MFS Port Augusta Station

Detailed Site Investigation

South Australian Metropolitan Fire Service

13 February 2024

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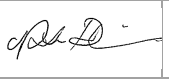
S4	0	T. Wilson	L. Bourne		N. Robinson		13/02/24

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Executive Summary

Background

GHD Pty Ltd (GHD) was commissioned by the South Australian (SA) Metropolitan Fire Service (MFS) to undertake a Detailed Site Investigation (DSI) for the MFS Port Augusta Station, located at 1 Trent Road, Port Augusta, South Australia, 5700 (the site). Historically, the MFS has used AFFF containing PFAS at the site during training activities. Residual AFFF was also flushed from firefighting appliances on-site subsequent to emergency response incidents.

To assist the MFS in meeting the requirements prescribed by the SA EPA (GENI 62917), GHD completed a PSI for the MFS Port Augusta Station in 2023 (GHD 2023a) which was subsequently used to inform the development of a preliminary conceptual site model and design of an SAQP (GHD 2023b) for implementation as part of this DSI.

Objectives

The primary objectives of the DSI were to:

– Assess the nature and extent of identified site contamination, both on- and off-site, associated with historical use of AFFF containing PFAS
– Assess the potential risks to human health and the environment associated with identified PFAS contamination on-site, in the context of continued commercial/industrial use
– Assess the potential risks to human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant adjacent land uses and environments
– Provide recommendations to mitigate the potential impacts arising from identified residual source zones

Scope of Work

To achieve these objectives, GHD undertook the following tasks:

– Advancement of boreholes with associated soil logging, target-depth sampling and PFAS analysis across the site.
– Collection of surface soil samples (0 - 0.1 m bgl) across the southern yard where training and activities using AFFF foam were historically conducted
– Installation and development of on-site groundwater monitoring wells, with subsequent groundwater sample collection and analysis for PFAS analytes
– Refinement of the Conceptual Site Model (CSM), detailing the potential sources of contamination, receptors and exposure pathways

Assessment of Site Contamination

Based on the information presented in this DSI report, PFAS-impacted soil contamination is present at the site. Site contamination also exists in groundwater in the quaternary aquifer underlying the site.

Conclusions

The following conclusions were drawn based on the findings of the investigation:

– PFAS soil impacts are noted on site which can be attributed to the historical use of AFFF containing PFAS at the station
– PFAS concentrations in on-site soils were below the adopted Site-specific Health Investigation Levels (SSHILs)
– PFAS soil impacts are not uniformly distributed across historic on-site source areas and are primarily confined within surface and near-surface strata (approximately 0 - 0.5 m bgl), in which concentrations above the adopted ecological assessment criterion were noted
– Vegetation was observed growing within these areas where elevated PFAS concentrations were reported, presenting a potential complete SPR linkage with respect to ecological exposure

– In relation to the groundwater investigation, exceedances of the PFAS guidelines representative of domestic-use scenarios where groundwater is used for recreational purposes, such as in the filling of swimming pools, were reported for all three monitoring wells installed
– The extent/degree of PFAS in groundwater up- and down- hydraulic gradient of the site has not been delineated as yet, noting the presence of a potential up-gradient sources of PFAS contamination (Fire Equipment Maintenance Group)
– Considering the high percentage of registered wells within a 2 km of the site with no recorded purpose, the use of a certain number of these wells for recreational purposes cannot be discounted
– The potential uptake of contaminated, relatively shallow groundwater by trees down-hydraulic gradient of the site can also not be ruled out at this stage, possibly constituting a primary and/or intermediary receptor in the terrestrial ecology continuum
– Given the relatively close proximity of the Spencer Gulf to the site, in conjunction with the shallow groundwater levels, the discharge of local groundwater to the bay is perceivable, culminating in potential marine ecosystem impacts

Recommendations

To mitigate the potential ecological and human health exposure risks (i.e., those with confirmed or possible complete source-pathway-receptor linkages) identified in the DSI, the following recommendations are proposed:

– The collection of soil samples in the paddock, currently under the jurisdiction of SA Water Assets, to assess the degree and extent of PFAS soil impacts within this south-eastern corner of the site, formerly under the control of the MFS
– Collection of surface/near-surface soil samples at adjacent, off-site locations to assess the degree and extent of PFAS soil impacts potentially emanating from various dispersal mechanisms
– Consideration should be given to sealing the surface of the rear yard (e.g., with pavers or asphalt) to restrict floral and faunal access to contaminated soils in excess of the ecological assessment criteria, and thereby address the exposure pathway risk. This management measure will also address the potential surface water runoff and fugitive dust exposure pathways
– Installation of a series of off-site groundwater monitoring wells (one up-hydraulic gradient and three down-hydraulic gradient, progressively further away from site) to assess the lateral extent of groundwater impacts and potential marine and terrestrial ecosystem exposure risks via the groundwater pathway
– Conduct a groundwater-use survey within the vicinity of the site to evaluate the potential exposure risk attributable to the possible use of groundwater for currently unidentified domestic/recreational purposes

Limitations

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.5 and the assumptions and qualifications contained throughout the Report.

Table of Abbreviations

Abbreviation	Full Form
AFAC	Australasian Fire and Emergency Service Authorities Council
AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
COC	Chain of Custody
COPC	Chemicals of Potential Concern
CSM	Conceptual Site Model
DO	Dissolved Oxygen
DQIs	Data Quality Indicators
DQOs	Data Quality Objectives
EC	Electrical Conductivity
GAR	South Australian *Guidelines for the Assessment and Remediation of Site Contamination 2019*
GHD	GHD Pty Ltd
HEPA	Heads of Environment Protection Authorities Australia
HDPE	High-Density Polyethylene
HIL	Human Health Investigation Level
IP	Interface Probe
JSEA	Job Safety and Environment Analysis
LDPE	Low-Density Polyethylene
LOR	Limit of Reporting
m bgl	Metres Below Ground Level
MFS	South Australian Metropolitan Fire Service
mg/L	Milligrams /Litre
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEMP	PFAS National Environmental Management Plan Version 2.0 - January 2020
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
ORP	Oxidation-Reduction Potential
PFAS	Per- and Poly-Fluoroalkyl Substances
PFHxS	Perfluorohexane Sulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PFPeA	Perfluoropentanoic acid
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percentage Difference
SA EPA	South Australian Environment Protection Authority
SAQP	Sampling and Analysis Quality Plan

Abbreviation	Full Form
SOP	Standard Operating Procedure
SPR	Source-Pathway-Receptor
SWL	Standing Water Level
TDS	Total Dissolved Solids
TOC	Top of Casing
VSCAP	Voluntary Site Contamination Assessment Proposal
WQEPP	South Australian *Environmental Protection (Water Quality) Policy* 2015
µg/L	Micrograms /litre
µS/cm	Microsiemens /centimetre

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1. Introduction

GHD Pty Ltd (GHD) was commissioned by the South Australian (SA) Metropolitan Fire Service (MFS) to undertake a Detailed Site Investigation (DSI) for the MFS Port Augusta Station, located at 1 Trent Road, Port Augusta, South Australia, 5700 (the site).

The DSI is limited to the nature and extent of potential impacts from the historical use of aqueous film-forming foams (AFFF) containing per- and poly-fluoroalkyl substances (PFAS) as prescribed in the SA Environment Protection Authority (EPA) letter, referenced EPA GENI 62917 (refer to Appendix A). This correspondence outlines the requirement for further investigation of high-priority MFS sites related to potential PFAS impacts, including the Port Augusta Fire Station.

1.1 Background

Historically, the MFS has used AFFF containing PFAS at the site during training activities. However, it is understood that the MFS commenced phasing out the use of AFFF containing perfluorooctane sulfonate (PFOS) in 2007 and perfluorooctanoic acid (PFOA) in 2014 after conducting consultation and liaison with the Australasian Fire and Emergency Service Authorities Council (AFAC) and the SA EPA. The MFS replaced all firefighting foam concentrate in 2016. Currently, all MFS appliances utilise firefighting foams that do not contain PFOS or PFOA and are fluorine-free. During 2017/2018, the MFS removed all fire extinguishers containing PFAS from their inventory.

In 2022, GHD undertook a site history review of 17 MFS sites (GHD 2022) as part of an environmental risk profiling exercise using a multi-criteria analysis approach. This work was initiated to address the potential risks associated with former use of AFFF containing PFAS. The sites were prioritised to assist with the implementation of appropriate assessment and management measures to address the potential PFAS risks. The GHD 2022 Report was submitted to the SA EPA, who subsequently issued the above-referenced letter.

In 2023, GHD undertook a Preliminary Site Investigation (PSI) of the site which confirmed the use of PFAS containing AFFF at the site since 1978 (GHD 2023a). The PSI report recommended a Sampling and Analysis Quality Plan (SAQP) be prepared for further intrusive investigations to determine the nature and extent of identified PFAS impacts associated with historical activities at the site and to assess any potential risks to human health and/or the environment in the context of current land uses.

1.2 Objectives

In accordance with the SA EPA's requirements, the objectives of this investigation are to:

– Assess the nature and extent of contamination associated with historical use of AFFF containing PFAS
– Assess the potential risks to human health and the environment associated with identified PFAS contamination on-site, in the context of continued commercial/industrial use
– Assess the potential risks to human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant adjacent land uses and environments
– Provide recommendations to mitigate the potential impacts arising from identified residual source zones

1.3 Scope of works

This DSI has been prepared with reference to industry standards and guidelines including:

– NHMRC 2008, Guidelines for Managing Risks in Recreational Water, National Health and Medical Research Council and Natural Resources Management Ministerial Council, Commonwealth of Australia, updated with the recent changes in the ADWG - V3.8 - September 2022
– National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPM)

– Gov SA 2015, Environment Protection (Water Quality) Policy 2015 (WQEPP), Version 1.7.2020, Government of South Australia, updated 2020
– ANZG 2018, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, online resource www.waterquality.gov.au/anz-guidelines, Australian and New Zealand Governments, updated 26 July 2021, (AWQG)
– SA EPA 2019a, Guidelines for the Assessment and Remediation (GAR) of Site Contamination, Environment Protection Authority, South Australia, November 2019
– SA EPA 2019b, Guidelines for Regulatory Monitoring and Testing – Groundwater Sampling, Environment Protection Authority, South Australia, 2019
– HEPA 2020, PFAS National Environmental Management Plan (Version 2.0), Heads of Environment Protection Authorities Australia and New Zealand, January 2020, (PFAS NEMP)
– NSW EPA 2022, Sampling Design Guidelines for Contaminated Land, Environment Protection Authority, New South Wales, August 2022

The following scope of works was undertaken in general accordance with the SAQP (GHD 2023b) prepared for the site:

– Advancement of 7 boreholes with associated soil logging, target-depth sampling and PFAS analysis across the site to approximately 3.5 m below ground level (m bgl) to provide coverage across the site where historical PFAS impacts may have occurred
– Collection of seven surface soil samples (0 - 0.1 m bgl) across the southern yard where training and activities using AFFF foam were historically conducted on MFS land. Four surface soil sampling locations proposed on adjacent SA Water land were not collected due to inaccessibility of the site, and no prior approval obtained from SA Water, the decision to limit investigations to MFS land was made
– Installation and development of three permanent on-site groundwater monitoring wells, with subsequent groundwater sample collection and analysis for PFAS analytes
– Surveying of the three on-site groundwater monitoring wells relative to Australian Height Datum (AHD)
– Preparation of this DSI report, including the refinement of the Conceptual Site Model (CSM), detailing the potential sources of contamination, receptors, and exposure pathways

1.4 Person requesting works

The investigation was requested by Mr Eero Haatainen, Assistant Chief Fire Officer, Metropolitan Operations – Central and Special Operations, MFS, 99 Wakefield St, Adelaide SA 5000.

1.5 Limitations

This report: has been prepared by GHD for South Australian Metropolitan Fire Service and may only be used and relied on by South Australian Metropolitan Fire Service for the purpose agreed between GHD and South Australian Metropolitan Fire Service as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than South Australian Metropolitan Fire Service 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 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.

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The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.6 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.6 Assumptions

The assessment, conclusions and recommendations outlined in this report are based on the following assumptions:

– Surrounding land-uses include residential properties to the north and east, with commercial land to the south and west. Open space/parkland is present to the east, within the residential area
– No fruit, vegetables or herbs are grown on site for human consumption
– The term PFAS refers to a large number of perfluorinated and polyfluorinated compounds. The primary analytical suite adopted for this assessment incorporated 28 compounds, including PFOS, PFHxS and PFOA, which are the primary focus of this report
– The screening levels used in this Report were consistent with the guidance provided by Australian regulators at the time of reporting

2. Site information

2.1 Site identification

General site details are summarised in Table 2.1 below. The site location plan is depicted in Figure 1 in the Attachments.

Table 2.1 Summary of General Site Identification Information

Item	Detail
Site Address:	1 Trent Road, Port Augusta, SA 5700
Certificate of Title:	CR5759/680
Legal Description:	Sections 1188 and 1189 hundred of Davenport in the area named Port Augusta
Local Government Authority:	Port Augusta City Council
Current Zoning:	Employment
Property Owner:	South Australian Metropolitan Fire Service
Current Site Use:	Operational Fire Station
Area:	2,461 m²
Site Elevation:	10 m AHD

It should be noted that the site was expanded to the south to encompass the southern unsealed gravel area circa 2008. Prior to this, fire station activities were primarily undertaken in the northern portion of the site.

Further detailed information on the site's history and environmental setting is provided in the PSI report (GHD 2023a).

2.2 Surrounding land use

A description of the land use surrounding the site is summarised in Table 2.2.

Table 2.2 Land Uses and Zoning

Orientation	Description of Land Use	Zoning (Municipal Council)	Zoning (SAPPA)
North	Residential properties are present immediately north of the site. The Fire Equipment Maintenance Group (a potential off-site PFAS source) [refer to Figure 1 for location] and Wellingtons (Commercial) are further north, before Victoria Parade. Approximately 200 m to the north-west is the Youth Centre which is listed as a public institution.	Residential	Public Institution/Residential
East	Residential properties predominantly occupy land to the east of the site, with a few commercial properties located further east.	Commercial	Residential/Vacant Residential
South	Stirling Road is located immediately south of the site, with a number of commercial businesses located on the opposite side of the road. Among these are the National Disability Insurance Scheme (NDIS), Uniting Care and Port Augusta Collision Repair. Further south is the railway line and Railway Parade (refer to Figure 1).	Commercial	Commercial
West	The Port Augusta City Council Depot is situated immediately west of the site (refer to Figure 1), with the Pastoral Hotel located just beyond that. Further west is a mix of residential areas, utilities, education and other public institutions.	Public Institution	Public Institution/ Commercial

2.3 Site description

2.3.1 Site inspection and description

The site is located roughly 230 m south-west of the Augusta Highway and approximately 0.5 km from the waterway of the Harbour of Port Augusta (situated within the Spencer Gulf). The site was observed to be relatively flat, with minor sloping to the south-west towards Stirling Road. Approximately half of the site was unsealed, open ground, with the south-western portion comprising unsealed gravel and open garden beds. The north-eastern portion of the site comprises mainly concrete hardstand and houses the main vehicle bay and station building. The concrete was observed to be in fair to poor condition with cracks evident within some sections. Narrow garden beds with a small number of trees and shrubs were observed along the northern site boundary, in front of the main building on Trent Road and in the eastern portion of the rear yard.

Significant rill erosion was visible in the unsealed portion of the rear yard, caused by downpour events, characteristic of Port Augusta. Erosion rills indicated flow direction towards Stirling Road, congruent with the primary slope direction.

Two stormwater drains were located in the centre of the rear yard, serviced by a gutter running in a south-westerly direction routing water into the drains. Storm water discharges into the drainage network on Trent Road.

A parcel of land in the south-eastern corner of the site is owned by SA Water Assets (address: 25 Stirling Road) which has been subject to earthworks in mid- to late- 2022. The earthworks involved the stockpiling of soil on the southern portion of MFS land, which was subsequently levelled in March 2023. This activity may have affected the distribution of potentially PFAS-impacted soil at the site. The opportunistic sampling of surface soils within the SA Water land parcel was scheduled to be undertaken as part of the field sampling program. However, due to access restrictions, and no prior approval obtained from SA Water, the decision to limit investigations to MFS land was made.

2.3.2 Historical use and storage of PFAS

MFS staff identified that PFAS containing AFFF was first used at the site in 1982. The AFFF used at the site was branded ‘3M Light Water’.

Historically, foam training exercises utilising AFFF were conducted two to three times per year. These exercises primarily occurred in the southern portion of the site, which has an unsealed, gravel surface. Prior to the expansion of the site, circa 2008, training was also conducted on the concrete hardstand in the northern portion of the site.

The volume of AFFF historically used per training exercise was estimated at 20 L, with a single 20 L container being utilised per exercise. The AFFF was generally stored in the firefighting appliances, however when refilling was required, firefighters would carry a 20 L container of AFFF concentrate from the storage area to the training grounds for transferral to the relevant appliance. Foam and wastewater from the training events percolated into the ground or were discharged off-site via stormwater drains to Trent Road or overland flow to Stirling Road.

Historically, after call-outs involving AFFF use, appliances were washed down in the rear yard, primarily on the concrete hardstand behind the main building. Truck washdown refers to the flushing out of internal systems after foam use as well as any external cleaning of the truck, which is noted to be infrequent. The wastewater from the process was managed as stormwater and discharged off-site.

Approximately 30 containers (20 L each) with AFFF concentrate were stored on-site for training purposes, along with one 200 L drum and two appliance tanks. The containers and drum were stored in a shed in the northern corner of the site. Used/empty AFFF drums were returned to Adelaide Station. The historical training areas, washdown area and former AFFF concentrate storage area are depicted in Figure 2 in the Attachments. These areas represent potential PFAS source zones in the Conceptual Site Model (CSM) developed for the site, as discussed in Section 9.

3. Previous investigations

Previous PFAS investigations at the MFS Port Augusta Fire Station have been carried out by GHD in 2019, 2022 and 2023. Details of these investigations can be found in the following reports:

– GHD (2019) *MFS State-wide Appliance and Station Sampling*, Report for South Australian Metropolitan Fire Service, May 2019
– GHD (2022) *MFS 17 Fire Stations PFAS Risk Profiling*, Report for South Australian Metropolitan Fire Service, October 2022
– GHD (2023) *MFS Port Augusta Station, Preliminary Site Investigation*, Report for South Australian Metropolitan Fire Service, June 2023

Locations sampled at the MFS Port Augusta Fire Station as part of the above-referenced investigations are represented in Figure 3 in Attachments. The findings from these investigations are summarised below.

3.1.1 GHD (2019) MFS state-wide appliance and station sampling

GHD (2019) reported that the MFS Port Augusta Fire Station was included in the environmental investigations conducted at 35 fire stations across South Australia to assess PFAS concentrations that may remain in firefighting appliances, accessible on-site soil, and any consumable biota (fruit, vegetables, herbs and poultry), if present.

It is noted that the 2018 PFAS NEMP guidelines were relevant at the time of compilation of this report, which were superseded by the 2020 PFAS NEMP 2.0 specifications. Considering the new criteria in relation to PFAS concentrations at the time of sampling, the following observations are made:

– Two surface soil samples, collected from the western and south-western corners of the site, exceeded the PFAS NEMP (2020) Ecological Indirect Exposure criteria for PFOS, however fell below the human health investigation level (HIL) for Residential with Minimal Soil Access (HIL B) guideline

3.1.2 GHD (2022) MFS 17 fire stations PFAS risk profiling

The MFS Port Augusta Fire Station formed part of a 2022 desktop risk assessment and multi-criteria analysis (MCA) carried out at 17 MFS fire stations across South Australia to support appropriate risk management approaches associated with potential or identified PFAS contamination. The 17 sites requiring prioritisation, including MFS Port Augusta, were identified by the SA EPA in the letter GENI 62485, dated 21 October 2021.

The risk-profiling report presented the methodology and findings of the investigations for the 17 MFS fire stations with identified PFAS impacts in soil. The desktop review focused on identifying historical activities that may have represented a source of PFAS contamination, as well as potential sensitive human or ecological receptors in the vicinity of the sites. In so doing, clarity regarding the source-pathway-receptor linkages that may be present at each of the sites was acquired.

The report also provided a summary of the sites' prioritisation for further assessment based on their potential to cause harm to the environment and/or human health. The MFS Port Augusta station was classified as one of the high-priority sites for further investigation of PFAS contamination for the following reasons:

– High estimated on-site use of AFFF concentrate (approximately 2,040 L between 1982 and 2016) and bulk storage (approximately 800 L)
– Historical on-site training entailing the use of AFFF on unsealed surfaces
– Risk of infiltration of PFAS contamination to groundwater, given that < 50% of the site is sealed by hardstand and the depth to water is 2 - 5 m
– Potential nearby groundwater use for domestic purposes
– Close to marine surface water body (< 500 m)
– Adjacent residential land use

It should be noted that since completion of this report, the assumptions regarding the number of shifts at the Port Augusta Fire Station have been revised based on information subsequently provided to GHD in 2023. Initially it was assumed that the station was manned on a permanent basis. It was later revealed that MFS Port Augusta was a retained station with limited fire-fighting exercises.. The postulation resulted in the calculated volume of AFFF concentrate used at the site to be approximately 8,000 L. As the station is a retained facility with 15 part time staff, the revised value has been calculated to be 2,040 L, as outlined above.

3.1.3 GHD (2023) MFS Port Augusta Station – Preliminary Site Investigation

A PSI was undertaken by GHD in 2023 to address the action prescribed by the SA EPA, in a letter issued to the MFS on 1 February 2023. The objectives of the PSI were as follows:

– Determine the potential presence of PFAS impacts associated with historical use of firefighting foam at the site
– Identify potential sensitive receptors that may be at risk due to PFAS contamination at the site, in the context of the site's continued commercial/industrial use and the relevant adjacent land uses and environments

The PSI works encompassed a desktop review of available information regarding the site's historical AFFF use in the context of its environmental setting. The scope of work included a site inspection, interviews with relevant MFS personnel and the development of a Preliminary Conceptual Site Model (PCSM). The findings of the PSI are summarised below:

– Anecdotal information confirmed the use of PFAS containing AFFF at the site since 1982
– Training and washdown of PFAS-containing AFFF occurred on sealed and unsealed areas of the site
– AFFF concentrate was stored on site in numerous 20 L plastic containers, a 200 L plastic drum and various firefighting appliances
– The limited soil samples collected on site for analysis reported results below the adopted HIL B assessment criteria, however they exceeded the ecological indirect exposure guidelines
– Groundwater at the site was deemed to have no environmental value for extraction and use due to high salinity. However, due to the site's proximity to the Harbor of Port Augusta, the groundwater was deemed to have aquatic ecosystem, recreational, and aesthetic values

The PCSM identified the following potentially complete PFAS exposure pathways:

– Exposure of site users, visitors, maintenance, and construction workers to PFAS via direct dermal contact, incidental ingestion, or inhalation of contaminated soil/dust from disturbed soils
– Leaching of residual PFAS from contaminated soils or concrete surfaces followed by migration through porous media into groundwater
– PFAS-impacted surface/stormwater discharge from the site into nearby surface water bodies resulting in potential ecological exposure linkages
– PFAS-impacted surface/stormwater/groundwater discharge from the site into nearby surface water bodies and potential exposure to humans via ingestion through recreational activities or consumption of PFAS contaminated biota, including plants which come into contact with contaminated groundwater in the root zone and aquatic organisms exposed to PFAS via groundwater egress into the marine environment

4. Environmental setting

4.1 Topography

The topography of the site gently slopes from north to south; the southern boundary along Stirling Road is the lowest point. The northern corner has an elevation of approximately 10 m AHD and the southern corner an elevation of approximately 7 m AHD. The surrounding region is relatively flat and lies between the Spencer Gulf to the west and Ikara-Flinders Ranges to the east.

4.2 Site drainage

The northern half of the site comprises sealed surfaces (buildings, concrete hardstand, etc.) with the majority of stormwater discharging off-site underground stormwater drains via stormwater drainage pipes throughout the site. Stormwater drains are located on the eastern site boundary along Trent Road (Gov SA 2022).

The remainder of the site is exposed ground, with stormwater runoff directed through shallow erosion rills, with an indicative surface water flow direction towards Stirling Road (congruent with the primary slope direction).

4.3 Surface water

The nearest natural surface water body is the Spencer Gulf, located approximately 0.5 km south-west of the site. The Spencer Gulf flows south into the Southern and Pacific Oceans (Gov SA 2022).

4.4 Regional geology

A search of the South Australian Resources Information Gateway (SARIG) database indicated that the main stratigraphic units at the site are made up of Pleistocene – Holocene-age Quaternary aeolian sediments, described as aeolian sand of inland dune fields, including the Simpson sand, Coonarbine formation, Wintrena formation and Woorinen formation. Although the soil around the site has not been mapped, the area approximately 300 m from the site has, with the soil consisting of Calcarosols and Rudosols.

The geology encountered on-site during intrusive investigations was generally consistent with the regional geology and has been summarised in Table 4.1.

Table 4.1 Summary of Sub-surface Geology Encountered During Intrusive Site Investigations

Depth (m bgl) *	Soil Type	General Soil Description
0 – 0.4	Silty SAND	Fill/reworked natural, brown to orange-brown
0.4 – 2.5	Clayey SAND	Natural, brown to orange- brown
2.5 – 3.0	SAND/Clayey SAND	Natural, brown to orange- brown
3.0 – 4.5	SAND/Clayey SAND	Natural, pale brown to pale yellow-brown

Note: * Approximate depths. Detailed soil borehole logs can be found in Appendix D.

4.5 Hydrogeology

A search on Location SA Map Viewer (Gov SA 2022) indicated that the aquifers found beneath the site are part of the Torrens Basin, which features a shallow sedimentary groundwater basin. This aquifer consists of sedimentary rocks, with the basins specifically including limestone, often with cavernous sandstone, sand shale and clay. The SARIG database reports shallow groundwater in the vicinity of the site with standing water levels (SWL) of 2 – 5 m bgl within the Holocene-age Quaternary aeolian sediments, producing yields in the range of 0.5 – 2.5 L/second (SARIG 2023). Three wells within 0.7 km of the site had TDS data less than 30 years old, ranging between 16,359 mg/L to 29,742 mg/L, indicating highly saline water (> 16,000 mg/L).

4.6 Local Groundwater Users (WaterConnect Database)

A search of registered groundwater wells within a 2 km radius of the site was conducted using the SA WaterConnect Database (DEW 2023).

The results are summarised as follows:

– There were 283 registered wells within a 2.0 km radius of the site, including:
  - Six (6) were listed as operational, including:
    – Four (4) as explorative-observational
    – One (1) as observational
    – One (1) as dewatering
  - Seven (7) were listed as dry
  - 132 were listed as having an unknown status or no assigned status, including:
    – 65 were for investigation purposes
    – 34 for monitoring
    – 18 had no purpose listed
    – 10 for environmental purposes
    – Three (3) for foundation purposes
    – Two (2) for observation
  - 21 were listed as abandoned
  - 117 as backfilled
– No wells were located on-site

5. Assessment criteria

Since PFAS is the contaminant of concern being addressed by this environmental investigation, the pertinent assessment criteria were adopted from the following documents:

– HEPA 2020, PFAS National Environmental Management Plan (Version 2.0), Heads of Environment Protection Authorities Australia and New Zealand, January 2020, (PFAS NEMP)
– NHMRC 2011, Australian Drinking Water Guidelines 6 (ADWG), Version 3.7, National Water Quality Management Strategy, National Health and Medical Research Council and Natural Resources Management Ministerial Council, Commonwealth of Australia, updated September 2022
– GHD 2023c, Derivation of Site-specific Health Investigation Levels for Urban and Regional Fire Stations – South Australian Metropolitan Fire Service (MFS), June 2023

5.1 Soil

In accordance with the PFAS NEMP 2020 and ASC NEPM (as amended 2013), the PFAS assessment criteria listed in Table 5.1 have been adopted for the assessment of analytical results obtained from soil samples collected on site.

The typical usage patterns at MFS fire stations most closely align with the exposure assumptions that underpin HIL D (Industrial/Commercial) values. The following inconsistencies are however noted:

– The preliminary site investigations undertaken at MFS sites across South Australia has identified that some fire stations have a higher proportion of unsealed ground (up to approximately 75% of the total site area) than has been assumed in the derivation of the HIL D values (up to approximately 20% of the total site area). As a result of this, there may be greater opportunities for direct access to soil at MFS fire stations, including the ingestion of soil and soil-derived dust
– The shifts worked by MFS firefighters do not align with the assumption of a standard working week that underpins the HIL D values

Given these factors, Site-specific Health Investigation Levels (SSHILs) have been derived using exposure assumptions that reflect the typical usage pattern of the MFS fire stations, to allow for a more accurate assessment of the health risks that may be associated with the presence of PFAS in shallow soils (GHD 2023c).

Table 5.1 Adopted PFAS Assessment Criteria - Soil

Exposure scenario	PFHxS[1] mg/kg	PFOS[2] mg/kg	Sum of PFOS and PFHxS mg/kg	PFOA[3] mg/kg	Reference Document
Human Health Investigation Levels (HIL)					
SSHIL – Regional (retained) MFS Station	40	40	40	50	Derivation of site-specific health investigation levels for urban and regional fire stations (GHD 2023c)
HIL B – residential with limited soil contact[4]	2	2	2	20	PFAS NEMP 2.0 (HEPA 2020)
Ecological Screening Levels					
Ecological indirect exposure – developed sites	-	0.14[5]	-	-	PFAS NEMP 2.0 (HEPA 2020)
Ecological direct exposure	-	1	-	10	

Notes:
[1] PFHxS – perfluorohexane sulfonate
[2] PFOS – perfluorooctane sulfonate
[3] PFOA – perfluorooctanoic acid
[4] Trigger level for further union engagement

[5] For intensively developed sites with no secondary consumers and minimal potential for indirect ecological exposure, a higher criterion of up to 0.14 mg/kg is appropriate.

5.1.1 Human health soil guideline values

The PFAS NEMP (Section 8, 2020) provides nationally agreed guideline values that are to be used to inform site investigations. The human health-based investigation levels for soil were derived using a methodology consistent with assumptions set out in the ASC NEPM for the health investigation levels (HILs).

As noted above, the GHD letter report titled *Derivation of site-specific Health Investigation Levels (HILs) for urban and regional fire stations* (GHD, July 2023) outlines site-specific HILs for the two categories of MFS fire stations, namely urban/metropolitan and regional, also referred to as "staffed" and "retained", respectively. The methodology and associated exposure assessment processes are outlined in ASC NEPM (as amended 2013). The SSHILs will be adopted in place of the generic HIL D (commercial/industrial) guidelines from the PFAS NEMP 2.0.

GHD understands that the MFS, in consultation with the United Fire Fighters Union of South Australia, have agreed to also adopt a more stringent health investigation level (i.e. HIL B – residential with minimal opportunities for soil access) as a "trigger" for further engagement. This has been included at the direction of MFS and is for comparison purposes only.

Currently, there are no specific criteria for the assessment of concrete/pavers with regard to human health or ecological risk. Sampling of these media is conducted to assess their potential contribution as a flux source of residual PFAS impacts to the environment via leaching.

5.1.2 Ecological soil guideline values

The PFAS NEMP provides the following guidance regarding potential ecological risks associated with PFAS-impacted soils:

– For intensively developed sites with no secondary consumers and minimal potential for indirect ecological exposure, a higher criterion of up to 0.14 mg/kg may be appropriate
– The indirect exposure value may be over-protective if the area of exposed soil is too small to have any material impact on food chain transfer to secondary consumers such as invertivores and carnivores. In this situation, considering site-specific characteristics may justify the use of a higher value (up to 0.14 mg/kg) as the trigger for a detailed site-specific investigation of risk"

The PFAS NEMP does not provide a rationale for the selection of the 0.14 mg/kg, however GHD notes that this value was sourced from the same document as the other ecological criteria, namely Environment and Climate Change Canada (ECCC 2018) *Federal Environmental Quality Guidelines Perfluorooctane Sulfonate (PFOS)*. This document provides 0.14 mg/kg as the soil guideline for PFOS in two circumstances:

– Soil Quality Guideline to Protect Freshwater Life under all land uses
– Soil Quality Guideline for Off-site migration under commercial/industrial land uses

The soil quality guideline to protect freshwater aquatic life is the concentration in soil that is expected to protect against potential impacts on freshwater aquatic life from PFOS originating in soil that may enter the groundwater and subsequently discharge to a surface water body. The calculation of this value was made on the basis of the Canadian aquatic screening criteria for PFOS in surface water (6.8 ug/L) and a reverse fate and transport modelling process that assumes a minimum of 10 m lateral separation between the source and the surface water body and incorporates default parameters describing partitioning from soil to leachate, leaching to groundwater, mixing with groundwater and plume migration. The protection of aquatic life from soil impacts via migration in groundwater will be included in a groundwater assessment at the site. The closest aquatic receptor is the Spencer Gulf, a marine receptor, approximately 0.5 km from the site.

The soil quality guideline for off-site migration under commercial/industrial land uses considers the potential that wind and water erosion of soil can move PFOS contaminated soil from one site to another. The endpoint used to calculate this guideline is the soil quality guideline protective of ecological receptors in residential and agricultural land use settings (0.01 mg/kg – the ecological indirect criteria). A model was then used to predict the movement of soil, including the Universal Soil Loss Equation and the Wind Erosion Equation. The CCME (2017) specifically states that this approach is imprecise and that the derived values should be used as a check mechanism only, with professional judgement used to assess whether there is likely to be a migration pathway of concern for an individual site. Since the area surrounding the site is characterised by extensive development, it is unlikely that any soil migrating from the site via erosion would be deposited in an area of significant ecological value.

Although the CCME (2017) guidelines have been superseded, the more recent guidelines (Scientific Criteria Document for the Development of the Canadian Soil and Groundwater Quality Guidelines for the Protection of Environmental and Human Health - Perfluorooctane Sulfonate (PFOS) use a similar approach and derive comparable values. The reference to the CCME (2017) for this document is to maintain consistency with the PFAS NEMP 2.0 and the original reference material within that document.

5.2 Groundwater

5.2.1 Environmental Values of Groundwater

The South Australian Environment Protection (Water Quality) Policy 2015 (and amendments) (SA EPA 2015) (EPP) details the regulatory requirements for the protection of all water bodies (surface and groundwater) under the Environment Protection Act 1993. The Policy outlines the applicable environmental values (EVs) for a range of waters, including public stormwater and irrigation drains as well as providing definitions of harm, types of pollutants and the provisions that a person must comply with in taking all reasonable and practicable measures to prevent or minimise harm to aquatic systems. Table 5.2 outlines the EVs for various waters as described in Schedule 1 of the EPP.

Table 5.2 Environmental Values of Particular Waters (Extract from Schedule 1, Table 3 WQEPP)

Waters	Aquatic ecosystems	Recreation and aesthetics	Drinking water for human consumption	Irrigation and general use	Livestock watering	Aquaculture and aquatic food production
Marine waters	X					X
Surface waters	X		X	X	X	X
Surface water (Protection areas[1])	X	X	X	X	X	X
Public stormwater systems	X	X				
Groundwaters						
TDS < 1,200 mg/L			X	X	X	X
TDS between 1,200 – 3,000 mg/L				X	X	X
TDS between 3,000 – 12,000 mg/L					X	X

Note: [1] Water protection area means a part of the State for the time being declared by proclamation to be a water protection area (EPA 1993).

While not identified specifically in the EPP, contaminated site assessments typically consider the potential for abstraction of groundwater for recreational use and migration to aquatic ecosystems so these EVs are included for the purpose of this assessment.

To assess the contamination status of groundwater at a site, the GAR (SA EPA 2019a) provides a four-step process to determine the environmental values of groundwater and if actual or potential harm to groundwater that is not trivial has occurred. The four-step process provided in the GAR is described in Table 5.3.

Table 5.3 Four-step Process for Determining Environmental Values of Groundwater

Process	Assessment
Step 1: Apply Table 3 of Schedule 1 of the 2015 Water Quality Environment Protection Policy (WQEPP, Gov SA 2015) based on TDS ranges. Groundwater well data was filtered so only recent data (<30 years old) from within the same aquifer was used (considered to be a more representative data set).	A review of the WaterConnect database provided in the Lotsearch report (GHD 2023) identified 281 registered bores located within a 2.0 km radius of the site. Three wells within 0.7 km of the site had TDS data less than 30 years old, ranging between 16,359 mg/L to 29,742 mg/L indicating highly saline water (10,000 – 35,000 mg/L).
Step 2: Assess and identify surface water bodies within a 2 km buffer of the site	The closest surface water receptor is the Spencer Gulf, located approximately 0.5 km south-west of the site.
Step 3: Review registered groundwater users in the Water Connect database	A review of the WaterConnect database provided in the Lotsearch report (GHD 2023) identified a total of 283 registered bores within a 2.0 km radius of the site. The identified uses of the bores with an operational or unknown status were: investigation (65), dewatering (1), observation (7), monitoring (34), environmental (10) and foundations (3).
Step 4: Application of the SA EPA recognised criteria for the most sensitive environmental value	The most sensitive ecological environmental values to be applied to the site are PFAS NEMP 2.0 2020, Interim marine – 99% species protection (slightly to moderately disturbed systems) guideline.

Groundwater at the site was deemed to have no environmental value for extraction and use due to its high salinity.

However, due to the site's proximity to the Spencer Gulf, the groundwater was deemed to have aquatic ecosystem, recreation, and aesthetic values.

In Australia, the advice provided in the National Water Quality Management System and Water Quality Guidelines when assessing bioaccumulative contaminants, including PFAS, is to use a higher degree of species protection than would normally be used. In most cases, this means the 99% species protection level would be used as a screening value for slightly-to-moderately impacted systems, rather than the 95% value. This advice is intended as a practical measure to provide an additional level of protection to account for bioaccumulation (HEPA 2020). So although the marine water ecosystems of the Spencer Gulf may primarily be representative of slightly to moderately disturbed systems (and therefore require 95% protection), to account for potential bioaccumulation of PFAS the 99% species protection guideline values have been adopted for the purpose of groundwater assessment to be in alignment with the PFAS NEMP.

The adopted groundwater screening/investigation levels are summarised in Table 5.4.

Table 5.4 Adopted PFAS Interim Screening Criteria for Groundwater

Exposure Scenario	PFOS[1]	PFHxS[2]	Sum of PFOS and PFHxS	PFOA[3]	Source
Marine waters 95% Species Protection – Slightly to moderately disturbed ecosystems	0.13 µg/L	-	-	220 µg/L	PFAS NEMP (HEPA 2020)
Marine waters 99% Species Protection – High conservation value ecosystems	0.00023 µg/L	-	-	19 µg/L	PFAS NEMP (HEPA 2020)
Human Health – Recreational Water (domestic)[4]	0.7 µg/L	0.7 µg/L	0.7 µg/L	5.6 µg/L	NHMRC 2008 ADWG (NHMRC 2011)[5]

Notes:
[1] PFOS – perfluorooctane sulfonate
[2] PFHxS – perfluorohexane sulfonate
[3] PFOA – perfluorooctanoic acid
[4] The NHMRC 2008 Guidelines for Managing Risks in Recreational Water recommend health guideline values for recreational water that correspond to 10 times the current drinking water guideline value. These guideline values apply in a domestic setting where groundwater is used for recreational purposes such as the filling of swimming pools.
[5] Australian Drinking Water Guidelines 6, Version 3.7, updated January 2022

6. Soil investigation

6.1 Soil sample locations and rationale

The soil investigation works described in this section were conducted on the 18th and 19th September 2023 under the supervision of an experienced GHD environmental professional. A total of seven surface soil samples (SS01 - SS07) were collected from across the southern portion of the yard where training and exercises utilising AFFF foam were historically conducted. Seven soil bores (BH01 – BH07) were also drilled as part of the soil investigation and soil samples were collected during the drilling of monitoring well locations (MW01 - MW03). The investigation locations are shown on Figure 3 in the Attachments. A description of the soil bore locations is provided in Table 6.1 below.

Table 6.1 Soil Bore Locations

Proposed Soil Bore ID	Location Description
BH01	Located within the washdown and training area to the north-west of the main fire station building, to assess impact of washdown of trucks and appliances in relation to PFAS contamination.
BH02	Located on the concrete apron adjacent fire truck garage/shed.
BH03 - BH07	Located in the southern unsealed portion of the site, where training using AFFF was predominantly conducted in the past.
SS01 - SS07	Located in the southern half of the site where the majority of training, incorporating AFFF use, historically occurred.
MW01 - MW03	MW01 is located withing the washdown and training area to the north-west of the main fire station building. MW02 is situated within the southern unsealed portion of the site where training was conducted. MW03 is located in the south-western corner of the site, within a garden bed.

The number of soil sampling locations is in accordance with the NSW EPA Sampling Design Part 1 (NSW EPA, 2022) when using the targeted sampling rationale for the former training area. Soil bores were advanced to a depth of 3.5 m bgl based on the depth to groundwater.

6.2 Methodology

The soil investigation methodology was as follows:

– Prior to any intrusive works being undertaken a review of Before You Dig plans was conducted and all investigation locations were also cleared for underground service by an accredited service locator (Veris Australia Pty Ltd) to ensure safe drilling conditions
– Soil bores were advanced by means of hand auger or utilising an Eziprobe drill rig (push-tube drilling technique), operated by WB Drilling Pty Ltd. Where required, concrete coring was undertaken to access the underlying soil media. High density polyethylene (HDPE) core liners were used to retrieve soil cores to minimise the risk of PFAS cross-contamination
– Soils recovered from each soil bore were logged by an experienced GHD environmental professional to assess the underlying geology and contaminant indicators in accordance with AS 1726:2017
– Representative soil samples were collected at regular depth intervals and/or at each new soil horizon for potential laboratory analyses
– A fresh pair of disposable gloves were worn by the sampler when collecting soil samples. Soil samples were placed in laboratory-supplied sampling jars suitable for PFAS analysis
– Soil samples were stored under chilled conditions in an esky and transported to analytical laboratories under chain of custody documentation

6.3 Soil analytical program

The laboratories used for the soil investigation were Envirolab Services (primary laboratory) and Eurofins (secondary laboratory). Both laboratories are registered by the National Association of Testing Authorities (NATA) and the analyses conducted were within their NATA registration.

One sample from each surface soil location and two samples from each borehole location (for both lateral and vertical delineation of potential PFAS impacts) were submitted for laboratory analysis of PFAS (Extended Suite). This resulted in the analysis of 27 primary soil samples (including those obtained from bores advanced for groundwater monitoring wells) and six duplicate pairs as part of QA/QC protocol. A further discussion of the quality assurance (QA) and quality control (QC) procedures undertaken is presented in Appendix K.

6.4 Soil sampling results

6.4.1 Subsurface conditions

Subsurface conditions encountered during the soil investigation were generally as follows:

– Fill material was predominantly encountered at the surface (0 - 0.2 m bgl). This material generally comprised crushed stone and gravelly silt
– Natural material (primarily clayey sand or silty sand) was noted hereunder to depths of approximately 3.0 m bgl)
– Natural sandy material was evident at deeper depths, extending to 5 m bgl (borehole termination depth)
– No evidence of staining or the presence of any distinguishable olfactory odours were noted during sampling

Additional details of the lithological layers observed during the soil sampling program can be found in Appendix D.

6.4.2 Analytical results

Results of the soil analytical testing are summarised in the analytical results tables attached to this report (Table 1 in the Appendices). The laboratory certificates of analysis are contained in Appendix F. Results above the adopted PFAS assessment criteria are presented in Table 6.2.

Table 6.2 Results above Adopted PFAS Assessment Criteria

Location	Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFOA (mg/kg)	Sum of PFHxS and PFOS (mg/kg)
BH01	1.0 – 1.1	0.051	0.15	0.0042	0.2
	1.5 – 1.6	0.072	0.28	0.0079	0.35
BH07	0.5 – 0.6	0.12	0.14	0.0073	0.26
MW02	0.1 – 0.2	0.0053	0.32	0.0023	0.33
SS02	0.0 – 0.1	0.0002	0.22	0.0002	0.17
SS04	0.0 – 0.1	0.0012	1.0	0.0004	1.0
SS05	0.0 – 0.1	0.0018	1.8	0.0004	1.8
SS06	0.0 – 0.1	0.0018	0.54	0.0004	0.55

Notes:
Dark aqua denotes an exceedance of the ecological indirect exposure assessment criteria for developed sites.
Light aqua denotes an exceedance of the ecological direct exposure assessment criteria.

The concentrations of all remaining PFAS chemicals in samples assessed were reported either below the laboratory reporting limits or below the adopted ecological and health assessment criteria.

7. Groundwater investigation

The aim of the groundwater investigation was to assess the PFAS contamination status of groundwater beneath the site. The rationale and results are discussed in sections below.

7.1 Scope of work and rationale

Three groundwater wells (MW01 – MW03) were installed at the site on the 19th September 2023 under the supervision of an experienced GHD environmental professional.

The scope of the groundwater investigation undertaken at the site is summarised below:

– Installation of one up-hydraulic gradient well (MW01) located in northern portion of the site, approximately central of the former training/washdown area, to enable calculation of the local groundwater flow direction and to assess the PFAS groundwater impacts from this source
– Installation of two down-hydraulic gradient wells (MW02 and MW03) located in the southern portion and southwestern corner of the site, respectively, to facilitate calculation of the local groundwater flow direction and to assess potential PFAS groundwater impacts from historical activities utilising AFFF in this area
– Surveying of groundwater monitoring wells relative to Australian Height Datum (AHD)
– Development of groundwater monitoring wells to ensure the collection of representative groundwater samples
– Collection and analysis of groundwater samples for PFAS (extended suite) compounds in accordance with QA/QC protocol
– Comparison of reported analytical results against adopted groundwater assessment criteria

The location of the monitoring wells is shown in Figure 3.

7.2 Well Installation methodology

All groundwater monitoring wells were drilled and installed by WB Drilling Pty Ltd under the supervision of an experienced GHD environmental professional. The drilling method used included push-tube and solid flight auger to the base of the borehole. Copies of well permits, obtained from the Government of South Australia's Department of Environment and Water, are provided in Appendix H. The well construction methodology is outlined below:

– 3 m slotted PVC screens (class 18) were installed from the base of the boreholes with solid PVC casing to the surface. This length was considered adequate to account for seasonal groundwater level variations
– A gravel pack was installed around the screen, extending from the base to approximately 0.5 m bgl
– A bentonite plug was installed above the sand pack to protect the aquifer from any direct infiltration of surface water into the well screens
– A lockable gatic cover was installed and concreted in place, flush with the surrounding ground surface
– Following installation, the groundwater wells were developed to remove excess silt/entrained sediments to connect the well to the aquifer. The wells were developed using a submersible 12V pump. The pump was decontaminated between well locations using a phosphate-free detergent and subsequently rinsed with tap water, followed by de-ionised water
– Groundwater wells were surveyed by a licensed surveyor (Linkup Construction Surveys Pty Ltd). The survey data are included in Appendix I

Table 7.1 below presents a summary of the construction and survey details of the wells. Groundwater well construction logs are presented in Appendix D.

Table 7.1 Well Construction Details

Well ID	Well Construction Permit No.	Installation Date	Installation Depth (m bgl)	Screen Interval (m bgl)	Co-ordinates (GDA20 Z54)		Ground Level (m AHD)	TOC (m AHD)
					Easting	Northing		
MW01	448402	19/09/2023	5.0	2.0 - 5.0	760324.826	6401044.765	4.388	4.314
MW02	448403	19/09/2023	4.0	2.0 - 4.0	760295.223	6401009.818	3.587	3.524
MW03	448404	19/09/2023	5.0	2.0 - 5.0	760281.067	6401021.830	3.636	3.556

7.3 Groundwater sampling methodology

Groundwater samples were collected in accordance with GHD's standard operating procedures for groundwater sampling and in alignment with SA EPA guidelines for regulatory monitoring and testing – Groundwater sampling (SA EPA 2019b).

All groundwater wells were left for a minimum of seven days following well development to allow for the stabilisation of aquifer conditions. Groundwater sampling was conducted on the 28th September 2023.

All groundwater wells were gauged prior to sampling. The standing water levels were measured from the top of the well casing using an interface probe.

All monitoring wells were purged and sampled using a low flow sampling technique (bladder pump). During purging, field water quality parameters were collected, including pH, redox potential, dissolved oxygen, electrical conductivity, and temperature to ensure stable conditions prior to sample collection.

Groundwater samples were collected into laboratory supplied bottles suitable for PFAS analysis. The samples were subsequently stored in an esky and were delivered under chilled conditions to the analytical laboratory with accompanying chain of custody documentation.

The groundwater gauging and sampling records are provided in Appendix J.

7.4 Groundwater analytical program

All groundwater samples were analysed by Eurofins, a NATA-accredited laboratory, for PFAS (Extended Suite) analytes. In addition, QA/QC samples were analysed in accordance with quality control protocol.

We note GHD inadvertently did not submit any samples to a secondary laboratory as part of the groundwater sampling program for the purpose of QA/QC assessment. Further discussion regarding this divergence from this standard procedure is presented within the QA/QC report (Appendix K).

7.5 Groundwater investigation results

7.5.1 Subsurface conditions

Subsurface strata encountered during the soil investigation were generally as follows:

- Silty to clayey sand material was predominantly encountered at the surface (0 – 0.5 m bgl)
- Varying degrees of silty sand and clayey sand were evident from depths ranging from approximately 0.5 – 4 m bgl
- Natural sandy material was evident at deeper depths, extending to 5 m bgl (borehole termination depth)
- No evidence of staining or the presence of any distinguishable olfactory odours were noted during sampling

Groundwater well drilling logs are presented in Appendix D.

7.5.2 Groundwater levels and inferred groundwater flow

Groundwater levels in the wells were gauged from a marked point on the well casing on the 28th September 2023 using an electronic interface water level meter during the groundwater monitoring event. The groundwater sampling records are attached in Appendix J. Groundwater levels are presented in Table 7.2.

Table 7.2 Relative Groundwater Levels (to AHD)

Well ID	Surveyed Top of Casing (TOC) (m AHD)	Surveyed Ground Level (m AHD)	Depth to Groundwater (m bTOC)	Relative Groundwater Level (m AHD)
MW01	4.314	4.388	2.75	1.564
MW02	3.524	3.587	2.00	1.524
MW03	3.556	3.636	2.02	1.536

The groundwater gauging results and survey data were used to prepare a groundwater contour map, shown in Figure 4 in the Attachments. Groundwater was inferred to flow in a south-westerly direction, which is consistent with the expected regional groundwater flow and local topography.

7.5.3 Field measured water quality parameters

No contamination indicators (such as hydrocarbon presence, chemical odours or sheens) were noted in any of the monitoring wells during the well installation, well development or sampling phases of the investigation.

Groundwater quality parameters were monitored during purging and before sampling. The final values of these parameters prior to sampling are summarised in Table 7.3.

Table 7.3 Field-measured Groundwater Quality Parameters

Well ID	Date Sampled	Temp (°C)	pH	Dissolved oxygen (mg/L)	Oxidation-reduction potential (mV)	Electrical conductivity (µS/cm)
MW01	28/09/2023	23.2	7.55	5.97	136.2	7,061
MW02	28/09/2023	20.9	7.27	0.7	32.4	19,300
MW03	28/09/2023	22.9	7.43	0.21	28.4	12,291

The above field parameters are indicative of the following:

- The shallow groundwater encountered at the site is neutral with pH ranging between 7.27 and 7.55
- The groundwater is brackish with electrical conductivity values ranging between 7,061 and 19,300 µS/cm

7.5.4 Analytical results

A summary of exceedances to the adopted groundwater criteria is tabulated below. For detailed analytical groundwater results, please refer to the Table 2 in the appendices at the end of the report. The laboratory certificates of analysis are contained in Appendix F.

Table 7.4 Summary of Groundwater Exceedances against Adopted Criteria

Location	Approximate Distance from Nearest Site Boundary (metres)	Date	PFHxS (µg/L)	PFOS (µg/L)	PFOA (µg/L)	Sum of PFHxS and PFOS (µg/L)
MW01	10 (northern boundary)	28/09/2023	3.3	6.1	0.85	9.4
MW02	4 (southern boundary)	28/09/2023	14	1.9	0.34	15.9
MW03	3 (western boundary)	28/09/2023	6.8	0.56	0.29	7.36

Notes:
Green depicts exceedances of the ADWG 2011 (v3.7 updated 2022) Recreational Use guidelines.
Blue depicts exceedances of the PFAS NEMP 2.0 Marine – 95% Species Protection – Slightly to Moderately Disturbed Ecosystems criteria.

In addition to the above PFAS analyses, major cation and anion analytes were also included in the testing programme. The results are presented in Table 7.5.

Table 7.5 Summary of Major Cations and Anions

Location	Approximate Distance from Western Site Boundary (metres)	Date	Chloride (mg/L)	Sulphate (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	TDS (mg/L)
MW01	10 (northern boundary)	28/09/2023	2,000	300	160	150	1,200	3,200

8. Quality Assurance and Quality Control

A comprehensive QA/QC assessment was completed for all analytical sample data to evaluate the data's suitability on which to base the investigation. This included the collection and review of results obtained from duplicates, field blanks and rinsate blank samples.

The QA/QC assessment found that the majority of Data Quality Indicators (DQIs) were within the specified tolerance levels. A small proportion of RPD exceedances were reported for some PFAS soil analytes, however RPD exceedances are likely due to the heterogeneity of soils in the area. Additionally, given the relatively low-level concentrations detected for PFAS compounds, the likelihood of elevated RPD values is increased. Given that all other RPD values are within the acceptable range, GHD considers the data set to be of acceptable quality for which to base this assessment. All RPD results for the duplicate samples collected during the groundwater sampling program were within the 30% acceptance range. The QA/QC assessment is provided in Appendix K.

9. Conceptual site model

Fundamental to any contamination investigation is the development of a Conceptual Site Model (CSM), which is a description of the plausible mechanisms ('pathway'), by which people and ecology ('receptors') may be exposed to chemicals in the environment ('sources'). Potential risks to human health or the environment cannot occur unless there is a complete Source-Pathway-Receptor (SPR) linkage. Conversely, complete SPR linkages do not by default indicate a risk and the site investigation process is used to evaluate the extent of potential risks.

9.1 Potential contamination sources

As outlined in the PSI (GHD 2023a), the primary source of PFAS contamination at the site is associated with the historical use of AFFF which contained PFAS, prior to being phased out, including the following activities:

- Historical use of PFAS containing AFFF on the training area across the site (both sealed and unsealed areas)
- Post-incident washdown of vehicles and appliances on concrete apron
- Historical, on-site storage of PFAS-containing AFFF in drums within the storage shed
- Ongoing leaching of PFAS from impacted surfaces (concrete) associated with fire training and wash down activities
- Ongoing leaching of PFAS from impacted soils beneath the open areas historically used for training activities or post-incident washing down/decanting of appliances

Figure 2 in the Attachments shows the location of potential on-site sources of contamination.

Potential off-site sources of contamination were identified, and included Fire Equipment Maintenance Group, located up hydraulic gradient of the site.

9.2 Contaminants of potential concern

The primary contaminant of potential concern (COPC) considered is PFAS. PFAS are surfactant chemicals used in aqueous film forming foams (AFFF) to facilitate spread of the foam and provide resistance to thermal decay of the product. They consist of a completely (per-) or partially (poly-) fluorinated carbon chain or 'tail' (typically C2-C18) with an alkyl 'head'. The per-fluorinated tail is hydrophobic, meaning its insoluble in water. The alkyl head is hydrophilic, which gives the molecule its solubility.

Of the PFAS compounds included in the standard analytical suite, PFOS, PFHxS and PFOA are typically dominant PFAS compounds detected in environmental samples. Studies monitoring PFAS concentration in human blood have reported that PFOS, PFOA, PFHxS and Perfluorononanoic acid (PFNA) are the predominant PFAS compounds to which people are generally exposed. Many other PFAS compounds also breakdown to PFOS, PFHxS, and/or PFOA. Consequently, the guidelines produced by Australian health and environmental regulators have focused on PFOS, PFOA, and PFHxS, and these three compounds have been the focus of much of the scientific research undertaken on PFAS to date (ATSDR 2021).

Given the regulatory and scientific emphasis on PFOS, PFHxS, and PFOA, these chemicals are the primary analytes of focus in this assessment.

9.3 Potential exposure pathways and receptors

9.3.1 Contaminant release mechanisms and PFAS behaviour

Historically, PFAS could have been released to the environment through several processes including:

- Spray being dispersed by wind
- Historical use of AFFF during training activities
- Spillage to the ground and/or potential leakage of AFFF concentrate from containers
- Controlled and uncontrolled disposal of containers containing residual PFAS products

– Uncontrolled disposal of liquids containing PFAS, e.g. from washdown activities, to land or drains

Windborne dispersal of PFAS can arise from the use of AFFF during historical fire-training exercises. This is where a decreasing halo of PFAS emanates radially from a source area, such as a fire training pad, and can be identified through review of analytical results of near surface soils (i.e., soil and/or concrete contamination is generally closely associated with the source areas and concentrations progressively decrease with distance away from the source area).

PFAS compounds can mobilise from soil and hardstand areas during rain events and flow overland via drainage routes. Larger PFAS molecules (PFOS and PFOA) are likely to adsorb more strongly to soil than smaller molecules, and the rate of leaching may decrease if the soils contain a significant fraction of organic material and/or metal oxides. These factors can lead to different ratios of PFAS in the soil source area than in the water, with potentially increased concentrations of shorter chain PFAS in water than in soil.

PFAS that enters the groundwater will migrate in the direction of groundwater flow via advection. Groundwater flow, based on recorded groundwater levels, is inferred to be in a south-westerly direction towards the Spencer Gulf.

9.3.2 Site exposure pathways

For an exposure to occur, a complete pathway must exist between a source of contamination and a receptor. Where the exposure pathway is incomplete, there is no exposure, and hence no risk. Based on the environmental setting of the site and surrounding land use, the following exposure pathways were amongst those considered in the assessment:

– The off-site consumption of edible vegetation irrigated with or exposed to contaminated groundwater and/or growing in PFAS impacted soil
– Direct dermal contact or incidental ingestion of contaminated soil, groundwater, or surface runoff from other impacted surfaces (concrete slabs)
– Inhalation of dust emanating from wind or activities in unsealed source areas
– Surface runoff and groundwater transporting residual PFAS contaminants off-site to downstream and down-gradient areas

9.3.3 Receptors

The potential human and ecological receptors at risk of PFAS exposure via the above mechanisms, include:

– On-site staff and visitors conducting activities in source areas.
– Subsurface construction workers and maintenance workers who come into contact with contaminated soil and/or groundwater
– People using groundwater for domestic purposes (e.g., filling of swimming pools) down-gradient of the site and consequent incidental ingestion of contaminated water
– People using groundwater for irrigation of edible vegetation with which they grow produce for consumption (off-site)
– People growing edible vegetation in soil which may interact with off-site, PFAS-impacted groundwater
– Off-site surface water bodies (ecosystems and recreational users) where stormwater systems and/or groundwater discharge, such as the Harbor of Port Augusta/Spencer Gulf
– Plants including grasses and aquatic plants, which are consumed by faunal species
– Lower order animals (e.g., earthworms and insects) exposed to PFAS-impacted soils
– Higher order animals (e.g., fish, birds, small mammals, and reptiles) that consume lower order species

9.4 Potential source-pathway-receptor linkages

Based on the potential SPR linkages identified in this investigation and information obtained from the PSI conducted (GHD 2023a), a CSM has been developed for the site, with an assessment of exposure risk summarised in Table 9.1. Graphical representations of the CSM can be found in Figure 7 and Figure 8 in the Attachments.

SPR linkages were assessed under the following categories:

– Unknown – Not enough data available to indicate if a linkage is present or absent
– Possible – Data indicates PFAS impacts, or a potential source has been identified, and receptors are present, however source extent of PFAS impacts and/or pathways to a receptor are not understood
– Likely – PFAS impact has been confirmed and pathways to receptors are likely present, however extent of the connection has not been confirmed or is not fully understood
– Confirmed – PFAS impact greater than the adopted assessment criteria are shown to present at the receptor, hence SPR linkage has been confirmed present
– Unlikely – Source and/or pathways have not been identified or have been identified below the assessment criteria protective of the receptor, hence SPR linkage is unlikely complete

SPR linkages classified as ‘unknown’, ‘possible’ or ‘likely’ are considered to warrant further investigation.

Table 9.1 CSM for PFAS Exposure – SPR Linkage Assessment

Potential Source	Potential Receptor	Exposure Pathway	Risk from exposure through SPR Linkages
On-site PFAS impacted soils	Site users, visitors, maintenance and construction workers	Direct dermal contact with contaminated soil	**Unlikely** Site-specific Health Investigation Levels (SSHILs) have been derived using exposure assumptions that reflect the typical usage pattern of the MFS fire stations. PFAS concentrations in on-site soils were below the adopted criteria. It is considered unlikely that site users, visitors, maintenance or construction workers would be exposed to PFAS quantities detrimental to their health.
		Incidental ingestion of contaminated soil	
		Inhalation of contaminated soil or dust from disturbed soils	
	Ecosystem at, and immediately surrounding, the site	Direct contact with contaminated soil	**Possible** The area in which ecological assessment guidelines were exceeded is predominantly unvegetated, patches of shrub, trees and grass. The exceedances represent a potentially complete SPR linkage in the source-pathway-receptor. Further assessment work may be required to confirm the absence of ecological exposure because of on-site PFAS impacts..
		Ingestion of contaminated soil	
		Bioaccumulation through indirect contact	
	People growing edible vegetation in impacted soil	Consumption of PFAS impacted edible vegetation	**Unlikely** The MFS has removed all edible vegetation from the site. Although rosemary bushes were noted on site, this vegetation serves an ornamental/aesthetic purpose.
	Groundwater beneath the site	Rainwater/surface runoff leaching impacted soil followed by migration through porous media into groundwater	**Confirmed** Analyses of groundwater samples from all three wells on site reported PFAS concentrations above the adopted PFAS criteria. Due to the shallow nature of the PFAS-impacted groundwater, root uptake of this water by plants (particularly larger trees) cannot be discounted.
On-site PFAS impacted concrete surfaces	Soil and groundwater beneath the site	Rainwater/surface runoff leaching impacted concrete followed by migration through porous media into groundwater	**Possible** Although analyses of paver/concrete samples at other MFS sites yielded results below the adopted PFAS assessment criteria protective of human health and the environment, concrete hardstand within historical source zones, is yet to be assessed. Concrete hardstand in historical source areas may present a PFAS-flux risk.
Off-site PFAS impacted soils	Off-site users of the area inclusive of maintenance and subsurface construction workers	Direct dermal contact with contaminated soil	**Unlikely** Highest PFAS concentrations within soil are anticipated in on-site areas where activities entailing the use of AFFF were historically undertaken. Since PFAS concentrations in on-site soils were below the adopted criteria, it is unlikely that maintenance and subsurface construction workers will be exposed to off-site soils, containing PFAS levels detrimental to their health, taking cognisance of the limited duration of potential exposure via this pathway.
		Incidental ingestion of contaminated soil	
		Inhalation of contaminated soil or dust from disturbed soils	

Potential Source	Potential Receptor	Exposure Pathway	Risk from exposure through SPR Linkages
	Ecosystem surrounding the site	Direct contact with contaminated soil Ingestion of contaminated soil Bioaccumulation through indirect contact	**Possible** Lateral delineation of PFAS soil impacts is yet to be completed. Although areas to the south and west of the site are largely developed with concrete and asphalt hardstand, unsealed surfaces with patches of vegetation growth are evident to the north and east of the site. The historic dispersion of PFAS via overspray during training activities is plausible and may have contributed to soil impacts. Given the relatively stringent ecological indirect exposure criteria, potential risks to off-site terrestrial ecology cannot be discounted.
	Groundwater beneath impacted soil	Rainwater/surface runoff leaching impacted soil followed by migration through porous media into groundwater	**Possible** Since the lateral extent of PFAS soil impacts are yet to be established, the degree to which potentially contaminated off-site soil can impact groundwater beneath these areas cannot be evaluated at this stage. Nevertheless, the most significant groundwater impacts are anticipated to be directly below historical source areas, dispersing down-hydraulic gradient (south-westerly direction).
PFAS-impacted groundwater	People using groundwater for drinking purposes	Consumption of contaminated groundwater	**Unlikely** No registered groundwater wells within a 2 km radius of the site had TDS values below 1,200 mg/L, which is deemed suitable for domestic and primary irrigation purposes (Gov SA 2015). The potable use of groundwater is therefore precluded.
	People using groundwater for irrigation of edible vegetation with which they grow produce for consumption	Consumption of edible vegetation irrigated by contaminated groundwater	**Unlikely** No registered groundwater wells within a 2 km radius of the site had TDS values below 1,200 mg/L, which is deemed suitable for domestic and primary irrigation purposes (Gov SA 2015). Of the nine registered groundwater wells with TDS data (WaterConnect database), only two had TDS values lower than 13,000 mg/L, indicative of brackish water not suitable for irrigation.
	People growing edible vegetation in open soil which may interact with groundwater	Consumption of PFAS impacted edible vegetation	**Possible** The extent/degree of PFAS in groundwater down-hydraulic gradient of the site has not been delineated as yet. Residential properties with gardens where edible vegetation (e.g., fruit trees) could be grown are present within 2 km of the site. Considering the relatively shallow groundwater levels in the area (~ 2 m bgl), the uptake of groundwater by larger trees is plausible.
	People using groundwater for recreational purposes such as filling of swimming pools	Incidental ingestion of contaminated groundwater	**Possible** Although there are no registered wells in the vicinity of the site listed for recreational/domestic purposes, swimming pools are evident in close proximity to the station. To the north, private swimming pools are located approximately 25 m and 50 m from the site, respectively. To the east, a swimming pool is observed approximately 50 m from the site. Several swimming pools are also evident to the south of the site, beyond the railway line and Railway Parade. Groundwater PFAS impacts have been confirmed on site, however the lateral extent of the PFAS contaminant plume is yet to be established.

Potential Source	Potential Receptor	Exposure Pathway	Risk from exposure through SPR Linkages
	Down-gradient, off-site maintenance and sub-surface construction workers that contact PFAS contaminated groundwater	Direct dermal contact or incidental ingestion of contaminated groundwater	**Unlikely** Despite the extent of groundwater PFAS impacts yet to be defined both vertically and laterally, it is unlikely that down-gradient, off-site maintenance or sub-surface construction workers will incidentally ingest contaminated water in quantities and concentrations detrimental to their health.
	Livestock watering, aquaculture or human consumption of aquatic foods	Abstraction of groundwater	**Unlikely** No registered groundwater wells within a 2 km radius of the site had TDS values below 1,200 mg/L, which is deemed suitable for domestic purposes (Gov SA 2015). The use of groundwater for livestock watering and aquaculture is therefore precluded.
	Migration of PFAS contaminated groundwater to downgradient marine receptors	Incidental ingestion of contaminated water	**Possible** The extent/degree of PFAS in groundwater down-hydraulic gradient of the site has not been delineated as yet. Given the close proximity of the site to the Spencer Gulf and relatively shallow groundwater depths, the interaction of groundwater with marine waters via direct discharge cannot be discounted.
PFAS-impacted surface waters (off-site)	People using coastal waters for swimming	Incidental ingestion of contaminated groundwater	**Unlikely** Although the local interaction of groundwater with marine waters is plausible, exposure of recreational users of coastal waters (e.g., swimmers and paddlers) to PFAS in quantities and concentrations detrimental to their health is considered negligible due to the dilution effect. Further investigation down gradient with respect to potential site derived PFAS and off-site, down gradient sources may further contextualise potential exposure risk to this receptor.
	People fishing from coastal waters	Consumption of PFAS contaminated biota	**Possible** The extent/degree of PFAS in groundwater down-hydraulic gradient of the site has not been delineated as yet. Since groundwater-marine water interactions are possible and given the propensity for PFAS to bioaccumulate in edible higher order animals (e.g., fish, molluscs and crustaceans), the exposure risk via this pathway cannot be discounted at this stage.
	Marine ecosystems downstream from the site	Discharge of PFAS impacted surface water into the marine environment	**Possible** Several surface soil samples collected on site reported PFAS concentrations above the adopted soil assessment criteria. Considering the potential dissolution of soil-bound PFAS contaminants subsequent to surface applications (e.g., flushing of equipment) or atmospheric deposition (i.e., rainfall), a linkage between historical source areas and down-gradient receptors (marine ecosystems) may be completed via PFAS-impacted surface water runoff.

10. Existence of site contamination

Based on the information presented in this DSI report, PFAS-impacted soil contamination hotspots exist on site. Site contamination also exists in relation to the quaternary aquifer underlying the site.

Section 5B from the *Environment Protection (Site Contamination) Amendment Act 2007* (EP Act) states that:

1. For the purposes of the Act, site contamination exists at a site if:
    a. chemical substances are present on or below the surface of the site in concentrations above the background concentrations (if any); and
    b. the chemical substances have, at least in part, come to be present there as a result of an activity at the site or elsewhere; and
    c. the presence of the chemical substances in those concentrations has resulted in:
        i. actual or potential harm to the health or safety of human beings that is not trivial, taking into account current or proposed land uses; or
        ii. actual or potential harm to water that is not trivial; or
        iii. other actual or potential environmental harm that is not trivial, taking into account current or proposed land uses

It is understood that the SA EPA were notified, under Section 83A of the Environment Protection Act 1993, of groundwater PFAS impacts on the 11 October 2023.

11. Discussion

11.1 PFAS soil impacts

Highest PFAS concentrations in soils were observed in the southern portion of the site, within the former training area. There were no identified exceedances of the adopted human health assessment criteria in on-site soils. PFAS soil impacts appear to be localised in extent and primarily confined within surface and near-surface soils (approximately 0 – 0.5 m bgl), with the exception of BH01 (located within the historical training area, west of the fire station building), in which concentrations above the adopted ecological assessment criterion were noted at 1.5 m bgl. Notwithstanding the exceedance, BH01 is positioned adjacent to the station building within a concrete pad, rendering the underlying soil effectively inaccessible to fauna and flora.

The area where ecological assessment guidelines were exceeded is predominantly unvegetated, patches of shrub, trees and grass are found at locations which reported elevated PFOS concentrations (e.g., SS02, SS06 and BH07). This presents a potential complete SPR linkage as far as ecological exposure is concerned, as water-soluble PFAS constituents are within the root zone of the soil profile and thus are likely to be bioavailable.

Four of the seven surface soil samples collected on site exceeded the adopted soil assessment criteria. The vertical delineation of PFAS impacts at these locations was not assessed as part of the sampling program. Since groundwater PFAS impacts are evident at the site at depths in the region of 2 m bgl, vertical delineation of soil impacts at these locations is unlikely to add meaningful value to the overall assessment. Elevated surface soil results within these areas are indicative of the highly dispersive nature of PFAS.

The presence and extent of PFAS within the south-eastern corner of the site, currently under the jurisdiction of South Australia Water Assets, is still undefined owing to the area being inaccessible at the time of scheduled fieldwork. This portion of land was formerly within the confines of the MFS site and subject to training exercises utilising AFFF. Consequently, potential PFAS impacts within this particular area could not be assessed.

In view of the extensively sealed surfaces surrounding the site to the south and west, in the form of roads and commercial development, potential soil impacts and/or exposure pathways external to the site are considered negligible and as such does not warrant further investigation. Similarly, the nominal coverage of potential AFFF overspray north and east of the station (where residential housing is observed) in the past, is likely to have resulted in negligible soil impacts within these vicinities. Nevertheless, potential soil impacts for more sensitive surrounding areas are yet to be assessed.

11.2 PFAS groundwater impacts

Exceedances of the PFAS guidelines representative of domestic-use scenarios where groundwater is used for recreational purposes, such as in the filling of swimming pools, were reported for all three monitoring wells installed on site. Since the Marine Waters (95% species protection) PFOS criterion is more stringent than the aforementioned recreational-use guideline, exceedances of the marine waters criterion are also apparent for all wells.

Given the high percentage of registered wells within a 2 km of the site with no recorded purpose, the use of a certain number of these wells for recreational purposes cannot be discounted. The extent/degree of PFAS in groundwater down-hydraulic gradient of the site has not been delineated as yet. This potentially presents a complete SPR linkage from a groundwater-use perspective. Although rainwater harvesting is evident in residential properties adjacent to the site, and is likely the preferred source of water for domestic purposes (excluding consumption), the use of potentially unregistered groundwater wells in the vicinity of the site for swimming pool filling is plausible. The potential uptake of contaminated, relatively shallow groundwater by trees down-hydraulic gradient of the site can also not be ruled out at this stage.

Furthermore, considering the relatively close proximity of the Harbor of Port Augusta to the site, in conjunction with the shallow groundwater levels, the efflux of local groundwater to the bay is perceivable, culminating in potential marine ecosystem impacts.

12. Conclusions and recommendations

The primary objectives of the DSI are to:

– Assess the nature and extent of identified site contamination associated with historical use of PFAS containing AFFF
– Assess the potential risks to human health and the environment associated with identified PFAS contamination on-site, in the context of continued industrial use
– Assess the potential risks to human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant land uses and environments

In fulfilment of these objectives, GHD undertook, inter alia, the following tasks:

– Advancement of 7 boreholes with associated soil logging, target-depth sampling and PFAS analysis across the site to approximately 3.5 m below ground level (m bgl) to provide coverage across the site where historical PFAS impacts may have occurred
– Collection of seven surface soil samples (0 - 0.1 m bgl) across the southern yard where training and activities using AFFF foam were historically conducted on MFS land
– Installation and development of three permanent on-site groundwater monitoring wells, with subsequent groundwater sample collection and analysis for PFAS analytes
– Surveying of the three on-site groundwater monitoring wells relative to Australian Height Datum (AHD)
– Preparation of this DSI report, including the refinement of the Conceptual Site Model (CSM), detailing the potential sources of contamination, receptors and exposure pathways

The following conclusions were drawn based on the findings of the investigation:

– PFAS soil impacts are noted on site which can be attributed to the historical use of AFFF containing PFAS at the station
– PFAS concentrations in on-site soils were below the adopted Site-specific Health Investigation Levels (SSHILs)
– PFAS soil impacts are not uniformly distributed across historic on-site source areas and are primarily confined within surface and near-surface strata (approximately 0 – 0.5 m bgl), in which concentrations above the adopted ecological assessment criterion were noted
– Vegetation was observed growing within these areas where elevated PFAS concentrations were reported, presenting a potential SPR linkage with respect to ecological exposure.
– The presence and extent of PFAS within the south-eastern corner of the site, currently under the jurisdiction of South Australia Water Assets, is still undefined owing to the area being inaccessible at the time of scheduled fieldwork
– In relation to the groundwater investigation, exceedances of the PFAS guidelines representative of domestic-use scenarios where groundwater is used for recreational purposes, such as in the filling of swimming pools, were reported for all three monitoring wells installed
– The extent/degree of PFAS in groundwater up- and down- hydraulic gradient of the site has not been delineated as yet.
– Considering the high percentage of registered wells within a 2 km of the site with no recorded purpose, the use of a certain number of these wells for recreational purposes cannot be discounted
– The potential uptake of contaminated, relatively shallow groundwater by trees down-hydraulic gradient of the site can also not be ruled out at this stage, possibly constituting a primary and/or intermediary receptor in the terrestrial ecology continuum
– Given the relatively close proximity of the Spencer Gulf to the site, in conjunction with the shallow groundwater levels, the discharge of local groundwater to the bay is perceivable, culminating in potential marine ecosystem impacts

To mitigate the potential ecological and human health exposure risks (i.e., those with confirmed or possible complete source-pathway-receptor linkages) identified in the DSI, the following recommendations are proposed:

– The collection of soil samples on adjacent SA Water land to assess the degree and extent of PFAS soil impacts within this south-eastern corner of the site, formerly under the control of the MFS
– Collection of surface/near-surface soil samples at adjacent, off-site locations to assess the degree and extent of PFAS soil impacts potentially emanating from various dispersal mechanisms
– Consideration should be given to sealing the surface of the rear yard (e.g., with pavers or asphalt) to restrict floral and faunal access to contaminated soils in excess of the ecological assessment criteria, and thereby address the exposure pathway risk. This management measure will also address the potential surface water runoff and dust exposure pathways
– Installation of a series of off-site groundwater monitoring wells (one up-hydraulic gradient and three down-hydraulic gradient, progressively further away from site) to assess the lateral extent of groundwater impacts and potential marine and terrestrial ecosystem exposure risks via the groundwater pathway
– Conduct a groundwater-use survey within the vicinity of the site to evaluate the potential exposure risk attributable to the possible use of groundwater for currently unidentified domestic/recreational purposes

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Figures

Figure 1 *MFS Port Augusta Site Location Plan*

Figure 2 *MFS Port Augusta Site Layout Plan*

Figure 3 *MFS Port Augusta Soil and Groundwater Sampling Locations*

Figure 4 *MFS Port Augusta Interpolated Groundwater Contour Map*

Figure 5 *MFS Port Augusta Soil Exceedances of Adopted Criteria*

Figure 6 *MFS Port Augusta Groundwater Exceedances of Adopted Criteria*

Figure 7 *MFS Port Augusta Conceptual Site Model*

Figure 8 *MFS Port Augusta Conceptual Site Model Cross Section*

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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 2020
Grid: 2020 MGA Zone 53

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GHD

South Australian Metropolitan Fire Service
Port Augusta DSI

Project No. 12616805
Revision No. C
Date 13/12/2023

Port Augusta MFS Site Location Plan

FIGURE 1

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Print date: 13 Dec 2023 - 16:21

Data source: GHD: Site Boundary (2022); DPTI: Cadastre, Roads (2015). Nearmap WMS: Imagery (Date Extracted: 12/10/2023). Created by: ejuan

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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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South Australian Metropolitan Fire Service
Port Augusta DSI

Port Augusta MFS Site Layout Plan

Project No. **12616805**
Revision No. **B**
Date **17/11/2023**

FIGURE 2

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Data source: GHD: Site Boundary (2022); DPTI: Cadastre, Roads (2015), Nearmap WMS: Imagery (Date Extracted: 12/10/2023). Created by: ejuan

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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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South Australian Metropolitan Fire Service
Port Augusta DSI

Port Augusta MFS Soil and Groundwater Sampling Locations

Project No. **12616805**
Revision No. **A**
Date **17/11/2023**

FIGURE 3

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Print date: 17 Nov 2023 - 18:03

Data source: GHD: Site Boundary (2022); DPTI: Cadastre, Roads (2015). Nearmap WMS: Imagery (Date Extracted: 12/10/2023). Created by: ejuan

Data Disclaimer

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Paper Size ISO A3

0 3 6 9 12 15

Meters

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 2020
Grid: GDA 2020 MGA Zone 53

GHD

South Australian Metropolitan Fire Service
Port Augusta DSI

Port Augusta
MFS Groundwater Map

Project No. **12616805**
Revision No. **D**
Date **23/11/2023**

FIGURE 4

\\ghdnet\ghd\AU\Melbourne\Projects\33\12616805\GIS\Maps\Deliverables\12616805_Figures.aprx
Print date: 23 Nov 2023 - 14:08

Data source: GHD: Site Boundary (2022); DPTI: Cadastre, Roads (2015). Nearmap WMS: Imagery (Date Extracted: 12/10/2023). Created by: ejuan, egubatanga

BH01			
Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFHxS+PFOS (mg/kg)
1.0 – 1.1	0.051	0.15	0.2
1.5 – 1.6	0.072	0.28	0.35

SS06			
Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFHxS+PFOS (mg/kg)
0.0 – 0.1	0.0018	0.54	0.55

SS05			
Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFHxS+PFOS (mg/kg)
0.0 – 0.1	0.0018	1.8	1.8

SS02			
Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFHxS+PFOS (mg/kg)
0.0 – 0.1	0.0002	0.17	0.17

BH07			
Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFHxS+PFOS (mg/kg)
0.5 – 0.6	0.12	0.14	0.26

SS04			
Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFHxS+PFOS (mg/kg)
0.0 – 0.1	0.0012	1	1

Port Augusta 2			
Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFHxS+PFOS (mg/kg)
0.0 – 0.1	0.023	0.49	0.51

MW02			
Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg)	PFHxS+PFOS (mg/kg)
0.1 – 0.2	0.0053	0.32	0.33

Criteria	PFHxS (mg/kg)	PFOS (mg/kg)	PFHxS+PFOS (mg/kg)
PFAS NEMP 2.0 2020 Ecological indirect exposure – developed sites	-	0.14	-
PFAS NEMP 2.0 2020 Ecological direct exposure	-	1	-

Legend

- Groundwater Monitoring Wells
- Soil Boreholes
- Surface Soil Locations (GHD 2019)
- Surface Soil Samples
- Roads
- Historical Training Area
- Washdown Area
- Former PFAS Storage
- Storm Water Egress
- Stormwater Drains
- Site Boundary
- Cadastre

BH02 MW01 BH01 BH03 SS02 SS01 SS05 MW03 SS03 BH04 Port Augusta 2 BH05 SS06 SS04 BH06 BH07 SS07 MW02 Port Augusta 1 TRENTROAD

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Paper Size ISO A3

0 3 6 9 12 15

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 2020
Grid: GDA 2020 MGA Zone 53

N

GHD

South Australian Metropolitan Fire Service
Port Augusta DSI

Port Augusta Soil Exceedances of Adopted Criteria

Project No. 12616805
Revision No. B
Date 20/11/2023

FIGURE 5

\\ghdnet\ghd\AU\Melbourne\Projects\33\12616805\GIS\Maps\Deliverables\12616805_Figures.aprx
Print date: 20 Nov 2023 - 18:30

Data source: GHD: Site Boundary (2022); DPTI: Cadastre, Roads (2015). Nearmap WMS: Imagery (Date Extracted: 12/10/2023). Created by: ejuan, egubatanga

MW01		
PFHxS (µg/L)	PFOS (µg/L)	PFHxS+PFOS (µg/L)
3.2	5.2	8.4

MW03		
PFHxS (µg/L)	PFOS (µg/L)	PFHxS+PFOS (µg/L)
6.8	0.56	7.36

MW02		
PFHxS (µg/L)	PFOS (µg/L)	PFHxS+PFOS (µg/L)
14	1.9	15.9

Criteria	PFHxS (µg/L)	PFOS (µg/L)	PFHxS+PFOS (µg/L)
PFAS NEMP 2.0 2020 Marine – 95% – slightly to moderately disturbed ecosystems	-	0.13	-
ADWG 2011 Recreational (v3.7 updated 2022)	0.7	0.7	0.7

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Paper Size ISO A3

0 3 6 9 12 15 Meters

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 2020
Grid: GDA 2020 MGA Zone 53

GHD

South Australian Metropolitan Fire Service
Port Augusta DSI

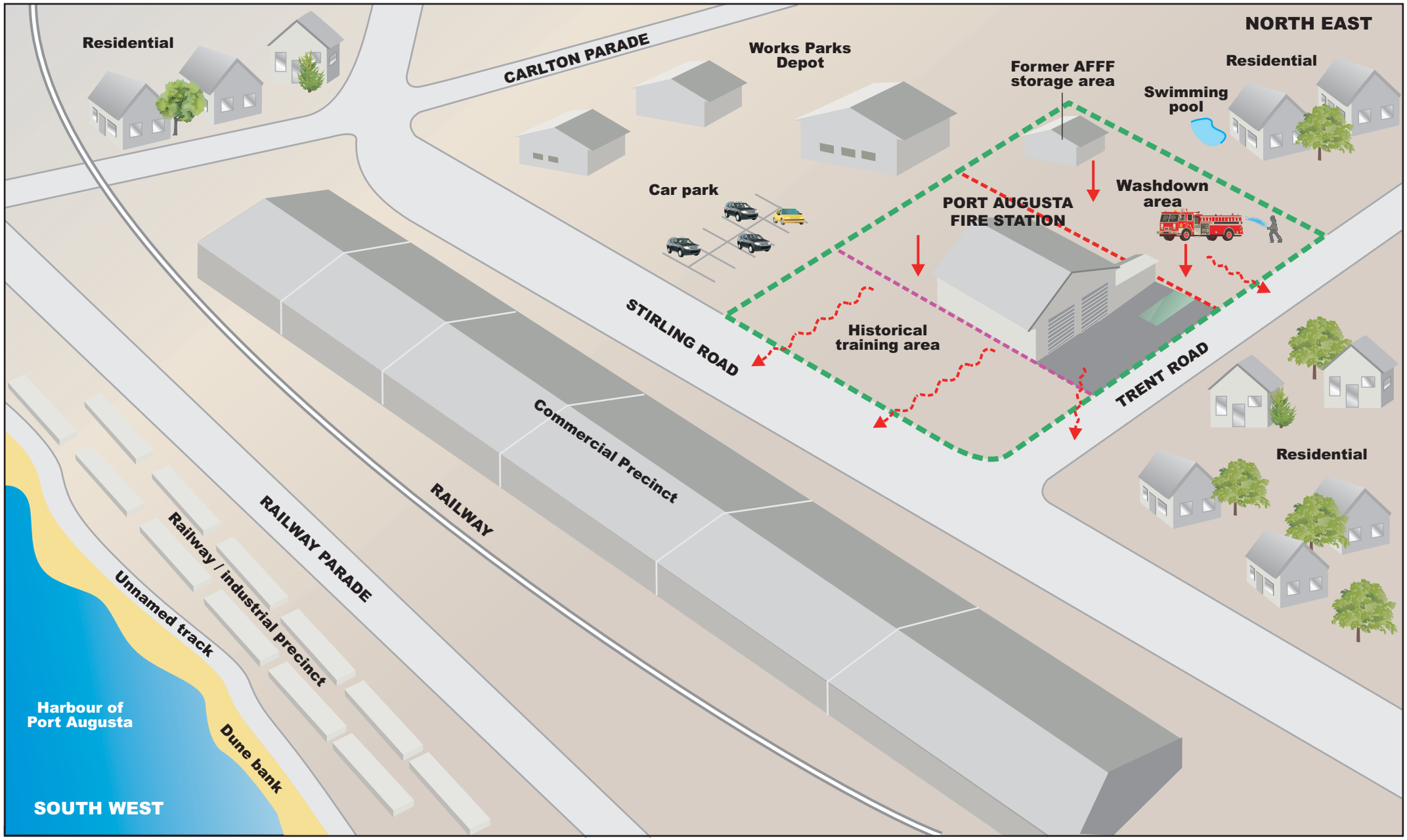
Port Augusta Groundwater Exceedances of Adopted Criteria

Project No. **12616805**
Revision No. **B**
Date **21/11/2023**

FIGURE 6

\\ghdnet\ghd\AU\Melbourne\Projects\33\12616805\GIS\Maps\Deliverables\12616805_Figures.aprx
Print date: 21 Nov 2023 - 13:40

Data source: GHD: Site Boundary (2022); DPTI: Cadastre, Roads (2015). Nearmap WMS: Imagery (Date Extracted: 12/10/2023). Created by: egubatanga



LEGEND

- Site boundary
- Discharge of PFAS and AFFF to stormwater
- PFAS migrating vertically to groundwater

Conceptual diagram only - not to scale

GHD

SA MFS
Port Augusta DSI
1 Trent Road, Port Augusta, SA 5700

Conceptual site model

Project No. 12616805
Revision No. A
Date 29/11/2023

FIGURE 7

AU\Launceston\Projects\Admin\Graphics\12\616805\12616805_LST_01.cdr

Level 4, 211 Victoria Square Adelaide SA 5000 T 61 8 8111 6600 F 61 8 8111 6699 E ademail@ghd.com W www.ghd.com

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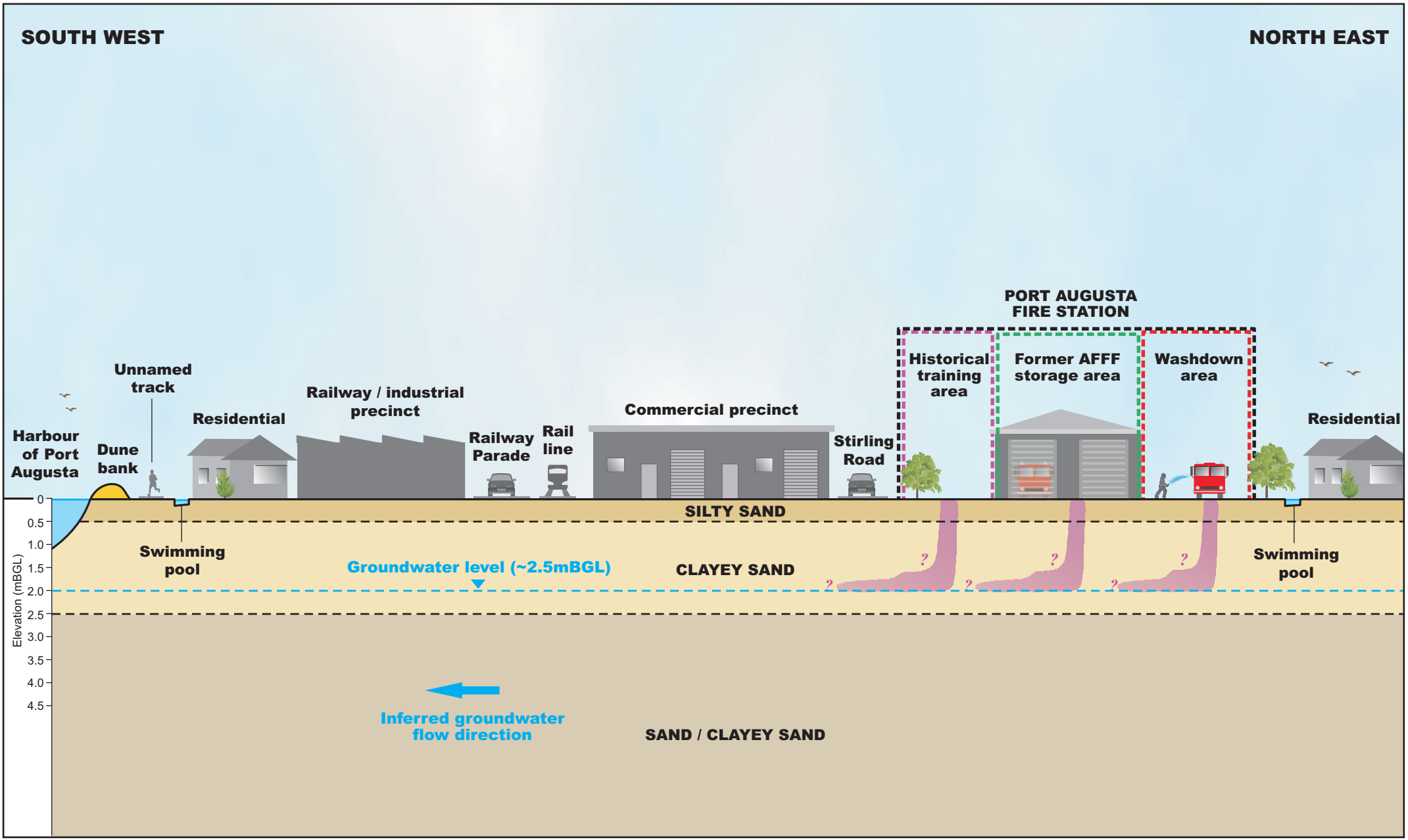

LEGEND

Inferred PFAS

Conceptual diagram only - scale is approximate

GHD

SA MFS
Port Augusta DSI
1 Trent Road, Port Augusta, SA 5700

Conceptual site model cross section

Project No. 12616805
Revision No. A
Date 29/11/2023

FIGURE 8

AU\Launceston\Projects\Admin\Graphics\12\616805\12616805_LST_02.cdr

Level 4, 211 Victoria Square Adelaide SA 5000 T 61 8 8111 6600 F 61 8 8111 6699 E ademail@ghd.com W www.ghd.com

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Appendices

Appendix A

SA EPA Letter

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
T (08) 8204 2004
Country areas 1800 623 445

EPA GENI 62917

Krystle Mitchell
Senior Scientific and Environmental Officer
South Australian Metropolitan Fire Service
By Email: Krystle.Mitchell@eso.sa.gov.au

Dear Ms Mitchell,

RE: REVIEW OF SITE CONTAMINATION REPORT – ACTION REQUIRED

Site: Various Metropolitan Fire Service (MFS) Fire Stations, South Australia

Thank you for providing the Environment Protection Authority (EPA) with a copy of the following report:

- *MFS 17 Fire Stations PFAS Risk Profiling*, prepared by GHD and dated 26 October 2022.

The above report documents a desktop risk profiling and prioritisation assessment completed for 17 MFS stations previously identified as containing PFAS contamination, based on limited site sampling completed in 2019 (GHD 2019)[1].

The EPA requests that you submit a plan of proposed works and associated timelines to address the highest risk sites by **30 June 2023**.

If you agree to undertake the above listed works it is requested that you submit written acknowledgement to the EPA stating as such. If you wish to discuss potential alterations to the recommended works or delivery date please contact the EPA as soon as possible.

It is not clear in the above report whether stations where no soil sampling was completed, or where the limited sampling showed no site contamination, were considered as part of the risk screening assessment. The EPA notes that the sampling documented in GHD (2019) was highly limited and may not capture all potential PFAS source areas at a station. The EPA recommends that these stations be risk profiled if not undertaken previously.

Please provide a copy of this letter to your engaged consultant to assist them in developing a scope of works for the relevant sites. Fact sheets relating to your obligations under the *Environment Protection Act 1993* and how to engage a site contamination consultant be found at www.epa.sa.gov.au. If you would like further assistance on this matter please contact Brooke Ryan on (08) 8204 8525 or at brooke.ryan2@sa.gov.au.

Yours sincerely

HCustance
Hannah Custance

PRINCIPAL ADVISER, SITE CONTAMINATION

ENVIRONMENT PROTECTION AUTHORITY

Date: 1 February 2023

Cc: Ben Petticrew, Technical/Project Director – Contamination Assessment and Remediation, GHD (ben.petticrew@ghd.com)

[1] *MFS State Wide Appliance and Station Sampling*, prepared by GHD and dated May 2019.

Appendix B

Photolog

Site Details

Site Name	Port Augusta
Site Address	1 Trent Road, Port Augusta, SA 5700
Inspection Date	March 8, 2023 4:11 PM
Inspector (GHD)	

Photograph Log

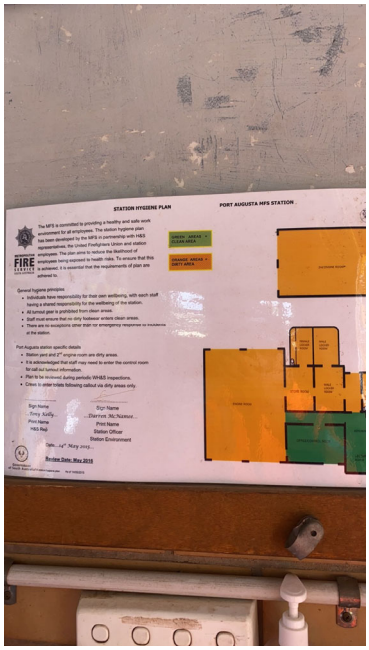
ID	Description	Photograph
1	**Northing:** 6,401,043 **Easting:** 760,318 **Facing:** N **Description:** Inside shed - storage of AFFF along wall up to even a year ago	
2	**Northing:** 6,401,044 **Easting:** 760,321 **Facing:** E **Description:** Storage shed - trailer to the left used for storing foam containers	

ID	Description	Photograph
3	**Northing:** 6,401,043 **Easting:** 760,322 **Facing:** SW **Description:** Training yard - unsealed area aquired by MFS approximately 15 years ago. Site slopes down to road in background	
4	**Northing:** 6,401,014 **Easting:** 760,306 **Facing:** SW **Description:** Gutter draining surface runoff offsite, appears to turn left directing water to Trent Rd	
5	**Northing:** 6,401,039 **Easting:** 760,304 **Facing:** NE **Description:** Rest of storage shed	

ID	Description	Photograph
6	**Northing:** 6,401,024 **Easting:** 760,309 **Facing:** SW **Description:** Area used for stockpiling soil excavated by SA Water 6 months ago, flattened using council vehicle last week	
7	**Northing:** 6,401,020 **Easting:** 760,308 **Facing:** S **Description:** Corner of site taken back by SA Water recently - contains a valve for southern Port Augusta	
8	**Northing:** 6,401,020 **Easting:** 760,311 **Facing:** SE **Description:** On-site vegetation	

ID	Description	Photograph
9	**Northing:** 6,401,019 **Easting:** 760,313 **Facing:** NE **Description:** Concrete training and wash down area	
10	**Northing:** 6,401,030 **Easting:** 760,318 **Facing:** E **Description:** Sewage system wells	
11	**Northing:** 6,401,034 **Easting:** 760,320 **Facing:** SW **Description:** View of backyard - minimum cracking in concrete, small gaps between each slab	

ID	Description	Photograph
12	**Northing:** 6,401,035 **Easting:** 760,337 **Facing:** SE **Description:** Entrance to yard, semi open drain present	
13	**Northing:** 6,401,026 **Easting:** 760,354 **Facing:** W **Description:** View of station from Trent Road	
14	**Northing:** 6,401,010 **Easting:** 760,341 **Facing:** NW **Description:** View of station front	
15	**Northing:** 6,401,032 **Easting:** 760,314 **Facing:** W **Description:** Water front truck runoff visible draining to rear yard	

ID	Description	Photograph
16	**Northing:** 6,401,034 **Easting:** 760,314 **Facing:** **Description:** Clean/dirty area plan from 2015, not so much adhered to now	

Appendix C

MFS Surveys

MFS Station – AFFF Historical Use Questionnaire

Please distribute the following questionnaire to nominated MFS personnel who have worked at MFS sites when active use of AFFF ***(aqueous film-forming foam, firefighting foam)*** occurred before it was phased out in 2016. When applicable, please annotate key site features on the site plans attached at the end of this questionnaire.

MFS Station: Port Augusta SAMFS Fire Station

Name:

Position when working at the site: Station Officer

Phone number: **Email:**

Date of response: 06/25/22

Item	Question	Response
1	*When did you start working at this station?*	01/06/2022
2	*How long have you worked at this station?*	40 Years
3	*Can you describe where stormwater from the site is usually discharged to (e.g. stormwater pit, nearby creek / pond, street gutter)?*	Gutter in front of station
4	*Can you describe any changes in how stormwater has been managed at the site over time?*	Nil changes
5	*Is stormwater harvested within the site?*	No
5.1	*If yes, please describe where and how stormwater is harvested.*	
5.2	*For what purposes is stormwater harvested?*	
6	*Are there groundwater wells / bores at the site?*	No
6.1	*If yes, for what purpose is groundwater used at the site?*	

Item	Question	Response
6.2	*Where are the groundwater well / bores located on site? Please mark the location on the attached site plan.*	
7	*Date when AFFF was first used on site?*	1982
8	*Can you provide the product names of any AFFF used on the site? (e.g. Ansulite, 3M Light Water)*	3M Light water, HiEx Foam
9	*Was AFFF used in regular training exercises?* *If so:*	2-3 Times per year
9.1	*How often was the training?* *(e.g. weekly, monthly, quarterly)*	weekly
9.2	*Can you describe the location of the training areas and annotate them on the site plan?*	Rear training yard
9.3	*Can provide an estimate of how much AFFF was used in each training?*	20 litres
9.4	*Was the training ground sealed / open?*	open
9.5	*Was AFFF dispersed aerially?* *If so, please indicate the maximum extent on the site plan?*	yes
9.6	*When was the date of the last training event that included the use of AFFF?*	Approx 2015
10	*Please describe how the waste water was managed following training events?* *Specifically, was there a recycling system, storage pond, storage tanks or drains?* *Please annotate waste water discharge point / pathways on the site plan.*	Via storm water drainage system or soaked into training area.
11	*Did any waste water flow into drains that directed the waste water off-site?* *Please annotate the waste water discharge points / pathways on the site plan.*	Yes
12	*Were there any changes how the waste water was managed over time?* *If so, please describe the changes.*	No
13	*Is there any inventory of AFFF use for the site?*	No

Item	Question	Response
14	*Can you estimate the total volume of AFFF used on site before it was phased out in 2016?*	Approx 300 litres
15	*Where was AFFF stored on site?* *Please annotate the storage location on the site plan.*	Appliances and rear storage area
15.1	*What type and size of storage containers were used to store AFFF on site?*	1 x 200 litres drum and 30 x 20 litre drums plus 2 x appliance tanks.
15.2	*What is the number of storage containers or the total volume of AFFF that was typically stored on site at any given time prior to 2016?*	30 x 20 lite drums
16	*Please describe where and how AFFF was transferred from storage containers to the fire trucks / fire-fighting appliances.* *What equipment was used to transfer the AFFF?*	Manually filled tanks by poring foam concentrate into appliance tanks.
17	*How were spent drums of AFFF disposed of?*	Returnd to HQ store for refilling
18	*Were there any wash down areas for fire trucks, equipment or AFFF containers?* *If so:*	Rear station apron
18.1	*How was the waste water from such areas managed? (e.g. recycling, treatment, storage pond or discharge to drains)*	storm water drainage
18.2	*Were there any changes how the waste water was managed over?* *If so, please describe the changes.*	No
19	*Please describe / annotate the specific location(s) of any other chemical storage facilities (including fuel and oil) and describe the type and typical use of those chemicals.*	
20	*Is there an incident log / register for the site?*	No

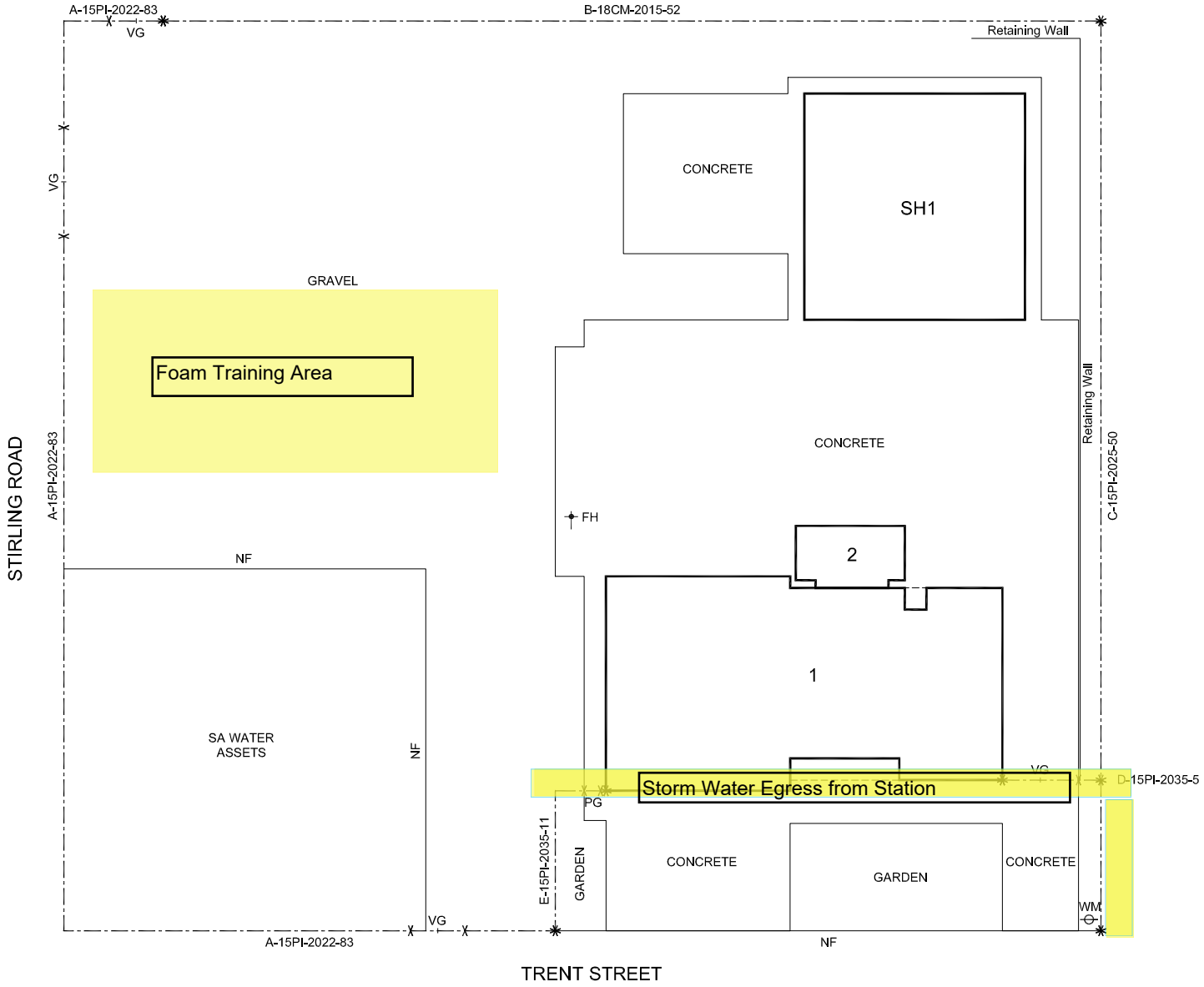
Item	Question	Response
21	*Are you aware of any AFFF (or other chemical) releases that may have occurred outside of typical application scenarios? If so:*	Nil
21.1	*When did such release(s) happen?*	
21.2	*What substance(s) was/were released?*	
21.3	*Where did such release(s) happen?* *Please annotate the release point(s) on the site plan.*	
21.4	*Where was the released AFFF or chemical discharged to?* *Please annotate the discharge point(s) on the site plan.*	
22	*Are there areas of the site where training activities and / or AFFF release(s) have historically occurred that are now unused or have been built on?*	
23	*Have there been any significant bulk earthworks on the Station site that resulted in soil being relocated from one area to another?*	
24	*Please describe any changes to the Station that you are aware of with respect to the storage and use of AFFF.*	

Any other comments or notes.

Scale Bar Units in Metres (1:250) Plot at scale of 1=.025 All dimensions to be verified on site

10 20 30 40 50 60 70

NORTH



BUILDINGS

1 FIRE STATION
2 CHANGE ROOMS

SH1 COLORBOND APPLIANCE SHED

FENCES	code-height-type-fail date-length (ms)	
CI corrugated iron		PW post and wire
CM chain mesh		WM weld mesh
GT galtube		NF not fenced
PG pedestrian gate		VG vehicle gate
WM Water Meter		Fence junction
GM Gas Meter	PMT	Pad mtd trans

PORT AUGUSTA
SAMFS FIRE STATION
1 TRENT ROAD
PORT AUGUSTA 5700

Government of South Australia
Department for Transport, Energy and Infrastructure

Asset no.	09187	Client.	ODEPT
DTEI Office.	PTAUGUSTA	Sheet.	1 of 1
Created by.	Archink	A Bentley	May 2010
Modified by.	-	-	-
Audited by.	Archink	A Bentley	May 2010
Title details.	refer layer " site-allotment "	RT-8862539	
Site area.	0.2483 ha	Accuracy.	site survey

Strategic Asset Management Information System Plan

SAMIS 09187

Appendix D

Borehole Logs

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH01

Client MFS
Project MFS Port Augusta DSI
Project No. 12616805
Site Port Augusta Fire Station
Location 1 Trent Road
Date Drilled 19/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 3.50
Diameter (mm) 50

Easting 760314.9004
Northing 6401031.126
Grid Ref GDA2020_MGA_zone_53
Elevation
Logged By Alexandra Kirkman
Checked By Tom Duncan

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	CC		BH01_0.1			CONCRETE				
0.2	HA					Sandy SILT fine to medium, subangular, orange-brown, with fine to coarse gravel (FILL)	D	L	No odour; No staining	-0.2
0.4						Clayey SAND fine, poorly graded, subangular, orange-brown with mottled grey-brown (NATURAL - SOIL)	SM	MD	No odour; No staining	-0.4
0.6										-0.6
0.8										-0.8
1	PT		BH01_1.0							-1
1.2										-1.2
1.4			BH01_1.5							-1.4
1.6										-1.6
1.8										-1.8
2										-2
2.2						SAND fine to medium, poorly graded, subangular, orange- brown (NATURAL - SOIL)	M	L	No odour; No staining	-2.2
2.4										-2.4
2.6										-2.6
2.8				▽		SAND medium, well graded, subangular, pale brown (NATURAL - SOIL)	W	L	No odour; No staining	-2.8
3										-3
3.2										-3.2
3.4										-3.4
3.6						Termination Depth at:3.50 m. Target depth achieved.				-3.6

Notes

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, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH02

Client MFS
Project MFS Port Augusta DSI
Project No. 12616805
Site Port Augusta Fire Station
Location 1 Trent Road
Date Drilled 19/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 3.50
Diameter (mm) 50

Easting 760306.3702
Northing 6401042.353
Grid Ref GDA2020_MGA_zone_53
Elevation
Logged By Alexandra Kirkman
Checked By Tom Duncan

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	CC		BH02_0.1			CONCRETE				0
0.2	HA					Silty SAND fine to medium, poorly graded, subangular, orange- brown, trace fine to coarse gravel (NATURAL - SOIL)	D	MD	No odour; No staining	-0.2
0.4						Silty SAND fine to medium, poorly graded, subangular, orange- brown with mottled grey-brown (NATURAL - SOIL)	D	MD	No odour; No staining	-0.4
0.6										-0.6
0.8										-0.8
1	PT									-1
1.2										-1.2
1.4			BH02_1.5							-1.4
1.6										-1.6
1.8										-1.8
2										-2
2.2						SAND fine to medium, well graded, subangular, orange-brown (NATURAL - SOIL)	M	L	No odour; No staining	-2.2
2.4										-2.4
2.6										-2.6
2.8				▽		SAND low to medium plasticity, medium, well graded, subangular, pale brown (NATURAL - SOIL)	W	L	No odour; No staining	-2.8
3										-3
3.2										-3.2
3.4										-3.4
3.6						Termination Depth at:3.50 m. Target depth achieved.				-3.6

Notes

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, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH03

Client MFS
Project MFS Port Augusta DSI
Project No. 12616805
Site Port Augusta Fire Station
Location 1 Trent Road
Date Drilled 18/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 3.50
Diameter (mm) 50

Easting 760307.7067
Northing 6401018.151
Grid Ref GDA2020_MGA_zone_53
Elevation
Logged By Alexandra Kirkman
Checked By Tom Duncan

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA		BH03_0.1			CRUSHED STONE				
0.2						Gravelly SILT fine, pale brown, with fine to medium sand (FILL)	D	D	No odour; No staining	-0.2
						Silty SAND fine, poorly graded, subangular, orange-brown with mottled grey-brown (NATURAL - SOIL)	D	MD	No odour; No staining	
0.4										-0.4
0.6										-0.6
0.8										-0.8
1	PT		BH03_1.0			Clayey SAND fine, poorly graded, subangular, grey with mottled orange (NATURAL - SOIL)	M	MD	No odour; No staining	-1
1.2										-1.2
1.4										-1.4
1.6						Clayey SAND fine, well graded, subangular, pale brown (NATURAL - SOIL)	W	MD	No odour; No staining	-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4										-2.4
2.6				▽						-2.6
2.8										-2.8
3										-3
3.2						SAND, medium to coarse, well graded, subangular, pale brown (NATURAL - SOIL)	W	L	No odour; No staining	-3.2
3.4										-3.4
3.6						Termination Depth at:3.50 m. Target depth achieved.				-3.6

Notes

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, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH04

Client MFS
Project MFS Port Augusta DSI
Project No. 12616805
Site Port Augusta Fire Station
Location 1 Trent Road
Date Drilled 18/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 3.50
Diameter (mm) 50

Easting 760300.4653
Northing 6401021.794
Grid Ref GDA2020_MGA_zone_53
Elevation
Logged By Alexandra Kirkman
Checked By Tom Duncan

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					CRUSHED STONE				0
0.2						Silty SAND fine to medium, poorly graded, pale brown, with medium gravel (FILL)	D	MD	No odour; No staining	-0.2
						Silty SAND fine to medium, poorly graded, subangular, orange-brown with mottled grey- brown (NATURAL - SOIL)	D	MD	No odour; No staining	
0.4			BH04_0.5							-0.4
0.6										-0.6
0.8										-0.8
1	PT					Clayey SAND poorly graded, subangular, grey with mottled orange (NATURAL - SOIL)	M	MD	No odour; No staining	-1
1.2										-1.2
1.4										-1.4
1.6										-1.6
1.8										-1.8
2			BH04_2.0							-2
2.2				▽						-2.2
2.4										-2.4
2.6						Sandy CLAY low to medium plasticity, subangular, pale grey-brown (NATURAL - SOIL)	W	F	No odour; No staining	-2.6
2.8										-2.8
3										-3
3.2										-3.2
3.4										-3.4
3.6						Termination Depth at:3.50 m. Target depth achieved.				-3.6

Notes

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, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH05

Client MFS
Project MFS Port Augusta DSI
Project No. 12616805
Site Port Augusta Fire Station
Location 1 Trent Road
Date Drilled 18/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 3.50
Diameter (mm) 50

Easting 760282.7214
Northing 6401015.786
Grid Ref GDA2020_MGA_zone_53
Elevation
Logged By Alexandra Kirkman
Checked By Tom Duncan

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA		BH05_0.1			CRUSHED STONE				
0.2						Gravelly SILT fine, pale brown, with fine to medium sand (FILL)	D	D	No odour; No staining	-0.2
						Silty SAND poorly graded, subangular, orange- brown with mottled grey- brown (NATURAL - SOIL)	D	MD	No odour; No staining	
1	PT		BH05_1.0			Clayey SAND poorly graded, subangular, grey with mottled orange (NATURAL - SOIL)	M	MD	No odour; No staining	-1
1.6						Clayey SAND low to medium plasticity, well graded, subangular, pale brown (NATURAL - SOIL)	W	MD	No odour; No staining	-1.6
3.6						Termination Depth at:3.50 m. Target depth achieved.				-3.6

Notes

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, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH06

Client MFS
Project MFS Port Augusta DSI
Project No. 12616805
Site Port Augusta Fire Station
Location 1 Trent Road
Date Drilled 18/09/2023 -

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 3.50
Diameter (mm) 50

Easting 760307.7067
Northing 6401018.151
Grid Ref GDA2020_MGA_zone_53
Elevation
Logged By Alexandra Kirkman
Checked By Tom Duncan

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					CRUSHED STONE			No odour; No staining	
0.2						Gravelly SILT, fine, pale brown, with fine to medium sand (FILL)	D	D	No odour; No staining	-0.2
0.4			BH06_0.5			Silty SAND poorly graded, subangular, orange- brown with mottled grey- brown (NATURAL - SOIL)	D	MD	No odour; No staining	-0.4
0.6										-0.6
0.8										-0.8
1	PT					Clayey SAND poorly graded, subangular, grey with mottled orange (NATURAL - SOIL)	M	MD	No odour; No staining	-1
1.2										-1.2
1.4										-1.4
1.6						Clayey SAND low to medium plasticity, well graded, subangular, pale brown (NATURAL - SOIL)	W	MD	No odour; No staining	-1.6
1.8										-1.8
2										-2
2.2				▽						-2.2
2.4			BH06_2.5							-2.4
2.6										-2.6
2.8										-2.8
3										-3
3.2						SAND , medium to coarse, well graded, subangular, pale brown (NATURAL - SOIL)	W	MD	No odour; No staining	-3.2
3.4										-3.4
3.6						Termination Depth at:3.50 m. Target depth achieved.				-3.6

Notes

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, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH07

Client MFS
Project MFS Port Augusta DSI
Project No. 12616805
Site Port Augusta Fire Station
Location 1 Trent Road
Date Drilled 19/09/2023

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Total Depth (m) 3.50
Diameter (mm) 50

Easting 760319.0739
Northing 6401010.413
Grid Ref GDA2020_MGA_zone_53
Elevation
Logged By Alexandra Kirkman
Checked By Tom Duncan

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	HA					TOPSOIL			Trace rootlets	
0.2						Silty SAND fine to medium, poorly graded, orange-brown, with fine to medium sand (NATURAL - SOIL)	D	MD	No odour; No staining	-0.2
0.4			BH07_0.5							-0.4
0.6										-0.6
0.8										-0.8
1	PT		BH07_1.0							-1
1.2										-1.2
1.4										-1.4
1.6										-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4				▽						-2.4
2.6						Clayey SAND fine to medium, well graded, subangular, grey-brown (NATURAL - SOIL)	W	MD	No odour; No staining	-2.6
2.8										-2.8
3						SAND medium to coarse, well graded, subangular, pale brown (NATURAL - SOIL)	W	MD	No odour; No staining	-3
3.2										-3.2
3.4										-3.4
3.6						Termination Depth at:3.50 m. Target depth achieved.				-3.6

Notes

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, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW01

Client MFS
Project MFS Port Augusta DSI
Project No. 12616805
Site Port Augusta Fire Station
Location 1 Trent Road
Date Drilled 19/09/2023 -

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Drill Method
Total Depth (m) 5.00
Casing Diameter (mm) 50

Easting, Northing 760324.826, 6401044.765
Grid Ref GDA2020_MGA_zone_53
Elevation 4.388
TOC mAHD 4.314
Logged By Alexandra Kirkman
Checked By Tom Duncan

B.C.L No. 448402 **Casing** 50 mm 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	CC						CONCRETE				0
0.2	HA				Concrete		Sandy SILT fine to medium, poorly graded, subangular, brown, with fine to coarse gravel (FILL)	D	MD	No odour; No staining	0.2
0.4											0.4
0.6			MW01_0.5		Bentonite		Clayey SAND fine, poorly graded, subangular, brown (NATURAL - SOIL)	SM	MD	No odour; No staining	0.6
0.8											0.8
1	PT										1
1.2											1.2
1.4											1.4
1.6											1.6
1.8											1.8
2											2
2.2							SAND fine to medium, poorly graded, subangular, pale brown (NATURAL - SOIL)	M	MD	No odour; No staining	2.2
2.4											2.4
2.6			MW01_2.5								2.6
2.8							SAND fine to coarse, well graded, subangular, pale brown (NATURAL - SOIL)	W	MD	No odour; No staining	2.8
3					Sand						3
3.2											3.2
3.4											3.4
3.6											3.6
3.8											3.8
4											4
4.2											4.2
4.4											4.4
4.6	SFA										4.6
4.8											4.8
5											5
5.2							Termination Depth at: 5.00 m. Target depth achieved.				5.2

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling 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, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler

Moisture Abbreviations

D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

Consistency Abbreviations

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 MFS
Project MFS Port Augusta DSI
Project No. 12616805
Site Port Augusta Fire Station
Location 1 Trent Road
Date Drilled 19/09/2023 -

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Drill Method
Total Depth (m) 3.93
Casing Diameter (mm) 50

Easting, Northing 760295.223, 6401009.818
Grid Ref GDA2020_MGA_zone_53
Elevation 3.587
TOC mAHD 3.524
Logged By Alexandra Kirkman
Checked By Tom Duncan

B.C.L No. 448403 **Casing** 50 mm 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						TOPSOIL			Trace rootlet	0
0.2			MW02_0.1		Concrete		Sandy SILT fine to medium, poorly graded, subangular, brown, trace fine to medium gravel (NATURAL - SOIL)	D	MD	No odour; No staining	0.2
0.4							SAND fine to medium, poorly graded, orange- brown, some silt (NATURAL - SOIL)	D	MD	No odour; No staining	0.4
0.6											0.6
0.8					Bentonite						0.8
1	PT						Clayey SAND fine, poorly graded, subangular, brown (NATURAL - SOIL)	SM	MD	No odour; No staining	1
1.2											1.2
1.4											1.4
1.6											1.6
1.8							Silty SAND fine to medium, poorly graded, subangular, brown (NATURAL - SOIL)	M	MD	No odour; No staining	1.8
2				▼							2
2.2				▽							2.2
2.4					Sand		Sandy SILT fine to coarse, subangular, pale brown (NATURAL - SOIL)	W	MD	No odour; No staining	2.4
2.6											2.6
2.8											2.8
3			MW02_3.0								3
3.2											3.2
3.4											3.4
3.6							CLAY low plasticity, mottled brown- grey (NATURAL - SOIL)	VM	F	No odour; No staining	3.6
3.8							SAND fine to medium, poorly graded, yellow- brown (NATURAL - SOIL)	W	MD	No odour; No staining	3.8
4							Termination Depth at: 3.93 m. Target depth achieved.				4
4.2											4.2

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

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, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, 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 MFS
Project MFS Port Augusta DSI
Project No. 12616805
Site Port Augusta Fire Station
Location 1 Trent Road
Date Drilled 19/09/2023 -

Drill Co. WBD Drilling Pty. Ltd.
Driller WBD Drilling Pty. Ltd.
Rig Type Eziprobe
Drill Method
Total Depth (m) 5.00
Casing Diameter (mm) 50

Easting, Northing 760281.067, 6401021.83
Grid Ref GDA2020_MGA_zone_53
Elevation 3.636
TOC mAHD 3.556
Logged By Alexandra Kirkman
Checked By Tom Duncan

B.C.L No. 448404 **Casing** 50 mm 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				Concrete		CRUSHED STONE				0
0.2							Clayey SAND fine to medium, subangular, brown, trace fine to medium gravel (NATURAL - SOIL)	D	MD	No odour; No staining	0.2
0.4											0.4
0.6			MW03_0.5				Silty SAND fine to medium, poorly graded, brown, some clay (NATURAL - SOIL)	D	MD	No odour; No staining	0.6
0.8					Bentonote						0.8
1	PT						Silty SAND fine, poorly graded, subangular, brown (NATURAL - SOIL)	M	MD	No odour; No staining	1
1.2											1.2
1.4											1.4
1.6											1.6
1.8											1.8
2			MW03_2.0 (FD06, FS06)	▽			Sandy SILT fine to medium, subangular, brown with mottled grey (NATURAL - SOIL)	W	D	No odour; No staining	2
2.2											2.2
2.4											2.4
2.6											2.6
2.8				▼							2.8
3					Sand						3
3.2							Silty SAND fine to medium, subangular, pale yellow- brown (NATURAL - SOIL)	W	MD	No odour; No staining	3.2
3.4											3.4
3.6											3.6
3.8											3.8
4	SFA										4
4.2											4.2
4.4											4.4
4.6											4.6
4.8											4.8
5							Termination Depth at: 5.00 m. Target depth achieved.				5
5.2											5.2

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

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, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, 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 E

SSHILs Methodology

Crown Tower, Level 11, 200 Crown Street
Wollongong, New South Wales 2500
Australia
www.ghd.com

Our ref: 12602101

28 June 2023

Krystle Mitchell
Senior Scientific and Environment Officer
South Australian Metropolitan Fire Service
99 Wakefield Street
Adelaide, SA 5000

Derivation of site-specific health investigation levels for urban and regional fire stations – South Australia Metropolitan Fire Service (SA MFS)

Dear Krystle,

1. Introduction

This letter describes the derivation of site-specific health investigation levels (SSHILs) for per- and poly-fluoroalkyl substance (PFAS) contaminated soil at fire stations operated by the South Australia Metropolitan Fire Service (SA MFS). SSHILs have been derived for urban and regional settings based on the methodology provided in the following documents: .

- Heads of EPAs Australia and New Zealand (HEPA) and the Australian Government Department of the Environment and Energy (DoEE) – *PFAS National Environmental Management Plan* (the 'PFAS NEMP') (HEPA, 2020)
- National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPC, 2013) (the 'ASC NEPM')
- NSW and Office of Environment and Heritage (OEH, 2019) *Human health soil screening criteria for PFOS, PFHxS and PFOA*

1.1 Background

From 2007, SA MFS began phasing out the use of aqueous film-forming foam (AFFF) containing perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) as key constituents, due to concerns regarding the hazards posed by these compounds to human health and the environment. The SA MFS replaced all firefighting foam in 2016 to ensure that only fluorine-free foam was in use. Currently, state-wide, all SA MFS appliances carry firefighting foams that do not contain PFOS or PFOA and are fluorine-free. During 2017/2018, the SA MFS also removed all fire extinguishers containing PFAS. In 2018, SA MFS engaged GHD to provide ongoing environmental services and undertake site contamination assessments across many of their operational sites as well as risk profiling for their entire portfolio of sites to effectively manage the potential for PFAS contamination and any associated human health and ecological risks.

The PFAS NEMP provides generic health investigation levels (HILs) for PFOS, PFOA and perfluorohexane sulfonate (PFHxS) in soil in four land use settings, as summarised in Table 1 below. The land use settings considered in the PFAS NEMP are consistent with those that underpin the HILs presented for a variety of contaminants within the ASC NEPM. The derivation of the PFAS HIL values is described in detail by OEH (2019).

Table 1 Summary of exposure scenarios adopted to derive generic HILs.

Land use	HIL (mg/kg)	Exposure scenario description
HIL A Residential, with gardens /accessible soil	PFOS+PFHxS: 0.01 PFOA: 0.1	- Low-density residential settings with sizeable gardens and with areas of soil that are accessible - Gardens are assumed to consist of lawns, garden beds and small vegetable gardens and areas of fruit trees - Assumes home-grown produce provides up to 10% of fruit and vegetable intake (does not account for consumption of eggs from home poultry) - Site users are adults, children and infants who spend most of their time at home and use the outdoor areas of the residences on a frequent basis for activities such as gardening or recreation. This scenario assumes 20 hours a day spent indoors and 4 hours a day spent outdoors in direct contact with soil. - Children are the most sensitive human receptors. This scenario is protective of childcare centres, kindergartens, preschools and primary schools and their integral playgrounds.
HIL B Residential, with minimal opportunities for soil access	PFOS+PFHxS: 2 PFOA: 20	- High-density residential settings, such as unit blocks, where communal outdoor spaces are largely covered by permanent paving and with some small areas of landscaping or lawns - Assumes that there are minimal opportunities for direct access to soil by residents. There may be some potential for residents to inhale, ingest or come into direct dermal contact with dust particulates derived from the on-site soil. - Assumes no use of soil to produce vegetables, fruit or poultry - Site users are adults, children and infants who spend most of their time indoors with limited use of communal outdoor areas on site. This scenario assumes 20 hours a day spent indoors and 1 hour a day spent outdoors in direct contact with soil. - Children are the most sensitive human receptors
HIL C Public open space	PFOS+PFHxS: 1 PFOA: 10	- Parks, playgrounds, recreational areas and playing fields that are fully accessible to the public - These areas may contain lawns, gardens, vegetated areas, and walkways with some areas of exposed soil - Assumes no use of soil to produce vegetables, fruit or poultry - Site users are adults and children who may use the area for up to 2 hours a day, 7 days a week - Children are the most sensitive human receptors
HIL D Commercial/ industrial	PFOS+PFHxS: 20 PFOA: 50	- Commercial and/or industrial settings where the outdoor areas are largely (80%) covered by hardstand, possibly with some limited areas of landscaping or lawns - Site users are adult employees that spend up to 8 hours a day indoors and 1 hour a day outdoors for up to 240 days per year - There are minimal opportunities for direct access to soil. There is the potential for employees to inhale, ingest or come into direct contact with dust particulates derived from the soil on the site.

A review of Table 1 indicates that the typical usage patterns at SA MFS fire stations most closely align with the exposure assumptions that underpin the HIL D values. The following inconsistencies are however noted:

– The preliminary site investigations undertaken at SA MFS sites across South Australia has identified that some fire stations have a higher proportion of unsealed ground (up to approximately 75% of the total site area) than has been assumed in the derivation of the HIL D values (up to approximately 20% of the total site area). As a result of this, there may be greater opportunities for direct access to soil at SA MFS fire stations, including the ingestion of soil and soil-derived dust.

– The shifts worked by SA MFS firefighters do not align with the assumption of a standard working week than underpins the HIL D values

Given these factors, SSHILs have been derived using exposure assumptions that reflect the typical usage pattern of the SA MFS fire stations, to allow for a more accurate assessment of the health risks that may be associated with the presence of PFAS in shallow soils.

1.2 Objective of this report

The objective of this report is to derive SSHILs for PFOS+PFHxS and PFOA in soils that are protective of workers at SA MFS fire stations in typical urban and regional settings. The purpose of these SSHILs is to facilitate the screening assessment of soil datasets for human health risks.

2. Derivation methodology

The SSHILs have been calculated using the HILs spreadsheet (Excel format) provided on the ASC NEPM website[1]. The algorithms underlying the HILs spreadsheet are detailed in Schedule B7 of the ASC NEPM. These algorithms were also used in the derivation of the HILs PFOS+PFHxS and PFOA, presented in Table 1 and as detailed by OEH (2019).

The process used to derive the SSHILs involved the following key steps:

- ***Toxicity assessment:*** which established the relationships between PFAS exposure and potential health and ecological effects, using published toxicological information
- ***Exposure assessment:*** which produced estimates of the PFAS exposure that may be experienced by users of SA MFS fire stations.
- ***Risk characterisation:*** which combines the results of the toxicity assessment and exposure assessment, to derive soil criteria that are protective of potential risks to the health of users of SA MFS fire stations.

The toxicity assessment and exposure assessment inputs used in the derivation of the SSHILs are detailed herein, with the SSHILs provided in Section 3.

2.1 Toxicity assessment methodology

A toxicity assessment determines whether human exposure to a chemical could cause an increase in the incidence of an adverse health condition (NEPC, 2013). The outcomes of the toxicity assessment process are a set of toxicity criteria that have been used to derive the SSHILs.

For most chemicals there is a dose below which no adverse health effect will occur (i.e., a threshold toxicant). PFAS have been linked with several threshold toxicities, including effects on cholesterol and immunotoxicity. Accordingly, the SSHILs focus on potential threshold risks linked to PFAS exposure. Chronic health risks for threshold chemicals are assessed by comparing the estimated intake with toxicity reference values (TRVs), which are a measure of tolerable daily exposure. The TRVs adopted in the derivation of the SSHILs are consistent with those that underpin the HIL D values presented in the PFAS NEMP, as detailed in Table 2.

The toxicity assessment process also considers the toxicokinetics of PFAS and in particular the tendency of PFAS to be absorbed via the various potential routes of exposure (i.e., ingestion, inhalation and dermal absorption). Consistent with the approach adopted by OEH (2019) the dermal uptake of PFAS has been assumed to be negligible and has not been included in the derivation of the SSHILs.

[1] **https://www.nepc.gov.au/nepms/assessment-site-contamination/toolbox**

Table 2 Summary of toxicological input parameters used in the derivation of the SSHILs.

Chemical	Toxicity assessment input parameters	Source
Toxicity reference values		
PFOS, PFHxS (sum)	20 ng/kg/day	OEH (2019); FSANZ (2017)
PFOA	160 ng/kg/day	OEH (2019); FSANZ (2017)
Absorption parameters		
Dermal absorption	Negligible	OEH (2019)
Gastrointestinal absorption	100%	OEH (2019); FSANZ (2017)

2.2 Exposure assessment methodology

In an exposure assessment, appropriate exposure assumptions are identified for each exposure pathway, and these are used in conjunction with exposure modelling algorithms to estimate intakes of contaminants by the exposed receptors (NEPC, 2013).

The exposure assessment inputs adopted in the derivation of the SSHILs have primarily been sourced from OEH (2019), with adjustments made as appropriate, based on information provided by SA MFS. A summary of the adopted exposure assessment inputs and the rational underpinning the selected values is provided in Attachment 1. These inputs can be summarised as follows:

- *Firefighter physiology*: The ASC NEPM Schedule B7 provides standard exposure parameters for commercial / industrial scenarios, including factors such as the body weight and inhalation characteristics of adult workers. Consistent with the approach adopted by OEH (2019), these have been adopted in the derivation of SSHILs, as SA MFS firefighters will typically be physiologically consistent with the general population.
- *Exposure frequency and time onsite*: Information provided by SA MFS has been used to select appropriate input assumptions around exposure frequency and time spent onsite, as detailed in Section 2.2.1
- *Exposure to PFAS from external sources*: PFAS is present in a variety of domestic products and commercial applications and is ubiquitous in urban settings. Hence, SA MFS firefighters are likely to be exposed to PFAS from a variety of sources external to the fire stations, such as food, air, water and consumer products. The TRVs detailed in Section 2.1 are relevant to the PFAS intake from all sources. The HIL D presented in the PFAS NEMP were derived based on the conservative assumption that 80% of the exposure to PFAS experienced by workers originates from external sources, with 20% of the TRV allocated to PFAS in fire station soils. This conservative assumption has been retained in the derivation of SSHILs for SA MFS firefighters
- *Incidental soil ingestion rates*: The incidental soil ingestion rates for SA MFS firefighters have been assumed to be consistent with those experienced by adults in a residential setting (50 mg/day), rather than those adopted in the ASC NEPM and by OEH (2019) for commercial/industrial sites (25 mg/day). This approach is likely to be conservative but has been adopted to account for the extended shifts worked by firefighters in metropolitan areas and the substantial areas of unsealed ground that are present on some of the SA MFS fire stations.
- *Use of SA MFS fire stations by children*: Children have not been specifically included in the derivation of the SSHILs. It is understood that children do visit the SA MFS fire stations but that this does not occur with regularity. Hence, the SSHILs, which have been derived to be protective of firefighters employed at the fire stations, will also be adequately protective of the health children visiting less frequently.

– *Produce production and consumption*: Historically, produce gardens were present on a number of the SA MFS fire stations and it is understood that there was some concern that the time spent tending these gardens and consuming produce would be associated with increased levels of exposure to PFAS. In 2022 however, SA MFS issued a directive on advice from GHD and EPA that all fruit and vegetable plants be removed from fire stations and replaced with ornamental plants (refer to Attachment 2). Areas of ornamental landscaping are not inconsistent with the exposure assumptions underpinning the HIL D values and therefore adjustments to the exposure assumptions used to derive the SSHILs have not been made on this basis.

2.2.1 Firefighter shifts

As noted in Table 1, the generic HIL D values assume that workers spend up to 240 days a year at commercial/industrial sites: eight hours a day indoors and one hour a day outdoors. This is equivalent to a total yearly exposure of 2160 hours. Given that the shifts worked by firefighter in both urban and regional areas differ from this pattern, the specific exposure times provided by SA MFS have been adopted in the derivation of the SSHILs as follows:

– Metropolitan fire stations – SA MFS has indicated that firefighters typically work two 10-hour dayshifts and two 14-hours nightshifts followed by four days off work and that firefighters work for 6 months before taking 6 weeks of annual leave. This averages to 12-hour shifts for circa 150 days per year. This is equivalent to a total yearly exposure of 1800 hours, which is lower than the exposure assumption underpinning the generic HIL D values.
– Regional fire stations – SA MFS has indicated that firefighters can spend up to three hours a week at regional fire stations. This is equivalent to a total yearly exposure of 156 hours per year, which is substantially lower than the exposure assumption underpinning the generic HIL D.

3. Site-specific HILs for the screening of PFAS contaminated soils at SA MFS sites

The input parameters selected via the toxicity assessment and exposure assessment processes, as detailed in Sections 2.1 and 2.2 respectively, have been combined to calculate SSHILs for the screening of PFAS contaminated soils at SA MFS fire stations. The models used to calculate the SSHILs are presented in Attachment 3 and Table 3 summarises the derived SSHIL values.

Table 3 SSHILs derived for the screening of PFAS contaminated soil in urban and regional SA MFS fire stations

Fire station type	PFOS+PFHxS	PFOA*	Comment
Metropolitan	14 mg/kg	50 mg/kg	These SSHILs assumes four 12-hour shifts every eight days (i.e., four days at work and four days off)
Regional	40 mg/kg	50 mg/kg	These SSHILs assumes one 3-hour shift per week.
Notes: Although higher values were calculated using the toxicity and exposure assessment process, the SSHIL for PFOA has been set as 50 mg/kg in anticipation of the Stockholm Convention low content limit. This is consistent with the PFAS NEMP			

4. Closure

We trust that the information above is sufficient for SA MFS's purposes. Should you have any further questions on this document please do not hesitate to contact the undersigned.

Regards

Davide Menozzi
Senior Environmental Scientist
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Ben Petticrew
Technical Director
ben.petticrew@ghd.com

5. References

FSANZ. (2017). *Food Standards Australia New Zealand's (FSANZ) report on Perfluorinated Chemicals in Food.*

HEPA. (2020). *PFAS National Environmental Management Plan - Version 2.0* .

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Amendment Measure* .

OEH. (2019). *Human health soil screening criteria for PFOS, PFHxS and PFOA.*

Attachments

Attachment 1

Summary of exposure assessment inputs

Summary of SA MFS sites - unsealed areas

Location (metro)	Unsealed area (m^2)	Total area (m^2)	% unsealed
Angle park	111254	153034	73%
Adelaide	115	20000	1%
St Marys	1229	4543	27%
Largs	1163	3316	35%
Woodville	141	2172	6%
Christie Downs	710	2321	31%
Camden Park	531	2771	19%
Oakden	1302	4802	27%
Port Adelaide	449	4349	10%
O'Halloran Hill	2959	7300	41%
Brooklyn Park	1090	3710	29%
Beulah Park	335	2791	12%
Elizabeth	100	3256	3%
Gawler	1300	3457	38%
Glen Osmond	180	3152	6%
Golden Grove	1172	3994	29%
Paradise	680	4090	17%
Prospect	580	2820	21%
Salisbury	2442	12607	19%
Seaford	2300	7450	31%
Mount Barker	362	2110	17%
	Unsealed Average	**Total Area Average**	**% average**
	815	4,913	17%
Max	111254	153034	73%
Min	100	2110	1%

Location (regional)	Unsealed area (m^2)	Total area (m^2)	% unsealed
Loxton	987	2154	46%
Moonta	1	920	0%
Whyalla	6224	11054	56%
Mt Gambier	1506	3884	39%
Kapunda	1	395	0%
Peterborough	519	994	52%
Port Pirie	7875	19297	41%
Port Augusta	961	2461	39%
Murray Bridge	796	2005	40%
Berri	583	3065	19%
Kadina	1	577	0%
Port Lincoln	420	6058	7%
Renmark	70	3573	2%
Tanunda	168	1438	12%
Victor Harbor	400	1847	22%
Wallaroo	1032	1600	65%
	Unsealed Average	**Total Area Average**	**% average**
	222	2,276	10%
Max	7875	19297	65%
Min	1	395	0%

Summary of exposure parameters

Summary of Exposure Parameters	units	Parameter			Rationale
		HIL D	SA MFS SSHIL - Urban	SA MFS SSHIL - Regional	
Soil and Dust Ingestion Rate	mg/day	25	50	50	HIL D assumes that the incidential soil ingestion rate experienced by adults working for 8-hours on a commercial industrial site (25 mg/day) is likely to be ~50% of that experienced by adults in a residential setting (50 mg/day), given that waking hours are typically ~16-hours per day. The ASC NEPM residential soil ingestion rate has been adopted for SA MFS firefighters, given that substantial areas of unsealed ground are present on some of the SA MFS fire stations and firefighters may spend significant periods of time outdoors. This assumption is likely to be conservative for firefighters in regional settings, who typically spend less time onsite
Time Spent Outdoors	hours	1	4	2	HIL D assumes a standard 8-hour working day, with minimal time spent outdoors. MFS SA has indicated that: - firefighters in metropolitan locations typically work 12-hour shifts - firefighters in regional locations typically work 3-hour shifts It has also been assumed that firefighters may spend significant amounts of time outdoors, undertaking activities such as training and equipment and facility maintenance
Time Spent Indoors	hours	8	8	1	
Lung Retention Factor	-	0.375	0.375	0.375	ASC NEPM default, as detailed in Schedule B7. Describes the percentage of dust that is small enough to be inhaled.
Particulate Emission Factor	(m^3/kg)	3.70E+10	9.7E+09	9.7E+09	Calculated as described in Schedule B7 of the ASC NEPM. For HIL D, up to 20% of the site is assumed to be open ground. For the SA MFS fire stations up to 75% of the site is assumed to be open ground
Indoor Air Dust Factor	(m^3/kg)	2.6E+07	2.6E+07	2.6E+07	ASC NEPM default, as described in Schedule B7. The indoor dust concentration is assumed to be equal to the 95th percentile from Australian data (enHealth 2012; 39 µg/m^3), noting that indoor air can be enriched with dust compared to the outdoor environment, due to the movement of dust indoors on clothing, footwear etc.
Fraction of indoor dust comprised of outdoor soil	-	0.5	0.5	0.5	ASC NEPM default, as described in Schedule B7. Assume 50% of indoor dust is comprised of soi tracked into the building
Body weight	kg	70	70	70	ASC NEPM default, as described in Schedule B7.
Exposure Frequency	days/year	240	140	52	HIL D assumes a 5-day working week for 48 weeks per year. MFS has indicated that - firefighters in metropolitan stations typically work four shifts every eight days - firefighters in regional stations typically work one 3-hour shift per week
Exposure Duration	years	30	30	30	ASC NEPM default, as described in Schedule B7. Note that this parameter does not influence the derived HIL for threshold chemicals, as exposure is averaged over the exposure duration.
Averaging Time (ingestion)	days	10950	10950	10950	Calculated based on the exposure duration. Multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (inhalation)	hours	262800	262800	262800	

Attachment 2

SA MFS directive on the removal of produce

Government of South Australia

SOUTH AUSTRALIAN METROPOLITAN FIRE SERVICE

MEMORANDUM NO. 77/2022

METROPOLITAN FIRE SERVICE SOUTH AUSTRALIA

29 September 2022

FRUIT AND VEGETABLE GARDEN REMOVAL FROM ALL MFS STATIONS

MFS is directing all MFS stations to remove all fruit and vegetable gardens from MFS stations.

This is required to be completed by the **31st of October 2022**.

Garden waste can be disposed of as per the normal station procedures to dispose of this sort of waste. Where this is not practicable due to volume, please contact your Commander to arrange for an alternative solution, such as the provision of the high sided/skip pod.

If the fruit and vegetable garden cannot be removed by station personnel, please advise via the mfspfas@sa.gov.au. That email is to contain an audit of all fruit/vegetable trees that require removal by external contractors prior to 21 October 2022. The MFS will then arrange for these to be removed.

All fruit and vegetable gardens are required to be removed as the EPA see the presence of fruit and vegetable trees on fire stations as a possible human receptor to PFAS (even if you are not consuming the fruit and vegetables from them).

The MFS will provide ornamental plants and vegetation to replace the plants pulled out up to a value of $100 on application. Applications from each station can be sent to mfspfas@sa.gov.au. Approval will then be forwarded to the relevant Metropolitan/Regional Commander to use their credit card to purchase the goods.

Metropolitan and Regional Commanders are to ensure that there are no fruit and vegetable gardens remaining at their relevant stations after the 31st of October 2022.

C Shift is responsible under the Station Management System - Station Administration, to ensure that this document is read, signed, placed on the Notice Board and filed.

Staff are reminded that the current SAPs, SOPs, Policies, SP Forms, Memorandums, Service Directives and Operational Procedures are available on the Members Only Website (MOW). This is a directive from the Chief Officer.

SIGNED

M. Morgan
CHIEF OFFICER and
CHIEF EXECUTIVE

ACTION	DATE	SIGN
Instruction received at Station		
Instruction read to “A” Shift		
Instruction read to “B” Shift		
Instruction read to “C” Shift		
Instruction read to “D” Shift		
Instruction read to Retained Staff		
Instruction read to OTR		
Placed on Notice Board		
Filed in Station File		

Attachment 3

SSHILs modelling inputs and outputs.

Derivation of Site specific health investigation levels

Firefighters at regional fire stations - South Australian Metropolitan Fire Service

Summary of Exposure Parameters	Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate - Adults	IR_{SA}	mg/day	50	Site-specific assumption: Consistent with assumption adopted for adults in residential settings
Time Spent Outdoors	ETo	hours	1	Site-specific assumption; 3-hour shifts during which 1 hour is spent outdoors.
Time Spent Indoors	ETi	hours	2	Site-specific assumption; 3-hour shifts during which 2 hours are spent indoors.
Lung Retention Factor	RF	-	0.375	ASC NEPM default assumption
Particulate Emission Factor	PEFo	(m^3/kg)	9.7E+09	Calculated: Based on the site-specific assumption that up to 75% of individual sites is open ground
Indoor Air Dust Factor	PEFi	(m^3/kg)	2.6E+07	ASC NEPM default assumption
Fraction of indoor dust comprised of outdoor soil	TF	-	0.5	ASC NEPM default
Body weight - Adults	BW_C	kg	70	ASC NEPM default
Exposure Frequency	EF	days/year	52	Site-specific assumption: One shift per week
Exposure Duration - Adults	ED_C	years	30	ASC NEPM default assumption
Averaging Time (non-carcinogenic)	AT_T	days	ED*365	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Adult Worker

Compound	Toxicity Reference Value Oral (TRV_O) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV_D) (mg/kg/day)	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI_O) (% of TDI)	Toxicity Reference Value Inhalation (TRV_I) (mg/m^3)	Background Intake Inhalation (BIi) (% of TC)		Pathway Specific HILs (mg/kg)			Derived Soil HIL (not rounded) (mg/kg)
										Soil Ingestion	Dermal	Dust	
PFOS+PFHxS	0.00002	1	0.00002	100%	-	80%	0.00007	0%		3.9E+01	NA	8.0E+05	39
PFOA	0.00016	1	0.00016	100%	-	80%	0.00056	0%		3.1E+02	NA	6.4E+06	314

NA Pathway not of significance for chemical assessed

Derivation of Site specific health investigation levels

Fire fighters at metropolitan fire stations - South Australian Metropolitan Fire Service

Summary of Exposure Parameters	Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate - Adults	IR_{SA}	mg/day	50	Site-specific assumption: Consistent with assumption adopted for adults in residential settings
Time Spent Outdoors	ETo	hours	4	Site-specific assumption; 12-hour shifts during which 4 hours are spent outdoors.
Time Spent Indoors	ETi	hours	8	Site-specific assumption; 12-hour shifts during which 8 hours are spent indoors.
Lung Retention Factor	RF	-	0.375	ASC NEPM default assumption
Particulate Emission Factor	PEFo	(m^3/kg)	9.7E+09	Calculated: Based on the site-specific assumption that up to 75% of individual sites is open ground
Indoor Air Dust Factor	PEFi	(m^3/kg)	2.6E+07	ASC NEPM default assumption
Fraction of indoor dust comprised of outdoor soil	TF	-	0.5	ASC NEPM default
Body weight - Adults	BW_C	kg	70	ASC NEPM default
Exposure Frequency	EF	days/year	146	Site-specific assumption: Four shifts every eight days (i.e., four days at work and four days off)
Exposure Duration - Adults	ED_C	years	30	ASC NEPM default assumption
Averaging Time (non-carcinogenic)	AT_T	days	ED*365	Calculated based on ED, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Adult Worker

Compound	Toxicity Reference Value Oral (TRV_O) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV_D) (mg/kg/day)	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI_O) (% of TDI)	Toxicity Reference Value Inhalation (TRV_I) (mg/m^3)	Background Intake Inhalation (BIi) (% of TC)		Pathway Specific HILs (mg/kg)			Derived Soil HIL (not rounded) (mg/kg)
										Soil Ingestion	Dermal	Dust	
PFOS+PFHxS	0.00002	1	0.00002	100%	-	80%	0.00007	0%		1.4E+01	NA	7.2E+04	14
PFOA	0.00016	1	0.00016	100%	-	80%	0.00056	0%		1.1E+02	NA	5.7E+05	112

NA Pathway not of significance for chemical assessed

Appendix F

Laboratory Reports

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote GHD STANDARD RATES

Project Number	12616805
Project Name	MFS Port Augusta DSI
GHD Project Manager	Tom Duncan
GHD Contact	Ally Kirkman
GHD PM email	Tom.Duncan@ghd.com
GHD Contact email	Ally.Kirkman@ghd.com

Laboratory	Envirolab Services Adelaide
Laboratory Address	7a The Parade, Norwood SA 5067
Laboratory Contact	Alex Stenta

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on reciept and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
- Laboratory contact should sign the COC and send a copy (via email) to the GHD Project Manager and GHD Contact, along with a sample receipt notice, within 24 hours of reciept.
- A signed copy of the COC should be returned to the GHD Project Manager and GHD Contact with the results via email at the completion of analysis as requested.
- All results should reference the Job Number and Project Name.
- All results should be provided in NATA accredited pdf format and ESDAT format.

Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Preservative	Containers: Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO EUROFINS	SAMPLE COMMENTS
BH01_0.1	19-Sep-23		Soil	Ice	J	1		X			
BH01_0.5	19-Sep-23		Soil	Ice	J	1			X		
BH01_1.0	19-Sep-23		Soil	Ice	J	1		X			
BH01_1.5	19-Sep-23		Soil	Ice	J	1			X		
BH01_2.0	19-Sep-23		Soil	Ice	J	1			X		
BH01_2.5	19-Sep-23		Soil	Ice	J	1			X		
BH01_3.0	19-Sep-23		Soil	Ice	J	1			X		
BH01_3.5	19-Sep-23		Soil	Ice	J	1			X		
BH02_0.1	19-Sep-23		Soil	Ice	J	1		X			
BH02_0.5	19-Sep-23		Soil	Ice	J	1			X		
BH02_1.0	19-Sep-23		Soil	Ice	J	1			X		
BH02_1.5	19-Sep-23		Soil	Ice	J	1		X			
BH02_2.0	19-Sep-23		Soil	Ice	J	1			X		
BH02_2.5	19-Sep-23		Soil	Ice	J	1			X		
BH02_3.0	19-Sep-23		Soil	Ice	J	1			X		
BH02_3.5	19-Sep-23		Soil	Ice	J	1			X		
BH03_0.1	18-Sep-23		Soil	Ice	J	1		X			
BH03_0.5	18-Sep-23		Soil	Ice	J	1			X		
BH03_1.0	18-Sep-23		Soil	Ice	J	1		X			
BH03_1.5	18-Sep-23		Soil	Ice	J	1			X		
TOTAL NUMBER OF SAMPLES	100										
TOTAL NUMBER OF ESKIES	2										

Envirolab Services
25 Research Drive
Croydon South VIC 3136
Ph: (03) 9763 2500

Job No: 397165
Date Received: 22/9/23
Time Received: 8:30
Received By: AP
Temp: Cool/Ambient 5.8
Cooling: Ice/Ice-pack
Security: Intact/Broken/None

CUSTODY DETAILS

SAMPLER AK

		Date/Time	Relinquished by: TD	Date/Time	21-9-23
GHD SERVICE CENTRE					
Received by:		Date/Time	Relinquished by:	Date/Time	
COURIER					
Received by Courier:		Date/Time	Relinquished by: EBS Adelaide A. Stenta	Date/Time	21/9/23 @ 4:30 pm 3.9°C ice.
LABORATORY					
Received by Lab:		Date/Time			

AS

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote GHD STANDARD RATES

Project Number	**Laboratory**
12516805	Eurofins Environmental
Project Name	**Laboratory Address**
MFS Port Augusta DSI	9 Main Terrace, Richmond SA 5033
GHD Project Manager	**Laboratory Contact**
Tom Duncan	Amy Meunier
GHD Contact	
Ally Kirkman	
GHD PM email	**GHD Contact email**
Tom.Duncan@ghd.com	Ally.Kirkman@ghd.com

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on reciept and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
- Laboratory contact should sign the COC and send a copy (via email) to the GHD Project Manager and GHD Contact along with a sample receipt notice within 24 hours of reciept.
- A signed copy of the COC should be returned to the GHD Project Manager and GHD Contact with the results via email at the completion of analysis as requested.
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- All results should be provided in NATA accredited pdf format and ESDAT format.

Sample I.D.		Date and Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Preservative	Containers: Type J: soil jar V: vial B: bag G: glass bottle P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite														HOLD	SEND TO EUROFINS	SAMPLE COMMENTS
BH03_2.0	21	18-Sep-23		Soil	Ice	J	1																X		
BH03_2.5	22	18-Sep-23		Soil	Ice	J	1																X		
BH03_3.0	23	18-Sep-23		Soil	Ice	J	1																X		
BH03_3.5	24	18-Sep-23		Soil	Ice	J	1																X		
BH04_0.1	25	18-Sep-23		Soil	Ice	J	1																X		
BH04_0.5	26	18-Sep-23		Soil	Ice	J	1		X																
BH04_1.0	27	18-Sep-23		Soil	Ice	J	1																X		
BH04_1.5	28	18-Sep-23		Soil	Ice	J	1																X		
BH04_2.0	29	18-Sep-23		Soil	Ice	J	1		X																
BH04_2.5	30	18-Sep-23		Soil	Ice	J	1																X		
BH04_3.0	31	18-Sep-23		Soil	Ice	J	1																X		
BH04_3.5	32	18-Sep-23		Soil	Ice	J	1																X		
BH05_0.1	33	18-Sep-23		Soil	Ice	J	1		X																
BH05_0.5	34	18-Sep-23		Soil	Ice	J	1																X		
BH05_1.0	35	18-Sep-23		Soil	Ice	J	1		X																
BH05_1.5	36	18-Sep-23		Soil	Ice	J	1																X		
BH05_2.0	37	18-Sep-23		Soil	Ice	J	1																X		
BH05_2.5	38	18-Sep-23		Soil	Ice	J	1																X		
BH05_3.0	39	18-Sep-23		Soil	Ice	J	1																X		
BH05_3.5	40	18-Sep-23		Soil	Ice	J	1																X		
TOTAL NUMBER OF SAMPLES		109																							
TOTAL NUMBER OF ESKIES		2																							

CUSTODY DETAILS			
SAMPLER			
	Date/Time	Relinquished by:	Date/Time
GHD SERVICE CENTRE			
Received by:	Date/Time	Relinquished by:	Date/Time
COURIER			
Received by Courier:	Date/Time	Relinquished by:	Date/Time
LABORATORY			
Received by Lab:	Date/Time	AS	

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote GHD STANDARD RATES

Project Number	12616805
Project Name	MFS Port Augusta DSI
GHD Project Manager	Tom Duncan
GHD Contact	Ally Kirkman
GHD PM email	Tom.Duncan@ghd.com
GHD Contact email	Ally.Kirkman@ghd.com

Laboratory	Eurofins Environmental
Laboratory Address	9 Main Terrace, Richmond SA 5033
Laboratory Contact	Amy Meunier

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on reciept and release of samples, between each party.
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Sample I.D.	Date and Time	Composite Sample	Sample Matrix: S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Preservative	Containers: Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO EUROFINS	SAMPLE COMMENTS
BH06_0.1 41	18-Sep-23		Soil	Ice	J	1			X		
BH06_0.5 42	18-Sep-23		Soil	Ice	J	1		X			
BH06_1.0 43	18-Sep-23		Soil	Ice	J	1			X		
BH06_1.5 44	18-Sep-23		Soil	Ice	J	1			X		
BH06_2.0 45	18-Sep-23		Soil	Ice	J	1			X		
BH06_2.5 46	18-Sep-23		Soil	Ice	J	1		X	X		
BH06_3.0 47	18-Sep-23		Soil	Ice	J	1			X		
BH06_3.5 48	18-Sep-23		Soil	Ice	J	1			X		
BH07_0.1 49	19-Sep-23		Soil	Ice	J	1			X		
BH07_0.5 50	19-Sep-23		Soil	Ice	J	1		X			
BH07_1.0 51	19-Sep-23		Soil	Ice	J	1		X			
BH07_1.5 52	19-Sep-23		Soil	Ice	J	1			X		
BH07_2.0 53	19-Sep-23		Soil	Ice	J	1			X		
BH07_2.5 54	19-Sep-23		Soil	Ice	J	1			X		
BH07_3.0 55	19-Sep-23		Soil	Ice	J	1			X		
BH07_3.5 56	19-Sep-23		Soil	Ice	J	1			X		
SS01 57	19-Sep-23		Soil	Ice	J	1		X			
SS02 58	19-Sep-23		Soil	Ice	J	1		X			
SS03 59	19-Sep-23		Soil	Ice	J	1		X			
SS04 60	19-Sep-23		Soil	Ice	J	1		X			
TOTAL NUMBER OF SAMPLES	108										
TOTAL NUMBER OF ESKIES	2										

CUSTODY DETAILS

SAMPLER			
	Date/Time	Relinquished by:	Date/Time
GHD SERVICE CENTRE			
Received by:	Date/Time	Relinquished by:	Date/Time
COURIER			
Received by Courier:	Date/Time	Relinquished by: AS	Date/Time
LABORATORY			
Received by Lab:	Date/Time		

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote GHD STANDARD RATES

Project Number 12616805	**Laboratory** Eurofins Environmental
Project Name MFS Port Augusta DSI	**Laboratory Address** 9 Main Terrace, Richmond SA 5033
GHD Project Manager Tom Duncan	**Laboratory Contact** Amy Meunier
GHD Contact Ally Kirkman	
GHD PM email Tom.Duncan@ghd.com	**GHD Contact email** Ally.Kirkman@ghd.com

COURIER AND LABORATORY INSTRUCTIONS:

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Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Preservative	Containers: Type J: soil jar B: bag G: glass bottle V: vial P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite													HOLD	SEND TO EUROFINS	SAMPLE COMMENTS
SS05	61 19-Sep-23		Soil	Ice	J	1		X															
SS06	62 19-Sep-23		Soil	Ice	J	1		X															
SS07	63 19-Sep-23		Soil	Ice	J	1		X															
MW01_0.1	64 19-Sep-23		Soil	Ice	J	1															X		
MW01_0.5	65 19-Sep-23		Soil	Ice	J	1		X															
MW01_1.0	66 19-Sep-23		Soil	Ice	J	1															X		
MW01_1.5	67 19-Sep-23		Soil	Ice	J	1															X		
MW01_2.0	68 19-Sep-23		Soil	Ice	J	1															X		
MW01_2.5	69 19-Sep-23		Soil	Ice	J	1		X															
MW01_3.0	70 19-Sep-23		Soil	Ice	J	1															X		
MW01_3.5	71 19-Sep-23		Soil	Ice	J	1															X		
MW01_4.0	72 19-Sep-23		Soil	Ice	J	1															X		
MW01_4.5	73 19-Sep-23		Soil	Ice	J	1															X		
MW02_0.1	74 19-Sep-23		Soil	Ice	J	1		X															
MW02_0.5	75 19-Sep-23		Soil	Ice	J	1															X		
MW02_1.0	76 19-Sep-23		Soil	Ice	J	1															X		
MW02_1.5	77 19-Sep-23		Soil	Ice	J	1															X		
MW02_2.0	78 19-Sep-23		Soil	Ice	J	1															X		
MW02_2.5	79 19-Sep-23		Soil	Ice	J	1															X		
MW02_3.0	80 19-Sep-23		Soil	Ice	J	1		X															
TOTAL NUMBER OF SAMPLES	100																						
TOTAL NUMBER OF ESKIES	2																						

CUSTODY DETAILS			
SAMPLER			
	Date/Time	Relinquished by:	Date/Time
GHD SERVICE CENTRE			
Received by:	Date/Time	Relinquished by:	Date/Time
COURIER			
Received by Courier:	Date/Time	Relinquished by: AS	Date/Time
LABORATORY			
Received by Lab:	Date/Time		

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote GHD STANDARD RATES

Project Number	**Laboratory**
12516805	Eurofins Environmental
Project Name	**Laboratory Address**
MFS Port Augusta DSI	9 Main Terrace, Richmond SA 5033
GHD Project Manager	**Laboratory Contact**
Tom Duncan	Amy Meunier
GHD Contact	
Ally Kirkman	
GHD PM email	**GHD Contact email**
Tom.Duncan@ghd.com	Ally.Kirkman@ghd.com

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Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air Grit: Groundwater	Preservative	Containers: Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO EUROFINS	SAMPLE COMMENTS
MW02_3.5 (81)	19-Sep-23		Soil	Ice	J	1			X		
MW02_4.0 (82)	19-Sep-23		Soil	Ice	J	1			X		
NR – MW02_4.5 (83)	19-Sep-23		Soil	Ice	J	1			X		
MW03_0.1 (84)	19-Sep-23		Soil	Ice	J	1			X		
MW03_0.5 (85)	19-Sep-23		Soil	Ice	J	1		X			
MW03_1.0 (86)	19-Sep-23		Soil	Ice	J	1			X		
MW03_1.5 (87)	19-Sep-23		Soil	Ice	J	1			X		
MW03_2.0 (88)	19-Sep-23		Soil	Ice	J	1		X			
MW03_2.5 (89)	19-Sep-23		Soil	Ice	J	1			X		
MW03_3.0 (90)	19-Sep-23		Soil	Ice	J	1			X		
MW03_3.5 (91)	19-Sep-23		Soil	Ice	J	1			X		
MW03_4.0 (92)	19-Sep-23		Soil	Ice	J	1			X		
NR – MW03_4.5 (93)	19-Sep-23		Soil	Ice	J	1			X		
FD01 (94)	18-Sep-23		Soil	Ice	J	1		X			
FS01 (–)	18-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins for analysis
FD02 (95)	18-Sep-23		Soil	Ice	J	1		X			
FS02 (–)	18-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins for analysis
FD03 (96)	19-Sep-23		Soil	Ice	J	1		X			
FS03 (–)	19-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins for analysis
FD04 (97)	19-Sep-23		Soil	Ice	J	1		X			
TOTAL NUMBER OF SAMPLES	106										
TOTAL NUMBER OF ESKIES	2										

CUSTODY DETAILS

SAMPLER			
	Date/Time	Relinquished by:	Date/Time
GHD SERVICE CENTRE			
Received by:	Date/Time	Relinquished by:	Date/Time
COURIER			
Received by Courier:	Date/Time	Relinquished by: AS	Date/Time
LABORATORY			
Received by Lab:	Date/Time		

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone (08) 8111 6600	STANDARD	Quote GHD STANDARD RATES

Project Number 12616805	**Laboratory** Eurofins Environmental
Project Name MFS Port Augusta DSI	**Laboratory Address** 9 Main Terrace, Richmond SA 5033
GHD Project Manager Tom Duncan	**Laboratory Contact** Amy Meunier
GHD Contact Ally Kirkman	
GHD PM email Tom.Duncan@ghd.com	**GHD Contact email** Ally.Kirkman@ghd.com

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Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Preservative	Containers: Type (J: soil jar; B: bag; V: vial; G: glass bottle; P: plastic bottle)	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO EUROFINS	SAMPLE COMMENTS
FS04	19-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins
FD05	19-Sep-23		Soil	Ice	J	1		X			
FS05	19-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins
FD06	19-Sep-23		Soil	Ice	J	1		X			
FS06	19-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins
RB01	19-Sep-23		Water	Ice	P	2		X			
RB02	19-Sep-23		Water	Ice	P	2		X			
FB01	19-Sep-23		Water	Ice	P	2		X			
BH01_PAVER	19-Sep-23		Concrete	Ice	J	1			X		
MW01_PAVER	19-Sep-23		Concrete	Ice	J	1			X		
BH02_PAVER	19-Sep-23		Concrete	Ice	J	1			X		

TOTAL NUMBER OF SAMPLES	111
TOTAL NUMBER OF ESKIES	2

CUSTODY DETAILS

SAMPLER			
	Date/Time	Relinquished by	Date/Time
GHD SERVICE CENTRE			
Received by	Date/Time	Relinquished by	Date/Time
COURIER			
Received by Courier	Date/Time	Relinquished by	Date/Time
LABORATORY			
Received by Lab	Date/Time		

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 39765

Client Details

Client	GHD SA
Attention	Tom Duncan
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12616805**
Number of Samples	102 Soil, 3 Water
Date samples received	22/09/2023
Date completed instructions received	22/09/2023

Analysis Details

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

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

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

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

Report Details

Date results requested by	28/09/2023
Date of Issue	02/10/2023

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

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

Results Approved By
Azrin Akram, Senior Chemist
Chris De Luca, Assistant Lab Manager

Authorised By
Pamela Adams, Laboratory Manager

PFAS in Soil Extended						
Our Reference		39765-1	39765-3	39765-9	39765-12	39765-17
Your Reference	UNITS	BH01_0.1	BH01_1.0	BH02_0.1	BH02_1.5	BH03_0.1
Date Sampled		19/09/2023	19/09/2023	19/09/2023	19/09/2023	18/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Perfluorobutanesulfonic acid	µg/kg	<0.1	0.4	0.2	3.6	4.0
Perfluoropentanesulfonic acid	µg/kg	<0.1	2.7	0.3	3.8	7.2
Perfluorohexanesulfonic acid PFHxS	µg/kg	1.7	51	3.1	22	79
Perfluoroheptanesulfonic acid	µg/kg	0.3	3.8	0.1	0.5	5.0
Perfluorooctanesulfonic acid PFOS	µg/kg	54	150	2.1	5.1	42
Perfluorodecanesulfonic acid	µg/kg	0.4	0.6	<0.2	<0.2	<0.2
Perfluorobutanoic acid	µg/kg	<0.2	<0.2	<0.2	0.3	1
Perfluoropentanoic acid	µg/kg	<0.2	0.4	0.5	1	2.1
Perfluorohexanoic acid	µg/kg	<0.1	4.3	0.9	6.8	14
Perfluoroheptanoic acid	µg/kg	<0.1	1.6	0.4	0.6	2.9
Perfluorooctanoic acid PFOA	µg/kg	0.3	4.2	0.2	0.7	10
Perfluorononanoic acid	µg/kg	<0.1	0.1	0.2	<0.1	1
Perfluorodecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluoroundecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	µg/kg	<5	<5	<5	<5	<5
4:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	µg/kg	1.8	5.3	0.4	<0.1	15
8:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
10:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	µg/kg	1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfon -amide	µg/kg	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	<5	<5	<5	<5	<5
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	100	90	91	92	81
Surrogate $^{13}C_2$ PFOA	%	96	103	102	100	102
Extracted ISTD $^{13}C_3$ *PFBS*	%	78	75	77	76	78
Extracted ISTD $^{18}O_2$ *PFHxS*	%	75	73	79	74	93
Extracted ISTD $^{13}C_4$ *PFOS*	%	71	111	79	78	77
Extracted ISTD $^{13}C_4$ *PFBA*	%	83	81	82	81	84

PFAS in Soil Extended						
Our Reference		39765-1	39765-3	39765-9	39765-12	39765-17
Your Reference	UNITS	BH01_0.1	BH01_1.0	BH02_0.1	BH02_1.5	BH03_0.1
Date Sampled		19/09/2023	19/09/2023	19/09/2023	19/09/2023	18/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Extracted ISTD $^{13}C_3$ *PFPeA*	%	80	76	79	79	81
Extracted ISTD $^{13}C_2$ *PFHxA*	%	79	78	79	80	78
Extracted ISTD $^{13}C_4$ *PFHpA*	%	80	74	78	74	71
Extracted ISTD $^{13}C_4$ *PFOA*	%	83	78	79	78	79
Extracted ISTD $^{13}C_5$ *PFNA*	%	67	52	81	80	78
Extracted ISTD $^{13}C_2$ *PFDA*	%	80	79	76	80	87
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	64	73	72	76	87
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	75	81	86	81	82
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	77	71	81	74	97
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	78	69	83	70	69
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	77	75	71	74	75
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	69	85	84	80	73
Extracted ISTD $^{13}C_8$ *FOSA*	%	90	89	93	87	94
Extracted ISTD d_3 *N MeFOSA*	%	85	77	79	80	82
Extracted ISTD d_5 *NEtFOSA*	%	83	82	81	79	85
Extracted ISTD d_7 *N MeFOSE*	%	80	77	79	69	84
Extracted ISTD d_9 *N EtFOSE*	%	82	80	81	78	81
Extracted ISTD d_3 *N MeFOSAA*	%	73	75	85	75	87
Extracted ISTD d_5 *N EtFOSAA*	%	74	74	78	74	79
Total Positive PFHxS & PFOS	µg/kg	55	200	5.2	27	120
Total Positive PFOS & PFOA	µg/kg	54	160	2.3	5.8	52
Total Positive PFAS	µg/kg	59	230	8.4	44	180

PFAS in Soil Extended						
Our Reference		39765-19	39765-26	39765-29	39765-33	39765-35
Your Reference	UNITS	BH03_1.0	BH04_0.5	BH04_2.0	BH05_0.1	BH05_1.0
Date Sampled		18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Perfluorobutanesulfonic acid	µg/kg	9.4	9.6	2.8	9.7	8.3
Perfluoropentanesulfonic acid	µg/kg	8.1	5.7	4.8	2.8	21
Perfluorohexanesulfonic acid PFHxS	µg/kg	34	59	24	45	75
Perfluoroheptanesulfonic acid	µg/kg	0.6	4.1	0.3	17	2.3
Perfluorooctanesulfonic acid PFOS	µg/kg	2.1	2.3	2.6	110	19
Perfluorodecanesulfonic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorobutanoic acid	µg/kg	2.6	6.6	0.2	6.5	0.6
Perfluoropentanoic acid	µg/kg	5.0	12	0.8	11	1
Perfluorohexanoic acid	µg/kg	26	33	11	19	23
Perfluoroheptanoic acid	µg/kg	1.5	2.8	1.7	1.3	3.8
Perfluorooctanoic acid PFOA	µg/kg	1.4	12	1.4	5.5	2.6
Perfluorononanoic acid	µg/kg	<0.1	<0.1	<0.1	0.3	<0.1
Perfluorodecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluoroundecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	µg/kg	<5	<5	<5	<5	<5
4:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	µg/kg	<0.1	<0.1	<0.1	69	<0.1
8:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
10:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfon -amide	µg/kg	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	<5	<5	<5	<5	<5
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	97	99	106	101	97
Surrogate $^{13}C_2$ PFOA	%	98	107	105	99	104
Extracted ISTD $^{13}C_3$ *PFBS*	%	78	76	77	76	77
Extracted ISTD $^{18}O_2$ *PFHxS*	%	77	94	74	102	97
Extracted ISTD $^{13}C_4$ *PFOS*	%	79	77	72	100	80
Extracted ISTD $^{13}C_4$ *PFBA*	%	80	79	81	78	83

PFAS in Soil Extended						
Our Reference		39765-19	39765-26	39765-29	39765-33	39765-35
Your Reference	UNITS	BH03_1.0	BH04_0.5	BH04_2.0	BH05_0.1	BH05_1.0
Date Sampled		18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Extracted ISTD $^{13}C_3$ *PFPeA*	%	81	74	80	76	78
Extracted ISTD $^{13}C_2$ *PFHxA*	%	76	72	74	77	76
Extracted ISTD $^{13}C_4$ *PFHpA*	%	78	71	75	74	70
Extracted ISTD $^{13}C_4$ *PFOA*	%	82	76	77	76	78
Extracted ISTD $^{13}C_5$ *PFNA*	%	80	81	74	67	77
Extracted ISTD $^{13}C_2$ *PFDA*	%	81	83	77	73	83
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	93	69	91	66	81
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	84	88	75	69	90
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	76	70	66	82	93
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	77	81	87	75	73
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	81	72	80	97	76
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	88	83	76	78	93
Extracted ISTD $^{13}C_8$ *FOSA*	%	94	89	88	87	92
Extracted ISTD d_3 *N MeFOSA*	%	82	84	80	72	72
Extracted ISTD d_5 *NEtFOSA*	%	81	81	79	81	86
Extracted ISTD d_7 *N MeFOSE*	%	78	77	78	75	74
Extracted ISTD d_9 *N EtFOSE*	%	80	82	78	81	81
Extracted ISTD d_3 *N MeFOSAA*	%	80	78	77	77	83
Extracted ISTD d_5 *N EtFOSAA*	%	75	81	78	78	91
Total Positive PFHxS & PFOS	µg/kg	36	61	27	160	94
Total Positive PFOS & PFOA	µg/kg	3.5	14	4.1	120	22
Total Positive PFAS	µg/kg	90	150	50	300	160

PFAS in Soil Extended						
Our Reference		39765-42	39765-46	39765-50	39765-51	39765-57
Your Reference	UNITS	BH06_0.5	BH06_2.5	BH07_0.5	BH07_1.0	SS01
Date Sampled		18/09/2023	18/09/2023	19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Perfluorobutanesulfonic acid	µg/kg	13	2.7	5.3	5.1	0.2
Perfluoropentanesulfonic acid	µg/kg	6.1	2.3	12	7.2	0.1
Perfluorohexanesulfonic acid PFHxS	µg/kg	12	9.7	120	51	1.4
Perfluoroheptanesulfonic acid	µg/kg	0.4	0.2	11	1.7	0.3
Perfluorooctanesulfonic acid PFOS	µg/kg	2.3	1.9	140	34	50
Perfluorodecanesulfonic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	0.9
Perfluorobutanoic acid	µg/kg	5.2	0.6	1	1	1
Perfluoropentanoic acid	µg/kg	8.5	1	2.3	2.7	1
Perfluorohexanoic acid	µg/kg	29	5.2	19	17	0.5
Perfluoroheptanoic acid	µg/kg	0.8	0.4	3.4	1.4	0.2
Perfluorooctanoic acid PFOA	µg/kg	0.9	0.3	7.3	1.2	0.5
Perfluorononanoic acid	µg/kg	<0.1	<0.1	0.1	<0.1	0.8
Perfluorodecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	3
Perfluoroundecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<5
Perfluorododecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<5
Perfluorotridecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	µg/kg	<5	<5	<5	<5	<5
4:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	0.7
8:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	7.2
10:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	9.6
Perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<10
N-Methyl perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<10
N-Ethyl perfluorooctanesulfon -amide	µg/kg	<1	<1	<1	<1	<10
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	<1	<1	<1	<1	<10
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	<5	<5	<5	<5	<50
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<2
Surrogate $^{13}C_8$ PFOS	%	91	91	83	69	87
Surrogate $^{13}C_2$ PFOA	%	106	103	108	102	103
Extracted ISTD $^{13}C_3$ *PFBS*	%	76	73	73	76	79
Extracted ISTD $^{18}O_2$ *PFHxS*	%	75	74	114	71	80
Extracted ISTD $^{13}C_4$ *PFOS*	%	79	77	110	79	58
Extracted ISTD $^{13}C_4$ *PFBA*	%	80	77	81	81	76

PFAS in Soil Extended						
Our Reference		39765-42	39765-46	39765-50	39765-51	39765-57
Your Reference	UNITS	BH06_0.5	BH06_2.5	BH07_0.5	BH07_1.0	SS01
Date Sampled		18/09/2023	18/09/2023	19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Extracted ISTD $^{13}C_3$ *PFPeA*	%	79	74	79	81	80
Extracted ISTD $^{13}C_2$ *PFHxA*	%	74	76	78	80	81
Extracted ISTD $^{13}C_4$ *PFHpA*	%	77	73	63	71	71
Extracted ISTD $^{13}C_4$ *PFOA*	%	79	75	74	79	65
Extracted ISTD $^{13}C_5$ *PFNA*	%	80	75	51	74	46
Extracted ISTD $^{13}C_2$ *PFDA*	%	81	74	86	90	51
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	62	84	80	67	#
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	79	78	87	87	56
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	70	77	86	82	50
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	80	64	70	73	71
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	78	79	73	78	64
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	79	75	82	89	80
Extracted ISTD $^{13}C_8$ *FOSA*	%	91	88	96	95	64
Extracted ISTD d_3 *N MeFOSA*	%	83	77	83	80	65
Extracted ISTD d_5 *NEtFOSA*	%	81	78	82	79	81
Extracted ISTD d_7 *N MeFOSE*	%	80	73	82	82	81
Extracted ISTD d_9 *N EtFOSE*	%	80	78	83	80	80
Extracted ISTD d_3 *N MeFOSAA*	%	76	72	82	89	52
Extracted ISTD d_5 *N EtFOSAA*	%	78	74	86	79	70
Total Positive PFHxS & PFOS	µg/kg	15	12	260	85	51
Total Positive PFOS & PFOA	µg/kg	3.2	2.2	150	35	50
Total Positive PFAS	µg/kg	78	25	330	120	77

PFAS in Soil Extended						
Our Reference		39765-58	39765-59	39765-60	39765-61	39765-62
Your Reference	UNITS	SS02	SS03	SS04	SS05	SS06
Date Sampled		19/09/2023	19/09/2023	19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/09/2023	25/09/2023	25/09/2023	26/09/2023	26/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023	26/09/2023	26/09/2023
Perfluorobutanesulfonic acid	µg/kg	<0.1	0.1	<0.1	0.5	0.1
Perfluoropentanesulfonic acid	µg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.2	1.4	1.2	1.8	1.8
Perfluoroheptanesulfonic acid	µg/kg	0.2	0.2	0.6	1.7	6.7
Perfluorooctanesulfonic acid PFOS	µg/kg	170	2.3	1,000	1,800	540
Perfluorodecanesulfonic acid	µg/kg	0.4	<0.2	0.6	<0.2	<0.2
Perfluorobutanoic acid	µg/kg	<0.2	0.5	<0.2	1	<0.2
Perfluoropentanoic acid	µg/kg	<0.2	0.3	<0.2	0.8	<0.2
Perfluorohexanoic acid	µg/kg	<0.1	0.5	0.3	3.0	0.4
Perfluoroheptanoic acid	µg/kg	<0.1	0.3	<0.1	0.3	<0.1
Perfluorooctanoic acid PFOA	µg/kg	0.2	3.8	0.4	0.4	0.4
Perfluorononanoic acid	µg/kg	0.5	<0.1	<1	<1	0.3
Perfluorodecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluoroundecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	µg/kg	<5	<5	<5	<5	<5
4:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	µg/kg	0.4	120	0.7	1.9	0.5
8:2 FTS	µg/kg	1	0.2	0.5	1	<0.2
10:2 FTS	µg/kg	0.3	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	µg/kg	<1	<1	4	5	<1
N-Methyl perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfon -amide	µg/kg	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	<5	<5	<5	<5	<5
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	96	85	88	108	127
Surrogate $^{13}C_2$ PFOA	%	97	102	104	102	109
Extracted ISTD $^{13}C_3$ *PFBS*	%	81	77	77	79	79
Extracted ISTD $^{18}O_2$ *PFHxS*	%	81	81	82	85	82
Extracted ISTD $^{13}C_4$ *PFOS*	%	111	84	105	88	91
Extracted ISTD $^{13}C_4$ *PFBA*	%	84	82	83	85	81

PFAS in Soil Extended						
Our Reference		39765-58	39765-59	39765-60	39765-61	39765-62
Your Reference	UNITS	SS02	SS03	SS04	SS05	SS06
Date Sampled		19/09/2023	19/09/2023	19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Extracted ISTD $^{13}C_3$ *PFPeA*	%	83	80	79	86	83
Extracted ISTD $^{13}C_2$ *PFHxA*	%	86	79	83	86	82
Extracted ISTD $^{13}C_4$ *PFHpA*	%	79	78	77	82	84
Extracted ISTD $^{13}C_4$ *PFOA*	%	84	75	77	86	81
Extracted ISTD $^{13}C_5$ *PFNA*	%	48	75	75	81	47
Extracted ISTD $^{13}C_2$ *PFDA*	%	81	82	76	89	90
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	61	81	59	108	64
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	70	72	67	96	79
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	102	93	102	114	117
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	70	74	75	86	84
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	67	97	69	76	87
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	77	67	78	91	84
Extracted ISTD $^{13}C_8$ *FOSA*	%	83	90	79	98	89
Extracted ISTD d_3 *N MeFOSA*	%	67	74	68	87	78
Extracted ISTD d_5 *NEtFOSA*	%	75	76	74	83	80
Extracted ISTD d_7 *N MeFOSE*	%	68	71	68	87	75
Extracted ISTD d_9 *N EtFOSE*	%	73	76	71	85	81
Extracted ISTD d_3 *N MeFOSAA*	%	80	80	75	92	84
Extracted ISTD d_5 *N EtFOSAA*	%	73	70	65	87	78
Total Positive PFHxS & PFOS	µg/kg	170	3.8	1,000	1,800	550
Total Positive PFOS & PFOA	µg/kg	170	6.2	1,000	1,800	540
Total Positive PFAS	µg/kg	170	130	1,000	1,800	550

PFAS in Soil Extended						
Our Reference		39765-63	39765-65	39765-69	39765-74	39765-80
Your Reference	UNITS	SS07	MW01_0.5	MW01_2.5	MW02_0.1	MW02_3.0
Date Sampled		19/09/2023	19/09/2023	19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	26/09/2023	26/09/2023	26/09/2023	26/09/2023	26/09/2023
Date analysed	-	26/09/2023	26/09/2023	26/09/2023	26/09/2023	26/09/2023
Perfluorobutanesulfonic acid	µg/kg	0.3	<0.1	0.5	0.2	2.7
Perfluoropentanesulfonic acid	µg/kg	0.2	<0.1	1.3	0.2	2.9
Perfluorohexanesulfonic acid PFHxS	µg/kg	3.5	0.2	19	5.3	20
Perfluoroheptanesulfonic acid	µg/kg	1.1	<0.1	1.1	3.0	1.1
Perfluorooctanesulfonic acid PFOS	µg/kg	110	4.9	19	320	31
Perfluorodecanesulfonic acid	µg/kg	0.6	<0.2	<0.2	2	<0.2
Perfluorobutanoic acid	µg/kg	0.8	<0.2	<0.2	0.8	1
Perfluoropentanoic acid	µg/kg	0.7	<0.2	<0.2	2	3.2
Perfluorohexanoic acid	µg/kg	0.9	<0.1	2.2	2.4	11
Perfluoroheptanoic acid	µg/kg	0.2	<0.1	0.6	0.7	2.2
Perfluorooctanoic acid PFOA	µg/kg	0.7	<0.1	1.2	2.3	2.6
Perfluorononanoic acid	µg/kg	0.5	<0.1	<0.1	3.2	<0.1
Perfluorodecanoic acid	µg/kg	<0.5	<0.5	<0.5	3	<0.5
Perfluoroundecanoic acid	µg/kg	<5	<0.5	<0.5	9.5	<0.5
Perfluorododecanoic acid	µg/kg	<5	<0.5	<0.5	0.7	<0.5
Perfluorotridecanoic acid	µg/kg	0.6	<0.5	<0.5	2	<0.5
Perfluorotetradecanoic acid	µg/kg	<5	<5	<5	<5	<5
4:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	µg/kg	0.2	<0.1	0.2	5.8	6.9
8:2 FTS	µg/kg	0.5	<0.2	<0.2	9.0	<0.2
10:2 FTS	µg/kg	0.7	<0.2	<0.2	3.5	<0.2
Perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfon -amide	µg/kg	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	<5	<5	<5	<5	<5
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	111	97	92	107	94
Surrogate $^{13}C_2$ PFOA	%	101	99	104	99	102
Extracted ISTD $^{13}C_3$ *PFBS*	%	79	82	79	79	73
Extracted ISTD $^{18}O_2$ *PFHxS*	%	82	82	81	82	76
Extracted ISTD $^{13}C_4$ *PFOS*	%	93	79	82	94	74
Extracted ISTD $^{13}C_4$ *PFBA*	%	74	86	84	77	74

PFAS in Soil Extended						
Our Reference		39765-63	39765-65	39765-69	39765-74	39765-80
Your Reference	UNITS	SS07	MW01_0.5	MW01_2.5	MW02_0.1	MW02_3.0
Date Sampled		19/09/2023	19/09/2023	19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Extracted ISTD $^{13}C_3$ *PFPeA*	%	83	83	82	81	77
Extracted ISTD $^{13}C_2$ *PFHxA*	%	82	86	80	81	76
Extracted ISTD $^{13}C_4$ *PFHpA*	%	80	85	82	81	73
Extracted ISTD $^{13}C_4$ *PFOA*	%	80	84	82	85	77
Extracted ISTD $^{13}C_5$ *PFNA*	%	55	85	83	51	75
Extracted ISTD $^{13}C_2$ *PFDA*	%	74	83	84	62	77
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	69	72	87	64	74
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	81	93	90	71	83
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	97	92	97	127	84
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	79	85	75	80	83
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	86	79	83	80	73
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	78	80	73	115	84
Extracted ISTD $^{13}C_8$ *FOSA*	%	51	95	93	82	87
Extracted ISTD d_3 *N MeFOSA*	%	54	83	83	68	78
Extracted ISTD d_5 *NEtFOSA*	%	63	79	81	71	72
Extracted ISTD d_7 *N MeFOSE*	%	59	88	83	67	76
Extracted ISTD d_9 *N EtFOSE*	%	60	82	84	68	75
Extracted ISTD d_3 *N MeFOSAA*	%	63	87	80	95	78
Extracted ISTD d_5 *N EtFOSAA*	%	62	88	83	86	74
Total Positive PFHxS & PFOS	µg/kg	110	5.1	38	330	51
Total Positive PFOS & PFOA	µg/kg	110	4.9	20	330	33
Total Positive PFAS	µg/kg	120	5.1	45	380	84

PFAS in Soil Extended						
Our Reference		39765-85	39765-88	39765-94	39765-95	39765-96
Your Reference	UNITS	MW03_0.5	MW03_2.0	FD01	FD02	FD03
Date Sampled		19/09/2023	19/09/2023	18/09/2023	18/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	26/09/2023	26/09/2023	26/09/2023	26/09/2023	26/09/2023
Date analysed	-	26/09/2023	26/09/2023	26/09/2023	26/09/2023	26/09/2023
Perfluorobutanesulfonic acid	µg/kg	5.8	0.1	4.1	20	<0.1
Perfluoropentanesulfonic acid	µg/kg	3.1	0.1	4.4	10	<0.1
Perfluorohexanesulfonic acid PFHxS	µg/kg	30	1.2	95	21	0.2
Perfluoroheptanesulfonic acid	µg/kg	1.0	<0.1	35	0.8	0.2
Perfluorooctanesulfonic acid PFOS	µg/kg	19	0.8	85	5.2	190
Perfluorodecanesulfonic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorobutanoic acid	µg/kg	4.5	<0.2	3.5	6.3	<0.2
Perfluoropentanoic acid	µg/kg	18	<0.2	7.0	12	<0.2
Perfluorohexanoic acid	µg/kg	17	0.1	20	49	0.1
Perfluoroheptanoic acid	µg/kg	11	<0.1	2.8	1.3	<0.1
Perfluorooctanoic acid PFOA	µg/kg	1.9	<0.1	28	1.4	0.2
Perfluorononanoic acid	µg/kg	<0.1	<0.1	0.7	<0.1	0.5
Perfluorodecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluoroundecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	µg/kg	<5	<5	<5	<5	<5
4:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	µg/kg	20	<0.1	34	0.3	0.3
8:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	0.7
10:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	0.3
Perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfon -amide	µg/kg	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	<5	<5	<5	<5	<5
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	92	94	107	97	101
Surrogate $^{13}C_2$ PFOA	%	99	102	97	104	101
Extracted ISTD $^{13}C_3$ *PFBS*	%	78	77	79	76	82
Extracted ISTD $^{18}O_2$ *PFHxS*	%	75	77	100	78	81
Extracted ISTD $^{13}C_4$ *PFOS*	%	80	77	96	81	95
Extracted ISTD $^{13}C_4$ *PFBA*	%	80	79	78	82	85

PFAS in Soil Extended						
Our Reference		39765-85	39765-88	39765-94	39765-95	39765-96
Your Reference	UNITS	MW03_0.5	MW03_2.0	FD01	FD02	FD03
Date Sampled		19/09/2023	19/09/2023	18/09/2023	18/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Extracted ISTD $^{13}C_3$ *PFPeA*	%	82	80	79	77	85
Extracted ISTD $^{13}C_2$ *PFHxA*	%	79	78	76	73	85
Extracted ISTD $^{13}C_4$ *PFHpA*	%	76	80	71	80	84
Extracted ISTD $^{13}C_4$ *PFOA*	%	84	79	76	83	86
Extracted ISTD $^{13}C_5$ *PFNA*	%	83	77	85	83	47
Extracted ISTD $^{13}C_2$ *PFDA*	%	84	78	84	86	80
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	87	85	71	100	81
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	96	81	88	87	79
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	107	88	110	100	106
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	77	81	80	81	80
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	80	70	70	72	85
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	91	77	93	78	74
Extracted ISTD $^{13}C_8$ *FOSA*	%	94	92	90	93	92
Extracted ISTD d_3 *N MeFOSA*	%	81	81	81	84	83
Extracted ISTD d_5 *NEtFOSA*	%	81	74	79	82	81
Extracted ISTD d_7 *N MeFOSE*	%	79	84	77	83	85
Extracted ISTD d_9 *N EtFOSE*	%	77	79	79	79	78
Extracted ISTD d_3 *N MeFOSAA*	%	90	85	79	82	80
Extracted ISTD d_5 *N EtFOSAA*	%	91	75	86	75	73
Total Positive PFHxS & PFOS	µg/kg	49	2.0	180	26	190
Total Positive PFOS & PFOA	µg/kg	21	0.8	110	6.6	190
Total Positive PFAS	µg/kg	130	2.3	320	130	190

PFAS in Soil Extended				
Our Reference		39765-97	39765-98	39765-99
Your Reference	UNITS	FD04	FD05	FD06
Date Sampled		19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil
Date prepared	-	25/09/2023	25/09/2023	25/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023
Perfluorobutanesulfonic acid	µg/kg	<0.1	0.1	0.2
Perfluoropentanesulfonic acid	µg/kg	0.2	<0.1	0.1
Perfluorohexanesulfonic acid PFHxS	µg/kg	8.2	1.2	1.1
Perfluoroheptanesulfonic acid	µg/kg	0.6	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	µg/kg	61	12	0.8
Perfluorodecanesulfonic acid	µg/kg	<0.2	<0.2	<0.2
Perfluorobutanoic acid	µg/kg	<0.2	<0.2	<0.2
Perfluoropentanoic acid	µg/kg	<0.2	<0.2	<0.2
Perfluorohexanoic acid	µg/kg	0.3	0.1	0.1
Perfluoroheptanoic acid	µg/kg	0.3	<0.1	<0.1
Perfluorooctanoic acid PFOA	µg/kg	1.1	0.3	<0.1
Perfluorononanoic acid	µg/kg	<0.1	<0.1	<0.1
Perfluorodecanoic acid	µg/kg	<0.5	<0.5	<0.5
Perfluoroundecanoic acid	µg/kg	<0.5	<0.5	<0.5
Perfluorododecanoic acid	µg/kg	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	µg/kg	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	µg/kg	<5	<5	<5
4:2 FTS	µg/kg	<0.1	<0.1	<0.1
6:2 FTS	µg/kg	2.7	<0.1	<0.1
8:2 FTS	µg/kg	<0.2	<0.2	<0.2
10:2 FTS	µg/kg	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	µg/kg	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	µg/kg	<1	<1	<1
N-Ethyl perfluorooctanesulfon -amide	µg/kg	<1	<1	<1
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	<1	<1	<1
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	<5	<5	<5
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	93	93	93
Surrogate $^{13}C_2$ PFOA	%	105	103	100
Extracted ISTD $^{13}C_3$ *PFBS*	%	78	76	72
Extracted ISTD $^{18}O_2$ *PFHxS*	%	79	74	74
Extracted ISTD $^{13}C_4$ *PFOS*	%	74	78	78
Extracted ISTD $^{13}C_4$ *PFBA*	%	83	82	79

PFAS in Soil Extended				
Our Reference		39765-97	39765-98	39765-99
Your Reference	UNITS	FD04	FD05	FD06
Date Sampled		19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil
Extracted ISTD $^{13}C_3$ *PFPeA*	%	79	77	75
Extracted ISTD $^{13}C_2$ *PFHxA*	%	78	80	78
Extracted ISTD $^{13}C_4$ *PFHpA*	%	75	76	75
Extracted ISTD $^{13}C_4$ *PFOA*	%	79	79	76
Extracted ISTD $^{13}C_5$ *PFNA*	%	71	77	80
Extracted ISTD $^{13}C_2$ *PFDA*	%	82	80	76
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	106	68	87
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	86	84	79
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	85	73	74
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	74	76	76
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	75	80	71
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	88	80	82
Extracted ISTD $^{13}C_8$ *FOSA*	%	93	92	90
Extracted ISTD d_3 *N MeFOSA*	%	80	78	80
Extracted ISTD d_5 *NEtFOSA*	%	83	78	81
Extracted ISTD d_7 *N MeFOSE*	%	76	75	77
Extracted ISTD d_9 *N EtFOSE*	%	84	77	79
Extracted ISTD d_3 *N MeFOSAA*	%	77	83	74
Extracted ISTD d_5 *N EtFOSAA*	%	76	76	72
Total Positive PFHxS & PFOS	µg/kg	69	14	1.8
Total Positive PFOS & PFOA	µg/kg	62	13	0.8
Total Positive PFAS	µg/kg	74	14	2.3

Moisture						
Our Reference		39765-1	39765-3	39765-9	39765-12	39765-17
Your Reference	UNITS	BH01_0.1	BH01_1.0	BH02_0.1	BH02_1.5	BH03_0.1
Date Sampled		19/09/2023	19/09/2023	19/09/2023	19/09/2023	18/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/09/2023	23/09/2023	23/09/2023	23/09/2023	23/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Moisture	%	4.9	8.8	10	10	3.6

Moisture						
Our Reference		39765-19	39765-26	39765-29	39765-33	39765-35
Your Reference	UNITS	BH03_1.0	BH04_0.5	BH04_2.0	BH05_0.1	BH05_1.0
Date Sampled		18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/09/2023	23/09/2023	23/09/2023	23/09/2023	23/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Moisture	%	7.2	12	15	9.9	9.1

Moisture						
Our Reference		39765-42	39765-46	39765-50	39765-51	39765-57
Your Reference	UNITS	BH06_0.5	BH06_2.5	BH07_0.5	BH07_1.0	SS01
Date Sampled		18/09/2023	18/09/2023	19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/09/2023	23/09/2023	23/09/2023	23/09/2023	23/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Moisture	%	9.4	26	9.2	6.6	0.6

Moisture						
Our Reference		39765-58	39765-59	39765-60	39765-61	39765-62
Your Reference	UNITS	SS02	SS03	SS04	SS05	SS06
Date Sampled		19/09/2023	19/09/2023	19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/09/2023	23/09/2023	23/09/2023	23/09/2023	23/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Moisture	%	5.4	5.8	6.1	5.5	8.6

Moisture						
Our Reference		39765-63	39765-65	39765-69	39765-74	39765-80
Your Reference	UNITS	SS07	MW01_0.5	MW01_2.5	MW02_0.1	MW02_3.0
Date Sampled		19/09/2023	19/09/2023	19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/09/2023	23/09/2023	23/09/2023	23/09/2023	23/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Moisture	%	4.3	7.1	6.6	8.7	26

Moisture						
Our Reference		39765-85	39765-88	39765-94	39765-95	39765-96
Your Reference	UNITS	MW03_0.5	MW03_2.0	FD01	FD02	FD03
Date Sampled		19/09/2023	19/09/2023	18/09/2023	18/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/09/2023	23/09/2023	23/09/2023	23/09/2023	23/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023	25/09/2023	25/09/2023
Moisture	%	8.4	18	12	13	4.9

Moisture				
Our Reference		39765-97	39765-98	39765-99
Your Reference	UNITS	FD04	FD05	FD06
Date Sampled		19/09/2023	19/09/2023	19/09/2023
Type of sample		Soil	Soil	Soil
Date prepared	-	23/09/2023	23/09/2023	23/09/2023
Date analysed	-	25/09/2023	25/09/2023	25/09/2023
Moisture	%	7.4	14	18

PFAS in Waters Extended				
Our Reference		39765-100	39765-101	39765-102
Your Reference	UNITS	RB01	RB02	FB01
Date Sampled		19/09/2023	19/09/2023	19/09/2023
Type of sample		Water	Water	Water
Date prepared	-	22/09/2023	22/09/2023	22/09/2023
Date analysed	-	22/09/2023	22/09/2023	22/09/2023
Perfluorobutanesulfonic acid	µg/L	<0.01	<0.01	<0.01
Perfluoropentanesulfonic acid	µg/L	<0.01	<0.01	<0.01
Perfluorohexanesulfonic acid PFHxS	µg/L	<0.01	<0.01	<0.01
Perfluoroheptanesulfonic acid	µg/L	<0.01	<0.01	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	<0.01	<0.01	<0.01
Perfluorodecanesulfonic acid	µg/L	<0.02	<0.02	<0.02
Perfluorobutanoic acid	µg/L	<0.02	<0.02	<0.02
Perfluoropentanoic acid	µg/L	<0.02	<0.02	<0.02
Perfluorohexanoic acid	µg/L	<0.01	<0.01	<0.01
Perfluoroheptanoic acid	µg/L	<0.01	<0.01	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01	<0.01	<0.01
Perfluorononanoic acid	µg/L	<0.01	<0.01	<0.01
Perfluorodecanoic acid	µg/L	<0.02	<0.02	<0.02
Perfluoroundecanoic acid	µg/L	<0.02	<0.02	<0.02
Perfluorododecanoic acid	µg/L	<0.05	<0.05	<0.05
Perfluorotridecanoic acid	µg/L	<0.1	<0.1	<0.1
Perfluorotetradecanoic acid	µg/L	<0.5	<0.5	<0.5
4:2 FTS	µg/L	<0.01	<0.01	<0.01
6:2 FTS	µg/L	<0.01	<0.01	<0.01
8:2 FTS	µg/L	<0.02	<0.02	<0.02
10:2 FTS	µg/L	<0.02	<0.02	<0.02
Perfluorooctane sulfonamide	µg/L	<0.1	<0.1	<0.1
N-Methyl perfluorooctane sulfonamide	µg/L	<0.05	<0.05	<0.05
N-Ethyl perfluorooctanesulfon -amide	µg/L	<0.1	<0.1	<0.1
N-Me perfluorooctanesulfonamid -oethanol	µg/L	<0.05	<0.05	<0.05
N-Et perfluorooctanesulfonamid -oethanol	µg/L	<0.5	<0.5	<0.5
MePerfluorooctanesulf- amid oacetic acid	µg/L	<0.02	<0.02	<0.02
EtPerfluorooctanesulf- amid oacetic acid	µg/L	<0.02	<0.02	<0.02
Surrogate $^{13}C_8$ PFOS	%	98	96	93
Surrogate $^{13}C_2$ PFOA	%	96	100	95
Extracted ISTD $^{13}C_3$ *PFBS*	%	91	89	90
Extracted ISTD $^{18}O_2$ *PFHxS*	%	91	90	90
Extracted ISTD $^{13}C_4$ *PFOS*	%	86	82	83
Extracted ISTD $^{13}C_4$ *PFBA*	%	92	91	82

PFAS in Waters Extended				
Our Reference	UNITS	39765-100	39765-101	39765-102
Your Reference		RB01	RB02	FB01
Date Sampled		19/09/2023	19/09/2023	19/09/2023
Type of sample		Water	Water	Water
Extracted ISTD $^{13}C_3$ *PFPeA*	%	96	94	93
Extracted ISTD $^{13}C_2$ *PFHxA*	%	91	89	90
Extracted ISTD $^{13}C_4$ *PFHpA*	%	95	91	90
Extracted ISTD $^{13}C_4$ *PFOA*	%	96	94	95
Extracted ISTD $^{13}C_5$ *PFNA*	%	94	91	88
Extracted ISTD $^{13}C_2$ *PFDA*	%	88	77	83
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	89	69	87
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	74	54	71
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	39	#	37
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	93	88	96
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	88	92	94
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	84	85	76
Extracted ISTD $^{13}C_8$ *FOSA*	%	94	94	95
Extracted ISTD d_3 *N MeFOSA*	%	95	91	92
Extracted ISTD d_5 *NEtFOSA*	%	94	92	91
Extracted ISTD d_7 *N MeFOSE*	%	90	93	95
Extracted ISTD d_9 *N EtFOSE*	%	88	87	87
Extracted ISTD d_3 *N MeFOSAA*	%	91	82	84
Extracted ISTD d_5 *N EtFOSAA*	%	92	85	85
Total Positive PFHxS & PFOS	µg/L	<0.01	<0.01	<0.01
Total Positive PFOS & PFOA	µg/L	<0.01	<0.01	<0.01
Total Positive PFAS	µg/L	<0.01	<0.01	<0.01

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105°C for a minimum of 12 hours.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.4 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Soil Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	39765-50
Perfluorobutanesulfonic acid	µg/kg	0.1	Org-029	<0.1	3	0.4	0.4	0	118	128
Perfluoropentanesulfonic acid	µg/kg	0.1	Org-029	<0.1	3	2.7	2.7	0	117	132
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	<0.1	3	51	49	4	113	##
Perfluoroheptanesulfonic acid	µg/kg	0.1	Org-029	<0.1	3	3.8	3.8	0	117	96
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	3	150	140	7	118	##
Perfluorodecanesulfonic acid	µg/kg	0.2	Org-029	<0.2	3	0.6	0.5	18	118	142
Perfluorobutanoic acid	µg/kg	0.2	Org-029	<0.2	3	<0.2	<0.2	0	111	126
Perfluoropentanoic acid	µg/kg	0.2	Org-029	<0.2	3	0.4	0.4	0	118	127
Perfluorohexanoic acid	µg/kg	0.1	Org-029	<0.1	3	4.3	4.3	0	113	##
Perfluoroheptanoic acid	µg/kg	0.1	Org-029	<0.1	3	1.6	1.6	0	117	123
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	3	4.2	3.9	7	117	88
Perfluorononanoic acid	µg/kg	0.1	Org-029	<0.1	3	0.1	0.1	0	114	131
Perfluorodecanoic acid	µg/kg	0.5	Org-029	<0.5	3	<0.5	<0.5	0	112	115
Perfluoroundecanoic acid	µg/kg	0.5	Org-029	<0.5	3	<0.5	<0.5	0	121	109
Perfluorododecanoic acid	µg/kg	0.5	Org-029	<0.5	3	<0.5	<0.5	0	114	111
Perfluorotridecanoic acid	µg/kg	0.5	Org-029	<0.5	3	<0.5	<0.5	0	120	128
Perfluorotetradecanoic acid	µg/kg	5	Org-029	<5	3	<5	<5	0	110	105
4:2 FTS	µg/kg	0.1	Org-029	<0.1	3	<0.1	<0.1	0	126	116
6:2 FTS	µg/kg	0.1	Org-029	<0.1	3	5.3	4.7	12	126	125
8:2 FTS	µg/kg	0.2	Org-029	<0.2	3	<0.2	<0.2	0	111	135
10:2 FTS	µg/kg	0.2	Org-029	<0.2	3	<0.2	<0.2	0	121	130
Perfluorooctane sulfonamide	µg/kg	1	Org-029	<1	3	<1	<1	0	109	112
N-Methyl perfluorooctane sulfonamide	µg/kg	1	Org-029	<1	3	<1	<1	0	115	105
N-Ethyl perfluorooctanesulfon -amide	µg/kg	1	Org-029	<1	3	<1	<1	0	116	122
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	1	Org-029	<1	3	<1	<1	0	120	131
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	5	Org-029	<5	3	<5	<5	0	125	110
MePerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-029	<0.2	3	<0.2	<0.2	0	121	136
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-029	<0.2	3	<0.2	<0.2	0	125	108
Surrogate $^{13}C_8$ PFOS	%		Org-029	95	3	90	97	7	94	#
Surrogate $^{13}C_2$ PFOA	%		Org-029	99	3	103	102	1	103	99
Extracted ISTD $^{13}C_3$ PFBS	%		Org-029	85	3	75	78	4	80	75

QUALITY CONTROL: PFAS in Soil Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	39765-50
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	83	3	73	72	1	80	62
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	85	3	111	115	4	77	63
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	89	3	81	81	0	82	76
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	87	3	76	81	6	80	77
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	87	3	78	79	1	81	77
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	86	3	74	73	1	81	63
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	89	3	78	79	1	80	76
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	87	3	52	54	4	80	54
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	89	3	79	80	1	82	83
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	96	3	73	88	19	78	106
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	91	3	81	87	7	82	90
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	100	3	71	78	9	93	85
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	78	3	69	75	8	69	74
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	86	3	75	78	4	77	77
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	79	3	85	78	9	86	76
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	99	3	89	92	3	89	91
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	89	3	77	75	3	83	79
Extracted ISTD d_5 *NEtFOSA*	%		Org-029	91	3	82	82	0	86	79
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	88	3	77	79	3	79	76
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	88	3	80	81	1	81	83

QUALITY CONTROL: PFAS in Soil Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	39765-50
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	87	3	75	80	6	77	78
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	87	3	74	78	5	76	85

QUALITY CONTROL: PFAS in Soil Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	39765-99
Perfluorobutanesulfonic acid	µg/kg	0.1	Org-029	[NT]	46	2.7	3.0	11	122	125
Perfluoropentanesulfonic acid	µg/kg	0.1	Org-029	[NT]	46	2.3	2.6	12	127	125
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	[NT]	46	9.7	12	21	120	116
Perfluoroheptanesulfonic acid	µg/kg	0.1	Org-029	[NT]	46	0.2	0.3	40	121	116
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	[NT]	46	1.9	3.5	59	110	120
Perfluorodecanesulfonic acid	µg/kg	0.2	Org-029	[NT]	46	<0.2	<0.2	0	114	121
Perfluorobutanoic acid	µg/kg	0.2	Org-029	[NT]	46	0.6	0.6	0	114	118
Perfluoropentanoic acid	µg/kg	0.2	Org-029	[NT]	46	1	1	0	115	121
Perfluorohexanoic acid	µg/kg	0.1	Org-029	[NT]	46	5.2	5.3	2	113	111
Perfluoroheptanoic acid	µg/kg	0.1	Org-029	[NT]	46	0.4	0.5	22	120	120
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	[NT]	46	0.3	0.5	50	117	116
Perfluorononanoic acid	µg/kg	0.1	Org-029	[NT]	46	<0.1	<0.1	0	121	119
Perfluorodecanoic acid	µg/kg	0.5	Org-029	[NT]	46	<0.5	<0.5	0	113	111
Perfluoroundecanoic acid	µg/kg	0.5	Org-029	[NT]	46	<0.5	<0.5	0	124	113
Perfluorododecanoic acid	µg/kg	0.5	Org-029	[NT]	46	<0.5	<0.5	0	119	112
Perfluorotridecanoic acid	µg/kg	0.5	Org-029	[NT]	46	<0.5	<0.5	0	127	128
Perfluorotetradecanoic acid	µg/kg	5	Org-029	[NT]	46	<5	<5	0	110	115
4:2 FTS	µg/kg	0.1	Org-029	[NT]	46	<0.1	<0.1	0	111	118
6:2 FTS	µg/kg	0.1	Org-029	[NT]	46	<0.1	<0.1	0	125	117
8:2 FTS	µg/kg	0.2	Org-029	[NT]	46	<0.2	<0.2	0	139	117
10:2 FTS	µg/kg	0.2	Org-029	[NT]	46	<0.2	<0.2	0	140	127
Perfluorooctane sulfonamide	µg/kg	1	Org-029	[NT]	46	<1	<1	0	112	113
N-Methyl perfluorooctane sulfonamide	µg/kg	1	Org-029	[NT]	46	<1	<1	0	110	108
N-Ethyl perfluorooctanesulfon -amide	µg/kg	1	Org-029	[NT]	46	<1	<1	0	121	120
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	1	Org-029	[NT]	46	<1	<1	0	121	121
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	5	Org-029	[NT]	46	<5	<5	0	115	118
MePerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-029	[NT]	46	<0.2	<0.2	0	125	123
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-029	[NT]	46	<0.2	<0.2	0	115	129
Surrogate $^{13}C_8$ PFOS	%		Org-029	[NT]	46	91	85	7	87	97
Surrogate $^{13}C_2$ PFOA	%		Org-029	[NT]	46	103	100	3	97	102
Extracted ISTD $^{13}C_3$ *PFBS*	%		Org-029	[NT]	46	73	70	4	79	71

QUALITY CONTROL: PFAS in Soil Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	39765-99
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	[NT]	46	74	72	3	76	72
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	[NT]	46	77	79	3	84	71
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	[NT]	46	77	79	3	82	74
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	[NT]	46	74	71	4	81	73
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	[NT]	46	76	78	3	81	75
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	[NT]	46	73	75	3	79	72
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	[NT]	46	75	76	1	81	75
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	[NT]	46	75	74	1	80	74
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	[NT]	46	74	76	3	86	78
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	[NT]	46	84	92	9	98	94
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	[NT]	46	78	73	7	87	77
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	[NT]	46	77	69	11	90	75
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	[NT]	46	64	74	14	83	68
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	[NT]	46	79	66	18	77	77
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	[NT]	46	75	79	5	70	78
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	[NT]	46	88	89	1	92	82
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	[NT]	46	77	77	0	84	76
Extracted ISTD d_5 *NEtFOSA*	%		Org-029	[NT]	46	78	78	0	84	77
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	[NT]	46	73	71	3	81	73
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	[NT]	46	78	72	8	86	76

QUALITY CONTROL: PFAS in Soil Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	39765-99
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	[NT]	46	72	79	9	88	74
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	[NT]	46	74	68	8	88	69

QUALITY CONTROL: PFAS in Soil Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Perfluorobutanesulfonic acid	µg/kg	0.1	Org-029	[NT]	65	<0.1	<0.1	0	[NT]	[NT]
Perfluoropentanesulfonic acid	µg/kg	0.1	Org-029	[NT]	65	<0.1	<0.1	0	[NT]	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	[NT]	65	0.2	0.1	67	[NT]	[NT]
Perfluoroheptanesulfonic acid	µg/kg	0.1	Org-029	[NT]	65	<0.1	<0.1	0	[NT]	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	[NT]	65	4.9	4.4	11	[NT]	[NT]
Perfluorodecanesulfonic acid	µg/kg	0.2	Org-029	[NT]	65	<0.2	<0.2	0	[NT]	[NT]
Perfluorobutanoic acid	µg/kg	0.2	Org-029	[NT]	65	<0.2	<0.2	0	[NT]	[NT]
Perfluoropentanoic acid	µg/kg	0.2	Org-029	[NT]	65	<0.2	<0.2	0	[NT]	[NT]
Perfluorohexanoic acid	µg/kg	0.1	Org-029	[NT]	65	<0.1	<0.1	0	[NT]	[NT]
Perfluoroheptanoic acid	µg/kg	0.1	Org-029	[NT]	65	<0.1	<0.1	0	[NT]	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	[NT]	65	<0.1	<0.1	0	[NT]	[NT]
Perfluorononanoic acid	µg/kg	0.1	Org-029	[NT]	65	<0.1	<0.1	0	[NT]	[NT]
Perfluorodecanoic acid	µg/kg	0.5	Org-029	[NT]	65	<0.5	<0.5	0	[NT]	[NT]
Perfluoroundecanoic acid	µg/kg	0.5	Org-029	[NT]	65	<0.5	<0.5	0	[NT]	[NT]
Perfluorododecanoic acid	µg/kg	0.5	Org-029	[NT]	65	<0.5	<0.5	0	[NT]	[NT]
Perfluorotridecanoic acid	µg/kg	0.5	Org-029	[NT]	65	<0.5	<0.5	0	[NT]	[NT]
Perfluorotetradecanoic acid	µg/kg	5	Org-029	[NT]	65	<5	<5	0	[NT]	[NT]
4:2 FTS	µg/kg	0.1	Org-029	[NT]	65	<0.1	<0.1	0	[NT]	[NT]
6:2 FTS	µg/kg	0.1	Org-029	[NT]	65	<0.1	<0.1	0	[NT]	[NT]
8:2 FTS	µg/kg	0.2	Org-029	[NT]	65	<0.2	<0.2	0	[NT]	[NT]
10:2 FTS	µg/kg	0.2	Org-029	[NT]	65	<0.2	<0.2	0	[NT]	[NT]
Perfluorooctane sulfonamide	µg/kg	1	Org-029	[NT]	65	<1	<1	0	[NT]	[NT]
N-Methyl perfluorooctane sulfonamide	µg/kg	1	Org-029	[NT]	65	<1	<1	0	[NT]	[NT]
N-Ethyl perfluorooctanesulfon -amide	µg/kg	1	Org-029	[NT]	65	<1	<1	0	[NT]	[NT]
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	1	Org-029	[NT]	65	<1	<1	0	[NT]	[NT]
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	5	Org-029	[NT]	65	<5	<5	0	[NT]	[NT]
MePerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-029	[NT]	65	<0.2	<0.2	0	[NT]	[NT]
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-029	[NT]	65	<0.2	<0.2	0	[NT]	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	[NT]	65	97	95	2	[NT]	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	[NT]	65	99	100	1	[NT]	[NT]
Extracted ISTD $^{13}C_3$ PFBS	%		Org-029	[NT]	65	82	78	5	[NT]	[NT]

QUALITY CONTROL: PFAS in Soil Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	[NT]	65	82	80	2	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	[NT]	65	79	80	1	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	[NT]	65	86	83	4	[NT]	[NT]
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	[NT]	65	83	82	1	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	[NT]	65	86	83	4	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	[NT]	65	85	82	4	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	[NT]	65	84	83	1	[NT]	[NT]
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	[NT]	65	85	85	0	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	[NT]	65	83	83	0	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	[NT]	65	72	77	7	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	[NT]	65	93	92	1	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	[NT]	65	92	108	16	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	[NT]	65	85	74	14	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	[NT]	65	79	73	8	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	[NT]	65	80	79	1	[NT]	[NT]
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	[NT]	65	95	91	4	[NT]	[NT]
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	[NT]	65	83	83	0	[NT]	[NT]
Extracted ISTD d_5 *NEtFOSA*	%		Org-029	[NT]	65	79	83	5	[NT]	[NT]
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	[NT]	65	88	87	1	[NT]	[NT]
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	[NT]	65	82	83	1	[NT]	[NT]

QUALITY CONTROL: PFAS in Soil Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	[NT]	65	87	78	11	[NT]	[NT]
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	[NT]	65	88	80	10	[NT]	[NT]

QUALITY CONTROL: PFAS in Soil Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Perfluorobutanesulfonic acid	µg/kg	0.1	Org-029	[NT]	98	0.1	0.1	0	[NT]	[NT]
Perfluoropentanesulfonic acid	µg/kg	0.1	Org-029	[NT]	98	<0.1	<0.1	0	[NT]	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	[NT]	98	1.2	1.2	0	[NT]	[NT]
Perfluoroheptanesulfonic acid	µg/kg	0.1	Org-029	[NT]	98	<0.1	<0.1	0	[NT]	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	[NT]	98	12	13	8	[NT]	[NT]
Perfluorodecanesulfonic acid	µg/kg	0.2	Org-029	[NT]	98	<0.2	<0.2	0	[NT]	[NT]
Perfluorobutanoic acid	µg/kg	0.2	Org-029	[NT]	98	<0.2	<0.2	0	[NT]	[NT]
Perfluoropentanoic acid	µg/kg	0.2	Org-029	[NT]	98	<0.2	<0.2	0	[NT]	[NT]
Perfluorohexanoic acid	µg/kg	0.1	Org-029	[NT]	98	0.1	0.1	0	[NT]	[NT]
Perfluoroheptanoic acid	µg/kg	0.1	Org-029	[NT]	98	<0.1	<0.1	0	[NT]	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	[NT]	98	0.3	0.3	0	[NT]	[NT]
Perfluorononanoic acid	µg/kg	0.1	Org-029	[NT]	98	<0.1	<0.1	0	[NT]	[NT]
Perfluorodecanoic acid	µg/kg	0.5	Org-029	[NT]	98	<0.5	<0.5	0	[NT]	[NT]
Perfluoroundecanoic acid	µg/kg	0.5	Org-029	[NT]	98	<0.5	<0.5	0	[NT]	[NT]
Perfluorododecanoic acid	µg/kg	0.5	Org-029	[NT]	98	<0.5	<0.5	0	[NT]	[NT]
Perfluorotridecanoic acid	µg/kg	0.5	Org-029	[NT]	98	<0.5	<0.5	0	[NT]	[NT]
Perfluorotetradecanoic acid	µg/kg	5	Org-029	[NT]	98	<5	<5	0	[NT]	[NT]
4:2 FTS	µg/kg	0.1	Org-029	[NT]	98	<0.1	<0.1	0	[NT]	[NT]
6:2 FTS	µg/kg	0.1	Org-029	[NT]	98	<0.1	<0.1	0	[NT]	[NT]
8:2 FTS	µg/kg	0.2	Org-029	[NT]	98	<0.2	<0.2	0	[NT]	[NT]
10:2 FTS	µg/kg	0.2	Org-029	[NT]	98	<0.2	<0.2	0	[NT]	[NT]
Perfluorooctane sulfonamide	µg/kg	1	Org-029	[NT]	98	<1	<1	0	[NT]	[NT]
N-Methyl perfluorooctane sulfonamide	µg/kg	1	Org-029	[NT]	98	<1	<1	0	[NT]	[NT]
N-Ethyl perfluorooctanesulfon -amide	µg/kg	1	Org-029	[NT]	98	<1	<1	0	[NT]	[NT]
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	1	Org-029	[NT]	98	<1	<1	0	[NT]	[NT]
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	5	Org-029	[NT]	98	<5	<5	0	[NT]	[NT]
MePerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-029	[NT]	98	<0.2	<0.2	0	[NT]	[NT]
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-029	[NT]	98	<0.2	<0.2	0	[NT]	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	[NT]	98	93	106	13	[NT]	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	[NT]	98	103	104	1	[NT]	[NT]
Extracted ISTD $^{13}C_3$ PFBS	%		Org-029	[NT]	98	76	75	1	[NT]	[NT]

QUALITY CONTROL: PFAS in Soil Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	[NT]	98	74	75	1	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	[NT]	98	78	71	9	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	[NT]	98	82	80	2	[NT]	[NT]
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	[NT]	98	77	77	0	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	[NT]	98	80	79	1	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	[NT]	98	76	78	3	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	[NT]	98	79	75	5	[NT]	[NT]
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	[NT]	98	77	79	3	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	[NT]	98	80	80	0	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	[NT]	98	68	91	29	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	[NT]	98	84	76	10	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	[NT]	98	73	89	20	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	[NT]	98	76	70	8	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	[NT]	98	80	75	6	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	[NT]	98	80	77	4	[NT]	[NT]
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	[NT]	98	92	90	2	[NT]	[NT]
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	[NT]	98	78	81	4	[NT]	[NT]
Extracted ISTD d_5 *NEtFOSA*	%		Org-029	[NT]	98	78	82	5	[NT]	[NT]
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	[NT]	98	75	77	3	[NT]	[NT]
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	[NT]	98	77	79	3	[NT]	[NT]

QUALITY CONTROL: PFAS in Soil Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	[NT]	98	83	78	6	[NT]	[NT]
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	[NT]	98	76	73	4	[NT]	[NT]

QUALITY CONTROL: PFAS in Waters Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	39765-102
Perfluorobutanesulfonic acid	µg/L	0.01	Org-029	<0.01	100	<0.01	<0.01	0	112	117
Perfluoropentanesulfonic acid	µg/L	0.01	Org-029	<0.01	100	<0.01	<0.01	0	117	119
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029	<0.01	100	<0.01	<0.01	0	115	122
Perfluoroheptanesulfonic acid	µg/L	0.01	Org-029	<0.01	100	<0.01	<0.01	0	114	115
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	100	<0.01	<0.01	0	115	127
Perfluorodecanesulfonic acid	µg/L	0.02	Org-029	<0.02	100	<0.02	<0.02	0	109	116
Perfluorobutanoic acid	µg/L	0.02	Org-029	<0.02	100	<0.02	<0.02	0	106	118
Perfluoropentanoic acid	µg/L	0.02	Org-029	<0.02	100	<0.02	<0.02	0	108	121
Perfluorohexanoic acid	µg/L	0.01	Org-029	<0.01	100	<0.01	<0.01	0	113	123
Perfluoroheptanoic acid	µg/L	0.01	Org-029	<0.01	100	<0.01	<0.01	0	109	120
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	100	<0.01	<0.01	0	111	116
Perfluorononanoic acid	µg/L	0.01	Org-029	<0.01	100	<0.01	<0.01	0	97	112
Perfluorodecanoic acid	µg/L	0.02	Org-029	<0.02	100	<0.02	<0.02	0	112	124
Perfluoroundecanoic acid	µg/L	0.02	Org-029	<0.02	100	<0.02	<0.02	0	100	122
Perfluorododecanoic acid	µg/L	0.05	Org-029	<0.05	100	<0.05	<0.05	0	114	124
Perfluorotridecanoic acid	µg/L	0.1	Org-029	<0.1	100	<0.1	<0.1	0	105	89
Perfluorotetradecanoic acid	µg/L	0.5	Org-029	<0.5	100	<0.5	<0.5	0	107	117
4:2 FTS	µg/L	0.01	Org-029	<0.01	100	<0.01	<0.01	0	91	113
6:2 FTS	µg/L	0.01	Org-029	<0.01	100	<0.01	<0.01	0	104	108
8:2 FTS	µg/L	0.02	Org-029	<0.02	100	<0.02	<0.02	0	96	102
10:2 FTS	µg/L	0.02	Org-029	<0.02	100	<0.02	<0.02	0	94	98
Perfluorooctane sulfonamide	µg/L	0.1	Org-029	<0.1	100	<0.1	<0.1	0	103	114
N-Methyl perfluorooctane sulfonamide	µg/L	0.05	Org-029	<0.05	100	<0.05	<0.05	0	112	124
N-Ethyl perfluorooctanesulfon -amide	µg/L	0.1	Org-029	<0.1	100	<0.1	<0.1	0	114	124
N-Me perfluorooctanesulfonamid -oethanol	µg/L	0.05	Org-029	<0.05	100	<0.05	<0.05	0	96	105
N-Et perfluorooctanesulfonamid -oethanol	µg/L	0.5	Org-029	<0.5	100	<0.5	<0.5	0	111	122
MePerfluorooctanesulf- amid oacetic acid	µg/L	0.02	Org-029	<0.02	100	<0.02	<0.02	0	100	112
EtPerfluorooctanesulf- amid oacetic acid	µg/L	0.02	Org-029	<0.02	100	<0.02	<0.02	0	106	105
Surrogate $^{13}C_8$ PFOS	%		Org-029	100	100	98	104	6	99	95
Surrogate $^{13}C_2$ PFOA	%		Org-029	97	100	96	97	1	101	95
Extracted ISTD $^{13}C_3$ *PFBS*	%		Org-029	88	100	91	91	0	86	89

QUALITY CONTROL: PFAS in Waters Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	39765-102
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	89	100	91	88	3	84	87
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	85	100	86	82	5	83	83
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	91	100	92	91	1	89	79
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	94	100	96	94	2	91	88
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	88	100	91	88	3	86	86
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	92	100	95	92	3	90	90
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	93	100	96	96	0	90	92
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	93	100	94	92	2	89	85
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	85	100	88	88	0	80	78
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	89	100	89	88	1	88	79
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	74	100	74	83	11	76	73
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	42	100	39	49	23	55	#
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	92	100	93	89	4	98	89
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	98	100	88	91	3	87	94
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	89	100	84	83	1	84	86
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	92	100	94	95	1	89	87
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	96	100	95	91	4	90	88
Extracted ISTD d_5 *NEtFOSA*	%		Org-029	92	100	94	93	1	90	87
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	96	100	90	94	4	90	91
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	89	100	88	91	3	87	84

QUALITY CONTROL: PFAS in Waters Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	39765-102
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	83	100	91	86	6	89	85
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	82	100	92	84	9	83	87

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

PFAS_S: ## Matrix spike recovery is not possible to report due to the high concentration of analytes in the sample/s have caused interference or outside of acceptance criteria due to relatively high background levels. However, an acceptable recovery was obtained for the LCS.

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote GHD STANDARD RATES

Project Number	**Laboratory**
12616805	Eurofins Environmental
Project Name	**Laboratory Address**
MFS Port Augusta DSI	9 Main Terrace, Richmond SA 5033
GHD Project Manager	**Laboratory Contact**
Tom Duncan	Amy Meunier
GHD Contact	
Ally Kirkman	
GHD PM email	**GHD Contact email**
Tom.Duncan@ghd.com	Ally.Kirkman@ghd.com

COURIER AND LABORATORY INSTRUCTIONS:
- Sign chain of custody document on reciept and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
- Laboratory contact should sign the COC and send a copy (via email) to the GHD Project Manager and GHD Contact, along with a sample receipt notice, within 24 hours of reciept.
- A signed copy of the COC should be returned to the GHD Project Manager and GHD Contact with the results via email at the completion of analysis as requested.
- All results should reference the Job Number and Project Name.
- All results should be provided in NATA accredited pdf format and ESDAT format.

Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil SLS Sludge W: Water AI: Air GW: Groundwater	Preservative	Containers: Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO EUROFINS	SAMPLE COMMENTS
MW02_3.5	19-Sep-23		Soil	Ice	J	1			X		
MW02_4.0	19-Sep-23		Soil	Ice	J	1			X		
MW02_4.5	19-Sep-23		Soil	Ice	J	1			X		
MW03_0.1	19-Sep-23		Soil	Ice	J	1			X		
MW03_0.5	19-Sep-23		Soil	Ice	J	1		X			
MW03_1.0	19-Sep-23		Soil	Ice	J	1			X		
MW03_1.5	19-Sep-23		Soil	Ice	J	1			X		
MW03_2.0	19-Sep-23		Soil	Ice	J	1		X			
MW03_2.5	19-Sep-23		Soil	Ice	J	1			X		
MW03_3.0	19-Sep-23		Soil	Ice	J	1			X		
MW03_3.5	19-Sep-23		Soil	Ice	J	1			X		
MW03_4.0	19-Sep-23		Soil	Ice	J	1			X		
MW03_4.5	19-Sep-23		Soil	Ice	J	1			X		
FD01	18-Sep-23		Soil	Ice	J	1		X			
FS01	18-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins for analysis
FD02	18-Sep-23		Soil	Ice	J	1		X			
FS02	18-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins for analysis
FD03	19-Sep-23		Soil	Ice	J	1		X			
FS03	19-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins for analysis
FD04	19-Sep-23		Soil	Ice	J	1		X			
TOTAL NUMBER OF SAMPLES	18										
TOTAL NUMBER OF ESKIES	2										

#1028743

22/9/23

CUSTODY DETAILS

SAMPLER				
	Date/Time	Relinquished by:		Date/Time
GHD SERVICE CENTRE				
Received by:	Date/Time	Relinquished by:		Date/Time
COURIER				
Received by Courier:	Date/Time	Relinquished by:	AS	Date/Time
LABORATORY				
Received by Lab:	Date/Time			

DATE: 22/9/23
TIME: 4pm
COURIER:
TEMPERATURE 12.9
ATTEMP TO CHILL : YES NO

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 6600	STANDARD	Quote GHD STANDARD RATES

Project Number	12616805
Project Name	MFS Port Augusta DSI
GHD Project Manager	Tom Duncan
GHD Contact	Ally Kirkman
GHD PM email	Tom.Duncan@ghd.com
GHD Contact email	Ally.Kirkman@ghd.com

Laboratory	Eurofins Environmental
Laboratory Address	9 Main Terrace, Richmond SA 5033
Laboratory Contact	Amy Meunier

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on reciept and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
- Laboratory contact should sign the COC and send a copy (via email) to the GHD Project Manager and GHD Contact, along with a sample receipt notice, within 24 hours of reciept.
- A signed copy of the COC should be returned to the GHD Project Manager and GHD Contact with the results via email at the completion of analysis as requested.
- All results should reference the Job Number and Project Name.
- All results should be provided in NATA accredited pdf format and ESDAT format.

Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Preservative	Containers: Type (J: soil jar B: bag V: vial G: glass bottle P: plastic bottle)	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO EUROFINS	SAMPLE COMMENTS
FS04	19-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins
FD05	19-Sep-23		Soil	Ice	J	1		X			
FS05	19-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins
FD06	19-Sep-23		Soil	Ice	J	1		X			
FS06	19-Sep-23		Soil	Ice	J	1		X		X	please send to eurofins
RB01	19-Sep-23		Water	Ice	P	2		X			
RB02	19-Sep-23		Water	Ice	P	2		X			
FB01	19-Sep-23		Water	Ice	P	2		X			

TOTAL NUMBER OF SAMPLES	108
TOTAL NUMBER OF ESKIES	2

CUSTODY DETAILS

SAMPLER			
	Date/Time	Relinquished by:	Date/Time
GHD SERVICE CENTRE			
Received by:	Date/Time	Relinquished by:	Date/Time
COURIER			
Received by Courier:	Date/Time	Relinquished by: AS	Date/Time
LABORATORY			
Received by Lab:	Date/Time		

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Eurofins Environment Testing Australia Pty Ltd

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Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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NZBN: 9429046024954

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Tel: +64 9 526 4551	Tel: +64 3 343 5201	Tel: +64 9 525 0568
IANZ# 1327	IANZ# 1290	IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd VIC
Contact name:	Tom Duncan
Project name:	MFS PORT AUGUSTA DSI
Project ID:	12616805
Turnaround time:	5 Day
Date/Time received	Sep 22, 2023 4:00 PM
Eurofins reference	1028743

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Harry Bacalis on phone : +61 3 8564 5064 or by email: HarryBacalis@eurofins.com

Results will be delivered electronically via email to Tom Duncan - tom.duncan@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd VIC email address.

GHD Melbourne
Level 8, 180 Lonsdale St
Melbourne
VIC 3000

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Tom Duncan**

Report **1028743-S**
Project name MFS PORT AUGUSTA DSI
Project ID 12616805
Received Date Sep 22, 2023

Client Sample ID			**FS01**	**FS02**	**FS03**	**FS04**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**M23-Se0055333**	**M23-Se0055334**	**M23-Se0055335**	**M23-Se0055336**
Date Sampled			**Sep 18, 2023**	**Sep 18, 2023**	**Sep 19, 2023**	**Sep 19, 2023**
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	18	10	2.6	6.5
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	7.8	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	12	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	63	< 5	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	6.0	< 5	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	99	100	104	107
13C5-PFPeA (surr.)	1	%	109	116	117	116
13C5-PFHxA (surr.)	1	%	110	109	110	114
13C4-PFHpA (surr.)	1	%	102	105	119	110
13C8-PFOA (surr.)	1	%	108	109	114	114
13C5-PFNA (surr.)	1	%	97	102	106	108
13C6-PFDA (surr.)	1	%	111	116	114	119
13C2-PFUnDA (surr.)	1	%	120	129	125	124
13C2-PFDoDA (surr.)	1	%	138	139	135	138
13C2-PFTeDA (surr.)	1	%	92	81	89	86
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10

Client Sample ID			FS01	FS02	FS03	FS04
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23-Se0055333	M23-Se0055334	M23-Se0055335	M23-Se0055336
Date Sampled			Sep 18, 2023	Sep 18, 2023	Sep 19, 2023	Sep 19, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
13C8-FOSA (surr.)	1	%	116	120	120	120
D3-N-MeFOSA (surr.)	1	%	110	117	108	112
D5-N-EtFOSA (surr.)	1	%	118	118	118	116
D7-N-MeFOSE (surr.)	1	%	102	104	101	104
D9-N-EtFOSE (surr.)	1	%	98	106	101	100
D5-N-EtFOSAA (surr.)	1	%	144	120	111	128
D3-N-MeFOSAA (surr.)	1	%	122	107	90	109
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	[N09]26	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	11	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	[N09]12	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	[N09]32	[N09]30	< 5	[N09]11
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	[N09]6.2	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]50	[N09]11	[N09]220	[N09]65
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	107	103	114	107
18O2-PFHxS (surr.)	1	%	100	104	106	108
13C8-PFOS (surr.)	1	%	94	106	98	105
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	10	ug/kg	11	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	107	121	122	132
13C2-6:2 FTSA (surr.)	1	%	106	123	95	107
13C2-8:2 FTSA (surr.)	1	%	105	125	136	125
13C2-10:2 FTSA (surr.)	1	%	138	129	111	121
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	82	41	220	76
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	56	11	220	65
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	88	41	220	76
Sum of WA DWER PFAS (n=10)*	10	ug/kg	99	149.8	220	76
Sum of PFASs (n=30)*	50	ug/kg	105.2	172.8	220	76

Client Sample ID			FS05	FS06
Sample Matrix			Soil	Soil
Eurofins Sample No.			M23-Se0055337	M23-Se0055338
Date Sampled			Sep 19, 2023	Sep 19, 2023
Test/Reference	LOR	Unit		
Sample Properties				
% Moisture	1	%	15	21
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5
13C4-PFBA (surr.)	1	%	90	96
13C5-PFPeA (surr.)	1	%	109	104
13C5-PFHxA (surr.)	1	%	94	106
13C4-PFHpA (surr.)	1	%	104	104
13C8-PFOA (surr.)	1	%	107	108
13C5-PFNA (surr.)	1	%	108	98
13C6-PFDA (surr.)	1	%	118	106
13C2-PFUnDA (surr.)	1	%	131	128
13C2-PFDoDA (surr.)	1	%	128	132
13C2-PFTeDA (surr.)	1	%	81	76
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	5	ug/kg	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	5	ug/kg	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10
13C8-FOSA (surr.)	1	%	112	108
D3-N-MeFOSA (surr.)	1	%	109	105
D5-N-EtFOSA (surr.)	1	%	115	107
D7-N-MeFOSE (surr.)	1	%	104	98
D9-N-EtFOSE (surr.)	1	%	104	95
D5-N-EtFOSAA (surr.)	1	%	99	114
D3-N-MeFOSAA (surr.)	1	%	88	102
Perfluoroalkyl sulfonic acids (PFSAs)				
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	< 5

Client Sample ID			FS05	FS06
Sample Matrix			Soil	Soil
Eurofins Sample No.			M23-Se0055337	M23-Se0055338
Date Sampled			Sep 19, 2023	Sep 19, 2023
Test/Reference	LOR	Unit		
Perfluoroalkyl sulfonic acids (PFSAs)				
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]11	< 5
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5
13C3-PFBS (surr.)	1	%	105	99
18O2-PFHxS (surr.)	1	%	99	93
13C8-PFOS (surr.)	1	%	110	94
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	10	ug/kg	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	124	111
13C2-6:2 FTSA (surr.)	1	%	104	107
13C2-8:2 FTSA (surr.)	1	%	122	121
13C2-10:2 FTSA (surr.)	1	%	98	118
PFASs Summations				
Sum (PFHxS + PFOS)*	5	ug/kg	11	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	11	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	11	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	11	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50	< 50

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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
% Moisture	Melbourne	Sep 22, 2023	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Melbourne	Sep 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Melbourne	Sep 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Melbourne	Sep 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Melbourne	Sep 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
PFASs Summations	Melbourne	Sep 22, 2023	
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

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6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
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Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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NATA# 2377
Site# 2370

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IANZ# 1327	IANZ# 1290	IANZ# 1402

Company Name: GHD Pty Ltd VIC
Address: Level 8, 180 Lonsdale St
Melbourne
VIC 3000

Project Name: MFS PORT AUGUSTA DSI
Project ID: 12616805

Order No.:
Report #: 1028743
Phone: 8687 8000
Fax: 8687 8111

Received: Sep 22, 2023 4:00 PM
Due: Oct 2, 2023
Priority: 5 Day
Contact Name: Tom Duncan

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	FS01	Sep 18, 2023		Soil	M23-Se0055333	X	X
2	FS02	Sep 18, 2023		Soil	M23-Se0055334	X	X
3	FS03	Sep 19, 2023		Soil	M23-Se0055335	X	X
4	FS04	Sep 19, 2023		Soil	M23-Se0055336	X	X
5	FS05	Sep 19, 2023		Soil	M23-Se0055337	X	X
6	FS06	Sep 19, 2023		Soil	M23-Se0055338	X	X
Test Counts						6	6

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. 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 SRA.

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.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**µg/L:** micrograms per litre
ppm: parts per million	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
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.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

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%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

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. 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.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	72			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	65			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	73			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	72			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	79			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	74			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	77			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	83			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	78			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	62			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	78			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	75			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	81			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	72			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	%	77			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	%	81			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	74			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	78			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	67			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	86			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	74			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	63			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	77			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	63			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	75			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	74			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	71			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	%	86			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	73			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	75			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					
Perfluoropentanoic acid (PFPeA)	M23-Se0055486	NCP	%	72			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0055486	NCP	%	83			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M23-Se0055486	NCP	%	73			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0055486	NCP	%	80			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M23-Se0055334	CP	%	66			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0055334	CP	%	70			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0055334	CP	%	75			50-150	Pass	
Perfluorononanoic acid (PFNA)	M23-Se0055334	CP	%	78			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0055334	CP	%	79			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Se0055334	CP	%	87			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0055334	CP	%	84			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Se0055334	CP	%	66			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0055334	CP	%	86			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M23-Se0055334	CP	%	81			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0055334	CP	%	84			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0055334	CP	%	76			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0055334	CP	%	81			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0055334	CP	%	84			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0055334	CP	%	74			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0055334	CP	%	78			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorononanesulfonic acid (PFNS)	M23-Se0055334	CP	%	95			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0055334	CP	%	51			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0055334	CP	%	51			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0055334	CP	%	65			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Se0055334	CP	%	58			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0055334	CP	%	84			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0055334	CP	%	83			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0055334	CP	%	84			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0055334	CP	%	74			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0055334	CP	%	74			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	M23-Se0055244	NCP	%	3.9	3.5	12	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0055335	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0055335	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Se0055335	CP	ug/kg	220	240	6.6	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0055335	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0055335	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0055338	CP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0055338	CP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0055338	CP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0055338	CP	ug/kg	< 5	< 5	<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.
N15	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:

Harry Bacalis	Analytical Services Manager
Edward Lee	Senior Analyst-PFAS

Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

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39765 - B

Alanah Gilson

Subject: FW: Job No. 39765 - possible additional analysis

From: Terrence Wilson <Terrence.Wilson@ghd.com>
Sent: Wednesday, November 8, 2023 2:36 PM
To: Alex Stenta <astenta@envirolab.com.au>
Cc: Tom Duncan <Thomas.Duncan@ghd.com>
Subject: RE: Job No. 39765 - possible additional analysis

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Thanks Alex, #4

If so, please could we have "BH01_1.5" analysed for PFAS (full suite).

Regards,

Terrence Wilson
Environmental Scientist

GHD
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Level 4/211 Victoria Square Adelaide SA 5000 Australia
D +61 8 8111 6514 | **M** +61 467 034 756 | **E** Terrence.Wilson@ghd.com

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From: Alex Stenta <astenta@envirolab.com.au>
Sent: Wednesday, November 8, 2023 2:20 PM
To: Terrence Wilson <Terrence.Wilson@ghd.com>
Subject: RE: Job No. 39765 - possible additional analysis

Hi Terrence,

I think we do still have these samples.

Kind Regards,

Alex Stenta | BD Manager SA | Envirolab Group

Great Science. Great Service.

7a The Parade Norwood SA 5067
T 08 7087 6800 | **M** 0406 350 706
E astenta@envirolab.com.au | **W** www.envirolab.com.au

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

From: Terrence Wilson <Terrence.Wilson@ghd.com>
Sent: Wednesday, November 8, 2023 1:44 PM
To: Alex Stenta <astenta@envirolab.com.au>
Subject: Job No. 39765 - possible additional analysis

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Hi Alex,

Trust you are well…

Please could you check whether you may by any chance still have the samples placed on hold in the following COC. If so, we would like to have the highlighted sample analysed.

Thanks.

GHD

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address
Level 4 - 211 Victoria Square, Adelaide SA 5000
Telephone: (08) 8111 6600

Comp
STAN

Project Number	12616805
Project Name	MFS Port Augusta DSI
GHD Project Manager	Tom Duncan
GHD Contact	Ally Kirkman
GHD PM email	Tom.Duncan@ghd.com
GHD Contact email	Ally.Kirkman@ghd.com
Laboratory	Envirolab Services Adelaide
Laboratory Address	7a The Parade, Norwood SA 5067
Laboratory Contact	Alex Stenta

	Sample I.D.	Date and Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Preservative	Containers: Type J: acid jar B: bag V: vial G: glass bottle P: plastic bottle	Containers: Number	Containers: Volume (ml)	Analys: PFAS Full 30 Analyte Suite
1	BH01_0.1	19-Sep-23		Soil	Ice	J	1		X
2	BH01_0.5	19-Sep-23		Soil	Ice	J	1		
3	BH01_1.0	19-Sep-23		Soil	Ice	J	1		X
4	BH01_1.5	19-Sep-23		Soil	Ice	J	1		
5	BH01_2.0	19-Sep-23		Soil	Ice	J	1		
6	BH01_2.5	19-Sep-23		Soil	Ice	J	1		
7	BH01_3.0	19-Sep-23		Soil	Ice	J	1		
8	BH01_3.5	19-Sep-23		Soil	Ice	J	1		
9	BH02_0.1	19-Sep-23		Soil	Ice	J	1		
10	BH02_0.5	19-Sep-23		Soil	Ice	J	1		X
11	BH02_1.0	19-Sep-23		Soil	Ice	J	1		
12	BH02_1.5	19-Sep-23		Soil	Ice	J	1		
13	BH02_2.0	19-Sep-23		Soil	Ice	J	1		X
14	BH02_2.5	19-Sep-23		Soil	Ice	J	1		
15	BH02_3.0	19-Sep-23		Soil	Ice	J	1		
16	BH02_3.5	19-Sep-23		Soil	Ice	J	1		
17	BH03_0.1	18-Sep-23		Soil	Ice	J	1		
18	BH03_0.5	18-Sep-23		Soil	Ice	J	1		X
19	BH03_1.0	18-Sep-23		Soil	Ice	J	1		
20	BH03_1.5	18-Sep-23		Soil	Ice	J	1		X
	TOTAL NUMBER OF SAMPLES	100							
	TOTAL NUMBER OF ESKIES	2							

CUSTODY DETAILS
SAMPLER

GHD SERVICE CENTRE	Date/Time	
Received by:		Relinquished by:
COURIER	Date/Time	
Received by Couner:		Relinquished by:
LABORATORY	Date/Time	
Received by Lab:		Relinquished by:
	Date/Time	

Terrence Wilson
Environmental Scientist

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→ The Power of Commitment
Connect

Envirolab Services Pty Ltd
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25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 39765-B

Client Details

Client	GHD SA
Attention	Terrence Wilson
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12616805**
Number of Samples	102 Soil, 3 Water
Date samples received	22/09/2023
Date completed instructions received	08/11/2011

Analysis Details

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

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

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

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

Report Details

Date results requested by	15/11/2023
Date of Issue	15/11/2023

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

Results Approved By
Azrin Akram, Senior Chemist
Chris De Luca, Assistant Lab Manager

Authorised By
Pamela Adams, Laboratory Manager

PFAS in Soil Extended		
Our Reference		39765-B-4
Your Reference	UNITS	BH01_1.5
Date Sampled		19/09/2023
Type of sample		Soil
Date prepared	-	11/11/2023
Date analysed	-	11/11/2023
Perfluorobutanesulfonic acid	µg/kg	3.3
Perfluoropentanesulfonic acid	µg/kg	8.4
Perfluorohexanesulfonic acid PFHxS	µg/kg	72
Perfluoroheptanesulfonic acid	µg/kg	11
Perfluorooctanesulfonic acid PFOS	µg/kg	280
Perfluorodecanesulfonic acid	µg/kg	0.4
Perfluorobutanoic acid	µg/kg	0.6
Perfluoropentanoic acid	µg/kg	2.9
Perfluorohexanoic acid	µg/kg	20
Perfluoroheptanoic acid	µg/kg	2.7
Perfluorooctanoic acid PFOA	µg/kg	7.9
Perfluorononanoic acid	µg/kg	<0.2
Perfluorodecanoic acid	µg/kg	<0.5
Perfluoroundecanoic acid	µg/kg	<0.5
Perfluorododecanoic acid	µg/kg	<0.5
Perfluorotridecanoic acid	µg/kg	<0.5
Perfluorotetradecanoic acid	µg/kg	<5
4:2 FTS	µg/kg	<0.1
6:2 FTS	µg/kg	2.6
8:2 FTS	µg/kg	<0.2
10:2 FTS	µg/kg	<0.2
Perfluorooctane sulfonamide	µg/kg	<1
N-Methyl perfluorooctane sulfonamide	µg/kg	<1
N-Ethyl perfluorooctanesulfon -amide	µg/kg	<1
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	<1
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	<5
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2
Surrogate $^{13}C_8$ PFOS	%	93
Surrogate $^{13}C_2$ PFOA	%	107
Extracted ISTD $^{13}C_3$ *PFBS*	%	86
Extracted ISTD $^{18}O_2$ *PFHxS*	%	101
Extracted ISTD $^{13}C_4$ *PFOS*	%	105
Extracted ISTD $^{13}C_4$ *PFBA*	%	98

PFAS in Soil Extended		
Our Reference		39765-B-4
Your Reference	UNITS	BH01_1.5
Date Sampled		19/09/2023
Type of sample		Soil
Extracted ISTD $^{13}C_3$ *PFPeA*	%	89
Extracted ISTD $^{13}C_2$ *PFHxA*	%	81
Extracted ISTD $^{13}C_4$ *PFHpA*	%	75
Extracted ISTD $^{13}C_4$ *PFOA*	%	86
Extracted ISTD $^{13}C_5$ *PFNA*	%	#
Extracted ISTD $^{13}C_2$ *PFDA*	%	101
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	113
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	119
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	166
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	79
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	85
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	76
Extracted ISTD $^{13}C_8$ *FOSA*	%	107
Extracted ISTD d_3 *N MeFOSA*	%	91
Extracted ISTD d_5 *NEtFOSA*	%	98
Extracted ISTD d_7 *N MeFOSE*	%	80
Extracted ISTD d_9 *N EtFOSE*	%	84
Extracted ISTD d_3 *N MeFOSAA*	%	109
Extracted ISTD d_5 *N EtFOSAA*	%	106
Total Positive PFHxS & PFOS	µg/kg	350
Total Positive PFOS & PFOA	µg/kg	290
Total Positive PFAS	µg/kg	410

Moisture		
Our Reference		39765-B-4
Your Reference	UNITS	BH01_1.5
Date Sampled		19/09/2023
Type of sample		Soil
Date prepared	-	10/11/2023
Date analysed	-	11/11/2023
Moisture	%	7.9

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105°C for a minimum of 12 hours.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.4 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Soil Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorobutanesulfonic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Perfluoropentanesulfonic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Perfluoroheptanesulfonic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Perfluorodecanesulfonic acid	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	91	[NT]
Perfluorobutanoic acid	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	107	[NT]
Perfluoropentanoic acid	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	101	[NT]
Perfluorohexanoic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	115	[NT]
Perfluoroheptanoic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Perfluorononanoic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Perfluorodecanoic acid	µg/kg	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	102	[NT]
Perfluoroundecanoic acid	µg/kg	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	103	[NT]
Perfluorododecanoic acid	µg/kg	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	104	[NT]
Perfluorotridecanoic acid	µg/kg	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	130	[NT]
Perfluorotetradecanoic acid	µg/kg	5	Org-029	<5	[NT]	[NT]	[NT]	[NT]	94	[NT]
4:2 FTS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
6:2 FTS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
8:2 FTS	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	91	[NT]
10:2 FTS	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	92	[NT]
Perfluorooctane sulfonamide	µg/kg	1	Org-029	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
N-Methyl perfluorooctane sulfonamide	µg/kg	1	Org-029	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]
N-Ethyl perfluorooctanesulfon -amide	µg/kg	1	Org-029	<1	[NT]	[NT]	[NT]	[NT]	87	[NT]
N-Me perfluorooctanesulfonamid -oethanol	µg/kg	1	Org-029	<1	[NT]	[NT]	[NT]	[NT]	139	[NT]
N-Et perfluorooctanesulfonamid -oethanol	µg/kg	5	Org-029	<5	[NT]	[NT]	[NT]	[NT]	106	[NT]
MePerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	120	[NT]
EtPerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	107	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	87	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	101	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD $^{13}C_3$ PFBS	%		Org-029	91	[NT]	[NT]	[NT]	[NT]	91	[NT]

QUALITY CONTROL: PFAS in Soil Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	94	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	103	[NT]	[NT]	[NT]	[NT]	100	[NT]
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	102	[NT]	[NT]	[NT]	[NT]	95	[NT]
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	88	[NT]
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	89	[NT]	[NT]	[NT]	[NT]	85	[NT]
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	93	[NT]	[NT]	[NT]	[NT]	86	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	97	[NT]	[NT]	[NT]	[NT]	90	[NT]
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	90	[NT]
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	97	[NT]	[NT]	[NT]	[NT]	102	[NT]
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	116	[NT]	[NT]	[NT]	[NT]	118	[NT]
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	113	[NT]	[NT]	[NT]	[NT]	116	[NT]
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	113	[NT]	[NT]	[NT]	[NT]	142	[NT]
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	86	[NT]	[NT]	[NT]	[NT]	79	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	97	[NT]	[NT]	[NT]	[NT]	91	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	85	[NT]	[NT]	[NT]	[NT]	90	[NT]
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	107	[NT]	[NT]	[NT]	[NT]	106	[NT]
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	79	[NT]	[NT]	[NT]	[NT]	86	[NT]
Extracted ISTD d_5 *NEtFOSA*	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	102	[NT]
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	85	[NT]	[NT]	[NT]	[NT]	80	[NT]

QUALITY CONTROL: PFAS in Soil Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	113	[NT]	[NT]	[NT]	[NT]	108	[NT]
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	104	[NT]	[NT]	[NT]	[NT]	96	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

PFAS: For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

CHAIN OF CUSTODY RECORD
GHD Pty Ltd

GHD Adelaide Office Address	Completion Date / Turnaround	Quote #
Level 4 - 211 Victoria Square, Adelaide SA 5000 Telephone: (08) 8111 8600	STANDARD	Quote 230726GHDS

Project Number	12519805
Project Name	MFS Port Augusta DSI
GHD Project Manager	Tom Duncan
GHD Contact	Josh Anderson
GHD PM email	Tom.Duncan@ghd.com
GHD Contact email	Josh.Anderson2@ghd.com

Laboratory	Eurofins
Laboratory Address	6 Monterey Road, Dandenong VIC 3175
Laboratory Contact	Amy Meunier

COURIER AND LABORATORY INSTRUCTIONS:

- Sign chain of custody document on receipt and release of samples, between each party.
- Samples are to be delivered to the laboratory address shown.
- Laboratory contact should sign the COC and send a copy (via email) to the GHD Project Manager and GHD Contact, along with a sample receipt notice, within 24 hours of receipt.
- A signed copy of the COC should be returned to the GHD Project Manager and GHD Contact with the results via email at the completion of analysis as requested.
- All results should reference the Job Number and Project Name.
- All results should be provided in NATA accredited pdf format and ESDAT format.

Sample I.D.	Date and Time	Composite Sample	Matrix (S: Soil, SB: Solid, W: Water, A: Air, SW: Groundwater)	Preservative	Containers: Type (V: Vial / G: glass bottle, P: plastic bottle)	Containers: Number	Containers: Volume (ml)	Analyses Required: PFAS Full 30 Analyte Suite	HOLD	SEND TO EUROFINS	SAMPLE COMMENTS
MW01	26-Sep-23		GW	Ice	P	2		X			
MW02	26-Sep-23		GW	Ice	P	2		X			
MW03	26-Sep-23		GW	Ice	P	2		X			
RB01	26-Sep-23		GW	Ice	P	2		X			
FD01	26-Sep-23		GW	Ice	P	2		X			
FS01	26-Sep-23		GW	Ice	P	2		X			
TOTAL NUMBER OF SAMPLES	6										
TOTAL NUMBER OF ESKIES	1										

CUSTODY DETAILS

SAMPLER			
	Date/Time	Relinquished by	Date/Time
GHD SERVICE CENTRE			
Received by:	Date/Time	Relinquished by	Date/Time
COURIER			
Received by Courier:	Date/Time	Relinquished by	Date/Time
LABORATORY			
Received by Lab:	Date/Time		

#1051199
3/10/23

Tyrone Gowans

From: Amy Meunier
Sent: Tuesday, 3 October 2023 2:48 PM
To: #AU_CAU001_EnviroSampleVic
Subject: FW: 12616805 12616806 12616807 COCs
Attachments: 12616805_12616806_12616807 _COCs-combined.pdf

Follow Up Flag: Follow up
Flag Status: Completed

INFO: INTERNAL EMAIL - Sent from your own Eurofins email domain.

Hi Tyrone – COC attached for samples received.

Kind regards,

Amy Meunier

Analytical Services Manager
Mobile : +61 477 574 867
Email : AmyMeunier@eurofins.com

Eurofins
6 Monterey Road,
Dandenong VIC 3175
Australia

My office hours are 9am to 5:30pm (Monday to Friday)
If you require sample receipt outside these hours please email envirosamplevic@eurofins.com

eurofins Total Sulfur in Soils by LECO, NATA Accredited LEARN MORE

From: Ally Kirkman <Ally.Kirkman@ghd.com>
Sent: Tuesday, 3 October 2023 1:59 PM
To: Amy Meunier <AmyMeunier@eurofins.com>
Cc: Ben Petticrew <Ben.Petticrew@ghd.com>; Tom Duncan <Thomas.Duncan@ghd.com>
Subject: RE: 12616805 12616806 12616807 COCs

CAUTION: EXTERNAL EMAIL - Sent from an email domain that is not formally trusted by Eurofins. Do not click on links or open attachments unless you recognise the sender and are certain that the content is safe.

Hi Amy,

My apologies, please find the COCs attached (one combined file).

Let me know if you have any queries.

#1031199
3/10/23

Cheers,
Ally

From: Amy Meunier <AmyMeunier@eurofins.com>
Sent: Tuesday, October 3, 2023 12:51 PM

eurofins | Environment Testing

PROJECT INFORMATION

Date Received: ~~27~~ 29/09/2023

Company: GHD

Contact person: Tom Duncan

Contact Number: 0413476581

Contact E-mail: thomas.Duncan@ghd.com

Project Name/site: Port Augusta ~~GME~~, Port Pirie GME, Peterborough GME - MFS

Project Number: Port Pirie - 12616807
Port Augusta - 12616805
Peterborough - 12616806

COC: Attached ☐
E-mailed ☐
Not received ☐

17.0°C
−0.3°C
16.7°C on IB.

#1031199
3/10/23

Last modified on: 16 October 2019	Approved on: 16 October 2019	Version: QS1039_R2
Last modified by: H. Le	Approver: M. Makarios	Page 1 of 1
Editorial Committee: T. Lakeland, F. Sanjaya, H. Le, M. Makarios		Next required review date: 16 October 2022

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Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

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6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

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Eurofins Environment Testing NZ Ltd

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IANZ# 1327	IANZ# 1290	IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd SA
Contact name:	Thomas Duncan
Project name:	MFS PORT AUGUSTA DSI
Project ID:	12616805
Turnaround time:	5 Day
Date/Time received	Oct 3, 2023 1:59 PM
Eurofins reference	1031199

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
✗	Split sample sent to requested external lab.
✗	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Amy Meunier on phone : or by email: AmyMeunier@eurofins.com

Results will be delivered electronically via email to Thomas Duncan - thomas.duncan@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd SA email address.

GHD Pty Ltd
GPO Box 2052
Adelaide
SA 5001

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Thomas Duncan**

Report **1031199-W**
Project name MFS PORT AUGUSTA DSI
Project ID 12616805
Received Date Oct 03, 2023

Client Sample ID			**MW01**	**MW02**	**MW03**	**RB01**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**M23-Oc0004441**	**M23-Oc0004442**	**M23-Oc0004443**	**M23-Oc0004444**
Date Sampled			**Sep 28, 2023**	**Sep 28, 2023**	**Sep 28, 2023**	**Sep 28, 2023**
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	0.12	1.6	0.76	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	0.32	3.2	0.93	< 0.01
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	1.1	11	3.0	< 0.01
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	[N09]0.05	[N09]0.44	[N09]0.23	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	[N09]0.85	[N09]0.34	[N09]0.29	< 0.01
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	85	92	80	82
13C5-PFPeA (surr.)	1	%	55	91	121	134
13C5-PFHxA (surr.)	1	%	59	91	121	120
13C4-PFHpA (surr.)	1	%	72	67	95	124
13C8-PFOA (surr.)	1	%	73	70	90	111
13C5-PFNA (surr.)	1	%	68	72	101	122
13C6-PFDA (surr.)	1	%	71	73	110	104
13C2-PFUnDA (surr.)	1	%	75	70	94	85
13C2-PFDoDA (surr.)	1	%	86	78	86	80
13C2-PFTeDA (surr.)	1	%	61	45	54	55
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	87	83	89	99
D3-N-MeFOSA (surr.)	1	%	71	68	85	94

Client Sample ID			MW01	MW02	MW03	RB01
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			M23-Oc0004441	M23-Oc0004442	M23-Oc0004443	M23-Oc0004444
Date Sampled			Sep 28, 2023	Sep 28, 2023	Sep 28, 2023	Sep 28, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
D5-N-EtFOSA (surr.)	1	%	82	76	92	93
D7-N-MeFOSE (surr.)	1	%	74	72	76	96
D9-N-EtFOSE (surr.)	1	%	70	66	69	101
D5-N-EtFOSAA (surr.)	1	%	47	44	70	95
D3-N-MeFOSAA (surr.)	1	%	44	47	75	106
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	[N09]0.77	[N09]7.0	[N09]3.1	< 0.01
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	0.23	3.4	1.5	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	[N09]0.44	[N09]3.6	[N09]1.5	< 0.01
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]3.2	[N09]14	[N09]6.8	< 0.01
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	[N09]0.20	[N09]0.13	[N09]0.21	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]5.2	[N09]1.9	[N09]0.56	< 0.01
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	69	97	117	132
18O2-PFHxS (surr.)	1	%	73	95	113	106
13C8-PFOS (surr.)	1	%	63	99	115	103
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	0.05	ug/L	0.13	0.21	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	81	75	93	125
13C2-6:2 FTSA (surr.)	1	%	77	83	109	85
13C2-8:2 FTSA (surr.)	1	%	52	59	79	128
13C2-10:2 FTSA (surr.)	1	%	58	59	67	113
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	8.4	15.9	7.36	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	6.05	2.24	0.85	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	9.25	16.24	7.65	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	11.74	39.69	15.67	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	12.61	46.82	18.88	< 0.1

Client Sample ID			FD01	FS01
Sample Matrix			Water	Water
Eurofins Sample No.			M23-Oc0004445	M23-Oc0004446
Date Sampled			Sep 28, 2023	Sep 28, 2023
Test/Reference	LOR	Unit		
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	0.16	0.15
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	0.32	0.32
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	1.1	1.1
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	[N09]0.05	[N09]0.05
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	[N09]0.73	[N09]0.74

Client Sample ID			FD01	FS01
Sample Matrix			Water	Water
Eurofins Sample No.			M23-Oc0004445	M23-Oc0004446
Date Sampled			Sep 28, 2023	Sep 28, 2023
Test/Reference	LOR	Unit		
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	63	77
13C5-PFPeA (surr.)	1	%	70	80
13C5-PFHxA (surr.)	1	%	69	77
13C4-PFHpA (surr.)	1	%	82	93
13C8-PFOA (surr.)	1	%	80	88
13C5-PFNA (surr.)	1	%	72	86
13C6-PFDA (surr.)	1	%	76	89
13C2-PFUnDA (surr.)	1	%	81	99
13C2-PFDoDA (surr.)	1	%	75	94
13C2-PFTeDA (surr.)	1	%	51	57
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	80	88
D3-N-MeFOSA (surr.)	1	%	73	72
D5-N-EtFOSA (surr.)	1	%	78	82
D7-N-MeFOSE (surr.)	1	%	69	79
D9-N-EtFOSE (surr.)	1	%	61	71
D5-N-EtFOSAA (surr.)	1	%	49	63
D3-N-MeFOSAA (surr.)	1	%	48	70
Perfluoroalkyl sulfonic acids (PFSAs)				
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	[N09]0.83	[N09]0.82
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	0.27	0.27
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	[N09]0.49	[N09]0.52
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]3.3	[N09]3.2
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	[N09]0.20	[N09]0.22
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]6.1	[N09]5.2
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	75	85
18O2-PFHxS (surr.)	1	%	66	70
13C8-PFOS (surr.)	1	%	50	64

Client Sample ID			FD01	FS01
Sample Matrix			Water	Water
Eurofins Sample No.			M23-Oc0004445	M23-Oc0004446
Date Sampled			Sep 28, 2023	Sep 28, 2023
Test/Reference	LOR	Unit		
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	0.05	ug/L	0.12	0.12
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	98	108
13C2-6:2 FTSA (surr.)	1	%	76	88
13C2-8:2 FTSA (surr.)	1	%	59	66
13C2-10:2 FTSA (surr.)	1	%	55	69
PFASs Summations				
Sum (PFHxS + PFOS)*	0.01	ug/L	9.4	8.4
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	6.83	5.94
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	10.13	9.14
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	12.71	11.7
Sum of PFASs (n=30)*	0.1	ug/L	13.67	12.71

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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 Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Melbourne	Oct 05, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Melbourne	Oct 05, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Melbourne	Oct 05, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Melbourne	Oct 05, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
PFASs Summations	Melbourne	Oct 03, 2023	
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Site# 2370

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IANZ# 1327	IANZ# 1290	IANZ# 1402

Company Name: GHD Pty Ltd SA
Address: GPO Box 2052
Adelaide
SA 5001

Project Name: MFS PORT AUGUSTA DSI
Project ID: 12616805

Order No.:
Report #: 1031199
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Oct 3, 2023 1:59 PM
Due: Oct 10, 2023
Priority: 5 Day
Contact Name: Thomas Duncan

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	MW01	Sep 28, 2023		Water	M23-Oc0004441	X
2	MW02	Sep 28, 2023		Water	M23-Oc0004442	X
3	MW03	Sep 28, 2023		Water	M23-Oc0004443	X
4	RB01	Sep 28, 2023		Water	M23-Oc0004444	X
5	FD01	Sep 28, 2023		Water	M23-Oc0004445	X
6	FS01	Sep 28, 2023		Water	M23-Oc0004446	X
Test Counts						6

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. 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 SRA.

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.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**µg/L:** micrograms per litre
ppm: parts per million	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
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.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

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%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

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. 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.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. 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 (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	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							
Perfluoroalkyl sulfonamido substances							
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							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	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 (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	81			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	66			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	67			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	58			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	57			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	57			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	69			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	59			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	72			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	53			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	74			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	85			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	68			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	98			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	%	70			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	%	65			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	70			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	79			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	64			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	63			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	66			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	56			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	63			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	64			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	65			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	51			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	61			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	%	71			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	66			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	61			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)	M23-Oc0001079	NCP	%	77			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Oc0004441	CP	%	73			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Oc0004441	CP	%	67			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Oc0004441	CP	%	81			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M23-Oc0004441	CP	%	85			50-150	Pass	
Perfluorononanoic acid (PFNA)	M23-Oc0004441	CP	%	70			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M23-Oc0004441	CP	%	79			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Oc0004441	CP	%	79			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Oc0004441	CP	%	77			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Oc0004441	CP	%	61			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Oc0004441	CP	%	82			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M23-Oc0004441	CP	%	87			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Oc0004441	CP	%	83			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Oc0004441	CP	%	85			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Oc0004441	CP	%	93			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Oc0004441	CP	%	73			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Oc0004441	CP	%	71			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Oc0004441	CP	%	81			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M23-Oc0004441	CP	%	51			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Oc0004441	CP	%	76			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Oc0004441	CP	%	53			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Oc0004441	CP	%	98			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Oc0008822	NCP	%	69			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Oc0004441	CP	%	94			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Oc0001079	NCP	%	59			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Oc0004441	CP	%	69			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Oc0004441	CP	%	71			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Oc0004441	CP	%	91			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Oc0004441	CP	%	77			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Oc0004441	CP	%	81			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)	M23-Oc0008819	NCP	ug/L	3.9	4.2	7.1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M23-Oc0005886	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Oc0005886	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Oc0005886	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Oc0005886	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Oc0005886	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Oc0005886	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Oc0005886	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Oc0011169	NCP	ug/L	0.12	0.12	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Oc0011169	NCP	ug/L	0.02	0.02	1.7	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Oc0005886	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Oc0005886	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Oc0005886	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.
N15	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:

Amy Meunier	Analytical Services Manager
Joseph Edouard	Senior Analyst-PFAS

Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

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Tyrone Gowans

From: Ben Petticrew <Ben.Petticrew@ghd.com>
Sent: Wednesday, 11 October 2023 2:34 PM
To: Amy Meunier
Cc: Tom Duncan; #AU_CAU001_EnviroSampleVic
Subject: RE: Eurofins Test Results, Invoice - Report 1031206 : Site MFS PETERBOROUGH DSI (12616806)
Attachments: 1031201-W_report.pdf; 1031206-W_report.pdf; 1031199-W_report.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: ADDITIONALS

CAUTION: EXTERNAL EMAIL - Sent from an email domain that is not formally trusted by Eurofins. Do not click on links or open attachments unless you recognise the sender and are certain that the content is safe.

Yes please, can we do the same for the other recent batches as well? Analyse MW01 from each batch for major anions, cations and TDS

All attached

Cheers

Ben Petticrew
Technical/Project Director – Contamination Assessment and Remediation

GHD
M 61 460 830 524 **E** ben.petticrew@ghd.com

#1033582

From: Amy Meunier <AmyMeunier@eurofins.com>
Sent: Wednesday, October 11, 2023 1:52 PM
To: Ben Petticrew <Ben.Petticrew@ghd.com>
Cc: Tom Duncan <Thomas.Duncan@ghd.com>; #AU_CAU001_EnviroSampleVic <EnviroSampleVic@eurofins.com>
Subject: RE: Eurofins Test Results, Invoice - Report 1031206 : Site MFS PETERBOROUGH DSI (12616806)

Hi Ben,

No problem, Standard TAT?

Tyrone – additionals below thanks.

Kind regards,

Amy Meunier

Analytical Services Manager
Mobile : +61 477 574 867
Email : AmyMeunier@eurofins.com

Tyrone Gowans

From: Amy Meunier
Sent: Wednesday, 11 October 2023 2:22 PM
To: Ben Petticrew
Cc: Tom Duncan; #AU_CAU001_EnviroSampleVic
Subject: RE: Eurofins Test Results, Invoice - Report 1031206 : Site MFS PETERBOROUGH DSI (12616806)

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: ADDITIONALS

INFO: INTERNAL EMAIL - Sent from your own Eurofins email domain.

Hi Ben,

No problem, Standard TAT?

Tyrone – additionals below thanks.

Kind regards,

Amy Meunier

Analytical Services Manager
Mobile : +61 477 574 867
Email : AmyMeunier@eurofins.com

Eurofins
6 Monterey Road,
Dandenong VIC 3175
Australia

My office hours are 9am to 5:30pm (Monday to Friday)
If you require sample receipt outside these hours please email envirosamplevic@eurofins.com

From: Ben Petticrew <Ben.Petticrew@ghd.com>
Sent: Wednesday, 11 October 2023 2:02 PM
To: Amy Meunier <AmyMeunier@eurofins.com>
Cc: Tom Duncan <Thomas.Duncan@ghd.com>
Subject: RE: Eurofins Test Results, Invoice - Report 1031206 : Site MFS PETERBOROUGH DSI (12616806)

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Hi Amy,

Yes please add for sample MW01. If we can get major anions and cations as well that would be good

Cheers

Ben Petticrew
Technical/Project Director – Contamination Assessment and Remediation

GHD
M 61 460 830 524 **E** ben.petticrew@ghd.com

From: Amy Meunier <AmyMeunier@eurofins.com>
Sent: Wednesday, October 11, 2023 12:57 PM
To: Ben Petticrew <Ben.Petticrew@ghd.com>
Cc: Tom Duncan <Thomas.Duncan@ghd.com>
Subject: RE: Eurofins Test Results, Invoice - Report 1031206 : Site MFS PETERBOROUGH DSI (12616806)

Hi Ben,

Yes this should be possible, would you like to request this as additional analysis?

Kind regards,

Amy Meunier

Analytical Services Manager
Mobile : +61 477 574 867
Email : AmyMeunier@eurofins.com

Eurofins
6 Monterey Road,
Dandenong VIC 3175
Australia

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If you require sample receipt outside these hours please email envirosamplevic@eurofins.com

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From: Ben Petticrew <Ben.Petticrew@ghd.com>
Sent: Wednesday, 11 October 2023 1:13 PM
To: Amy Meunier <AmyMeunier@eurofins.com>
Cc: Tom Duncan <Thomas.Duncan@ghd.com>
Subject: FW: Eurofins Test Results, Invoice - Report 1031206 : Site MFS PETERBOROUGH DSI (12616806)

CAUTION: EXTERNAL EMAIL - Sent from an email domain that is not formally trusted by Eurofins. Do not click on links or open attachments unless you recognise the sender and are certain that the content is safe.

Hey Amy,

Possible to have TDS run on these water samples?

Cheers

Ben Petticrew
Technical/Project Director – Contamination Assessment and Remediation

GHD
M 61 460 830 524 **E** ben.petticrew@ghd.com

From: Ben Petticrew <Ben.Petticrew@ghd.com>
Sent: Monday, October 9, 2023 11:39 AM
To: Nicole Peachey <Nicole.Peachey@ghd.com>
Subject: FW: Eurofins Test Results, Invoice - Report 1031206 : Site MFS PETERBOROUGH DSI (12616806)

Ben Petticrew
Technical/Project Director – Contamination Assessment and Remediation

GHD
M 61 460 830 524 **E** ben.petticrew@ghd.com

From: Tom Duncan <tom.duncan@ghd.com>
Sent: Friday, October 6, 2023 3:53 PM
To: Ally Kirkman <Ally.Kirkman@ghd.com>
Cc: Ben Petticrew <Ben.Petticrew@ghd.com>
Subject: FW: Eurofins Test Results, Invoice - Report 1031206 : Site MFS PETERBOROUGH DSI (12616806)

Tom Duncan (he/him)
B. Engineering (Environmental) (Hons)
Senior Environmental Engineer

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Level 9, 180 Lonsdale Street, Melbourne, VIC 3000
D 61 0 8687 8327 **M** 61 413 476 581 **E** Tom.Duncan@ghd.com

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From: AmyMeunier@eurofins.com <AmyMeunier@eurofins.com>
Sent: Friday, October 6, 2023 3:07 PM
To: Tom Duncan <tom.duncan@ghd.com>
Cc: GHD Lab Reports <GHDLabReports@ghd.com>
Subject: Eurofins Test Results, Invoice - Report 1031206 : Site MFS PETERBOROUGH DSI (12616806)

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Eurofins Environment Testing Australia Pty Ltd

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NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

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Penrose,	Rolleston,	Gate Pa,
Auckland 1061	Christchurch 7675	Tauranga 3112
Tel: +64 9 526 4551	Tel: +64 3 343 5201	Tel: +64 9 525 0568
IANZ# 1327	IANZ# 1290	IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd SA
Contact name:	Ben Petticrew
Project name:	MFS PORT AUGUSTA DSI
Project ID:	12616805/6/7
Turnaround time:	5 Day
Date/Time received	Oct 11, 2023 2:34 PM
Eurofins reference	1033582

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Amy Meunier on phone : or by email: AmyMeunier@eurofins.com

Results will be delivered electronically via email to Ben Petticrew - ben.petticrew@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd SA email address.

GHD Pty Ltd
GPO Box 2052
Adelaide
SA 5001

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Ben Petticrew**

Report **1033582-W**
Project name MFS PORT AUGUSTA DSI
Project ID 12616805/6/7
Received Date Oct 11, 2023

Client Sample ID			**MW01 (12616805)**	**MW01 (12616807)**	**MW01 (12616806)**
Sample Matrix			**Water**	**Water**	**Water**
Eurofins Sample No.			**M23-Oc0022406**	**M23-Oc0022407**	**M23-Oc0022408**
Date Sampled			**Sep 28, 2023**	**Sep 28, 2023**	**Sep 27, 2023**
Test/Reference	LOR	Unit			
Ammonia (as N)	0.01	mg/L	0.06	0.77	0.15
Chloride	1	mg/L	2000	30000	270
Nitrate (as N)	0.02	mg/L	160	0.07	1.7
Sulphate (as SO4)	5	mg/L	300	6400	120
Total Dissolved Solids Dried at 180 °C ± 2 °C	10	mg/L	3200	43000	1200
Alkalinity (speciated)					
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	780	1100	1200
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10	< 10	< 10
Alkali Metals					
Calcium	0.5	mg/L	75	850	34
Magnesium	0.5	mg/L	160	2300	57
Potassium	0.5	mg/L	150	420	20
Sodium	0.5	mg/L	1200	15000	410

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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
Eurofins Suite B11			
Ammonia (as N)	Melbourne	Oct 12, 2023	28 Days
- Method: LTM-INO-4450 Determination of Nitrogen Species by Discrete Analyser			
Chloride	Melbourne	Oct 12, 2023	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
Nitrate (as N)	Melbourne	Oct 12, 2023	28 Days
- Method: LTM-INO-4450 Determination of Nitrogen Species by Discrete Analyser			
Sulphate (as SO4)	Melbourne	Oct 12, 2023	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
Alkalinity (speciated)	Melbourne	Oct 12, 2023	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Alkali Metals	Melbourne	Oct 12, 2023	180 Days
- Method: LTM-MET-3010 Alkali Metals Sulfur Silicon Phosphorus by ICP-AES			
Total Dissolved Solids Dried at 180 °C ± 2 °C	Melbourne	Oct 12, 2023	28 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	Tel: +61 2 4968 8448
Tel: +61 3 8564 5000	Tel: +61 3 8564 5000	Tel: +61 2 9900 8400	Tel: +61 2 6113 8091	Tel: +61 7 3902 4600	NATA# 1261
NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	Site# 25079 & 25289
Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377
Site# 2370

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954

Auckland	Christchurch	Tauranga
35 O'Rorke Road	43 Detroit Drive	1277 Cameron Road,
Penrose,	Rolleston,	Gate Pa,
Auckland 1061	Christchurch 7675	Tauranga 3112
Tel: +64 9 526 4551	Tel: +64 3 343 5201	Tel: +64 9 525 0568
IANZ# 1327	IANZ# 1290	IANZ# 1402

Company Name: GHD Pty Ltd SA
Address: GPO Box 2052
Adelaide
SA 5001

Project Name: MFS PORT AUGUSTA DSI
Project ID: 12616805/6/7

Order No.:
Report #: 1033582
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Oct 11, 2023 2:34 PM
Due: Oct 18, 2023
Priority: 5 Day
Contact Name: Ben Petticrew

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						Eurofins Suite B11	Total Dissolved Solids Dried at 180 °C ± 2 °C
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	MW01 (12616805)	Sep 28, 2023		Water	M23-Oc0022406	X	X
2	MW01 (12616807)	Sep 28, 2023		Water	M23-Oc0022407	X	X
3	MW01 (12616806)	Sep 27, 2023		Water	M23-Oc0022408	X	X
Test Counts						3	3

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. 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 SRA.

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.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**µg/L:** micrograms per litre
ppm: parts per million	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
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.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

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%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

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. 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.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. 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							
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Chloride	mg/L	< 1			1	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Sulphate (as SO4)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180 °C ± 2 °C	mg/L	< 10			10	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO3)	mg/L	< 10			10	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Ammonia (as N)	%	127			70-130	Pass	
Chloride	%	103			70-130	Pass	
Sulphate (as SO4)	%	119			70-130	Pass	
Total Dissolved Solids Dried at 180 °C ± 2 °C	%	96			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO3)	%	104			70-130	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	88			80-120	Pass	
Magnesium	%	95			80-120	Pass	
Potassium	%	93			80-120	Pass	
Sodium	%	93			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M23-Oc0023585	NCP	%	113			75-125	Pass	
Magnesium	M23-Oc0024093	NCP	%	105			75-125	Pass	
Potassium	M23-Oc0023585	NCP	%	109			75-125	Pass	
Sodium	M23-Oc0024093	NCP	%	104			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	M23-Oc0022934	NCP	mg/L	0.73	0.73	<1	30%	Pass	
Chloride	M23-Oc0023588	NCP	mg/L	9.5	9.6	<1	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	M23-Oc0024067	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Carbonate Alkalinity (as CaCO3)	M23-Oc0024067	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M23-Oc0023585	NCP	mg/L	360	370	3.4	30%	Pass	
Magnesium	M23-Oc0023585	NCP	mg/L	1200	1300	3.5	30%	Pass	
Potassium	M23-Oc0023585	NCP	mg/L	370	380	4.6	30%	Pass	
Sodium	M23-Oc0016009	NCP	mg/L	16000	17000	2.0	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Catherine Wilson	Analytical Services Manager
Caitlin Breeze	Senior Analyst-Inorganic
Mary Makarios	Senior Analyst-Inorganic
Mary Makarios	Senior Analyst-Metal

Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

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Appendix G

Tabulated Analytical Reports

		Inorganics	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids							
		Moisture (%)	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)
		%	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		0.1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0005	0.0005
PFAS NEMP 2.0 2020 Ecological direct exposure							1						10			
PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites							0.14									
PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)					2		2						20			
SA MFS Site Specific Criteria - Metropolitan (Staffed)					40		40						50			
Location Code	**Date**	**Lab Report Number**	**Field ID**	**Depth**													
BH01	19 Sep 2023	39765	BH01_0.1	0.1 - 0.2	4.9	< 0.0001	< 0.0001	0.0017	0.0003	0.054	0.0004	< 0.0002	< 0.0002	< 0.0001	< 0.0001	0.0003	< 0.0001	< 0.0005	< 0.0005
			BH01_1.0	1.0 - 1.1	8.8	0.0004	0.0027	0.051	0.0038	0.15	0.0006	< 0.0002	0.0004	0.0043	0.0016	0.0042	0.0001	< 0.0005	< 0.0005
		39765-B	BH01_1.5	1.5 - 1.6	7.9	0.0033	0.0084	0.072	0.011	0.28	0.0004	0.0006	0.0029	0.02	0.0027	0.0079	< 0.0002	< 0.0005	< 0.0005
BH02	19 Sep 2023	39765	BH02_0.1	0.1 - 0.2	10	0.0002	0.0003	0.0031	0.0001	0.0021	< 0.0002	< 0.0002	0.0005	0.0009	0.0004	0.0002	0.0002	< 0.0005	< 0.0005
			BH02_1.5	1.5 - 1.6	10	0.0036	0.0038	0.022	0.0005	0.0051	< 0.0002	0.0003	0.001	0.0068	0.0006	0.0007	< 0.0001	< 0.0005	< 0.0005
BH03	18 Sep 2023	39765	BH03_0.1	0.1 - 0.2	3.6	0.0040	0.0072	0.079	0.0050	0.042	< 0.0002	0.001	0.0021	0.014	0.0029	0.01	0.001	< 0.0005	< 0.0005
			BH03_1.0	1.0 - 1.1	7.2	0.0094	0.0081	0.034	0.0006	0.0021	< 0.0002	0.0026	0.0050	0.026	0.0015	0.0014	< 0.0001	< 0.0005	< 0.0005
BH04	18 Sep 2023	39765	BH04_0.5	0.5 - 0.6	12	0.0096	0.0057	0.059	0.0041	0.0023	< 0.0002	0.0066	0.012	0.033	0.0028	0.012	< 0.0001	< 0.0005	< 0.0005
			BH04_2.0	2.0 - 2.1	15	0.0028	0.0048	0.024	0.0003	0.0026	< 0.0002	0.0002	0.0008	0.011	0.0017	0.0014	< 0.0001	< 0.0005	< 0.0005
BH05	18 Sep 2023	39765	BH05_0.1	0.1 - 0.2	9.9	0.0097	0.0028	0.045	0.017	0.11	< 0.0002	0.0065	0.011	0.019	0.0013	0.0055	0.0003	< 0.0005	< 0.0005
			BH05_1.0	1.0 - 1.1	9.1	0.0083	0.021	0.075	0.0023	0.019	< 0.0002	0.0006	0.001	0.023	0.0038	0.0026	< 0.0001	< 0.0005	< 0.0005
BH06	18 Sep 2023	39765	BH06_0.5	0.5 - 0.6	9.4	0.026*	0.012*	0.03*	0.0004	0.011*	< 0.0002	0.0078*	0.012*	0.063*	0.0013*	0.0014*	< 0.0001	< 0.0005	< 0.0005
			BH06_2.5	2.5 - 2.6	26	0.0027	0.0023	0.0097	0.0002	0.0019	< 0.0002	0.0006	0.001	0.0052	0.0004	0.0003	< 0.0001	< 0.0005	< 0.0005
BH07	19 Sep 2023	39765	BH07_0.5	0.5 - 0.6	9.2	0.0053	0.012	0.12	0.011	0.14	< 0.0002	0.001	0.0023	0.019	0.0034	0.0073	0.0001	< 0.0005	< 0.0005
			BH07_1.0	1.0 - 1.1	6.6	0.0051	0.0072	0.051	0.0017	0.034	< 0.0002	0.001	0.0027	0.017	0.0014	0.0012	< 0.0001	< 0.0005	< 0.0005
MW01	19 Sep 2023	39765	MW01_0.5	0.5 - 0.6	7.1	< 0.0001	< 0.0001	0.0002	< 0.0001	0.0049	< 0.0002	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
			MW01_2.5	2.5 - 2.6	6.6	0.0005	0.0013	0.019	0.0011	0.019	< 0.0002	< 0.0002	< 0.0002	0.0022	0.0006	0.0012	< 0.0001	< 0.0005	< 0.0005
MW02	19 Sep 2023	39765	MW02_0.1	0.1 - 0.2	8.7	0.0002	0.0002	0.0053	0.0030	0.32	0.002	0.0008	0.002	0.0024	0.0007	0.0023	0.0032	0.003	0.0095
			MW02_3.0	3.0 - 3.1	26	0.0027	0.0029	0.02	0.0011	0.031	< 0.0002	0.001	0.0032	0.011	0.0022	0.0026	< 0.0001	< 0.0005	< 0.0005
MW03	19 Sep 2023	39765	MW03_0.5	0.5 - 0.6	8.4	0.0058	0.0031	0.03	0.0010	0.019	< 0.0002	0.0045	0.018	0.017	0.011	0.0019	< 0.0001	< 0.0005	< 0.0005
			MW03_2.0	2.0 - 2.1	18	0.0002*	0.0001	0.0012	< 0.0001	0.0008	< 0.0002	< 0.0002	< 0.0002	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
SS01	19 Sep 2023	39765	SS01	0.0 - 0.1	0.6	0.0002	0.0001	0.0014	0.0003	0.05	0.0009	0.001	0.001	0.0005	0.0002	0.0005	0.0008	0.003	< 0.005
SS02	19 Sep 2023	39765	SS02	0.0 - 0.1	5.4	< 0.0001	< 0.0001	0.0002	0.0002	0.22*	0.0004	< 0.0002	< 0.0002	< 0.0001	< 0.0001	0.0002	0.0005	< 0.0005	< 0.0005
SS03	19 Sep 2023	39765	SS03	0.0 - 0.1	5.8	0.0001	< 0.0001	0.0014	0.0002	0.0023	< 0.0002	0.0005	0.0003	0.0005	0.0003	0.0038	< 0.0001	< 0.0005	< 0.0005
SS04	19 Sep 2023	39765	SS04	0.0 - 0.1	6.1	< 0.0001	< 0.0001	0.0012	0.0006	1	0.0006	< 0.0002	< 0.0002	0.0003	< 0.0001	0.0004	< 0.001	< 0.0005	< 0.0005
SS05	19 Sep 2023	39765	SS05	0.0 - 0.1	5.5	0.0005	0.0002	0.0018	0.0017	1.8	< 0.0002	0.001	0.0008	0.0030	0.0003	0.0004	< 0.001	< 0.0005	< 0.0005
SS06	19 Sep 2023	39765	SS06	0.0 - 0.1	8.6	0.0001	< 0.0001	0.0018	0.0067	0.54	< 0.0002	< 0.0002	< 0.0002	0.0004	< 0.0001	0.0004	0.0003	< 0.0005	< 0.0005
SS07	19 Sep 2023	39765	SS07	0.0 - 0.1	4.3	0.0003	0.0002	0.0035	0.0011	0.11	0.0006	0.0008	0.0007	0.0009	0.0002	0.0007	0.0005	< 0.0005	< 0.005

Note: * Higher QA/QC result reported.

					PFAS - Perfluoroalkyl Carboxylic Acids			PFAS - Perfluoroalkyl Sulfonamide							PFAS - Fluorotelomer Sulfonic Acids			
					Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)
					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					0.0005	0.0005	0.005	0.001	0.001	0.001	0.0002	0.001	0.005	0.0002	0.0001	0.0001	0.0002	0.0002
PFAS NEMP 2.0 2020 Ecological direct exposure																		
PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites																		
PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)																		
SA MFS Site Specific Criteria - Metropolitan (Staffed)																		
Location Code	**Date**	**Lab Report Number**	**Field ID**	**Depth**														
BH01	19 Sep 2023	39765	BH01_0.1	0.1 - 0.2	< 0.0005	< 0.0005	< 0.005	0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0018	< 0.0002	< 0.0002
			BH01_1.0	1.0 - 1.1	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0053	< 0.0002	< 0.0002
		39765-B	BH01_1.5	1.5 - 1.6	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0026	< 0.0002	< 0.0002
BH02	19 Sep 2023	39765	BH02_0.1	0.1 - 0.2	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0004	< 0.0002	< 0.0002
			BH02_1.5	1.5 - 1.6	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002
BH03	18 Sep 2023	39765	BH03_0.1	0.1 - 0.2	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.015	< 0.0002	< 0.0002
			BH03_1.0	1.0 - 1.1	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002
BH04	18 Sep 2023	39765	BH04_0.5	0.5 - 0.6	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002
			BH04_2.0	2.0 - 2.1	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002
BH05	18 Sep 2023	39765	BH05_0.1	0.1 - 0.2	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.069	< 0.0002	< 0.0002
			BH05_1.0	1.0 - 1.1	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002
BH06	18 Sep 2023	39765	BH06_0.5	0.5 - 0.6	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002
			BH06_2.5	2.5 - 2.6	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002
BH07	19 Sep 2023	39765	BH07_0.5	0.5 - 0.6	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002
			BH07_1.0	1.0 - 1.1	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002
MW01	19 Sep 2023	39765	MW01_0.5	0.5 - 0.6	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002
			MW01_2.5	2.5 - 2.6	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0002	< 0.0002	< 0.0002
MW02	19 Sep 2023	39765	MW02_0.1	0.1 - 0.2	0.0007	0.002	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0058	0.0090	0.0035
			MW02_3.0	3.0 - 3.1	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0069	< 0.0002	< 0.0002
MW03	19 Sep 2023	39765	MW03_0.5	0.5 - 0.6	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.02	< 0.0002	< 0.0002
			MW03_2.0	2.0 - 2.1	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002
SS01	19 Sep 2023	39765	SS01	0.0 - 0.1	< 0.005	< 0.0005	< 0.005	< 0.01	< 0.01	< 0.01	< 0.0002	< 0.01	< 0.05	< 0.002	< 0.0001	0.0007	0.0072	0.0096
SS02	19 Sep 2023	39765	SS02	0.0 - 0.1	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0004	0.001	0.0003
SS03	19 Sep 2023	39765	SS03	0.0 - 0.1	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.12	0.0002	< 0.0002
SS04	19 Sep 2023	39765	SS04	0.0 - 0.1	< 0.0005	< 0.0005	< 0.005	0.004	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0007	0.0005	< 0.0002
SS05	19 Sep 2023	39765	SS05	0.0 - 0.1	< 0.0005	< 0.0005	< 0.005	0.005	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0019	0.001	< 0.0002
SS06	19 Sep 2023	39765	SS06	0.0 - 0.1	< 0.0005	< 0.0005	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0005	< 0.0002	< 0.0002
SS07	19 Sep 2023	39765	SS07	0.0 - 0.1	< 0.005	0.0006	< 0.005	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.001	< 0.005	< 0.0002	< 0.0001	0.0002	0.0005	0.0007

Note: * Higher QA/QC result reported.

	PFAS - Sums		
	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)
	mg/kg	mg/kg	mg/kg
EQL	0.0001	0.0001	0.0001
PFAS NEMP 2.0 2020 Ecological direct exposure			
PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites			
PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)	2		
SA MFS Site Specific Criteria - Metropolitan (Staffed)	40		

Location Code	Date	Lab Report Number	Field ID	Depth			
BH01	19 Sep 2023	39765	BH01_0.1	0.1 - 0.2	0.055	0.054	0.059
			BH01_1.0	1.0 - 1.1	0.2	0.16	0.23
		39765-B	BH01_1.5	1.5 - 1.6	0.35	0.29	0.41
BH02	19 Sep 2023	39765	BH02_0.1	0.1 - 0.2	0.0052	0.0023	0.0084
			BH02_1.5	1.5 - 1.6	0.027	0.0058	0.044
BH03	18 Sep 2023	39765	BH03_0.1	0.1 - 0.2	0.12	0.052	0.18
			BH03_1.0	1.0 - 1.1	0.036	0.0035	0.09
BH04	18 Sep 2023	39765	BH04_0.5	0.5 - 0.6	0.061	0.014	0.15
			BH04_2.0	2.0 - 2.1	0.027	0.0041	0.05
BH05	18 Sep 2023	39765	BH05_0.1	0.1 - 0.2	0.16	0.12	0.3
			BH05_1.0	1.0 - 1.1	0.094	0.022	0.16
BH06	18 Sep 2023	39765	BH06_0.5	0.5 - 0.6	0.041*	0.011*	0.1728*
			BH06_2.5	2.5 - 2.6	0.012	0.0022	0.025
BH07	19 Sep 2023	39765	BH07_0.5	0.5 - 0.6	0.26	0.15	0.33
			BH07_1.0	1.0 - 1.1	0.085	0.035	0.12
MW01	19 Sep 2023	39765	MW01_0.5	0.5 - 0.6	0.0051	0.0049	0.0051
			MW01_2.5	2.5 - 2.6	0.038	0.02	0.045
MW02	19 Sep 2023	39765	MW02_0.1	0.1 - 0.2	0.33	0.33	0.38
			MW02_3.0	3.0 - 3.1	0.051	0.033	0.084
MW03	19 Sep 2023	39765	MW03_0.5	0.5 - 0.6	0.049	0.021	0.13
			MW03_2.0	2.0 - 2.1	0.0020	0.0008	0.0023
SS01	19 Sep 2023	39765	SS01	0.0 - 0.1	0.051	0.05	0.077
SS02	19 Sep 2023	39765	SS02	0.0 - 0.1	0.22*	0.22*	0.22*
SS03	19 Sep 2023	39765	SS03	0.0 - 0.1	0.0038	0.0062	0.13
SS04	19 Sep 2023	39765	SS04	0.0 - 0.1	1	1	1
SS05	19 Sep 2023	39765	SS05	0.0 - 0.1	1.8	1.8	1.8
SS06	19 Sep 2023	39765	SS06	0.0 - 0.1	0.55	0.54	0.55
SS07	19 Sep 2023	39765	SS07	0.0 - 0.1	0.11	0.11	0.12

Note: * Higher QA/QC result reported.

Table 2
Analytical Groundwater Results

				PFAS - Perfluoroalkyl Sulfonic Acids							PFAS - Perfluoroalkyl Carboxylic Acids										
				Perfluoropropanesulfonic acid (PFPrS)	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)
				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	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value ecosystem									0.00023						19						
PFAS NEMP 2.0 2020 Interim marine - 95% - slightly-to-moderately disturbed ecosystem									0.13						220						
ADWG 2011 Recreational (v3.7 updated 2022)							0.7		0.7						5.6						
Location Code	**Date**	**Field ID**	**Lab Report Number**																		
MW01	28 Sep 2023	MW01	1031199	0.27*	0.83*	0.52*	3.3*	0.22*	6.1*	< 0.01	0.16*	0.32	1.1	0.05	0.85	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MW02	28 Sep 2023	MW02	1031199	3.4	7.0	3.6	14	0.13	1.9	< 0.01	1.6	3.2	11	0.44	0.34	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
MW03	28 Sep 2023	MW03	1031199	1.5	3.1	1.5	6.8	0.21	0.56	< 0.01	0.76	0.93	3.0	0.23	0.29	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Note: * Higher QA/QC result reported.

Table 2
Analytical Groundwater Results

				PFAS - Perfluoroalkyl Sulfonamide								PFAS - Fluorotelomer Sulfonic Acids				PFAS - Sums					PFAS - Other
				Perfluoropropanes sulfonic acid (PFPrS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of USEPA PFAS (PFOS+ PFOA)*	PFAS (Sum of Total)	Sum of enHealth PFAS (PFHxS+ PFOS + PFOA)*	PFAS (Sum of Total)WA DER List)	Perfluorononane sulfonate (PFNS)
				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	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.05	0.01	0.01	0.01	0.01	0.1	0.01	0.05	0.01
PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value ecosystem																					
PFAS NEMP 2.0 2020 Interim marine - 95% - slightly-to-moderately disturbed ecosystem																					
ADWG 2011 Recreational (v3.7 updated 2022)																0.7					
Location Code	**Date**	**Field ID**	**Lab Report Number**																		
MW01	28 Sep 2023	MW01	1031199	0.27*	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	0.13	< 0.01	< 0.01	9.4*	6.83*	13.67*	10.13*	12.71*	< 0.01
MW02	28 Sep 2023	MW02	1031199	3.4	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	0.21	< 0.01	< 0.01	15.9	2.24	46.82	16.24	39.69	< 0.01
MW03	28 Sep 2023	MW03	1031199	1.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01	< 0.05	< 0.01	< 0.01	7.36	0.85	18.88	7.65	15.67	< 0.01

Note: * Higher QA/QC result reported.

Location Code			BH06			BH06			MW03			MW03			SS02			SS02		
Date			18 Sep 2023			18 Sep 2023	18 Sep 2023		19 Sep 2023			19 Sep 2023	19 Sep 2023		19 Sep 2023			19 Sep 2023	19 Sep 2023	
Field ID			BH06_0.5	FD02		BH06_0.5	FS02		MW03_2.0	FD06		MW03_2.0	FS06		SS02	FD03		SS02	FS03	
Matrix Type			Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
Sample Type			Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D	
Lab Report Number			39765	39765	RPD	39765	1028743	RPD	39765	39765	RPD	39765	1028743	RPD	39765	39765	RPD	39765	1028743	RPD
	Unit	EQL																		
Misc.																				
% Moisture_	%	1	-	-	-	-	10	-	-	-	-	-	21	-	-	-	-	-	2.6	-
Inorganics																				
Moisture (%)	%	0.1	9.4	13	32	9.4	-	-	18	18	0	18	-	-	5.4	4.9	10	5.4	-	-
PFAS - Perfluoroalkyl Sulfonic Acids																				
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005	-	-	-	-	0.011	-	-	-	-	-	< 0.005	-	-	-	-	-	< 0.005	-
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0001	0.013	0.02	**42**	0.013	0.026	**67**	0.0001	0.0002	67	0.0001	< 0.005	-	< 0.0001	< 0.0001	0	< 0.0001	< 0.005	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0001	0.0061	0.01	**48**	0.0061	0.012	**65**	0.0001	0.0001	0	0.0001	< 0.005	-	< 0.0001	< 0.0001	0	< 0.0001	< 0.005	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0001	0.012	0.021	**55**	0.012	0.03	**86**	0.0012	0.0011	9	0.0012	< 0.005	-	0.0002	0.0002	0	0.0002	< 0.005	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0001	0.0004	0.0008	67	0.0004	< 0.005	-	< 0.0001	< 0.0001	0	< 0.0001	< 0.005	0	0.0002	0.0002	0	0.0002	< 0.005	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0001	0.0023	0.0052	**77**	0.0023	0.011	**131**	0.0008	0.0008	0	0.0008	< 0.005	-	0.17	0.19	11	0.17	0.22	26
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002	< 0.0002	< 0.0002	0	< 0.0002	< 0.005	0	< 0.0002	< 0.0002	0	< 0.0002	< 0.005	0	0.0004	< 0.0002	-	0.0004	< 0.005	0
PFAS - Perfluoroalkyl Carboxylic Acids																				
Perfluorobutanoic acid (PFBA)	mg/kg	0.0002	0.0052	0.0063	19	0.0052	0.0078	**40**	< 0.0002	< 0.0002	0	< 0.0002	< 0.005	0	< 0.0002	< 0.0002	0	< 0.0002	< 0.005	0
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	0.0085	0.012	**34**	0.0085	0.012	**34**	< 0.0002	< 0.0002	0	< 0.0002	< 0.005	0	< 0.0002	< 0.0002	0	< 0.0002	< 0.005	0
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0001	0.029	0.049	**51**	0.029	0.063	**74**	0.0001	0.0001	0	0.0001	< 0.005	-	< 0.0001	0.0001	-	< 0.0001	< 0.005	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0001	0.0008	0.0013	48	0.0008	< 0.005	-	< 0.0001	< 0.0001	0	< 0.0001	< 0.005	0	< 0.0001	< 0.0001	0	< 0.0001	< 0.005	0
Perfluorooctanoic acid (PFOA)	mg/kg	0.0001	0.0009	0.0014	43	0.0009	< 0.005	-	< 0.0001	< 0.0001	0	< 0.0001	< 0.005	0	0.0002	0.0002	0	0.0002	< 0.005	0
Perfluorononanoic acid (PFNA)	mg/kg	0.0001	< 0.0001	< 0.0001	0	< 0.0001	< 0.005	0	< 0.0001	< 0.0001	0	< 0.0001	< 0.005	0	0.0005	0.0005	0	0.0005	< 0.005	0
Perfluorodecanoic acid (PFDA)	mg/kg	0.0005	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0005	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0005	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0
Perfluorotridecanoic acid	mg/kg	0.0005	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0	< 0.0005	< 0.0005	0	< 0.0005	< 0.005	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.005	< 0.005	< 0.005	0	< 0.005	< 0.005	0	< 0.005	< 0.005	0	< 0.005	< 0.005	0	< 0.005	< 0.005	0	< 0.005	< 0.005	0
PFAS - Perfluoroalkyl Sulfonamide																				
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.001	< 0.001	< 0.001	0	< 0.001	< 0.005	0	< 0.001	< 0.001	0	< 0.001	< 0.005	0	< 0.001	< 0.001	0	< 0.001	< 0.005	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.001	< 0.001	< 0.001	0	< 0.001	< 0.005	0	< 0.001	< 0.001	0	< 0.001	< 0.005	0	< 0.001	< 0.001	0	< 0.001	< 0.005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.001	< 0.001	< 0.001	0	< 0.001	< 0.005	0	< 0.001	< 0.001	0	< 0.001	< 0.005	0	< 0.001	< 0.001	0	< 0.001	< 0.005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	0.0002	< 0.0002	< 0.0002	0	< 0.0002	< 0.01	0	< 0.0002	< 0.0002	0	< 0.0002	< 0.01	0	< 0.0002	< 0.0002	0	< 0.0002	< 0.01	0
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	mg/kg	0.001	< 0.001	< 0.001	0	< 0.001	< 0.005	0	< 0.001	< 0.001	0	< 0.001	< 0.005	0	< 0.001	< 0.001	0	< 0.001	< 0.005	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.005	< 0.005	< 0.005	0	< 0.005	< 0.005	0	< 0.005	< 0.005	0	< 0.005	< 0.005	0	< 0.005	< 0.005	0	< 0.005	< 0.005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	0.0002	< 0.0002	< 0.0002	0	< 0.0002	< 0.01	0	< 0.0002	< 0.0002	0	< 0.0002	< 0.01	0	< 0.0002	< 0.0002	0	< 0.0002	< 0.01	0
PFAS - Fluorotelomer Sulfonic Acids																				
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0001	< 0.0001	< 0.0001	0	< 0.0001	< 0.005	0	< 0.0001	< 0.0001	0	< 0.0001	< 0.005	0	< 0.0001	< 0.0001	0	< 0.0001	< 0.005	0
6:2 Fluorotelomer Sulfonate (6:2 FTS)	mg/kg	0.0001	< 0.0001	0.0003	-	< 0.0001	< 0.01	0	< 0.0001	< 0.0001	0	< 0.0001	< 0.01	0	0.0004	0.0003	29	0.0004	< 0.01	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0002	< 0.0002	< 0.0002	0	< 0.0002	< 0.005	0	< 0.0002	< 0.0002	0	< 0.0002	< 0.005	0	0.001	0.0007	35	0.001	< 0.005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0002	< 0.0002	< 0.0002	0	< 0.0002	< 0.005	0	< 0.0002	< 0.0002	0	< 0.0002	< 0.005	0	0.0003	0.0003	0	0.0003	< 0.005	0
PFAS - Sums																				
Sum of PFHxS and PFOS	mg/kg	0.0001	0.015	0.026	**54**	0.015	0.041	**93**	0.0020	0.0018	11	0.0020	< 0.005	-	0.17	0.19	11	0.17	0.22	26
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.0001	0.0032	0.0066	**69**	0.0032	0.011	**110**	0.0008	0.0008	0	0.0008	< 0.005	0	0.17	0.19	11	0.17	0.22	26
PFAS (Sum of Total)	mg/kg	0.0001	0.078	0.13	**50**	0.078	0.1728	**76**	0.0023	0.0023	0	0.0023	< 0.05	0	0.17	0.19	11	0.17	0.22	26
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005	-	-	-	-	0.041	-	-	-	-	-	< 0.005	-	-	-	-	-	0.22	-
PFAS (Sum of Total)(WA DER List)	mg/kg	0.01	-	-	-	-	0.1498	-	-	-	-	-	< 0.01	-	-	-	-	-	0.22	-
PFAS																				
Perfluorononane sulfonate	mg/kg	0.005	-	-	-	-	< 0.005	-	-	-	-	-	< 0.005	-	-	-	-	-	< 0.005	-

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

Location Code			MW01			MW01		
Date			28 Sep 2023			28 Sep 2023		
Field ID			MW01	FS01		MW01	FD01	
Matrix Type			Water	Water		Water	Water	
Sample Type			Normal	Field_S	RPD	Normal	Field_D	RPD
	Unit	EQL						
PFAS - Perfluoroalkyl Sulfonic Acids								
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	0.23	0.27	16	0.23	0.27	16
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.77	0.82	6	0.77	0.83	7
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.44	0.52	17	0.44	0.49	11
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	3.2	3.2	0	3.2	3.3	3
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.20	0.22	10	0.20	0.20	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	5.2	5.2	0	5.2	6.1	16
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	< 0.01	< 0.01	0	< 0.01	< 0.01	0
PFAS - Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	µg/L	0.05	0.12	0.15	22	0.12	0.16	29
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.32	0.32	0	0.32	0.32	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	1.1	1.1	0	1.1	1.1	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.05	0.05	0	0.05	0.05	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.85	0.74	14	0.85	0.73	15
Perfluorononanoic acid (PFNA)	µg/L	0.01	< 0.01	< 0.01	0	< 0.01	< 0.01	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	< 0.01	< 0.01	0	< 0.01	< 0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	< 0.01	< 0.01	0	< 0.01	< 0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	< 0.01	< 0.01	0	< 0.01	< 0.01	0
Perfluorotridecanoic acid	µg/L	0.01	< 0.01	< 0.01	0	< 0.01	< 0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	< 0.01	< 0.01	0	< 0.01	< 0.01	0
PFAS - Perfluoroalkyl Sulfonamide								
Perfluorooctane sulfonamide (FOSA)	µg/L	0.05	< 0.05	< 0.05	0	< 0.05	< 0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	< 0.05	< 0.05	0	< 0.05	< 0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	< 0.05	< 0.05	0	< 0.05	< 0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.05	< 0.05	< 0.05	0	< 0.05	< 0.05	0
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	< 0.05	< 0.05	0	< 0.05	< 0.05	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	< 0.05	< 0.05	0	< 0.05	< 0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid	µg/L	0.05	< 0.05	< 0.05	0	< 0.05	< 0.05	0
PFAS - Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	< 0.01	< 0.01	0	< 0.01	< 0.01	0
6:2 Fluorotelomer sulfonate (6:2 FTS)	µg/L	0.05	0.13	0.12	8	0.13	0.12	8
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	< 0.01	< 0.01	0	< 0.01	< 0.01	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	< 0.01	< 0.01	0	< 0.01	< 0.01	0
PFAS - Sums								
Sum of PFHxS and PFOS	µg/L	0.01	8.4	8.4	0	8.4	9.4	11
Sum of USEPA PFAS (PFOS + PFOA)*	µg/L	0.01	6.05	5.94	2	6.05	6.83	12
PFAS (Sum of Total)	µg/L	0.1	12.61	12.71	1	12.61	13.67	8
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	9.25	9.14	1	9.25	10.13	9
PFAS (Sum of Total)(WA DER List)	µg/L	0.05	11.74	11.7	0	11.74	12.71	8
PFAS								
Perfluorononane sulfonate	µg/L	0.01	< 0.01	< 0.01	0	< 0.01	< 0.01	0

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

		Date	19 Sep 2023			28 Sep 2023
		Field ID	FB01	RB01	RB02	RB01
		Matrix Type	Water	Water	Water	Water
		Lab Report Number	39765	39765	39765	1031199
	Unit	EQL				
PFAS - Perfluoroalkyl Sulfonic Acids						
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	< 0.01
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	< 0.02	< 0.02	< 0.02	< 0.01
PFAS - Perfluoroalkyl Carboxylic Acids						
Perfluorobutanoic acid (PFBA)	µg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.05
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	< 0.02	< 0.02	< 0.02	< 0.01
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctanoic acid (PFOA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorononanoic acid (PFNA)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)	µg/L	0.01	< 0.02	< 0.02	< 0.02	< 0.01
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	< 0.02	< 0.02	< 0.02	< 0.01
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	< 0.05	< 0.05	< 0.05	< 0.01
Perfluorotridecanoic acid	µg/L	0.01	< 0.1	< 0.1	< 0.1	< 0.01
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	< 0.5	< 0.5	< 0.5	< 0.01
PFAS - Perfluoroalkyl Sulfonamide						
Perfluorooctane sulfonamide (FOSA)	µg/L	0.05	< 0.1	< 0.1	< 0.1	< 0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	< 0.1	< 0.1	< 0.1	< 0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.05
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	< 0.5	< 0.5	< 0.5	< 0.05
N-Ethyl perfluorooctane sulfonamidoacetic acid	µg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.05
PFAS - Fluorotelomer Sulfonic Acids						
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	< 0.02	< 0.02	< 0.02	< 0.01
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	< 0.02	< 0.02	< 0.02	< 0.01
PFAS - Sums						
Sum of PFHxS and PFOS	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sum of USEPA PFAS (PFOS + PFOA)*	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01
PFAS (Sum of Total)	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.1
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	-	-	-	< 0.01
PFAS (Sum of Total)(WA DER List)	µg/L	0.05	-	-	-	< 0.05
PFAS						
Perfluorononane sulfonate	µg/L	0.01	-	-	-	< 0.01

Appendix H

Well Permits

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	448402
Expiry Date:	04/09/2024

Permission is hereby granted to: GHD PTY LTD
ACN 008 488 373
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Monitoring

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CR 5759/680
   Section 1188
   Hundred of Davenport

2. The authorised activity must be undertaken by a licensed driller.
3. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
4. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
5. Water samples are required from all wells drilled in respect of this permit.
6. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
7. Strata samples are not required.
8. This work may be subject to inspection by the Department's Drilling Inspectors.
9. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

10. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
11. All wells must be drilled vertical unless written permission is obtained from the Minister.
12. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
13. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
14. The activity must not adversely affect water-dependent ecosystems nearby.
15. The activity shall not significantly increase local drawdown.
16. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.
17. The activity shall not adversely affect the quality, quantity and accessibility of water for supply from existing wells operated by other landholders.
18. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
19. The well subject to this permit must not be completed as an industrial water supply well unless prior approval has been obtained from the department.
20. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
21. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
22. Due to known soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well.

NOTES:

1. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
2. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
3. This permit is not transferable.
4. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

5. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
6. This permit is not an approval to clear native vegetation.
7. This permit does not authorise the taking of water from the well for any purpose other than testing.
8. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

Date: 04/09/2023

Sonya Knight
Senior Water Licensing Officer
Delegate of Minister for Climate, Environment and Water

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	448403
Expiry Date:	04/09/2024

Permission is hereby granted to: GHD PTY LTD
ACN 008 488 373
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Monitoring

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CR 5759/680
   Section 1188
   Hundred of Davenport

2. The authorised activity must be undertaken by a licensed driller.
3. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
4. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
5. Water samples are required from all wells drilled in respect of this permit.
6. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
7. Strata samples are not required.
8. This work may be subject to inspection by the Department's Drilling Inspectors.
9. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

10. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
11. All wells must be drilled vertical unless written permission is obtained from the Minister.
12. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
13. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
14. The activity must not adversely affect water-dependent ecosystems nearby.
15. The activity shall not significantly increase local drawdown.
16. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.
17. The activity shall not adversely affect the quality, quantity and accessibility of water for supply from existing wells operated by other landholders.
18. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
19. The well subject to this permit must not be completed as an industrial water supply well unless prior approval has been obtained from the department.
20. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
21. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
22. Due to known soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well.

NOTES:

1. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
2. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
3. This permit is not transferable.
4. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

5. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
6. This permit is not an approval to clear native vegetation.
7. This permit does not authorise the taking of water from the well for any purpose other than testing.
8. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

Date: 04/09/2023

Sonya Knight
Senior Water Licensing Officer
Delegate of Minister for Climate, Environment and Water

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	448404
Expiry Date:	04/09/2024

Permission is hereby granted to: GHD PTY LTD
ACN 008 488 373
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Monitoring

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CR 5759/680
   Section 1188
   Hundred of Davenport

2. The authorised activity must be undertaken by a licensed driller.
3. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
4. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
5. Water samples are required from all wells drilled in respect of this permit.
6. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
7. Strata samples are not required.
8. This work may be subject to inspection by the Department's Drilling Inspectors.
9. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

10. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
11. All wells must be drilled vertical unless written permission is obtained from the Minister.
12. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
13. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
14. The activity must not adversely affect water-dependent ecosystems nearby.
15. The activity shall not significantly increase local drawdown.
16. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.
17. The activity shall not adversely affect the quality, quantity and accessibility of water for supply from existing wells operated by other landholders.
18. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
19. The well subject to this permit must not be completed as an industrial water supply well unless prior approval has been obtained from the department.
20. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
21. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
22. Due to known soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well.

NOTES:

1. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
2. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
3. This permit is not transferable.
4. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

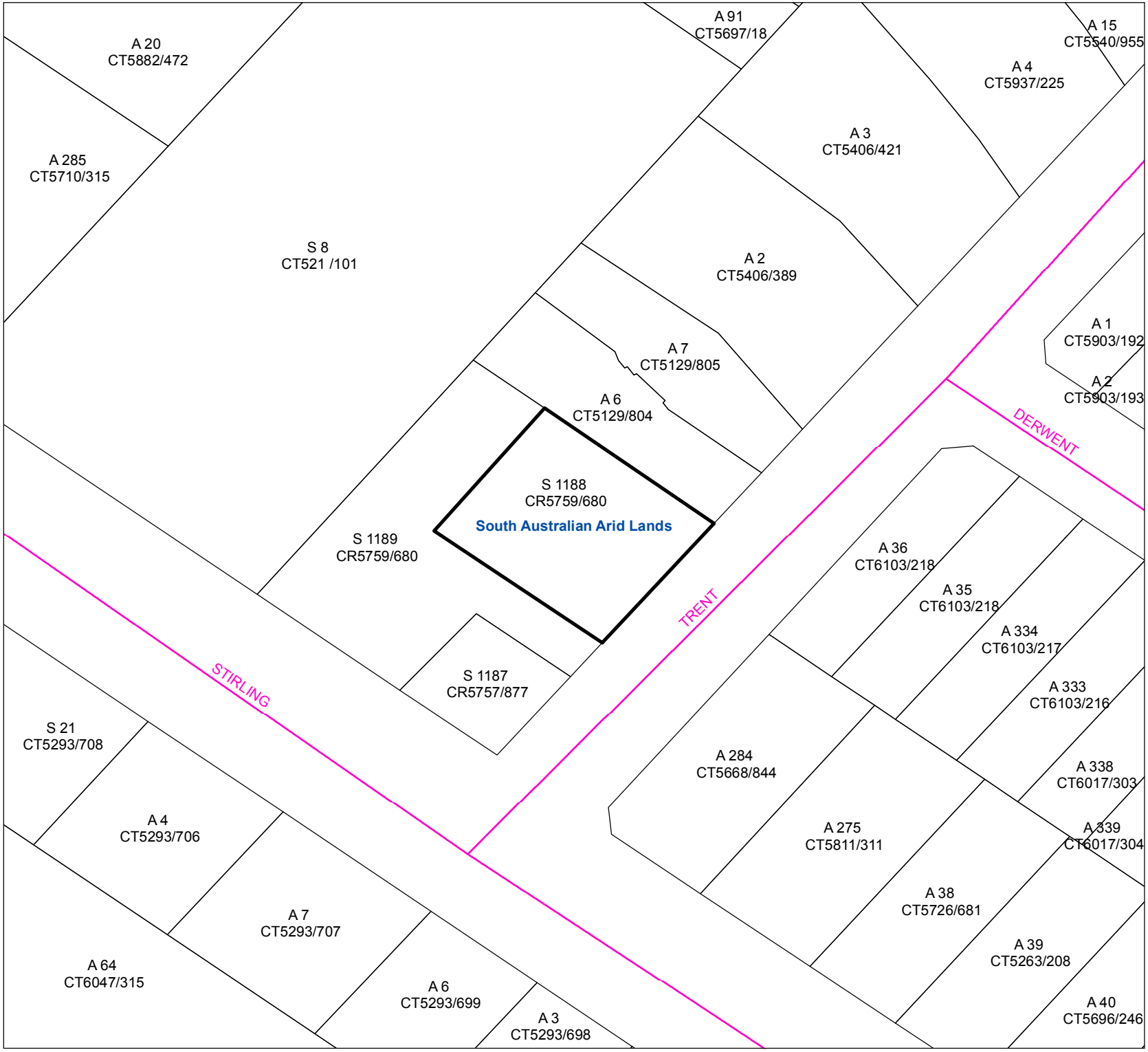
WELL PERMIT

5. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
6. This permit is not an approval to clear native vegetation.
7. This permit does not authorise the taking of water from the well for any purpose other than testing.
8. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

Date: 04/09/2023

Sonya Knight
Senior Water Licensing Officer
Delegate of Minister for Climate, Environment and Water



PLEASE ATTACH WELL LOCATION MAP TO THE DRILLERS REPORT

CLIENT: GHD P/L
Permit No: 448402 TO 448404 (3)
Prescribed Area: NTH
Hundred: DAVENPORT
Suburb: PORT AUGUSTA
NRM Region/Plan: SA AL
CR 5759/680, H330600, S1188 X3

Legend

- DCDB.ParcelCadastreFull
- Topo.Roads
- LANDSCAPE REGIONS
- Prescribed Wells Area
- Prescribed Watercourse

0 25 50
Meters

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Appendix I

Well Survey Results

LINKUP CONSTRUCTION SURVEYS PTY LTD

`

To: Tom Duncan
Company: GHD
Phone: 0413 476 581

From: Lincoln Jeffery
Phone: 0414 840 569
Email: Lincoln@linkupconstructionsurveys.com.au

Date: 18/10/2023

Monitoring well coordinates – Port Augusta MFS

Well or Bore No.	Easting GDA20	Northing GDA20	R.L. Top of Casing A.H.D.	Natural Surface A.H.D.
MW01	760324.826	6401044.765	4.314	4.388
MW02	760295.223	6401009.818	3.524	3.587
MW03	760281.067	6401021.830	3.556	3.636

All Survey information was based from the GDA20 Z53 grid system and Australian Height Datum (AHD), Triangulated from Network Survey Marks.

Appendix J

Groundwater Purge Records

Purging and Sampling Record

Bore ID: MW01

Job Information

Client: MFS
Project: Port Augusta DSI
Proj. No.: 12616805
Sampler: RT/ JA
Date: 28/9/23
Round ……

Sampling Information

Purge Method: Low Flow Bladder Pump
Sample Method: ……
WQ Meter Type: YSI
Flow Cell: Y / N **Pump Depth:** 3.75 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge

Bore Information

SWL(mbTOC): 2.75 m **Logic Check:** ……
Screen: From: ……**to**…… m **Stick Up:** ……m
NAPL Check: …… **Bore Diam.** …… mm
Ref.datum: …… **Well Cap Secure?** YES
Bore Depth: …… m

Field Filtered? Y / N (filter vessel, disposable filter/syringe)

Time (……)	Volume (L)	Temp (ºC)	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*		
4:20	2.0	21.3	7.63	6327	11.04	169.9	2.75	CPM4	Orange-brown, low turbidity, moderate to high sediment load, no sheen, moderate to high flow rate
4:25	4.0	22.4	7.95	8001	10.63	147.0	2.75		V=12.0L purged
4:30	6.0	23.8	7.81	8020	6.69	136.6	2.75		
4:35	8.0	22.7	7.56	7118	5.91	137.7	2.75		
4:40	10.0	23.1	7.55	7092	5.84	136.4	2.75		
4:45	12.0	23.2	7.55	7061	5.97	136.2	2.75		

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

Purging and Sampling Record

Bore ID: MW02

Job Information

Client: MFS
Project: Port Augusta DSI
Proj. No.: 12616805
Sampler: RT/ JA
Date: 28/9/23
Round

Sampling Information

Purge Method: Low Flow Bladder Pump
Sample Method:
WQ Meter Type: YSI
Flow Cell: Y / N **Pump Depth:** 3.0 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge

Bore Information

SWL(mbTOC): 2.0 m **Logic Check:**
Screen: From: to m **Stick Up:** m
NAPL Check: **Bore Diam.** mm
Ref.datum: **Well Cap Secure?** YES
Bore Depth: 4.21 m

Field Filtered? Y / N (filter vessel, disposable filter/syringe)

Time (……..…)	Volume (L)	Temp (ºC)	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*		
3:15	2.0	21.4	7.28	19190	0.51	123.3	2.02	CPM4	Yellowish brown, low turbidity, low to moderate sediment load, no sheen, no odour, moderate to high flow rate
3:18	3.2	21.3	7.27	19191	0.44	111.0	2.02		V=11.6 L purged
3:21	4.4	21.3	7.23	19217	0.38	94.2	2.02		
3:24	3.6	21.2	7.29	19226	0.35	72.2	2.02		
3:27	6.8	21.2	7.27	19269	0.43	58.3	2.02		
3:30	8.0	21.2	7.27	19292	0.39	44.5	2.02		
3:33	9.2	21.2	7.27	19303	0.63	40.5	2.02		
3:36	10.4	21.0	7.27	19300	0.69	30.8	2.02		
3:39	11.6	20.9	7.27	19300	0.70	32.4	2.02		

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

Purging and Sampling Record

Bore ID: MW03

Job Information

Client: MFS
Project: Port Augusta DSI
Proj. No.: 12616805
Sampler: RT/ JA
Date: 28/9/23
Round

Sampling Information

Purge Method: Low Flow Bladder Pump
Sample Method:
WQ Meter Type: YSI
Flow Cell: Y / N **Pump Depth:** 3.20 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge

Bore Information

SWL(mbTOC): 2.02 m **Logic Check:**
Screen: From: to m **Stick Up:** m
NAPL Check: **Bore Diam.** mm
Ref.datum: **Well Cap Secure?** YES
Bore Depth: 4.29 m

Field Filtered? Y / N (filter vessel, disposable filter/syringe)

Time (……..…)	Volume (L)	Temp (ºC)	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*		
2:35	2.0	23.2	7.47	10371	0.32	86.7	2.02	CPM4	Brownish yellow, low turbidity, low to moderate sediment load, no sheen, no odour, moderate to high flow rate
2:38	3.2	22.3	7.42	12151	0.04	58.6	2.02		V=8.0 L purged
2:41	4.4	22.4	7.42	12250	0.16	48.2	2.02		
2:44	5.6	22.4	7.43	12273	0.16	33.1	2.02		
2:47	6.8	22.9	7.43	12290	0.19	30.7	2.02		
2:50	8.0	22.9	7.45	12291	0.21	28.4	0.02		

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

Appendix K

QA/QC Report

Quality Assurance and Quality Control Report

1. GHD QA/QC Assessment

1.1 Laboratories and data set

All samples recovered during the detailed site investigation (DSI) were submitted to Envirolab and Eurofins, which are National Association of Testing Authorities (NATA) accredited laboratories, certified to perform the required analysis.

The selected laboratories conducted all the requested analyses in accordance with the guidelines outlined in NEPM 1999 (as amended 2013).

The laboratories used for sample analysis are set out in Table 1.1.

Table 1.1 Analytical laboratories and reports

Laboratory	NATA Certified for Analysis Requested	Report No.
Envirolab Services Pty Ltd	Yes	39765, 39765-A, 39765-B
Eurofins Environment Testing Australia Pty Ltd	Yes	1031199, 1028743, 12616805

Sample results of the DSI are outlined in the analytical results tables of the DSI report. The laboratory certificates of analysis are located in Appendix F.

The data quality assessment detailed in the following pages refers to the data provided in these laboratory reports and the results of the QA/QC analysis. Please note this QA/QC report excludes results and laboratory reports from historical sampling events.

1.2 Data quality indicators

Table 1.2 sets out the QA/QC Data Quality Indicators (DQIs) used in the sampling investigation and outcomes for each of these for each DQI.

Table 1.2 Summary of QA/QC compliance for sampling

Item	Objective	Outcome	References
GHD Internal Procedures			
Comparison of field and analytical data	Agreement between visual and olfactory evidence with laboratory results	Achieved	Tabulated Analytical Results, Certificates of Analysis, Borehole Logs and Field Records.
Calibration of field instruments	Meet calibration specifications	Achieved	Copies of calibration certificates.
Chain of Custody documentation	Supply Chain of Custody Documentation with all samples	Achieved	Copies of Chain of Custody Documentation.
Sample analysis and extraction holding times	Comply with holding times	Achieved	Envirolab/Eurofins internal Quality Control criteria summarised in Certificates of Analysis.

Item	Objective	Outcome	References
GHD Internal Procedures			
Analysis of inter- and intra-laboratory duplicate samples	Analysis of duplicate samples in 10% of primary samples	Achieved	PFAS NEMP 2.0.
Analysis of duplicate and split samples	Frequencies and RPDs within guideline and internal laboratory limits (RPD of 0 – 30%)	Minor non-conformances as stated in The majority of the RPD results for the intra/inter laboratory field duplicates collected during the soil sampling were within the absolute 30% acceptance range, with the exception of the following RPD exceedances of analytes of concern summarised below: Table 2.1	PFAS NEMP 2.0.
External Laboratory Procedures			
Analysis of laboratory method blanks	No contamination of blanks	Achieved	Envirolab/Eurofins internal Quality Control criteria summarised in Certificates of Analysis.
Analysis of laboratory spike recoveries	Recoveries within the laboratory specified recovery limits	Achieved, with some minor deviations	Envirolab/Eurofins internal Quality Control criteria summarised in Certificates of Analysis.
Analysis of laboratory internal duplicates	Frequencies and RPDs within guideline and internal laboratory limits (RPD of 20 – 50%)	Achieved	Envirolab/Eurofins internal Quality Control criteria summarised in Certificates of Analysis.

1.3 QA/QC assessment method

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

– Use of appropriately qualified and trained staff.
– Use of suitable sampling equipment and laboratory sample containers.
– Preservation of samples under chilled conditions prior to submission to analytical laboratories.
– Transportation of samples with accompanying Chain of Custody documentation.
– Compliance with sample holding times.
– Review of results of blind duplicate samples.
– Review of results of split duplicate samples.
– Review of results of field blank samples.
– Review of internal analysis of laboratory duplicates, spikes and blanks.

The QA/QC program employed during this investigation was in accordance with the general requirements set out in the PFAS NEMP 2.0 (2020). QA/QC samples provide information that discounts or potentially identifies errors due to possible sources of cross contamination, inconsistencies in sampling and analytical techniques used. The QA/QC program included the collection and analysis of duplicate samples, field blanks and rinsate samples as described below:

– **Split duplicate samples**: These are duplicate samples split in the field, with one sample being sent to a secondary laboratory for analysis. The same parameters are analysed utilising similar analytical techniques.

– **Blind duplicate samples**: These are coded duplicate samples submitted to the primary laboratory for analysis as individual samples without any indication to the laboratory that they have been duplicated.
– **Rinsate samples**: A sample of deionised water collected from equipment used during sampling to indicate whether cross contamination occurred from equipment.

A relative percentage difference (RPD) analysis of primary and blind duplicate/split duplicate samples is used to measure the representativeness and/or precision of duplicate samples. The RPD values were calculated using the following equation:

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

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

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

Validation and interpretation of the field QA/QC data was undertaken by calculating the relative percentage difference for duplicate sample pairs. Duplicate samples with an RPD below 30% are considered to have acceptable correlation. However, consideration also needs to be given to the concentrations detected. In general, should the reported concentrations be less than 10x the LOR, no RPD limit is asserted.

2. RPD Results

2.1 Soil

The majority of the RPD results for the intra/inter laboratory field duplicates collected during the soil sampling were within the absolute 30% acceptance range, with the exception of the following RPD exceedances of analytes of concern summarised below:

Table 2.1 Blind duplicate and split duplicate RPD exceedance summary – soil

Primary Sample ID	QA/QC Sample ID	Analyte	Results			RPD %	
			Primary Result (mg/Kg)	Blind (B) Result (mg/Kg)	Split (S) Result (mg/Kg)	Blind RPD (%)	Split RPD (%)
BH06_0.5	FD02 (B) FS02 (S)	PFOS	0.002	0.005	0.011	77	131
		PFHxS	0.012	0.021	0.030	55	86
		Sum of PFHxS and PFOS	0.015	0.026	0.041	54	93
		PFBS	0.013	0.020	0.026	42	67
		PFPeS	0.006	0.010	0.012	48	65
		PFPeA	0.009	0.012	0.012	34	34
		PFHxA	0.029	0.049	0.063	51	74

The above RPD exceedances are likely exaggerated given the relatively low-level concentrations detected for PFAS compounds. It is noted that where a higher concentration has been reported within a duplicate or split sample, that GHD has considered these values as part of the assessment. No criteria exceedances within higher reported values are noted. With respect to this, and given other RPD values are calculated to be within the acceptable range, GHD considers the data set to be of acceptable quality on which to base this assessment.

2.2 Groundwater

All RPD results for the duplicate samples collected during the groundwater sampling program were within the 30% acceptance range. It is noted that a split duplicate sample was not submitted to a secondary laboratory for the purposes of the QA/QC assessment. Instead, the sample was inadvertently analysed by the primary laboratory. Since no anomalies were reported in the RPD assessment of the primary and blind duplicate sample results, GHD considers the analytical data of suitable quality for the assessment.

3. Blanks

Equipment blank (rinsate) samples were collected during the soil and groundwater investigations to indicate whether possible cross contamination may have occurred during sampling. The rinsate blank samples obtained during the soil sampling program were collected off clean push-tube liners prior to submission to the laboratory for PFAS full-suite analysis. The rinsate blank samples obtained during the groundwater investigation were collected from a decontaminated interface probe.

Field blanks were also collected during the sampling of groundwater to assess whether contamination may have occurred in the field during sampling.

All rinsate and field blanks collected during the investigation reported PFAS concentrations below laboratory reporting limits, indicating that decontamination procedures were acceptable and cross-contamination between samples and sampling equipment did not occur.

The results of the rinsate and field blank analyses are presented in the analytical results tables at the end of this report.

4. Laboratory QA/QC

4.1 Internal duplicates

All RPDs for laboratory internal duplicates from the Envirolab and Eurofins reports were within the laboratory nominated acceptable ranges, with the exception of those presented in Table 4.1.

Table 4.1 Internal duplicate RPD outliers

Analyte	Lab report	Primary Sample	RPD (%)	RPD Limit (%)	Comment
Soil					
PFOS	39765	39765-99	59	50	RPD exceeds PQL based limits. RPD values are generally higher as the results approach the PQL and the estimated measurement uncertainty will statistically increase.

4.2 Matrix spikes

Matrix spikes from the laboratory reports were within the acceptable ranges, with the exception of those presented in Table 4.2.

Table 4.2 Matrix spike outliers

Analyte	Lab report	Primary Sample	Laboratory comment
Soil			
PFHxS	39765	39765-99	Matrix spike recovery is not possible to report due to the high concentration of analytes in the sample/s have caused interference or outside of acceptance criteria due to relatively high background levels. However, an acceptable recovery was obtained for the LCS.
PFOS			Matrix spike recovery is not possible to report due to the high concentration of analytes in the sample/s have caused interference or outside of acceptance criteria due to relatively high background levels. However, an acceptable recovery was obtained for the LCS.
Perfluorohexanoic acid			Matrix spike recovery is not possible to report due to the high concentration of analytes in the sample/s have caused interference or outside of acceptance criteria due to relatively high background levels. However, an acceptable recovery was obtained for the LCS.
Surrogate $^{13}C_8$ PFOS			The respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier.

4.3 Laboratory control spikes

All laboratory control spikes from the laboratory reports were within the nominated acceptable ranges.

4.4 Method blanks

All reported method blank concentrations were less than their respective laboratory LOR and indicating that potential laboratory cross contamination was unlikely to have occurred.

4.5 Compliance with holding times

All analytes were extracted and analysed within both Envirolab and Eurofins technical holding times.

4.6 Laboratory QA/QC summary

With the exception of a few RPD and matrix spike deviations, the results of the internal quality assurance programs of the analytical laboratories displayed appropriate internal laboratory QA/QC protocol adopted by both laboratories. Since the majority of internal laboratory QA/QC samples were within acceptance limits, these minor variations are not considered to impact the overall data quality and as such are not significant in terms of the outcomes of this investigation.

5. Conclusion

Based on the results of the field QA/QC indicators above and internal laboratory quality control parameters, the data obtained during the assessment are considered to be of acceptable standard on which to base interpretations and draw conclusions regarding the status of the site.

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