Fire & Rescue NSW

Greenacre Facility

Phase 2 Environmental Site Assessment - PFAS

October 2017

Executive summary

GHD Pty Ltd (GHD) was engaged by Fire and Rescue NSW (FRNSW) to provide a phase 2 environmental site assessment (ESA) at a land parcel identified within Lot 2 of DP588394 and Lot 1 DP 193478 located at 1 and 1A Amarina Avenue, Greenacre NSW 2190 (the 'site').

The site is owned and operated by FRNSW, comprising a warehouse and mechanical workshop. Site activities included testing of fire trucks during maintenance works, potentially including the use of aqueous film forming foams (AFFF). The foams historically used on site may have contained perfluoro alkyl substances (PFASs) including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), which are potentially harmful to human health and the environment.

The overall objective of this investigation is to further delineate the PFAS impacts identified during the ESA completed by GHD between November 2016 and April 2017 (GHD, 2017), and to confirm surface water flow directions on the site.

The scope of work comprised:

- Drilling and installation of three groundwater monitoring wells (MW03, MW04 and MW05), including soil sampling (including laboratory analysis of a retrieved section of concrete from MW04 for PFAS)
- Collection of one sediment sample (SS02) and seven surface water samples (SW01, SW02, SW03, SW05, SW08 and FW01, and FW02) and laboratory analysis for PFAS.
- A groundwater monitoring event (GME) of the five groundwater wells
- Laboratory analysis of selected soil, sediment, surface water and groundwater samples for chemicals of potential concern (COPC) including PFAS, total organic carbon (TOC), pH, and ASLP testing for PFAS for soils/sediments, and PFAS, total dissolved solids (TDS) / total suspended solids (TSS) in groundwater water and surface water.
- Surveying of new wells
- Review of surface water drainage across the site using DBYD plans, underground service locator information and observations from site visits.

The following conclusions were made:

- Laboratory analyses indicated the presence of PFAS in all media sampled (soils, sediment, concrete, leachate, surface water and groundwater) and a number of locations report concentrations above the relevant screening criteria for the protection of human health and/ or ecological receptors. This suggests PFAS contamination is widespread and may have multiple sources.
- Potential PFAS sources are likely to include historical storage and use of PFAS products (AFFF), legacy PFAS contamination in site infrastructure, hardstand surfaces and vehicles and secondary sources such as impacted soils, sediments and surface water.
- Impacted concrete, soil and sediments may continue to act as a source of PFAS to surface and groundwater receptors, however an ongoing source of PFAS may be present at the site.
- Elevated PFAS concentrations were reported in three on-site groundwater wells, one of which is located down hydraulic gradient of the remaining investigation locations and on the site boundary (MW04). The extent and source of this impact is not fully understood and

further investigation is required to understand the extent of impact including off-site migration.

- Surface water samples collected from stormwater drains indicate PFAS impacted surface water is migrating off-site via the two drainage systems – to the north-east via storm water and to sewer via the site interceptor.

Based on these conclusions and in conjunction with the limitations set out in Section 11 and the assumptions contained throughout the report, the following recommendations are made (full recommendations provided in Section 9.2):

- FRNSW should notify Sydney Water of the presence of PFAS in the surface water being discharged to sewer.
- Further assessment to understand the possible sources of PFAS (current and historic) across the site, to allow the development of practical management options for the site. This would include:
  - Assessment of the vehicles arriving on site for potential residual PFAS contamination. Assessment of the trucks would address possible sources of PFAS to surface water in the main warehouse, surface water in the eastern stormwater drainage system, and in groundwater via the fire retention pits/possible leaking pipes and/or the truck wash bay.
  - Further assessment of sediments in drains leading from potential sources i.e. main warehouse and washdown bay. The sediment analysis should include analysis for other contaminants associated with activities conducted in those source areas such as petroleum hydrocarbons, oils and metals.
  - Assessment of the concrete and shallow soils in the main warehouse around the former AFFF storage area prior to disposal, to assess whether the concrete is acting as an ongoing source of PFAS to the surface water drainage line in the main warehouse (SW02 and SW08).
  - Collection of surface water and sediment samples (if possible) from locations up-gradient of SW05 to assess the possible source of PFAS contamination in this drainage line.
  - CCTV assessment of pipes and the surface water drainage network to ascertain the quality of this existing network. This would indicate if the surface waters on site, known to be impacted with PFAS, could be a contributing source to the groundwater. Monitoring of the pipes and drainage network would also provide an indication of the volume of sediments in the network that could be acting as a source via leachate, and that could be transported off-site.
  - Installation and sampling of a new groundwater monitoring well up gradient of MW03, to delineate the extent of PFAS in groundwater on-site.
- Further assessment to understand the possible extent of PFAS off-site. This would include:
  - Installation and sampling of new groundwater monitoring wells off-site to the east to delineate the extent of impact detected in MW04.
  - Continued survey of the stormwater drainage system past Wentworth Street to determine the endpoint of discharge. Samples should be collected along the drainage line (if possible) and at the point of discharge to ascertain the possible extent of off-site impact and the possible receptors exposed.
- Consider possible immediate management actions which can be implemented on-site to restrict the flow of PFAS to off-site receptors including:
  - Sampling of truck foam and water tanks to assess levels of PFAS.

  - Update site management practices to ensure that the water from the deep retention pit on the eastern site boundary (FW02) is not disposed of to the ground surface and surface water drainage network when the location is emptied for pump testing. The water at the location exceeds the adopted ecological guidelines, and should therefore be collected and disposed of appropriately by a licenced contractor.
  - Development of an alternate system for the catchment/disposal of waste water from their fire trucks and the retention pits, rather than discharging the water directly off-site via the drainage network. This could include re-circulation of wastewater on site and/or changes to the use of water in site maintenance practices. Minimising the volume of water entering the current drainage network would prevent the site surface water acting as an on-going source of PFAS to possible aquatic environments down stream of the site.
- Additional sampling of groundwater, surface water and sediments to evaluate the effectiveness of any management actions implemented and to account for possible seasonal fluctuations/rainfall events to gain sufficient data to assess possible long term concentration trends.

Glossary

Abbreviation	Description
AHD	Australian Height Datum
ALS	Australian Laboratory Services
ANZECC	Australian and New Zealand Environment and Conservation Council
BTEXN	Benzene, toluene, ethylbenzene, xylenes and naphthalene
COC	Chain of custody
COPC	Contaminants of potential concern
CSM	Conceptual site model
DBYD	Dial Before You Dig
DO	Dissolved oxygen
DQI	Data quality indicator
DQO	Data quality objective
DTW	Depth to water
EC	Electrical conductivity
EIL	Ecological Investigation Level
EPA	NSW Environment Protection Authority
ESA	Environmental Site Assessment
GIL	Groundwater Investigation Level
GME	Groundwater monitoring event
GPR	Ground penetrating radar
HIL	Health Investigation Level
HSL	Health Screening Level
JSEA	Job Safety Environmental Analysis
LOR	Limit of reporting
mAHD	metres Australian Height Datum
m bgl	Metres below ground level
mbTOC	Metres below top of casing
mg/L	Milligrams per litre
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
PID	Photo-ionisation detector
QA/ QC	Quality assurance/ quality control
REDOX	Oxidation-reduction potential
RPD	Relative Percent Difference
SFOP	Standard field operating procedures
SPR	Source pathway receptor
SWL	Standing water level

Abbreviation	Description
TOC	Top of casing
TPH	Total petroleum hydrocarbons
TRH	Total recoverable hydrocarbons
µg/L	Micrograms per litre
UPSS	Underground Petroleum Storage System
USCS	Unified Soil Classification System

Table of contents

Table index

Appendices

1. Introduction

Fire and Rescue NSW (FRNSW) engaged GHD Pty Ltd (GHD) to provide a phase 2 environmental site assessment (ESA) at a land parcel identified within Lot 2 of DP588394 and Lot 1 DP 193478 located at 1 and 1A Amarina Avenue, Greenacre NSW 2190 (the 'site').

The site is owned and operated by FRNSW for use as storage, office headquarters and mechanical workshop / outfitting. The site area is located with a primarily commercial and industrial setting, bound by industrial warehouses with Amarina Avenue to the west and Wentworth Street to the east. The approximate site boundaries are presented in Figure 1, Appendix A.

Site activities included testing of fire trucks during maintenance works, potentially including the use of aqueous film forming foams (AFFF). The foams historically used on site may have contained per- and poly-fluoro alkyl substances (PFASs) including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), which are potentially harmful to human health and the environment. For this reason, PFAS may have been released to the environment, which may have resulted in contamination.

The NSW Environmental Protection Authority (NSW EPA) is currently undertaking an investigation program to assess the historical legacy of PFAS use across NSW. In 2016, the EPA requested further investigation at this site to understand potential contamination issues be undertaken by FRNSW.

1.1 Project background

A preliminary site investigation (PSI) was undertaken by GHD in 2016 to identify potential sources of contamination and areas of potential concern, as well as develop a sampling and analytical plan for further intrusive investigations on the site. The findings of the PSI are reported in:

- GHD (2016) *Greenacre PFAS Investigation, Preliminary Site Investigation and Sampling and Analysis Quality Plan*. Draft August 2016.

Following the PSI, an environmental site assessment (ESA) was undertaken by GHD in 2016 and 2017. The aim of the investigation was to further characterise impacts from PFAS on the site. The findings of the ESA are reported in:

- GHD (2017) Fire & Rescue NSW, *Greenacre Facility, Environmental Site Assessment - PFAS*. April 2017.

The conceptual site model from this report is presented in Section 2.7 of this report as a basis for the current phase of works. The NSW EPA reviewed the ESA report and made the following conclusions in a letter review to FRNSW (NSW EPA, March 2017):

- *As recommended in the report, there should be a focus on characterising the source and managing off-site transport. Some further delineation of groundwater and surface water pathways to potential receptors, accounting for existing creeks and the likely groundwater flow pathway, is also required.*
- *For management actions to restrict the flow of PFAS offsite, relevant management plans and management of waste disposal need to be considered.*
- *The EPA supports the recommendations listed in the Fire & Rescue NSW, Greenacre Facility Environmental Site Assessment – PFAS, GHD March 2017.*

This report documents the outcomes of further intrusive site investigations undertaken as part of the current phase of works on the site. For full details on the site history, reference is made to the PSI report (GHD, 2016).

1.2 Objective

The overall objective of this investigation was to further delineate the PFAS impacts identified during the ESA completed by GHD between November 2016 and April 2017 (GHD, 2017), and to confirm surface water flow directions on the site.

To address the investigation objectives outlined above, and based on the data gaps identified in the conceptual site model (CSM, Table 8.1 in GHD, 2017, and repeated in Section 2.7 of this report), this current stage of investigation was designed to target:

- PFAS impact in groundwater to ascertain groundwater flow direction, to assess potential off-site migration and to assess risk to possible receptors.
- PFAS impact in surface water and sediments along drainage lines on-site and to determine surface water flow direction from the site.

1.3 Scope

The scope of work comprised:

- Review of the EPA comments (NSW EPA, March 2017) of the recent ESA report (GHD 2017)
- Preparation of a Health, Safety and Environment Plan (HSEP) and site specific Job Safety and Environmental Analysis (JSEA)
- Service location including a review of site plans (where available), dial before you dig (DBYD) plans, and scanning using ground penetrating radar to identify the presence of underground services
- Drilling and installation of three additional groundwater monitoring wells (MW03, MW04 and MW05), including soil sampling (including laboratory analysis of a retrieved section of concrete from MW04 for PFAS)
- Collection of one sediment sample (SS02) and seven surface water samples (SW01, SW02, SW03, SW05, SW08 and FW01, and FW02) and laboratory analysis for PFAS. GHD notes that sediment and surface water sampling was limited by water flow and the quantity of sediment in the drains at the time of sampling
- A groundwater monitoring event (GME) of the five groundwater wells on-site (MW01 to MW05)
- Laboratory analysis of selected soil, sediment, concrete, surface water and groundwater samples for chemicals of potential concern (COPCs) including:
  - PFAS, total organic carbon (TOC), and pH in soils and sediments, including ASLP testing for PFAS in selected samples.
  - PFAS, total dissolved solids (TDS) / total suspended solids (TSS) in groundwater water and surface water.
- A quality control and quality assurance (QA/QC) program
- Surveying of newly installed wells
- Review of surface water drainage across the site using DBYD plans, underground service locator information and observations from site visits

- Preparation of this environmental site assessment report.

1.4 Limitations

This report is subject to the limitations provided in Section 11.

2. Site setting

2.1 Site identification

A summary of site identification details is provided in Table 2-1. The site location is presented in Figure 1 in Appendix A.

Table 2-1 Site identification summary

Information	Details
Street Address	1 and 1A Amarina Avenue, Greenacre NSW 2190
Lot and DP number	Lot 1 DP 193478 and Lot 2 of DP588394
Site Area	23 550 m2
Local Government Area	Strathfield Municipal Council
Local Land Use Zoning	IN1 – General Industrial
Current Land Use	Mechanical workshop, mechanical fit out and offices (new FRNSW headquarters).

2.2 Surrounding land and environment

The surrounding land uses and local environment are summarised below in Table 2-2. For further details on each characteristic, refer to the PSI (GHD, 2016) and ESA (GHD, 2017) reports.

Table 2-2 Summary of surrounding land use and local environment

Characteristic	Description
Surrounding land use	Industrial ware houses and commercial facilities surround the site (zoned as general industrial). To the east of the site after Wentworth Street is a rail corridor zoned as 'rail infrastructure'.
Topography	Generally flat across the site, with a high point on the south-east corner of the site and over to the site entrance at Amarina Avenue. The site surface has been artificially graded to aid surface/storm water flow directions (see Section 6.6.1 for further details on site surface water drainage). Regional topography appears to fall to the east from the site towards Wentworth Street. The site lies at approximately 25 m Australian Height Datum (mAHD)
Soils	The site is located on 'disturbed terrain', which is characterised by extensive human activity disturbance. Landfill includes soil, rock, building and waste materials. Original vegetation completely cleared, replaced with turf or grassland. Acid sulphate soils are unlikely to be encountered on the site or within 500 m of the site.

2.3 Geology

Regional geology of the area is Bringelly Shale and is near the interface with the Ashfield Shale. The shale is underlain by Hawksbury Sandstone. The presence of fill, underlain by sandstone has been confirmed by previous investigations (JK Geotechnics, 2013; GHD 2017).

2.4 Hydrogeology

2.4.1 Aquifers

The site is within the Sydney Basin. The site is located on Bringelly and Ashfield Shale and residual clays, which are expected to have low overall hydraulic conductivities and have low beneficial use potential from both a yield and water quality perspective. Groundwater is expected to flow predominantly along shale clay interface and fractures. The low hydraulic conductivity shales and clays present the beneath the area will limit the hydraulic connection between groundwater across the site and impede the overall movement of contaminants off-site in groundwater.

Regional groundwater flow is expected to follow the local topography and therefore drain towards Coxs Creek and the Cooks River, south-east and east of the site. However, local flow is likely to be governed by geological variations and local recharge sources.

2.4.2 Existing Groundwater Bores

GHD conducted a review of existing groundwater borehole records using the NSW Department of Primary industries, Office of Water, groundwater database (June 2017). The search was conducted to identify registered groundwater boreholes in close proximity and to record information such as use and standing water level. Three groundwater boreholes were identified within a 1 kilometre radius of the site (summarised in Table 2-3), all registered for monitoring purposes. None of these groundwater boreholes are located within the site boundary. The closest groundwater bore licenced for abstraction for domestic, commercial or stock purposes was 1.7 km north-east of the site (also included in Table 2-3**)**.

Table 2-3 Review of registered groundwater bores

Borehole ID	Purpose (licence status)	Depth (m)	Standing Water Level (m)	Approx. Distance from Site	Drillers Log
GW112333	Monitoring Bore (Active)	8.63	Unknown	150 m south-west	Fill underlain by shale and sandstone
GW112334	Monitoring Bore (Active)	9.00	Unknown	260 m south-west	Fill underlain by silty clay, shale and sandstone
GW112335	Monitoring Bore (Active)	8.80	Unknown	160 m south	Fill underlain by silty clay, shale and sandstone
GW024096	Domestic (Converted)	6.00	4.5	1700 m north-east.	Clay

2.5 Hydrology

The closest receiving water body is Coxs Creek, located approximately 1 km south-east of the site. This flows into Cooks River, located approximately 1.2 km east of the site. The creek is noted to be concrete lined and acts as a storm water canal.

2.6 Site layout and key site features

A site inspection was undertaken initially by GHD in July 2016. Observations made during the site inspection are presented in *Greenacre PFAS Investigation, Preliminary Site Investigation and Sampling and Analysis Quality Plan* (GHD, 2016).

Table 2-4 provides a summary of site details including site layout and key site features, which are shown on Figure 2, Appendix A.

Table 2-4 Key site features

Item	Summary observations
Fencing and access	The whole site is secured by a mixture of fences and building walls. The entrance and exit to the site is from Amarina Avenue. There is a boom gate and security gatehouse at this entrance/exit and access to the site is restricted to FRNSW personnel.
FRNSW site features	Key features of the site include: - Administration buildings and site offices (including new FRNSW headquarters) - Truck servicing area in the main warehouse/ mechanical work shop on the northern portion of the site - Truck parking along the eastern site boundary - Historical foam storage and truck wash stations (including pump pit for water from the trucks) on the eastern site boundary - The area in the south eastern corner of the site was also historically used to run training courses on fire extinguishers to the public - Historical underground fuel storage tank/s that have been decommissioned located to the north of the truck wash station.
Ground surface	The entire site is covered with concrete hardstand. The concrete is approximately 0.2 m thick along the roadways to accommodate the frequent heavy vehicle traffic (confirmed through drilling and service locating using ground penetrating radar).
Waste drums or bulk storage facilities	Historically within the main warehouse on the site, there was a collection of AFFF (IBCs and 20 L concentrate) and trade waste for collection and destruction. These were stored in the western corner of the building. The AFFF was reportedly sent to the site from other FRNSW sites for destruction. The AFFF was incinerated off-site with a destruction certificate supplied. FRNSW have confirmed that there is currently no AFFF stored on site. The storage area for other foams (Class A – Forexpan, and Class B – Solburg RF3x6) are located within a fence on hardstand with no evidence of spills noted at the time of the inspection (July, 2016). There are two water retention tanks for recycled truck water on the eastern site boundary. For further detail, refer to Section 6.6.1.

2.7 Conceptual site model

A preliminary conceptual site model (CSM) was prepared by GHD in 2016 as part of the PSI (GHD, 2016) and further developed as part of the ESA completed in 2017 (GHD, 2017). A summary of the CSM is provided below. The CSM was used as the basis for the current investigation works. For further information about the transport mechanisms of PFAS, refer to section 8.3.1 of the ESA report (GHD, 2017). An updated version of the CSM, based on the outcome of these works, is provided in Section 8.

2.7.1 Sources

The site is currently occupied by FRNSW and is used by staff as office space, meeting areas for crewing staff and mechanical maintenance of the NSW truck fleet (including washing and

emptying the truck tanks). AFFF containing PFAS are no longer actively used at the site and GHD is not aware of any AFFF storage on site currently. It is further understood that no large scale fire fighting training using truck hoses and monitors has occurred on the site and training has been restricted to fire extinguishers. Given this, the primary source of PFAS (i.e. the use of AFFF) is no longer present on the site.

Based on the findings of the PSI (GHD, 2016) and the ESA (GHD, 2017), the following secondary potential sources of contamination and associated COPCs were identified:

- Concrete around MW02
- The wash bay between MW01 and MW02
- The main warehouse and mechanical workshop (including historic AFFF storage areas and where fire extinguishers were filled) and drains leading from this area
- Concrete on historic fire extinguisher training area on the south east portion of the site (minor source area)
- Drainage or containment components receiving possible AFFF contaminated wastewater at designated equipment wash down areas after foam was used for fire extinguisher training

Impacted soils and sediments which have migrated from the main source zones (including to potential off-site locations), with subsequent leaching of PFAS, represent a secondary source of contamination.

2.7.2 Receptors

The following receptors were previously considered:

- On-site (FRNSW) and off-site commercial workers associated with the surrounding commercial/industrial areas
- Potential intrusive maintenance workers on and off-site
- Potential recreational users of surface waters down hydraulic gradient from the site or where surface water from the site discharges
- Beneficial uses of groundwater, including domestic groundwater resources
- Ecological receptors in surface water bodies (including those recharged by groundwater and those receiving drainage from the site).

Although drinking water receptors have been considered (as per the NSW EPA (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*), GHD understands that groundwater is not extracted at the site nor off-site for any beneficial purpose (including recreation and/or stock watering). Additionally, the groundwater in the region is relatively saline, and there is a reliable mains supply of water. The likelihood of groundwater being used as a potable water source is considered to be low.

2.7.3 Exposure pathways

The primary pathways by which receptors could be exposed to the sources of contamination outlined above were considered to be:

- Dermal contact with contaminated shallow soil, sediments and dust.
- Incidental ingestion of contaminated soils and dust.
- Direct contact or ingestion of groundwater and/or surface water.

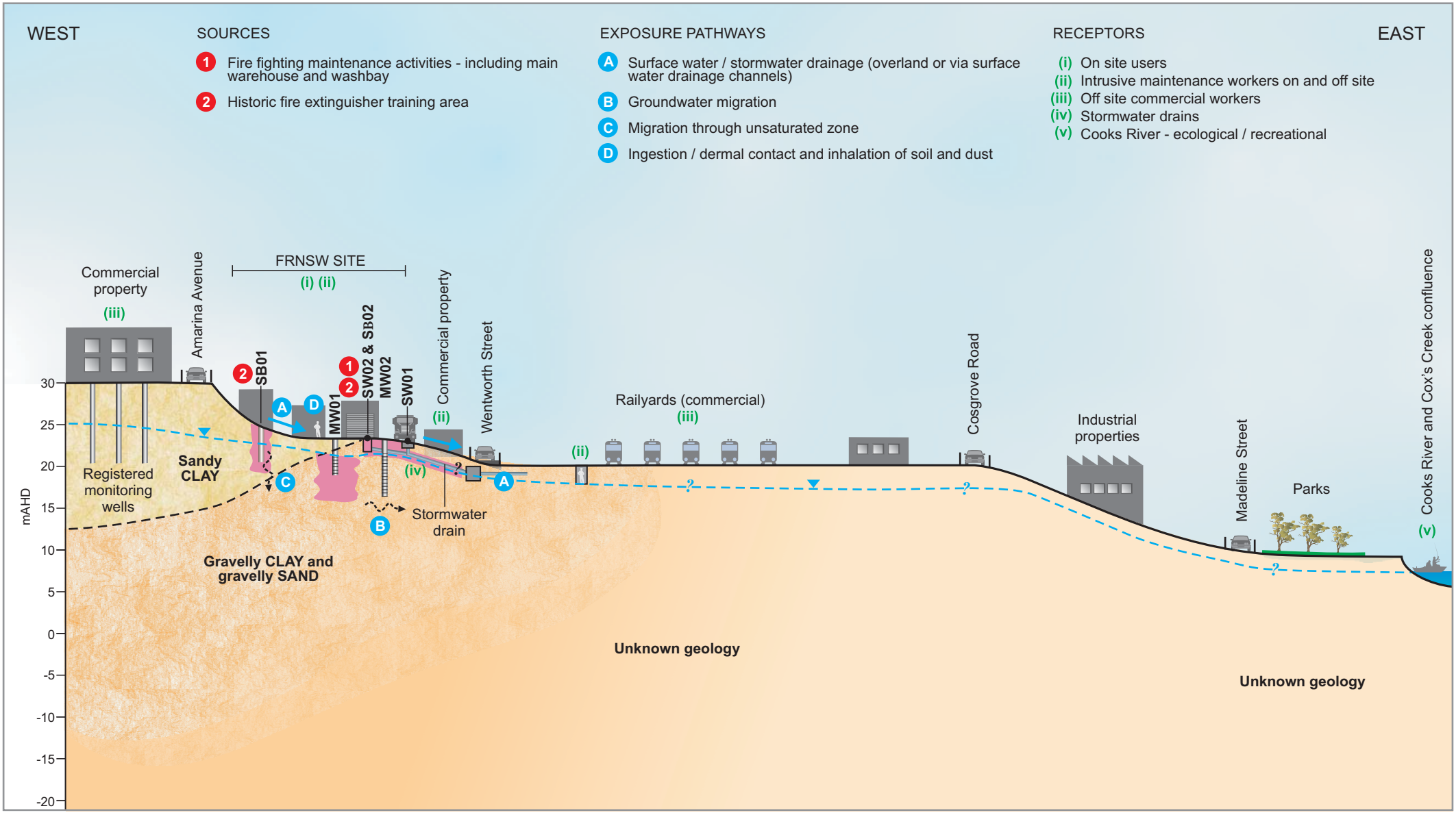
- Inhalation of contaminated soils or dust during soil movement.
- Vertical and horizontal migration of contaminated liquid through the unsaturated zone into the saturated zone, and subsequent horizontal migration within the groundwater and subsequent discharge to surface waters. The US EPA (2014) notes that PFAS are water soluble and can migrate readily from soil to groundwater, where they can be transported long distances.
- Surface runoff and sediment transport into storm water drainage and subsequent transport and discharge to surface waters.

Secondary exposure pathways exist for PFAS. Once in soil, PFAS can leach from soil to water (due to its solubility in water) as water migrates downward through soil to the water table, resulting in contaminated groundwater. Generally, the shorter chain PFAS species are more soluble than the longer chain PFAS. Groundwater will migrate and discharge into the nearest down gradient surface water body.

2.7.4 Source-pathway-receptor linkages

The ESA report (GHD, 2017) presents the preliminary CSM for on-site sources of contamination. The visually representation of this (from Figure 8, Appendix A of the ESA report – GHD, 2017) is presented below.

This investigation is focused primarily on PFAS contamination, and other potential sources of contamination identified during the PSI and ESA associated with general site activities are not considered further as part of these works. Reference to these sources is provided in the CSM in GHD 2017.



Conceptual diagram only - not to scale

LEGEND

- Sandy clay
- Groundwater table
- Vapour migration
- Surface water flow
- PFAS impact

Fire & Rescue NSW
Greenacre Fleet Management Unit

Conceptual Site Model

Job Number	21-25583
Revision	0
Date	28 Feb 2017

Figure 8

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

3. Data Quality Objectives

The Data Quality Objectives (DQOs) for the investigation are based on guidance presented in:

- NEPC (2013) *National Environmental Protection (Assessment of Site Contamination) Amended Measure (NEPM) No. 1 – Schedule B1, Guideline on Investigation Levels for Soil and Groundwater.*

The DQOs establish a framework for contamination investigations which incorporates a seven stepped continuum that defines the problem at the site. A series of stages then optimises the design of the investigation. The seven steps are outlined below:

- Step 1: State the Problem
- Step 2: Identify the Principal Study Question
- Step 3: Inputs to the Decision
- Step 4: Boundaries of the Study
- Step 5: Decision Rules
- Step 6: Tolerable Limits on Decision Errors
- Step 7: Optimisation of the Data Collection Process

An overview of the DQOs for the investigation are presented in the following steps.

Step 1: State the problem

The site has previously been used for public fire extinguisher training (Table 2-4) and is currently in use for truck maintenance activities, which has potentially included the use and storage of AFFF. The AFFF used may have contained PFAS including PFOS and PFOA, which are potentially harmful to human health and the environment.

The problem as it stands is that the use of AFFF containing PFAS has resulted in contamination of soil, surface water, groundwater and sediments on site, which requires further investigation.

Step 2: Identify the decision/goal of the study

The key study questions to be answered as part of the works are as follows:

- What is the extent of groundwater contamination beneath the site?
- Are contaminants present on the site at concentrations which pose a potentially unacceptable risk to human health or the environment under the current land use and adjacent land-uses?
- Is the data obtained of an acceptable quality to enable appropriate conclusions to be made in relation to the overall risks to human health and/ or the environment?

Should contamination present at the site pose a potentially unacceptable risk to human health for the current land uses or the environment based on concentrations of PFAS in soils, sediments, groundwater, surface waters, and/or site infrastructure (including concrete) the other decisions to be made are:

- Is the extent of the impact adequately delineated?
- Is further assessment or remediation/management required?

Step 3: Identify the information inputs

The following inputs are required for the decision:

- The location of potential PFAS contamination sources

- The concentrations of PFAS in soil, sediment, concrete, groundwater and surface water from laboratory analysis.
- Identify potential exposure routes and contamination migration pathways.
- The likelihood of PFAS impacted groundwater, surface water and sediments migrating off-site.

Step 4: Define the boundaries of the study

Boundaries of the investigation are summarised in Table 3-1.

Table 3-1 Investigation boundaries

Boundary	Definition
Spatial boundaries	The spatial boundaries for the site are identified as the lateral extent of the groundwater monitoring bore network as shown in Figure 3, Appendix A and down to a depth of approximately 8.0 m bgl, which is the maximum intrusive investigation depth.
Temporal boundaries	The timeframe for this investigation's scope of work is primarily defined to be the period of which works were undertaken in the investigation area as part of this assessment; namely April and May 2017. Historical data has also been considered.
Scale of decision making	The scale of the decision making is limited to the boundaries of the site and identified off-site receptors.
Potential constraints on data collection	Access to the proposed sampling locations may be restricted by services, buildings, site traffic and infrastructure. Collection of surface water and sediment samples is limited by the availability of the media for sampling at each investigation location.

Step 5: Decision rules

The degree of impact by contaminants and the decisions associated with accepting data will be assessed with reference to the chosen site investigation levels, which were established within the framework of guidelines made or approved by the NSW EPA.

The criteria which used for screening analytical results are discussed in Section 5.

The decision rule was considered to be:

- If concentrations of the COPC in soil, sediment, surface water, or groundwater on or off-site exceed the adopted criteria for permissible land use(s) (as per current zoning), then further assessment, remediation and/or management may be required.
- Conversely, no further action may be required in the event that concentrations are below adopted site criteria.

Step 6: Tolerable limits on decision errors

Data generated during this investigation must be appropriate to allow decisions to be made with confidence.

Specific limits for this investigation have been adopted in accordance with the appropriate guidance from the AS4482.1, which includes appropriate indicators of data quality (data quality indicators [DQIs] used to assess QA/QC, and GHD's Standard Field Operating Procedures). The pre-determined DQIs established for the investigation are discussed in Appendix H.

If any of the DQIs are not met, further investigation will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data.

Step 7: Optimisation of the data collection process

This step involves identifying the most resource effective sampling and analysis design which is required to satisfy the DQOs. The sampling and analysis plan which was developed to meet this objective is summarised in Section 4.

4. Methodology

4.1 General

The scope of work is summarised in Section 1.3. The tables in Section 4.2 to 4.5, summarise the groundwater well installation and soil sampling, sediment sampling, groundwater sampling and surface water sampling methodologies. In summary, the following activities were conducted between April and May 2017:

- 13 April 2017 – purging of existing groundwater wells MW01 and MW02 to remove any possible accidental contamination from the surface.
- 18 April 2017 – groundwater sampling at monitoring locations MW01 and MW02 (to provide additional data and confirm the findings of GHD (2017) where PFAS concentrations were reported to be elevated in MW01 (236ug/L) and below the limit of reporting in MW02).
- 12 May 2017 – installation of three new groundwater wells (MW03 to MW05, including soil sampling).
- 24 May 2017 – groundwater sampling at five monitoring locations (MW01 to MW05), sediment and surface water sampling.

Sampling methodologies were completed with reference to the procedures outlined in the following references:

- NSW EPA (1995) *Contaminated Sites: Sampling Design Guidelines*
- NSW DEC (2006) *Contaminated Sites: Guidelines for NSW Site Auditor Scheme*
- NSW DECC (2015) *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*
- NSW EPA (2011) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*
- NEPM (2013) *National Environment Protection (Assessment of Site Contamination) Amendment Measure (No.1),* National Environment Protection Council (NEPC)
- Western Australia Department of Environment Regulation (WA DER) 2017 *Interim Guideline on the assessment and management of perfluoroalkyl and polyfluoroalkyl substances* Appendix 1 (PFAS specific sample collection methods, equipment and equipment decontamination methods).

4.2 Groundwater well installation and soil sampling

Table 4-1 Groundwater well installation methodology (including soil sampling)

Item	Description
Date of fieldwork	12 May 2017
Work clearance	JSEA including daily pre-work assessment and hazard identification Site induction
Technical guideline	National Uniform Drillers Licensing Committee (2011) Minimum Construction Requirements for Water Bores in Australia (Edition 3, 2012) and WA DER (2017) sampling procedures.

Item	Description
Ground clearance	Scanning using ground penetrating radar (GPR) locating prior to mechanical drilling.
Drilling technique	Following hand auguring, push tube and solid flight augers were employed.
Bore logging	All field observations and subsurface conditions were recorded on lithological logs (Appendix E).
Field screening	Field screening for volatiles was undertaken prior to collection of soil samples for laboratory analysis using a PID, the results of which are included in Appendix E. PID calibration data is presented in Appendix D.
Soil sampling	Discrete soil samples were collected from the surface and from each lithological zone. Samples for VOC screening were collected in separate snap lock bags. Additionally, soil was sampled into laboratory supplied jars. Concrete samples were also collected from each investigation location.
Sample Analysis	At least two soil samples from each borehole (MW03 to MW05) plus one concrete sample will be submitted for laboratory analysis of COPC including PFAS, total organic carbon (TOC) and pH.
Sample handling and transport	Following collection, soil samples were immediately placed on ice and stored in a cool, dark environment (esky) prior to being forwarded to the analytical laboratory within the specified holding times along with a chain of custody (COC) form (presented in Appendix G).
QA/QC	A QA/QC sampling procedure was implemented and further details are described in Appendix H. QA/QC sampling included intra-laboratory duplicate samples.
Well construction	Wells were installed with the following general characteristics: - 50 mm polyvinyl chloride (PVC) Class 18 blank and screened casings - Primary filter pack material comprising a chemically inert material which was well rounded, with a high coefficient of uniformity and extended at least 0.5 m above the screened PVC casing - Bentonite pellets used as annular sealant which extended at least 0.5 m above the filter pack, followed by a cement slurry to the ground surface - Monitoring wells were finished with trafficable gatic covers and concrete
Development	Well development occurred following installation using bailers until either: - No further noticeable sand or silt was recovered - The water was relatively clear when removed from the well - All water was removed from the well
Surveying	Following well installation, all newly installed were surveyed by a registered surveyor. The survey report for the wells is provided in Appendix C.
Waste disposal	Soil cuttings and purged groundwater has been stored in 205 L drums on site for disposal to a licenced waste facility. Waste disposal documentation will be provided in the final report once received.

4.3 Sediment sampling

Table 4-2 Sediment sampling methodology

Item	Description
Date of fieldwork	24 May 2017
Work clearance	JSEA including daily pre-work assessment and hazard identification
Technical guideline	GHD's Standard Field Operating Procedures
Sampling	Samples were collected by hand from location SS02 and were placed directly into laboratory supplied sample jars.
Sample handling and transport	Following collection, sediment samples were immediately placed on ice and stored in a cool, dark environment (esky) prior to being forwarded to the analytical laboratory within the specified holding times along with a COC form (Appendix G).
Decontamination	Prior to and following the collection of each sample, all non-disposable sampling equipment underwent decontamination including: - Rinsing of equipment with fresh water
Sample analysis	All sediment samples were submitted for laboratory analysis of COPC including PFAS, TOC, and pH.
Quality assurance and quality control (QA/QC)	Sediment sampling was considered part of the soil sampling program. A QA/QC sampling procedure was implemented and further details are described in Appendix H. QA/QC sampling included intra-laboratory duplicate samples.

4.4 Groundwater sampling

Table 4-3 Groundwater sampling methodology

Item	Description
Date of fieldwork	18 April 2017 (MW01 and MW02 only) 24 May 2017 (MW01 to MW05)
Work clearance	JSEA including daily pre-work assessment and hazard identification Site induction
Technical guideline	ASTM D6771–02, Standard practice for low-flow purging and sampling for wells and devices used for groundwater quality investigations, ASTM International Australian Standard 5667:1998 Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (AS 5667.1:1998) Australian Standard 5667:1998 Water Quality – Sampling, Part 11: Guidance on the Sampling of Groundwaters (AS 566.11:1998)
Gauging	Monitoring wells were gauged using an oil/water interface probe to measure standing water levels (SWL) and assess for the potential presence of light non-aqueous phase liquid (LNAPL) prior to sampling. LNAPL was not encountered, therefore no LNAPL sampling was required.
Field chemistry	Field measurements were taken using a calibrated water quality meter and flow through cell, with measurements of temperature, pH, electrical conductivity (EC), dissolved oxygen (DO) and oxidation-reduction potential (REDOX) recorded. Field sampling sheets are presented in Appendix D.
Sampling	All monitoring wells were low flow sampled using a peristaltic pump.

Item	Description
Sample handling and transport	The groundwater samples were immediately placed on ice and stored in a cool, dark environment (esky) prior to being forwarded to the analytical laboratory within the specified holding times along with a COC form (Appendix G).
Decontamination	Prior to and following the collection of each groundwater sample, all non-disposable sampling equipment underwent decontamination including: - Rinsing of equipment with fresh water
Sample analysis	All groundwater samples were submitted for laboratory analysis of COPC including PFAS and total dissolved solids (TDS). Laboratory results are summarised in Appendix B and certificates of analysis and COC included in Appendix G.
Quality assurance and quality control (QA/QC)	A QA/QC sampling procedure was implemented and further details are described in Appendix H. QA/QC sampling included intra-laboratory duplicate samples.
Waste disposal	Purged groundwater was transferred into 205 L sealed drums on site for disposal to a licenced waste facility. Soil cuttings and purged groundwater has been stored in 205 L drums on site for disposal to a licenced waste facility. Waste disposal documentation will be provided in the final report once received.

4.5 Surface water sampling

Table 4-4 Surface water sampling methodology

Item	Description
Date of fieldwork	24 May 2017
Work clearance	JSEA including daily pre-work assessment and hazard identification
Technical guideline	GHD's Standard Field Operating Procedures
Field chemistry	Field parameters including temperature, pH, electrical conductivity (EC), dissolved oxygen (DO), and reduction-oxidation potential (redox) of the surface water were recorded at each sample point using a water quality meter placed directly into a bucket of water from the water body if there was adequate amounts of surface water for collection.
Sampling	Surface water samples were collected from storm water drains and the water retention basin using dedicated sampling equipment and/or a peristaltic pump (depending on accessibility).
Sample handling and transport	The surface water samples were then transferred into laboratory provided bottles. The sample bottles were transferred to an ice filled cool box for sample preservation prior to and during shipment to the sampling laboratory. A chain of custody form was completed, and forwarded with the samples to the testing laboratory.
Decontamination	Dedicated sample bottles were used to collect surface water samples, eliminating the need for decontamination of equipment and rinsate samples.
Sample analysis	All surface water samples were submitted for laboratory analysis of COPC including PFAS, and total suspended solids (TSS).
Quality assurance and quality control (QA/QC)	QA/QC samples were collected as outlined in Appendix H.

5. Assessment criteria

5.1 Basis for assessment

Screening criteria for the assessment of PFAS impacted sites are still in the process of development in Australia. Only a few values have been published by Australian regulatory agencies, some of which are interim, draft or are "to be reviewed". GHD has been involved with the development of National guidelines for the assessment and management of PFAS contamination which has included drafting of the guidelines for a working group organised by CRC CARE and involving State and Commonwealth regulatory agencies and organisations. These have now been released in draft and have been considered as part of this investigation.

Published guideline documents currently available and considered as part of this review include:

- CRC CARE 2017. Assessment, management and remediation guidance for perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA) – Part 2: Health screening levels, CRC CARE Technical Report no. 38, CRC for Contamination Assessment and Remediation of the Environment, Newcastle, Australia.
- Department of Environment and Energy (DoEE), October 2016. DRAFT *Commonwealth Environmental Management Guidance on Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFAS)*
- EC 2017. Canadian Environmental Protection Act, 1999 Federal Environmental Quality Guidelines Perfluorooctane Sulfonate (PFOS). Environment and Climate Change Canada, February 2017.
- Health 2017. Release of Food Standards Australia New Zealand's (FSANZ) report on: Perfluorinated chemicals in food Supporting Information. Australian Government Department of Health, 31 March 2017.
- OEH/NSW Health 2017. Calculation of Tier I human health PFAS screening values for soil and fish. In preparation**.**
- Western Australia Department of Environment Regulation (WA DER) 2017 *Interim Guideline on the assessment and management of perfluoroalkyl and polyfluoroalkyl substances.*

For the purpose of the assessment of data collected from the site, a number of guidelines and information sources have been reviewed in order to identify the most appropriate and current site assessment criteria at the time of preparation of this report. GHD notes that the criteria used differ slightly to those outlined in the letter from the EPA to FRNSW (dated 31/03/2017) as new documentation and guidance has been published since the receipt of that letter. The screening criteria documented herein supersede any criteria previously specified in the site PSI (GHD, 2016) and ESA (GHD, 2017).

It is noted that the assessment of PFAS impacted sites is a rapidly developing field and consequently site assessment criteria are continually under review and may be revised as new scientific information comes to light.

5.2 Rationale for assessment criteria

The assessment criteria were selected to allow decisions to be made for the following identified receptors (from Section 2.7.2):

- On-site (FRNSW) and off-site commercial workers associated with the surrounding commercial/industrial areas

- Potential intrusive maintenance workers on and off-site
- Beneficial uses of groundwater, including domestic groundwater resources
- Ecological receptors in surface water bodies (including those recharged by groundwater)

Recreational receptors were not considered in this investigation, as the local receiving surface water body at the point of possible groundwater discharge is now understood to be concrete lined as a stormwater canal (Coxs Creek). It is therefore unlikely to be used for recreational purposes. Additionally, there is no groundwater abstraction within a 1 km radius of the site for possible domestic recreational purposes (e.g. swimming pool top-up).

5.3 Nominated assessment criteria

The objective of this investigation is focused primarily on PFAS contamination. Therefore, PFAS is the primary COPC which was analysed in samples and the adopted assessment criteria for this investigation are specific for PFAS investigations.

It is noted that no assessment criteria or guidance exists to account for potential exposure to intrusive maintenance workers. Therefore, no specific assessment criteria have been adopted to account for this receptor.

Additionally, concrete samples do not correspond with any sample matrix for which screening values exist. Therefore, no assessment criteria have been adopted for concrete samples and the data is considered in the context of actual concentrations which may present an on-going source of contamination.

5.3.1 Surface water and groundwater

The nominated assessment criteria and screening levels for PFAS are outlined in Table 5-1, and are shown on Table D in Appendix B. Historic results are also presented in Table D.

In accordance with NSW EPA (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, contaminants identified in groundwater have been screened against existing generic groundwater investigation levels (GILs) which protect the following environmental values:

- Drinking water
- Aquatic ecosystems

On the basis that groundwater and surface water could potentially discharge to a fresh water system (Coxs Creek, located approximately 1 km south-east of the site), GILs for fresh waters have been adopted.

GHD notes that direct toxicity for freshwater ecology has been adopted for this assessment. OEH (2017) recommends that secondary poisoning and bioaccumulation should be assessed using biota sampling/analysis (instead of using water) and the wildlife diet screening values provided by Canadian guidelines. Considering only on-site assessment has been conducted in this phase of works, as well as the industrial/commercial nature of the site, assessment of bioaccumulation and secondary poisoning has not been considered further in this investigation.

Table 5-1 Nominated PFAS screening criteria for surface water and groundwater

Exposure Scenario	PFOS + PFHxS	PFOA	Basis for nomination of criteria
Drinking water quality	0.07 µg/L	0.56 µg/L	Criteria adopted from the Australian Government Department of Health *Release of Food Standards Australia New Zealand report on perfluorinated chemicals in food supporting information* (Health, 2017) as recommended by NSW Office of Environment and Heritage (OEH). Drinking water is not extracted on site and no registered domestic use groundwater bores were located in a 1 km radius of the site. However, drinking water criteria are considered in accordance with NSW EPA (2007) *Guidelines for the Assessment and Management of Groundwater Contamination.*
Ecological - freshwater	0.13 µg/L (PFOS only)	220 µg/L	Criteria adopted for direct toxicity assessment from the *Draft Commonwealth Environmental Management Guidance on Perfluorooctance Sulfonic Acid (PFOS) and Perfluorooctanoic Acid* (PFOA)(Australian Government Department of the Environment and Energy (DoEE), 2016). As directed by NSW EPA (2017), a 95% species protection level has been adopted (slightly to moderately disturbed ecosystems).

5.3.2 Soil

Contaminants in soil have been assessed against guidelines protective of the receptors identified in section 5.2.

Ecological

The site surface is fully sealed with hardstand concrete. There is therefore little opportunity for ecological receptors to contact impacted soils or live beneath the concrete on site. As such, no ecological assessment criteria are adopted for this investigation.

Human health

The site is considered a 'commercial/industrial' land use scenario, and the NSW EPA (letter 2017) has acknowledged that this site is not currently used as a fire training facility. As such, soil criteria based on the National Environmental Protection Measure (NEPM, 2013) commercial/industrial exposure scenario assumptions are suitable for use. As there is little opportunity for contact with impacted soils on site, GHD does not consider bioaccumulation and secondary poisoning to be applicable to this site. Leaching and off-site transport has been assessed using Australian Standard Leachate Potential (ASLP) test on soils/sediments and through sediment sampling across the site (refer to Section 5.3.3 for sediment assessment criterion).

The nominated assessment criteria and screening levels for PFAS are outlined in Table 5-2, and are shown on Table A in Appendix B.

Table 5-2 Nominated PFAS screening criteria for soil

Exposure Scenario	PFOS + PFHxS	PFOA	Basis for nomination of criteria
Health Based			
Commercial/ industrial	20	100	Criteria adopted from OEH and NSW Health *Calculation of Tier 1 human health PFAS screening values for soil and fish* (2017 – in preparation) to account for commercial activity on the site.
Ecological based			
(Not applicable to this site)			

Leachate data is useful to demonstrate potential for off-site transport. However, as noted by NSW EPA (2017), uncertainties in the relevance of leach testing to real world processes means comparing leachate values to screening values is problematic, even if adjusted for dilution. As such, no screening value or action level have been applied to leachate data.

5.3.3 Sediment

According to *Sediment quality assessment: a practical guide* (Simpson and Batley, 2016), a sediment is defined as 'unconsolidated mineral and organic particulate material that has settled to the bottom of aquatic environments'. All sediment samples were collected from constructed drainage lines that are not considered to be 'aquatic environments'. Therefore the sediment samples collected in this investigation were assessed against the adopted soil assessment criteria outlined in Section 5.3.2.

6. Results

6.1 General

This section presents the results of all soil/concrete, groundwater, sediment and surface water investigations undertaken on the site by GHD in April and May 2017. Analytical results and groundwater / surface water field parameters are summarised in the following tables in Appendix B:

- Table A: Soil analytical results
- Table B: ASLP analytical results
- Table C: Concrete analytical results
- Table D: Groundwater and surface water analytical results

Historical results for PFAS are also displayed for comparison on each table. Refer to the ESA report (GHD, 2017) for other COPC previously tested.

6.2 Quality assurance and quality control

An evaluation of the field and laboratory data quality was undertaken in accordance with the NEPM '*Schedule B2, Assessment of data quality,'* and is included in Appendix H.

In summary, the review of the QA/QC program indicates that the soil, groundwater, surface water and sediment analytical data are of an acceptable quality upon which to draw meaningful conclusions regarding impacts to groundwater and soil at the site.

6.3 Soil and sediment results

Soil was examined by GHD during drilling works at newly installed groundwater wells MW03 MW04 and MW05. Additionally, one sample of concrete was collected from MW04 and submitted for laboratory analysis. Descriptions of the site lithology including visual and olfactory observations, sample identifications along with the well construction details and elevations are presented in borehole logs contained in Appendix E.

The soil and sediment sampling laboratory results are summarised in Table A, Appendix B, and the concrete sample results are shown on Table C, Appendix B. Laboratory certificates of analysis are presented in Appendix G.

6.3.1 Soil profile

The observed lithology across the three investigation locations completed during this scope of works is summarised in Table 6-1. Each well was noted to encounter a range of varying lithology. This was generally consistent with the lithological layers encountered by GHD (2016), which consisted of sandy clay, gravelly sand and gravelly clay layers overlain by a thin layer of fill material and concrete.

Table 6-1 Generalised lithology encountered

Depth range (m)	Lithology
0.0 – 0.2	Concrete hardstand
0.2 – 0.6	FILL (gravelly sand or clayey sand)
0.6 – 1.5	MW03/MW04 - Clayey GRAVEL or gravelly CLAY MW05 – CLAY, grey with orange, varying plasticity, firm to very stiff
1.5 – 4.0	MW03/MW05 – Clayey SAND, sandy CLAY

Depth range (m)	Lithology
1.5 – 7.0	MW04 – Sandy CLAY and CLAY, low plasticity, soft to stiff, grey with red/brown mottle
4.0 – 6.0 4.0 – 8.0	MW03 – Gravelly CLAY, dark brown, low plasticity, soft to hard (weathered bedrock) MW05 – CLAY, brown, low to medium plasticity, soft

6.3.2 Soil analytical results

All soil results were reported below the nominated screening criteria. The concentration of PFAS analytes were low in approximately half of the samples analysed, with the results generally being less than the laboratory LOR and/or several orders of magnitude below the nominated screening levels under a commercial/industrial land use scenario.

In the most recent well installations, a sample of concrete was analysed for COPC from monitoring location MW04 (MW02 and SB01 concrete previously analysed). No assessment criteria is available for concrete samples, however the concentration of PFAS (sum of total) was noted to be greater than soil samples from the same monitoring location.

The vertical distribution of PFAS (sum of total) indicates a rapid decline in concentration with depth at all sample locations, as shown in Chart 1. This is most apparent at MW05, MW02 and MW04. This indicates some attenuation in the vertical migration of PFAS, possibly due to the permeability of the soil and the presence of hardstand which would limit rain penetration.

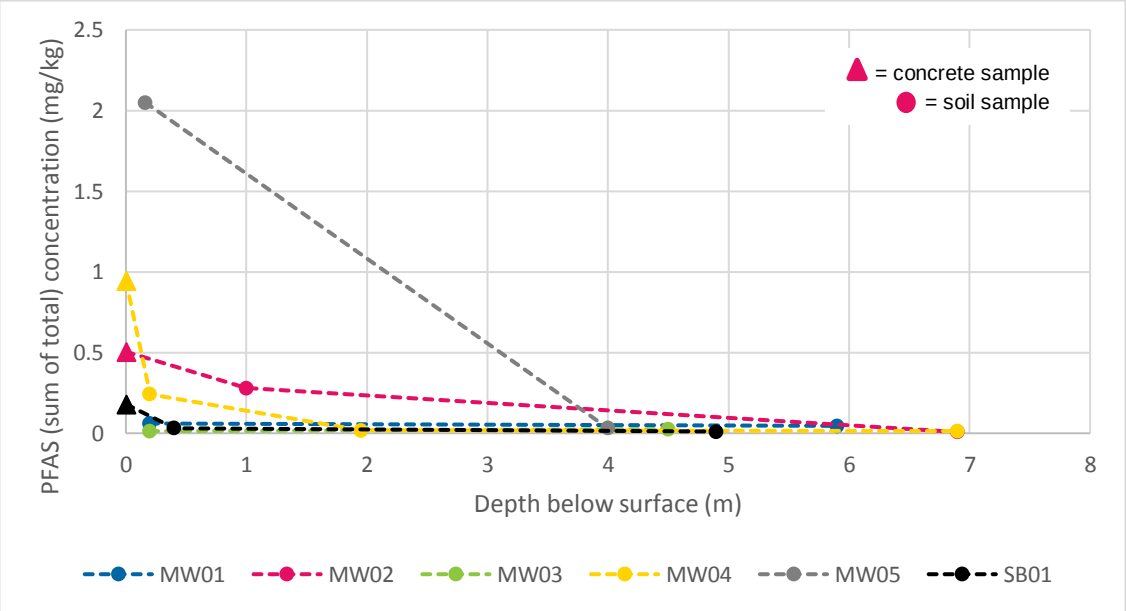


Chart 1 Change in PFAS concentration in concrete and soils with depth (GHD, 2017 and current investigation)

6.3.3 Sediment analytical results

Only one sediment sample was collected (SS02, within the main warehouse) during this phase of works due to accessibility issues into the drainage pits, and a lack of sediment in the nominated sample locations within these surface water drainage channels.

The sediment samples did not exceed the nominated assessment criteria. The concentration of PFAS (sum of total) at SS02 was 6.83 mg/kg, which is similar to the concentration recorded in December 2016 at the same location (8.9 mg/kg).

6.4 ASLP analytical results

All soil samples and sediment samples, as well as the concrete core sample were submitted for ASLP testing for PFAS. The leachate laboratory results are summarised on Table B, Appendix B.

No assessment criteria were adopted for ASLP assessment as the purpose of the leachate analysis was to assess the potential for leachate to form, and to confirm a possible migration mechanism. It must be noted however that leachate potential would be restricted somewhat by the presence of hardstand cover over most of the site.

The concentration of PFAS (sum of total) in leachate from shallow soil samples at MW04 and MW05 were noted to be at least an order of magnitude greater than that recorded in deep samples from these locations and compared to the remaining investigation locations (including MW01 and MW02), with a maximum concentration of 49.9 ug/L at MW05 (0.16 mbgl). The concrete sample collected from MW04 had a total PFAS concentration of 36 ug/L.

The concentration of total PFAS in leachate from sediment at monitoring location SS02 (main ware house) was a maximum of 55.7 ug/L during this investigation, which is lower than the concentration recorded in December 2016 (125 ug/L) but is noted to be greater than the maximum concentration observed in soil samples.

6.5 Groundwater results

6.5.1 Groundwater gauging

Gauging results are summarised in Table 6-2. The top of casing (TOC) elevation was determined by a professional surveyor and was used to calculate the groundwater elevation in metres Australian Height Datum (mAHD).

Table 6-2 Groundwater Gauging Data

Well ID	Depth of well (m)	Depth to groundwater (m bTOC)	TOC (m AHD)	Corrected groundwater elevation (m AHD)
MW01	6.003	3.186	26.886	23.700
MW02	7.487	2.074	26.863	24.789
MW03	5.900	2.580	26.72	24.140
MW04	6.900	3.192	26.825	23.633
MW05	7.981	3.310	28.291	24.981

Note: TOC = top of casing

A groundwater contour map showing the interpolated groundwater contours and the inferred groundwater flow direction is presented on Figure 4, Appendix A. Groundwater contours were calculated based on groundwater elevations using an inbuilt ArcGIS interpolation tool to derive the contours with a kriging method.

The contour figure shows monitoring location MW01 to be a local low point between MW02 and MW05. This may be due to the surface water drainage channel adjacent to this location between MW02/MW05 and MW01. Groundwater appears to flow towards this region from the north and south with a component of flow towards the eastern boundary.

6.5.2 Water quality

Prior to groundwater sample collection, field parameters and observations were recorded. Field parameters for the site from the most recent monitoring round (May 2017) are summarised in Table 6-3.

Table 6-3 Summary of ground water quality field parameters

Parameter range	Groundwater results
pH	6.23 (MW03) to 6.70 (MW01)
Temp (°C)	20.6°C (MW04) and 23.0°C (MW05)
EC (µS/cm)	5,990 µS/cm (MW01) and 16,541µS/cm (MW02)
DO (mg/L)	0.86 mg/L (MW01) and 1.51 mg/L (MW03)
ORP (mV)	-80.2 mV (MW03) and 167.7 mV (MW01)

No hydrocarbon or chemical odours or sheen were noted in groundwater samples or purge water. The groundwater was noted as clear and colourless to moderately turbid.

6.5.3 Groundwater analytical results

Samples were collected from five onsite groundwater wells (MW01 to MW05). The groundwater laboratory results are summarised in Table D, Appendix B. Laboratory certificates of analysis are presented in Appendix G.

Groundwater COPCs reported in excess of the nominated screening criteria are summarised in Table 6-4, and are shown on Figure 6 in Appendix A. Further discussion pertaining to these exceedances is provided in Section 7. The concentration of PFAS analytes at MW02 and MW05 were all below the laboratory LOR, although PFOS was detected in MW02 in April 2017 at 0.02 µg/L.

Table 6-4 Summary groundwater exceedances – May 2017

Analyte	Guideline Exceedance	Monitoring locations
PFHxS and PFOS (sum of total)	FSANZ Drinking water (human health)	MW01, MW03 and MW04
PFOA	FSANZ Drinking water (human health)	MW01
PFOS	Commonwealth Draft Environmental Management (ecological)	MW01, MW03 and MW04

6.6 Surface water results

6.6.1 Surface water drainage

An inspection of the surface water drainage channels was undertaken by the environmental field scientist during the drilling works and GME (April and May 2017) to provide further information about the drainage patterns on site. The direction of drain channels was observed through surface grates and was recorded on a site map. The drainage lines were then followed off-site to the north-east over to Wentworth Street, as DBYD plans indicated that this was the expected drainage path (GHD, 2016 and GHD 2017).

A surface water drainage map as observed during this inspection is provided on Figure 5, Appendix A. Sample locations are shown on Figure 2 Appendix A and are summarised in Section 6.6.2. Photographs from site inspections are included in Appendix F. Based on the findings of previous stages of work, and observations made during the recent stage of investigation, the following points are noted:

- It was understood that no surface water storage ponds were present at this site. A large retention tank for recycled truck water was identified during the PSI (GHD, 2016) on the eastern site boundary (designated as FW01). A second underground tank (FW02) was

observed during this phase of works adjacent to FW01 to the north, and was sampled as FW02 (photograph 1).

  - Both tanks were made of / lined with concrete and were full of water during the investigation
  - FW01 tank was approximately 1.2 m deep, 6 m long and 2 m wide, and sits mostly above ground level. Pump equipment (including hoses) remains permanently attached to the tank.

    The second tank (FW02) was greater than 8 m deep (anecdotal evidence reported that the tank is approximately 12 m deep), 1 m wide and 1.5 m long. The tank remains covered and is flush with the ground surface (photograph 1). GHD understands that it is used to test pumps for high rise buildings.
  - The base of both tanks was not observed and therefore, no comment can be made about the condition of the concrete at the base of the tanks.

- The retention tank FW01 was observed to be emptied into the stormwater drainage system via stop valves located between the two tanks. The tank was emptied after a fire truck accidently discharged foaming agent into the tank as part of routine maintenance works, causing the tank to start overflowing with foam when the pumps were switched on (photograph 4). The retention pit was refilled using the mains water supply.
- Drainage diagrams for the site provided by FRNSW showed that all stormwater drains exit the site in the north-eastern corner via stormwater. This was confirmed to be via a pit immediately adjacent to the site (SW04, photograph 7) and not directly via sample location SW01 as previously assumed. It was noted that there are at least two drainage lines leading to the north-east corner from the site. These drainage lines were identified and sampled during the current phase of works and include:

  - Sample location SW05 appears to receive water from location SW06 and a down pipe connected to the roof of the truck wash (photograph 2). It then appears to connect directly to location SW04. The drainage line at SW05 and SW06 is understood to be approximately 3 m below the site ground surface, which corresponds with the approximate elevation of drainage point SW04. SW06 may receive water from further up-gradient (unconfirmed during the site inspection).
  - Sample location SW03 (approximately 2 m to 3 m below ground surface), located at the eastern end of the main warehouse, was observed to only have an outlet channel, which appears to connect to SW01 (photograph 5 and photograph 6). The drain at location SW01 also receives water from drains connected in series along the northern site boundary, and releases into location SW04.
- From off-site pit SW04, the DBYD plans corresponded with a large mound across the ground surface observed to follow the eastern perimeter of the premises north of the site (photograph 8). This mound ended in approximately the same location as a stormwater drain observed on Wentworth Street. The surface water drainage from the site is therefore assumed to connect to the stormwater drain at this location. The storm water drain then passes under Wentworth Street and is observed to enter the Enfield rail yards (Enfield Intermodal Logistics Centre) via a concrete lined stormwater channel (photograph 11). The channel passes under the first rail line, however the final destination of the channel was not confirmed. It may drain into a swale area between the rail lines for evaporation (photograph 10) or it may continue under the rail yards for discharge to the Cox's Creek or Cooks River.

In addition to the surface water/stormwater drainage system described above exiting the site from the north-east corner, water from the main warehouse was confirmed to flow through a

shallow drainage channel (approximately 0.2 m below ground surface). This channel drains to the site interceptor, as shown on Figure 5, Appendix A. Water from the interceptor exits the site by direct discharge to sewer under a Sydney Water trade waste agreement (sampled as SW08).

6.6.2 Summary of surface water monitoring locations

A summary of the monitoring locations investigated at the Greenacre facility is shown in Table 6-5. Monitoring locations SW01, SW02, SW03 and FW01 were also assessed in the ESA report (GHD, 2017).

Table 6-5 Summary of surface water monitoring locations investigated at the Greenacre facility – May 2017

Monitoring location ID	Location on site	Sampled in May 2017?
SW01	On-site, north-east corner of the site. Connected to SW03 and the drainage line on the northern boundary, and drains into SW04.	Yes
SW02	Located in the main-warehouse and drains to SW08.	Yes
SW03	Located at the eastern end of the main-warehouse and drains to SW04. No incoming channel.	Yes.
SW04	Off-site pit adjacent to the north east corner of the site. Incoming channels from SW01 and SW05, and drains off site towards Wentworth Street.	No – not accessible for sampling.
SW05	Located north of MW02. Incoming channels from SW06 and a downpipe from the roof of the truck wash bay. Receives surface water from trucks emptying to the ground surface at the fire retention pits (photograph 2). Drains to SW04.	Yes
SW06	Located near MW01 and the fire water retention pits. Unknown source of incoming channel, and drains to SW05/SW04.	No – not enough water for sampling.
SW07	Long, thin, shallow drain south of the truck wash bay. No incoming channels and it is unknown where this drains to.	No – not enough water for sampling.
SW08	Located after the site interceptor, which receives water from the channel in the main warehouse. Discharges to the sewer under a trade waste agreement.	Yes
FW01	Recycled water retention pit, shallow and aboveground. Frequently used.	Yes
FW02	Recycled water retention pit north of FW02, deep and only used to test pumps for high-rise buildings.	Yes

6.6.3 Water quality

Prior to surface water sample collection, field parameters and observations were recorded (if there was adequate water sample). In this investigation, surface water parameters were collected from SW08 and FW01 only due to a lack of water to take parameter readings at the other monitoring locations. Field parameters for the site are summarised in Table 6-6.

Table 6-6 Summary of surface water quality field parameters

Parameter range	Surface water results
pH	6.09 (SW08) to 7.69 (FW01)
Temp (°C)	17.7°C (FW01) to 18.2°C (SW08)
EC (µS/cm)	200.8 uS/cm (FW01) to 1,050 uS/cm (SW08)
DO (mg/L)	1.57 mg/L (SW08) to 7.81 mg/L (FW01)
ORP (mV)	-117.6 mV (SW08) to -36.5 mV (FW01)

Samples collected from the firewater pits (FW01 and FW02) were noted to be clear, colourless and odourless. Sample SW08, collected from the site interceptor was observed to be very turbid, grey/black in colour and to have a hydrocarbon odour which is consistent with the slightly higher EC, lower DO and more negative ORP readings. The source of water passing through this point is from the mechanics warehouse, and given the purpose of an interceptor, the hydrocarbon odour is therefore not unexpected.

6.6.4 Surface water analytical results

Samples were collected from seven sample locations for laboratory analysis. The surface water laboratory results are summarised in Table D, Appendix B. Laboratory certificates of analysis are presented in Appendix G.

Surface water COPC reported in excess of the nominated screening criteria are summarised in Table 6-7, and are shown on Figure 6 in Appendix A. Further discussion pertaining to these exceedances is provided in Section 7. All surface water samples collected are noted to exceed both human health and ecological assessment criteria.

Table 6-7 Summary surface water exceedances

Analyte	Guideline Exceedance	Monitoring locations
PFHxS and PFOS (sum of total)	FSANZ Drinking water (human health)	SW01, SW02, SW03, SW05, SW08 FW01 and FW02
PFOA	FSANZ Drinking water (human health)	SW02 and SW08
PFOS	Commonwealth Draft Environmental Management (ecological)	SW01, SW02, SW03, SW05, SW08 FW01 and FW02

7. Discussion

Historical PFAS results are included on the results tables provided in Appendix B for completeness. This stage of works is focused primarily on PFAS contamination associated with historical use of AFFF. Other contaminants of concern, initially considered during the previous ESA (GHD, 2017) are not discussed further in this report.

7.1 PFAS Contamination status

7.1.1 Soil and sediment

No soil or sediment samples exceeded the adopted PFAS screening criteria based on a commercial/industrial land use. The concentration of PFAS identified on site is unlikely to represent an unacceptable risk to on-site users, particularly given that the site soils are covered by hardstand/buildings and that sediments are confined to covered drains.

Soils and concrete on site

The concentration of PFAS analytes were generally less than the laboratory LOR and/or several orders of magnitude below the nominated investigation levels under a commercial/industrial land use scenario. However, all soil and concrete samples contained a total concentration of PFAS (sum of total) greater than the laboratory LOR, indicating that PFAS is present at multiple locations across this site. It must be noted that the soil assessment utilised a targeted and somewhat opportunistic approach rather than a systematic approach across the site. Therefore, PFAS may be present at other areas of the site not assessed in this study.

Chart 1 (section 6.3.2) shows that the concentration of PFAS (sum of total) is generally greatest at the surface, and is greater in the concrete ground surface relative to the soils below. This is important to note when considering future management options for the site, as the PFAS in concrete may continue to leach into the soils overtime. The rapid decline in soil concentrations with depth further suggests very little may be reaching groundwater through leaching and that the hardstand may prevent significant leaching.

Sediments on site

Only one sediment sample was collected in this investigation, from monitoring location SS02. The concentration of PFAS remained similar to that recorded in the previous monitoring round. Surface water from SS02 drains to the site interceptor, where sediments transported in the drainage channel are likely to become trapped. The solubility of the PFAS suggests these sediments may act as an on-going source of PFAS surface water contamination and therefore has the ability to migrate from the site via sewer and stormwater drains. However, the mass of PFAS sorbed to sediment at the site may be limited as not all proposed sediment sample locations had sufficient sediment to obtain a sample for analysis (e.g. monitoring locations SS01 and SS03). The lack of sediments at these locations could be due to high water flow rates through the drains preventing the settlement of sediments, and the overall lack of sediments from the site considering that the majority of the site surface is sealed by concrete. Therefore, sediments are unlikely to represent a substantial risk to on-site and off-site receptors due to the potentially low volume of sediment emanating from the site via the surface water drainage system and/or due to the potentially short residence time of sediments in the drainage network. The volume of sediments in the surface water drains should be assessed by surveying/monitoring the drainage lines from the site.

Sediment collected from monitoring location SS02 is likely to be derived from truck washing activities within the main warehouse, which is an ongoing activity at the site. The presence of

PFAS in these sediments may therefore suggest an on-going source associated with legacy PFAS contamination of the infrastructure within the warehouse and/or within the fire trucks themselves. The rate of sediment generation may therefore be greater than that observed in the surface water drains, and should be taken into consideration.

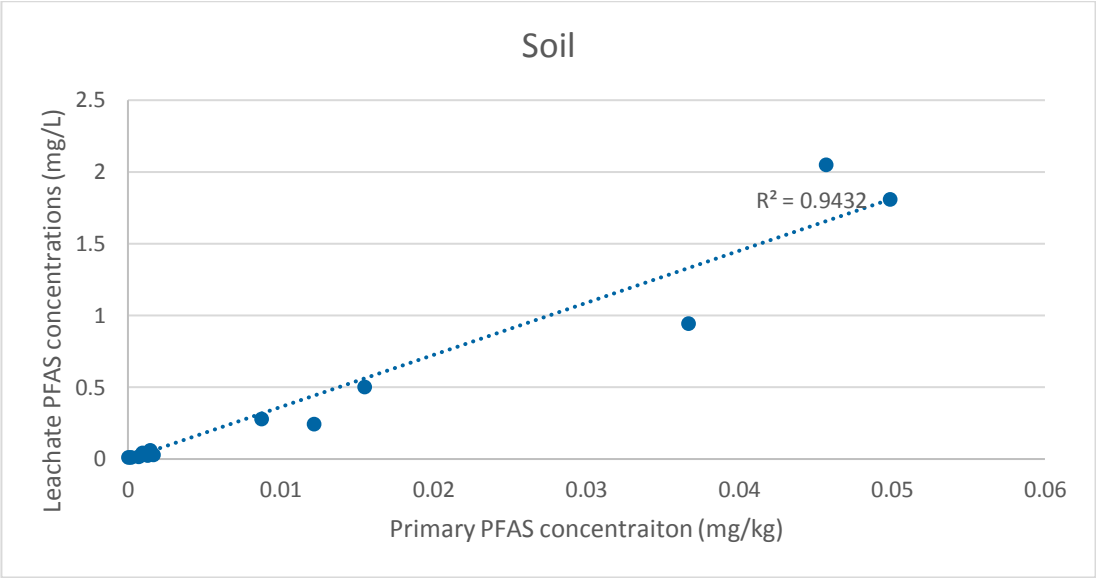
PFAS leachability

Table 7-1 presents a comparison of total PFAS data and leachable PFAS data and the corresponding calculated percentage of PFAS in leachate. The average percentage of PFAS leaching under ASLP conditions is shown to be relatively consistent across the site for each matrix type and between each location. PFAS in concrete, soils and sediments may act as an ongoing source to groundwater and surface water across the site if they come into contact with infiltrating water. However, it is noted that the ASLP testing procedure is more vigorous than natural conditions for soils and concrete. Therefore, the percentage of PFAS in leachate is likely to overestimate PFAS leachate occurring in natural conditions at the site.

It is also noteworthy that there is a linear relationship between soil concentration and leachate concentration in soil samples. This relationship is not as clear in sediments. This may reflect the more heterogeneous nature of the sediment where sorption sites may vary depending on the sediment particle types.

Table 7-1 Leachability calculation of soils, concrete and sediment

Sample ID	Sample matrix type	PFAS (sum of total) concentration		% PFAS in leachate	Average % leaching
		Leachate (mg/L)	Soils (mg/kg)		
MW01_0.22-0.32	Soil – gravelly sand (fill)	0.00148	0.0605	2.4%	
MW01_5.9-6.0	Soil – gravelly clay	0.00098	0.0449	2.2%	2.3%
MW02_Concrete	Concrete	0.0155	0.505	3.1%	
MW02_1.0-1.1	Soil - clay	0.00875	0.28	3.1%	3.1%
MW03_0.2-0.25	Soil – gravelly sand (fill)	0.00023	0.013	1.8%	
MW03_4.5-4.55	Soil – gravelly clay	0.00132	0.0255	5.2%	3.5%
MW04_0.0-0.19	Concrete	0.0367	0.946	3.9%	
MW04_0.2-0.25	Soil – clayey sand (fill)	0.0122	0.242	5.0%	
MW04_1.95-2.0	Soil - clay	0.00071	0.0172	4.1%	
MW04_6.95-7.0	Soil - clay	0.00005	0.0135	0.4%	3.4%
MW05_0.16-0.25	Soil – clayey gravel (fill)	0.0457	2.05	2.2%	
MW05_0.16-0.25 (QA02)		0.0499	1.81	2.8%	
MW05_4.0-4.05	Soil - clay	0.00168	0.0308	5.5%	3.5%
SB01_0.4-0.5	Soil - clay	0.00097	0.031	3.1%	3.1%
SS02	Sediment	0.125	8.9	1.4%	
SS02	Sediment	0.0492	5.86	0.8%	
SS02 (SSQA03)	Sediment	0.0557	0.831	6.7%	3.0%
SS03	Sediment	0.00648	6.83	0.1%	0.1%



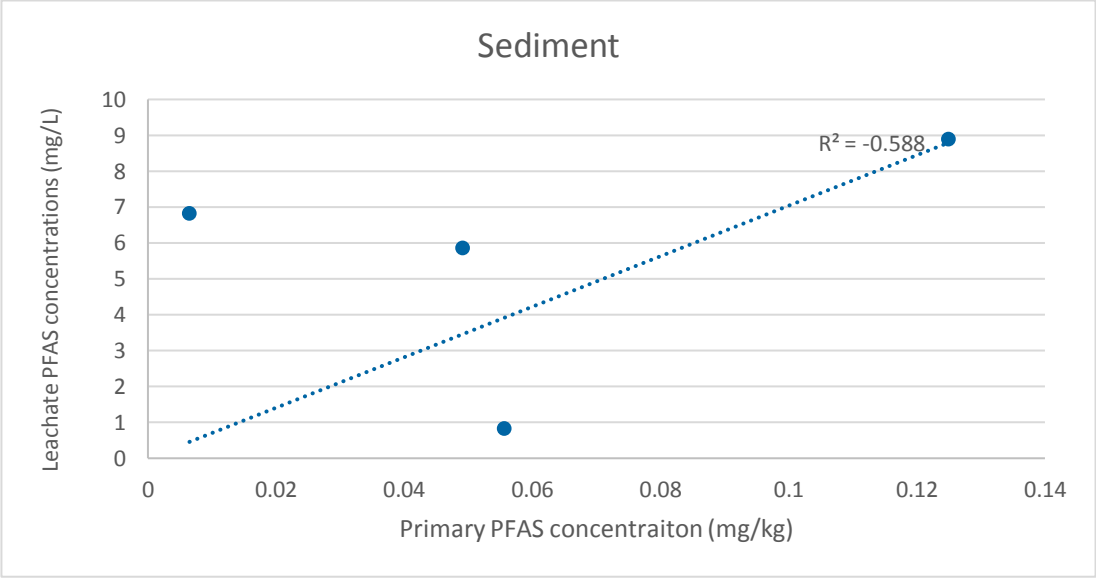


Chart 2. PFAS concentrations is soil and sediment compared to primary concentrations

7.1.2 Groundwater

Five groundwater wells were sampled as part of this phase of works. Groundwater contours indicated a somewhat complex groundwater flow pattern (Figure 4). The groundwater elevation at MW02 and MW05 is greater than that measured at MW03, MW01 and MW04, which appear as a channel between MW02 and MW05. This variation on site corresponds with current understanding of the site hydrogeology, as the shale aquifer is known to be highly variable on a local scale.

Additionally, the local groundwater flow may be impacted by the presence of deep underground structures close to the monitoring locations which would intersect the standing groundwater table, such as the surface water drainage channel through SW06/SW05 adjacent to MW01 (approximately 3 m deep) and the water retention pit for high-rise pumps (FW02) adjacent to MW04 (approximately 12 m deep).

The highest PFAS concentration was in MW01 which is located closest to the washdown bay and the main N-S surface drain.

PFAS was detected in groundwater on the site at concentrations greater than the adopted assessment criteria for the protection of drinking water and ecological receptors at MW01, MW03, and MW04. These exceedances are unlikely to represent a risk to human health and aquatic ecology based on the following lines of evidence:

- The site is surrounded by commercial land use with a mains water supply.
- The closest registered abstraction bores is 1.7 km north-east of the site.
- The closest likely groundwater receptor is Coxs Creek (1 km south-east) which is lined with concrete.
- The groundwater is brackish to saline, and is therefore not suitable for drinking water purposes.

However it is acknowledged that PFAS was detected at elevated concentrations in MW04, which is down gradient of the main source areas and located on the site boundary. Therefore further delineation of the groundwater down gradient of MW04 (i.e. off-site) would clarify the potential risk to ecological receptors in Coxs Creek and the extent of contamination off-site.

The concentration of PFAS remained the greatest at MW01 by an order of magnitude compared to the other groundwater monitoring locations, and is substantially elevated compared to the nominated assessment criteria. This could be a result of historic PFAS use on the site and/or current sources. The source of PFAS at MW01 is still unclear, however at least three options exist, of which multiple could be contributing as sources:

1. MW01 is located in close proximity to the surface water drainage channel. This channel is likely to receive water from across the ground surface from trucks arriving at the site for maintenance, including emptying tanks at the fire retention pit (photograph 3, Appendix F) and the water retention pit and its associated overflow infrastructure (as described in Section 6.6.1). Leaking of surface water from the drainage channel and the recycled water retention pit into the groundwater via cracks in the concrete could cause groundwater impact, especially when considering the possible historic sources of PFAS around this infrastructure. The drains and retention pit could act as a historic source, and/or a current source if water from the trucks still arriving on site is contaminated with PFAS.
2. The wash bay – trucks potentially containing PFAS from previous use arrive on site and are washed out in the wash bay. The water from here is assumed to go to the site interceptor via underground pipes and storage tanks. Leaks from the bay and its associated pipe/tank network may therefore be providing a route for contaminated water to enter the groundwater. Similarly to option 1, the wash bay could therefore act as a historic source, and/or a current source if water from the trucks arriving on site is still contaminated with PFAS.
3. An unidentified source of PFAS further up gradient. This would represent a historical source of PFAS, as PFAS is no longer used at the site.

Support for an interaction with a surface water source is provided by the fact that MW01 also reported the lowest salinity result (4020 mg/L TDS) compared to all other wells where TDS was in excess of 10,000 mg/L.

To better understand the source of PFAS in the groundwater on site, assessment of the underground pipe work and drainage channels could be conducted.

The concentration of PFAS (sum of total) at MW01 is noted to have decreased since the initial phase of works (GHD, 2017) by approximately 53% over two monitoring rounds. It is possible that this is due to PFAS at this location dispersing into the local aquifer or it is reflecting changes

in relative recharge in this area e.g. through changes in maintenance or truck washing schedules or rainfall.

7.1.3 Surface waters

PFAS has been detected at all surface water sampling locations across the site at concentrations greater than the adopted assessment criteria for the protection of drinking water and ecological receptors. Due to the commercial/industrial nature of the area (including the lack of registered abstraction bores) and the availability of mains water in the area, it is unlikely that there is a plausible drinking water receptor in the area surrounding and down-gradient of the site.

The surface water exceedances at all monitoring locations are unlikely to indicate an unacceptable risk to human health via ingestion. However, it is possible that there is a risk to aquatic ecological environments, as the surface water flows directly off-site via two different drainage systems to an unknown end zone.

The concentration of PFAS was noted to be elevated at SW02 and SW08. This corresponds to the elevated concentrations noted in the sediment from SS02. These two monitoring locations are connected via the drain through the main warehouse, and discharge to sewer via the site interceptor. Elevated concentrations of PFAS are therefore entering the sewer from the site. This may have implications for the site's trade waste agreement.

The source of elevated PFAS at SW02 is unclear and requires further assessment in order to determine possible future actions. This monitoring location is close to the area where AFFF was collected and stored prior to destruction. As noted in other areas of historic AFFF use, it is possible that the concrete around this location is contaminated and is acting as an ongoing source. Additionally and/or alternatively, trucks coming onto site may contain residues of PFAS from previous use which may be entering the drainage network while they are in the warehouse for maintenance.

PFAS was also detected in the stormwater drains along the eastern site boundary (SW03), and in the down gradient drain on north-eastern corner of the site (SW01), carrying surface water off-site. Additionally, SW05 was noted to have high concentrations of PFAS, and also drains off-site via the north-east corner (SW04 – not sampled in this investigation).

As discussed in Section 6.6.1, it is understood that the surface water drain flows under Wentworth Street and into the Enfield rail yards east of the site via a concrete lined storm water channel (photograph 9, photograph 10 and photograph 11, Appendix F), however the end point of this channel is unknown.

SW05 was observed to receive water from the retention pit (FW01) as it was emptied. The concentration of PFAS at FW01 is noted to be lower than that recorded at SW05. Trucks discharging their tanks to the ground surface at the retention pit, which flows to SW05, should be considered as an alternative source for the impact reported at SW05..

The concentration of PFAS in the above ground retention pit (FW01) was noted to be relatively low compared to the underground retention pit used for high-rise pumps (FW02). GHD understands that this deep pit (FW02) is not frequently used, however when it is used the pit would be emptied of water. The water in this pit exceeds the adopted ecological guidelines, and should therefore not be disposed of directly to the ground surface or drainage network.

8. Updated Conceptual site model

Based on the sampling analytical results, the preliminary CSM (GHD, 2016 and GHD, 2017) has been refined. The updated potential source-pathway-receptor linkages are summarised in Table 8-1, where the yellow shading indicates the updated linkages. Potential linkages involving non-PFAS COPC such as TRH, BTEX and PAHs have been removed from the table (refer to GHD, 2017).

Table 8-1 Updated CSM (updates to the links shown by yellow shading)

Potential source	Primary pathway	Receptor	Pathway links present?
Concrete ground surface (and subsequent impacted shallow soils) around the historic training area on the south-east portion of the site (SB01, MW05, MW03 and possibly MW01)	Dermal contact	FRNSW and wider training facility commercial workers	No – PFAS below adopted assessment criteria for commercial/industrial land use
		Intrusive maintenance workers	No – PFAS below adopted assessment criteria for commercial/industrial land use.
	Vertical/horizontal migration of leachate through unsaturated zone	Groundwater – subsequent migration in groundwater (secondary)	Possible – PFAS impact in groundwater however no source confirmed (further assessment required) and site hardstand would reduce the likelihood of leaching
	Surface runoff and sediment transport via drainage systems leading off site	Surface waters (including to commercial properties and ecological receptors)	Possible – PFAS reported above the adopted human health and ecological assessment criteria in surface water samples from drainage lines potentially associated with sediments. However, the source(s) of PFAS in surface water samples is to be confirmed. Considering the site surface is concrete, minimal movement of sediment from impacted soils is expected in surface water runoff. Additionally, the likelihood of adjacent commercial properties using water from the drainage system is low. Final destination of drainage systems is currently unknown, but may be connected to the local river systems (Coxs River and Cooks River).
Impacted sediment in main the warehouse and mechanical workshop (including PFAS storage areas)	Dermal contact and ingestion	FRNSW and wider training facility commercial workers	No – PFAS impact at SS02 was reported below adopted human health screening criteria.
	Leaching into surface waters. Flow through on site drainage systems (either as leachate or sediments)	Local sewage system and possible off-site receptors at point of discharge (ecological and human)	Possible – PFAS concentration at SW02 and SW08 greater than adopted drinking water and ecological assessment criteria. Final point of discharge unknown, however water from this source unlikely to be used for drinking water purposes.

Potential source	Primary pathway	Receptor	Pathway links present?
Wash bay between MW01 and MW02	Vertical/horizontal migration of leachate through unsaturated zone	Groundwater (via soil profile)	Possible – PFAS contamination detected in the groundwater and only up gradient source (base on inferred flow direction) is the wash bay.
Leaking drainage network and/or surface water retention pits	Vertical/horizontal migration of leachate through unsaturated zone	Groundwater	Possible – PFAS contamination detected in the groundwater and these areas may have acted as a historic source of PFAS.
Trucks containing PFAS from other sites or from historic use arriving at the site	Contaminated water flowing from the truck tanks as they are emptied prior to maintenance Waste water becoming contaminated after washing the trucks Sediments from the trucks	Surface water in on site drainage network (leading to possible human and ecological off-site receptors at point of discharge)	Possible – source of PFAS in surface waters was not confirmed. Further assessment of this possible source is required.
Contaminated groundwater (secondary source)	Vertical/horizontal migration	Down gradient surface waters recharged by groundwater	Possible – PFAS impact above adopted ecological assessment criteria at MW04 on the site boundary. No delineation of the potential extent of groundwater impact off-site. The full extent of contamination in groundwater and hydraulic connection to surface waters has not been investigated, however groundwater is unlikely to flow into the nearest surface water receptor (Coxs Creek) which is understood to be concrete lined.
		Abstraction bores (stock and/or domestic use)	No – closest registered abstraction bore is 1.7 km north-east (up gradient based on inferred groundwater flow direction) of the site.
		Intrusive maintenance workers on site	Unlikely – PFAS detected above drinking water assessment criterion however groundwater is greater than 2.5 m bgl and this assessment criterion does not represent the relevant exposure of maintenance workers.

9. Conclusions and recommendations

9.1 Conclusions

The overall objective of this investigation was to further delineate the PFAS impacts identified during the ESA completed by GHD between November 2016 and April 2017 (GHD, 2017), and to confirm surface water flow directions on the site. Based on the scope of works presented in Section 1.3 of this report and subject to the limitations presented in Section 11, the following conclusions are made:

- Laboratory analyses indicated the presence of PFAS in all media sampled (soils, sediment, concrete, leachate, surface water and groundwater) and a number of locations report concentrations above the relevant screening criteria for the protection of human health and/ or ecological receptors. This suggests PFAS contamination is widespread and may have multiple sources.
- Potential PFAS sources are likely to include historical storage and use of PFAS products (AFFF), legacy PFAS contamination in site infrastructure, hardstand surfaces and vehicles and secondary sources such as impacted soils, sediments and surface water.
- Impacted concrete, soil and sediments may continue to act as a source of PFAS to surface and groundwater receptors, however an ongoing source of PFAS may be present at the site.
- Elevated PFAS concentrations were reported in three on-site groundwater wells, one of which is located down hydraulic gradient of the remaining investigation locations and on the site boundary (MW04). The extent and source of this impact is not fully understood and further investigation is required to understand the extent of impact including off-site migration.
- Surface water samples collected from stormwater drains indicate PFAS impacted surface water is migrating off-site via the two drainage systems – to the north-east via storm water and to sewer via the site interceptor.

9.2 Recommendations

Based on the findings of these works, the following recommendations are made:

- FRNSW review the site licence conditions in respect of PFAS in surface water being discharged to sewer.
- Hydrocarbon odour was noted from the surface water sample collected at the site interceptor (SW08). This is expected given the source of water passing through this point is from the mechanics warehouse, however hydrocarbons were not included as part of the analysis at this monitoring location in this investigation (previously assessed at other sample points on site). FRNSW should confirm the hydrocarbon fractions in water discharging from the site via this monitoring location and compare results against their Sydney Water trade waste agreement.
- Further assessment to understand the possible sources of PFAS (current and historic) across the site, to allow the development of practical management options for the site. This would include:
  - Assessment of the vehicles arriving on site for potential residual PFAS contamination. Assessment of the trucks would address possible sources of PFAS to surface water in the main warehouse, surface water in the eastern stormwater drainage system, and in

groundwater via the fire retention pits/possible leaking pipes and/or the truck wash bay.

  - Further assessment of sediments in drains leading from potential sources i.e. main warehouse and washdown bay. The sediment analysis should include analysis for other contaminants associated with activities conducted in those source areas such as petroleum hydrocarbons, oils and metals.
  - Assessment of the concrete and shallow soils in the main warehouse around the former AFFF storage area prior to disposal, to assess whether the concrete is acting as an ongoing source of PFAS to the surface water drainage line in the main warehouse (SW02 and SW08).
  - Collection of surface water and sediment samples (if possible) from locations up-gradient of SW05 to assess the possible source of PFAS contamination in this drainage line.
  - CCTV assessment of pipes and the surface water drainage network to ascertain the quality of this existing network. This would indicate if the surface waters on site, known to be impacted with PFAS, could be a contributing source to the groundwater. Monitoring of the pipes and drainage network would also provide an indication of the volume of sediments in the network that could be acting as a source via leachate, and that could be transported off-site.
  - Installation and sampling of a new groundwater monitoring well up gradient of MW03, to delineate the extent of PFAS in groundwater on-site.
- Further assessment to understand the possible extent of PFAS off-site. This would include:
  - Installation and sampling of new groundwater monitoring wells off-site to the east to delineate the extent of impact detected in MW04.
  - Continued survey of the stormwater drainage system past Wentworth Street to determine the endpoint of discharge. Samples should be collected along the drainage line (if possible) and at the point of discharge to ascertain the possible extent of off-site impact and the possible receptors exposed.
- Consider possible immediate management actions which can be implemented on-site to restrict the flow of PFAS to off-site receptors. However, it should be noted that the source of PFAS on site should be confirmed and monitored as part of any management approach to ensure that short-term management actions remain effective. GHD recommends the following short term management practices are considered:
  - Sampling of truck foam and water tanks to assess levels of PFAS.
  - Update site management practices to ensure that the water from the deep retention pit on the eastern site boundary (FW02) is not disposed of to the ground surface and surface water drainage network when the location is emptied for pump testing. The water at the location exceeds the adopted ecological guidelines, and should therefore be collected and disposed of appropriately by a licenced contractor.
  - Development of an alternate system for the catchment/disposal of waste water from their fire trucks and the retention pits, rather than discharging the water directly off-site via the drainage network. This could include re-circulation of wastewater on site and/or changes to the use of water in site maintenance practices. Minimising the volume of water entering the current drainage network would prevent the site surface water acting as an on-going source of PFAS to possible aquatic environments down stream of the site.

- Additional sampling of groundwater, surface water and sediments to evaluate the effectiveness of any management actions implemented and to account for possible seasonal fluctuations/rainfall events to gain sufficient data to assess possible long term concentration trends.

10. References

AS4482 (1999 and 2005). Guide to the investigation and sampling of sites with potentially contaminated soil.

AS/NZS5567.11 (1998). Water Quality – Sampling – Guidance on the sampling of groundwater.

DoEE 2016. Draft Commonwealth Environmental Management Guidance on Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA). Australian Government Department of the Environment and Energy, October 2016.

DER (2016); Interim Guideline on the Assessment and Management of Perfluoroalkyl and *Polyfluoroalkyl Substances (PFAS), Contaminated Site Guidelines;* WA Department of Environment Regulations Perth, Western Australia.

GHD (2016) *Greenacre PFAS Investigation, Preliminary Site Investigation and Sampling and Analysis Quality Plan.* August 2016.

GHD (2017); Fire & Rescue NSW, *Greenacre Facility, Environmental Site Assessment*. March 2017.

Health 2017. *Release of Food Standards Australia New Zealand's (FSANZ) report on: Perfluorinated chemicals in food Supporting Information*. Australian Government Department of Health, 31 March 2017

National Health and Medical Research Council (NHMRC & NRMMC 2011) *Australian Drinking Water Guidelines*

National Uniform Drillers Licensing Committee (2011) *Minimum Construction Requirements for Water Bores in Australia* (Edition 3, 2012)

NEPC (2013) National *Environmental Protection (Assessment of Site Contamination) Amended Measure (NEPM) No. 1 – Schedule B1, Guideline on Investigation Levels for Soil and Groundwater*

NSW DEC, 2006; Contaminated Sites: Guidelines for NSW Site Auditor Scheme

NSW DECC, 2009; *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*

NSW EPA, 1995; Contaminated Sites: Sampling Design Guidelines

NSW EPA, 2017; Letter to FRNSW *RE: Fire and Rescue NSW Firefighting Training Sites – Albion Park, Armidale, Deniliquin and Greenacre*, dated March 2017.

Office of Environment and Heritage (OEH), 2011; Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites

OEH – Contaminants and Risk (C&R), 2017; *PFAS Screening Criteria*. May 2017.

US EPA, 2014; Emerging Contaminants – Perfluorooctane Sulfonate (PFOS) and *Perfluoroactanoic Acid (PFOA), Emerging Contaminants Fact Sheet – PFOS and PFOA*

US EPA, 2014a; Health Effects Document for Perfluorooctanoic Acid (PFOA); US EPA Washington DC, United States.

US EPA, 2014b; Health Effects Document for Perfluorooctane Sulfonate (PFOS); US EPA Washington DC, United States

11. Limitations

This report has been prepared by GHD for Fire & Rescue NSW and may only be used and relied on by Fire & Rescue NSW for the purpose agreed between GHD and the Fire & Rescue NSW as set out in this report.

GHD otherwise disclaims responsibility to any person other than Fire & Rescue NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

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

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

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described throughout this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Where data supplied by Fire & Rescue NSW or other external sources, including previous site investigation data and site plans, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by GHD for incomplete or inaccurate data supplied by others.

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

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

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

Appendices

Appendix A – Figures

LEGEND

- Site Boundary
- Streets
- Major Waterways
- Minor Waterways

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Greenacre Site Investigation

Job Number 21-25583
Revision A
Date 28 Jun 2017

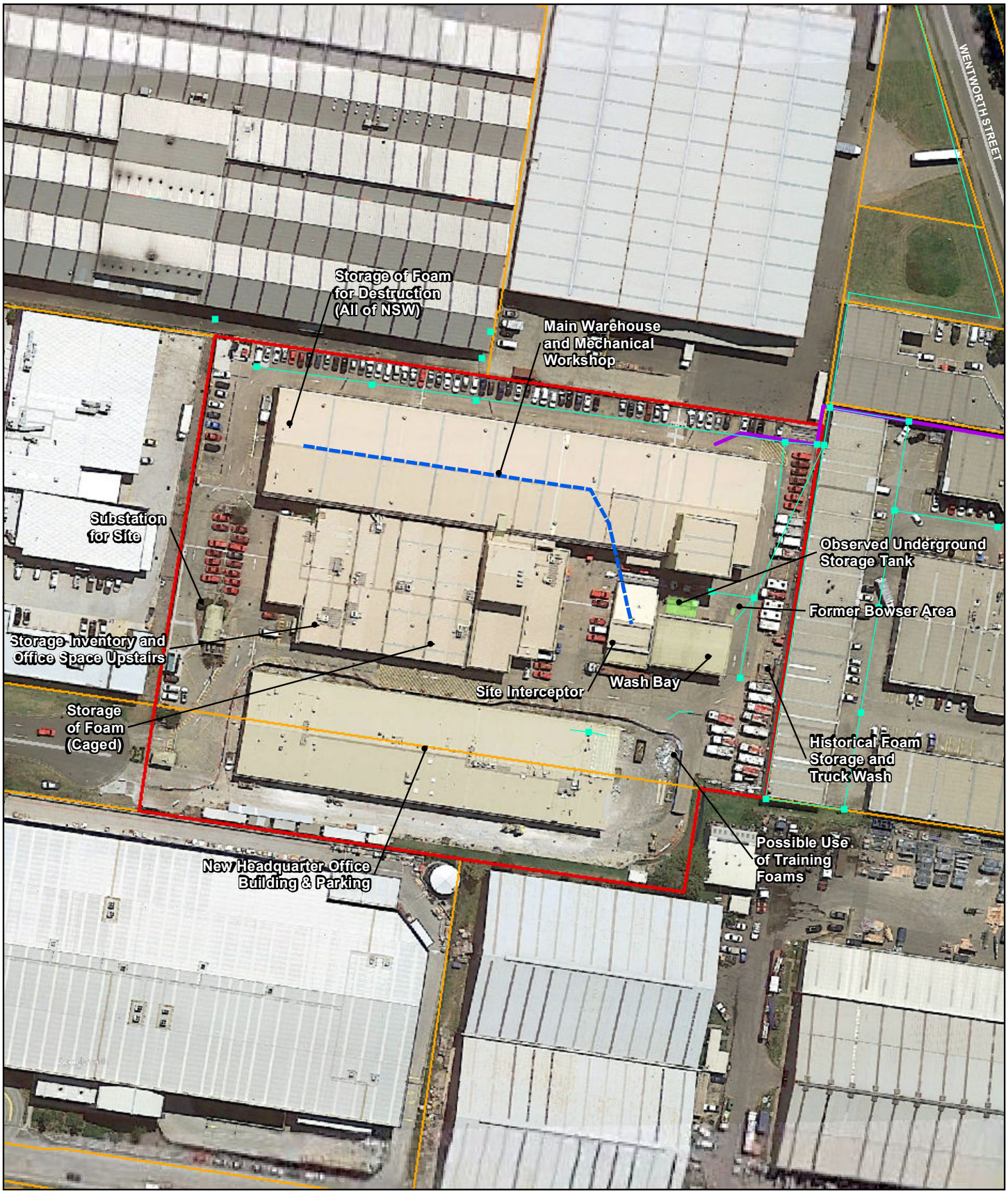
Site Location Plan

Figure 1

G:\21\25583\GIS\Maps\Deliverables\Greenacre\21_25583_Z001_Greenacre_SiteLocation.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - Google Earth Pro; Streets, Waterways - NSW LPI 2012 DTDB. Created by:tnham



LEGEND

- Site Boundary
- Cadastre
- Streets
- Storm Water Pits/Trenches
- Drainage Channel
- Surface Water Drainage Lines
- Gas Line

0 5 10 20 30 40 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Greenacre Site Investigation

Job Number 21-25583
Revision A
Date 28 Jun 2017

Site Layout

Figure 2

G:\21\25583\GIS\Maps\Deliverables\Greenacre\21_25583_Z002_Greenacre_SiteLayout.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - Google Earth Pro; Streets, Waterways - NSW LPI 2012 DTDB. Created by:tnham

LEGEND

- Site Boundary
- Sewer
- Drainage Channel
- Surface Water Drainage Lines
- Gas Line
- Storm Water Pits/Trenches
- Sewer Pits
- Not Monitored
- Groundwater Monitoring Well (GHD, 2016)
- Sediment Sample Location (GHD, 2016)
- Surface Water Sample Location (GHD, 2016)
- Recycled Fire Water Sample (GHD, 2016)

Paper Size A3

0 5 10 20 30

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Greenacre Site Investigation

Job Number	21-25583
Revision	A
Date	28 Jun 2017

Investigation Locations

Figure 3

G:\21\25583\GIS\Maps\Deliverables\Greenacre\21_25583_Z008_Greenacre_Phase2_InvestigationLocations.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 28/06/17); Streets, Waterways - NSW LPI 2012 DTDB. Created by:tnham

LEGEND

- Site Boundary
- Sewer
- Drainage Channel
- Surface Water Drainage Lines
- Gas Line
- Storm Water Pits/Trenches
- Sewer Pits
- Not Monitored
- Groundwater Elevation Contours (mAHD)
- Groundwater Monitoring Well (GHD, 2016)
- Sediment Sample Location (GHD, 2016)
- Surface Water Sample Location (GHD, 2016)
- Recycled Fire Water Sample (GHD, 2016)

Paper Size A3

0 1 2 4 6 8 10

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Greenacre Site Investigation

Job Number 21-25583
Revision A
Date 28 Jun 2017

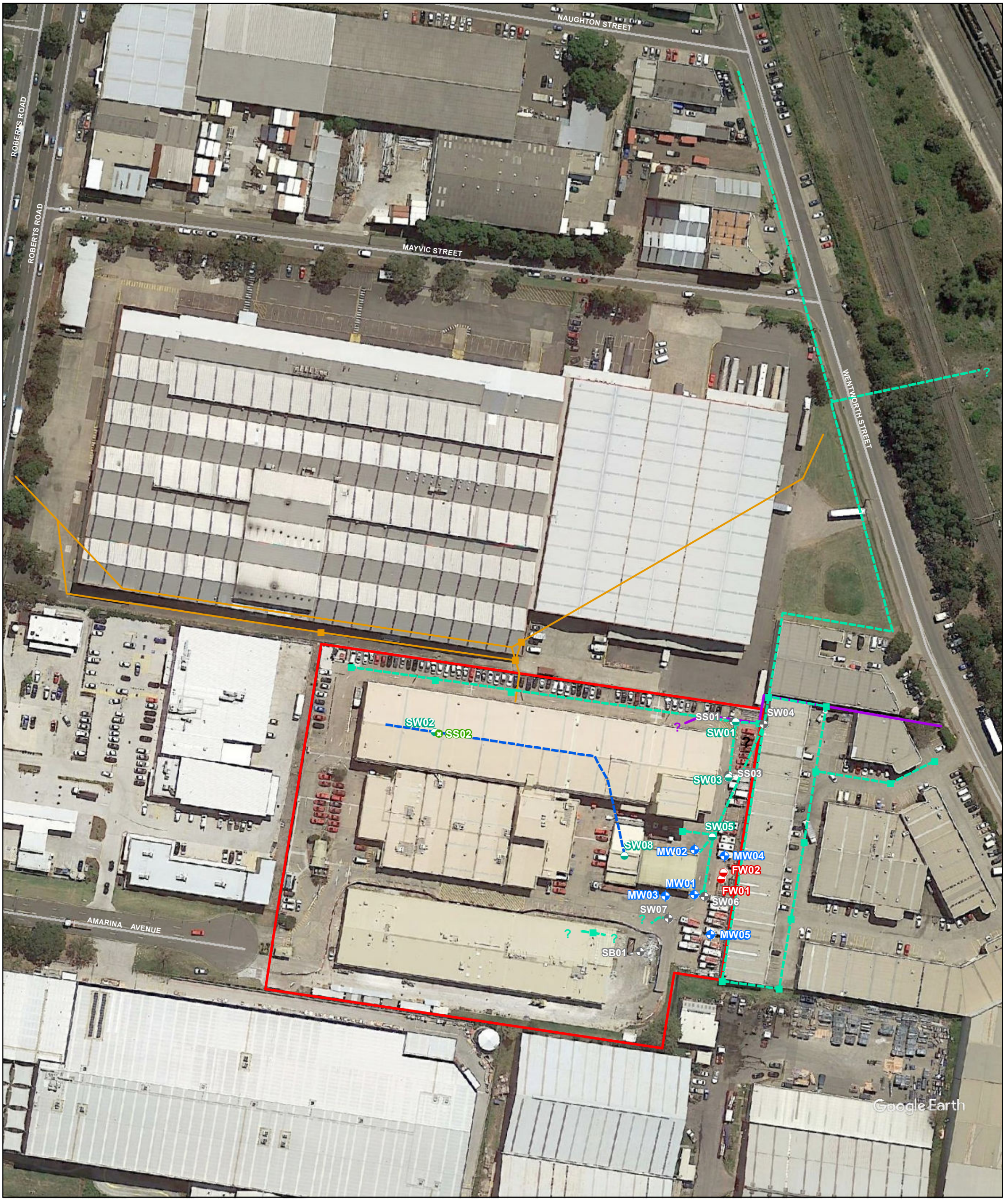
Groundwater Contours

Figure 4

G:\21\25583\GIS\Maps\Deliverables\Greenacre\21_25583_Z010_Greenacre_GroundwaterElevationContours.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 28/06/17); Streets, Waterways - NSW LPI 2012 DTDB. Created by:tnham



LEGEND

- Site Boundary
- Sewer
- Drainage Channel
- Surface Water Drainage Lines
- Gas Line
- Storm Water Pits/Trenches
- Sewer Pits
- Not Monitored
- Groundwater Monitoring Well (GHD, 2016)
- Sediment Sample Location (GHD, 2016)
- Surface Water Sample Location (GHD, 2016)
- Recycled Fire Water Sample (GHD, 2016)

Paper Size A3

0 10 20 40 60

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Fire & Rescue NSW
Greenacre Site Investigation

Surface Water Drainage and Utility Services

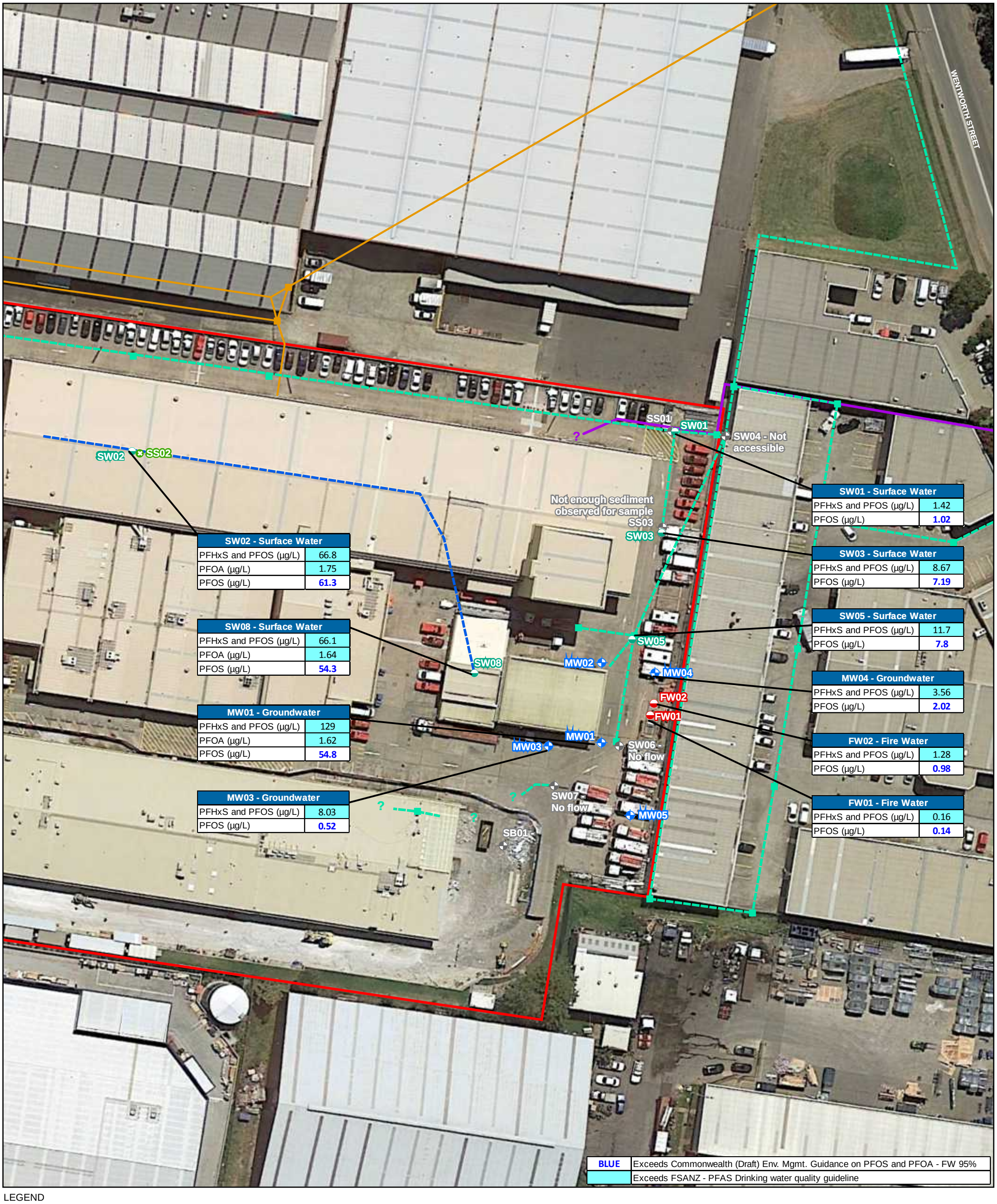
Job Number 21-25583
Revision A
Date 28 Jun 2017

Figure 5

G:\21\25583\GIS\Maps\Deliverables\Greenacre\21_25583_Z009_Greenacre_SurfaceWaterDrainageandServices.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 28/06/17); Streets, Waterways - NSW LPI 2012 DTDB. Created by:tnham



LEGEND

- Site Boundary
- Sewer
- Drainage Channel
- Surface Water Drainage Lines
- Gas Line
- Storm Water Pits/Trenches
- Sewer Pits
- Not Monitored
- Groundwater Monitoring Well (GHD, 2017)
- Sediment Sample Location (GHD, 2017)
- Surface Water Sample Location (GHD, 2017)
- Recycled Fire Water Sample (GHD, 2017)

Paper Size A3

0 5 10 20 30

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Greenacre Site Investigation

Job Number 21-25583
Revision A
Date 28 Jun 2017

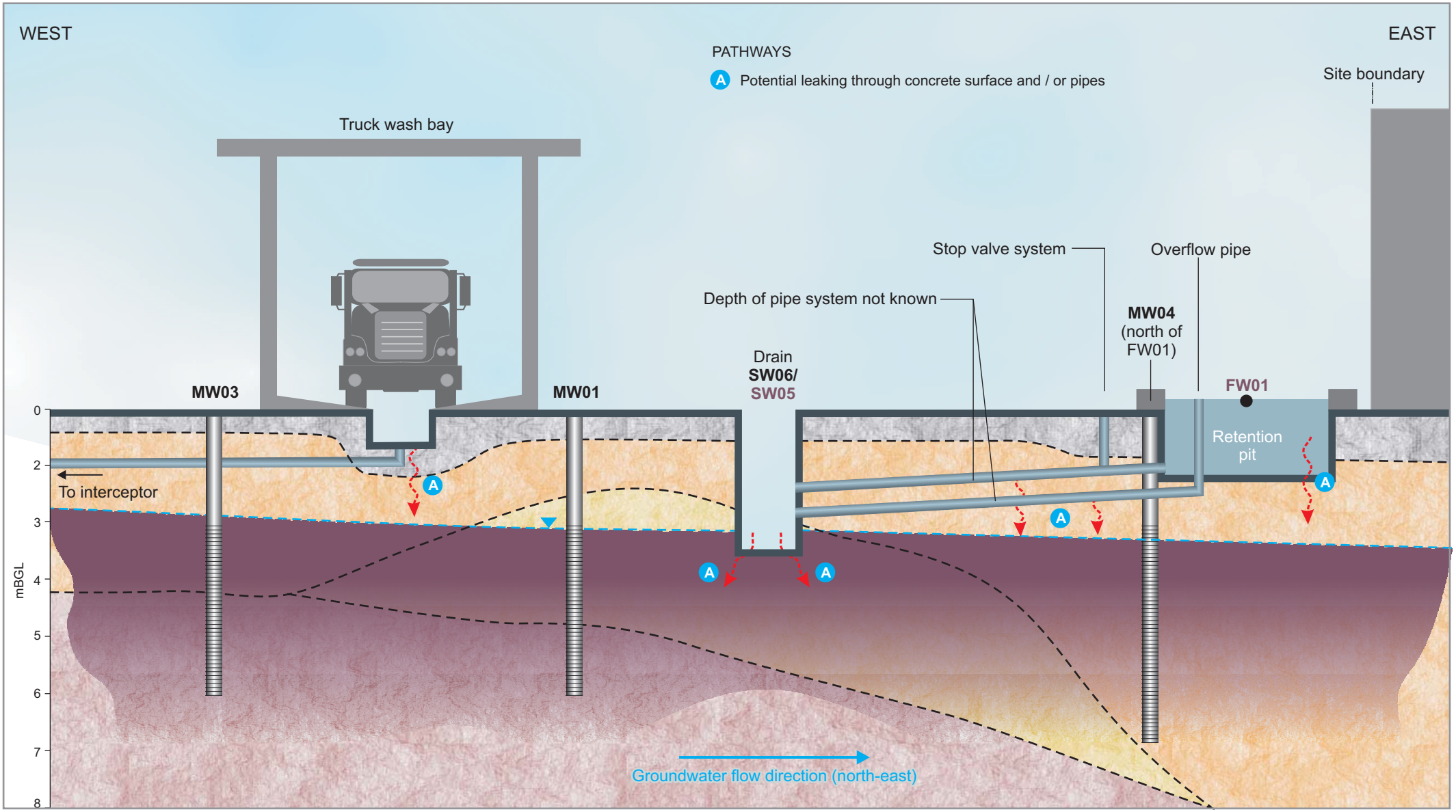
Water Exceedances

Figure 6

G:\21\25583\GIS\Maps\Deliverables\Greenacre\21_25583_Z011_Greenacre_WaterExceedances_May2017.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 28/06/17); Streets, Waterways - NSW LPI 2012 DTDB. Created by:tnham



Conceptual diagram only - scale is approximate

LEGEND

- Fill
- Sandy clay, clayey sand
- Gravelly sand
- Gravelly clay
- PFAS impact
- Groundwater table
- Potential leaking through concrete surface and/or pipes

Fire & Rescue NSW
Greenacre Fleet Management Unit
ESA Phase 2

Cross Section (West-East)

Job Number	21-25583
Revision	0
Date	7 Jul 2017

Figure 7

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

Appendix B – Analytical results summary tables

Appendix B
Table A
Soil and sediment analytical results

				TOC	PFAS																																		
				Total Organic Carbon	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
				%	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	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.02	0.0002	0.0002	0.0002	0.0005	0.0005	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0002	0.0002	0.0002
OEH/NSW Health 2017 Commercial/Industrial											20											100																
Field_ID	Location_Code	Sample_Depth_Range	Sampled_Date_Time																																				
MW01_0.22-0.32	MW01	0.22-0.32	19/12/2016	-	<0.0002	0.0009	0.0008	0.001	<0.0005	<0.0002	0.0249	0.0005	0.005	0.0035	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0202	0.0014	0.0005	<0.001	<0.0002	0.0002	0.0009	0.0049	<0.0002	0.0199	0.0004	<0.0005	0.0004	<0.0002	0.0605	0.0563
MW01_5.9-6.0	MW01	5.9-6	19/12/2016	-	<0.0002	<0.0002	0.0009	<0.0005	<0.0005	<0.0002	0.0335	0.002	0.0203	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0014	0.0013	<0.001	<0.0002	<0.0002	0.0003	0.0047	<0.0002	0.0132	<0.0002	<0.0005	<0.0002	<0.0002	0.0449	0.0427
QA04	MW01	5.9-6	19/12/2016	-	<0.0002	<0.0002	0.0011	<0.0005	<0.0005	<0.0002	0.0332	0.0023	0.0221	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0017	0.0015	<0.001	<0.0002	<0.0002	<0.0002	0.005	<0.0002	0.0111	<0.0002	<0.0005	<0.0002	<0.0002	0.0457	0.0431
MW02_1.0-1.1	MW02	1-1.1	19/12/2016	-	<0.0002	<0.0002	0.0101	<0.0005	<0.0005	<0.0002	0.24	0.0043	0.0445	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0028	0.0072	0.0044	<0.001	<0.0002	<0.0002	0.0024	0.0062	<0.0002	0.196	<0.0002	<0.0005	<0.0002	<0.0002	0.28	0.265
MW02_6.9-7.0	MW02	6.9-7	19/12/2016	-	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0063	0.0003	0.0021	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0003	0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0005	<0.0002	0.0042	<0.0002	<0.0005	<0.0002	<0.0002	0.0076	0.0074
QA02	MW02	6.9-7	19/12/2016	-	-	<0.005	-	-	<0.005	-	-	<0.005	<0.005	<0.005	<0.005	<0.01	-	<0.01	-	<0.01	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	-	-
MW03_0.2-0.25	MW03	0.2-0.25	11/05/2017	0.11	<0.0002	0.0011	<0.0002	<0.0005	<0.0005	<0.0002	0.0112	<0.0002	0.0008	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	0.0002	<0.0002	0.0005	<0.0002	0.0104	<0.0002	<0.0005	<0.0002	<0.0002	0.013	0.0117
MW03_4.5-4.55	MW03	4.5-4.55	11/05/2017	0.12	<0.0002	<0.0002	0.001	<0.0005	<0.0005	<0.0002	0.0197	0.0011	0.0061	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0007	0.0008	<0.001	<0.0002	<0.0002	0.0003	0.0019	<0.0002	0.0136	<0.0002	<0.0005	<0.0002	<0.0002	0.0255	0.0237
MW04_0.2-0.25	MW04	0.2-0.25	11/05/2017	0.17	<0.0002	<0.0002	0.0045	<0.0005	<0.0005	<0.0002	0.218	0.0036	0.0166	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0031	0.0032	<0.001	<0.0002	<0.0002	0.0012	0.0078	<0.0002	0.201	<0.0002	<0.0005	<0.0002	<0.0002	0.242	0.234
MW04_1.95-2.0	MW04	1.95-2	11/05/2017	0.09	<0.0002	<0.0002	0.0007	<0.0005	<0.0005	<0.0002	0.0097	0.002	0.0077	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	0.0016	<0.001	<0.0002	<0.0002	<0.0002	0.0004	0.0022	<0.0002	0.002	<0.0002	<0.0005	<0.0002	<0.0002	0.0172	0.0149
MW04_6.95-7.0	MW04	6.95-7	11/05/2017	0.51	<0.0002	<0.0002	0.0004	<0.0005	<0.0005	<0.0002	0.0118	0.0003	0.0015	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0002	0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0006	<0.0002	0.0103	<0.0002	<0.0005	<0.0002	<0.0002	0.0135	0.0129
MW05_0.16-0.25	MW05	0.16-0.25	12/05/2017	0.77	<0.0002	0.0044	0.051	<0.0005	<0.0005	<0.0002	1.9	0.0107	0.555	0.0032	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0166	0.0141	0.002	<0.0002	<0.0002	0.0028	0.0379	0.0002	1.35	0.0009	<0.0005	<0.0002	<0.0002	2.05	1.98
QA02	MW05	0.16-0.25	12/05/2017	0.94	<0.0002	0.0035	0.0402	<0.0005	<0.0005	<0.0002	1.7	0.0086	0.489	0.0023	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0138	0.0112	0.002	<0.0002	<0.0002	0.0024	0.0288	<0.0002	1.21	0.0008	<0.0005	<0.0002	<0.0002	1.81	1.76
MW05_4.0-4.05	MW05	4-4.05	12/05/2017	0.06	<0.0002	<0.0002	0.0008	<0.0005	<0.0005	<0.0002	0.0248	0.0008	0.0085	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.0006	<0.001	<0.0002	<0.0002	<0.0002	0.0003	0.003	<0.0002	0.0163	<0.0002	<0.0005	<0.0002	<0.0002	0.0308	0.0294
SB01_0.4-0.5	SB01	0.4-0.5	19/12/2016	-	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0231	0.0007	0.0067	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.003	0.0003	0.0003	<0.001	<0.0002	<0.0002	<0.0002	0.0025	<0.0002	0.0164	<0.0002	<0.0005	<0.0002	<0.0002	0.031	0.0307
SB01_4.9-5.0	SB01	4.9-5	19/12/2016	-	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0064	0.0014	0.0054	0.0004	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0003	0.0008	<0.001	<0.0002	<0.0002	<0.0002	0.0015	<0.0002	0.001	<0.0002	<0.0005	<0.0002	<0.0002	0.0108	0.01
SS02	SS02		20/12/2016	-	0.0017	0.0213	0.0882	0.0368	<0.0005	0.0017	7.91	0.0077	0.321	0.0056	0.22	<0.0005	<0.0005	<0.0005	<0.0005	0.319	0.137	0.0182	<0.001	0.002	0.0009	0.0278	0.0947	0.0006	7.59	0.0092	<0.0005	<0.0002	<0.0002	8.9	8.72
SS02	SS02		24/05/2017	3.98	0.0021	0.0233	0.0471	0.0366	<0.0005	0.0025	5.06	0.0049	0.102	<0.0002	0.37	<0.0005	<0.0005	<0.0005	<0.0005	0.228	0.0335	0.0114	<0.001	0.0023	0.0005	0.0068	0.0189	0.0009	4.96	0.0112	<0.0005	<0.0002	0.001	5.86	5.72
SSQA03	SS02		24/05/2017	3.67	0.002	0.0265	0.045	0.0392	<0.0005	0.0024	5.92	0.0014	0.0825	<0.0002	0.424	<0.0005	<0.0005	<0.0005	<0.0005	0.29	0.0331	0.0049	<0.001	0.0026	0.0007	0.0067	0.0167	0.0012	5.84	0.0142	<0.0005	<0.0002	0.0008	6.83	6.69
SS03	SS03		20/12/2016	-	0.0016	0.0064	0.0051	0.0208	<0.0005	0.001	0.64	0.0035	0.0379	0.0037	0.0658	<0.0005	<0.0005	<0.0005	<0.0005	0.0468	0.0098	0.0031	<0.001	0.001	0.0004	0.0036	0.0115	0.0005	0.602	0.0066	<0.0005	<0.0002	0.0002	0.831	0.785
Quality Assurance/Quality Control																																						
TRIP BLANK			24/05/2017	-	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
TRIPBLANK			11/05/2017	-	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
RB01	water sample (ug/L)		11/05/2017	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
RB02	water sample (ug/L)		12/05/2017	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
Duplicate Samples																																						
MW05_0.16-0.25	MW05	0.16-0.25	12/05/2017	0.77	<0.0002	0.0044	0.051	<0.0005	<0.0005	<0.0002	1.9	0.0107	0.555	0.0032	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0166	0.0141	0.002	<0.0002	<0.0002	0.0028	0.0379	0.0002	1.35	0.0009	<0.0005	<0.0002	<0.0002	2.05	1.98
QA02	MW05	0.16-0.25	12/05/2017	0.94	<0.0002	0.0035	0.0402	<0.0005	<0.0005	<0.0002	1.7	0.0086	0.489	0.0023	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0138	0.0112	0.002	<0.0002	<0.0002	0.0024	0.0288	<0.0002	1.21	0.0008	<0.0005	<0.0002	<0.0002	1.81	1.76
RPD(%)				*20*	*NC*	*23*	*24*	*NC*	*NC*	*NC*	*11*	*22*	*13*	*33*	*NC*	*NC*	*NC*	*NC*	*NC*	*NC*	*18*	*23*	*0*	*NC*	*NC*	*15*	*27*	*0*	*11*	*12*	*NC*	*NC*	*NC*	*12*	*12*
SS02	SS02		24/05/2017	3.98	0.0021	0.0233	0.0471	0.0366	<0.0005	0.0025	5.06	0.0049	0.102	<0.0002	0.37	<0.0005	<0.0005	<0.0005	<0.0005	0.228	0.0335	0.0114	<0.001	0.0023	0.0005	0.0068	0.0189	0.0009	4.96	0.0112	<0.0005	<0.0002	0.001	5.86	5.72
SSQA03	SS02		24/05/2017	3.67	0.002	0.0265	0.045	0.0392	<0.0005	0.0024	5.92	0.0014	0.0825	<0.0002	0.424	<0.0005	<0.0005	<0.0005	<0.0005	0.29	0.0331	0.0049	<0.001	0.0026	0.0007	0.0067	0.0167	0.0012	5.84	0.0142	<0.0005	<0.0002	0.0008	6.83	6.69
RPD(%)				*8*	*5*	*13*	*5*	*7*	*NC*	*4*	*16*	*111*	*21*	*NC*	*14*	*NC*	*NC*	*NC*	*NC*	*24*	*1*	*80*	*NC*	*12*	*33*	*1*	*12*	*29*	*16*	*24*	*NC*	*NC*	*22*	*15*	*16*

	RPD exceeds nominal threshold of 30% for inorganics and 50% for organics
NC	RPD not calculated as both the primary and the duplicate sample were below the PQL

Where one of either the primary or duplicate sample was recorded below the laboratory PQL, the PQL was adopted to calculate the RPD

Appendix B
Table B
ASLP analytical results

					PFAS																				
					N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.02	0.02	0.02	0.05	0.05	0.02	0.01	0.02	0.02	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02
Field_ID	Location_Code	Sample_Depth_Range	Sampled_Date_Time	Matrix_Type																								
MW02_Concrete	MW02		19/12/2016	concrete ASLP	<0.02	<0.02	0.27	<0.05	<0.05	<0.02	10.4	1.22	4.03	0.28	<0.05	<0.05	<0.05	<0.05	<0.05	1.01	0.33	0.62	<0.1	<0.02	<0.02	0.1	1.22	<0.02
MW04_0.0-0.19	MW04	0-0.19	11/05/2017	concrete ASLP	<0.02	<0.02	0.19	<0.05	<0.05	<0.02	24.5	3.83	5.61	0.76	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	0.49	3	0.4	<0.02	<0.02	0.26	3.21	<0.02
MW01_0.22-0.32	MW01	0.22-0.32	19/12/2016	soil ASLP	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.87	0.02	0.26	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	0.19	0.05	<0.02	<0.1	<0.02	<0.02	0.02	0.23	<0.02
MW01_5.9-6.0	MW01	5.9-6	19/12/2016	soil ASLP	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.4	0.07	0.36	0.03	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.02	0.04	<0.1	<0.02	<0.02	<0.02	0.12	<0.02
MW01_5.9-6.0	MW01	5.9-6	19/12/2016	soil ASLP	<0.02	<0.02	0.03	<0.05	<0.05	<0.02	0.66	0.07	0.44	0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.02	0.04	<0.1	<0.02	<0.02	<0.02	0.12	<0.02
MW02_1.0-1.1	MW02	1-1.1	19/12/2016	soil ASLP	<0.02	<0.02	0.3	<0.05	<0.05	<0.02	7.65	0.22	1.63	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	0.16	<0.1	<0.02	<0.02	0.03	0.22	<0.02
MW02_1.0-1.1	MW02	1-1.1	19/12/2016	soil ASLP	<0.02	<0.02	0.15	<0.05	<0.05	<0.02	4.26	0.08	0.75	0.03	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	0.06	<0.1	<0.02	<0.02	<0.02	0.08	<0.02
MW03_0.2-0.25	MW03	0.2-0.25	11/05/2017	soil ASLP	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.17	<0.02	<0.02	<0.02	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02
MW03_4.5-4.55	MW03	4.5-4.55	11/05/2017	soil ASLP	<0.02	<0.02	0.04	<0.05	<0.05	<0.02	1.11	0.04	0.4	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.02	0.04	<0.1	<0.02	<0.02	<0.02	0.07	<0.02
MW04_0.2-0.25	MW04	0.2-0.25	11/05/2017	soil ASLP	<0.02	<0.02	0.21	<0.05	<0.05	<0.02	11.2	0.14	1.13	0.03	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	0.14	<0.1	<0.02	<0.02	0.04	0.25	<0.02
MW04_1.95-2.0	MW04	1.95-2	11/05/2017	soil ASLP	<0.02	<0.02	0.02	<0.05	<0.05	<0.02	0.51	0.06	0.43	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.06	<0.1	<0.02	<0.02	<0.02	0.06	<0.02
MW04_6.95-7.0	MW04	6.95-7	11/05/2017	soil ASLP	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.05	<0.02	0.03	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02
MW05_0.16-0.25	MW05	0.16-0.25	12/05/2017	soil ASLP	<0.02	<0.02	1.3	<0.05	<0.05	<0.02	40.9	0.36	16.1	0.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.55	0.44	<0.1	<0.02	<0.02	0.14	1.7	<0.02
QA02	MW05	0.16-0.25	12/05/2017	soil ASLP	<0.02	<0.02	1.34	<0.05	<0.05	<0.02	45	0.35	17.6	0.29	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.59	0.43	<0.1	<0.02	<0.02	0.14	1.72	<0.02
MW05_4.0-4.05	MW05	4-4.05	12/05/2017	soil ASLP	<0.02	<0.02	0.03	<0.05	<0.05	<0.02	1.45	0.04	0.63	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.01	0.02	<0.1	<0.02	<0.02	<0.02	0.13	<0.02
SB01_0.4-0.5	SB01	0.4-0.5	19/12/2016	soil ASLP	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.77	0.03	0.2	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	0.02	<0.1	<0.02	<0.02	<0.02	0.09	<0.02
SS02	SS02		20/12/2016	sediment ASLP	<0.02	0.09	1.54	0.2	<0.05	<0.02	77.6	0.42	6.3	0.47	5.32	<0.05	<0.05	<0.05	<0.05	34.6	1.72	0.47	<0.1	<0.02	<0.02	0.3	1.72	0.08
SS02	SS02		24/05/2017	sediment ASLP	<0.02	0.1	0.46	<0.05	<0.05	<0.02	40.7	<0.02	0.73	<0.02	3.18	<0.05	<0.05	<0.05	<0.05	3.85	0.33	0.04	<0.1	<0.02	<0.02	0.06	0.19	0.03
SS03	SS03		20/12/2016	sediment ASLP	<0.02	<0.02	0.05	<0.05	<0.05	<0.02	5.09	<0.02	0.27	0.04	0.58	<0.05	<0.05	<0.05	<0.05	0.52	0.04	<0.02	<0.1	<0.02	<0.02	<0.02	0.07	<0.02
SSQA03	SS02		24/05/2017	sediment ASLP	<0.02	0.11	0.45	<0.05	<0.05	<0.02	46.4	<0.02	0.78	<0.02	3.77	<0.05	<0.05	<0.05	<0.05	4.2	0.33	0.04	<0.1	<0.02	<0.02	0.06	0.18	0.03

latest data
Env Stds Comments

Appendix B
Table B
ASLP analytical results

					Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.01	0.02	0.05	0.02	0.02	0.01	0.01
Field_ID	Location_Code	Sample_Depth_Range	Sampled_Date_Time	Matrix_Type							
MW02_Concrete	MW02		19/12/2016	concrete ASLP	6.4	<0.02	<0.05	<0.02	<0.02	15.5	14.6
MW04_0.0-0.19	MW04	0-0.19	11/05/2017	concrete ASLP	18.9	0.02	<0.05	<0.02	<0.02	36.7	33.5
MW01_0.22-0.32	MW01	0.22-0.32	19/12/2016	soil ASLP	0.61	<0.02	<0.05	<0.02	<0.02	1.48	1.48
MW01_5.9-6.0	MW01	5.9-6	19/12/2016	soil ASLP	0.04	<0.02	<0.05	<0.02	<0.02	0.68	0.64
MW01_5.9-6.0	MW01	5.9-6	19/12/2016	soil ASLP	0.22	<0.02	<0.05	<0.02	<0.02	0.98	0.91
MW02_1.0-1.1	MW02	1-1.1	19/12/2016	soil ASLP	6.02	<0.02	<0.05	<0.02	<0.02	8.75	8.29
MW02_1.0-1.1	MW02	1-1.1	19/12/2016	soil ASLP	3.51	<0.02	<0.05	<0.02	<0.02	4.73	4.52
MW03_0.2-0.25	MW03	0.2-0.25	11/05/2017	soil ASLP	0.17	<0.02	<0.05	<0.02	<0.02	0.23	0.17
MW03_4.5-4.55	MW03	4.5-4.55	11/05/2017	soil ASLP	0.71	<0.02	<0.05	<0.02	<0.02	1.32	1.24
MW04_0.2-0.25	MW04	0.2-0.25	11/05/2017	soil ASLP	10.1	<0.02	<0.05	<0.02	<0.02	12.2	11.8
MW04_1.95-2.0	MW04	1.95-2	11/05/2017	soil ASLP	0.08	<0.02	<0.05	<0.02	<0.02	0.71	0.63
MW04_6.95-7.0	MW04	6.95-7	11/05/2017	soil ASLP	0.02	<0.02	<0.05	<0.02	<0.02	0.05	0.05
MW05_0.16-0.25	MW05	0.16-0.25	12/05/2017	soil ASLP	24.8	<0.02	<0.05	<0.02	<0.02	45.7	44
QA02	MW05	0.16-0.25	12/05/2017	soil ASLP	27.4	<0.02	<0.05	<0.02	<0.02	49.9	48.1
MW05_4.0-4.05	MW05	4-4.05	12/05/2017	soil ASLP	0.82	<0.02	<0.05	<0.02	<0.02	1.68	1.63
SB01_0.4-0.5	SB01	0.4-0.5	19/12/2016	soil ASLP	0.57	<0.02	<0.05	<0.02	<0.02	0.97	0.95
SS02	SS02		20/12/2016	sediment ASLP	71.3	0.12	<0.05	<0.02	<0.02	125	122
SS02	SS02		24/05/2017	sediment ASLP	40	0.18	<0.05	<0.02	<0.02	49.2	48.3
SS03	SS03		20/12/2016	sediment ASLP	4.82	0.09	<0.05	<0.02	<0.02	6.48	6.34
SSQA03	SS02		24/05/2017	sediment ASLP	45.6	0.18	<0.05	<0.02	<0.02	55.7	54.9

latest data
Env Stds Comments

Appendix B
Table C
Concrete sample analytical results

				TOC	Inorganics		PFAS																										
				Total Organic Carbon	pH (Final)	Moisture	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid
				%	pH 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
EQL				0.02	0.1	1	0.0002	0.0002	0.0002	0.0005	0.0005	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005
Field_ID	Location_Code	Sample_Depth_Range	Sampled_Date_Time																														
MW02_Concrete	MW02		19/12/2016	-	11.9	4.1	<0.0002	<0.0002	0.0095	<0.0005	<0.0005	<0.0002	0.346	0.0346	0.106	0.0121	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0222	0.0115	0.0186	<0.001	<0.0002	<0.0002	0.0068	0.0428	0.0006	0.24	0.0007	<0.0005
MW04_0.0-0.19	MW04	0-0.19	11/05/2017	0.2	11.8	5	<0.0005	<0.0005	0.0123	<0.0005	<0.0005	<0.0005	0.648	0.0764	0.156	0.0218	<0.0005	<0.0012	<0.0012	<0.0012	<0.0012	0.001	0.0139	0.0402	0.02	<0.0005	<0.0005	0.0088	0.104	<0.0005	0.492	<0.0005	<0.0012
SB01_Concrete	SB01		19/12/2016	-	-	6.1	<0.0002	<0.0002	0.0012	<0.0005	<0.0005	<0.0002	0.0615	0.0311	0.0458	0.0076	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0214	0.0034	0.0145	<0.001	<0.0002	<0.0002	0.0049	0.0334	0.0006	0.0157	<0.0002	<0.0005

Appendix B
Table C
Concrete sample analytical results

				Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
				mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.0002	0.0002	0.0002	0.0002
Field_ID	Location_Code	Sample_Depth_Range	Sampled_Date_Time				
MW02_Concrete	MW02		19/12/2016	<0.0002	<0.0002	0.505	0.476
MW04_0.0-0.19	MW04	0-0.19	11/05/2017	<0.0005	<0.0005	0.946	0.894
SB01_Concrete	SB01		19/12/2016	<0.0002	<0.0002	0.18	0.163

Appendix B
Table D
Groundwater and surface water analytical results

Field_ID	Location_Code	Sampled_Date_Time	Field Parameters: DO (mg/L) (Field)	Electrical conductivity (field)	pH (Field)	Redox (Field)	Temperature (Field)	Inorganics: pH (Lab)	Total Dissolved Solids (Filtered)	Total Suspended Solids	PFAS: N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
			mg/L	µS/cm	pH Units	mV	°C	pH Units	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL								0.01	10	5	0.02	0.02	0.02	0.05	0.05	0.02	0.01	0.02	0.02	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01	0.01
Commonwealth (Draft) Env. Mgmt. Guidance on PFOS and PFOA - FW 95%																											220								0.13						
FSANZ - PFAS Drinking water quality guideline																	0.07										0.56														
Field_ID	Location_Code	Sampled_Date_Time																																							
MW01	MW01	12/01/2017	0.96	5488	6.83	73.8	25	7.63	3550	-	<0.02	<0.02	7.05	<0.05	<0.05	<0.02	236	9.96	145	3.66	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	5.24	9.86	1.9	<0.02	<0.02	2.15	16.9	<0.02	90.8	<0.02	<0.05	<0.02	<0.02	293	276
Repeat test 1	MW01	12/01/2017	-	-	-	-	-	-	-	-	<0.02	<0.02	8.23	<0.05	<0.05	<0.02	-	11.19	114.37	4.11	<0.05	<0.05	<0.05	<0.05	<0.05	0.2	6.46	10.34	2.5	<0.02	<0.02	2.75	18.2	<0.02	77.55	<0.02	<0.05	<0.02	<0.02	-	-
Repeat test 2	MW01	12/01/2017	-	-	-	-	-	-	-	-	<0.02	<0.02	7.52	<0.05	<0.05	<0.02	-	10.75	107.58	3.71	<0.05	<0.05	<0.05	<0.05	<0.05	0.16	5.75	9.26	2.25	<0.02	<0.02	2.45	19.1	<0.02	71.02	<0.02	<0.05	<0.02	<0.02	-	-
MW01	MW01	18/04/2017	2.01	10,936	6.54	418.3	23.3	-	-	-	<0.02	<0.02	6.3	<0.05	<0.05	<0.02	142	5.94	69.4	1.34	<0.05	<0.05	<0.05	<0.05	<0.05	0.35	3.33	7.7	0.5	<0.02	<0.02	1.02	11.2	<0.02	72.6	<0.02	<0.05	<0.02	<0.02	180	166
FD01	MW01	18/04/2017	-	-	-	-	-	-	-	-	<0.3	<0.3	7.1[#1]	<0.3	<0.3	<0.3	-	7.3	62[#1]	3.2[#1]	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	3.7[#1]	8[#1]	2	<0.3	<0.3	2[#1]	13[#1]	<0.3	72[#1]	<0.3	<0.3	<0.3	<0.3	-	-
MW1	MW01	24/05/2017	0.86	5990	6.7	167.7	22.9	-	4020	-	<0.02	<0.02	0.59	<0.05	<0.05	<0.02	129	5.66	74.1	2.5	<0.05	<0.05	<0.05	<0.05	<0.05	0.18	1.62	6.81	2	<0.02	<0.02	0.67	8.22	0.03	54.8	<0.02	<0.05	<0.02	<0.02	157	150
MW02	MW02	12/01/2017	0.87	17,698	6.59	-140.9	27.7	7.43	12,800	-	<0.1	<0.1	<0.1	<0.25	<0.25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.05	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.25	<0.1	<0.1	<0.1	<0.1
MW02	MW02	18/04/2017	2.28	19,735	7.75	94.1	22.9	-	-	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.05	<0.02	<0.02	0.02	0.02
MW02	MW02	24/05/2017	1.07	16,541	6.51	6.2	21.7	-	13,300	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
GWQA01	MW02	24/05/2017	-	-	-	-	-	-	12,100	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
MW3	MW03	24/05/2017	1.51	14,115	6.23	-80.2	21.2	-	10,200	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	8.03	0.97	7.51	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.16	1.17	<0.1	<0.02	<0.02	0.08	1.01	<0.02	0.52	<0.02	<0.05	<0.02	<0.02	11.5	10.4
MW4	MW04	24/05/2017	0.94	15,410	6.52	-55.8	20.6	-	10,500	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	3.56	0.21	1.54	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.26	<0.1	<0.02	<0.02	<0.02	0.24	<0.02	2.02	<0.02	<0.05	<0.02	<0.02	4.32	4.06
MW5	MW05	24/05/2017	1.11	16,140	6.39	-44.1	23	-	12,600	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
SW01	SW01	20/12/2016	2.26	231	8.3	120.6	20.9	8.25	664	-	<0.02	<0.02	0.36	<0.05	<0.05	<0.02	17.4	1.28	5.96	2.61	<0.05	<0.05	<0.05	<0.05	<0.05	3.09	0.87	0.82	<0.1	<0.02	<0.02	0.76	3.32	<0.02	11.4	<0.02	<0.05	<0.02	<0.02	30.5	29.3
SW01	SW01	24/05/2017	-	-	-	-	-	-	-	34	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	1.42	0.09	0.4	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	0.02	0.08	<0.1	<0.02	<0.02	0.03	0.11	<0.02	1.02	<0.02	<0.05	<0.02	<0.02	1.87	1.79
SW02	SW02	20/12/2016	-	-	-	-	-	7.55	2550	-	<0.02	<0.02	0.63	<0.05	<0.05	<0.02	27.2	1.07	6.57	1.93	3.17	<0.05	<0.05	<0.05	<0.05	55.6	3.36	1.04	<0.1	<0.02	<0.02	1.18	11	<0.02	20.6	0.06	<0.05	<0.02	<0.02	106	104
SW02	SW02	24/05/2017	-	-	-	-	-	-	-	113	<0.02	0.05	0.72	<0.05	<0.05	<0.02	66.8	0.41	5.47	1.31	5.46	<0.05	<0.05	<0.05	<0.05	34	1.75	0.68	<0.1	<0.02	<0.02	0.65	2.31	0.07	61.3	<0.02	<0.05	<0.02	<0.02	114	113
SW03	SW03	20/12/2016	4.47	209.6	8.19	87.3	20.2	7.72	149	-	<0.02	<0.02	0.1	<0.05	<0.05	<0.02	5.6	1.16	1.52	0.42	0.26	<0.05	<0.05	<0.05	<0.05	1.35	0.51	0.42	<0.1	<0.02	<0.02	0.2	1.5	<0.02	4.08	0.03	<0.05	<0.02	<0.02	11.6	11
SW03	SW03	24/05/2017	-	-	-	-	-	-	-	172	<0.02	<0.02	0.14	<0.05	<0.05	<0.02	8.67	0.17	1.48	<0.02	0.16	<0.05	<0.05	<0.05	<0.05	1.27	0.19	0.22	<0.1	<0.02	<0.02	0.09	0.39	<0.02	7.19	<0.02	<0.05	<0.02	<0.02	11.3	10.9
SW05	SW05	24/05/2017	-	-	-	-	-	-	-	12	<0.02	<0.02	0.17	<0.05	<0.05	<0.02	11.7	0.39	3.89	0.99	<0.05	<0.05	<0.05	<0.05	<0.05	0.7	0.26	0.48	<0.1	<0.02	<0.02	0.23	1.2	<0.02	7.8	<0.02	<0.05	<0.02	<0.02	16.1	15.5
SW08	SW08	24/05/2017	1.57	1050	6.09	-117.6	18.2	-	-	692	<0.02	<0.02	0.87	<0.05	<0.05	<0.02	66.1	1.58	11.8	1.42	0.24	<0.05	<0.05	<0.05	<0.05	6.52	1.64	1.8	0.5	<0.02	<0.02	0.59	2.7	0.03	54.3	<0.02	<0.05	<0.02	<0.02	84	81.3
FW01	FW01	20/12/2016	1.88	243.3	8.39	108.7	21.6	7.7	156	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.17	<0.02	<0.02	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.18	0.06	<0.02	<0.1	<0.02	<0.02	<0.02	0.04	<0.02	0.17	<0.02	<0.05	<0.02	<0.02	0.5	0.5
QA101	FW01	20/12/2016	-	-	-	-	-	-	-	-	-	<0.01	-	-	<0.01	-	-	<0.01	0.02[#1]	0.03	0.01	<0.05	-	<0.05	-	0.11	0.01[#1]	-	<0.05	<0.01	<0.01	<0.01	0.03	<0.01	0.15[#1]	<0.05	<0.01	<0.01	<0.01	-	-
FW01	FW01	24/05/2017	7.81	200.8	7.69	-36.5	17.7	-	-	6	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.16	<0.02	0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.14	<0.02	<0.05	<0.02	<0.02	0.16	0.16
SWQA02	FW01	24/05/2017	-	-	-	-	-	-	-	7	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.16	<0.02	0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.14	<0.02	<0.05	<0.02	<0.02	0.16	0.16
FW02	FW02	11/05/2017	-	-	-	-	-	-	-	-	<0.02	<0.02	0.02	<0.05	<0.05	<0.02	1.28	0.03	0.3	0.24	<0.05	<0.05	<0.05	<0.05	<0.05	0.31	0.07	0.03	<0.1	<0.02	<0.02	0.04	0.19	<0.02	0.98	0.02	<0.05	<0.02	<0.02	2.23	2.16
Quality Assurance/Quality Control																																									
RINSATE	Rinsate	24/05/2017	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
TB	Trip blank	13/01/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Duplicate samples																																									
MW01	MW01	18/04/2017	2.01	10,936	6.54	418.3	23.3	-	-	-	<0.02	<0.02	6.3	<0.05	<0.05	<0.02	142	5.94	69.4	1.34	<0.05	<0.05	<0.05	<0.05	<0.05	0.35	3.33	7.7	0.5	<0.02	<0.02	1.02	11.2	<0.02	72.6	<0.02	<0.05	<0.02	<0.02	180	166
FD01	MW01	18/04/2017	-	-	-	-	-	-	-	-	<0.3	<0.3	7.1	<0.3	<0.3	<0.3	-	7.3	62	3.2	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	3.7	8	2	<0.3	<0.3	2	13	<0.3	72	<0.3	<0.3	<0.3	<0.3	-	-
RPD(%)			-	-	-	-	-	-	-	-	NC	NC	12	NC	NC	NC	-	21	11	82	NC	NC	NC	NC	NC	15	11	4	120	NC	NC	65	15	NC	1	NC	NC	NC	NC	-	-
MW02	MW02	24/05/2017	1.07	16,541	6.51	6.2	21.7	-	13,300	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
GWQA01	MW02	24/05/2017	-	-	-	-	-	-	-	-	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
RPD(%)			-	-	-	-	-	-	-	-	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
FW01	FW01	24/05/2017	7.81	200.8	7.69	-36.5	17.7	-	-	6	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.16	<0.02	0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.14	<0.02	<0.05	<0.02	<0.02	0.16	0.16
SWQA02	FW01	24/05/2017	-	-	-	-	-	-	-	7	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.16	<0.02	0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.14	<0.02	<0.05	<0.02	<0.02	0.16	0.16
RPD(%)			-	-	-	-	-	-	-	15	NC	NC	NC	NC	NC	NC	0	NC	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	0	NC	NC	NC	NC	0	0

(yellow)	RPD exceeds nominal threshold of 30% for inorganics and 50% for organics
NC	RPD not calculated as both the primary and the duplicate sample were below the PQL

Where one of either the primary or duplicate sample was recorded below the laboratory PQL, the PQL was adopted to calculate the RPD

Appendix C - Survey results

Pot Hole No.	Easting	Northing	Pipe RL	Surface RL
MW3	321389.682	6247179.019	26.720	26.792
MW4	321410.765	6247197.560	26.825	26.913
MW5	321406.679	6247161.666	28.291	28.334

Appendix D – Field sampling sheets and calibration certificates

Purging and Sampling Record

Bore ID: MW02

Job Information	Sampling Information	Bore Information
Client: EPNSW	Purge Method: peri pump	SWL(mbTOC): 2.130 m
Project: 2125583	Sample Method: peri pump	Screen: From: ..... to ..... m
Proj. No.: Greenacre	WQ Meter Type: YSI	NAPL Check: –
Sampler: AW	Flow Cell: (Y) / N	Pump Depth: 6.6 m
Date: 18/04/17	WLevel Meter Type:	Ref.datum: TOC
Round ~~1~~ 2	Dip / Fox / (Int.Foe) / Gge	Bore Depth: 7.613 m
	Field Filtered? Y / N (filter vessel, disposable filter/syringe)	Logic Check: .....
		Stick Up: ..... m
		Bore Diam.: 50 mm
		Well Cap Secure? Y

Time (am)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µS/cm)	Dis.Oxygen (ppm)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*		
10:39	0.5	23.0	6.70	19560	1.22	121.4	2.28		Slightly turbid, light brown, odourless
10:43	1.5	23.0	6.74	19781	1.95	82.2	2.38		"
10:~~54~~	2.5	23.0	7.59	19760	2.35	102.3	2.52		"
11:00	3.5	23.0	7.77	19748	2.31	106.8	2.56		"
11:05	4.5	22.9	7.83	19699	2.30	101.2	2.60		"
11:09	5.5	22.9	7.75	19735	2.28	94.1	2.62		"

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.	PFAS			
Preservatives										X			

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Purging and Sampling Record

Bore ID: MW01

Job Information		Sampling Information		Bore Information	
Client:	FRNSW	Purge Method:	peri pump	SWL(mbTOC):	3.256 m
Project:	Greenacre	Sample Method:	peri pump	Screen: From:	to: m
Proj. No.:	21 25583	WQ Meter Type:	YSI	NAPL Check:	-
Sampler:	AW	Flow Cell: (Y) N	Pump Depth: ~5.2 m	Ref.datum:	TOC
Date:	18/04/17	WLevel Meter Type:	Dip / Fox / (Int.Fce) / Gge	Bore Depth:	6.015 m
Round	2	Field Filtered? Y / (N) (filter vessel, disposable filter/syringe)			

Logic Check:	
Stick Up:	~0.07 m
Bore Diam.:	50 mm
Well Cap Secure?	Y

Time (am)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µS/cm)	Dis.Oxygen (ppm)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable		
9:40	0.5	23.2	6.33	15910	0.29	110.0	3.33		clear, colourless, odourless
9:47	1.5	23.4	6.43	16219	0.33	204.7	3.44		decreased flow rate
9:58	2.5	23.5	6.61	15895	1.92	224.8	3.38		
10:03	3.5	23.6	6.67	14990	2.33	275.5	3.50		
10:13	4.5	23.6	6.77	12813	1.90	3669	3.54		
10:17	5.5	23.7	6.71	12106	2.11	378.7	3.58		
10:24	6.5	23.4	6.56	11162	1.87	412.8	3.57		
10:29	7.5	23.3	6.54	10936	2.01	418.3	3.53		

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.	PFAS			
Preservatives										X			

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Duplicate - FD01

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

5.5L

Purging and Sampling Record

Bore ID: MW01

Job Information
- Client: FRNSW
- Project: Greenacre phase 2 GME
- Proj. No.: 21255831Z
- Sampler: AW
- Date: 24/05/17
- Round:

Sampling Information
- Purge Method: peri pump
- Sample Method: peri pump
- WQ Meter Type: YSI
- Flow Cell: (Y) / N Pump Depth: 5 m
- WLevel Meter Type: Dip / Fox / (Int.Fce) / Gge
- Field Filtered? Y / (N) (filter vessel, disposable filter/syringe)

Bore Information
- SWL(mbTOC): 3.186 m Logic Check:
- Screen: From: to: m Stick Up: -0.11 m
- NAPL Check: - Bore Diam.: 50 mm
- Ref.datum: TOC Well Cap Secure? Y
- Bore Depth: 6.003 m

Time (am.)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µS/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*		
10:17	0.5	21.9	6.84	4314	0.86	103.4	3.27		decreased to minimum flow rate.
10:28	3.0	21.6	6.78	4590	0.66	182.5	3.43		clear, colourless, odourless.
10:41	4.0	21.6	6.76	4695	0.52	179.5	3.43		
10:53	6.0	22.5	6.74	4917	0.60	166.3	3.43		
11:03	7.0	22.3	6.73	5196	0.85	166.7	3.46		
11:11	8.0	22.6	6.71	5714	0.87	170.0	3.46		
11:14	9.0	22.8	6.70	5923	0.88	169.2	3.46		
11:20	10.0	22.9	6.70	5990	0.86	167.7	3.46		

Field QA Checks:
- Air bubbles in vials? Y / N Any violent reactions? Y / N
- Decontamination as per GHD procedure? Y / N
- Was sampling equipment pre-cleaned? Y / N
- COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Preservatives													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

breife solid noise by IP during purging
checked well with bailer → no NAPL observed.
2 bottles (no filtering)

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

9.56L.

Purging and Sampling Record

Bore ID: MW07

Job Information		Sampling Information		Bore Information	
Client:	FRNSW	Purge Method:	peri pump	SWL(mbTOC):	2.074 m
Project:	Greenacre Phase 2 GME	Sample Method:	peri pump	Screen: From: ..... to:	m
Proj. No.:	21 25583 [redacted] 12	WQ Meter Type:	YSI	NAPL Check:	—
Sampler:	AW	Flow Cell: (Y) N	Pump Depth: 6.4 m	Ref.datum:	TOC
Date:	24/05/17	WLevel Meter Type:	Dip / Fox / Int.Fce / Gge	Bore Depth:	7.487 m
Round	A	Field Filtered? Y / N (filter vessel, disposable filter/syringe)			

Time (am)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µS/cm)	Dis.Oxygen (PPM mg/L)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*		
8:31	1.0	20.7	6.53	14675	0.87	42.1	2.40		moderate turbidity, no odour, no sheen
8:50	3.0	20.8	6.53	15703	0.43	16.1	2.48		
9:08	5.0	21.2	6.52	16143	0.75	7.7	2.57		
9:20	7.0	21.3	6.53	16267	0.89	3.9	2.61		clearing.
9:36	9.0	21.4	6.51	16397	[redacted] 1.02	5.6	2.68		
9:40	10.0	21.5	6.51	16436	1.04	9.2	2.69		
9:46	11.0	21.7	6.51	16531	1.06	6.8	2.65		
9:51	12.0	21.7	6.51	16541	1.07	6.2	2.66		

Field QA Checks:

Air bubbles in vials? Y (N) Any violent reactions? Y (N)
Decontamination as per GHD procedure? (Y) / N
Was sampling equipment pre-cleaned? (Y) / N
COC updated? (Y) / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.	PFAS	TDS		
Preservatives										x	x		

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

GWQA01 2+2 bottles

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

18.4 L

Purging and Sampling Record

Bore ID: MW03

Job Information	Sampling Information	Bore Information
Client: AFNSW	Purge Method: peri pump	SWL(mbTOC): 2.58 m
Project: 21255831 2	Sample Method: peri pump	Logic Check:
Proj. No.: Greenacre phase 2	WQ Meter Type: YSI	Screen: From: to: m
Sampler: AW	Flow Cell: Y / N	Pump Depth: m
Date: 24/05/17	WLevel Meter Type: Dip / Fox / Int.Fce / Gge	Stick Up: -0.09 m
Round	Field Filtered? Y / N (filter vessel, disposable filter/syringe)	NAPL Check: -
		Bore Diam.: 50 mm
		Ref.datum: TOC
		Well Cap Secure? Y
		Bore Depth: 5.90 m

Time (am)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µs/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*		
11:56	0.5	21.7	6.14	14837	0.37	85.8	2.88		clear, colourless, odourless
12:06	2.0	21.4	6.18	14811	1.07	4.0	3.00		decreased flow rate to min.
12:29	4.0	21.5	6.28	12924	1.49	-60.0	3.14		
12:36	6.0	19.5	6.22	13742	1.53	-57.9	3.33		
12:41	7.0	21.1	6.20	14593	1.50	-61.3	3.38		
12:48	8.0	21.0	6.23	14337	1.51	-75.3	3.41		
12:53	9.0	21.2	6.23	14115	1.51	-80.2	3.44		

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Preservatives													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

11.28L

Purging and Sampling Record

Bore ID: MW04

Job Information	Sampling Information	Bore Information
Client: FRNSW	Purge Method: peri pump	SWL(mbTOC): 3.192 m
Project: Greenacre phase 2	Sample Method: peri pump	Screen: From:.....to..... m
Proj. No.: 21 25583 12	WQ Meter Type: YSI	NAPL Check: -
Sampler: AW	Flow Cell: (Y) / N	Pump Depth: 5.9 m
Date: 24/05/17	WLevel Meter Type:	Dip / Fox / (Int.Fce) / Gge
Round	Field Filtered? Y / (N) (filter vessel, disposable filter/syringe)	

Logic Check: .....
Stick Up: -0.08 m
Bore Diam.: 50 mm
Ref.datum: TOC
Well Cap Secure? Yes
Bore Depth: 6.900 m

Time (pm)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µS/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*			
~~2:20~~	0.5	21.0	6.51	15940	0.60	39.1	3.29		clear, colourless, odourless
2:29	3.0	20.9	6.50	15933	0.28	-28.5	3.57		
2:38	5.0	20.8	6.50	15826	0.80	-54.7	3.64		
2:56	~~7~~ 7.0	20.6	6.51	15529	0.94	-55.3	3.68		
3:01	8.0	20.6	6.51	15415	0.94	-55.8	3.67		
3:06	9.0	20.6	6.52	15410	0.94	-55.8	3.69		
3:13	10.0	20.6							

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Preservatives													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

12.61

Purging and Sampling Record

Bore ID: MW05

Job Information	Sampling Information	Bore Information
Client: FRNSW	Purge Method: peri. pump	SWL(mbTOC): 3.310 m
Project: Greenacre phase 2	Sample Method: peri. pump	Logic Check:
Proj. No.: 21 25583 13	WQ Meter Type: YSI	Screen: From: to: m
Sampler: AW	Flow Cell: (Y) / N	Pump Depth: 6.5 m
Date: 24/05/17	WLevel Meter Type: Dip / Fox / (Int.Fce) / Gge	NAPL Check: -
Round	Field Filtered? Y / (N) (filter vessel, disposable filter/syringe)	Ref.datum: TOC
		Bore Depth: 7.981 m
		Stick Up: m
		Bore Diam.: 50 mm
		Well Cap Secure? Y

Time (..pm..)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µS/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*		
1:26	1.0	22.1	6.38	15888	1.39	-8.1	3.62		decreased flow rate to minimum
1:33	3.0	22.3	6.38	15977	0.63	-28.8	3.70		
1:41	5.0	22.6	6.37	16092	0.83	-34.2	3.75		
1:53	7.0	22.8	6.38	16114	1.03	-42.0	3.90		
1:59	8.0	22.9	6.38	16120	1.05	-43.8	3.94		
2:04	9.0	22.8	6.38	16113	1.09	-45.2	3.96		
2:11	10.0	23.0	6.39	16140	1.11	-44.1	4.01		

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Preservatives													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

15.8 L

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus
Serial No. 11C100753

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 10.00		pH 10.00		293215	pH 9.30
2. pH 7.00		pH 7.00		288773	pH 6.78
3. pH 4.00		pH 4.00		288994	pH 4.23
4. mV		230.7mV		OB1388/OB1390	230.7mV
5. EC		2.76 mS		290786	2.78mS
6. D.O		0.00ppm		4347	0.00ppm
7. Temp		21.6°C		MultiTherm	21.8°C

Calibrated by: SB. Sophie Boler

Calibration date: 18/04/2017

Next calibration due: 15/10/2017

Oil / Water Interface Meter

Instrument Interface Meter (50M)
Serial No. 122 009747-1

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: SB **Sophie Boler**

Calibration date: **18/04/2017**

Next calibration due: **17/06/2017**

Multi Parameter Water Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument YSI Quatro Pro Plus
Serial No. 09K100883

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 10.00		pH 10.00		293215	pH 9.35
2. pH 7.00		pH 7.00		290453	pH 6.89
3. pH 4.00		pH 4.00		288994	pH 4.07
4. mV		227.4mV		OB1388/OB1390	227.5mV
5. EC		2.76mS		292380	2.77mS
6. D.O		0.00ppm		4347	0.00ppm
7. Temp		22.5°C		MultiTherm	22.6°C

Calibrated by: Joanna Wong

Calibration date: 23/05/2017

Next calibration due: 22/06/2017

Oil / Water Interface Meter

Instrument Geotech Interface Meter (30M)
Serial No. 4087

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	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

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

Calibrated by: **Wenyi Shen**

Calibration date: **16/05/2017**

Next calibration due: **15/07/2017**

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-105762

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	✓	Low	High	TWA	STEL
	Settings	✓	50ppm	100ppm	N/A	N/A
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	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		98ppm Isobutylene	NATA	SY137		99.3ppm

Calibrated by: Joanna Wong

Calibration date: 10/05/2017

Next calibration due: 9/06/2017

Oil / Water Interface Meter

Instrument Geotech Interface Meter (60M)
Serial No. 3887

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	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

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

Calibrated by: _____ **Meixi Huo**

Calibration date: **10/05/2017**

Next calibration due: **9/07/2017**

Appendix E – Borehole logs

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW01

Client Fire & Rescue NSW	**Drill Co.** Terratest	**Easting, Northing** ,
Project Greenacre FRNSW Site Investigation	**Driller**	**Grid Ref** GDA94_MGA_zone_56
Project No. 212558306	**Rig Type**	**Elevation**
Site Greenacre FRNSW	**Drill Method**	**Collar RL** -
Location 1 Amarina Avenue, Greenacre NSW 2190	**Total Depth (m)** 6	**Logged By** Terry Nham
Date Drilled 19/12/2016 - 19/12/2016	**Diameter (mm)** 125	**Checked By**

B.C.L No. N/A **Casing** PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA	2.8	MW01_0.22-0.32		Cement		CONCRETE				0
0.5		0.4	MW01_0.4-0.5				gravelly SAND, fine, poorly graded, subangular, grey and pale brown, coarse gravel (FILL)	M	MD	weak hydrocarbon odour, hydrocarbon staining	-0.5
1	PT	0	MW01_1.0-1.1		Backfill		CLAY, low to medium plasticity, red-orange and grey (NATURAL - SOIL)	SM	ST		-1
1.5							sandy CLAY, low to medium plasticity, pale grey, fine, poorly graded sand (NATURAL - SOIL)	SM	ST		-1.5
2	SFA	0	MW01_2.0-2.1		Bentonite		gravelly SAND, fine, brown, subangular, medium to coarse, poorly graded gravel (NATURAL - SOIL)	SM			-2
2.5											-2.5
3		0	MW01_2.9-3.0				gravelly SAND, fine, pale grey, subangular, medium to coarse, poorly graded gravel (NATURAL - SOIL)	D			-3
3.5											-3.5
4		0	MW01_3.9-4.0		Gravel						-4
4.5				▽			gravelly CLAY, low to medium plasticity, brown, fine sand, subangular, medium to coarse, poorly graded gravel (NATURAL - SOIL)	VM	ST		-4.5
5		0	MW01_4.9-5.0								-5
5.5											-5.5
6		0	MW01_5.9-6.0 (QA04)				Termination Depth at: 6.00 m. Target depth achieved.				-6
6.5											-6.5
7											-7
7.5											-7.5
8											-8
8.5											-8.5
9											-9
9.5											-9.5

Notes

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

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

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW02

Client Fire & Rescue NSW	**Drill Co.** Terratest	**Easting, Northing** ,
Project Greenacre FRNSW Site Investigation	**Driller**	**Grid Ref** GDA94_MGA_zone_56
Project No. 212558306	**Rig Type**	**Elevation**
Site Greenacre FRNSW	**Drill Method**	**Collar RL** -
Location 1 Amarina Avenue, Greenacre NSW 2190	**Total Depth (m)** 8	**Logged By** Terry Nham
Date Drilled 19/12/2016 - 19/12/2016	**Diameter (mm)** 125	**Checked By**

B.C.L No. N/A **Casing** PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA	0	MW02_0.24-0.34				CONCRETE				0
0.5							gravelly SAND, fine, pale brown, angular, coarse, poorly graded gravel (FILL)	SM	MD		-0.5
		0	MW02_0.6-0.7		Cement		gravelly CLAY, medium to high plasticity, olive- brown, angular, fine to medium, poorly graded gravel (FILL)	M	S		
1		0	MW02_1.0-1.1		Backfill			SM	ST		-1
	PT						CLAY, medium to high plasticity, orange-red and grey (NATURAL - SOIL)				
1.5								SM	VST		-1.5
		0	MW02_1.8-1.9				gravelly CLAY, low to medium plasticity, grey- orange, platy, fine to medium, poorly graded gravel (NATURAL - SOIL)				
2	SFA				Bentonite			D	ST		-2
2.5							gravelly CLAY, medium to high plasticity, brown, subangular, fine to medium, poorly graded gravel (NATURAL - SOIL)				-2.5
3		0	MW02_2.9-3.0								-3
3.5											-3.5
4		0	MW02_3.9-4.0				gravelly SAND, fine, pale brown- grey, subangular, fine to medium, poorly graded gravel (NATURAL - SOIL)	D			-4
4.5											-4.5
5		0	MW02_4.9-5.0								-5
5.5					Gravel		gravelly SAND, fine, dark grey- brown, subangular, medium to coarse, poorly graded gravel (NATURAL - SOIL)	SM			-5.5
6		0	MW02_5.9-6.0 (QA01)								-6
6.5							gravelly CLAY, low to medium plasticity, brown, subangular, fine to medium, poorly graded gravel (NATURAL - SOIL)	VM	F		-6.5
7		0	MW02_6.9-7.0 (QA02)								-7
7.5											-7.5
8		0	MW02_7.9-8.0 (QA03)				Termination Depth at: 8.00 m. Target depth achieved.				-8
8.5											-8.5
9											-9
9.5											-9.5

Notes

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

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

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW03

Client Fire and Rescue NSW
Project Greenacre FRNSW Phase 2 Site Investigations
Project No. 212558312
Site Greenacre FRNSW
Location 1 Amarina Avenue, Greenacre NSW 2190
Date Drilled 11/05/2017 - 11/05/2017

Drill Co. Terratest
Driller Pat
Rig Type Truck mounted
Drill Method
Total Depth (m) 6
Diameter (mm) 125

Easting, Northing ,
Grid Ref GDA94_MGA_zone_56
Elevation
Collar RL -
Logged By Alice Walker
Checked By

B.C.L No. N/A **Casing** PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	DC	0.5	MW03_0.2_0.25_329				CONCRETE			staining staining	0
0.5	HA	0.5	MW03_0.5_0.55_330 (QA01)				Gravelly SAND, fine to coarse, well graded, angular, pale brown, with clay (FILL)	SM		no odour, no staining staining	-0.5
1		0.5	MW03_1.0_1.05_331		Grout		Gravelly CLAY, medium plasticity, grey mottled red, subangular, medium to coarse, poorly graded gravel (possible NATURAL - SOIL)	SM	S	no odour, no staining staining	-1
1.5	PT							D		no odour, no staining staining	-1.5
2		0.5	MW03_2.3_2.35_332		Bentonite		Clayey SAND, fine, poorly graded, subangular, pale red (NATURAL - SOIL)	D	H	no odour, no staining staining	-2
2.5	SFA						Clayey SAND, fine to medium, poorly graded, subangular, pale yellow to red (NATURAL - SOIL)				-2.5
3							Sandy CLAY, medium plasticity, brown (NATURAL - SOIL)	D		no odour, no staining staining	-3
3.5							CLAY, medium plasticity, brown- red (NATURAL - SOIL)	W	S	no odour, no staining staining	-3.5
4					Sand		Gravelly CLAY, low plasticity, brown (NATURAL - BEDROCK)	SM	S	no odour, no staining staining	-4
4.5		0.6	MW03_4.5_4.55_333								-4.5
5											-5
5.5							Gravelly CLAY, low to medium plasticity, dark brown (NATURAL - BEDROCK)	W	S	no odour, no staining staining	-5.5
6		0.6	MW03_5.9_5.95				Termination Depth at: 6.00 m. Target depth achieved.				-6
6.5											-6.5
7											-7
7.5											-7.5
8											-8
8.5											-8.5
9											-9
9.5											-9.5

Notes

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

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

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW04

Client Fire and Rescue NSW
Project Greenacre FRNSW Phase 2 Site Investigations
Project No. 212558312
Site Greenacre FRNSW
Location 1 Amarina Avenue, Greenacre NSW 2190
Date Drilled 11/05/2017 - 11/05/2017

Drill Co. Terratest
Driller Pat
Rig Type Truck mounted
Drill Method
Total Depth (m) 7
Diameter (mm) 125

Easting, Northing ,
Grid Ref GDA94_MGA_zone_56
Elevation
Collar RL -
Logged By Alice Walker
Checked By

B.C.L No. N/A **Casing** PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	DC	0.7	MW04_0.0_0.19_321				CONCRETE			staining staining	0
	HA		MW04_0.2_0.25_322				Clayey SAND, medium to coarse, poorly graded, angular, pale brown, and gravel,	M	L	no odour, no staining staining	
0.5		0.7	MW04_0.5_0.55_323				weak to moderate cementation (FILL)	M	ST	no odour, no staining staining	-0.5
1		0.7	MW04_1.0_1.05_324		Grout		CLAY, high plasticity, pale brown with orange (possible FILL)	D		no odour, no staining staining, trace coarse gravel	-1
1.5	PT						Clayey GRAVEL, fine to medium, poorly graded, subangular, pale grey- brown (possible NATURAL - SOIL)	SM	F	no odour, no staining staining	-1.5
2	SFA	0.8	MW04_1.95_2_325		Bentonite		CLAY, low plasticity, grey (NATURAL - SOIL)	SM	H	no odour, no staining staining	-2
2.5							CLAY, low plasticity, grey (NATURAL - SOIL)	D	S	no odour, no staining staining	-2.5
3							Sandy CLAY, low plasticity, red mottled pale grey (NATURAL - SOIL)	D	S	no odour, no staining staining	-3
3.5							Sandy CLAY, medium plasticity, brown (NATURAL - SOIL)				-3.5
4		0.7	MW04_4.1_4.15_326								-4
4.5					Sand						-4.5
5							Sandy CLAY, medium plasticity, orange-brown (NATURAL - SOIL)	M	S	no odour, no staining staining	-5
5.5		1.2	MW04_5.5_5.55_327				CLAY, low plasticity, brown mottled grey (NATURAL - SOIL)	M	VST	no odour, no staining staining	-5.5
6											-6
6.5							CLAY, low plasticity, dark brown (NATURAL - SOIL)	W	S	no odour, no staining staining	-6.5
7		0.8	MW04_6.95_7				Termination Depth at: 7.00 m. Target depth achieved.				-7
7.5											-7.5
8											-8
8.5											-8.5
9											-9
9.5											-9.5

Notes

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

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

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW05

Client Fire and Rescue NSW
Project Greenacre FRNSW Phase 2 Site Investigations
Project No. 212558312
Site Greenacre FRNSW
Location 1 Amarina Avenue, Greenacre NSW 2190
Date Drilled 12/05/2017 - 12/05/2017

Drill Co. Terratest
Driller Pat
Rig Type Truck mounted
Drill Method
Total Depth (m) 8
Diameter (mm) 125

Easting, Northing ,
Grid Ref GDA94_MGA_zone_56
Elevation
Collar RL -
Logged By Alice Walker
Checked By

B.C.L No. N/A **Casing** PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	DC	1.8	MW05_0.0_0.16_335				CONCRETE	M		staining staining	0
0.5	HA	1	MW05_0.16_0.25_336 (QA02)				Clayey GRAVEL, fine to medium, poorly graded, angular, dark black- brown (FILL)	SM	VST	no odour, no staining staining	-0.5
			MW05_0.35_0.4_337				CLAY, high plasticity, grey and orange-red (possible NATURAL - SOIL)			no odour, no staining staining	
1		0.7	MW05_1.0_1.05_338		Grout		CLAY, low plasticity, grey with orange (NATURAL - SOIL)	SM	F	no odour, no staining staining	-1
1.5	PT										-1.5
2		0.7	MW05_2.0_2.05_339				Clayey SAND, fine to medium, well graded, subangular, pale pink- orange to grey (NATURAL - SOIL)	D	VD	no odour, no staining staining	-2
2.5	SFA										-2.5
3					Bentonite						-3
3.5							CLAY, low plasticity, brown, some sand (NATURAL - SOIL)	M	S	no odour, no staining staining	-3.5
4		0.6	MW05_4.0_4.05_340								-4
4.5											-4.5
5											-5
5.5		0.5	MW05_5.5_5.55_341		Sand		CLAY, low plasticity, dark brown (NATURAL - SOIL)	SM	S	no odour, no staining staining	-5.5
6											-6
6.5		0.6	MW05_6.5_6.55_342				CLAY, medium plasticity, dark brown (NATURAL - SOIL)	SM	S	no odour, no staining staining	-6.5
7											-7
7.5			MW05_7.55_7.6 (QA03)								-7.5
8							Termination Depth at: 8.00 m. Target depth achieved.				-8
8.5											-8.5
9											-9
9.5											-9.5

Notes

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

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

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL SB01

Client Fire & Rescue NSW
Project Greenacre FRNSW Site Investigation
Project No. 212558306
Site Greenacre FRNSW
Location 1 Amarina Avenue, Greenacre NSW 2190
Date Drilled 19/12/2016 - 19/12/2016

Drill Co. Terratest
Driller
Rig Type
Drill Method
Total Depth (m) 5
Diameter (mm) 125

Easting, Northing ,
Grid Ref GDA94_MGA_zone_56
Elevation
Collar RL -
Logged By Terry Nham
Checked By

B.C.L No. N/A **Casing** **Screen** **Surface Completion** Concrete

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA	0.1	SB01_0.18-0.28				CONCRETE	W	MD		0
0.5		0	SB01_0.4-0.5				GP - GRAVEL, poorly graded, angular, grey Poorly graded gravel (FILL)	M	ST		-0.5
	PT						CLAY, low to medium plasticity, red-orange and grey (NATURAL - SOIL)	SM	ST		
1		0	SB01_1.0-1.1				sandy CLAY, low plasticity, grey- orange, fine, poorly graded sand (NATURAL - SOIL)				-1
1.5		0.2	SB01_1.6-1.7								-1.5
2	SFA						sandy CLAY, low to medium plasticity, brown, fine to medium sand (NATURAL - SOIL)	M	F		-2
2.5											-2.5
3		0.2	SB01_2.9-3.0								-3
3.5											-3.5
4		0.1	SB01_3.9-4.0								-4
4.5											-4.5
5		0	SB01_4.9-5.0				Termination Depth at: 5.00 m. Target depth achieved.				-5
5.5											-5.5
6											-6
6.5											-6.5
7											-7
7.5											-7.5
8											-8
8.5											-8.5
9											-9
9.5											-9.5

Notes

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

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

Appendix F – Photo log

FRNSW - Greenacre Site Photographs

Photograph 1: Second retention tank pit identified (FW02), showing a truck connected to the above ground recycled fire water tank (FW01)

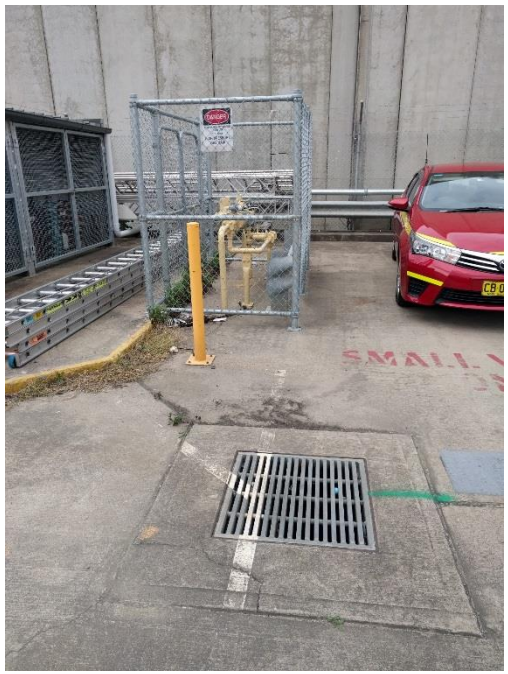
Photograph 3: Surface water flow path from trucks connected to the retention tank (flowing into sample location SW05).

Photograph 2: Sample location SW05 facing towards MW02, showing the incoming and outgoing drainage channel directions from SW06 and a down pipe on the truck wash, to SW04.

Photograph 4: Fire retention pit foaming after accidental discharge of foaming agent from a truck into the pit.

FRNSW - Greenacre Site Photographs

Photograph 5: Facing west, surface water drain (sample location SW03) at the eastern entrance to the main warehouse, showing the out going drainage channel from this location (green marking) to SW01.



Photograph 6: Facing east, surface water drain (sample location SW01) on the north-east corner of the site, showing the incoming drainage channel from SW03 as the green marking. Also showing the high pressure gas pipe coming onto the site.

Photograph 7: Sample location SW04 (not sampled during this investigation), located off-site adjacent to the north-east corner of the site. Drainage from SW01 and SW05 are assumed to flow to this pit.

Photograph 8: Facing south on Wentworth Street near Mayvic Street, showing the FRNSW Greenacre site in the background, and the stormwater drain to which it is likely to be connected to on Wentworth Street

FRNSW - Greenacre Site Photographs

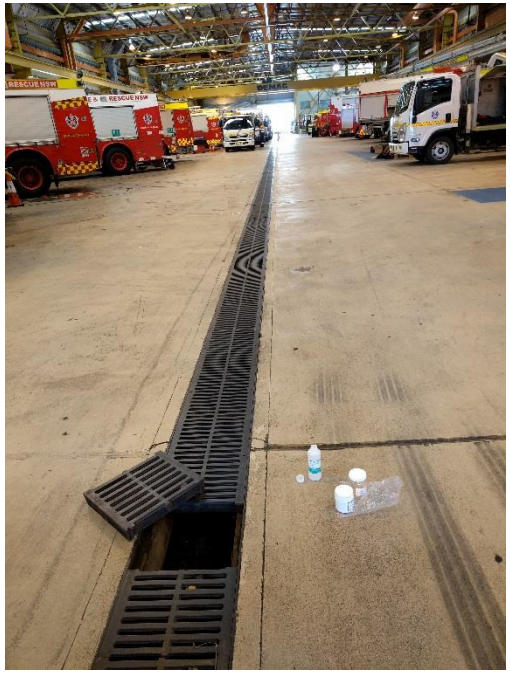
Photograph 9: Sewage pit and storm water drainage channel on eastern side of Wentworth Street.

Photograph 10: Facing north from Mainline road over the Enfield rail yards, showing the possible swale area between rails where surface water may drain to.

Photograph 11: Storm water drainage channel, observed to go under the Enfield rail line. Final destination was not observed.

FRNSW - Greenacre Site Photographs

Photograph 12: Site interceptor system (sampled as SW08), showing water holding tanks in the background, leading to the discharge point in the foreground.



Photograph 13: Drainage channel in the main warehouse, leading to the site interceptor and sampled as SS02/SW02.

Appendix G – NATA accredited laboratory reports and chain of custody documentation

CHAIN OF CUSTODY RECORD

☐ Eurofins | mgt Sydney Lab — Unit F3 Building F, 16 Mars Road, Lane Cove West, NSW 2066 P: +61 2 9900 8400 E: EnviroSampleNSW@eurofins.com.au

☐ Eurofins | mgt Brisbane Lab — Unit 1, 21 Smallwood Place, Murarrie, QLD 4172 P: +61 7 3902 4600 E: EnviroSampleQLD@eurofins.com.au

☐ Eurofins | mgt Melbourne Lab — 2 Kingston Town Close Oakleigh VIC 3166 P: +61 3 8564 5000 F: +61 3 8564 5090 E: EnviroSampleVic@eurofins.com.au

Company	GHD	Purchase Order	21 25583	Project Manager	Nicole Rosen
Address	level 15, 133 Castlereagh St	Eurofins | mgt Quote №	150612GHDN	Project №	21 25583
Contact Name	Alice Walker				
Contact Phone №	0415952075				
Special Direction					
Relinquished by (Signature)	Alice Walker ~~Alice Walker~~				
(Time / Date)	— — 18/04/17				

Project Name	FRNSW-Greenacre
Electronic Results Format	Esdat
Email for Results	Nicole.rosen@ghd.com alice.walker@ghd.com
Turn Around Requirements	☐ 1 DAY* ☐ 2 DAY* ☐ 3 DAY* *Surcharges apply ☒ 5 DAY (Std.) ☐ Other ( )

Analysis (Note: Where metals are requested please specify "Total" or "Filtered")

№	Client Sample ID	Date	Matrix	PFC's (full suite)	Containers: 1L Plastic	250mL Plastic	125 mL Plastic	200mL Amber Glass	40mL vial	125mL Amber Glass	Jar	Sample Comments / DG Hazard Warning
1	FD01	18/04/17	water	X								
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

Method of Shipment: ☐ Courier (#) ☐ Hand Delivered ☐ Postal

Laboratory Use Only								
Received By	Rupam	SYD | BNE | MEL | PER | ADL | NEW | DAR	Date	19/04/17	Time	14 36	Signature	Temperature
Received By		SYD | BNE | MEL | PER | ADL | NEW | DAR	Date	__/__/__	Time	__ __	Signature	Report № 542868

eurofins | mgt

Certificate of Analysis

GHD Pty Ltd NSW
Level 15, 133 Castlereagh Street
Sydney
NSW 2000

NATA Accredited
Accreditation Number 1261
Site Number 18217

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

Attention: **Nicole Rosen**

Report **542868-W**
Project name FRNSW - GREENACRE
Project ID 2125583
Received Date Apr 19, 2017

Client Sample ID			**FD01**
Sample Matrix			**Water**
Eurofins | mgt Sample No.			**S17-Ap15112**
Date Sampled			**Apr 18, 2017**
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)	0.05	ug/L	2.0
13C4-PFBA (surr.)	1	%	35
Perfluoropentanoic acid (PFPeA)	0.01	ug/L	[N09]3.2
13C5-PFPeA (surr.)	1	%	38
Perfluorohexanoic acid (PFHxA)	0.01	ug/L	[N09]13
13C5-PFHxA (surr.)	1	%	45
Perfluoroheptanoic acid (PFHpA)	0.01	ug/L	[N09]2.0
13C4-PFHpA (surr.)	1	%	46
Perfluorooctanoic acid (PFOA)	0.01	ug/L	[N09]3.7
13C8-PFOA (surr.)	1	%	50
Perfluorononanoic acid (PFNA)	0.01	ug/L	< 0.3
13C5-PFNA (surr.)	1	%	57
Perfluorodecanoic acid (PFDA)	0.01	ug/L	< 0.3
13C6-PFDA (surr.)	1	%	57
Perfluoroundecanoic acid (PFUnA)	0.01	ug/L	< 0.3
13C2-PFUnDA (surr.)	1	%	63
Perfluorododecanoic acid (PFDoA)	0.01	ug/L	< 0.3
13C2-PFDoDA (surr.)	1	%	77
Perfluorotridecanoic acid (PFTrDA)	0.01	ug/L	< 0.3
Perfluorotetradecanoic acid (PFTeDA)	0.01	ug/L	< 0.3
13C2-PFTeDA (surr.)	1	%	44
Perfluoroalkane sulfonamides (PFASAs)			
Perfluorooctane sulfonamide (FOSA)	0.05	ug/L	< 0.3
13C8-FOSA (surr.)	1	%	88
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	0.05	ug/L	< 0.3
D3-N-MeFOSA (surr.)	1	%	119
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	0.05	ug/L	< 0.3
D5-N-EtFOSA (surr.)	1	%	147
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	0.05	ug/L	< 0.3
D7-N-MeFOSE (surr.)	1	%	86
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	0.05	ug/L	< 0.3
D9-N-EtFOSE (surr.)	1	%	79
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	0.05	ug/L	< 0.3

Client Sample ID			FD01
Sample Matrix			**Water**
Eurofins | mgt Sample No.			**S17-Ap15112**
Date Sampled			**Apr 18, 2017**
Test/Reference	LOR	Unit	
Perfluoroalkane sulfonamides (PFASAs)			
D5-N-EtFOSAA (surr.)	1	%	71
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	0.05	ug/L	< 0.3
D3-N-MeFOSAA (surr.)	1	%	64
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)	0.01	ug/L	7.3
13C3-PFBS (surr.)	1	%	59
Perfluoropentanesulfonic acid (PFPeS)	0.01	ug/L	[N09]8.0
Perfluorohexanesulfonic acid (PFHxS)	0.01	ug/L	[N09]62
18O2-PFHxS (surr.)	1	%	64
Perfluoroheptanesulfonic acid (PFHpS)	0.01	ug/L	[N09]7.1
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]72
13C8-PFOS (surr.)	1	%	73
Perfluorodecanesulfonic acid (PFDS)	0.01	ug/L	< 0.3
n:2 Fluorotelomer sulfonic acids			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	0.01	ug/L	< 0.3
13C2-4:2 FTS (surr.)	1	%	21
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	0.05	ug/L	< 0.3
13C2-6:2 FTS (surr.)	1	%	25
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	0.01	ug/L	< 0.3
13C2-8:2 FTS (surr.)	1	%	23
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	0.01	ug/L	< 0.3

Sample History

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

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

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

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

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

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

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

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

Company Name: GHD Pty Ltd NSW
Address: Level 15, 133 Castlereagh Street
Sydney
NSW 2000

Project Name: FRNSW - GREENACRE
Project ID: 2125583

Order No.: 2125583
Report #: 542868
Phone: 02 9239 7100
Fax: 02 9239 7199

Received: Apr 19, 2017 2:36 PM
Due: Apr 27, 2017
Priority: 5 Day
Contact Name: Nicole Rosen

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						X
Perth Laboratory - NATA Site # 18217						
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	FD01	Apr 18, 2017		Water	S17-Ap15112	X
Test Counts						1

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

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

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkane sulfonamides (PFASAs)							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	110			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	110			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	110			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	109			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	112			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	112			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	114			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	%	109			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	%	111			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	92			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	116			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonamides (PFASAs)							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorooctane sulfonamide (FOSA)	%	108			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	114			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	118			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	107			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	108			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	109			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	115			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	109			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	111			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	106			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	112			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	101			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	125			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	%	102			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	%	101			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	%	84			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	%	57			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	B17-Ap15826	NCP	%	99			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	B17-Ap15826	NCP	%	116			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	B17-Ap15826	NCP	%	110			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	B17-Ap15826	NCP	%	116			50-150	Pass	
Perfluorooctanoic acid (PFOA)	B17-Ap15826	NCP	%	113			50-150	Pass	
Perfluorononanoic acid (PFNA)	B17-Ap15826	NCP	%	117			50-150	Pass	
Perfluorodecanoic acid (PFDA)	B17-Ap15826	NCP	%	117			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	B17-Ap15826	NCP	%	117			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	B17-Ap15826	NCP	%	116			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	B17-Ap15826	NCP	%	115			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B17-Ap15826	NCP	%	120			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonamides (PFASAs)				Result 1					
Perfluorooctane sulfonamide (FOSA)	B17-Ap15826	NCP	%	114			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B17-Ap15826	NCP	%	109			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B17-Ap15826	NCP	%	110			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B17-Ap15826	NCP	%	110			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B17-Ap15826	NCP	%	109			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B17-Ap15826	NCP	%	112			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B17-Ap15826	NCP	%	104			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorobutanesulfonic acid (PFBS)	B17-Ap15826	NCP	%	113			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B17-Ap15826	NCP	%	116			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B17-Ap15826	NCP	%	109			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B17-Ap15826	NCP	%	113			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B17-Ap15826	NCP	%	109			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	B17-Ap15826	NCP	%	118			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	B17-Ap15826	NCP	%	107			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	B17-Ap15826	NCP	%	109			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	B17-Ap15826	NCP	%	87			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	B17-Ap15826	NCP	%	53			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	B17-Ap15827	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnA)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoA)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkane sulfonamides (PFASAs)				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	B17-Ap15827	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B17-Ap15827	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B17-Ap15827	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B17-Ap15827	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B17-Ap15827	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B17-Ap15827	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B17-Ap15827	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	

Duplicate									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	B17-Ap15827	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	B17-Ap15827	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

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

Authorised By

Nibha Vaidya	Analytical Services Manager
Jonathon Angell	Senior Analyst-Organic (QLD)

Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1709080**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS NICOLE ROSEN	Contact	: Customer Services ES
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9239 7100	Telephone	: +61-2-8784 8555
Project	: FRNSW - GREENACRE	Date Samples Received	: 18-Apr-2017 15:00
Order number	: 2125583	Date Analysis Commenced	: 21-Apr-2017
C-O-C number	: ----	Issue Date	: 24-Apr-2017 17:12
Sampler	: ALICE WALKER		
Site	: ----		
Quote number	: EN/005/15		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW01	MW02	----	----	----
				Client sampling date / time	18-Apr-2017 00:00	18-Apr-2017 00:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1709080-001	ES1709080-002	--------	--------	--------
					Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**5.94**	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**7.70**	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**69.4**	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**6.30**	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**72.6**	**0.02**	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		**0.5**	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**1.34**	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**11.2**	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**1.02**	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**3.33**	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW01	MW02	----	----	----
				Client sampling date / time	18-Apr-2017 00:00	18-Apr-2017 00:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1709080-001	ES1709080-002	--------	--------	--------
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**0.35**	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**180**	**0.02**	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**142**	**0.02**	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**166**	**0.02**	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**93.5**	**66.8**	----	----	----

Surrogate Control Limits

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1709080**	Page	: 1 of 6
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS NICOLE ROSEN	Contact	: Customer Services ES
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9239 7100	Telephone	: +61-2-8784 8555
Project	: FRNSW - GREENACRE	Date Samples Received	: 18-Apr-2017
Order number	: 2125583	Date Analysis Commenced	: 21-Apr-2017
C-O-C number	: ----	Issue Date	: 24-Apr-2017
Sampler	: ALICE WALKER		
Site	: ----		
Quote number	: EN/005/15		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW

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: 844383)									
ES1708943-099	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
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 844383)									
ES1708943-099	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 844383)									
ES1708943-099	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

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: 844383) - continued									
ES1708943-099	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 844383)									
ES1708943-099	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 844383)									
ES1708943-099	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

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

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

Sub-Matrix: **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: 844383)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	98.8	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	92.4	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	95.8	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	100	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	97.2	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	113	70	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 844383)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	100	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	80.4	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	70.0	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	101	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	110	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	109	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	89.8	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	92.0	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	80.0	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	97.0	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	114	70	124
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 844383)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	88.2	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	89.6	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	87.4	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	97.5	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	107	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	82.4	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	98.8	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 844383)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	101	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	94.2	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	94.0	70	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: 844383) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	102	70	130

Matrix Spike (MS) Report

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

Sub-Matrix: **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: 844383)							
ES1708943-099	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	110	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	113	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	111	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	116	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	111	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	121	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 844383)							
ES1708943-099	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	110	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	86.6	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	118	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	115	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	120	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	112	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	109	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	100	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	88.0	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	78.8	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	90.2	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 844383)							
ES1708943-099	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	102	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	82.6	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	81.3	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	92.4	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	98.0	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	78.8	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 844383) - continued							
ES1708943-099	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	82.6	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 844383)							
ES1708943-099	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	120	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	83.0	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	72.4	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	58.2	50	130

ES1709080

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENT ☒ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE: level 15, 133 Castlereagh St, Sydney	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes / No / N/A
PROJECT: FRNSW – Greenacre	ALS QUOTE NO.: EN/005/16	Presence/Absence of Ice/Ice Packs on Receipt?	Yes / No / N/A
ORDER NUMBER: 2125583	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt:	16.1 °C
PROJECT MANAGER: Nicole Rosen	CONTACT PH: 0292397215	Other comment:	
SAMPLER: Alice Walker	SAMPLER MOBILE: 0415952075		
COC emailed to ALS? (YES / (NO)	EDD FORMAT (or default): Esdat		
Email Reports to: nicole.rosen@ghd.com, alice.walker@ghd.com			
Email Invoice to (will default to PM if no other addresses are listed): PM			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Alice Walker	Jenny Cutten ALS Newcastle		Sophie Pi GHD
DATE/TIME: 18/04/17	DATE/TIME: 18/4/17 1205pm	DATE/TIME:	DATE/TIME: 18/4/17 1500

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

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).

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFCs (Full Suite)
1	MW01	18/04/17	water		1	X
2	MW02	↓	↓		1	X
—	FD01	↓	↓		1	Please forward to Eurofins with COC attached
					TOTAL	

Delivered by: Courier / Hand / Post / PO
Lab / Analysis: Eurofins
Organised by / Date: FD01
Relinquished By / Date:
Courier / Courier:
WO No: ES1709080
Attach by PO / Internal Sheet:

Environmental Division
Sydney
Work Order Reference
ES1709080

Telephone : + 61-2-8784 8555

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.

CHAIN OF CUSTODY RECORD

☐ **Eurofins | mgt Sydney Lab** — Unit F3 Building F, 16 Mars Road, Lane Cove West, NSW 2066 | P : +61 2 9900 8400 | E : EnviroSampleNSW@eurofins.com.au

☐ **Eurofins | mgt Brisbane Lab** — Unit 1, 21 Smallwood Place, Murarrie, QLD 4172 | P : +61 7 3902 4600 | E : EnviroSampleQLD@eurofins.com.au

☐ **Eurofins | mgt Melbourne Lab** — 2 Kingston Town Close, Oakleigh, VIC 3166 | P : +61 3 8564 5000 F : +61 3 8564 5090 | E : EnviroSampleVic@eurofins.com.au

Company	GHD	Purchase Order	21 25583	Project Manager	Nicole Rosen
Address	level 15, 133 Castlereagh St	Eurofins | mgt Quote №	150612GHDN	Project №	21 25583
Contact Name	Alice Walker				
Contact Phone №	0415952075				
Special Direction					
Relinquished by (Signature)	Alice Walker				
(Time / Date)	__:__ 18/04/17				

Project Name	FRNSW-Greenacre
Electronic Results Format	Esdat
Email for Results	Nicole.rosen@ghd.com alice.walker@ghd.com
Turn Around Requirements	☐ 1 DAY* ☐ 2 DAY* ☐ 3 DAY* *Surcharges apply ☒ 5 DAY (Std.) ☐ Other ( )

Analysis (Note: Where metals are requested, please specify "Total" or "Filtered")

№	Client Sample ID	Date	Matrix	PFC's (full suite)	Containers: 1L Plastic	250mL Plastic	125 mL Plastic	200mL Amber Glass	40mL vial	125mL Amber Glass	Jar	Sample Comments / DG Hazard Warning
1	FD01	18/04/17	water	X								
2												
3												
4												
5												
6												
7												copy COC
8												
9												
10												
11												
12												

Method of Shipment: ☐ Courier (#) ☐ Hand Delivered ☐ Postal

Laboratory Use Only									
Received By		SYD | BNE | MEL | PER | ADL | NEW | DAR	Date __/__/__	Time __:__	Signature		Temperature	
Received By		SYD | BNE | MEL | PER | ADL | NEW | DAR	Date __/__/__	Time __:__	Signature		Report №	

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1711504**	Page	: 1 of 23
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS NICOLE ROSEN	Contact	: Customer Services ES
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9239 7100	Telephone	: +61-2-8784 8555
Project	: FRNSW - Greenacre	Date Samples Received	: 12-May-2017 19:15
Order number	: 2125583	Date Analysis Commenced	: 16-May-2017
C-O-C number	: ----	Issue Date	: 30-May-2017 13:53
Sampler	: ALICE WALKER		
Site	: ----		
Quote number	: SY/143/17		
No. of samples received	: 33		
No. of samples analysed	: 17		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG005T: Poor precision was obtained for Zinc on sample ES1711504 #003 due to sample heterogeneity. Results have been confirmed by re-extraction and reanalysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)				Client sample ID	MW04_0.2-0.25	MW04_1.95-2.0	MW04_6.95-7.0	WC04 DI WATER LEACH	MW03_0.2-0.25
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	12-May-2017 00:00	11-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1711504-007	ES1711504-010	ES1711504-013	ES1711504-015	ES1711504-017
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.14**	**0.06**	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.14**	**0.06**	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**1.13**	**0.43**	**0.03**	**0.51**	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.21**	**0.02**	<0.02	**0.03**	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**10.1**	**0.08**	**0.02**	**0.56**	**0.17**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.03**	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.25**	**0.06**	<0.02	**0.08**	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.04**	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.11**	<0.01	<0.01	**0.02**	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)				Client sample ID	MW04_0.2-0.25	MW04_1.95-2.0	MW04_6.95-7.0	WC04 DI WATER LEACH	MW03_0.2-0.25
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	12-May-2017 00:00	11-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1711504-007	ES1711504-010	ES1711504-013	ES1711504-015	ES1711504-017
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	**0.06**
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**12.2**	**0.71**	**0.05**	**1.20**	**0.23**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**11.2**	**0.51**	**0.05**	**1.07**	**0.17**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**11.8**	**0.63**	**0.05**	**1.17**	**0.17**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**88.8**	**93.8**	**87.0**	**90.5**	**89.4**

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)				Client sample ID	MW03_4.5-4.55	MW05_0.16-0.25	MW05_4.0-4.05	QA02	----
				Client sampling date / time	11-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	----
Compound	CAS Number	LOR	Unit		ES1711504-021	ES1711504-025	ES1711504-029	ES1711504-032	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.04**	**0.36**	**0.04**	**0.35**	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.04**	**0.44**	**0.02**	**0.43**	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**0.40**	**16.1**	**0.63**	**17.6**	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.04**	**1.30**	**0.03**	**1.34**	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.71**	**24.8**	**0.82**	**27.4**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	**0.30**	<0.02	**0.29**	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.07**	**1.70**	**0.13**	**1.72**	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	**0.14**	<0.02	**0.14**	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.02**	**0.55**	**0.01**	**0.59**	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)				Client sample ID	MW03_4.5-4.55	MW05_0.16-0.25	MW05_4.0-4.05	QA02	----
				Client sampling date / time	11-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	----
Compound	CAS Number	LOR	Unit		ES1711504-021	ES1711504-025	ES1711504-029	ES1711504-032	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**1.32**	**45.7**	**1.68**	**49.9**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**1.11**	**40.9**	**1.45**	**45.0**	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**1.24**	**44.0**	**1.63**	**48.1**	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**94.0**	**95.9**	**95.6**	**97.4**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TRIPBLANK	WC01	WC02	WC03	MW04_0.2-0.25
			Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00
Compound	CAS Number	LOR	Unit	ES1711504-001	ES1711504-003	ES1711504-004	ES1711504-005	ES1711504-007
				Result	Result	Result	Result	Result
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	----	15.8	24.3	9.5	10.0
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	6	<5	8	----
Cadmium	7440-43-9	1	mg/kg	----	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg	----	6	4	7	----
Copper	7440-50-8	5	mg/kg	----	23	34	16	----
Lead	7439-92-1	5	mg/kg	----	10	10	12	----
Nickel	7440-02-0	2	mg/kg	----	28	26	34	----
Zinc	7440-66-6	5	mg/kg	----	94	116	110	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	<0.1	<0.1	<0.1	----
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	----	9.8	9.0	8.9	----
After HCl pH	----	0.1	pH Unit	----	1.9	1.8	1.9	----
Extraction Fluid Number	----	1	-	----	1	1	1	----
Final pH	----	0.1	pH Unit	----	5.3	5.2	5.0	----
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	----	----	----	----	8.8
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	----	0.09	0.25	0.17	0.17
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TRIPBLANK	WC01	WC02	WC03	MW04_0.2-0.25
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1711504-001	ES1711504-003	ES1711504-004	ES1711504-005	ES1711504-007
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	**0.6**	**0.6**	**0.6**	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	**1.2**	**1.2**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg		----	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg		----	<100	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg		----	<100	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg		----	<50	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg		----	<100	<100	<100	----
>C34 - C40 Fraction	----	100	mg/kg		----	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	<50	<50	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	<50	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	<0.2	<0.2	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		----	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg		----	<1	<1	<1	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	**0.0076**	**0.0007**	**0.0028**	**0.0036**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TRIPBLANK	WC01	WC02	WC03	MW04_0.2-0.25
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1711504-001	ES1711504-003	ES1711504-004	ES1711504-005	ES1711504-007
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	**0.0041**	**0.0004**	**0.0020**	**0.0032**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	**0.0153**	**0.0034**	**0.0100**	**0.0166**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	**0.0011**	**0.0008**	**0.0009**	**0.0045**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	**0.0227**	**0.0460**	**0.0098**	**0.201**
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	**0.0020**	<0.0002	**0.0004**	**0.0009**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	**0.0143**	**0.0018**	**0.0047**	**0.0078**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	**0.0013**	**0.0003**	**0.0005**	**0.0012**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	**0.0018**	**0.0008**	**0.0007**	**0.0031**
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TRIPBLANK	WC01	WC02	WC03	MW04_0.2-0.25
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1711504-001	ES1711504-003	ES1711504-004	ES1711504-005	ES1711504-007
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		<0.0002	**0.0702**	**0.0542**	**0.0318**	**0.242**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	**0.0380**	**0.0494**	**0.0198**	**0.218**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	**0.0650**	**0.0530**	**0.0289**	**0.234**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	**83.3**	**84.7**	**85.9**	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	**85.8**	**86.0**	**84.1**	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	**88.1**	**86.4**	**75.9**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	**81.5**	**86.4**	**85.9**	----
Anthracene-d10	1719-06-8	0.5	%		----	**85.7**	**90.6**	**95.8**	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	**87.0**	**103**	**95.6**	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	**99.4**	**113**	**100**	----
Toluene-D8	2037-26-5	0.2	%		----	**102**	**124**	**105**	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	**95.7**	**118**	**100**	----
EP231S: PFAS Surrogate									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TRIPBLANK	WC01	WC02	WC03	MW04_0.2-0.25
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1711504-001	ES1711504-003	ES1711504-004	ES1711504-005	ES1711504-007
					Result	Result	Result	Result	Result
EP231S: PFAS Surrogate - Continued									
13C4-PFOS	----	0.0002	%		**80.2**	**82.3**	**73.7**	**90.2**	**71.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	MW04_1.95-2.0	MW04_6.95-7.0	WC04 DI WATER LEACH	WC04 TCLP WATER LEACH	MW03_0.2-0.25
			Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	11-May-2017 00:00
Compound	CAS Number	LOR	Unit	ES1711504-010	ES1711504-013	ES1711504-015	ES1711504-016	ES1711504-017
				Result	Result	Result	Result	Result
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	15.8	17.7	17.6	----	14.8
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	----	----	6	----	----
Cadmium	7440-43-9	1	mg/kg	----	----	<1	----	----
Chromium	7440-47-3	2	mg/kg	----	----	12	----	----
Copper	7440-50-8	5	mg/kg	----	----	24	----	----
Lead	7439-92-1	5	mg/kg	----	----	15	----	----
Nickel	7440-02-0	2	mg/kg	----	----	24	----	----
Zinc	7440-66-6	5	mg/kg	----	----	91	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	----	<0.1	----	----
EN33: TCLP Leach								
Initial pH	----	0.1	pH Unit	----	----	----	8.7	----
After HCl pH	----	0.1	pH Unit	----	----	----	1.9	----
Extraction Fluid Number	----	1	-	----	----	----	1	----
Final pH	----	0.1	pH Unit	----	----	----	4.9	----
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	8.4	8.8	8.9	----	9.0
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	0.09	0.51	----	----	0.11
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	----	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	----	----	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	----	----	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	----	----	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	----	----	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	----	----	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg	----	----	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	----	----	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	----	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	----	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	<0.5	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW04_1.95-2.0	MW04_6.95-7.0	WC04 DI WATER LEACH	WC04 TCLP WATER LEACH	MW03_0.2-0.25
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	11-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1711504-010	ES1711504-013	ES1711504-015	ES1711504-016	ES1711504-017
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	----	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	----	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	----	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	----	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	----	**0.6**	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	----	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	----	<10	----	----
C10 - C14 Fraction	----	50	mg/kg		----	----	<50	----	----
C15 - C28 Fraction	----	100	mg/kg		----	----	<100	----	----
C29 - C36 Fraction	----	100	mg/kg		----	----	<100	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	----	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	----	<10	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	----	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg		----	----	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg		----	----	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg		----	----	<100	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	----	<50	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	----	<50	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	----	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		----	----	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		----	----	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	----	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		----	----	<0.5	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	----	<0.2	----	----
^ Total Xylenes	1330-20-7	0.5	mg/kg		----	----	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg		----	----	<1	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	MW04_1.95-2.0	MW04_6.95-7.0	WC04 DI WATER LEACH	WC04 TCLP WATER LEACH	MW03_0.2-0.25
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	11-May-2017 00:00
					ES1711504-010	ES1711504-013	ES1711504-015	ES1711504-016	ES1711504-017
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		**0.0020**	**0.0003**	**0.0025**	----	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		**0.0016**	**0.0002**	**0.0040**	----	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0077**	**0.0015**	**0.160**	----	**0.0008**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		**0.0007**	**0.0004**	**0.0145**	----	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0020**	**0.0103**	**0.311**	----	**0.0104**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	**0.0012**	----	**0.0011**
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	----	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	**0.0018**	----	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		**0.0022**	**0.0006**	**0.0160**	----	**0.0005**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		**0.0004**	<0.0002	**0.0013**	----	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		**0.0006**	**0.0002**	**0.0055**	----	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	**0.0002**
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	<0.0005
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	**0.0003**	----	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW04_1.95-2.0	MW04_6.95-7.0	WC04 DI WATER LEACH	WC04 TCLP WATER LEACH	MW03_0.2-0.25
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	11-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1711504-010	ES1711504-013	ES1711504-015	ES1711504-016	ES1711504-017
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0172**	**0.0135**	**0.518**	----	**0.0130**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0097**	**0.0118**	**0.471**	----	**0.0112**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0149**	**0.0129**	**0.498**	----	**0.0117**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	----	**86.1**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	----	**83.5**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%		----	----	**77.0**	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	----	**86.2**	----	----
Anthracene-d10	1719-06-8	0.5	%		----	----	**91.0**	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	----	**90.9**	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		----	----	**100**	----	----
Toluene-D8	2037-26-5	0.2	%		----	----	**108**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW04_1.95-2.0	MW04_6.95-7.0	WC04 DI WATER LEACH	WC04 TCLP WATER LEACH	MW03_0.2-0.25
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	11-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1711504-010	ES1711504-013	ES1711504-015	ES1711504-016	ES1711504-017
					Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued									
4-Bromofluorobenzene	460-00-4	0.2	%		----	----	98.8	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		87.5	89.3	98.0	----	88.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW03_4.5-4.55	MW05_0.16-0.25	MW05_4.0-4.05	QA02	----
				Client sampling date / time	11-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	----
Compound	CAS Number	LOR	Unit		ES1711504-021	ES1711504-025	ES1711504-029	ES1711504-032	--------
					Result	Result	Result	Result	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		10.0	15.2	11.0	16.1	----
EN60: Bottle Leaching Procedure									
Final pH	----	0.1	pH Unit		9.0	9.0	8.8	9.0	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.12	0.77	0.06	0.94	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		0.0011	0.0107	0.0008	0.0086	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		0.0008	0.0141	0.0006	0.0112	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0061	0.555	0.0085	0.489	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		0.0010	0.0510	0.0008	0.0402	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0136	1.35	0.0163	1.21	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	0.0044	<0.0002	0.0035	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	0.002	<0.001	0.002	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	0.0032	<0.0002	0.0023	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		0.0019	0.0379	0.0030	0.0288	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		0.0003	0.0028	0.0003	0.0024	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		0.0007	0.0166	0.0005	0.0138	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	0.0002	<0.0002	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MW03_4.5-4.55	MW05_0.16-0.25	MW05_4.0-4.05	QA02	----
				Client sampling date / time	11-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	12-May-2017 00:00	----
Compound	CAS Number	LOR	Unit		ES1711504-021	ES1711504-025	ES1711504-029	ES1711504-032	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	**0.0009**	<0.0002	**0.0008**	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0255**	**2.05**	**0.0308**	**1.81**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0197**	**1.90**	**0.0248**	**1.70**	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0237**	**1.98**	**0.0294**	**1.76**	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**79.8**	**87.5**	**81.5**	**94.6**	----

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)				Client sample ID	WC01	WC02	WC03	WC04 TCLP WATER LEACH	----
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	12-May-2017 00:00	----
Compound	CAS Number	LOR	Unit		ES1711504-003	ES1711504-004	ES1711504-005	ES1711504-016	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.66**	**0.04**	**0.08**	**0.03**	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.62**	**0.03**	**0.09**	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**1.91**	**0.22**	**0.50**	**0.25**	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.05**	**0.02**	**0.03**	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.55**	**1.37**	**0.49**	**0.03**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.26**	**0.03**	**0.04**	**0.03**	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.96**	**0.06**	**0.11**	**0.13**	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.15**	<0.02	**0.02**	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.09**	**0.02**	**0.02**	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: TCLP LEACHATE (Matrix: WATER)				Client sample ID	WC01	WC02	WC03	WC04 TCLP WATER LEACH	----
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	11-May-2017 00:00	12-May-2017 00:00	----
Compound	CAS Number	LOR	Unit		ES1711504-003	ES1711504-004	ES1711504-005	ES1711504-016	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**5.25**	**1.79**	**1.38**	**0.47**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**2.46**	**1.59**	**0.99**	**0.28**	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**4.58**	**1.74**	**1.26**	**0.47**	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**80.6**	**80.2**	**82.3**	**87.3**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	FW02	RB01	RB02	----	----
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	12-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1711504-002	ES1711504-014	ES1711504-034	--------	--------
					Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.03**	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.03**	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**0.30**	<0.02	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.02**	<0.02	<0.02	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.98**	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.24**	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.19**	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.04**	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.07**	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		**0.02**	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	FW02	RB01	RB02	----	----
				Client sampling date / time	11-May-2017 00:00	11-May-2017 00:00	12-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1711504-002	ES1711504-014	ES1711504-034	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**0.31**	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**2.23**	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**1.28**	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**2.16**	<0.01	<0.01	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**103**	**96.6**	**108**	----	----

Surrogate Control Limits

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

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130

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

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1711504**	Page	: 1 of 19
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS NICOLE ROSEN	Contact	: Customer Services ES
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9239 7100	Telephone	: +61-2-8784 8555
Project	: FRNSW - Greenacre	Date Samples Received	: 12-May-2017
Order number	: 2125583	Date Analysis Commenced	: 16-May-2017
C-O-C number	: ----	Issue Date	: 30-May-2017
Sampler	: ALICE WALKER		
Site	: ----		
Quote number	: SY/143/17		
No. of samples received	: 33		
No. of samples analysed	: 17		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 895865)									
ES1711504-005	WC03	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	9.5	9.9	3.73	No Limit
EA055: Moisture Content (QC Lot: 897196)									
ES1711504-013	MW04_6.95-7.0	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	17.7	17.7	0.00	0% - 50%
ES1711602-006	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	6.8	7.9	14.8	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 899287)									
ES1711504-003	WC01	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	6	6	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	28	20	37.2	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	6	6	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	23	16	36.5	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	10	10	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	94	# 155	49.2	0% - 20%
ES1712160-007	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	3	3	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	2	3	39.6	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	6	6	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	17	16	8.25	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	54	49	9.84	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	90	94	4.66	0% - 50%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 899286)									
ES1711504-003	WC01	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES1712160-007	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 910417)									
ES1711504-003	WC01	EP003: Total Organic Carbon	----	0.02	%	0.09	0.09	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 (%)*
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 910417) - continued									
ES1711504-032	QA02	EP003: Total Organic Carbon	----	0.02	%	0.94	0.90	3.48	0% - 20%
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 889799)									
ES1711504-003	WC01	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
ES1711669-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	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 (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 889799) - continued									
ES1711669-001	Anonymous	EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 889802)									
ES1711504-003	WC01	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1711669-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 895815)									
ES1711504-003	WC01	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 889802)									
ES1711504-003	WC01	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES1711669-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 895815)									
ES1711504-003	WC01	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 895815)									
ES1711504-003	WC01	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 889573)									
ES1711504-001	TRIPBLANK	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES1711504-025	MW05_0.16-0.25	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0107	0.0098	9.00	0% - 20%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0141	0.0127	10.4	0% - 20%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.555	0.508	8.87	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 (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 889573) - continued									
ES1711504-025	MW05_0.16-0.25	EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0510	0.0458	10.7	0% - 20%
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	1.35	1.22	10.4	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0044	0.0042	5.37	0% - 20%
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 889573)									
ES1711504-001	TRIPBLANK	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES1711504-025	MW05_0.16-0.25	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0032	0.0030	8.48	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0379	0.0350	8.10	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0028	0.0027	4.21	0% - 50%
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0166	0.0160	3.75	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0002	0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	0.002	0.002	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 889573)									
ES1711504-001	TRIPBLANK	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

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: 889573) - continued									
ES1711504-025	MW05_0.16-0.25	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0009	0.0010	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 889573)									
ES1711504-001	TRIPBLANK	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
ES1711504-025	MW05_0.16-0.25	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: 889717)									
ES1711423-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.82	0.85	4.55	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.29	0.29	0.00	0% - 50%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.24	0.23	4.24	0% - 50%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.85	0.85	0.00	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.06	0.06	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
ES1711598-002	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

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: 889717) - continued									
ES1711598-002	Anonymous	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
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 898046)									
EM1706338-002	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	3180	3.79	17.6	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	20	0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	20	0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	100	0.12	16.5	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	30	0.03	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	40	0.04	0.00	No Limit
ES1711504-010	MW04_1.95-2.0	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.08	0.08	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.06	0.06	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.06	0.06	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.43	0.41	5.94	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.02	0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 889717)									
ES1711423-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.12	0.12	0.00	0% - 50%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.26	0.29	12.4	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	1.53	1.54	0.715	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.09	0.09	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	0.2	0.2	0.00	No Limit
ES1711598-002	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 898046)									
EM1706338-002	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	40	0.05	27.3	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<20	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	40	0.04	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<20	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<20	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<20	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<20	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<20	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<20	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<50	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<100	<0.1	0.00	No Limit
ES1711504-010	MW04_1.95-2.0	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.06	0.06	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 889717)									
ES1711423-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES1711598-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit

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: 889717) - continued									
ES1711598-002	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 898046)									
EM1706338-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<20	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<20	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<20	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<50	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<50	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<50	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<50	<0.05	0.00	No Limit
ES1711504-010	MW04_1.95-2.0	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 889717)									
ES1711423-001	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	0.48	0.48	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 889717) - continued									
ES1711423-001	Anonymous	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
ES1711598-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 898046)									
EM1706338-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<50	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<50	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<50	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<50	<0.05	0.00	No Limit
ES1711504-010	MW04_1.95-2.0	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 889717)									
ES1711423-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	4.94	5.00	1.21	0% - 20%
ES1711598-002	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 898046)									
EM1706338-002	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	3470	4.11	16.9	0% - 20%
ES1711504-010	MW04_1.95-2.0	EP231X: Sum of PFAS	----	0.01	µg/L	0.71	0.69	2.86	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
EG005T: Total Metals by ICP-AES (QCLot: 899287)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	99.4	86	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	98.2	83	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	88.7	76	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	103	86	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	97.8	80	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	98.1	87	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	105	80	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 899286)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	91.4	70	105
EN33: TCLP Leach (QCLot: 892172)								
EN33a: Initial pH	----	0.1	pH Unit	1.0	----	----	----	----
EN33a: After HCl pH	----	0.1	pH Unit	1.0	----	----	----	----
EN33a: Final pH	----	0.1	pH Unit	1.0	----	----	----	----
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 910417)								
EP003: Total Organic Carbon	----	0.02	%	<0.02	100 %	104	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 889799)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	91.0	77	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	92.2	72	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	94.5	73	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	92.9	72	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	93.1	75	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	89.8	77	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	95.4	73	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	95.5	74	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	89.9	69	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	88.7	75	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	96.8	68	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	93.7	74	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	91.0	70	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	90.9	61	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	98.2	62	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	95.8	63	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 889802)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 889802) - continued								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	200 mg/kg	98.0	75	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	300 mg/kg	102	77	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	200 mg/kg	97.3	71	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 895815)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	96.0	68	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 889802)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	250 mg/kg	99.2	77	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	350 mg/kg	102	74	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	150 mg/kg	91.9	63	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 895815)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	93.0	68	128
EP080: BTEXN (QCLot: 895815)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	99.5	62	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	93.0	67	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	91.6	65	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	89.2	66	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	86.3	68	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	96.9	63	119
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 889573)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.7	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	67.2	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	53.4	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.1	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	55.6	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 889573)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	82.3	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.0	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.5	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.0	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.8	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.8	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	75.0	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.2	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	119	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	81.6	59	129

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 889573)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	103	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	99.8	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	103	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	68.1	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.2	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	124	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 889573)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	80.8	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	90.4	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	129	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	112	60	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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 889717)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	106	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	108	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	86.6	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	106	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	102	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	110	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 898046)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	84.8	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	107	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	104	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	111	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	91.8	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	128	70	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 889717)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	102	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	107	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	116	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	117	70	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: 889717) - continued								
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	116	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	115	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	106	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	103	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	105	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	115	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	102	70	124
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 898046)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	97.4	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	70.4	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	90.4	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	95.8	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	110	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	92.0	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	93.4	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	114	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	87.6	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	76.0	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	102	70	124
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 889717)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	100	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	116	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	108	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	109	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	112	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	102	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	116	70	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 898046)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	75.0	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	106	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	114	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	112	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	93.8	70	126

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 898046) - continued								
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	111	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	130	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 889717)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	107	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	102	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	103	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	97.8	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 898046)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	102	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	90.8	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	90.8	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	84.0	70	130

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 899287)							
ES1711504-003	WC01	EG005T: Arsenic	7440-38-2	50 mg/kg	95.5	70	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	92.2	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	95.4	70	130
		EG005T: Copper	7440-50-8	250 mg/kg	96.8	70	130
		EG005T: Lead	7439-92-1	250 mg/kg	92.9	70	130
		EG005T: Nickel	7440-02-0	50 mg/kg	118	70	130
		EG005T: Zinc	7440-66-6	250 mg/kg	130	70	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 899286)							
ES1711504-003	WC01	EG035T: Mercury	7439-97-6	5 mg/kg	96.9	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 889799)							
ES1711504-003	WC01	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	84.9	70	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	88.9	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 889802)							
ES1711504-003	WC01	EP071: C10 - C14 Fraction	----	523 mg/kg	93.8	73	137

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
EP080/071: Total Petroleum Hydrocarbons (QCLot: 889802) - continued							
ES1711504-003	WC01	EP071: C15 - C28 Fraction	----	2319 mg/kg	93.5	53	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	117	52	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 895815)							
ES1711504-003	WC01	EP080: C6 - C9 Fraction	----	32.5 mg/kg	91.6	70	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 889802)							
ES1711504-003	WC01	EP071: >C10 - C16 Fraction	----	860 mg/kg	93.3	73	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	98.2	53	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	113	52	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 895815)							
ES1711504-003	WC01	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	96.5	70	130
EP080: BTEXN (QCLot: 895815)							
ES1711504-003	WC01	EP080: Benzene	71-43-2	2.5 mg/kg	92.7	70	130
		EP080: Toluene	108-88-3	2.5 mg/kg	89.2	70	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	94.0	70	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	87.0	70	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	83.7	70	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	97.5	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 889573)							
ES1711504-001	TRIPBLANK	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	92.8	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	76.0	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	62.9	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	95.0	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	108	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	67.4	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 889573)							
ES1711504-001	TRIPBLANK	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	94.1	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	96.4	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	95.3	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	116	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	110	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	112	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	121	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	88.7	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	116	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	104	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	100.0	30	130

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 889573)							
ES1711504-001	TRIPBLANK	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	56.4	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	90.4	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	65.2	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.00312 mg/kg	65.6	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	76.4	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	112	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	86.6	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 889573)							
ES1711504-001	TRIPBLANK	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	89.1	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	106	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	65.3	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	119	50	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 889717)							
ES1711423-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	97.4	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	109	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	78.2	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	115	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	84.6	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	108	50	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 898046)							
EM1706338-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	95.8	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	127	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	112	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	121	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	# Not Determined	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	116	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 889717)							
ES1711423-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	114	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	118	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: 889717) - continued							
ES1711423-001	Anonymous	EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	110	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	115	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	118	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	108	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	98.0	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	105	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	99.8	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	102	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	65.5	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 898046)							
EM1706338-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	114	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	124	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	91.6	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	120	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	127	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	92.0	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	111	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	113	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	105	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	76.2	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	77.0	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 889717)							
ES1711423-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	105	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	120	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	121	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	98.6	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	108	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	93.6	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	106	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 898046)							
EM1706338-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	94.0	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	120	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	121	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 898046) - continued							
EM1706338-002	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	128	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	122	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	103	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	103	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 889717)							
ES1711423-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	112	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	99.2	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	106	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	89.8	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 898046)							
EM1706338-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	101	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	82.8	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	123	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	108	50	130

24/5/17

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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

CLIENT: GHD Pty Ltd	**TURNAROUND REQUIREMENT** ☑ Standard TAT (List due date): ~~Monday 15/5~~	**FOR LABORATORY USE ONLY (Circle)**	
OFFICE: Sydney	(Standard TAT may be longer for some tests e.g.. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes / No / N/A
PROJECT: FRNSW - Greenacre	**ALS QUOTE NO.:** SY-143-17 V2 GHD	Free ice / frozen ice bricks present upon receipt?	Yes / No / N/A
ORDER NUMBER: 21 35583	**COC SEQUENCE NUMBER (Circle)** COC: (1) 2 3 4 5 6 7	Random Sample Temperature on Receipt	3.7 °C
PROJECT MANAGER: Nicole Rosen	**CONTACT PH:** 92397215 OF: 1 2 (3) 4 5 6 7	Other comment:	
SAMPLER: Alice Walker	**SAMPLER MOBILE:** 0415952075		
COC emailed to ALS? (YES / (NO)	**EDD FORMAT (or default):** Esdat		
Email Reports to: alice.walker@ghd.com, nicole.rosen@ghd.com			
Email Invoice to (will default to PM if no other addresses are listed): PM			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Alice Walker	Jenny Giles ALS Chatswood West.		Frank ALS
DATE/TIME: 12/05/17	DATE/TIME: 12/5/17 5:35pm.	DATE/TIME:	DATE/TIME: 12-5-17 1915

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: PLEASE HOLD ALL soil/concrete SAMPLES FOR ~~TWO WEEKS~~ SIX MONTHS

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).

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION														
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	moisture	TOC	PFAS full suite	ASLP with full suite PFAS	TCLP with full suite PFAS	TRH/BTEXN/ PAHs	HOLD six months for soils please & concrete	Metals (inc)					
1	Tripblank	11/05/17	soil		1			X										
2	FW02		water		1			X										
3	WC01		soil		2	X	X	X	X	X	X		X					
4	WC02					X	X	X	X	X	X		X					
5	WC03					X	X	X		X	X		X					
6	MW04_0.0-0.19		concrete		bag	X	X	X	X									
7	MW04_0.2-0.25		soil		2	X	X	X	X									
8	MW04_0.5-0.55											X						
9	MW04_1.0-1.05											X						
10	MW04_1.95-2.0					X	X	X	X									
11	MW04_4.1-4.5											X						
12	MW04_5.5-5.55											X						
					TOTAL													

Sydney / Perward Lab / Split WO
Lab: _____
Organised By / Date: Concrete
Relinquished By / Date: Split into
Courier: _____
WO No: _____

Environmental Division Sydney
Work Order Reference
ES1711504

Telephone : +61-2-8784 8555

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 P
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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

CLIENT: GHD Pty Ltd
OFFICE: Sydney
PROJECT: FRNSW Greenacre
ORDER NUMBER: 21255831
PROJECT MANAGER:
CONTACT PH:
SAMPLER:
SAMPLER MOBILE:
COC emailed to ALS? (YES / NO)
EDD FORMAT (or default): esdat
Email Reports to:
Email Invoice to (will default to PM if no other addresses are listed):

TURNAROUND REQUIREMENT ☑ Standard TAT (List due date):
(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):
ALS QUOTE NO.: SY-143-17 V2 GHD

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

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes (No) N/A
Free Ice / frozen ice bricks present upon receipt? (Yes) No N/A
Random Sample Temperature on Receipt: 3.7 °C
Other comments:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Alice Walker	Jenny Allen ALS crows nest		Fraul ALS
DATE/TIME: 12/5/17	DATE/TIME: 12/5/17 5.35pm	DATE/TIME:	DATE/TIME: 12-5-17 1915

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

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).

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		Moisture	TOC	PFAS full suite	ASLP with PFAS full suite	TRH/BTEXN/PAHs	Metals (M8)	HOLD six months	TCLP with PFAS full suite								
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS																
13	MW04_6.95-7.0	11/05/17	soil		2	X	X	X	X												
	~~MW04_0.0-0.19~~	~~11/05/17~~	concrete		bag																
14	~~MW04~~ RB01	11/05/17	water		1			X	~~X~~	~~X~~	~~X~~		~~X~~								
15, 16	WC04	12/05/17	soil		2			X	X	X	X		X								
~~17~~	MW03_0.0-0.19	11/05/17	concrete		bag								X								
17	MW03_0.2-0.25		soil		2	X	X	X	X												
18	MW03_0.5-0.55												X								
19	MW03_1.0-1.05												X						ES1711504		
20	MW03_2.3-2.35												X								
21	MW03_4.5-4.55					X	X	X	X												
22	MW03_5.9-5.95					~~X~~	~~X~~	~~X~~	~~X~~				X								
23	QA01												X								
					TOTAL																

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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

CLIENT: GHD Pty Ltd	**TURNAROUND REQUIREMENT** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☑ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: Sydney		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes / (No) / N/A
PROJECT: PRNSW Greenacre	**ALS QUOTE NO.:** SY-143-17 V2 GHD	**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: 21 25583 12		OF: 1 2 (3) 4 5 6 7	Random Sample Temperature on Receipt: 3.7 °C
PROJECT MANAGER:	**CONTACT PH:**		Other comments:
SAMPLER:	**SAMPLER MOBILE:**	**RELINQUISHED BY:** Alice Walker	**RECEIVED BY:** Jenny Wilen ALS Crows Nest
COC emailed to ALS? (YES / NO)	**EDD FORMAT (or default):** esdat	DATE/TIME: 12/5/17	DATE/TIME: 12/5/17 5.35pm.
Email Reports to:		**RELINQUISHED BY:**	**RECEIVED BY:** Frank MS
Email Invoice to (will default to PM if no other addresses are listed):		DATE/TIME:	DATE/TIME: 12-5-17 1915

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	MOISTURE	TOC /	PFAS full suite	ASLP with PFAS full suite			HOLD six months for soils	
24	MW05_0.0-0.16	12/05/17	concrete		bag							X	
25	MW05_0.16-0.25		soil		2	X	X	X	X				
26	MW05_0.35-0.4											X	
27	MW05_1.0-1.05											X	
28	MW05_2.0-2.05											X	
29	MW05_4.0-4.05					X	X	X	X				
30	MW05_6.5-6.55											X	
31	MW05_7.55-8.0											X	
32	QA02					X	X	X	X				ES1711504
33	QA03		↓		↓							X	
34	RB02	↓	water		1			X					
35	MW05.5.5_5.55	extra sample											
					TOTAL								

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1712664**	Page	: 1 of 13
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS NICOLE ROSEN	Contact	: Customer Services ES
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9239 7100	Telephone	: +61-2-8784 8555
Project	: FRNSW Greenacre phase 2 GME	Date Samples Received	: 24-May-2017 16:50
Order number	: 21 25583 12	Date Analysis Commenced	: 25-May-2017
C-O-C number	: ----	Issue Date	: 31-May-2017 16:57
Sampler	: Alice Walker		
Site	: ----		
Quote number	: SY/143/17		
No. of samples received	: 18		
No. of samples analysed	: 17		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Andrew Epps	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)				Client sample ID	SS02	SSQA03	----	----	----
				Client sampling date / time	24-May-2017 00:00	24-May-2017 00:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1712664-013	ES1712664-015	--------	--------	--------
					Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.04**	**0.04**	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**0.73**	**0.78**	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.46**	**0.45**	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**40.0**	**45.6**	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		**0.10**	**0.11**	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.19**	**0.18**	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.06**	**0.06**	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.33**	**0.33**	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		**0.03**	**0.03**	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		**0.18**	**0.18**	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)				Client sample ID	SS02	SSQA03	----	----	----
				Client sampling date / time	24-May-2017 00:00	24-May-2017 00:00	----	----	----
Compound	CAS Number	LOR	Unit		ES1712664-013	ES1712664-015	--------	--------	--------
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**3.85**	**4.20**	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		**3.18**	**3.77**	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**49.2**	**55.7**	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**40.7**	**46.4**	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**48.3**	**54.9**	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**104**	**108**	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TRIP BLANK	SS02	SSQA03	----	----
				Client sampling date / time	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1712664-001	ES1712664-013	ES1712664-015	--------	--------
					Result	Result	Result	----	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		----	**49.6**	**58.6**	----	----
EN60: Bottle Leaching Procedure									
Final pH	----	0.1	pH Unit		----	**8.2**	**7.9**	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		----	**3.98**	**3.67**	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	**0.0049**	**0.0014**	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	**0.0114**	**0.0049**	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	**0.102**	**0.0825**	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	**0.0471**	**0.0450**	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	**4.96**	**5.84**	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	**0.0233**	**0.0265**	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	**0.0189**	**0.0167**	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	**0.0068**	**0.0067**	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	**0.0335**	**0.0331**	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	**0.0009**	**0.0012**	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	**0.0023**	**0.0026**	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	**0.0010**	**0.0008**	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	**0.0005**	**0.0007**	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231C: Perfluoroalkyl Sulfonamides									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TRIP BLANK	SS02	SSQA03	----	----
				Client sampling date / time	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1712664-001	ES1712664-013	ES1712664-015	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	**0.0112**	**0.0142**	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	**0.0025**	**0.0024**	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	**0.0021**	**0.0020**	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	**0.228**	**0.290**	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	**0.370**	**0.424**	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	**0.0366**	**0.0392**	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		<0.0002	**5.86**	**6.83**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	**5.06**	**5.92**	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	**5.72**	**6.69**	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**73.2**	**72.8**	**70.9**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MW02	GWQA01	MW3	MW5	MW1
			Client sampling date / time	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00
Compound	CAS Number	LOR	Unit	ES1712664-003	ES1712664-004	ES1712664-005	ES1712664-006	ES1712664-007
				Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**13300**	**12100**	**10200**	**12600**	**4020**
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	**0.97**	<0.02	**5.66**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	**1.17**	<0.02	**6.81**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	**7.51**	<0.02	**74.1**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	**0.59**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	**0.52**	<0.01	**54.8**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	**2.0**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	**0.10**	<0.02	**2.50**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	**1.01**	<0.02	**8.22**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	**0.08**	<0.02	**0.67**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	**0.16**	<0.01	**1.62**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	**0.03**
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW02	GWQA01	MW3	MW5	MW1
				Client sampling date / time	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1712664-003	ES1712664-004	ES1712664-005	ES1712664-006	ES1712664-007
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	**0.18**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	**11.5**	<0.01	**157**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	**8.03**	<0.01	**129**
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	**10.4**	<0.01	**150**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**60.9**	**63.9**	**68.9**	**75.3**	**73.4**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW4	FW01	SWQA02	SW08	RINSATE
				Client sampling date / time	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1712664-008	ES1712664-009	ES1712664-010	ES1712664-011	ES1712664-012
					Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**10500**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**----**	**6**	**7**	**692**	**----**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.21**	<0.02	<0.02	**1.58**	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.26**	<0.02	<0.02	**1.80**	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**1.54**	**0.02**	**0.02**	**11.8**	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	**0.87**	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**2.02**	**0.14**	**0.14**	**54.3**	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	**0.5**	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	**1.42**	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.24**	<0.02	<0.02	**2.70**	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	**0.59**	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.05**	<0.01	<0.01	**1.64**	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	**0.03**	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MW4	FW01	SWQA02	SW08	RINSATE
				Client sampling date / time	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00
Compound	CAS Number	LOR	Unit		ES1712664-008	ES1712664-009	ES1712664-010	ES1712664-011	ES1712664-012
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	**6.52**	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	**0.24**	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**4.32**	**0.16**	**0.16**	**84.0**	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**3.56**	**0.16**	**0.16**	**66.1**	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		**4.06**	**0.16**	**0.16**	**81.3**	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**71.6**	**85.1**	**86.2**	**83.1**	**92.4**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	SW02	SW05	SW03	SW01	----
			Client sampling date / time	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	----
Compound	CAS Number	LOR	Unit	ES1712664-014	ES1712664-016	ES1712664-017	ES1712664-018	--------
				Result	Result	Result	Result	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**113**	**12**	**172**	**34**	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	**0.41**	**0.39**	**0.17**	**0.09**	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	**0.68**	**0.48**	**0.22**	**0.08**	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**5.47**	**3.89**	**1.48**	**0.40**	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	**0.72**	**0.17**	**0.14**	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**61.3**	**7.80**	**7.19**	**1.02**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	**0.05**	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	**1.31**	**0.99**	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	**2.31**	**1.20**	**0.39**	**0.11**	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	**0.65**	**0.23**	**0.09**	**0.03**	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	**1.75**	**0.26**	**0.19**	**0.02**	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	**0.07**	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW02	SW05	SW03	SW01	----
				Client sampling date / time	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	24-May-2017 00:00	----
Compound	CAS Number	LOR	Unit		ES1712664-014	ES1712664-016	ES1712664-017	ES1712664-018	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**34.0**	**0.70**	**1.27**	**0.12**	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		**5.46**	<0.05	**0.16**	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**114**	**16.1**	**11.3**	**1.87**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**66.8**	**11.7**	**8.67**	**1.42**	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**113**	**15.5**	**10.9**	**1.79**	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**86.4**	**91.3**	**90.5**	**87.4**	----

Surrogate Control Limits

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

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

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1712664**	Page	: 1 of 15
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS NICOLE ROSEN	Contact	: Customer Services ES
Address	: LEVEL 15, 133 CASTLEREAGH STREET SYDNEY NSW, AUSTRALIA 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 9239 7100	Telephone	: +61-2-8784 8555
Project	: FRNSW Greenacre phase 2 GME	Date Samples Received	: 24-May-2017
Order number	: 21 25583 12	Date Analysis Commenced	: 25-May-2017
C-O-C number	: ----	Issue Date	: 31-May-2017
Sampler	: Alice Walker		
Site	: ----		
Quote number	: SY/143/17		
No. of samples received	: 18		
No. of samples analysed	: 17		

ilac-MRA NATA

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Andrew Epps	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 910002)									
ES1712496-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	11.6	11.7	0.996	0% - 50%
ES1712638-003	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	23.1	23.4	1.36	0% - 20%
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 916477)									
ES1712598-008	Anonymous	EP003: Total Organic Carbon	----	0.02	%	1.54	1.64	6.52	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 913732)									
ES1712314-002	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	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES1712541-006	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	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 913732)									
ES1712314-002	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

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: 913732) - continued									
ES1712314-002	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
ES1712541-006	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 913732)									
ES1712314-002	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)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES1712541-006	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)	2448-09-7	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: 913732) - continued									
ES1712541-006	Anonymous	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: 913732)									
ES1712314-002	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
ES1712541-006	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

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 914035)									
ES1712664-003	MW02	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	13300	13200	0.980	0% - 20%
EW1702108-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	110	109	0.910	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 910012)									
ES1712603-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	5	<5	0.00	No Limit
ES1712672-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	16	19	17.1	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 907477)									
ES1712564-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.10	<0.10	0.00	No Limit
ES1712664-010	SWQA02	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.14	0.13	7.94	0% - 50%
		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

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: 916500)									
ES1712409-068	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.42	0.45	5.50	0% - 20%
		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	0.04	0.05	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
ES1712664-015	SSQA03	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	45.6	45.0	1.30	0% - 20%
		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	0.04	0.04	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.78	0.73	6.89	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.45	0.45	0.00	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	0.11	0.08	28.6	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 907477)									
ES1712564-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.25	<0.25	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.5	<0.5	0.00	No Limit
ES1712664-010	SWQA02	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 916500)									
ES1712409-068	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.01	0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit

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: 916500) - continued									
ES1712409-068	Anonymous	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
ES1712664-015	SSQA03	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.33	0.32	3.99	0% - 20%
		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	0.18	0.17	5.81	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.06	0.06	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.03	0.03	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 907477)									
ES1712564-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.25	<0.25	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.25	<0.25	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.25	<0.25	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.25	<0.25	0.00	No Limit
ES1712664-010	SWQA02	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

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: 907477) - continued									
ES1712664-010	SWQA02	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 916500)									
ES1712409-068	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES1712664-015	SSQA03	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	0.18	0.17	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 907477)									
ES1712564-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.10	<0.10	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.10	<0.10	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 907477) - continued									
ES1712664-010	SWQA02	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 916500)									
ES1712409-068	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
ES1712664-015	SSQA03	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	4.20	4.04	4.10	0% - 20%
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	3.77	3.66	2.99	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 907477)									
ES1712564-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.10	<0.10	0.00	No Limit
ES1712664-010	SWQA02	EP231X: Sum of PFAS	----	0.01	µg/L	0.16	0.13	20.7	0% - 50%
EP231P: PFAS Sums (QC Lot: 916500)									
ES1712409-068	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	0.47	0.51	8.16	0% - 20%
ES1712664-015	SSQA03	EP231X: Sum of PFAS	----	0.01	µg/L	55.7	54.8	1.77	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
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 916477)								
EP003: Total Organic Carbon	----	0.02	%	<0.02	100 %	99.4	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 913732)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.5	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	102	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 913732)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	93.6	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.4	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	100	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	119	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	110	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	110	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	108	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	89.9	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 913732)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	107	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	71.4	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	108	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	111	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 913732)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	116	54	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: 913732) - continued								
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	114	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	116	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	120	60	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 914035)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	89.0	87	109
				<10	293 mg/L	88.7	66	126
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 910012)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	121	83	129
				<5	1000 mg/L	92.1	82	110
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 907477)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	72.8	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	102	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	99.8	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	95.8	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	96.6	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	99.8	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 916500)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	79.8	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	83.0	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	87.4	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	90.0	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	84.8	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	109	70	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 907477)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	102	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	96.4	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	94.2	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	114	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	114	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	112	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	114	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	117	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	94.8	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	114	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	94.3	70	124

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: 916500)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	90.0	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	79.8	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	83.0	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	80.6	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	95.6	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	98.0	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	95.0	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	102	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	71.4	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	101	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	99.7	70	124
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 907477)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	93.6	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	119	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	94.9	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	103	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	115	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	115	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	105	70	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 916500)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	93.4	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	101	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	100	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	84.4	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	91.6	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	93.4	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	100	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 907477)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	89.2	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	87.0	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	102	70	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: 907477) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	76.0	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 916500)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	84.8	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	92.8	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	112	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	129	70	130

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 913732)							
ES1712314-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	80.8	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	86.0	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	92.0	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	87.6	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	80.4	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	78.0	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 913732)							
ES1712314-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	110	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	82.4	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	86.4	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	108	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	120	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	110	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	97.2	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	106	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	94.0	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	78.4	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	68.6	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 913732)							
ES1712314-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	73.6	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	93.9	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	68.9	30	130

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 913732) - continued							
ES1712314-002	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.00312 mg/kg	64.3	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	67.0	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	104	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	102	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 913732)							
ES1712314-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	105	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	55.0	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	103	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	110	50	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 907477)							
ES1712664-003	MW02	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	82.2	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	107	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	78.6	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	55.6	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	81.4	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	51.2	50	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 916500)							
ES1712409-068	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	78.2	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	93.8	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	98.8	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	94.4	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	103	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	101	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 907477)							
ES1712664-003	MW02	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	117	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	77.6	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	77.0	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	76.8	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	73.6	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	75.4	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	76.2	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: 907477) - continued							
ES1712664-003	MW02	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	51.2	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	87.8	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	124	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	66.0	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 916500)							
ES1712409-068	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	81.9	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	90.4	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	89.4	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	91.8	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	103	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	96.4	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	87.6	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	108	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	80.6	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	103	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	86.1	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 907477)							
ES1712664-003	MW02	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	51.6	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	108	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	122	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	116	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	111	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	89.8	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	63.0	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 916500)							
ES1712409-068	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	84.4	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	102	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	114	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	93.2	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	107	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 916500) - continued							
ES1712409-068	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	108	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	96.4	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 907477)							
ES1712664-003	MW02	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	72.4	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	97.8	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	54.2	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	64.6	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 916500)							
ES1712409-068	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	95.0	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	88.4	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	110	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	62.6	50	130

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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

CLIENT: GHD Pty Ltd	**TURNAROUND REQUIREMENT** ☑ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: Sydney	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: FRNSW Greenacre phase 2 GME	**ALS QUOTE NO.:** SY - 143-17 V2	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: 21 25583 1[illegible]	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 19.5 °C
PROJECT MANAGER: Nicole Rosen — **CONTACT PH:** 9239 7215	OF: 1 2 3 4 5 6 7	Other comment: @ Mt Crosa West
SAMPLER: Alice Walker — **SAMPLER MOBILE:** 0415952075	**RELINQUISHED BY:** Alice Walker DATE/TIME: 24/05/17	**RECEIVED BY:** Jenny Cutter NCS Cross West DATE/TIME: 24/5/17 4:50pm.
COC emailed to ALS? (YES / NO) — **EDD FORMAT (or default):** Esdat	**RELINQUISHED BY:** DATE/TIME:	**RECEIVED BY:** @ Smithfield DATE/TIME: 24-5-17 19:10
Email Reports to: alice.walker@ghd.com nicole.rosen@ghd.com		
Email Invoice to (will default to PM if no other addresses are listed): Nicole		

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE | **SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)** | **CONTAINER INFORMATION** | **ANALYSIS REQUIRED including SUITES** (NB. Suite Codes must be listed to attract suite price). Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS (full suite)	TDS	Suspended solids
1	TRIP BLANK	24/05/17	soil		1	X		
2	TRIP BLANK		water		1	X		
3	MW02				2	X	X	
4	GWQA01				2	X	X	
5	MW03				2	X	X	
6	MW05				2	X	X	
7	MW01				2	X	X	
8	MW04				2	X	X	
9	FW01				2	X		X
10	SWQA02				2	X		X
11	SW08				2	X		X
12	RINSATE	V	↓		1	X		
				TOTAL				

Suitcon / Forward Lab / Split WO
Lab / Analysis: Brisbane → TOC
Organised By / Date:
Relinquished By / Date:
Connote / Courier:
WO No: ES1712664
Attach By PO / Internal Sheet:

Environmental Division
Sydney
Work Order Reference
ES1712664

Telephone : + 61-2-8784 8555

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.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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

CLIENT: GHD Pty Ltd	**TURNAROUND REQUIREMENT** ☑ Standard TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)**	
OFFICE: Sydney	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes No N/A
PROJECT: FRNSW Greenacre phase 2 GME	**ALS QUOTE NO.:** SY - 143-17 V2	Free ice / frozen ice bricks present upon receipt?	Yes No N/A
ORDER NUMBER: 21 255830 ~~16~~ 17	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt:	19.5 °C @ ALS Goulburn West
PROJECT MANAGER: Nicole Rosen	CONTACT PH: 9239 7215 OF: 1 2 3 4 5 6 7	Other comment:	
SAMPLER: Alice Walker	SAMPLER MOBILE: 0415952075		
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat		
Email Reports to: alice.walker@ghd.com nicole.rosen@ghd.com			
Email Invoice to (will default to PM if no other addresses are listed): Nicole			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Alice Walker	Jenny Wilson		M Gaud @ Smithfield
DATE/TIME: 24/05/17	DATE/TIME: ALS Goulburn 24/5/17 4:50pm	DATE/TIME:	DATE/TIME: 24.5.17 19:10

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

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).

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION																						
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS full suite	ASLP with PFAS full suite	TOC (+ moisture)	suspended solids																	
13	SS02	24/05/17	~~WS~~ soil	second container only partially filled. Please do PFAS as priority	2	X	X	X																		
14	SW02		water		2	X			X																	
15	SSQA03		soil	1P	2	X	X	X																		
16	~~SS~~ SW05		water		2	X			X																	
17	SW03		↓		2	X			X																	
18	SW01		↓		2	X			X																	
TOTAL																										

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

Appendix H – Assessment of data quality

Quality Assurance and Quality Control Report

Data Quality Indicators

Data generated during this investigation must be appropriate to allow decisions to be made with confidence. Specific limits for this investigation have been adopted in accordance with guidance from the AS4482.1 which includes appropriate indicators of data quality (data quality indicators [DQIs] used to assess QA/QC, and GHD's Standard Field Operating Procedures).

To assess the usability of the data prior to making decisions, the data is assessed against pre-determined DQIs. The DQIs including precision, accuracy, representativeness, comparability and completeness, will be reviewed at the completion of the investigation works to assess for the presence of decision errors.

The pre-determined DQIs established for the investigation are discussed below and shown in Table 1.

- Precision - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percentage Difference (RPD) of duplicate samples.
- Accuracy - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this investigation is a measure of the closeness of the analytical results obtained by a method to the 'true' (or standard) value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- Representativeness - expresses the degree to which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- Comparability - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- Completeness - is defined as the percentage of measurements made which are judged to be valid measurements.

Table 1 Summary of quality assurance / quality control criteria

Data quality indicator	Frequency	Data quality acceptance criteria
Precision		
Inter/ intra duplicates	1 / 10 samples	<30-50% RPD
Accuracy		
Surrogate spikes	All organic samples	70-130%
Laboratory control samples	1 per lab batch	<LOR
Matrix spikes	1 per lab batch	70-130%
Representativeness		

Data quality indicator	Frequency	Data quality acceptance criteria
Sampling appropriate for media and analytes	All samples	-
Samples extracted and analysed within holding times	All samples	Organics (7-14 days) Inorganics (6 months) Some exceptions to these holding times are listed below ([1])
LORs appropriate and consistent	All samples	All samples
Comparability		
Consistent field conditions, sampling staff and laboratory analysis	All samples	All samples
Standard operating procedures for sample collection & handling	All samples	All samples
Standard analytical methods used for all analyses	All samples	All samples
Completeness		
Sample description and COCs completed and appropriate	All Samples	All Samples
Appropriate documentation	All Samples	All Samples
Satisfactory frequency and result for QA/QC samples	All QA/QC samples	-
Data from critical samples is considered valid	-	Critical samples valid
Acronyms COC: Chain of Custody LOR: Limit of Reporting QA/QC: Quality assurance / quality control		

[1] Exceptions to these holding times may exist

If any of the DQIs are not met, further investigation will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data.

Field quality assurance and quality control

The quality assurance/quality control (QA/QC) procedures are based on NSW EPA *Guidelines for the Site Auditor Scheme* (2006) and AS 4482.1 – 2005 and AS 4482.2 – 1999.

QA involves all the actions, procedures, checks and decisions undertaken to ensure the representativeness and integrity of samples and accuracy and reliability of analytical results (NEPC 2013). QC involves protocols to monitor and measure the effectiveness of QA procedures.

All fieldwork was conducted with reference to the Australian Standards AS 4482.1 – 2005, AS 4482.2 – 1999 and GHD's Standard Field Operating Procedures, which ensure all samples are collected by a set of uniform and systematic methods, as required by GHD's QA system. Key requirements of these procedures are listed below:

- Decontamination procedures – including washing and rinsing of re-useable equipment, the use of new disposable gloves and sampling tubing between each sampling location and the use of sampling containers provided by the laboratory.
- Sample identification procedures - samples were immediately transferred to sample containers of appropriate composition and preservation for the required laboratory

analysis. All sample containers were clearly labelled with a sample number, job number, and sample date. The sample containers were then transferred to a chilled insulated container for sample preservation prior to and during shipment to the analytical laboratory.

- Chain of custody information requirements - a chain of custody form was completed and forwarded to the testing laboratory with the samples.
- Inter and intra duplicate and sample frequency.
- Calibration was undertaken by the rental supplier and certificates are provided in Appendix D
- Field instrument field checks were undertaken on the equipment:
  - Interface probe: A daily equipment check was undertaken to ensure that the equipment worked correctly when immersed in water.
  - Low flow pump: The low flow sampling equipment was in good working condition. The equipment was inspected by GHD at the start of each day to ensure that all parts of the equipment were in good working order. Purge volumes were recorded on the groundwater sampling field sheets for each site.

Groundwater sampling and analysis quality control

The QC samples collected during the investigation are described below.

- Intra laboratory duplicate: Intra duplicates are used to identify the variation in the analyte concentration between samples from the same sampling point and the repeatability of the laboratory's analysis.
- Inter laboratory duplicate: Inter duplicates provide an indication of the repeatability of the results between laboratories.

Table 2 Quality control (QC) sampling frequency

Sample	Recommended sampling rate	Media	No. QC samples	No. of primary samples	Total
Intra	1/10 samples	Soil and sediment	2	8	10
Inter			0		
Intra	1/10 samples	Groundwater and surface water	2	12	15
Inter			1		

All quality control sampling frequency criteria were met during this investigation. The QC sample pairs are:

- QA02 / MW05_0.16-0.25 (Intra-laboratory duplicate)
- SSQA03 / SS02 (Intra-laboratory duplicate)
- FD01 / FW01 (Inter-laboratory duplicate)
- GWQA01 / MW02 (Intra-laboratory duplicate)
- SWQA02 / FW01 (Intra-laboratory duplicate)

Relative percentage difference calculations

Relative percentage difference (RPD) calculations are used to assess how closely primary and inter/intra duplicate sample results match. RPDs are a quantitative measure of the accuracy of the analytical results and are calculated in accordance with the procedure described in *AS 4482.1 – 2005* (Standards Australia 2005). According to *AS 4482.1 – 2005* typical RPDs are

expected to range between 30% and 50%; however, this may be higher for organics and for low concentrations of analytes. GHD adopts 30% for inorganics and 50% for organics as the general assessment criteria.

Where a result is below the laboratory limit of reporting (LOR) for one of the paired samples, the concentration assigned to that sample is the LOR. Where both results are reported below laboratory LOR the RPD is not calculated.

RPD exceedances were reported during this investigation are:

- Perfluorobutane sulfonic acid in SSQA03 / SS02 – 111%
- Perfluoropentane sulfonic acid in SSQA03 / SS02 – 80%
- Perfluorobutanoic acid in MW01 / FD01 – 120%
- Perfluoropentanoic acid in MW01 / FD01 – 80%

Trip blank

A trip blank was sent with each batch of samples to the laboratory, however the labs later informed GHD that the water blanks could not be analysed for PFAS. Therefore, only two soil trip blanks were analysed. All analytes were below detection limits (LOR) and therefore indicate no contamination of samples during transport.

Laboratory quality assurance / quality control

Laboratory methods used by the primary laboratory were suitable for environmental contaminant analysis and are based on established internationally recognised procedures such as those published by the United States Environmental Protection Agency (US EPA), American Public Health Association (APHA), AS and National Environment Protection (Assessment of Site Contamination) Measure (NEPM).

The individual testing laboratory conducted an assessment of the laboratory QC program however the results were also independently reviewed and assessed internally by GHD. Recovery targets below are defined in the ALS QA/QC section of the certificates of analysis reports. All laboratory QA/QC results are documented with the laboratory certificates of analysis in the appendices of the relevant site report.

Laboratory quality control procedures

Laboratory QC samples incorporated in the analytical process include:

Laboratory blind duplicate samples

A laboratory blind duplicate provides data on the analytical precision and reproducibility of the analytical result. The laboratory blind duplicate is created by sub sampling from one of the primary samples submitted for analysis. Laboratory blind duplicates are analysed at a rate equivalent to one in twenty samples per analytical batch, or one sample per batch if less than twenty samples are analysed in a batch.

The permitted ranges for the RPD of laboratory blind duplicates are dependent on the magnitude of the results in comparison to the level of reporting as shown in Table 6.

Table 6 Permitted laboratory blind duplicate relative percentage difference (RPD) ranges

Magnitude of result	Permitted RPD range
< 10 x limit of reporting (LOR)	No limits
10 – 20 x LOR	0% - 50%
> 20 x LOR	0% - 30%

Matrix spike recoveries

Matrix spike sample analysis is the analysis of one or more replicate portions of samples from the batch, after fortifying the additional portion(s) with known quantities of the analyte(s) of interest. The percentage recovery of target analyte(s) from matrix spike samples is used to determine the bias of the method in the specific sample matrix. Recoveries must lie between 70% and 130%.

Laboratory control sample

The laboratory control sample (LCS) analysis of either a reference material or a control matrix fortified with analytes representative of the analyte class. The purpose of LCS is to monitor method precision and accuracy independent of the sample matrix. Typically, the percentage recovery of the LCS is compared to the dynamic recovery limit based on the statistical analysis of the processed LCS analysis. The ALS acceptance criteria, indicates recoveries must lie between 70% and 130%.

Surrogate spike recoveries

Surrogate Spikes provide a means of checking that no gross errors have occurred during any stage of the analytical method leading to significant analyte loss. Surrogate recoveries are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time), but which are not normally found in environmental samples. Surrogate compounds are spiked into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques prior to sample extraction. Recoveries must lie between 50% and 150% for all analytes.

Method blank samples

Method or analysis blank sample analysis is the analysis of a sample that is as free as possible of the analytes of interest, but has been prepared the same manner as the samples under investigation. The analysis is to ascertain if laboratory reagent, glassware and other laboratory consumables contribute to the observed concentration of analytes in the process batch. If below the maximum acceptable method blank (20% of the practical quantification limit), the contribution is subtracted from the gross analytical signal for each analysis before calculating the sample analyte concentration. The method blank should return analyte concentrations as ‘not detected’.

The individual testing laboratory conducted an assessment of the laboratory QC program internally. However, the results were also independently reviewed and assessed by GHD.

Laboratory quality control results

All laboratory RPDs, matrix spike, LCSs and method blanks were within the ALS and Eurofins acceptable ranges.

Sample holding times

All samples were extracted and analysed by the laboratory within holding times.

Evaluation of DQI

To minimise the potential for decision errors, the sampling and analysis program completed at the site by GHD has been evaluated with consideration of the Data Quality Indicators (DQIs) described above; namely representativeness, completeness, comparability, precision and accuracy.

- Data representativeness: The sampling methodology ensured all environmental samples were collected by a set of uniform and systematic methods. Laboratory and field QA/QC

procedures were carried out to ensure data representativeness. All samples were provided to the laboratory with adequate preservation and in compliant containers as stated in the laboratory sample receipt documentation. Consequently, data representativeness is considered to have been satisfied.

- Completeness: It is considered that the field QA/QC procedures carried out such as duplicate collection frequencies and the analytes tested provide completeness in terms of the required number of field duplicate samples. Laboratory QA/QC sample analysis is considered sufficient to provide a complete overview of QA/QC procedures.
- Precision: Field duplicate results generally reported RPDs below the adopted criterion (30% for inorganics and 50% for organics) for the majority of analytes. GHD therefore considers that laboratory results are acceptable for interpretation in this report.
- Accuracy: Environmental sampling procedures ensured that collection, preservation and laboratory analytical techniques are appropriate for analysis of environmental contaminants.
- Comparability: All field work was conducted with reference to the Australian Standards, which ensured all environmental samples were collected by a set of uniform and systematic methods, as required by GHD's QA system. GHD considers that the laboratory data are of a suitable quality for assessing the environmental status of the site.

The overall review of the QC results from the primary and secondary laboratories indicates that the current analytical data are of an acceptable quality upon which to draw meaningful conclusions regarding impacts at the site as part of this investigation.

GHD

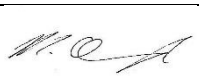
133 Castlereagh St Sydney NSW 2000

-

T: +61 2 9239 7100 F: +61 2 9239 7199 E: sydmail@ghd.com.au

G:\21\25583\WP\220153 - Greenacre phase 2 ESA.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	A. Walker	J. Hallchurch		M. Clough		12/07/2017

www.ghd.com