓
EB1919842-011	26-Jul-2019 13:44	PR_SS1_0.5 _190726		✓	✓
EB1919842-012	26-Jul-2019 16:26	PR_BH02_0.3_190726	✓		
EB1919842-013	26-Jul-2019 16:27	PR_BH02_0.5 _190726		✓	✓
EB1919842-014	26-Jul-2019 16:28	PR_BH02_1.0 _190726		✓	✓
EB1919842-015	26-Jul-2019 16:28	PR_BH02_1.5 _190726	✓		
EB1919842-016	26-Jul-2019 16:48	PR_BH02_2.0 _190726	✓		
EB1919842-017	26-Jul-2019 16:49	PR_BH02_3.0 _190726	✓		
EB1919842-018	26-Jul-2019 16:49	PR_BH02_4.0 _190726	✓		
EB1919842-019	26-Jul-2019 16:50	PR_BH02_5.0 _190726		✓	✓
EB1919842-020	26-Jul-2019 16:58	PR_BH02_6.0 _190726	✓		
EB1919842-021	27-Jul-2019 07:59	PR_BH01_0.25 _190727		✓	✓
EB1919842-022	27-Jul-2019 08:01	PR_BH01_0.5 _190727	✓		
EB1919842-023	27-Jul-2019 08:01	PR_BH01_1.0 _190727		✓	✓
EB1919842-024	27-Jul-2019 08:01	PR_BH01_1.5 _190727	✓		
EB1919842-025	27-Jul-2019 08:21	PR_BH01_2.0 _190727	✓		
EB1919842-026	27-Jul-2019 08:22	PR_BH01_3.0 _190727	✓		
EB1919842-027	27-Jul-2019 08:23	PR_BH01_4.0 _190727	✓		
EB1919842-028	27-Jul-2019 08:23	PR_BH01_5.0 _190727		✓	✓
EB1919842-029	27-Jul-2019 10:43	PR_BH03_0.3_190727	✓		
EB1919842-030	27-Jul-2019 10:43	PR_BH03_0.5 _190727		✓	✓
EB1919842-031	27-Jul-2019 10:44	PR_BH03_1.0 _190727		✓	✓
EB1919842-032	27-Jul-2019 10:44	PR_BH03_1.5 _190727	✓		
EB1919842-033	27-Jul-2019 11:11	PR_BH03_2.0 _190727	✓		

			(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EB1919842-034	27-Jul-2019 11:12	PR_BH03_3.0 _190727	✓		
EB1919842-035	27-Jul-2019 11:12	PR_BH03_4.0 _190727	✓		
EB1919842-036	27-Jul-2019 11:13	PR_BH03_5.0 _190727		✓	✓
EB1919842-037	26-Jul-2019 11:21	PR_QC100 _190726		✓	✓
EB1919842-040	26-Jul-2019 16:29	PR_QC101 _190726		✓	✓
EB1919842-042	27-Jul-2019 07:59	PR_QC102 _190727	✓		
EB1919842-043	27-Jul-2019 10:45	PR_QC103 _190727	✓		

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)
EB1919842-038	26-Jul-2019 13:20	PR_QC300_190726	✓
EB1919842-039	26-Jul-2019 13:21	PR_QC301 _190726	✓
EB1919842-041	27-Jul-2019 07:58	PR_QC302_190727	✓

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AP_CustomerService.ANZ@aecom.com

CAMDEN McCOSKER

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

JAMES PEACHEY

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1919842**	Page	: 1 of 13
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 6060958_PR	Date Samples Received	: 01-Aug-2019 09:40
Order number	: 60609758 2.0	Date Analysis Commenced	: 01-Aug-2019
C-O-C number	: 2657	Issue Date	: 08-Aug-2019 16:53
Sampler	: CAMDEN McCOSKER		
Site	: ----		
Quote number	: BN/112/19		
No. of samples received	: 43		
No. of samples analysed	: 19		

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*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Minh Wills	2IC Organic Chemist	Brisbane Organics, 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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS 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 recovery due to matrix interference. Confirmed by re-extraction and re-analysis.

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	PR_BH04_0.5 _190726	PR_BH04_1.0 _190726	PR_BH04_5.0 _190726	PR_SS1_0.1 _190726	PR_SS1_0.5 _190726
				Client sampling date / time	26-Jul-2019 11:19	26-Jul-2019 11:20	26-Jul-2019 13:23	26-Jul-2019 13:44	26-Jul-2019 13:44
					EB1919842-002	EB1919842-003	EB1919842-009	EB1919842-010	EB1919842-011
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**23.1**	**20.4**	**20.1**	**13.3**	**18.3**
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	**0.0004**	**0.0002**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0007**	**0.0008**	**0.0006**	**0.0120**	**0.0054**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**0.0003**	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0017**	<0.0002	**0.0130**	**0.0672**	**0.0596**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**0.0003**	<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	**0.0004**	**0.0012**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**0.0012**	**0.0037**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	**0.0013**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**0.0006**	**0.0020**
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	**0.0008**
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	**0.0008**	**0.0010**
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	**0.0018**	**0.0004**
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	**0.0024**	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	PR_BH04_0.5 _190726	PR_BH04_1.0 _190726	PR_BH04_5.0 _190726	PR_SS1_0.1 _190726	PR_SS1_0.5 _190726
				Client sampling date / time	26-Jul-2019 11:19	26-Jul-2019 11:20	26-Jul-2019 13:23	26-Jul-2019 13:44	26-Jul-2019 13:44
Compound	CAS Number	LOR	Unit		EB1919842-002	EB1919842-003	EB1919842-009	EB1919842-010	EB1919842-011
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0024**	**0.0008**	**0.0136**	**0.0874**	**0.0756**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0024**	**0.0008**	**0.0136**	**0.0792**	**0.0650**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0024**	**0.0008**	**0.0136**	**0.0814**	**0.0732**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**86.0**	**78.0**	**91.5**	**75.5**	**70.0**
13C8-PFOA	----	0.0002	%		**75.5**	**92.5**	**80.5**	**82.0**	**75.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	PR_BH02_0.5 _190726	PR_BH02_1.0 _190726	PR_BH02_5.0 _190726	PR_BH01_0.25 _190727	PR_BH01_1.0 _190727
			Client sampling date / time	26-Jul-2019 16:27	26-Jul-2019 16:28	26-Jul-2019 16:50	27-Jul-2019 07:59	27-Jul-2019 08:01
Compound	CAS Number	LOR	Unit	EB1919842-013	EB1919842-014	EB1919842-019	EB1919842-021	EB1919842-023
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**16.3**	**12.8**	**20.8**	**23.8**	**11.2**
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	**0.0014**	**0.0014**	<0.0002	**0.0004**	**0.0003**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	**0.0006**	**0.0016**	<0.0002	**0.0008**	**0.0006**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0003**	**0.0160**	**0.0013**	**0.0250**	**0.0110**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	**0.0008**	<0.0002	**0.0009**	**0.0008**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	**0.0132**	**0.0144**	**0.0408**	**0.0231**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**0.0004**	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	**0.002**	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**0.0079**	**0.0013**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	**0.0004**	**0.0012**	<0.0002	**0.0085**	**0.0022**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**0.0038**	**0.0002**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	**0.0004**	<0.0002	**0.0032**	**0.0003**
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	**0.0011**	**0.0004**	**0.0026**	**0.0005**
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**0.0010**	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**0.0139**	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**0.0011**	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**0.0616**	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	**0.0008**	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**0.0016**	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	PR_BH02_0.5 _190726	PR_BH02_1.0 _190726	PR_BH02_5.0 _190726	PR_BH01_0.25 _190727	PR_BH01_1.0 _190727
				Client sampling date / time	26-Jul-2019 16:27	26-Jul-2019 16:28	26-Jul-2019 16:50	27-Jul-2019 07:59	27-Jul-2019 08:01
Compound	CAS Number	LOR	Unit		EB1919842-013	EB1919842-014	EB1919842-019	EB1919842-021	EB1919842-023
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	**0.0012**	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	**0.0010**	<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		**0.0027**	**0.0357**	**0.0161**	**0.178**	**0.0403**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0003**	**0.0292**	**0.0157**	**0.0658**	**0.0341**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0021**	**0.0322**	**0.0157**	**0.0938**	**0.0384**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**82.5**	**73.5**	**86.5**	**92.0**	**89.0**
13C8-PFOA	----	0.0002	%		**80.5**	**81.5**	**95.5**	**82.5**	**75.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	PR_BH01_5.0 _190727	PR_BH03_0.5 _190727	PR_BH03_1.0 _190727	PR_BH03_5.0 _190727	PR_QC100 _190726
			Client sampling date / time	27-Jul-2019 08:23	27-Jul-2019 10:43	27-Jul-2019 10:44	27-Jul-2019 11:13	26-Jul-2019 11:21
Compound	CAS Number	LOR	Unit	EB1919842-028	EB1919842-030	EB1919842-031	EB1919842-036	EB1919842-037
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**16.2**	**19.6**	**13.9**	**21.3**	**22.9**
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	**0.0003**	**0.0004**	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0003**	**0.0048**	**0.0078**	**0.0010**	**0.0010**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	**0.0018**	**0.0041**	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0056**	**0.196**	**0.0126**	**0.0170**	**0.0016**
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	**0.0004**	**0.0003**	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	**0.0017**	**0.0016**	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	**0.0002**	**0.0004**	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	**0.0008**	**0.0027**	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	**0.0220**	**0.0046**	**0.0003**	<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	**0.0015**	<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

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	PR_BH01_5.0 _190727	PR_BH03_0.5 _190727	PR_BH03_1.0 _190727	PR_BH03_5.0 _190727	PR_QC100 _190726
				Client sampling date / time	27-Jul-2019 08:23	27-Jul-2019 10:43	27-Jul-2019 10:44	27-Jul-2019 11:13	26-Jul-2019 11:21
					EB1919842-028	EB1919842-030	EB1919842-031	EB1919842-036	EB1919842-037
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0074**	**0.228**	**0.0347**	**0.0185**	**0.0026**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0059**	**0.201**	**0.0204**	**0.0180**	**0.0026**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0059**	**0.204**	**0.0256**	**0.0180**	**0.0026**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**93.5**	**82.5**	**81.0**	**86.5**	**75.5**
13C8-PFOA	----	0.0002	%		**85.5**	**78.5**	**86.0**	**79.0**	**73.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	PR_QC101 _190726	----	----	----	----
				Client sampling date / time	26-Jul-2019 16:29	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1919842-040	--------	--------	--------	--------
					Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**13.2**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		**0.0012**	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		**0.0016**	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0156**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		**0.0008**	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0142**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		**0.0010**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		**0.0004**	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		**0.0012**	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	PR_QC101 _190726	----	----	----	----
				Client sampling date / time	26-Jul-2019 16:29	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1919842-040	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<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	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0360**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0298**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0324**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**85.5**	----	----	----	----
13C8-PFOA	----	0.0002	%		**83.5**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	PR_QC300_190726	PR_QC301 _190726	PR_QC302_190727	----	----
				Client sampling date / time	26-Jul-2019 13:20	26-Jul-2019 13:21	27-Jul-2019 07:58	----	----
Compound	CAS Number	LOR	Unit		EB1919842-038	EB1919842-039	EB1919842-041	--------	--------
					Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L		<0.002	<0.002	<0.002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L		<0.005	<0.005	<0.005	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L		<0.002	<0.002	<0.002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L		<0.005	<0.005	<0.005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L		<0.005	<0.005	<0.005	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	PR_QC300_190726	PR_QC301 _190726	PR_QC302_190727	----	----
				Client sampling date / time	26-Jul-2019 13:20	26-Jul-2019 13:21	27-Jul-2019 07:58	----	----
Compound	CAS Number	LOR	Unit		EB1919842-038	EB1919842-039	EB1919842-041	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L		<0.005	<0.005	<0.005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L		<0.005	<0.005	<0.005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L		<0.002	<0.002	<0.002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L		<0.002	<0.002	<0.002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L		<0.005	<0.005	<0.005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L		<0.005	<0.005	<0.005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L		<0.005	<0.005	<0.005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L		<0.005	<0.005	<0.005	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Sum of PFAS (WA DER List)	----	0.002	µg/L		<0.002	<0.002	<0.002	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.002	%		**87.0**	**73.6**	**83.7**	----	----
13C8-PFOA	----	0.002	%		**101**	**92.1**	**98.8**	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130
13C8-PFOA	----	70	130

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130
13C8-PFOA	----	70	130

QUALITY CONTROL REPORT

Work Order	: **EB1919842**	Page	: 1 of 12
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 6060958_PR	Date Samples Received	: 01-Aug-2019
Order number	: 60609758 2.0	Date Analysis Commenced	: 01-Aug-2019
C-O-C number	: 2657	Issue Date	: 08-Aug-2019
Sampler	: CAMDEN McCOSKER		
Site	: ----		
Quote number	: BN/112/19		
No. of samples received	: 43		
No. of samples analysed	: 19		

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*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Minh Wills	2IC Organic Chemist	Brisbane Organics, 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 (Dried @ 105-110°C) (QC Lot: 2501986)									
EB1919838-035	Anonymous	EA055: Moisture Content	----	0.1	%	19.9	19.7	1.02	0% - 20%
EB1919842-013	PR_BH02_0.5 _190726	EA055: Moisture Content	----	0.1	%	16.3	15.9	2.39	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2501987)									
EB1919842-040	PR_QC101 _190726	EA055: Moisture Content	----	0.1	%	13.2	13.2	0.00	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2501997)									
EB1919840-063	Anonymous	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	0.0003	0.0004	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	0.186	0.207	10.8	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EB1919842-019	PR_BH02_5.0 _190726	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	0.0013	0.0015	14.8	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	0.0144	0.0151	5.40	0% - 20%
		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: 2501997)									
EB1919840-063	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0004	0.0005	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0003	0.0003	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0003	0.0003	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	0.0016	0.0017	6.91	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.0004	0.0004	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 (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2501997) - continued									
EB1919840-063	Anonymous	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
EB1919842-019	PR_BH02_5.0 _190726	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	0.0004	0.0004	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: 2501997)									
EB1919840-063	Anonymous	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)	24448-09-7	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
EB1919842-019	PR_BH02_5.0 _190726	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)	24448-09-7	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 (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2501997) - continued									
EB1919842-019	PR_BH02_5.0 _190726	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: 2501997)									
EB1919840-063	Anonymous	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
EB1919842-019	PR_BH02_5.0 _190726	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: 2501826)									
EB1919838-042	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	<0.002	0.00	No Limit
EB1919842-038	PR_QC300_190726	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.002	<0.002	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 (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2501826) - continued									
EB1919842-038	PR_QC300_190726	EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	<0.002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2501826)									
EB1919838-042	Anonymous	EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.01	<0.01	0.00	No Limit
EB1919842-038	PR_QC300_190726	EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.01	<0.01	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2501826)									
EB1919838-042	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.005	<0.005	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: 2501826) - continued									
EB1919838-042	Anonymous	EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.005	<0.005	0.00	No Limit
EB1919842-038	PR_QC300_190726	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.005	<0.005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2501826)									
EB1919838-042	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.005	<0.005	0.00	No Limit
EB1919842-038	PR_QC300_190726	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.005	<0.005	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 2501826)									
EB1919838-042	Anonymous	EP231X-LL: Sum of PFAS	----	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	<0.002	<0.002	0.00	No Limit
EB1919842-038	PR_QC300_190726	EP231X-LL: Sum of PFAS	----	0.002	µg/L	<0.002	<0.002	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 (%)*
EP231P: PFAS Sums (QC Lot: 2501826) - continued									
EB1919842-038	PR_QC300_190726	EP231X-LL: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	<0.002	<0.002	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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2501997)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.0011 mg/kg	79.1	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00117 mg/kg	81.2	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	79.7	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	75.2	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	70.7	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.0012 mg/kg	103	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2501997)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	59.4	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.4	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.6	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.4	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.4	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.0	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.0	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	71.2	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	69.2	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.0	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	68.4	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2501997)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	68.8	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	68.8	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	93.8	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	68.4	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	89.9	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.0	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.4	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501997)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00116 mg/kg	88.4	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00118 mg/kg	77.1	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00119 mg/kg	77.3	62	130

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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501997) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.0012 mg/kg	102	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: 2501826)								
EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.002	0.0442 µg/L	91.2	50	130
EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.002	0.0469 µg/L	79.7	50	130
EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	<0.002	0.0473 µg/L	82.9	50	130
EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.002	0.0476 µg/L	82.1	50	130
EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	<0.002	0.0464 µg/L	58.2	50	130
EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	0.0482 µg/L	61.8	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2501826)								
EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.01	0.25 µg/L	76.3	50	130
EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.002	0.05 µg/L	81.0	50	130
EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.002	0.05 µg/L	87.0	50	130
EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.002	0.05 µg/L	84.6	50	130
EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.002	0.05 µg/L	82.2	50	130
EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.002	0.05 µg/L	74.6	50	130
EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.002	0.05 µg/L	70.0	50	130
EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.002	0.05 µg/L	60.6	40	130
EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.002	0.05 µg/L	60.6	40	130
EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.002	0.05 µg/L	68.4	40	130
EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.005	0.125 µg/L	74.6	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2501826)								
EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.002	0.05 µg/L	76.2	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.005	0.125 µg/L	68.6	40	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.005	0.125 µg/L	61.5	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.005	0.125 µg/L	51.8	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.005	0.125 µg/L	62.4	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.002	0.05 µg/L	62.6	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.002	0.05 µg/L	57.0	40	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501826)								
EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.005	0.0467 µg/L	91.6	50	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501826) - continued								
EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	<0.005	0.0474 µg/L	85.2	50	130
EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.005	0.0479 µg/L	72.2	50	130
EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.005	0.0482 µg/L	54.1	50	130
EP231P: PFAS Sums (QCLot: 2501826)								
EP231X-LL: Sum of PFAS	----	0.002	µg/L	<0.002	----	----	----	----
EP231X-LL: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.002	µg/L	<0.002	----	----	----	----
EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	<0.002	----	----	----	----

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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2501997)							
EB1919840-060	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	65.6	57	121
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	71.2	55	125
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	73.6	52	126
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	60.4	54	123
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	55	127
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	64.8	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2501997)							
EB1919840-060	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	57.9	52	128
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	81.2	54	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	79.6	58	127
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	84.8	57	128
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	73.2	60	134
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	66.0	63	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	72.0	55	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	64.4	62	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	56.8	53	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	53.2	49	129
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	# 51.9	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2501997)							
EB1919840-060	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	70.8	52	132

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
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2501997) - continued							
EB1919840-060	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	79.3	65	126
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	80.0	64	126
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	# 50.8	63	124
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	65.7	58	125
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	74.0	61	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	63.2	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501997)							
EB1919840-060	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	72.8	54	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	69.2	61	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	77.2	62	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	86.4	60	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: 2501826)							
EB1919838-043	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.05 µg/L	73.8	50	130
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.05 µg/L	73.0	50	130
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.05 µg/L	76.4	50	130
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.05 µg/L	75.0	50	130
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.05 µg/L	68.6	50	130
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.05 µg/L	57.6	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2501826)							
EB1919838-043	Anonymous	EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.25 µg/L	71.8	50	130
		EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.05 µg/L	75.4	50	130
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.05 µg/L	81.6	50	130
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.05 µg/L	79.8	50	130
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.05 µg/L	78.2	50	130
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.05 µg/L	71.0	50	130
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.05 µg/L	66.4	50	130
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.05 µg/L	53.6	40	130
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.05 µg/L	55.0	40	130
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.05 µg/L	74.8	40	130
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.125 µg/L	61.8	40	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: 2501826)							
EB1919838-043	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.05 µg/L	63.6	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.125 µg/L	59.9	40	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.125 µg/L	52.2	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.125 µg/L	51.0	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.125 µg/L	57.1	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.05 µg/L	52.8	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.05 µg/L	51.0	40	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501826)							
EB1919838-043	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05 µg/L	81.4	50	130
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05 µg/L	78.0	50	130
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05 µg/L	69.0	50	130
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05 µg/L	52.4	50	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1919842**	Page	: 1 of 7
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Telephone	: +61 7 3552 8616
Project	: 6060958_PR	Date Samples Received	: 01-Aug-2019
Site	: ----	Issue Date	: 08-Aug-2019
Sampler	: CAMDEN McCOSKER	No. of samples received	: 43
Order number	: 60609758 2.0	No. of samples analysed	: 19

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **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: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EB1919840--060	Anonymous	**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	EB1919840--060	Anonymous	**Perfluorotetradecanoic acid (PFTeDA)**	376-06-7	51.9 %	59-129%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1919840--060	Anonymous	**N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)**	24448-09-7	50.8 %	63-124%	**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 (Dried @ 105-110°C)								
HDPE Soil Jar (EA055)								
PR_BH04_0.5 _190726,	PR_BH04_1.0 _190726,	**26-Jul-2019**	**----**	----	----	**01-Aug-2019**	09-Aug-2019	✓
PR_BH04_5.0 _190726,	PR_SS1_0.1 _190726,							
PR_SS1_0.5 _190726,	PR_BH02_0.5 _190726,							
PR_BH02_1.0 _190726,	PR_BH02_5.0 _190726,							
PR_QC100 _190726,	PR_QC101 _190726							
HDPE Soil Jar (EA055)								
PR_BH01_0.25 _190727,	PR_BH01_1.0 _190727,	**27-Jul-2019**	**----**	----	----	**01-Aug-2019**	10-Aug-2019	✓
PR_BH01_5.0 _190727,	PR_BH03_0.5 _190727,							
PR_BH03_1.0 _190727,	PR_BH03_5.0 _190727							

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)								
PR_BH04_0.5 _190726,	PR_BH04_1.0 _190726,	**26-Jul-2019**	**03-Aug-2019**	22-Jan-2020	✓	**05-Aug-2019**	12-Sep-2019	✓
PR_BH04_5.0 _190726,	PR_SS1_0.1 _190726,							
PR_SS1_0.5 _190726,	PR_BH02_0.5 _190726,							
PR_BH02_1.0 _190726,	PR_BH02_5.0 _190726,							
PR_QC100 _190726,	PR_QC101 _190726							
HDPE Soil Jar (EP231X)								
PR_BH01_0.25 _190727,	PR_BH01_1.0 _190727,	**27-Jul-2019**	**03-Aug-2019**	23-Jan-2020	✓	**05-Aug-2019**	12-Sep-2019	✓
PR_BH01_5.0 _190727,	PR_BH03_0.5 _190727,							
PR_BH03_1.0 _190727,	PR_BH03_5.0 _190727							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
PR_BH04_0.5 _190726,	PR_BH04_1.0 _190726,	**26-Jul-2019**	**03-Aug-2019**	22-Jan-2020	✓	**05-Aug-2019**	12-Sep-2019	✓
PR_BH04_5.0 _190726,	PR_SS1_0.1 _190726,							
PR_SS1_0.5 _190726,	PR_BH02_0.5 _190726,							
PR_BH02_1.0 _190726,	PR_BH02_5.0 _190726,							
PR_QC100 _190726,	PR_QC101 _190726							
HDPE Soil Jar (EP231X)								
PR_BH01_0.25 _190727,	PR_BH01_1.0 _190727,	**27-Jul-2019**	**03-Aug-2019**	23-Jan-2020	✓	**05-Aug-2019**	12-Sep-2019	✓
PR_BH01_5.0 _190727,	PR_BH03_0.5 _190727,							
PR_BH03_1.0 _190727,	PR_BH03_5.0 _190727							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
PR_BH04_0.5 _190726,	PR_BH04_1.0 _190726,	**26-Jul-2019**	**03-Aug-2019**	22-Jan-2020	✓	**05-Aug-2019**	12-Sep-2019	✓
PR_BH04_5.0 _190726,	PR_SS1_0.1 _190726,							
PR_SS1_0.5 _190726,	PR_BH02_0.5 _190726,							
PR_BH02_1.0 _190726,	PR_BH02_5.0 _190726,							
PR_QC100 _190726,	PR_QC101 _190726							
HDPE Soil Jar (EP231X)								
PR_BH01_0.25 _190727,	PR_BH01_1.0 _190727,	**27-Jul-2019**	**03-Aug-2019**	23-Jan-2020	✓	**05-Aug-2019**	12-Sep-2019	✓
PR_BH01_5.0 _190727,	PR_BH03_0.5 _190727,							
PR_BH03_1.0 _190727,	PR_BH03_5.0 _190727							

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)							
PR_BH04_0.5 _190726, PR_BH04_1.0 _190726, PR_BH04_5.0 _190726, PR_SS1_0.1 _190726, PR_SS1_0.5 _190726, PR_BH02_0.5 _190726, PR_BH02_1.0 _190726, PR_BH02_5.0 _190726, PR_QC100 _190726, PR_QC101 _190726	**26-Jul-2019**	**03-Aug-2019**	22-Jan-2020	✓	**05-Aug-2019**	12-Sep-2019	✓
HDPE Soil Jar (EP231X)							
PR_BH01_0.25 _190727, PR_BH01_1.0 _190727, PR_BH01_5.0 _190727, PR_BH03_0.5 _190727, PR_BH03_1.0 _190727, PR_BH03_5.0 _190727	**27-Jul-2019**	**03-Aug-2019**	23-Jan-2020	✓	**05-Aug-2019**	12-Sep-2019	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
PR_BH04_0.5 _190726, PR_BH04_1.0 _190726, PR_BH04_5.0 _190726, PR_SS1_0.1 _190726, PR_SS1_0.5 _190726, PR_BH02_0.5 _190726, PR_BH02_1.0 _190726, PR_BH02_5.0 _190726, PR_QC100 _190726, PR_QC101 _190726	**26-Jul-2019**	**03-Aug-2019**	22-Jan-2020	✓	**05-Aug-2019**	12-Sep-2019	✓
HDPE Soil Jar (EP231X)							
PR_BH01_0.25 _190727, PR_BH01_1.0 _190727, PR_BH01_5.0 _190727, PR_BH03_0.5 _190727, PR_BH03_1.0 _190727, PR_BH03_5.0 _190727	**27-Jul-2019**	**03-Aug-2019**	23-Jan-2020	✓	**05-Aug-2019**	12-Sep-2019	✓

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-LL)							
PR_QC300_190726, PR_QC301 _190726	**26-Jul-2019**	**01-Aug-2019**	22-Jan-2020	✓	**01-Aug-2019**	22-Jan-2020	✓
HDPE (no PTFE) (EP231X-LL)							
PR_QC302_190727	**27-Jul-2019**	**01-Aug-2019**	23-Jan-2020	✓	**01-Aug-2019**	23-Jan-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X-LL)							
PR_QC300_190726, PR_QC301 _190726	**26-Jul-2019**	**01-Aug-2019**	22-Jan-2020	✓	**01-Aug-2019**	22-Jan-2020	✓
HDPE (no PTFE) (EP231X-LL)							
PR_QC302_190727	**27-Jul-2019**	**01-Aug-2019**	23-Jan-2020	✓	**01-Aug-2019**	23-Jan-2020	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X-LL)							
PR_QC300_190726, PR_QC301 _190726	**26-Jul-2019**	**01-Aug-2019**	22-Jan-2020	✓	**01-Aug-2019**	22-Jan-2020	✓
HDPE (no PTFE) (EP231X-LL)							
PR_QC302_190727	**27-Jul-2019**	**01-Aug-2019**	23-Jan-2020	✓	**01-Aug-2019**	23-Jan-2020	✓

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
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X-LL) PR_QC300_190726,	PR_QC301 _190726	**26-Jul-2019**	**01-Aug-2019**	22-Jan-2020	✓	**01-Aug-2019**	22-Jan-2020	✓
HDPE (no PTFE) (EP231X-LL) PR_QC302_190727		**27-Jul-2019**	**01-Aug-2019**	23-Jan-2020	✓	**01-Aug-2019**	23-Jan-2020	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X-LL) PR_QC300_190726,	PR_QC301 _190726	**26-Jul-2019**	**01-Aug-2019**	22-Jan-2020	✓	**01-Aug-2019**	22-Jan-2020	✓
HDPE (no PTFE) (EP231X-LL) PR_QC302_190727		**27-Jul-2019**	**01-Aug-2019**	23-Jan-2020	✓	**01-Aug-2019**	23-Jan-2020	✓

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	3	21	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	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)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	1	14	**7.14**	**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	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
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. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	WATER	In-house: Analysis of fresh and saline waters by solid phase extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1

Preparation Methods	Method	Matrix	Method Descriptions
Sample Extraction for PFAS	EP231-PR	SOIL	In house
SPE preparation for LL and saline PFCs	EP231-SPE	WATER	In house

AECOM 190802 / A
DUE: 07/08/19

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 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 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: AECOM Pty Ltd	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date): 5 Day	FOR LABORATORY USE ONLY (Circle)
OFFICE: Brisbane		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: 60609758 2.0	ALS QUOTE NO.: BN/112/19	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:		OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: James Peachey	CONTACT PH: 0426 206 362		Other comment:
SAMPLER: Camden McCosker	SAMPLER MOBILE: 0499 990 214		
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):		
Email Reports to (will default to PM if no other addresses are listed):			
Email Invoice to (will default to PM if no other addresses are listed):			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Camden			
DATE/TIME: 31/7/19 0940	DATE/TIME:	DATE/TIME: 1/8/19	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Please forward to NML with this COC

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	EP231X (PFAS 28)		EP231X-ST (PFAS 28 super trace)	EP231X-LL (low level)			HOLD	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	PR-QC200-190726	26/7/19	S	1P	1	✓				N19/019413			Forward to NML
	PR-QC201-190726	"	"	"	1	✓		* QC202190726 A		N19/019414			"
	PR-QC202-190726	27/7/19	"	"	1					N19/019415		✓	"
	PR-QC203-190727	"	"	"	1					N19/019416		✓	"
				TOTAL									

RECEIVED
02 AUG 2019
BY: [signature] LAB 0000 87360

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.

Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

SAMPLE RECEIPT NOTIFICATION

CUSTOMER DETAILS

Attention: JAMES PEACHEY

Customer: AECOM AUSTRALIA PTY LTD

Address: LEVEL 8
FORTITUDE VALLEY QLD 4006

Email: james.peachey@aecom.com

Telephone:

Fax:

LABORATORY DETAILS

Lab: National Measurement Institute

Contact: Susanne Neuman

Address: 105 Delhi Road, North Ryde, NSW
NSW 2113

Email: Susanne.Neuman@measurement.gov.au

Telephone: 02 9449 0181

Fax:

SAMPLE DETAILS

NMI Job Name: **AECO06/190802/1**

Total No. of Samples: **4**

LRNs	Customer Sample ID	Lab Sample Description
N19/019413	PR_QC200_190726	SOIL 26/07/2019
N19/019414	PR_QC201_190726	SOIL 26/07/2019
N19/019415	PR_QC202_190727	SOIL 27/07/2019
N19/019416	PR_QC203_190727	SOIL 27/07/2019

SAMPLE RECEIVED CONDITION

Date samples received:	2-AUG-2019
Sample received in good order:	Yes
NMI Quotation no. provided:	
Client purchase order number:	60609758_2_0
Temperature of samples:	Chilled
Comments:	SAMPLE QC201_190726 WAS QC202_190726 ON THE JAR, HOWEVER T ON HOLD.
Estimated report date:	9-AUG-2019
Mode of Delivery:	Courier

Additional Terms and Conditions

Incomplete / unclear information about samples or required testing will delay the start of the analysis work

If you require your Purchase Order (PO) number to be included on our invoice, please provide the number during sample submission and before the completion of work to avoid unnecessary delays and/or additional processing/handling fees.

The lodgement of an order or receipt of samples for NMI services referenced in this Sample Receipt Notification constitutes an acceptence of the current version of NMI Terms and Conditions or other applicable Terms referenced in the NMI Quotation. NMI Terms and Conditions are available on the web at http://www.measurement.gov.au/Services/EnvironmentalTesting/Pages/Terms-and-Conditions.aspx

REPORT OF ANALYSIS

Report No. RN1242617

Client	: AECOM AUSTRALIA PTY LTD	**Job No.**	: AECO06/190802/1
	LEVEL 8	**Quote No.**	: QT-02018
	540 WICKHAM STREET	**Order No.**	: 60609758_2_0
		Date Received	: 02-AUG-2019
Attention	: JAMES PEACHEY	**Sampled By**	: CLIENT
Project Name	: 60609758_2_0		
Your Client Services Manager	: Richard Coghlan	**Phone**	: 02 9449 0161

Lab Reg No.	Sample Ref	Sample Description
N19/019413	PR_QC200_190726	SOIL 26/07/2019
N19/019414	PR_QC201_190726	SOIL 26/07/2019

Lab Reg No.		N19/019413	N19/019414			
Date Sampled		26-JUL-2019	26-JUL-2019			
	Units					Method
PFAS (per-and poly-fluoroalkyl substances)						
PFBA (375-22-4)	mg/kg	<0.002	<0.002			NR70
PFPeA (2706-90-3)	mg/kg	<0.002	<0.002			NR70
PFHxA (307-24-4)	mg/kg	<0.001	0.0012			NR70
PFHpA (375-85-9)	mg/kg	<0.001	<0.001			NR70
PFOA (335-67-1)	mg/kg	<0.001	<0.001			NR70
PFNA (375-95-1)	mg/kg	<0.001	0.0012			NR70
PFDA (335-76-2)	mg/kg	<0.001	<0.001			NR70
PFUdA (2058-94-8)	mg/kg	<0.002	<0.002			NR70
PFDoA (307-55-1)	mg/kg	<0.002	<0.002			NR70
PFTrDA (72629-94-8)	mg/kg	<0.002	<0.002			NR70
PFTeDA (376-06-7)	mg/kg	<0.002	<0.002			NR70
PFHxDA (67905-19-5)	mg/kg	<0.002	<0.002			NR70
PFODA (16517-11-6)	mg/kg	<0.005	<0.005			NR70
FOUEA (70887-84-2)	mg/kg	<0.001	<0.001			NR70
PFBS (375-73-5)	mg/kg	<0.001	0.0014			NR70
PFPeS (2706-91-4)	mg/kg	<0.001	0.0013			NR70
PFHxS (355-46-4)	mg/kg	0.0015	0.016			NR70
PFHpS (375-92-8)	mg/kg	<0.001	<0.001			NR70
PFOS (1763-23-1)	mg/kg	0.0029	0.015			NR70
PFNS (68259-12-1)	mg/kg	<0.001	<0.001			NR70
PFDS (335-77-3)	mg/kg	<0.001	<0.001			NR70
PFOSA (754-91-6)	mg/kg	<0.001	<0.001			NR70
N-MeFOSA (31506-32-8)	mg/kg	<0.002	<0.002			NR70
N-EtFOSA (4151-50-2)	mg/kg	<0.002	<0.002			NR70
N-MeFOSAA (2355-31-9)	mg/kg	<0.002	<0.002			NR70
N-EtFOSAA(2991-50-6)	mg/kg	<0.002	<0.002			NR70
N-MeFOSE (24448-09-7)	mg/kg	<0.005	<0.005			NR70
N-EtFOSE (1691-99-2)	mg/kg	<0.005	<0.005			NR70

REPORT OF ANALYSIS

Lab Reg No.		N19/019413	N19/019414			
Date Sampled		26-JUL-2019	26-JUL-2019			
	Units					Method
PFAS (per-and poly-fluoroalkyl substances)						
4:2 FTS (757124-72-4)	mg/kg	<0.001	<0.001			NR70
6:2 FTS (27619-97-2)	mg/kg	<0.001	<0.001			NR70
8:2 FTS (39108-34-4)	mg/kg	<0.001	<0.001			NR70
10:2 FTS (120226-60-0)	mg/kg	<0.002	<0.002			NR70
8:2 diPAP (678-41-1)	mg/kg	<0.002	<0.002			NR70
PFBA (Surrogate Recovery)	%	128	126			NR70
PFPeA (Surrogate Recovery)	%	142	134			NR70
PFHxA (Surrogate Recovery)	%	133	131			NR70
PFHpA (Surrogate Recovery)	%	140	133			NR70
PFOA (Surrogate Recovery)	%	150	133			NR70
PFNA (Surrogate Recovery)	%	128	119			NR70
PFDA (Surrogate Recovery)	%	124	126			NR70
PFUdA (Surrogate Recovery)	%	146	114			NR70
PFDoA (Surrogate Recovery)	%	126	128			NR70
PFTeDA (Surrogate Recovery)	%	133	121			NR70
PFHxDA (Surrogate Recovery)	%	184	176			NR70
FOUEA (Surrogate Recovery)	%	86	81			NR70
PFBS (Surrogate Recovery)	%	140	128			NR70
PFHxS (Surrogate Recovery)	%	136	124			NR70
PFOS (Surrogate Recovery)	%	133	128			NR70
PFOSA (Surrogate Recovery)	%	127	107			NR70
N-MeFOSA (Surrogate Recovery)	%	151	132			NR70
N-EtFOSA (Surrogate Recovery)	%	130	122			NR70
N-MeFOSAA (Surrogate Recovery)	%	101	118			NR70
N-EtFOSAA (Surrogate Recovery)	%	133	106			NR70
N-MeFOSE (Surrogate Recovery)	%	114	117			NR70
N-EtFOSE (Surrogate Recovery)	%	122	177			NR70
4:2 FTS (Surrogate Recovery)	%	123	106			NR70
6:2 FTS (Surrogate Recovery)	%	112	99			NR70
8:2 FTS (Surrogate Recovery)	%	109	91			NR70
8:2 diPAP (Surrogate Recovery)	%	62	48			NR70
Dates						
Date extracted		6-AUG-2019	6-AUG-2019			
Date analysed		12-AUG-2019	12-AUG-2019			

N19/019413
To N19/019414

REPORT OF ANALYSIS

PFOS is quantified using a combined branched and linear standard,
linear and branched isomers are totalled for reporting.
All results corrected for labelled surrogate recoveries.
Selected PFAS surrogate recoveries are biased due to matrix effects.

Danny Slee, Section Manager
Organic - NSW
Accreditation No. 198

13-AUG-2019

Lab Reg No.		N19/019413	N19/019414			
Date Sampled		26-JUL-2019	26-JUL-2019			
	Units					Method
Trace Elements						
Total Solids	%	77.1	86.8			NT2_49

Pankaj Barai, Analyst
Inorganics - NSW
Accreditation No. 198

13-AUG-2019

All results are expressed on a dry weight basis.

REPORT OF ANALYSIS

This Report supersedes reports: *RN1242285* *RN1242607*

Measurement Uncertainty is available upon request.
Chemical Accreditation 198: 105 Delhi Road, North Ryde, NSW, 2113

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Client: AECOM AUSTRALIA PTY LTD

NMI QA Report No: AECO06/190802/1 **Sample Matrix:** Solid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
PFBA (375-22-4)	NR70	0.002	<0.002	NA	NA	NA	114	NA
PFPeA (2706-90-3)	NR70	0.002	<0.002	NA	NA	NA	103	NA
PFHxA (307-24-4)	NR70	0.001	<0.001	NA	NA	NA	108	NA
PFHpA (375-85-9)	NR70	0.001	<0.001	NA	NA	NA	104	NA
PFOA (335-67-1)	NR70	0.001	<0.001	NA	NA	NA	103	NA
PFNA (375-95-1)	NR70	0.001	<0.001	NA	NA	NA	115	NA
PFDA (335-76-2)	NR70	0.001	<0.001	NA	NA	NA	108	NA
PFUdA (2058-94-8)	NR70	0.002	<0.002	NA	NA	NA	108	NA
PFDoA (307-55-1)	NR70	0.002	<0.002	NA	NA	NA	104	NA
PFTrDA (72629-94-8)	NR70	0.002	<0.002	NA	NA	NA	100	NA
PFTeDA (376-06-7)	NR70	0.002	<0.002	NA	NA	NA	118	NA
PFHxDA (67905-19-5)	NR70	0.002	<0.002	NA	NA	NA	91	NA
PFODA (16517-11-6)	NR70	0.005	<0.005	NA	NA	NA	99	NA
FOUEA (70887-84-2)	NR70	0.001	<0.001	NA	NA	NA	104	NA
PFBS (375-73-5)	NR70	0.001	<0.001	NA	NA	NA	95	NA
PFPeS (2706-91-4)	NR70	0.001	<0.001	NA	NA	NA	96	NA
PFHxS (355-46-4)	NR70	0.001	<0.001	NA	NA	NA	102	NA
PFHpS (375-92-8)	NR70	0.001	<0.001	NA	NA	NA	110	NA
PFOS (1763-23-1)	NR70	0.002	<0.002	NA	NA	NA	107	NA
PFNS (68259-12-1)	NR70	0.001	<0.001	NA	NA	NA	108	NA
PFDS (335-77-3)	NR70	0.001	<0.001	NA	NA	NA	106	NA
PFOSA (754-91-6)	NR70	0.001	<0.001	NA	NA	NA	106	NA
N-MeFOSA (31506-32-8)	NR70	0.002	<0.002	NA	NA	NA	96	NA
N-EtFOSA (4151-50-2)	NR70	0.002	<0.002	NA	NA	NA	98	NA
N-MeFOSAA (2355-31-9)	NR70	0.002	<0.002	NA	NA	NA	100	NA
N-EtFOSAA(2991-50-6)	NR70	0.002	<0.002	NA	NA	NA	101	NA
N-MeFOSE (24448-09-7)	NR70	0.005	<0.005	NA	NA	NA	89	NA
N-EtFOSE (1691-99-2)	NR70	0.005	<0.005	NA	NA	NA	128	NA
4:2 FTS (757124-72-4)	NR70	0.001	<0.001	NA	NA	NA	103	NA
6:2 FTS (27619-97-2)	NR70	0.001	<0.001	NA	NA	NA	108	NA
8:2 FTS (39108-34-4)	NR70	0.001	<0.001	NA	NA	NA	101	NA
10:2 FTS (120226-60-0)	NR70	0.002	<0.002	NA	NA	NA	89	NA
8:2 diPAP (678-41-1)	NR70	0.002	<0.002	NA	NA	NA	107	NA

Results expressed in percentage (%) or mg/kg wherever appropriate.
Acceptable Spike recovery is 50-150%.
Maximum acceptable RPDs on spikes and duplicates is 40%.
'NA ' = Not Applicable.
RPD= Relative Percentage Difference.

Signed:

Danny Slee
Organics Manager, NMI-North Ryde

Date: **13/08/2019**

From: Peachey, James <james.peachey@aecom.com>
Sent: Tuesday, 13 August 2019 3:34 PM
To: Carsten Emrich <Carsten.Emrich@alsglobal.com>
Subject: [EXTERNAL] - Additional analysis

Hi Carsten

Please could you arrange for the following samples to be analysed for TOPA (EP231X-TOP):

EB1919842-030 PR_BH03_190727

Regards

James Peachey
Associate Director - Environment
D +61 7 3553 3909 M +61 426 206 362
james.peachey@aecom.com

AECOM
Level 8, 540 Wickham Street, Fortitude Valley, QLD 4006
PO Box 1307 Fortitude Valley QLD 4006
T +61 7 3553 2000 F +61 7 3553 2050
aecom.com

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Environmental Division
Brisbane
Work Order Reference
EB1921187

Telephone : +61-7-3243 7222

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EB1921187**		
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: james.peachey@aecom.com	E-mail	: carsten.emrich@alsglobal.com
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Facsimile	: +61 07 3553 2050	Facsimile	: +61-7-3243 7218
Project	: 60609758_PR,	Page	: 1 of 2
Order number	: 60609758	Quote number	: EB2019AECOMAU0002 (BN/112/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: CAMDEN McCOSKER		

Dates

Date Samples Received	: 13-Aug-2019 15:34	Issue Date	: 09-Sep-2019
Client Requested Due Date	: 21-Aug-2019	Scheduled Reporting Date	: **21-Aug-2019**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	: REBATCH	No. of samples received / analysed	: 4 / 4

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
- **This work order was created to rebatch samples from EB1920146, EB1919838, EB1919840 and EB1919842.**
-

- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

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 - EP231X (TOP) (solids) PFAS - Total Oxidisable Precursor (TOP) Assay
EB1921187-004	27-Jul-2019 00:00	PR_BH03_190727	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

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

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA055: Moisture Content							
PR_BH03_190727	HDPE Soil Jar	----	10-Aug-2019	13-Aug-2019	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AP_CustomerService.ANZ@aecom.com

CAMDEN McCOSKER

- *AU Certificate of Analysis - NATA (COA)	Email	camden.mccosker@aecom.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	camden.mccosker@aecom.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	camden.mccosker@aecom.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	camden.mccosker@aecom.com
- Chain of Custody (CoC) (COC)	Email	camden.mccosker@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	camden.mccosker@aecom.com

JAMES PEACHEY

- *AU Certificate of Analysis - NATA (COA)	Email	james.peachey@aecom.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	james.peachey@aecom.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	james.peachey@aecom.com
- A4 - AU Tax Invoice (INV)	Email	james.peachey@aecom.com
- Chain of Custody (CoC) (COC)	Email	james.peachey@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	james.peachey@aecom.com

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1921187-AD**	Page	: 1 of 5
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758_PR	Date Samples Received	: 13-Aug-2019 15:34
Order number	: 60609758	Date Analysis Commenced	: 16-Aug-2019
C-O-C number	: ----	Issue Date	: 27-Aug-2019 13:02
Sampler	: CAMDEN McCOSKER		
Site	: ----		
Quote number	: BN/112/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

-
- Amendment (27/8/19): This report has been amended to split samples into individual work orders. All analysis results are as per the previous report

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	PR_BH03_190727	----	----	----	----
				Client sampling date / time	27-Jul-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1921187-004	--------	--------	--------	--------
					Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**18.8**	----	----	----	----
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0038**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		**0.0015**	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.108**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	----	----	----	----
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		**0.0010**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		**0.0046**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		**0.0002**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		**0.0007**	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		**0.0152**	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	----	----	----	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	PR_BH03_190727	----	----	----	----
				Client sampling date / time	27-Jul-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1921187-004	--------	--------	--------	--------
					Result	----	----	----	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	----	----	----	----
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	----	----	----	----
EP231_TOP_P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.135**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.112**	----	----	----	----
Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.0002	mg/kg		**0.135**	----	----	----	----
Sum of TOP C4 - C14 as Fluorine	----	0.0002	mg/kg		**0.0880**	----	----	----	----
EP231_TOP_S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**65.5**	----	----	----	----
13C8-PFOA	----	0.0002	%		**69.5**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231_TOP_S: PFAS Surrogate			
13C4-PFOS	----	60	130
13C8-PFOA	----	60	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1921187-AD**	Page	: 1 of 5
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758_PR	Date Samples Received	: 13-Aug-2019
Order number	: 60609758	Date Analysis Commenced	: 16-Aug-2019
C-O-C number	: ----	Issue Date	: 27-Aug-2019
Sampler	: CAMDEN McCOSKER		
Site	: ----		
Quote number	: BN/112/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	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 (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2527602)									
EB1921187-001	Anonymous	EA055: Moisture Content	----	0.1	%	14.6	14.5	0.706	0% - 20%
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2527289)									
EB1921187-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0093	0.0102	9.42	0% - 20%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0064	0.0072	10.7	0% - 20%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.101	0.106	4.32	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0162	0.0148	9.04	0% - 20%
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	1.83	2.05	11.3	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2527289)									
EB1921187-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0883	0.105	17.4	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.109	0.119	8.85	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0241	0.0253	5.06	0% - 20%
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0357	0.0361	1.08	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.183	0.164	11.3	0% - 20%
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.0344	# 0.0258	28.6	0% - 20%
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0246	# 0.0186	27.7	0% - 20%
		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	0.0012	0.0013	9.02	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	0.028	0.030	4.66	0% - 20%
EP231_TOP_C: Perfluoroalkyl Sulfonamides (QC Lot: 2527289)									
EB1921187-001	Anonymous	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

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 (%)*
EP231_TOP_C: Perfluoroalkyl Sulfonamides (QC Lot: 2527289) - continued									
EB1921187-001	Anonymous	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)	24448-09-7	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
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2527289)									
EB1921187-001	Anonymous	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
EP231_TOP_P: PFAS Sums (QC Lot: 2527289)									
EB1921187-001	Anonymous	EP231X: Sum of PFAS	----	0.0002	mg/kg	2.49	2.71	8.53	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	1.93	2.16	11.0	0% - 20%
		EP231X: Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.0002	mg/kg	2.49	2.71	8.53	0% - 20%
		EP231X: Sum of TOP C4 - C14 as Fluorine	----	0.0002	mg/kg	1.62	1.76	8.36	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
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids (QCLot: 2527289)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00236 mg/kg	71.6	50	150
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00232 mg/kg	64.2	50	150
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QCLot: 2527289)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.0025 mg/kg	72.2	50	150
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	----	----	----	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides (QCLot: 2527289)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	----	----	----	----
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2527289)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	----	----	----
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00018 mg/kg	0.00	0	200
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	----	----	----

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
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2527289) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	----	----	----	----

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.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1921187**	Page	: 1 of 6
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Telephone	: +61 7 3552 8616
Project	: 60609758_PR	Date Samples Received	: 13-Aug-2019
Site	: ----	Issue Date	: 27-Aug-2019
Sampler	: CAMDEN McCOSKER	No. of samples received	: 4
Order number	: 60609758	No. of samples analysed	: 4

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							
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids			**Perfluorodecanoic acid (PFDA)**	335-76-2	28.6 %	0% - 20%	**RPD exceeds LOR based limits**
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids			**Perfluoroundecanoic acid (PFUnDA)**	2058-94-8	27.7 %	0% - 20%	**RPD exceeds LOR based limits**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA055: Moisture Content (Dried @ 105-110°C)						
HDPE Soil Jar	----	----	----	16-Aug-2019	15-Aug-2019	**1**
HDPE Soil Jar	----	----	----	16-Aug-2019	07-Aug-2019	**9**
HDPE Soil Jar PR_BH03_190727	----	----	----	16-Aug-2019	10-Aug-2019	**6**
HDPE Soil Jar	----	----	----	16-Aug-2019	12-Aug-2019	**4**

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: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055)	**01-Aug-2019**	**----**	----	----	**16-Aug-2019**	15-Aug-2019	×
HDPE Soil Jar (EA055)	**24-Jul-2019**	**----**	----	----	**16-Aug-2019**	07-Aug-2019	×
HDPE Soil Jar (EA055) PR_BH03_190727	**27-Jul-2019**	**----**	----	----	**16-Aug-2019**	10-Aug-2019	×
HDPE Soil Jar (EA055)	**29-Jul-2019**	**----**	----	----	**16-Aug-2019**	12-Aug-2019	×

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
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X (TOP))	**01-Aug-2019**	**16-Aug-2019**	29-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP))	**24-Jul-2019**	**16-Aug-2019**	21-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP)) PR_BH03_190727	**27-Jul-2019**	**16-Aug-2019**	24-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP))	**29-Jul-2019**	**16-Aug-2019**	26-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X (TOP))	**01-Aug-2019**	**16-Aug-2019**	29-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP))	**24-Jul-2019**	**16-Aug-2019**	21-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP)) PR_BH03_190727	**27-Jul-2019**	**16-Aug-2019**	24-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP))	**29-Jul-2019**	**16-Aug-2019**	26-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
EP231_TOP_C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X (TOP))	**01-Aug-2019**	**16-Aug-2019**	29-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP))	**24-Jul-2019**	**16-Aug-2019**	21-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP)) PR_BH03_190727	**27-Jul-2019**	**16-Aug-2019**	24-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP))	**29-Jul-2019**	**16-Aug-2019**	26-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X (TOP))	**01-Aug-2019**	**16-Aug-2019**	29-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP))	**24-Jul-2019**	**16-Aug-2019**	21-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP)) PR_BH03_190727	**27-Jul-2019**	**16-Aug-2019**	24-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP))	**29-Jul-2019**	**16-Aug-2019**	26-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓

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
EP231_TOP_P: PFAS Sums							
HDPE Soil Jar (EP231X (TOP))	**01-Aug-2019**	**16-Aug-2019**	29-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP))	**24-Jul-2019**	**16-Aug-2019**	21-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP)) PR_BH03_190727	**27-Jul-2019**	**16-Aug-2019**	24-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓
HDPE Soil Jar (EP231X (TOP))	**29-Jul-2019**	**16-Aug-2019**	26-Jan-2020	✓	**17-Aug-2019**	25-Sep-2019	✓

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	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	SOIL	In house, following oxidation per Houtz,Erika F.; Sedlak,David L. (2012): Oxidative Conversion as a Means of Detecting Precursors to Perfluoroalkyl Acids in Urban Runoff. In Environmental Science & Technology 46 (17), pp. 9342¿9349.: A portion of the oxidised sample is mixed with methanol (1:1) prior to analysis by LC-Electrospray-MS-MS,Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.

Preparation Methods	Method	Matrix	Method Descriptions
Sample Extraction for PFAS	EP231-PR	SOIL	In house

ANZ

FQM - Generic Chain of Custody Form

Environmental Division
Brisbane
Work Order Reference
EB1921176

Telephone : + 61-7-3243 7222

CONSULTANT: AECOM	ADDRESS / OFFICE:	SAMPLER: NK	
PROJECT MANAGER (PM): James Peachey	SITE: QFES Home Hill	MOBILE: 0499989474	PHONE:
PROJECT NUMBER & TASK CODE: 60609758	P.O. NO.: 60609758 2.0	EMAIL REPORT TO: james.peachey@aecom.com; janelle.passler@aecom.com;	
RESULTS REQUIRED (Date):	QUOTE NO.: BN/112/19	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract su	

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:
Hold onto samples for further TOPA Selection

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION		EP231X-LL: PFAS Low Level	EP231X-LL (TOPA): PFAS TOPA Low Level		EP231X-ST: PFAS Full Suite Super Trace		EP231X: PFAS Full Suite				HOLD
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles										

RELINQUISHED BY:		RECEIVED BY		RECEIVED BY		METHOD OF SHIPMENT
Name: N. Knw	Date: 9/8/19	Name: N. SUTTON	Date: 9/8/19	Name: WM	Date: 13/8/19	Con' Note No:
Of:	Time: 1500	Of: ALS MACKAY	Time: 3:00	Of: ALS QLD	Time: 9:30AM	Transport Co:

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. **Soil Container Codes:** Jar = Unpreserved glass jar

COC Page of

AECOM

ANZ

FQM - Generic Chain of Custody Form

Q4AN(EV)-007-FM1

CONSULTANT: AECOM	ADDRESS / OFFICE:	SAMPLER: NK	**Destination Laboratory**
PROJECT MANAGER (PM): James Peachey	SITE: QFES Ayr	MOBILE: 0499989474 PHONE:	Brisbane
PROJECT NUMBER & TASK CODE: 60609758	P.O. NO.: 60609758 2.0	EMAIL REPORT TO: james.peachey@aecom.com; janelle.passier@aecom.com;	
RESULTS REQUIRED (Date):	QUOTE NO.: BN/112/19	**ANALYSIS REQUIRED including SUITES** (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

Hold onto samples for further TOPA Selection

SAMPLE INFORMATION (note: S = Soil, W=Water)				CONTAINER INFORMATION		EP231X-LL: PFAS Low Level	EP231X-LL (TOPA): PFAS TOPA Low Level		EP231X-ST: PFAS Full Suite Super Trace		EP231X: PFAS Full Suite						HOLD
		MATRIX	DATE	Time	Type / Code	Total bottles											

Notes: e.g. Highly contaminated samples e.g. "High PAHs expected". Extra volume for QC or trace LORs etc.

RELINQUISHED BY:		RECEIVED BY		RECEIVED BY		METHOD OF SHIPMENT
Name: N. Kwo	Date: 9/8/19	Name: N. SUTTON	Date: 9/8/19	Name:	Date:	Con' Note No:
Of:	Time: 1500	Of: AES MACKAY	Time: 3:00	Of:	Time:	Transport Co:

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.

Soil Container Codes: Jar = Unpreserved glass jar

COC Page of

ANZ

FQM - Generic Chain of Custody Form

AECOM

Q4AN(EV)-007-FM1

CONSULTANT: AECOM	ADDRESS / OFFICE:	SAMPLER: NK	**Destination Laboratory**
PROJECT MANAGER (PM): **James Peachey**	SITE: **QFES Airlie Beach**	MOBILE: 0499989474 PHONE:	Brisbane
PROJECT NUMBER & TASK CODE: **60609758**	P.O. NO.: 60609758 2.0	EMAIL REPORT TO: james.peachey@aecom.com; janelle.passier@aecom.com;	
RESULTS REQUIRED (Date):	QUOTE NO.: BN/112/19	**ANALYSIS REQUIRED including SUITES** (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:
Hold onto samples for further TOPA Selection

SAMPLE INFORMATION (note: S = Soil, W=Water)	CONTAINER INFORMATION	1231X-LL: PFAS Low Level	1231X-LL (TOPA): PFAS TOPA Low Level	1231X-ST: PFAS Full Suite Super Trace	1231X: PFAS Full Suite						

Notes: e.g. Highly contaminated samples e.g. "High PAHs expected".
Extra volume for QC or trace LORs etc.

RELINQUISHED BY:		RECEIVED BY		RECEIVED BY		METHOD OF SHIPMENT
Name: N. Kuo	Date: 9/8/19	Name: N. SUTTON	Date: 9/8/19	Name:	Date:	Con' Note No:
Of:	Time: 1500	Of: ALS MACKAY	Time: 3:00	Of:	Time:	Transport Co:

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.
Soil Container Codes: Jar = Unpreserved glass jar

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ANZ

FQM - Generic Chain of Custody Form

AECOM

Q4AN(EV)-007-FM1

CONSULTANT: AECOM	ADDRESS / OFFICE:	SAMPLER: NK	**Destination Laboratory**
PROJECT MANAGER (PM): **James Peachey**	SITE: **QFES Proserpine**	MOBILE: 0499989474 PHONE:	Brisbane
PROJECT NUMBER & TASK CODE: **60609758**	P.O. NO.: 60609758 2.0	EMAIL REPORT TO: james.peachey@aecom.com; janelle.passier@aecom.com;	
RESULTS REQUIRED (Date):	QUOTE NO.: BN/112/19	**ANALYSIS REQUIRED including SUITES** (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:
Hold onto samples for further TOPA Selection

Notes: e.g. Highly contaminated samples e.g. "High PAHs expected". Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION		EP231X-LL: PFAS Low Level	EP231X-LL (TOPA): PFAS TOPA Low Level		EP231X-ST: PFAS Full Suite Super Trace		EP231X: PFAS Full Suite						HOLD	
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles													
34	PR_MW01_190807	W	7/08/19	1600	P	1		X											
35	PR_MW02_190807	W	7/08/19	1515	P	1		X											
36.	PR_MW03_190807	W	7/08/19	1440	P	1		X											
37.	PR_MW04_190807	W	7/08/19	1620	P	1		X											
38	PR_QC104_190807	W	7/08/19		P	1		X											
	PR_QC204_190807	W	7/08/19		P	1		X											Forward to NMI
39.	PR_QC303_190807	W	7/08/19		P	1		X											

RELINQUISHED BY:		RECEIVED BY		RECEIVED BY		METHOD OF SHIPMENT
Name: N. Vann	Date: 9/8/19	Name: N.SUTTON	Date: 9/8/19	Name:	Date:	Con' Note No:
Of:	Time: 15:00	Of: ALS MACKAY	Time: 3:00	Of:	Time:	Transport Co:

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. **Soil Container Codes:** Jar = Unpreserved glass jar

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SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1921176**

Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: james.peachey@aecom.com	E-mail	: carsten.emrich@alsglobal.com
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Facsimile	: +61 07 3553 2050	Facsimile	: +61-7-3243 7218
Project	: 60609758	Page	: 1 of 4
Order number	: 60609758 2.0	Quote number	: EB2019AECOMAU0002 (BN/112/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: QFES		
Sampler	: NK		

Dates

Date Samples Received	: 13-Aug-2019 09:30	Issue Date	: 13-Aug-2019
Client Requested Due Date	: 22-Aug-2019	Scheduled Reporting Date	: **22-Aug-2019**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 2	Temperature	: 1.4, 1.2°C - Ice present
Receipt Detail	: MEDIUM ESKIES	No. of samples received / analysed	: 39 / 37

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please be advised that samples "**

  "PR_QC204_190807" will be forwarded to NMI for analysis. Please note that this will incur a freight forwarding fee.
-

- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- **Super Trace PFAS 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 (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

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 - EP231X (solids) PFAS - Full Suite (28 analytes)

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) WATER No analysis requested	WATER - EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)	WATER - EP231X-ST PFAS - Super Trace Waters Long Suite (28

			(On Hold) WATER No analysis requested	WATER - EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)	WATER - EP231X-ST PFAS - Super Trace Waters Long Suite (28
EB1921176-034	07-Aug-2019 16:00	PR_MW01_190807		✓	
EB1921176-035	07-Aug-2019 15:15	PR_MW02_190807		✓	
EB1921176-036	07-Aug-2019 14:40	PR_MW03_190807		✓	
EB1921176-037	07-Aug-2019 16:20	PR_MW04_190807		✓	
EB1921176-038	07-Aug-2019 00:00	PR_QC104_190807		✓	
EB1921176-039	07-Aug-2019 00:00	PR_QC303_190807		✓	

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AP_CustomerService.ANZ@aecom.com

JAMES PEACHEY

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

JANELLE PASSIER

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1921176-AM**	Page	: 1 of 7
Amendment	: **3**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 13-Aug-2019 09:30
Order number	: 60609758 2.0	Date Analysis Commenced	: 15-Aug-2019
C-O-C number	: ----	Issue Date	: 04-Sep-2019 13:59
Sampler	: NK		
Site	: QFES		
Quote number	: BN/112/19		
No. of samples received	: 6		
No. of samples analysed	: 6		

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*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, 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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS 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-LL: Samples were diluted due to matrix interference. LOR adjusted accordingly.
- **Super Trace PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- Amendment (04/09/2019): This report has been amended and re-released to allow the reporting of additional analytical data.
- Amendment (29/8/19): This report has been amended to allow the splitting of the work order into 5 separate reports. All analysis results are as per the previous report.
- Amendment (30/8/19): This report has been amended to allow the the work order to be split into 4 separate reports. All analysis results are as per the previous report.
- EP231X-ST: Sample EB1921176_015 required dilution prior to extraction due to matrix interferences (high sediment content). LOR values have been adjusted accordingly.
- EP231X-LL & EP231X: Matrix spike shows results out of control limit due to primary sample matrix interference. Confirmed by re-extraction and re-analysis.
- EP231X: Particular samples show poor surrogate recovery due to matrix interference. Confirmed by re-extraction and re-analysis.
- EP231X: Duplicate shows results out of control limit due to sample heterogeneity. Confirmed by re-extraction and re-analysis.

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	PR_MW01_190807	PR_MW02_190807	PR_MW03_190807	PR_MW04_190807	PR_QC104_190807
				Client sampling date / time	07-Aug-2019 16:00	07-Aug-2019 15:15	07-Aug-2019 14:40	07-Aug-2019 16:20	07-Aug-2019 00:00
					EB1921176-034	EB1921176-035	EB1921176-036	EB1921176-037	EB1921176-038
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L		**0.096**	**0.680**	**0.091**	**0.122**	**0.680**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L		**0.134**	**1.09**	**0.151**	**0.234**	**1.01**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L		**1.46**	**11.4**	**1.82**	**2.50**	**10.9**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L		**0.119**	**0.800**	**0.103**	**0.149**	**0.713**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L		**4.10**	**37.6**	**7.92**	**6.96**	**34.9**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L		<0.010	<0.100	<0.010	<0.010	<0.010
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L		<0.05	<0.50	**0.02**	**0.02**	**0.12**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L		**0.036**	**0.260**	**0.031**	**0.041**	**0.252**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L		**0.128**	**0.990**	**0.171**	**0.101**	**0.981**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L		**0.026**	**0.230**	**0.026**	**0.034**	**0.241**
Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L		**0.063**	**0.550**	**0.073**	**0.076**	**0.557**
Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L		**0.018**	**0.350**	**0.148**	**0.153**	**0.386**
Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L		<0.010	<0.100	<0.010	<0.010	**0.017**
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L		**0.037**	**0.150**	**0.031**	<0.010	**0.111**
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L		<0.010	<0.100	<0.010	<0.010	<0.010
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L		<0.010	<0.100	<0.010	<0.010	<0.010
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L		<0.025	<0.250	<0.025	<0.025	<0.025
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L		<0.010	<0.100	<0.010	<0.010	<0.010
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L		<0.025	<0.250	<0.025	<0.025	<0.025
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L		<0.025	<0.250	<0.025	<0.025	<0.025

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	PR_MW01_190807	PR_MW02_190807	PR_MW03_190807	PR_MW04_190807	PR_QC104_190807
				Client sampling date / time	07-Aug-2019 16:00	07-Aug-2019 15:15	07-Aug-2019 14:40	07-Aug-2019 16:20	07-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EB1921176-034	EB1921176-035	EB1921176-036	EB1921176-037	EB1921176-038
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L		<0.025	<0.250	<0.025	<0.025	<0.025
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L		<0.025	<0.250	<0.025	<0.025	<0.025
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L		<0.010	<0.100	<0.010	<0.010	<0.010
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L		<0.010	<0.100	<0.010	<0.010	<0.010
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L		<0.010	<0.100	<0.010	<0.010	<0.010
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L		**0.010**	<0.100	<0.010	<0.010	**0.045**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L		<0.010	<0.100	<0.010	<0.010	**0.017**
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L		<0.010	<0.100	<0.010	<0.010	<0.010
EP231P: PFAS Sums									
Sum of PFAS	----	0.002	µg/L		**6.23**	**54.1**	**10.6**	**10.4**	**50.9**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L		**5.56**	**49.0**	**9.74**	**9.46**	**45.8**
Sum of PFAS (WA DER List)	----	0.002	µg/L		**5.92**	**51.7**	**10.2**	**9.85**	**48.7**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.002	%		**124**	**120**	**112**	**127**	**120**
13C8-PFOA	----	0.002	%		**123**	**125**	**120**	**117**	**122**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	PR_QC303_190807	----	----	----	----
				Client sampling date / time	07-Aug-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1921176-039	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L		<0.002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L		<0.002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L		<0.002	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L		<0.002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L		<0.002	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L		<0.002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L		<0.01	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L		<0.002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L		<0.002	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L		<0.002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L		<0.002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L		<0.002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L		<0.002	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L		<0.002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L		<0.002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L		<0.002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L		<0.005	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L		<0.002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L		<0.005	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L		<0.005	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	PR_QC303_190807	----	----	----	----
				Client sampling date / time	07-Aug-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1921176-039	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L		<0.005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L		<0.005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L		<0.002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L		<0.002	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L		<0.005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L		<0.005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L		<0.005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L		<0.005	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.002	µg/L		<0.002	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L		<0.002	----	----	----	----
Sum of PFAS (WA DER List)	----	0.002	µg/L		<0.002	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.002	%		**35.9**	----	----	----	----
13C8-PFOA	----	0.002	%		**45.5**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130
13C8-PFOA	----	70	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1921176-AM**	Page	: 1 of 11
Amendment	: **3**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 13-Aug-2019
Order number	: 60609758 2.0	Date Analysis Commenced	: 15-Aug-2019
C-O-C number	: ----	Issue Date	: 04-Sep-2019
Sampler	: NK		
Site	: QFES		
Quote number	: BN/112/19		
No. of samples received	: 6		
No. of samples analysed	: 6		

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*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, 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: **WATER**

				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: 2524698)									
EB1921176-001	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.010	0.010	0.00	No Limit
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	0.090	0.083	8.09	No Limit
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	0.056	0.031	57.5	No Limit
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.010	<0.010	0.00	No Limit
EB1921176-020	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	4.22	4.05	4.11	0% - 20%
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	0.250	0.300	18.2	No Limit
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	59.9	# 47.1	23.9	0% - 20%
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.100	<0.100	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2524699)									
EB1921138-002	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	0.205	0.205	0.00	0% - 20%

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 (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2524699) - continued									
EB1921138-002	Anonymous	EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.010	0.033	107	No Limit
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	1.37	1.30	4.64	0% - 20%
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	0.202	0.235	15.1	0% - 20%
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.010	<0.010	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2524698)									
EB1921176-001	Anonymous	EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.05	<0.05	0.00	No Limit
EB1921176-020	Anonymous	EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	0.260	0.260	0.00	No Limit
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	0.380	0.340	11.1	No Limit
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	0.610	0.550	10.3	No Limit
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	0.930	0.880	5.52	No Limit
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	0.110	0.130	16.7	No Limit
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.250	<0.250	0.00	No Limit
		EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.50	<0.50	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2524699)									
EB1921138-002	Anonymous	EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	0.317	0.327	3.10	0% - 20%
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	0.952	0.959	0.733	0% - 20%
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	0.334	0.320	4.28	0% - 20%
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	0.602	0.630	4.54	0% - 20%

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 (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2524699) - continued									
EB1921138-002	Anonymous	EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	0.020	0.019	5.13	No Limit
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	1.49	1.32	12.0	0% - 20%
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2524698)									
EB1921176-001	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.025	<0.025	0.00	No Limit
EB1921176-020	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.250	<0.250	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.250	<0.250	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.250	<0.250	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.250	<0.250	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2524699)									
EB1921138-002	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	0.156	0.144	8.00	0% - 50%
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.010	<0.010	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: 2524699) - continued									
EB1921138-002	Anonymous	EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.025	<0.025	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2524698)									
EB1921176-001	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.010	<0.010	0.00	No Limit
EB1921176-020	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	1.35	1.37	1.47	0% - 50%
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.100	<0.100	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2524699)									
EB1921138-002	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	0.190	0.196	3.11	0% - 50%
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	0.022	0.022	0.00	No Limit
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.010	<0.010	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 2524698)									
EB1921176-001	Anonymous	EP231X-LL: Sum of PFAS	----	0.002	µg/L	0.146	0.124	16.3	0% - 50%
		EP231X-LL: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L	0.146	0.114	24.6	0% - 50%
		EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	0.146	0.114	24.6	0% - 50%
EB1921176-020	Anonymous	EP231X-LL: Sum of PFAS	----	0.002	µg/L	68.0	# 55.0	21.2	0% - 20%

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 (%)*
EP231P: PFAS Sums (QC Lot: 2524698) - continued									
EB1921176-020	Anonymous	EP231X-LL: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L	64.1	# 51.2	22.5	0% - 20%
		EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	67.6	# 54.6	21.4	0% - 20%
EP231P: PFAS Sums (QC Lot: 2524699)									
EB1921138-002	Anonymous	EP231X-LL: Sum of PFAS	----	0.002	µg/L	5.86	5.71	2.59	0% - 20%
		EP231X-LL: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L	1.57	1.54	2.38	0% - 20%
		EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	5.68	5.51	3.04	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: **WATER**

				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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2524698)								
EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.002	0.0442 µg/L	93.7	50	130
EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.002	0.0469 µg/L	99.1	50	130
EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	<0.002	0.0473 µg/L	85.2	50	130
EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.002	0.0476 µg/L	93.5	50	130
EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	<0.002	0.0464 µg/L	77.6	50	130
EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	0.0482 µg/L	64.1	40	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2524699)								
EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.002	0.0442 µg/L	96.4	50	130
EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.002	0.0469 µg/L	108	50	130
EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	<0.002	0.0473 µg/L	90.5	50	130
EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.002	0.0476 µg/L	106	50	130
EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	<0.002	0.0464 µg/L	75.4	50	130
EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	0.0482 µg/L	75.3	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2524698)								
EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.01	0.25 µg/L	85.6	50	130
EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.002	0.05 µg/L	86.2	50	130
EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.002	0.05 µg/L	91.2	50	130
EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.002	0.05 µg/L	90.6	50	130
EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.002	0.05 µg/L	88.0	50	130
EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.002	0.05 µg/L	75.6	50	130
EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.002	0.05 µg/L	64.4	50	130
EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.002	0.05 µg/L	69.6	40	130
EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.002	0.05 µg/L	67.8	40	130
EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.002	0.05 µg/L	61.8	40	130
EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.005	0.125 µg/L	79.3	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2524699)								
EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.01	0.25 µg/L	92.4	50	130
EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.002	0.05 µg/L	85.2	50	130
EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.002	0.05 µg/L	94.8	50	130
EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.002	0.05 µg/L	90.2	50	130
EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.002	0.05 µg/L	88.2	50	130
EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.002	0.05 µg/L	81.2	50	130
EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.002	0.05 µg/L	70.8	50	130
EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.002	0.05 µg/L	62.6	40	130

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
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2524699) - continued								
EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.002	0.05 µg/L	66.2	40	130
EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.002	0.05 µg/L	85.4	40	130
EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.005	0.125 µg/L	78.2	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2524698)								
EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.002	0.05 µg/L	81.8	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.005	0.125 µg/L	88.2	40	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.005	0.125 µg/L	57.3	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.005	0.125 µg/L	57.3	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.005	0.125 µg/L	60.6	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.002	0.05 µg/L	53.4	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.002	0.05 µg/L	51.2	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2524699)								
EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.002	0.05 µg/L	73.4	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.005	0.125 µg/L	64.6	40	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.005	0.125 µg/L	61.6	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.005	0.125 µg/L	67.0	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.005	0.125 µg/L	69.7	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.002	0.05 µg/L	64.6	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.002	0.05 µg/L	58.8	40	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2524698)								
EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.005	0.0467 µg/L	89.9	50	130
EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	<0.005	0.0474 µg/L	96.0	50	130
EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.005	0.0479 µg/L	72.0	50	130
EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.005	0.0482 µg/L	56.6	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2524699)								
EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.005	0.0467 µg/L	101	50	130
EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	<0.005	0.0474 µg/L	98.7	50	130
EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.005	0.0479 µg/L	79.7	50	130
EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.005	0.0482 µg/L	69.7	50	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
EP231P: PFAS Sums (QCLot: 2524698)								
EP231X-LL: Sum of PFAS	----	0.002	µg/L	<0.002	----	----	----	----
EP231X-LL: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.002	µg/L	<0.002	----	----	----	----
EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	<0.002	----	----	----	----
EP231P: PFAS Sums (QCLot: 2524699)								
EP231X-LL: Sum of PFAS	----	0.002	µg/L	<0.002	----	----	----	----
EP231X-LL: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.002	µg/L	<0.002	----	----	----	----
EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	<0.002	----	----	----	----

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: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2524698)							
EB1921176-002	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.05 µg/L	114	50	130
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.05 µg/L	108	50	130
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.05 µg/L	82.4	50	130
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.05 µg/L	123	50	130
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.05 µg/L	# Not Determined	50	130
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.05 µg/L	107	40	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2524699)							
EB1921138-003	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.05 µg/L	108	50	130
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.05 µg/L	73.4	50	130
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.05 µg/L	85.4	50	130
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.05 µg/L	130	50	130
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.05 µg/L	100	50	130
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.05 µg/L	110	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2524698)							
EB1921176-002	Anonymous	EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.25 µg/L	103	50	130
		EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.05 µg/L	110	50	130
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.05 µg/L	107	50	130
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.05 µg/L	108	50	130
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.05 µg/L	106	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
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2524698) - continued							
EB1921176-002	Anonymous	EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.05 µg/L	103	50	130
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.05 µg/L	87.0	50	130
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.05 µg/L	125	40	130
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.05 µg/L	110	40	130
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.05 µg/L	97.8	40	130
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.125 µg/L	106	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2524699)							
EB1921138-003	Anonymous	EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.25 µg/L	93.2	50	130
		EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.05 µg/L	101	50	130
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.05 µg/L	107	50	130
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.05 µg/L	102	50	130
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.05 µg/L	95.6	50	130
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.05 µg/L	90.6	50	130
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.05 µg/L	82.2	50	130
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.05 µg/L	# 156	40	130
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.05 µg/L	110	40	130
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.05 µg/L	97.8	40	130
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.125 µg/L	104	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2524698)							
EB1921176-002	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.05 µg/L	123	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.125 µg/L	129	40	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.125 µg/L	112	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.125 µg/L	96.1	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.125 µg/L	114	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.05 µg/L	112	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.05 µg/L	81.4	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2524699)							
EB1921138-003	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.05 µg/L	114	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.125 µg/L	126	40	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.125 µg/L	100	40	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: 2524699) - continued							
EB1921138-003	Anonymous	EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.125 µg/L	80.8	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.125 µg/L	104	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.05 µg/L	102	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.05 µg/L	# 35.2	40	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2524698)							
EB1921176-002	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05 µg/L	117	50	130
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05 µg/L	116	50	130
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05 µg/L	119	50	130
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05 µg/L	114	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2524699)							
EB1921138-003	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05 µg/L	107	50	130
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05 µg/L	# 135	50	130
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05 µg/L	106	50	130
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05 µg/L	# 136	50	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1921176**	Page	: 1 of 13
Amendment	: **3**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 13-Aug-2019
Site	: QFES	Issue Date	: 04-Sep-2019
Sampler	: NK	No. of samples received	: 39
Order number	: 60609758 2.0	No. of samples analysed	: 39

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.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Laboratory Control outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.**

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: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP231A: Perfluoroalkyl Sulfonic Acids			**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	54.0 %	0% - 50%	**RPD exceeds LOR based limits**
Laboratory Control Spike (LCS) Recoveries							
EP231B: Perfluoroalkyl Carboxylic Acids	QC-2524688-002	----	**Perfluorobutanoic acid (PFBA)**	375-22-4	37.5 %	52-128%	**Recovery less than lower control limit**
EP231C: Perfluoroalkyl Sulfonamides	QC-2524688-002	----	**N-Methyl perfluorooctane sulfonamide (MeFOSA)**	31506-32-8	54.5 %	65-126%	**Recovery less than lower control limit**
EP231C: Perfluoroalkyl Sulfonamides	QC-2524688-002	----	**N-Ethyl perfluorooctane sulfonamide (EtFOSA)**	4151-50-2	45.4 %	64-126%	**Recovery less than lower control limit**
EP231C: Perfluoroalkyl Sulfonamides	QC-2524688-002	----	**N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)**	24448-09-7	35.2 %	63-124%	**Recovery less than lower control limit**
EP231C: Perfluoroalkyl Sulfonamides	QC-2524688-002	----	**N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)**	1691-99-2	48.1 %	58-125%	**Recovery less than lower control limit**
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids			**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	37.3 %	55-127%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorobutanoic acid (PFBA)**	375-22-4	26.1 %	52-128%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorononanoic acid (PFNA)**	375-95-1	62.2 %	63-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorodecanoic acid (PFDA)**	335-76-2	37.0 %	55-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluoroundecanoic acid (PFUnDA)**	2058-94-8	51.8 %	62-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorododecanoic acid (PFDoDA)**	307-55-1	51.3 %	53-134%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorotridecanoic acid (PFTrDA)**	72629-94-8	41.6 %	49-129%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorotetradecanoic acid (PFTeDA)**	376-06-7	49.2 %	59-129%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides			**N-Methyl perfluorooctane sulfonamide (MeFOSA)**	31506-32-8	49.2 %	65-126%	**Recovery less than lower data quality objective**

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries - Continued							
EP231C: Perfluoroalkyl Sulfonamides			**N-Ethyl perfluorooctane sulfonamide (EtFOSA)**	4151-50-2	48.6 %	64-126%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides			**N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)**	24448-09-7	33.0 %	63-124%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides			**N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)**	1691-99-2	39.7 %	58-125%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides			**N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)**	2991-50-6	51.2 %	55-130%	**Recovery less than lower data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids			**6:2 Fluorotelomer sulfonic acid (6:2 FTS)**	27619-97-2	57.6 %	61-130%	**Recovery less than lower data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids			**10:2 Fluorotelomer sulfonic acid (10:2 FTS)**	120226-60-0	46.8 %	60-130%	**Recovery less than lower data quality objective**

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP231A: Perfluoroalkyl Sulfonic Acids			**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	23.9 %	0% - 20%	**RPD exceeds LOR based limits**
EP231P: PFAS Sums			**Sum of PFAS**	----	21.2 %	0% - 20%	**RPD exceeds LOR based limits**
EP231P: PFAS Sums			**Sum of PFHxS and PFOS**	355-46-4/1763-23-1	22.5 %	0% - 20%	**RPD exceeds LOR based limits**
EP231P: PFAS Sums			**Sum of PFAS (WA DER List)**	----	21.4 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids			**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	EB1921138--003	Anonymous	**Perfluoroundecanoic acid (PFUnDA)**	2058-94-8	156 %	40-130%	**Recovery greater than upper data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1921138--003	Anonymous	**N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)**	2991-50-6	35.2 %	40-130%	**Recovery less than lower data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EB1921138--003	Anonymous	**6:2 Fluorotelomer sulfonic acid (6:2 FTS)**	27619-97-2	135 %	50-130%	**Recovery greater than upper data quality objective**

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries - Continued							
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EB1921138--003	Anonymous	**10:2 Fluorotelomer sulfonic acid (10:2 FTS)**	120226-60-0	136 %	50-130%	**Recovery greater than upper data quality objective**

Regular Sample Surrogates

Sub-Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP231S: PFAS Surrogate			**13C4-PFOS**	----	67.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C4-PFOS**	----	69.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C4-PFOS**	----	21.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C4-PFOS**	----	12.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C4-PFOS**	----	30.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C4-PFOS**	----	40.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C8-PFOA**	----	21.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C8-PFOA**	----	14.0 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C8-PFOA**	----	35.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C8-PFOA**	----	49.0 %	70-130 %	**Recovery less than lower data quality objective**

Sub-Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP231S: PFAS Surrogate	EB1921176-039	PR_QC303_190807	**13C4-PFOS**	----	35.9 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate	EB1921176-039	PR_QC303_190807	**13C8-PFOA**	----	45.5 %	70-130 %	**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 (Dried @ 105-110°C)							
HDPE Soil Jar (EA055)	**06-Aug-2019**	**----**	----	----	**15-Aug-2019**	20-Aug-2019	✓
HDPE Soil Jar (EA055)	**08-Aug-2019**	**----**	----	----	**15-Aug-2019**	22-Aug-2019	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓
HDPE Soil Jar (EP231X) AB_SED01_190808, AB_SED02_190808,	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓
HDPE Soil Jar (EP231X)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓

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
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)	06-Aug-2019	15-Aug-2019	02-Feb-2020	✓	19-Aug-2019	24-Sep-2019	✓
HDPE Soil Jar (EP231X)	08-Aug-2019	15-Aug-2019	04-Feb-2020	✓	19-Aug-2019	24-Sep-2019	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)	06-Aug-2019	15-Aug-2019	02-Feb-2020	✓	19-Aug-2019	24-Sep-2019	✓
HDPE Soil Jar (EP231X)	08-Aug-2019	15-Aug-2019	04-Feb-2020	✓	19-Aug-2019	24-Sep-2019	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)	06-Aug-2019	15-Aug-2019	02-Feb-2020	✓	19-Aug-2019	24-Sep-2019	✓
HDPE Soil Jar (EP231X)	08-Aug-2019	15-Aug-2019	04-Feb-2020	✓	19-Aug-2019	24-Sep-2019	✓

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

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-LL)	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**15-Aug-2019**	02-Feb-2020	✓
H	**06-Aug-2019**	**19-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) PR_MW01_190807, PR_MW02_190807	**07-Aug-2019**	**15-Aug-2019**	03-Feb-2020	✓	**15-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) PR_MW03_190807, PR_MW04_190807, PR_QC104_190807, PR_QC303_190807	**07-Aug-2019**	**16-Aug-2019**	03-Feb-2020	✓	**16-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**02-Sep-2019**	04-Feb-2020	✓	**02-Sep-2019**	04-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**15-Aug-2019**	04-Feb-2020	✓

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-LL)	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**15-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)	**06-Aug-2019**	**19-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) PR_MW01_190807, PR_MW02_190807	**07-Aug-2019**	**15-Aug-2019**	03-Feb-2020	✓	**15-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) PR_MW03_190807, PR_MW04_190807, PR_QC104_190807, PR_QC303_190807	**07-Aug-2019**	**16-Aug-2019**	03-Feb-2020	✓	**16-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**02-Sep-2019**	04-Feb-2020	✓	**02-Sep-2019**	04-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**15-Aug-2019**	04-Feb-2020	✓

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
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X-LL)	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**15-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)	**06-Aug-2019**	**19-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) PR_MW01_190807, PR_MW02_190807	**07-Aug-2019**	**15-Aug-2019**	03-Feb-2020	✓	**15-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) PR_MW03_190807, PR_MW04_190807, PR_QC104_190807, PR_QC303_190807	**07-Aug-2019**	**16-Aug-2019**	03-Feb-2020	✓	**16-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**02-Sep-2019**	04-Feb-2020	✓	**02-Sep-2019**	04-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**15-Aug-2019**	04-Feb-2020	✓

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
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X-LL)	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**15-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)	**06-Aug-2019**	**19-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)							
231X-LL)							
PR_MW01_190807, PR_MW02_190807	**07-Aug-2019**	**15-Aug-2019**	03-Feb-2020	✓	**15-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)							
PR_MW03_190807, PR_MW04_190807, PR_QC104_190807, PR_QC303_190807	**07-Aug-2019**	**16-Aug-2019**	03-Feb-2020	✓	**16-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**02-Sep-2019**	04-Feb-2020	✓	**02-Sep-2019**	04-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**15-Aug-2019**	04-Feb-2020	✓

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-LL)	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**15-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)	**06-Aug-2019**	**19-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) PR_MW01_190807, PR_MW02_190807	**07-Aug-2019**	**15-Aug-2019**	03-Feb-2020	✓	**15-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) PR_MW03_190807, PR_MW04_190807, PR_QC104_190807, PR_QC303_190807	**07-Aug-2019**	**16-Aug-2019**	03-Feb-2020	✓	**16-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**02-Sep-2019**	04-Feb-2020	✓	**02-Sep-2019**	04-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**15-Aug-2019**	04-Feb-2020	✓

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	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	**8.33**	**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)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	4	26	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	2	5	**40.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	3	26	**11.54**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	2	5	**40.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	3	26	**11.54**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	2	5	**40.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
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. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	WATER	In-house: Analysis of fresh and saline waters by solid phase extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	WATER	In-house: Analysis of fresh and saline waters by solid phase extraction and LC-Electrospray-MS-MS, Negative Mode using MRM. This method is targeted to pristine environmental and drinking waters reporting at sub-parts per trillion. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1

Preparation Methods	Method	Matrix	Method Descriptions
Sample Extraction for PFAS	EP231-PR	SOIL	In house
SPE preparation for LL and saline PFCs	EP231-SPE	WATER	In house

REPORT OF ANALYSIS

Report No. RN1244319

Client	: AECOM AUSTRALIA PTY LTD	**Job No.**	: AECO06/190816/3
	LEVEL 8	**Quote No.**	: QT-02018
	540 WICKHAM STREET	**Order No.**	: 60609759_2_0
		Date Received	: 16-AUG-2019
Attention	: JAMES PEACHEY	**Sampled By**	: CLIENT
Project Name	: 60609758_2_0		
Your Client Services Manager	: Richard Coghlan	**Phone**	: 02 9449 0161

Lab Reg No.	Sample Ref	Sample Description

Lab Reg No. / Date Sampled	Units		Method
PFAS (per-and poly-fluoroalkyl substances)			
PFBA (375-22-4)	mg/kg		NR70
PFPeA (2706-90-3)	mg/kg		NR70
PFHxA (307-24-4)	mg/kg		NR70
PFHpA (375-85-9)	mg/kg		NR70
PFOA (335-67-1)	mg/kg		NR70
PFNA (375-95-1)	mg/kg		NR70
PFDA (335-76-2)	mg/kg		NR70
PFUdA (2058-94-8)	mg/kg		NR70
PFDoA (307-55-1)	mg/kg		NR70
PFTrDA (72629-94-8)	mg/kg		NR70
PFTeDA (376-06-7)	mg/kg		NR70
PFHxDA (67905-19-5)	mg/kg		NR70
PFODA (16517-11-6)	mg/kg		NR70
FOUEA (70887-84-2)	mg/kg		NR70
PFBS (375-73-5)	mg/kg		NR70
PFPeS (2706-91-4)	mg/kg		NR70
PFHxS (355-46-4)	mg/kg		NR70
PFHpS (375-92-8)	mg/kg		NR70
PFOS (1763-23-1)	mg/kg		NR70
PFNS (68259-12-1)	mg/kg		NR70
PFDS (335-77-3)	mg/kg		NR70
PFOSA (754-91-6)	mg/kg		NR70
N-MeFOSA (31506-32-8)	mg/kg		NR70
N-EtFOSA (4151-50-2)	mg/kg		NR70
N-MeFOSAA (2355-31-9)	mg/kg		NR70
N-EtFOSAA(2991-50-6)	mg/kg		NR70
N-MeFOSE (24448-09-7)	mg/kg		NR70

REPORT OF ANALYSIS

Lab Reg No.						
Date Sampled						
	Units					Method
PFAS (per-and poly-fluoroalkyl substances)						
N-EtFOSE (1691-99-2)	mg/kg					NR70
4:2 FTS (757124-72-4)	mg/kg					NR70
6:2 FTS (27619-97-2)	mg/kg					NR70
8:2 FTS (39108-34-4)	mg/kg					NR70
10:2 FTS (120226-60-0)	mg/kg					NR70
8:2 diPAP (678-41-1)	mg/kg					NR70
PFBA (Surrogate Recovery)	%					NR70
PFPeA (Surrogate Recovery)	%					NR70
PFHxA (Surrogate Recovery)	%					NR70
PFHpA (Surrogate Recovery)	%					NR70
PFOA (Surrogate Recovery)	%					NR70
PFNA (Surrogate Recovery)	%					NR70
PFDA (Surrogate Recovery)	%					NR70
PFUdA (Surrogate Recovery)	%					NR70
PFDoA (Surrogate Recovery)	%					NR70
PFTeDA (Surrogate Recovery)	%					NR70
PFHxDA (Surrogate Recovery)	%					NR70
FOUEA (Surrogate Recovery)	%					NR70
PFBS (Surrogate Recovery)	%					NR70
PFHxS (Surrogate Recovery)	%					NR70
PFOS (Surrogate Recovery)	%					NR70
PFOSA (Surrogate Recovery)	%					NR70
N-MeFOSA (Surrogate Recovery)	%					NR70
N-EtFOSA (Surrogate Recovery)	%					NR70
N-MeFOSAA (Surrogate Recovery)	%					NR70
N-EtFOSAA (Surrogate Recovery)	%					NR70
N-MeFOSE (Surrogate Recovery)	%					NR70
N-EtFOSE (Surrogate Recovery)	%					NR70
4:2 FTS (Surrogate Recovery)	%					NR70
6:2 FTS (Surrogate Recovery)	%					NR70
8:2 FTS (Surrogate Recovery)	%					NR70
8:2 diPAP (Surrogate Recovery)	%					NR70
Dates						
Date extracted		19-AUG-2019	19-AUG-2019	19-AUG-2019		
Date analysed		21-AUG-2019	21-AUG-2019	21-AUG-2019		

N19/020818
to

REPORT OF ANALYSIS

N19/020822:

PFOS is quantified using a combined branched and linear standard,
linear and branched isomers are totalled for reporting.
All results corrected for labelled surrogate recoveries.
Selected PFAS surrogate recoveries are biased due to matrix effects.
FOUEA Surrogate Recovery was not reported.
LORs raised for selected analytes due to low surrogate recoveries.

Danny Slee, Section Manager
Organic - NSW
Accreditation No. 198

28-AUG-2019

Lab Reg No.			
Date Sampled			
	Units		Method
Trace Elements			
Total Solids	%		NT2_49

Pankaj Barai, Analyst
Inorganics - NSW
Accreditation No. 198

28-AUG-2019

All results are expressed on a dry weight basis.

REPORT OF ANALYSIS

Client	: AECOM AUSTRALIA PTY LTD	**Job No.**	: AECO06/190816/3
	LEVEL 8	**Quote No.**	: QT-02018
	540 WICKHAM STREET	**Order No.**	: 60609759_2_0
		Date Received	: 16-AUG-2019
Attention	: JAMES PEACHEY	**Sampled By**	: CLIENT
Project Name	: 60609758_2_0		
Your Client Services Manager	: Richard Coghlan	**Phone**	: 02 9449 0161

Lab Reg No.	Sample Ref	Sample Description
N19/020823	PR_QC204_190807	WATER 7/08/19

Lab Reg No.			N19/020823	
Date Sampled			07-AUG-2019	
		Units		Method
PFAS (per-and poly-fluoroalkyl substances)				
PFBA (375-22-4)		ug/L	0.15	NR70
PFPeA (2706-90-3)		ug/L	0.23	NR70
PFHxA (307-24-4)		ug/L	0.92	NR70
PFHpA (375-85-9)		ug/L	0.22	NR70
PFOA (335-67-1)		ug/L	0.34	NR70
PFNA (375-95-1)		ug/L	0.30	NR70
PFDA (335-76-2)		ug/L	0.027	NR70
PFUdA (2058-94-8)		ug/L	0.12	NR70
PFDoA (307-55-1)		ug/L	<0.001	NR70
PFTrDA (72629-94-8)		ug/L	<0.002	NR70
PFTeDA (376-06-7)		ug/L	<0.002	NR70
PFHxDA (67905-19-5)		ug/L	<0.002	NR70
PFODA (16517-11-6)		ug/L	<0.005	NR70
FOUEA (70887-84-2)		ug/L	<0.001	NR70
PFBS (375-73-5)		ug/L	0.50	NR70
PFPeS (2706-91-4)		ug/L	0.68	NR70
PFHxS (355-46-4)		ug/L	9.8	NR70
PFHpS (375-92-8)		ug/L	0.36	NR70
PFOS (1763-23-1)		ug/L	25	NR70
PFNS (68259-12-1)		ug/L	0.010	NR70
PFDS (335-77-3)		ug/L	<0.001	NR70
PFOSA (754-91-6)		ug/L	0.0016	NR70
N-MeFOSA (31506-32-8)		ug/L	<0.002	NR70
N-EtFOSA (4151-50-2)		ug/L	<0.002	NR70
N-MeFOSAA (2355-31-9)		ug/L	<0.002	NR70
N-EtFOSAA(2991-50-6)		ug/L	<0.002	NR70

REPORT OF ANALYSIS

Lab Reg No.						N19/020823	
Date Sampled						07-AUG-2019	
		Units					Method
PFAS (per-and poly-fluoroalkyl substances)							
N-MeFOSE (24448-09-7)		ug/L				<0.005	NR70
N-EtFOSE (1691-99-2)		ug/L				<0.005	NR70
4:2 FTS (757124-72-4)		ug/L				<0.001	NR70
6:2 FTS (27619-97-2)		ug/L				0.034	NR70
8:2 FTS (39108-34-4)		ug/L				0.028	NR70
10:2 FTS (120226-60-0)		ug/L				<0.001	NR70
8:2 diPAP (678-41-1)		ug/L				<0.002	NR70
PFBA (Surrogate Recovery)		%				104	NR70
PFPeA (Surrogate Recovery)		%				128	NR70
PFHxA (Surrogate Recovery)		%				102	NR70
PFHpA (Surrogate Recovery)		%				106	NR70
PFOA (Surrogate Recovery)		%				102	NR70
PFNA (Surrogate Recovery)		%				42	NR70
PFDA (Surrogate Recovery)		%				92	NR70
PFUdA (Surrogate Recovery)		%				94	NR70
PFDoA (Surrogate Recovery)		%				98	NR70
PFTeDA (Surrogate Recovery)		%				89	NR70
PFHxDA (Surrogate Recovery)		%				161	NR70
FOUEA (Surrogate Recovery)		%				58	NR70
PFBS (Surrogate Recovery)		%				126	NR70
PFHxS (Surrogate Recovery)		%				71	NR70
PFOS (Surrogate Recovery)		%				129	NR70
PFOSA (Surrogate Recovery)		%				79	NR70
N-MeFOSA (Surrogate Recovery)		%				84	NR70
N-EtFOSA (Surrogate Recovery)		%				97	NR70
N-MeFOSAA (Surrogate Recovery)		%				74	NR70
N-EtFOSAA (Surrogate Recovery)		%				85	NR70
N-MeFOSE (Surrogate Recovery)		%				113	NR70
N-EtFOSE (Surrogate Recovery)		%				127	NR70
4:2 FTS (Surrogate Recovery)		%				74	NR70
6:2 FTS (Surrogate Recovery)		%				89	NR70
8:2 FTS (Surrogate Recovery)		%				68	NR70
8:2 diPAP (Surrogate Recovery)		%				102	NR70
Dates							
Date extracted			23-AUG-2019	23-AUG-2019	23-AUG-2019	23-AUG-2019	
Date analysed			23-AUG-2019	23-AUG-2019	23-AUG-2019	23-AUG-2019	

REPORT OF ANALYSIS

Lab Reg No.		Units
Date Sampled		

N19/020823	
07-AUG-2019	
	Method

Danny Slee, Section Manager
Organic - NSW
Accreditation No. 198

28-AUG-2019

NATA
ACCREDITED FOR
TECHNICAL
COMPETENCE

Accredited for compliance with ISO/IEC 17025 - Testing.
This report shall not be reproduced except in full.
Results relate only to the sample(s) tested.

This Report supersedes reports: *RN1244317*

Measurement Uncertainty is available upon request.

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Client: AECOM Australia Pty Ltd

NMI QA Report No: AECO06/190813/3 **Sample Matrix:** Solid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
PFBA (375-22-4)	NR70	0.002	<0.002	NA	NA	NA	110	NA
PFPeA (2706-90-3)	NR70	0.002	<0.002	NA	NA	NA	97	NA
PFHxA (307-24-4)	NR70	0.001	<0.001	NA	NA	NA	101	NA
PFHpA (375-85-9)	NR70	0.001	<0.001	NA	NA	NA	94	NA
PFOA (335-67-1)	NR70	0.001	<0.001	NA	NA	NA	99	NA
PFNA (375-95-1)	NR70	0.001	<0.001	NA	NA	NA	86	NA
PFDA (335-76-2)	NR70	0.001	<0.001	NA	NA	NA	99	NA
PFUdA (2058-94-8)	NR70	0.002	<0.002	NA	NA	NA	100	NA
PFDoA (307-55-1)	NR70	0.002	<0.002	NA	NA	NA	106	NA
PFTrDA (72629-94-8)	NR70	0.002	<0.002	NA	NA	NA	100	NA
PFTeDA (376-06-7)	NR70	0.002	<0.002	NA	NA	NA	104	NA
PFHxDA (67905-19-5)	NR70	0.002	<0.002	NA	NA	NA	89	NA
PFODA (16517-11-6)	NR70	0.005	<0.005	NA	NA	NA	86	NA
FOUEA (70887-84-2)	NR70	0.001	<0.001	NA	NA	NA	99	NA
PFBS (375-73-5)	NR70	0.001	<0.001	NA	NA	NA	97	NA
PFPeS (2706-91-4)	NR70	0.001	<0.001	NA	NA	NA	97	NA
PFHxS (355-46-4)	NR70	0.001	<0.001	NA	NA	NA	96	NA
PFHpS (375-92-8)	NR70	0.001	<0.001	NA	NA	NA	92	NA
PFOS (1763-23-1)	NR70	0.002	<0.002	NA	NA	NA	110	NA
PFNS (68259-12-1)	NR70	0.001	<0.001	NA	NA	NA	94	NA
PFDS (335-77-3)	NR70	0.001	<0.001	NA	NA	NA	97	NA
PFOSA (754-91-6)	NR70	0.001	<0.001	NA	NA	NA	99	NA
N-MeFOSA (31506-32-8)	NR70	0.002	<0.002	NA	NA	NA	101	NA
N-EtFOSA (4151-50-2)	NR70	0.002	<0.002	NA	NA	NA	90	NA
N-MeFOSAA (2355-31-9)	NR70	0.002	<0.002	NA	NA	NA	102	NA
N-EtFOSAA(2991-50-6)	NR70	0.002	<0.002	NA	NA	NA	91	NA
N-MeFOSE (24448-09-7)	NR70	0.005	<0.005	NA	NA	NA	87	NA
N-EtFOSE (1691-99-2)	NR70	0.005	<0.005	NA	NA	NA	79	NA
4:2 FTS (757124-72-4)	NR70	0.001	<0.001	NA	NA	NA	91	NA
6:2 FTS (27619-97-2)	NR70	0.001	<0.001	NA	NA	NA	86	NA
8:2 FTS (39108-34-4)	NR70	0.001	<0.001	NA	NA	NA	100	NA
10:2 FTS (120226-60-0)	NR70	0.002	<0.002	NA	NA	NA	94	NA
8:2 diPAP (678-41-1)	NR70	0.002	<0.002	NA	NA	NA	93	NA

Results expressed in percentage (%) or mg/kg wherever appropriate.
Acceptable Spike recovery is 50-150%.
Maximum acceptable RPDs on spikes and duplicates is 40%.
'NA ' = Not Applicable.
RPD= Relative Percentage Difference.

Signed:

Danny Slee
Organics Manager, NMI-North Ryde

Date: **26/08/2019**

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Client: AECOM Australia Pty Ltd

NMI QA Report No: AECO06/190816/3 **Sample Matrix:** Liquid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		ug/L	ug/L	ug/L	ug/L	%	%	%
PFBA (375-22-4)	NR70	0.005	<0.005	NA	NA	NA	130	NA
PFPeA (2706-90-3)	NR70	0.002	<0.002	NA	NA	NA	97	NA
PFHxA (307-24-4)	NR70	0.001	<0.001	NA	NA	NA	96	NA
PFHpA (375-85-9)	NR70	0.001	<0.001	NA	NA	NA	94	NA
PFOA (335-67-1)	NR70	0.001	<0.001	NA	NA	NA	100	NA
PFNA (375-95-1)	NR70	0.001	<0.001	NA	NA	NA	104	NA
PFDA (335-76-2)	NR70	0.001	<0.001	NA	NA	NA	108	NA
PFUdA (2058-94-8)	NR70	0.001	<0.001	NA	NA	NA	83	NA
PFDoA (307-55-1)	NR70	0.001	<0.001	NA	NA	NA	80	NA
PFTrDA (72629-94-8)	NR70	0.002	<0.002	NA	NA	NA	90	NA
PFTeDA (376-06-7)	NR70	0.002	<0.002	NA	NA	NA	106	NA
PFHxDA (67905-19-5)	NR70	0.002	<0.002	NA	NA	NA	86	NA
PFODA (16517-11-6)	NR70	0.005	<0.005	NA	NA	NA	85	NA
FOUEA (70887-84-2)	NR70	0.001	<0.001	NA	NA	NA	90	NA
PFBS (375-73-5)	NR70	0.001	<0.001	NA	NA	NA	100	NA
PFPeS (2706-91-4)	NR70	0.001	<0.001	NA	NA	NA	99	NA
PFHxS (355-46-4)	NR70	0.001	<0.001	NA	NA	NA	104	NA
PFHpS (375-92-8)	NR70	0.001	<0.001	NA	NA	NA	101	NA
PFOS (1763-23-1)	NR70	0.002	<0.002	NA	NA	NA	99	NA
PFNS (68259-12-1)	NR70	0.001	<0.001	NA	NA	NA	98	NA
PFDS (335-77-3)	NR70	0.001	<0.001	NA	NA	NA	97	NA
PFOSA (754-91-6)	NR70	0.001	<0.001	NA	NA	NA	96	NA
N-MeFOSA (31506-32-8)	NR70	0.002	<0.002	NA	NA	NA	93	NA
N-EtFOSA (4151-50-2)	NR70	0.002	<0.002	NA	NA	NA	108	NA
N-MeFOSAA (2355-31-9)	NR70	0.002	<0.002	NA	NA	NA	91	NA
N-EtFOSAA(2991-50-6)	NR70	0.002	<0.002	NA	NA	NA	98	NA
N-MeFOSE (24448-09-7)	NR70	0.005	<0.005	NA	NA	NA	109	NA
N-EtFOSE (1691-99-2)	NR70	0.005	<0.005	NA	NA	NA	91	NA
4:2 FTS (757124-72-4)	NR70	0.001	<0.001	NA	NA	NA	98	NA
6:2 FTS (27619-97-2)	NR70	0.001	<0.001	NA	NA	NA	97	NA
8:2 FTS (39108-34-4)	NR70	0.001	<0.001	NA	NA	NA	106	NA
10:2 FTS (120226-60-0)	NR70	0.001	<0.001	NA	NA	NA	112	NA
8:2 diPAP (678-41-1)	NR70	0.002	<0.002	NA	NA	NA	103	NA

Results expressed in percentage (%) or ug/L wherever appropriate.
Acceptable Spike recovery is 50-150%.
Maximum acceptable RPDs on spikes and duplicates is 40%.
'NA ' = Not Applicable.
RPD= Relative Percentage Difference.

Signed:

Danny Slee
Organics Manager, NMI-North Ryde

Date: **28/08/2019**

From: Peachey, James <james.peachey@aecom.com>
Sent: Friday, 23 August 2019 5:47 AM
To: Carsten Emrich <Carsten.Emrich@alsglobal.com>
Cc: ALSEnviro Brisbane <ALSEnviro.Brisbane@alsglobal.com>
Subject: [EXTERNAL] - Rebatch EB1921176 and ES1925572

Hi Carsten

Please could you rebatch the following samples for TOPA (EP231X-TOP):

4 -035 (PR_MW02_190807)

James Peachey
Associate Director - Environment
D +61 7 3553 3909 M +61 426 206 362
james.peachey@aecom.com

AECOM
Level 8, 540 Wickham Street, Fortitude Valley, QLD 4006
PO Box 1307 Fortitude Valley QLD 4006
T +61 7 3553 2000 F +61 7 3553 2050
aecom.com

Imagine it. Delivered.

Environmental Division
Brisbane
Work Order Reference
EB1922105

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1922105**

Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: james.peachey@aecom.com	E-mail	: carsten.emrich@alsglobal.com
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Facsimile	: +61 07 3553 2050	Facsimile	: +61-7-3243 7218
Project	: 60609758	Page	: 1 of 2
Order number	: 60609758 2.0	Quote number	: EB2019AECOMAU0002 (BN/112/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: QFES		
Sampler	: NK		

Dates

Date Samples Received	: 23-Aug-2019 05:47	Issue Date	: 23-Aug-2019
Client Requested Due Date	: 30-Aug-2019	Scheduled Reporting Date	: **30-Aug-2019**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	: REBATCH	No. of samples received / analysed	: 4 / 4

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
-

- This work order has been created as a rebatch of EB1921176 and ES1925572
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

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: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231X (TOP) PFAS - Total Oxidisable Precursor (TOP) Assay
EB1922105-004	07-Aug-2019 00:00	PR_MW02_190807	✓

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AP_CustomerService.ANZ@aecom.com

JAMES PEACHEY

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

JANELLE PASSIER

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1922105**	Page	: 1 of 5
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 23-Aug-2019 05:47
Order number	: 60609758 2.0	Date Analysis Commenced	: 27-Aug-2019
C-O-C number	: ----	Issue Date	: 29-Aug-2019 17:06
Sampler	: NK		
Site	: QFES		
Quote number	: BN/112/19		
No. of samples received	: 4		
No. of samples analysed	: 4		

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*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, 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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID: PR_MW02_190807	----
			Client sampling date / time	07-Aug-2019 00:00	----
				EB1922105-004	--------
				Result	----
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids					
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	**0.64**	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	**0.69**	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**11.3**	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	**0.60**	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**28.0**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids					
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	**1.0**	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	**1.21**	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	**8.87**	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	**0.32**	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	**0.61**	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	**0.37**	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	**0.09**	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides					
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID: PR_MW02_190807	----
		Client sampling date / tim		07-Aug-2019 00:00	----
				EB1922105-004	--------
				Result	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides - Continued					
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids					
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----
EP231_TOP_P: PFAS Sums					
Sum of PFAS	----	0.01	µg/L	**53.7**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	**39.3**	----
Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.01	µg/L	**53.7**	----
^ **Sum of TOP C4 - C14 as Fluorine**	----	0.01	µg/L	**34.5**	----
EP231_TOP_S: PFAS Surrogate					
13C4-PFOS	----	0.02	%	**104**	----
13C8-PFOA	----	0.02	%	**128**	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231_TOP_S: PFAS Surrogate			
13C4-PFOS	----	60	130
13C8-PFOA	----	60	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1922105**	Page	: 1 of 6
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 23-Aug-2019
Order number	: 60609758 2.0	Date Analysis Commenced	: 27-Aug-2019
C-O-C number	: ----	Issue Date	: 29-Aug-2019
Sampler	: NK		
Site	: QFES		
Quote number	: BN/112/19		
No. of samples received	: 4		
No. of samples analysed	: 4		

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*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, 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: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2544054)									
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.75	0.75	0.00	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.05	0.04	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.08	0.07	15.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.81	0.76	7.14	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
EB1922179-007	Anonymous	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
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2544054)									
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.06	0.05	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.17	0.10	53.7	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.54	0.47	13.5	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.08	0.05	36.2	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
EB1922179-007	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	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 (%)*
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2544054) - continued									
EB1922179-007	Anonymous	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
EP231_TOP_C: Perfluoroalkyl Sulfonamides (QC Lot: 2544054)									
		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)	24448-09-7	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
EB1922179-007	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)	24448-09-7	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
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2544054)									
		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 (%)*
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2544054) - continued									
EB1922105-001	HH_MW03_190806	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
EB1922179-007	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
EP231_TOP_P: PFAS Sums (QC Lot: 2544054)									
		EP231X: Sum of PFAS	----	0.01	µg/L	2.57	2.32	10.2	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	1.56	1.51	3.26	0% - 20%
		EP231X: Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.01	µg/L	2.57	2.32	10.2	0% - 20%
		EP231X: Sum of TOP C4 - C14 as Fluorine	----	0.01	µg/L	1.64	1.48	10.3	0% - 20%
EB1922179-007	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Sum of TOP C4 - C14 as Fluorine	----	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: **WATER**

				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
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids (QCLot: 2544054)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.946 µg/L	87.4	50	150
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.928 µg/L	64.1	50	150
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QCLot: 2544054)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	1 µg/L	99.7	50	150
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides (QCLot: 2544054)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----	----	----	----
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2544054)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----	----	----	----
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.0948 µg/L	-1.05	0	200
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----	----	----	----

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
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2544054) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----
EP231_TOP_P: PFAS Sums (QCLot: 2544054)								
EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of TOP C4 - C14 as Fluorine	----	0.01	µg/L	<0.01	----	----	----	----

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.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1922105**	Page	: 1 of 5
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 23-Aug-2019
Site	: QFES	Issue Date	: 29-Aug-2019
Sampler	: NK	No. of samples received	: 4
Order number	: 60609758 2.0	No. of samples analysed	: 4

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

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: **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
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X (TOP))	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP)) PR_MW02_190807	**07-Aug-2019**	**27-Aug-2019**	03-Feb-2020	✓	**27-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**08-Aug-2019**	**27-Aug-2019**	04-Feb-2020	✓	**27-Aug-2019**	04-Feb-2020	✓
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X (TOP))	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP)) PR_MW02_190807	**07-Aug-2019**	**27-Aug-2019**	03-Feb-2020	✓	**27-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**08-Aug-2019**	**27-Aug-2019**	04-Feb-2020	✓	**27-Aug-2019**	04-Feb-2020	✓
EP231_TOP_C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X (TOP))	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP)) PR_MW02_190807	**07-Aug-2019**	**27-Aug-2019**	03-Feb-2020	✓	**27-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**08-Aug-2019**	**27-Aug-2019**	04-Feb-2020	✓	**27-Aug-2019**	04-Feb-2020	✓
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X (TOP))	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP)) PR_MW02_190807	**07-Aug-2019**	**27-Aug-2019**	03-Feb-2020	✓	**27-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**08-Aug-2019**	**27-Aug-2019**	04-Feb-2020	✓	**27-Aug-2019**	04-Feb-2020	✓

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
EP231_TOP_P: PFAS Sums							
HDPE (no PTFE) (EP231X (TOP))	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP)) PR_MW02_190807	**07-Aug-2019**	**27-Aug-2019**	03-Feb-2020	✓	**27-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**08-Aug-2019**	**27-Aug-2019**	04-Feb-2020	✓	**27-Aug-2019**	04-Feb-2020	✓

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: **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)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	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
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	WATER	In house, following oxidation per Houtz,Erika F.; Sedlak,David L. (2012): Oxidative Conversion as a Means of Detecting Precursors to Perfluoroalkyl Acids in Urban Runoff. In Environmental Science & Technology 46 (17),pp. 9342¿9349.: A portion of the oxidised sample is mixed with methanol (1:1) prior to analysis by LC-Electrospray-MS-MS,Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.

Preparation Methods	Method	Matrix	Method Descriptions
Total Oxidisable Precursor Digest for PFAS	* ORG70-W	WATER	In-House with oxidation per Houtz, Erika F.; Sedlak, David L. (2012): Oxidative Conversion as a Means of Detecting Precursors to Perfluoroalkyl Acids in Urban Runoff. In Environmental Science & Technology 46 (17), pp. 9342¿9349: A 5 mL sample is digested with persulfate under alkaline conditions, neutralised and prepared for analysis per EP231.