Largs North Fire Station Groundwater PFAS Investigation

2023

South Australian Metropolitan Fire Service

18 October 2023

→ The Power of Commitment

Project name		Largs North Fire Station PFAS GME					
Document title		Largs North Fire Station Groundwater PFAS Investigation | 2023					
Project number		3319080					
File name		3319080-REP_MFS Largs North GME 2023_REV 0.docx3					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	A (Draft)	C Davies	T Wilson D Valiff	**D. Valiff*	B Petticrew	**B. Petticrew*	4/08/2023
S3	B	C Davies	T Wilson D Valiff	**D. Valiff*	B Petticrew	**B. Petticrew*	11/08/2023
S4	0	D Valiff T Wilson	B Petticrew		N Robinson		18/10/2023

GHD Pty Ltd ABN 39 008 488 373

211 Victoria Square, Level 4

Adelaide, South Australia 5000, Australia

T +61 8 8111 6600 | **F** +61 8 8111 6699 | **E** adlmail@ghd.com | **ghd.com**

Executive Summary

This report is subject to, and must be read in conjunction with, the limitations set out in Section 3.2 and the assumptions and qualifications contained throughout the report.

The South Australian Metropolitan Fire Service (MFS) engaged GHD Pty Ltd (GHD) to undertake a groundwater monitoring event (GME) in the vicinity of the Largs North Fire Station (the site) following the identification of elevated concentrations of per and poly-fluoroalkyl substances (PFAS) in groundwater beneath the site and localised occurrence up- and down- hydraulic gradient of the site.

The GME works detailed in this report are part of an ongoing investigation program to delineate and monitor PFAS impacts in groundwater, identified during previous investigations undertaken between 2019 and 2021. The information presented in this report is a summary of the GME conducted by GHD in May 2023. The works were undertaken in accordance with the methodology outlined in the GHD (2022) Site Management Plan/Groundwater Monitoring Management Plan for the Largs North Fire Station.

The primary objective of the GME is to provide additional temporal data informing the extent of identified PFAS impacts in groundwater and to assess the degree of plume stability. The scope of this monitoring event included sampling and analyses of groundwater from ten existing on-site and off-site monitoring wells.

Based on this GME, the following conclusions were made:

– The standing water level (SWL) recorded during the May 2023 monitoring program ranged between 1.35 m below top of casing (m bTOC) at MW21 and 2.40 m bTOC at MW04. Groundwater elevations across the assessment area ranged between 0.504 m AHD (MW14) and 0.929 m AHD (MW18) and were generally consistent with expected seasonal groundwater level fluctuations.
– The groundwater is inferred to flow in a north-easterly direction towards the Port Adelaide River and was generally consistent with previous monitoring events.
– Seven of the ten monitoring wells reported concentrations of PFAS in groundwater above adopted drinking water assessment criteria.
– The highest PFAS concentrations were recorded at off-site wells MW08 and MW09, located immediately down-hydraulic gradient of the site which is indicative of PFAS migration in groundwater.
– PFAS concentrations at on-site groundwater well MW04 were recorded one to two orders of magnitude lower than those recorded in the last GME of 2022.
– PFOS concentrations in groundwater at down-hydraulic gradient well MW15 (located approximately 160 m north-east of the site) increased, marginally exceeding the Health Drinking Water criterion in the current GME. In previous monitoring events, PFOS concentrations at the same location were below the adopted guideline. This may potentially indicate slow PFAS migration in groundwater.
– An anomaly was noted in the significantly reduced PFAS concentrations at on-site well MW04 which were two orders of magnitude lower than previous groundwater monitoring results. This may not be representative and may warrant resampling.
– While the use of groundwater for domestic irrigation and / or drinking purposes is possible (based on the CSM review), groundwater-use surveys previously undertaken within the assessment area indicated these exposure pathways are unlikely to be complete.
– Overall, the data indicated the PFAS plume was generally stable in magnitude and extent. However, the groundwater PFAS results collected over time indicated some variations in 2023 sampling event which were not consistent with the previous GME results.
– Mann Kendall PFOS trend analysis also indicated that there were some uncertainties in the results and inconsistent PFOS trends in some wells, that warrant further groundwater monitoring.

Given some uncertainties in the results and inconsistent PFOS trends in some groundwater wells including wells MW04 and MW15 it is recommended that further groundwater monitoring be conducted over a minimum period of two years (i.e. 2024 and 2025) or until the PFAS concentrations exhibit consistent, stable or downward trend to enable the cessation of the GMMP.

Table of Abbreviations

Abbreviation	Full form
AFFF	Aqueous Film Forming Foam
AHD	Australian Height Datum
ASC NEPM	*National Environment Protection (Assessment of Site Contamination) Measure 1999*
COC	Chain of Custody
CSM	Conceptual Site Model
DO	Dissolved Oxygen
DQO	Data Quality Indicator
EC	Electrical Conductivity
GAR	South Australian *Guidelines for the Assessment and Remediation of Site Contamination 2019*
GHD	GHD Pty Ltd
GME	Groundwater Monitoring Event
HEPA	Heads of Environment Protection Authorities Australia
HDPE	High-Density Polyethylene
JSEA	Job Safety and Environment Analysis
LOR	Limit of Reporting
m bgl	Metres below ground level
MFS	South Australian Metropolitan Fire Service
mg/L	milligrams / Litre
mV	millivolt
NATA	National Association of Testing Authorities
NEMP	PFAS National Environmental Management Plan 2020
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
QA/QC	Quality Assurance and Quality Control
SA EPA	South Australian Environment Protection Authority
SAQP	Sampling and Analysis Quality Plan
SHE	Standard Hydrogen Electrode
SWL	Standing Water Level
TDS	Total Dissolved Solids
TOC	Top of Casing
VSCAP	Voluntary Site Contamination Assessment Proposal
WHS	Work Health and Safety
WQEPP	South Australian *Environmental Protection (Water Quality) Policy* 2015
µg/L	micrograms / Litre
µS/cm	microSiemens / centimetre

Contents

Tables in text

Appendices

1. Introduction

1.1 General

The South Australian Metropolitan Fire Service (MFS) engaged GHD Pty Ltd (GHD) to undertake a groundwater monitoring event (GME) in the vicinity of the Largs North Fire Station, located at 2-4 Willochra Street, Largs North, SA 5016 (the site). The GME is a requirement of the GHD Site Management Plan/Groundwater Monitoring Management Plan (SMP/GMMP) prepared by GHD on 16 August 2022 following the identification of elevated concentrations of per- and poly-fluoroalkyl substances (PFAS) in soil and in groundwater beneath and extending up and down hydraulic gradient of the site.

This report documents the scope of work, methodology and findings of the GME carried out by GHD on 9-11 May 2023. The works were undertaken in accordance with the methodology outlined in the SMP/GMMP (GHD 2022a).

1.2 Background

Due to their fire-retardant properties, PFAS have been used in aqueous film forming foam (AFFF) for firefighting and was first adopted in Australia in the 1960s. Due to its persistence in the environment and its ability to bioaccumulate, AFFF containing PFAS was banned for use in South Australia in 2018 to minimise the potential for human health or environmental risk associated with contamination.

AFFF containing PFAS was historically used at the site since 1988 (when MFS occupied the site) until 2016. During this period PFAS was released to the environment in the vicinity of the site during activities involving firefighting training and wash-down of firefighting appliances.

As part of a statewide PFAS-monitoring program, the MFS supported its staff to have voluntary blood tests for PFAS in 2018. Several firefighters stationed at Largs North made the MFS aware of higher-than-average levels of PFAS in their blood samples.

Since December 2018, environmental investigations have identified PFAS impacts in dust, soil, concrete paving, fruit, eggs and foliage on-site, and in groundwater both on- and off-site. The MFS submitted a Voluntary Site Contamination Assessment Proposal (VSCAP) for the site, dated 30 October 2019 (final endorsed version), to the South Australian Environment Protection Authority (SA EPA) (GHD 2019a). GHD understands remedial actions were undertaken by MFS at the site January - March 2019; these included: the removal of chickens, eggs, and fruit stored on site, site vegetation (fruit trees, shrubs and ornamental trees); covering accessible soil with geotextile and mulch; cleaning of the air conditioning system; and the extensive replacement of air circulation ducts.

The site is subject to an environmental audit by the appointed Site Contamination Auditor, Steve Kirsanovs, who is accredited in South Australia pursuant to Division 4 of Part 10A of the Environmental Protection Act 1993, No. 2009020. All final investigation reports and SMP/GMMP have been reviewed and endorsed by the auditor.

In addition to the investigation and remedial works, the MFS undertook community engagement, with the assistance of GHD. This included a Water Use and Home Grown Produce Survey of the surrounding properties and community drop-in session to provide members of the community with an update on the investigations being undertaken at the site.

Following the completion of delineation of PFAS impacts to soil and groundwater at the site (GHD 2019b - 2020g), a remediation options assessment was undertaken (GHD 2021) which identified a site management plan and ongoing monitoring of groundwater as the most appropriate measure to manage contamination.

A summary of previous investigations for the site is provided in Section 3.1.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 3.2.

1.3 Objectives

The objectives of this GME were to:

– Characterise the lateral extent of identified PFAS contamination in groundwater at the site associated with historical use of AFFF.
– Assess the PFAS plume stability and any potential changes to the risk profile with respect to human health and ecological receptors.

2. Site Information

2.1 Site Identification

Site information details are presented in Table 2.1 below.

Table 2.1 Summary of General Site Identification Information

Site Name:	Largs North Fire Station
Site Address:	2-4 Willochra Street, Largs North, SA 5016
Certificate of Title:	CT 5441/197
DP and Lot:	D7914 A11
Current Zoning:	Light Industry
Property Owner:	South Australian Metropolitan Fire Service
Current Site Use:	Fire Station
Area:	3,280 m^2
Site Elevation:	3.0 m AHD

A site location plan is depicted in Figure 1 and monitoring well locations are represented in Figure 2.

2.2 Surrounding Land Use

A summary of the surrounding land uses / zoning information for the site is summarised in Table 2.2.

Table 2.2 Summary of Surrounding Land Use / Zoning

Direction	Land Use / Zoning
North	Residential properties to the north of Willochra Street.
East	Immediately adjacent to the site is the Port Adelaide Enfield Council works depot bounded by Victoria Road to the west, Willochra Street to the north and Mildred Terrace to the east and south.
South	The area immediately south of the site is the Port Adelaide Enfield Council works depot, bounded by Mildred Terrace and Victoria Road is classified as Light Industry. Beyond Mildred Terrace is the BP Largs North petroleum terminal.
West	Largs North Reserve and the local football club are west of the site beyond Victoria Road. Residential properties approximately 200 m west, north-west and south-west of the MFS site across Carnarvon Terrace and Dover Terrace, respectively.

2.3 Regional Geology

A desktop search using the South Australian Resources Information Gateway (SARIG) map layers catalogue (1:100,000 Surface Geology Map: Adelaide updated 2013) indicated that the site is underlain by the Saint Kilda Formation, comprised of unconsolidated white bioclastic quartz – carbonate sand of modern beaches and transgressive dune fields of the Semaphore Sand Member.

This formation is underlain by limestone and sandy clay of the Glanville Formation, with a combined thickness in the order of 10 m. This is underlain by the Hindmarsh Clay to a total depth of approximately 90 m. The underlying clay, despite the presence of intermittent sand layers, is likely to inhibit the downward migration of PFAS contamination into the deep Hallett Cove Formation.

Soil lithological logs for the monitoring well network are provided in Appendix B.

2.4 Regional Hydrogeology

The DWLBC 2006/10 report by the Department of Water, Land and Biodiversity Conservation (Gerges 2006) provides an overview of the hydrogeology of the Adelaide metropolitan area, indicating that the region (Zone 3: Subzone 3B, Penrice [ICI – SAMCOR (industrial)]) contains five to six Quaternary aquifers and three to four, almost flat lying, Tertiary aquifers. The first and second Tertiary aquifers are the thickest and the most productive, with relatively low salinity. The greatest proportion of abstracted groundwater for industrial and recreational use comes from the first Tertiary aquifer. The DWLBC 2006/10 report indicates that the First Quaternary Aquifer (Q1) is located at depths between 3 m and 10 m below ground level (m bgl) with an average thickness of approximately 2 m. In the proximity of major structures and surface drainage, aquifer materials tend to be coarser and thicker and therefore more transmissive.

In the Le Fevre Peninsula area, where the Q1 Aquifer is overlain by dune sands, good quality groundwater is common due to local direct recharge from precipitation. This water is used extensively for garden watering (approximately 600 wells are recorded). An underlying layer, with poor water quality (salinities up to 21,000 mg/L) is also present (Gerges 2006).

2.5 Registered Bore Survey

The WaterConnect database was used to conduct a search of registered bores located within a 2 km radius of the site in. The results of the search (May 2023) indicated the following:

A total of 1,334 registered groundwater bores were recorded within the survey area. Of these:

- 514 were identified as domestic bores.
- 347 were identified as investigation bores.
- 65 were identified as monitoring bores.
- 37 were identified as irrigation bores.
- 24 were identified as environmental bores.
- 5 were identified as observation bores.
- 3 were identified as industrial bores.
- 1 bore was identified for irrigation/stock watering.
- 1 bore was identified for experimental.
- 1 bore was identified for recreational.
- 1 bore was identified for stock watering.
- No information on use/purpose was available for 335 registered bores.

Total dissolved solids (TDS) data was available for 760 bores, of these 452 reported TDS values below 1,200 mg/L.

The groundwater-use survey conducted in March-April 2019 (GHD 2019c) indicated that no respondents within approximately 350 m down-hydraulic gradient of the site possessed a groundwater bore for beneficial use.

The closest registered bores to the site were:

- 4 investigation bores:
  - 1 approximately 6 m to the north-east.
  - 1 approximately 17 m to the south-west.
  - 1 approximately 19 m to the north.
  - 1 approximately 80 m to the north-west.
- 1 monitoring bore, approximately 40 m to the west.

Plans showing the registered bores within a 2 km radius of the site and the corresponding WaterConnect Groundwater Data Reports are presented in Appendix A.

3. Previous Investigations

3.1 Summary of Previous Investigations

Previous GHD investigations were documented in the following reports:

- GHD 2019b, Largs North Station and Gallantry PFAS testing Detailed Site Investigation (DSI) Report for South Australian Metropolitan Fire Service, April 2019.
- GHD 2019c, Largs North Station and Gallantry PFAS Testing, Site Groundwater Use Survey & Groundwater Investigation for South Australian Metropolitan Fire Service, 27 May 2019.
- GHD 2019d, Largs North Fire Station Preliminary Site Investigation for South Australian Metropolitan Fire Service, 21 November 2019.
- GHD 2020a, Largs North Station Groundwater Investigation (October 2019) for South Australian Metropolitan Fire Service, 9 January 2020.
- GHD 2020b, Largs North Station and Gallantry PFAS testing, Resident Fruit Testing for South Australian Metropolitan Fire Service, 10 February 2020.
- GHD 2020c, Largs North Station and Gallantry PFAS Testing, Dust Testing – Post Clean Validation Sampling for South Australian Metropolitan Fire Service, 12 July 2020.
- GHD 2020d, Largs North Station Groundwater Investigation (February 2020) for South Australian Metropolitan Service, 21 April 2020.
- GHD 2020e, Sampling Analysis and Quality Plan (SAQP) prepared by GHD for the Largs North Fire Station, 24 June 2020.
- GHD 2020f, Largs North Station Detailed Site Investigation Groundwater Assessment for South Australian Metropolitan Fire Service (April 2020), June 2020.
- GHD 2020g, Largs North Station and Gallantry PFAS Testing, Dust Testing – Post Clean Validation Sampling (June 2020) for South Australian Metropolitan Fire Service, 16 July 2020.
- GHD 2021, Largs North Station PFAS Impact, Remediation Options Assessment for South Australian Metropolitan Fire Service, 24 September 2021.
- GHD 2022a, Largs North Fire Station Site Management Plan/Groundwater Monitoring Management Plan for South Australian Metropolitan Fire Service, 22 August 2022.
- GHD 2022b, Largs North Fire Station Groundwater Investigation for South Australian Metropolitan Fire Service, 23 September 2022.
- GHD 2022c, MFS Largs North Fire Station Hydrogeology Review, South Australian Metropolitan Fire Service, 14 June 2022.

3.2 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 and the SA EPA accredited Site Contamination Auditor Steve Kirsanovs under the Site Contamination Audit System, for the purpose agreed between GHD and South Australian Metropolitan Fire Service.

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.

4. Scope of Work

4.1 Scope of Work

The SMP/GMMP (GHD 2022a) identified 10 out of 26 existing on- and off-site groundwater monitoring wells for sampling on an annual basis over a two-year period (2022 and 2023), to assess the extent of PFAS contamination and verify PFAS-plume stability around the MFS site. Monitoring well locations are represented in Figure 2.

Each GME had the following scope:

– Undertake groundwater sampling at the 10 monitoring wells listed in Table 4.1. This included gauging of all wells and sampling using no-flow sampling techniques (HDPE Hydrasleeve™ samplers).
– Submit all groundwater samples to a National Association of Testing Authorities (NATA) accredited laboratory for analysis of PFAS extended suite analytes with ultra-trace limits of reporting (LOR).
– Submit a groundwater monitoring report to the MFS and the auditor for review and endorsement. The endorsed final GME report will then be submitted to the SA EPA. The report will include the monitoring results, a comparison to previous results, the adopted assessment criteria, and an assessment of plume stability.

Table 4.1 Groundwater Wells Selected for Further Monitoring

Location	Selected Well(s)	Rationale
On-site PFAS source area	MW04	Assess temporal plume stability. Assess potential ongoing harm to groundwater in the well with the previously reported highest PFAS concentration.
Off-site PFAS source area	MW18	Assess impact from off-site PFAS sources up / cross hydraulic gradient. Assess temporal plume stability. Confirm groundwater flow direction to the north / north-east.
Off-site to the north	MW08, MW20	Assess temporal plume stability down-hydraulic gradient.
Off-site to the north-east	MW09, MW10, MW14, MW15, MW21, MW23	Assess temporal plume stability down-hydraulic gradient. Identify plume extent down-hydraulic gradient.

4.2 Community Engagement

The SMP/GMMP also identified the requirement for community engagement to be undertaken if groundwater monitoring identifies an increase in groundwater PFAS concentrations resulting in a change in the level of risk to the identified receptors. If required, community engagement will be initiated within one to two months of receiving the laboratory results for the GME if these indicate an increased level of risk. Any community engagement will be undertaken in accordance with the SA EPA (2018) and VSCAP requirements, in consultation with the auditor and the SA EPA. It is noted that this is not a requirement based on the results of the current GME.

GHD letters to the land holder/occupier dated 2 May 2023 were dropped off by GHD personnel in the mailboxes of the residential properties located in the proximity to each of the 10 groundwater wells prior to sampling event on 9 May 2023. The letter stated the following:

Dear land holder/occupier

We wish to inform you GHD Pty Ltd (GHD), will be undertaking groundwater monitoring on 9 and 11 May 2023, between 9 am and 5 pm in the vicinity of your property. The groundwater sampling will be undertaken from the wells located on public land including road reserves and footpaths.

No access to private property will be required, however the works may cause temporary footpath access restriction. The works will cause minimal disruption to trafficable surfaces. There are no impacts (noise, access etc,) associated with the sampling works.

The GHD project team will make every effort to minimise the impacts on neighbouring landholders while the works are being undertaken and we thank you for your patience and understanding.

If you have any questions or concerns, please contact the GHD Project Manager on 1800 325 110.

It is noted that here were no contacts made by the members of the public / land holders / occupiers during the 2023 groundwater sampling. The above hotline telephone number is still active to date.

5. Methodology

5.1 Work Health and Safety

GHD prepared a project-specific Job Safety and Environmental Analysis (JSEA) for the site works in accordance with Work Health and Safety (WHS) legislation and associated Codes of Practice. The JSEA consisted of a summary of relevant site activities and specific job-related tasks; a hazard register that identifies all foreseeable hazards; risk ranking and risk management measures for each identified hazard; and procedures for monitoring and/or implementing remedial actions to manage all project-based risks.

5.2 Groundwater Well Sampling Methodology

Groundwater sampling was undertaken between 9 and 11 May 2023. The groundwater sampling methodology is summarised in Table 5.1.

Table 5.1 Groundwater Monitoring and Sampling Methodology

Activity	Details
Well gauging	The monitoring wells' SWL and bore depths were gauged in accordance with standard industry practice and field procedures. All on-site wells were gauged prior to sampling with an interface probe (IP). Measurements were taken from the wells' TOC. SWL and bore depths were recorded on a Groundwater Gauging Sheet. Equipment Calibration Certificate is presented in Appendix C.
Sampling	Sampling was conducted using a no-purge method via high density HydraSleeve™ samplers dedicated for each well. The sampler was slowly lowered into the screened section of the well to minimise disturbance and then drawn up to open the valve. Once the HydraSleeve was in position, the cabling was attached to the well head and left for 48 hours to allow the water column to normalise, hours in accordance with the current EPA and industry guidance. The HydraSleeve was retrieved from the well in 48 hours by raising carefully to ensure the valve was closed. Water sample was obtained directly from the sampler sleeve into laboratory supplied bottles. The bottles were appropriately labelled with a unique GHD job number, sample identification and sampling date. All samples were collected in laboratory supplied containers suitable for PFAS. Water quality parameters (pH, dissolved oxygen (DO), electrical conductivity (EC), reduction/ oxidation (redox) potential and temperature) were recorded via downhole readings prior to sampling using a multi parameter water meter. The groundwater was visually assessed for turbidity and evidence of contamination, such as odour or visible sheen, foaming or discolouration. A summary of the field sampling records is provided in Appendix D.
Sampling preservation and transport	Post collection, samples were immediately stored in an insulated cooler prior to and during delivery to the laboratory. All samples were transported to the laboratory by GHD Field Staff under Chain of Custody (COC) documentation. COC documentation is presented in Appendix E.
Decontamination	Decontamination of all non-disposable equipment (IP and multi-parameter water quality meter) was undertaken following a three-stage approach. The first stage involved cleaning the equipment using a mixture of pH neutral phosphate and PFAS free detergent (Liquinox) in water, followed by a potable water rinse stage, and a final de-ionised water rinse stage. Disposable nitrile gloves were worn during sampling and changed between samples to minimise the potential for cross contamination.
QA/QC	Quality control samples were collected at a minimum rate of one replicate pair per ten primary samples. The replicate pair included one intra-laboratory (blind) duplicate sample and one inter-laboratory (split) duplicate sample. Rinsate samples were collected from re-usable equipment (IP) at a rate of one (per day. Rinsate sampling was conducted to assess the potential for cross contamination to occur from re-usable sampling equipment.

5.3 Laboratory Analysis Program

5.3.1 Analytical Laboratories

GHD consigned all primary groundwater, rinsate and intra-laboratory field (blind) duplicate samples to Envirolab Group for analysis. The analysis of the inter-laboratory (split) duplicate sample, for QA/QC purposes, was undertaken by ALS Environmental. Both laboratories are accredited by the NATA.

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

5.3.2 Sample Analysis

Groundwater samples collected as part of this GME were analysed for PFAS (Extended Suite, Ultra Trace LOR). Table 5.2 summarises the sampling and analysis of groundwater samples undertaken.

Table 5.2 Laboratory Analytical Schedule

Sample type	No. primary samples		No. QA/QC duplicate samples		No. rinsate samples		Analytical suite
	Collected	Analysed	Collected	Analysed	Collected	Analysed	PFAS – Extended Suite, Ultra Trace LOR
Groundwater	10	10	2	2	1	1	

6. Assessment Criteria

PFAS was the key contaminant of enquiry as part of this environmental investigation. As such, the assessment criteria were adopted from the following guideline 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, 2019, Guidance on Per and poly-fluoroalkyl (PFAS) in Recreational Water, National Health and Medical Research Council, Canberra 2019.
– NHMRC/NRMMC, 2011, Australian Drinking Water Guidelines 6, Version 3.5 updated August 2018, National Water Quality Management Strategy, National Health and Medical Research Council and Natural Resource Management Ministerial Council, Canberra, 2018, (ADWG).

The assessment was also undertaken in general accordance with the following guidelines and policy:

– 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, 2018, (AWQG).
– Gov SA, 2015, Environment Protection (Water Quality) Policy (WQEPP) 2015, Version 30.1.2018, Government of South Australia, 2018.
– 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, revised 2019.

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 to determine if actual or potential harm to groundwater that is not trivial has occurred. The four-step process described in the GAR is described in Table 6.1.

Table 6.1 Four-step Process for Determining Harm to Groundwater

Process	Assessment
Step 1: Apply Table 3 of WQEPP 2015 Schedule 1 based on TDS ranges	Calculated TDS results for groundwater samples collected in May 2023 ranged between 174 mg/L and 2,040 mg/L, indicating fresh to brackish groundwater in the general area of the site that may be suitable for potable use and suitable for the irrigation purposes (SA EPA, 2019). The groundwater data in the WaterConnect database (Step 3) indicates that from 760 bores with available TDS data, 451 of those bores reported TDS values below 1,200 mg/L.
Step 2: Assess and identify surface water bodies within a 2 km buffer of the site	The stormwater network on the Le Fevre Peninsula consists of numerous individual catchments that ultimately discharge into the Port Adelaide River and the Gulf St Vincent. The Port Adelaide River is the closest water body, located approximately 770 m to the east and Gulf St Vincent is located approximately 1.3 km to the west. These water bodies are considered representative of marine ecosystems.
Step 3: Review registered groundwater users in the WaterConnect database	The registered bore search identified 1,334 registered bores within a 2 km radius of the site. The registered bores consisted of 514 domestic bores, 347 investigation bores, 37 irrigation bores, 65 monitoring bores, 24 environmental bores, 5 observation bores, 3 industrial bores, 1 irrigation/stock, 1 recreational and 1 stock watering bore. 335 bores had no listed purpose. The groundwater-use survey conducted in March – April 2019 (GHD 2019c) indicated that no respondents within 350 m down-hydraulic gradient of the site possessed a groundwater bore for beneficial use.
Step 4: Application of the SA EPA recognised criteria for the most sensitive environmental value	The most sensitive environmental values to be applied to the site are Health Recreational Water, Health Drinking Water and Interim (Marine) Water (95% Species Protection).

Based on the assessment outlined in Table 6.1, the groundwater criteria were selected to protect the relevant environmental values identified for groundwater underlying the area of investigation.

For the purpose of this assessment, criteria have been included to:

– Assess the potential risk to recreational users of Port Adelaide River, Gulf St Vincent and swimming pool users, should groundwater be extracted to fill swimming pools within the residential area adjacent and north-east of the site.
– Assess the potential risk to people using groundwater for domestic and drinking purposes, i.e. potable use.
– Assess the potential risk to users of groundwater for irrigation of fruit trees and vegetable gardens.
– Assess the potential risk to aquatic marine ecosystems. Given the Port Adelaide River receives various inputs from stormwater, it is considered to be a slightly to moderately modified ecosystem. Therefore, the 95% Species Protection value has been selected to assess the risk of PFAS on aquatic organisms.

The values for the adopted screening/investigation levels for groundwater, which are considered protective of potentially complete source-receptor linkages, are summarised in Table 6.2.

Table 6.2 Adopted PFAS Screening Criteria (Groundwater)

Exposure Scenario	PFOS	Sum of PFHxS & PFOS	PFOA	Source
PFAS NEMP 2020 Health Recreational Water	2.0 µg/L	2.0 µg/L	10 µg/L	PFAS NEMP 2.0, 2020
PFAS NEMP 2020 Health Drinking Water	0.07 µg/L	0.07 µg/L	0.56 µg/L	PFAS NEMP 2.0, 2020
PFAS NEMP 2.0, 2020 Interim Marine 95% Species Protection – Slightly to moderately disturbed systems	0.13 µg/L	-	220 µg/L	PFAS NEMP 2.0, 2020

7. Results

Calibration certificates for the interface probe and water quality meter can be found in Appendix C. The field notes collected as a part of this investigation can be found in Appendix ED. Laboratory reports and COC documentation can be found in Appendix E. Results tables for field parameters and analytical data can be found at the end of the report.

7.1 Field Observations

Groundwater field physicochemical parameters (pH, EC, DO, field redox potential and temperature) were recorded during the gauging and sampling process. The results were recorded on Groundwater Sampling Records, which are presented in Appendix D. The groundwater physiochemical results are summarised in Table 7.1.

Table 7.1 Summary of Groundwater Physicochemical Parameters

Parameter	Ranges
pH	6.97 (MW10) to 8.72 (MW18)
Temperature	20.9°C (MW04) to 22.8°C (MW10)
EC	267.1 µS/cm (MW18) to 3,138 µS/cm (MW10)
DO	0.25 mg/L (MW23) to 3.03 mg/L (MW09)
Field ORP	-242.8 mV (MW14) to -7.8 mV (MW04)
SHE* ORP	-44 mV (MW14) to 191 mV (MW04)

Note: * Standard Hydrogen Electrode (SHE) redox was calculated by applying a conversion factor of 199 mV to the field redox values.

7.2 Site Specific Hydrogeology

Groundwater gauging data collected as part of this GME are summarised in Table 7.2. The complete set of groundwater gauging results are presented in the attached Table 1 and historical groundwater gauging results are presented in Table 2 at the end of this report.

Table 7.2 Groundwater Gauging Data

Well ID	Top of casing (m AHD)	SWL (m TOC)	Relative SWL (m AHD)
MW04	3.293	2.40	0.893
MW08	3.045	2.24	0.805
MW09	3.055	2.27	0.785
MW10	2.802	2.10	0.702
MW14	2.854	2.35	0.504
MW15	2.945	2.14	0.805
MW18	3.079	2.15	0.929
MW20	2.683	1.77	0.913
MW21	2.217	1.35	0.867
MW23	2.167	1.43	0.737

Using the gauging data presented in Table 7.1 and Table 7.2, Table 7.3 provides a summary of the site-specific hydrogeology.

Table 7.3 Summary of Site-Specific Hydrogeology

Feature	Details
Groundwater Occurrence and Depth to Groundwater	The first regional aquifer is located at depths ranging between 1.350m bTOC (MW21) and 2.400 m bTOC (MW04). Groundwater elevations across the site ranged between 0.504 m AHD (MW14) and 0.929 m AHD (MW18).
Groundwater Flow Direction	Groundwater flow direction was inferred to be north-easterly towards the Port Adelaide River (refer to Figure 3).
Groundwater Gradient	The groundwater gradient was calculated to be 0.00059 m/m.
Effective Porosity	Based on literature, the effective porosity of the water bearing fine sand lithology was assumed to be 0.33.
Hydraulic Conductivity	The hydraulic conductivity of the sand (fine) aquifer (based on literature) was assumed to range between 0.017 m/day and 16.33 m/day, with an arithmetic mean of 2.49 m/day.
Seepage Velocity	The seepage velocity of groundwater beneath the site was calculated, based on literature values, to range between 1.2 $x10^{-2}$ m/year and 11 m/year, with an arithmetic mean of 1.7 m/year.
Groundwater Salinity	TDS within groundwater beneath the site, as an indicator of salinity, was calculated by applying a conversion factor of 0.65 to the EC values at each well. The calculated TDS values ranged between 174 mg/L (MW18) and 2,040 mg/L (MW10), indicating fresh to brackish groundwater beneath the investigation area. The calculated TDS values of the groundwater beneath the site indicate that groundwater beneath the site may be suitable for potable and irrigation purposes, notwithstanding other contaminants (SA EPA, 2019).

Groundwater field physicochemical parameters (pH, EC, DO, field redox potential and temperature) were recorded during the gauging and sampling process. In addition to the above summary the groundwater field physicochemical results are summarised as follows:

– The groundwater pH results ranged between pH 6.97 (MW10) to pH 8.72 (MW18), indicating neutral to alkaline groundwater conditions.
– Field EC ranged from 267.1 µS/cm (MW18) to 3,138 µS/cm (MW10).
– DO ranged between 0.25 mg/L (MW23) to 3.03 mg/L (MW09).
– The redox potential relative to the standard hydrogen electrode (SHE) was calculated by applying a conversion factor of 199 mV to the field redox readings and ranged between -44 mV (MW14) and 193 mV (MW15), indicating reducing to oxidising conditions in the investigation area.
– Temperature ranged between 20.9°C (MW04) and 22.8°C (MW10), which were considered within normal ranges.

7.3 Analytical Results

Groundwater analytical results are presented in Table 3 at the end of this report. Exceedances of screening criteria have been summarised in Table 7.4 below.

A graphical representation of groundwater concentrations/exceedances for Perfluorooctane sulfonate (PFOS), Perfluorooctanoic acid (PFOA) and the sum of Perfluorohexane sulfonate (PFHxS) and PFOS is included as Figure 4 at the end of this report. Historical PFAS groundwater results (2019-2023) are presented in Table 4 at the end of this report.

Table 7.4 Groundwater PFAS Analytical Exceedances May 2023

No. of Primary Samples	Analyte	Guideline Value (µg/L)	Value (µg/L)	Samples exceeding criteria
PFAS NEMP 2.0 2020 Health Drinking Water				
6 out of 10	PFHxS	0.07	0.180 0.22 0.85 0.13 0.16 0.09	MW04 MW08 MW09 MW10 MW14 MW20
5 out of 10	PFOS	0.07	0.32 0.53 0.23 0.07 0.14	MW04 MW08 MW09 MW15 MW20
7 out of 10	Sum of PFHxS and PFOS	0.07	0.49 0.75 1.10 0.14 0.21 0.12 0.23	MW04 MW08 MW09 MW10 MW14 MW15 MW20
PFAS NEMP 2.0 2020 Interim marine – 95% slightly-moderately disturbed system				
4 out of 10	PFOS	0.13	0.32 0.53 0.23 0.14	MW04 MW08 MW09 MW20

7.4 Mann Kendall PFAS trend analysis

Mann Kendall trend analysis was undertaken by GHD for PFOS concentrations in 10 wells based on the groundwater sampling events over the investigation period between 2019 and 2023. Mann Kendall PFOS Trend Analysis Results tables and diagrams are presented in Table 7 (attached).

The S statistic combined with the Confidence factor and the Coefficient of Variation calculated in Mann Kendall tool allows for the concentration trend at each monitoring well to be matched to 1 of 6 categories: Increasing, Decreasing, Probably Increasing, Probably Decreasing, Stable or No Trend.

The analysis indicated the following:

– Three out of the 10 monitoring wells (MW09, MW14 and MW15) reported PFOS trends “Probably Increasing”, based on the calculated positive *S* values and >90% trend confidence factor.
– While Mann Kendall for wells MW08 and MW20 reported “No Trend”, the positive calculated *S* values also indicated an increasing trend.
– Four wells MW04, MW10, MW18 and MW21 reported “Stable” trend of PFOS impact over the 5 years’ investigation period with <90% trend confidence factor. However, actual PFOS concentrations in these wells decreased in the 2023 GME round.
– None of the monitoring wells reported a decreasing PFOS trend over the investigation period.

The above Mann Kendall PFAS trend analysis indicated that there are some uncertainties in data and inconsistent PFOS trends in some wells, that need to be confirmed through further groundwater monitoring.

8. Quality Assurance and Quality Control

Data Quality Indicators (DQIs), field QA/QC, laboratory QA/QC and field QC Results are presented in Table 5 (relative percentage difference [RPD] values for duplicate samples), Table 6 (rinsate results) and Appendix F.

Based on the review of the QA/QC results, GHD considers the data to be valid and of sufficient quality for the purposes of this environmental investigation.

9. Discussion

9.1 Site Specific Hydrogeology

The reported May 2023 groundwater elevations were generally higher than the August 2022 groundwater elevations.

The closest water body was identified to be the Port Adelaide River located approximately 770 m to the south-east of the site. The general groundwater flow was inferred to be in a north-easterly direction towards the Port Adelaide River which is consistent with previous monitoring events and recent hydrogeological reviews for the site (GHD 2022c). However, the inferred groundwater flow direction may be variable as a result of tidal influences from the Port Adelaide River.

9.2 Distribution of PFAS in Groundwater

In contrast to previous groundwater monitoring rounds, PFAS concentrations in groundwater beneath the site at MW04 reported concentrations two orders of magnitude lower than previous groundwater monitoring events. In the August 2022 GME, the sum of PFHxS and PFOS exceeded the PFAS NEMP criterion for Recreational Water (2 µg/L) in excess of 30 times. In the current GME, the same analytes were observed to be at concentrations around a quarter of the adopted limit.

PFAS concentrations in groundwater immediately off-site at down-hydraulic gradient monitoring wells MW08 and MW09 reported the highest PFAS concentrations across the assessment area in the current GME. PFOS concentrations in groundwater at MW15 marginally exceeded the Health Drinking Water criterion in the current GME. In previous monitoring rounds, PFOS concentrations at the same location were below the adopted guideline.

Groundwater monitoring well MW18, to the south and up/cross-hydraulic gradient of the site reported reduced PFAS concentrations below the adopted drinking water criteria.

Based on the results of this investigation and historical GMEs, PFAS in groundwater, associated with historical site activities, remain delineated to the north and north-east.

Overall, the data indicated the PFAS plume was generally stable in magnitude and extent. However, the groundwater PFAS results collected over time indicated some variations in 2023 sampling event which were not consistent with the previous GME results.

Mann Kendall PFOS trend analysis also confirmed that there were some uncertainties in data and inconsistent PFOS impact trends in some wells, that warranted an additional groundwater monitoring round.

9.3 Conceptual Site Model

A site-specific Conceptual Site Model (CSM) has been developed to identify various receptors (human and environment) and potential exposure routes in order to determine the presence/absence of complete exposure pathways from PFAS-impacted groundwater to said receptors. An exposure pathway is the link between a contaminant source and a receptor.

The CSM uses information obtained throughout this investigation along with information obtained from the previous environmental investigations undertaken by GHD between 2019 and 2022.

For an identifiable risk to exist, an exposure pathway must be present which requires each of the following to be identified:

– Presence of substances that may cause harm (SOURCE).
– Presence of a receptor which may be harmed (RECEPTOR).
– Existence of a means of exposing a receptor to the source (EXPOSURE ROUTE / EXPOSURE PATHWAY) and assessing whether exposure pathways are complete or incomplete.

A tabular CSM is presented in Table 9.1 below and a graphic CSM is presented as Figure 5.

9.4 Triggers for GMMP review and cessation

Based on the GHD (2022a) SMP/GMMP requirements, groundwater monitoring can cease and the GMMP can be discontinued if all three conditions outlined in Table 9.1 are satisfied.

Table 9.1 Evaluation of GMMP Groundwater Monitoring Cessation Conditions

No.	Groundwater monitoring cessation condition	Condition Satisfied or not
1	Two annual GMEs (2022 and 2023) for 10 selected monitoring wells have been completed	Satisfied
2	The PFAS concentrations in 10 selected monitoring wells (on-site and off-site) exhibit a consistent, stable or downward trend over a minimum period of two years	Not satisfied for wells MW04, MW08, MW14, MW15, MW20. Partially satisfied for MW21 and MW23 - decrease for one year, not two.
3	There are no significant increases of PFAS in any of the wells selected for monitoring	Not satisfied for down-hydraulic gradient wells MW15 and MW20. PFOS in MW15 exceeded the PFAS NEMP Health Drinking Water criterion in 2023 GME, while it was below in previous monitoring rounds. PFOS in MW20 exceeded both PFAS NEMP criteria: Health Drinking Water and Interim marine - 95%.

Based on the evaluation of the GMMP groundwater monitoring cessation conditions, two out of three conditions were not satisfied. Therefore, further groundwater monitoring events are required until the PFAS concentrations exhibit consistent, stable or downward trend to enable the cessation of the GMMP.

Table 9.2 Conceptual Site Model

Potential source	Receptor	Pathway	Pathway present?
PFAS-impacted groundwater	People using groundwater for: domestic and drinking purposes.	Consumption of contaminated groundwater.	**Possible** Eight out of ten wells recorded TDS values in groundwater below 1,200 mg/L indicating that groundwater may be suitable for potable use (NHMRC, 2011 updated 2018). The results of the groundwater-use survey conducted by GHD from March – April 2019 did not identify groundwater being used for potable use and there has not been any evidence of any current groundwater use / extraction in the residential areas north/north-east of the site and within the identified plume. However, as the TDS is variable and, in some instances, below 1,200 mg/L, potable use cannot be ruled out.
	People using groundwater for: irrigation of vegetable gardens and / or fruit trees with which they grow produce for consumption.	Consumption of fruit and vegetables irrigated by contaminated groundwater.	**Unlikely** The average calculated TDS value of groundwater beneath the assessment area is 729 mg/L, which is considered suitable for domestic and primary irrigation purposes (Gov SA, 2015). The results of the groundwater use survey results undertaken from March – April 2019 did not identify groundwater being used for irrigation purposes in the assessment area, however this cannot be ruled out. The same survey identified the presence of fruit trees planted in open soil at numerous residential properties in the survey area. It was also confirmed that the produce is consumed. Fruit testing of both citrus and stone fruit at selected properties within the PFAS plume area, conducted by GHD in February 2020 and reported on in a letter report (GHD 2020b), found that PFAS was not detected in any of the fruit sampled at the selected properties.
	People growing fruit and / or vegetables in open soil which may interact with groundwater.	Consumption of PFAS impacted fruit and / or vegetables.	**Unlikely** A survey conducted in March - April 2019 identified the presence of fruit trees planted in open soil at numerous residential properties in the survey area. It was also confirmed that the produce is consumed. Fruit testing of both citrus and stone fruit at selected properties within the PFAS plume area, conducted by GHD in February 2020 and reported on in a letter report (GHD 2020b), found that PFAS was not detected in any of the fruit sampled at the selected properties.
	People using groundwater for recreational purposes such as filling of swimming pools.	Incidental ingestion of contaminated groundwater.	**Unlikely** Groundwater used for recreational purposes such as filling of swimming pools is considered unlikely (Gov SA, 2015). The extent of PFAS in groundwater down-hydraulic gradient of the site has been delineated and there has not been any evidence of any current groundwater use/extraction in the residential areas north/north-east of the site where PFAS has been detected in groundwater. It is considered unlikely that groundwater in this area is used for recreational purposes where users would incidentally ingest water (i.e., during swimming).

Potential source	Receptor	Pathway	Pathway present?
	Down gradient off-site maintenance workers that contact PFAS contaminated groundwater.	Direct dermal contact or incidental ingestion of contaminated groundwater.	**Unlikely** Whilst it is possible that off-site maintenance workers could incidentally ingest contaminated groundwater, it is unlikely that they'll ingest quantities detrimental to their health.
	Ecosystem of Gulf St Vincent	Migration through porous media and discharge to water bodies/marine environments.	**Unlikely** Gulf St Vincent is located approximately 1.3 km west and up or cross hydraulic gradient of the site. The extent of groundwater PFAS impacts has been delineated to the west of the site and is thus unlikely to reach Gulf St Vincent.
	Ecosystem of Port Adelaide River	Migration through porous media and discharge to water bodies/marine environments.	**Unlikely** Groundwater PFAS concentrations have been delineated in the direction of the Port Adelaide River at concentrations below the nominated ecological criteria.

10. Conclusions

Based on the findings of this investigation, the following conclusions are made:

- The SWL recorded during the May 2023 investigation ranged from 1.35 m TOC (MW21) and 2.40 m TOC (MW04). Groundwater elevations across the assessment area ranged between 0.504 m AHD (MW14) and 0.929 m AHD (MW18) and were generally consistent with expected seasonal groundwater level fluctuations.
- The groundwater is inferred to flow in a north-easterly direction towards the Port Adelaide River and is generally consistent with previous monitoring events.
- An assessment of groundwater salinity indicated that groundwater beneath and adjacent to the site may be suitable for potable use and irrigation purposes (Gov SA 2015).
- 7 of the 10 monitoring wells reported concentrations of PFAS in groundwater above adopted drinking water assessment criteria.
- The highest PFAS concentrations were recorded at off-site wells MW08 and MW09, located down-hydraulic gradient of the site, which is considered likely a result of PFAS migration in groundwater.
- PFAS concentrations in groundwater at MW04 (on-site monitoring well) were one to two orders of magnitude lower than those recorded in the last GME conducted in 2022.
- PFOS concentrations in groundwater at down-hydraulic gradient well MW15 (located approximately 160 m north-east of the site) increased, marginally exceeding the Health Drinking Water criterion in the current GME. In previous monitoring events, PFOS concentrations at the same location were below the adopted guideline. This may potentially indicate slow PFAS migration in groundwater.
- Significantly reduced PFAS concentrations were noted at on-site well MW04 which were two orders of magnitude lower than previous groundwater monitoring results.
- While the use of groundwater for domestic irrigation and / or drinking purposes is possible (based on the CSM review), groundwater-use surveys previously undertaken within the assessment area indicated these exposure pathways are unlikely to be complete.
- Mann Kendall trend analysis of PFOS indicated that there were some uncertainties in the results and possibly increasing trends in some wells, requiring further monitoring of groundwater at the site as per the GMMP.
- Based on the evaluation of the GMMP groundwater monitoring cessation conditions, two out of three conditions were not satisfied. Therefore, further groundwater monitoring events are required until the PFAS concentrations exhibit consistent, stable or downward trend to enable the cessation of the GMMP.

11. Recommendations

Given some uncertainties in the results and inconsistent PFOS trends in some groundwater wells including wells MW04 and MW15 it is recommended that further groundwater monitoring be conducted over a minimum period of two years (i.e. 2024 and 2025) or until the PFAS concentrations exhibit consistent, stable or downward trend to enable the cessation of the GMMP.

12. References

Australian Commonwealth Work Health and Safety Act 2011.

Australian Commonwealth Work Health and Safety Regulations 2011.

Australian/New Zealand Standard 2018, Australia and New Zealand Guidelines for Fresh and Marine Water Quality, online resource www.waterquality.gov.au/anz-guidelines , Australia and New Zealand Governments 2019.

Gerges, N. 2006, Overview of the hydrogeology of the Adelaide metropolitan area, South Australia, Department of Water, Land and Biodiversity Conservation, DWLBC Report 2006/10, June 2010.

GHD 2019a, MFS Largs North Station Voluntary Site Contamination Assessment Proposal for the South Australian Environment Protection Authority, 20 October 2019.

GHD 2019b, Largs North Station and Gallantry PFAS testing Detailed Site Investigation (DSI) Report for South Australian Metropolitan Fire Service, April 2019.

GHD 2019c, Largs North Station and Gallantry PFAS Testing, Site Groundwater Use Survey & Groundwater Investigation for South Australian Metropolitan Fire Service, 27 May 2019.

GHD 2019d, Largs North Fire Station Preliminary Site Investigation for South Australian Metropolitan Fire Service, 21 November 2019.

GHD 2020a, Largs North Station Groundwater Investigation (October 2019) for South Australian Metropolitan Fire Service, 9 January 2020.

GHD 2020b, Largs North Station and Gallantry PFAS testing, Resident Fruit Testing for South Australian Metropolitan Fire Service, 10 February 2020.

GHD 2020c, Largs North Station and Gallantry PFAS Testing, Dust Testing – Post Clean Validation Sampling for South Australian Metropolitan Fire Service, 12 July 2020.

GHD 2020d, Largs North Station Groundwater Investigation (February 2020) for South Australian Metropolitan Service, 21 April 2020.

GHD 2020e, Sampling Analysis and Quality Plan (SAQP) prepared by GHD for the Largs North Fire Station, 24 June 2020.

GHD 2020f, Largs North Station Detailed Site Investigation Groundwater Assessment for South Australian Metropolitan Fire Service (April 2020), June 2020.

GHD 2020g, Largs North Station and Gallantry PFAS Testing, Dust Testing – Post Clean Validation Sampling (June 2020) for South Australian Metropolitan Fire Service, 16 July 2020.

GHD 2021, Largs North Station PFAS Impact, Remediation Options Assessment for South Australian Metropolitan Fire Service, 24 September 2021.

GHD 2022a, Site Management Plan/Groundwater Monitoring Management Plan Largs North Fire Station, August 2022.

GHD 2022b, Largs North Fire Station Groundwater Investigation for South Australian Metropolitan Fire Service, 23 September 2022.

GHD 2022c, MFS Largs North Fire Station Hydrogeology Review, South Australian Metropolitan Fire Service, 14 June 2022.

Gov SA 1993, Environment Protection Act 1993, Version 1.4.2021, Government of South Australia.

Gov SA 2015, Environment Protection (Water Quality) Policy 2015 (WQEPP), Version 30.1.2018, Government of South Australia 2018.

HEPA 2020, PFAS National Environment Management Plan (Version 2.0), Heads of Environment Protection Authorities Australia and New Zealand, January 2020. (PFAS NEMP 2020).

Hydrasleeve 2016, Standard Operating Procedure: Sampling Groundwater with a Hydrasleeve.

NHMRC 2019, Guidance on Per and Polyfluoroalkyl (PFAS) in Recreational Water, National Health and Medical Research Council, Canberra 2019.

NHMRC/NRMMC 2011, Australian Drinking Water Guidelines 6 (ADWG), Version 3.5 Updated August 2018, National Health and Medical Research Council and Natural Resource Management Ministerial Council, Canberra 2018.

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 Agency, South Australia, revised 2019.

SA EPA 2016, Site Contamination: Guideline for communication and engagement, Environment Protection Authority, South Australia.

Tables

Groundwater Samples

Client: South Australian Metropolitan Fire Service (MFS)
Project: Groundwater Investigation (May 2023)
Job No.: 3319080
Location: Largs North Station
WL Meter Type: Int.Fce

Location ID	TOC Elevation (mAHD)	Sample Date	SWL (mTOC)	Depth of Well (mTOC)	RWL (mAHD)	pH	EC (µs/cm)	TDS (mg/L)	DO (mg/L)	Redox field (mV)	Redox SHE (mV)	Temp. °C	Sample Description
MW04	3.293	11/05/2023	2.400	4.450	0.893	7.96	1173	762	54.06	-7.8	191	20.9	Pale yellow, no odour, no sheen, bubbles.
MW08	3.045	11/05/2023	2.240	4.350	0.805	7.66	651	423	54.26	-120.6	78	22.5	Pale yellow, no odour, no sheen, low sediment.
MW09	3.055	11/05/2023	2.270	4.320	0.785	7.33	1477	960	14.16	-97.0	102	22.3	Pale brown, no odour, no sheen.
MW10	2.802	11/05/2023	2.100	4.440	0.702	6.97	3138	2040	45.70	-23.9	175	22.8	Clear, no odour, low sediment.
MW14	2.854	11/05/2023	2.350	4.370	0.504	7.20	2026	1317	50.88	-242.8	-44	21.7	Clear, no odour, low - medium sediment.
MW15	2.945	11/05/2023	2.140	4.480	0.805	7.54	706	459	36.50	-6.3	193	22.5	Pale brown, no odour, low sediment.
MW18	3.079	11/05/2023	2.150	4.350	0.929	8.72	267	174	42.79	-14.6	184	20.9	Clear, no odour, no sheen, low sediment.
MW20	2.683	11/05/2023	1.770	4.400	0.913	7.58	584	380	45.70	-104.4	95	21.90	Clear, organic matter, rootlets.
MW21	2.217	11/05/2023	1.350	4.450	0.867	7.73	491	319	45.30	-43.6	155	22.60	Clear, no odour, low sediment.
MW23	2.167	11/05/2023	1.430	4.450	0.737	7.53	402	261	39.90	-136.4	63	21.1	Clear, no odour, low sediment.

TOC denotes TOP of casing
SWL denotes standing water level
RWL denotes relative water level
Redox SHE denotes redox potential relative to the standard hydrogen electrode

Groundwater Samples

Client: South Australian Metropolitan Fire Service (MFS)
Project: Groundwater Investigation (May 2023)
Job No.: 3319080
Location: Largs North Station
WL Meter Type: Int.Fce

Location ID	TOC Elevation surveyed (mAHD)	Sample Date	SWL (mTOC)	Depth of Well (mTOC)	RWL (mAHD)	pH	EC (µs/cm)	TDS (mg/L)	DO (mg/L)	Redox field (mV)	Redox SHE (mV)	Temp. °C	Sample Description
MW01	3.082	13/02/2019	2.422	4.421	0.660	6.60	1877	1220	0.06	-128	71	22.6	Light grey / pale brown. Sulphur dioxide odour. No sheen. Low turbidity. Low sediment load - fine sand in bottom of Hydrasleeve and trace organic matter.
		11/04/2019	2.491	4.541	0.591	6.60	2134	1387	0.00	32	231	23.4	Pale brown. No odour. No sheen. High turbidity. High sediment load - fine sands in the bottom of the Hydrasleeve and trace organic matter.
		23/10/2019	2.300	4.440	0.782	7.30	1610	1047	3.53	149	348	21.6	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.427	4.424	0.655	7.26	1836	1193	2.68	76	275	23.8	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.320	4.424	0.762	-	-	-	-	-	-	-	Good condition.
		14/05/2021	2.506	4.500	0.576	6.7	1570	1021	0.77	61	260	22.500	Clear, very low turbidity, no odour, no sheen. Some long, fine roots (>15 cm long, <1 mm diameter.)
MW02	3.028	13/02/2019	2.454	4.451	0.574	7.60	1098	714	0.18	-14.9	184	22.8	Pale grey / brown. Low organic odour. No sheen. Medium - high turbidity. Low sediment load - fine sand in bottom of Hydrasleeve.
		11/04/2019	2.513	4.407	0.515	6.98	1101	716	2.53	52.8	252	23.2	Pale brown. Organic odour. No sheen. High turbidity. High sediment load - fine sands in the botton of the Hydrasleeve and trace organic matter.
		23/10/2019	2.350	4.420	0.678	7.45	1800	1170	2.50	143.3	342	23.1	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.476	4.403	0.552	7.78	1582	1028	0.66	-32.8	166	22.3	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.410	4.403	0.618	-	-	-	-	-	-	-	Good condition.
		20/04/2021	2.461	4.404	0.567	7.150	1497	973	3.79	-41.7	157	23.500	Dark brown, high turbidity, no sheen, no odor
MW03	3.560	13/02/2019	2.881	4.452	0.679	7.19	1864	1212	0.06	49.1	248	21.1	Pale brown. No odour. No sheen. Low - medium turbidity. No sediment load and trace organic matter.
		11/04/2019	2.944	4.527	0.616	6.76	2040	1326	0.00	83.5	283	22.5	Clear / pale brown. No odour. No sheen. Low turbidity. Low sediment load.
		23/10/2019	2.740	4.440	0.820	8.12	970	631	2.59	127.0	326	22.3	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.900	4.420	0.660	7.77	1063	691	3.36	78.3	277	21.7	Clear / pale brown. No odour. No sheen. Low turbidity. Low sediment load.
		29/04/2020	2.700	4.420	0.860	-	-	-	-	-	-	-	Good condition.
		-	-	-	-	-	-	-	-	-	-	-	Not sampled
MW04	3.293	13/02/2019	2.655	4.464	0.638	7.15	1454	945	0.08	67.0	266	20.2	Pale brown. No odour. No sheen. High turbidity. No sediment load and trace organic matter.
		11/04/2019	2.703	4.454	0.590	6.76	1681	1093	0.00	86.3	285	21.5	Pale brown. No odour. No sheen. Low - medium turbidity. Low sediment load.
		23/10/2019	2.530	4.470	0.763	7.54	1550	1008	9.00	114.8	314	22.6	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.678	4.459	0.615	7.62	1484	965	0.60	71.4	270	22.0	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.580	4.459	0.713	-	-	-	-	-	-	-	Good condition.
		20/04/2021	2.643	4.456	0.650	7.260	2084	1355	3.12	104.2	303	21.300	Pale brown, medium-high turbidity, no sheen, no odor, trace organic matter
MW05	3.020	11/04/2019	2.389	4.551	0.631	7.01	835	543	0.00	51.5	251	24.0	Pale brown. Very slight hydrocarbon odour. No sheen. High turbidity. High sediment load - fine sands in bottom of the hydrasleeve and trace organic matter.
		23/10/2019	2.200	4.580	0.820	7.56	700	455	6.67	63.2	262	21.2	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.457	4.425	0.563	8.23	1735	1128	1.50	70.2	269	21.8	Pale brown. Very slight hydrocarbon odour. No sheen. Low turbidity. Low sediment load - fine sands in bottom of the hydrasleeve and trace organic matter.
		29/04/2020	2.090	4.425	0.930	-	-	-	-	-	-	-	Good condition.
		20/04/2021	2.447	4.431	0.573	7.40	494	321	1.37	-42.6	156	23.1	Clear, light grey, no sheen, no odour, low-medium turbidity
MW06	3.117	11/04/2019	2.500	4.383	0.617	6.85	2992	1945	0.00	51.4	250	22.2	Pale brown. No odour. No sheen. Medium turbidity. High sediment load - fine sands in the bottom of the Hydrasleeve and trace organic matter.
		23/10/2019	2.310	4.380	0.807	7.24	1830	1190	2.21	59.1	258	21.4	Pale brown / clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.457	4.367	0.660	7.29	1983	1289	0.33	96.7	296	22.5	Pale brown. Very slight hydrocarbon odour. No sheen. Low turbidity. Low sediment load - fine sands in bottom of the hydrasleeve and trace organic matter.
		29/04/2020	2.340	4.367	0.777	-	-	-	-	-	-	-	Good condition.
		20/04/2021	2.405	4.364	0.712	6.94	4853	3154	1.88	-39.4	160	22.1	Dark brown, high turbidity, no sheen, no odor, trace organic matter
MW07	3.157	11/04/2019	2.541	4.361	0.616	6.99	1460	949	0.16	98.1	297	23.0	Pale brown. No odour. No sheen. High turbidity. High sediment load - fine sands in the bottom of the Hydrasleeve and trace organic matter.
		23/10/2019	2.340	4.350	0.817	7.00	1250	813	2.33	103.2	302	21.9	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.494	4.331	0.663	8.20	1377	895	2.10	65.5	265	22.4	Pale brown. No odour. No sheen. Low - medium turbidity. Low sediment load.
		29/04/2020	2.370	4.331	0.787	-	-	-	-	-	-	-	Good condition.
		20/04/2021	2.460	4.394	0.697	7.10	4598	2989	1.56	97.3	296	22.2	Dark brown, medium turbidity, no sheen, no odor, surfactant on top of water in hydrosleeve.
MW08	3.045	11/04/2019	2.507	4.421	0.538	6.96	2512	1633	0.00	97.1	296	23.2	Pale brown. No odour. No sheen. High turbidity. High sediment load - fine sands in the bottom of the Hydrasleeve.
		23/10/2019	2.330	4.430	0.715	7.15	1570	1021	2.03	90.2	289	21.0	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.475	4.201	0.570	7.94	1990	1294	1.35	13.3	212	23.8	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.420	4.201	0.625	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.456	4.422	0.589	7.12	1725	1121	0.79	40.9	240	23.7	Clear/pale brown, low - medium turbidity, nos sheen. H_2S odour, trace organic matter
MW09	3.055	11/04/2019	2.534	4.383	0.521	7.13	1222	794	0.00	1.2	200	23.9	Pale brown. No odour. No sheen. Medium - high turbidity. Low sediment load and trace organic matter.
		23/10/2019	2.360	4.380	0.695	7.26	1080	702	1.92	31.4	230	22.4	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.506	4.537	0.549	8.77	1790	1164	3.54	-22.1	177	23.1	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.450	4.537	0.605	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.490	4.357	0.565	7.16	1540	1001	0.65	-49.8	149	23.3	Pale brown, no sheen, no odour, medium turbidity
MW10	2.802	11/04/2019	2.289	4.431	0.513	6.80	2669	1735	0.00	44.8	244	24.1	Pale brown. Sulphur odour. No sheen. Medium - high turbidity. Low sediment load.
		23/10/2019	2.090	4.450	0.712	6.81	1920	1248	NR	-73.8	125	22.2	Clear. Trace organic matter (grasses). No sheen. Slight hydrogen sulfide odour.
		27/02/2020	2.263	4.436	0.539	8.64	2868	1864	3.11	-127.8	71	23.8	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.180	4.436	0.622	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.244	4.432	0.558	6.88	5373	3492	0.66	-87.2	112	23.5	Clear, low turbidity, trace organic matter, no sheen/odour
MW11	3.192	11/04/2019	2.646	4.427	0.546	7.20	2555	1661	0.00	-91.4	108	23.6	Clear / pale brown. No odour. No sheen. Low turbidity. Low sediment load.
		23/10/2019	2.460	4.440	0.732	7.41	1640	1066	4.66	8.3	207	21.8	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.614	4.424	0.578	7.78	1663	1081	1.90	-167.2	32	23.6	Clear / pale brown. No odour. No sheen. Low turbidity. Low sediment load.
		29/04/2020	2.530	4.424	0.662	-	-	-	-	-	-	-	Likely rain/stormwater infiltration.
		19/04/2021	2.598	4.426	0.594	7.07	2065	1342	0.79	-31.4	168	23.4	
MW12	3.044	23/10/2019	2.260	4.390	0.784	6.98	1660	1079	5.23	10.2	209	20.2	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.430	4.378	0.614	7.89	972	632	3.36	194.7	394	23.2	Clear / pale brown. No odour. No sheen. Low turbidity. Low sediment load.
		29/04/2020	2.350	4.378	0.694	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.414	4.373	0.630	6.72	1760	1144	1.05	-118.1	81	22.3	Pale brown/straw, trace organic matter, no sheen, no odour, surfactant on top of water in hydrosleeve.
MW13	3.095	23/10/2019	2.350	4.380	0.745	6.70	2770	1801	0.98	-55.0	144	22.7	Pale brown / clear. Low turbidity. No sheen. Slight hydrogen sulfide odour.
		27/02/2020	2.505	4.366	0.590	8.00	2167	1409	1.52	-91.3	108	25.3	Pale brown / clear. Low turbidity. No sheen. No odour.
		29/04/2020	2.450	4.366	0.645	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.491	4.379	0.604	6.94	2348	1526	0.42	-102.2	97	24.2	Pale brown/straw, low - medium turbidity, surfactant on top of water in hydrosleeve, no sheen, H_2S odour, trace organic matter.

Groundwater Samples

Client: South Australian Metropolitan Fire Service (MFS)
Project: Groundwater Investigation (May 2023)
Job No.: 3319080
Location: Largs North Station
WL Meter Type: Int.Fce

Location ID	TOC Elevation surveyed (mAHD)	Sample Date	SWL (mTOC)	Depth of Well (mTOC)	RWL (mAHD)	pH	EC (µs/cm)	TDS (mg/L)	DO (mg/L)	Redox field (mV)	Redox SHE (mV)	Temp. °c	Sample Description
MW14	2.854	23/10/2019	2.120	4.390	0.734	7.10	2750	1788	NR	-60.1	139	21.2	Clear. Low turbidity. No sheen. Hydrogen sulfide odour.
		27/02/2020	2.291	4.378	0.563	8.01	2731	1775	1.58	-269.1	-70	22.5	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.220	4.378	0.634	-	-	-	-	-	-	-	Good condition
		19/04/2021	2.263	4.372	0.591	6.97	3314	2154	1.31	-186.5	13	22.4	Clear/straw, low turbidity, no sheen, surfactant on top of water in hydrosleeve, H_2S odour, trace organic matter.
MW15	2.945	23/10/2019	2.220	4.390	0.725	6.87	2765	1797	11.70	-53.2	146	21.5	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.389	4.376	0.556	7.54	1762	1145	1.94	-93.3	106	24.4	Clear / pale brown. No odour. No sheen. Low turbidity. Low sediment load.
		29/04/2020	2.310	4.376	0.635	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.366	4.374	0.579	6.81	3079	2001	0.46	-99.3		23.4	Clear, low turbidity, surfuctant on top of water in hydrosleeve, no sheen, H_2S odour, trace organic matter
MW16	2.859	23/10/2019	2.070	4.290	0.789	7.60	3900	2535	6.36	96.9	296	22.1	Pale brown / clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.246	4.370	0.613	8.11	2912	1893	2.37	-74.9	124	22.5	Pale brown / clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.150	4.370	0.709	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.216	4.373	0.643	7.09	3152	2049	1.63	77.8	277	21.9	Clear/pale brown, low turbidity, trace organic matter, no sheen, H_2S odour
MW17	3.068	23/10/2019	2.290	4.400	0.778	7.51	2030	1320	3.72	85.4	284	21.9	Pale brown / clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.468	4.376	0.600	8.15	2731	1775	1.69	30.3	229	22.4	Pale brown. No odour. No sheen. Low turbidity. Low sediment load.
		29/04/2020	2.390	4.376	0.678	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.427	4.377	0.641	7.10	2289	1488	0.68	-69.3	130	22.4	Clear/pale brown, trace organic matter, no sheen, low-turbidity, H_2S odour
MW18	3.079	23/10/2019	2.270	4.390	0.809	7.89	461	300	NR	90.0	289	22.0	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.435	4.362	0.644	8.21	707	460	1.61	38.8	238	22.0	Pale brown / clear. Low turbidity. No sheen. No odour.
		29/04/2020	2.210	4.362	0.869	-	-	-	-	-	-	-	Good condition.
		20/04/2021	2.383	4.364	0.696	7.63	214	139	39.80	39.8	239	22.2	Pale brown, low - medium turbidity, no sheen, no odour
MW19	3.120	27/02/2020	2.505	4.448	0.615	7.51	2335	1518	1.63	57.4	256	23.1	Pale brown / clear. Low turbidity. No sheen. No odour.
		29/04/2020	2.410	4.448	0.710	-	-	-	-	-	-	-	Likely rainwater infiltration.
		19/04/2021	2.465	4.449	0.655	7.11	3809	2476	0.60	-91.2	108	23.0	Pale brown, medium turbidity, no sheen, no odour
MW20	2.683	27/02/2020	2.701	4.454	-0.018	7.90	1269	825	1.20	130.0	329	21.2	Clear. No odour. No sheen. Low turbidity.
		29/04/2020	2.460	4.460	0.223	7.17	1646	1070	0.31	83.8	283	19.13	Clear, no odour, no sheen.
		19/04/2021	2.031	4.447	0.652	7.04	1356	881	0.86	-56.6	142	21.90	Clear/pale brown, low - medium turbidity, no sheen. H2S odour, trace organic matter
MW21	2.217	27/02/2020	1.676	4.670	0.541	8.58	1449	942	1.40	67.8	267	23.3	Clear / pale brown. No odour. No sheen. No turbidity.
		29/04/2020	2.480	4.450	-0.263	7.02	2337	1519	0.09	80.9	280	24.27	Clear, no odour, no sheen.
		19/04/2021	1.616	4.441	0.601	7.03	1443	938	0.52	-90.3	109	24.40	Clear, low turbidity, no sheen, H_2S odour
MW22	2.054	27/02/2020	1.580	4.461	0.474	7.34	2405	1563	0.70	168.3	367	24.7	Clear / pale brown. No odour. No sheen. Low turbidity. Low sediment load.
		29/04/2020	2.350	4.460	-0.296	7.12	1318	857	0.22	122.3	321	23.28	Clear, no odour, no sheen.
		19/04/2021	1.501	4.457	0.553	7.21	855	556	0.43	-80.3	119	24.80	Pale brown/orange, medium, - high turbidity, no sheen, surfuctant on top of water in hydrosleeve
MW23	2.167	27/02/2020	1.639	4.436	0.528	7.91	1612	1048	0.94	124.4	323	24.8	Pale brown / clear. Low turbidity. No sheen. No odour.
		29/04/2020	2.540	4.460	-0.373	7.47	695	452	0.54	96.5	296	21.2	Clear, no odour, no sheen.
		19/04/2021	1.637	4.463	0.530	7.18	820	533	0.82	-23.9	175	22.6	Clear, low turbidity, no sheen, faint H_2S odour
MW24	3.03	29/04/2020	2.300	4.460	0.734	6.9	3320	2158	0.19	19.7	219	21.6	Clear, no odour, no sheen.
		19/04/2021	2.376	4.447	0.654	6.6	2595	1687	1.05	-15.6	183	22.6	Plae brown, low - medium turbidity, trace organic matter, no sheen, faint H_2S odour
MW25	3.00	29/04/2020	2.27	4.43	0.73	7.3	2736	1779	0.54	-4.5	195	21.8	Clear, no odour, no sheen.
		-	-	-	-	-	-	-	-	-	-	-	
MW26	2.71	29/04/2020	1.94	4.45	0.773	7.4	619	402	0.85	93.2	292	20.82	Clear, no odour, no sheen.
		19/04/2021	2.009	4.436	0.70	7.31	472	307	1.05	7.3	206	22.4	Pale brown, medium turbidity, trace organic matter, no sheen, faint H_2S odour

TOC denotes TOP of casing
SWL denotes standing water level
RWL denotes relative water level
Redox SHE denotes redox potential relative to the standard hydrogen electrode
MW01 - located to the south-east of the site, was not accessible in April 2021 due to stockpiles of mulch on the road verge covering the well. MW01 was sampled on 14/05/21.
MW03 – located in the south-east portion of the site, unable to locate due to waste fill generated from building works at the station
MW25 – located on the central strip of Victoria Road to the north of the site. This well has been destroyed. A pine tree has been planted over the well

Groundwater Samples

Client: South Australian Metropolitan Fire Service (MFS)
Project: Groundwater Investigation (May 2023)
Job No.: 3319080
Location: Largs North Station
WL Meter Type: Int.Fce

Location ID	TOC Elevation surveyed (mAHD)	Sample Date	SWL (mTOC)	Depth of Well (mTOC)	RWL (mAHD)	pH	EC (µs/cm)	TDS (mg/L)	DO (mg/L)	Redox field (mV)	Redox SHE (mV)	Temp. °C	Sample Description
MW04	3.293	13/02/2019	2.655	4.464	0.638	7.15	1454	945	0.08	67.0	266	20.2	Pale brown. No odour. No sheen. High turbidity. No sediment load and trace organic matter.
		11/04/2019	2.703	4.454	0.590	6.76	1681	1093	0.00	86.3	285	21.5	Pale brown. No odour. No sheen. Low - medium turbidity. Low sediment load.
		23/10/2019	2.530	4.470	0.763	7.54	1550	1008	9.00	114.8	314	22.6	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.678	4.459	0.615	7.62	1484	965	0.60	71.4	270	22.0	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.580	4.459	0.713	-	-	-	-	-	-	-	Good condition.
		20/04/2021	2.643	4.456	0.650	7.26	2084	1355	3.12	104.2	303	21.3	Pale brown, medium-high turbidity, no sheen, no odor, trace organic matter.
		22/08/2022	2.385	4.480	0.908	6.70	3696	2402	54.06	49.8	249	15.6	Pale yellow, no odour, no sheen, low turbidity, low sediment load.
		11/05/2023	2.400	4.450	0.893	7.96	1173	762	1.59	-7.8	191	20.9	Pale yellow, no odour, no sheen, bubbles.
MW08	3.045	11/04/2019	2.507	4.421	0.538	6.96	2512	1633	0.00	97.1	296	23.2	Pale brown. No odour. No sheen. High turbidity. High sediment load - fine sands in the bottom of the Hydrasleeve.
		23/10/2019	2.330	4.430	0.715	7.15	1570	1021	2.03	90.2	289	21.0	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.475	4.201	0.570	7.94	1990	1294	1.35	13.3	212	23.8	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.420	4.201	0.625	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.456	4.422	0.589	7.12	1725	1121	0.79	40.9	240	23.7	Clear/pale brown, low - medium turbidity, nos sheen. H_2S odour, trace organic matter.
		23/08/2022	2.213	3.615	0.832	6.75	1931	1255	54.26	75.2	274	15.0	Pale yellow, no odour, no sheen, moderate turbidity, low sediment load.
		11/05/2023	2.240	4.350	0.805	7.66	615	400	2.59	-120.6	78	22.5	Pale yellow, no odour, no sheen, low sediment.
MW09	3.055	11/04/2019	2.534	4.383	0.521	7.13	1222	794	0.00	1.2	200	23.9	Pale brown. No odour. No sheen. Medium - high turbidity. Low sediment load and trace organic matter.
		23/10/2019	2.360	4.380	0.695	7.26	1080	702	1.92	31.4	230	22.4	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.506	4.537	0.549	8.77	1790	1164	3.54	-22.1	177	23.1	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.450	4.537	0.605	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.490	4.357	0.565	7.16	1540	1001	0.65	-49.8	149	23.3	Pale brown, no sheen, no odour, medium turbidity.
		22/08/2022	2.250	2.600	0.805	6.56	27	18	14.16	36.0	235	14.9	Black, odour, no sheen, moderate turbidity, low to medium sediment load, trace rootlets.
		11/05/2023	2.270	4.320	0.785	7.33	1477	960	3.03	-97.0	102	22.3	Pale brown, no odour, no sheen.
MW10	2.802	11/04/2019	2.289	4.431	0.513	6.80	2669	1735	0.00	44.8	244	24.1	Pale brown. Sulphur odour. No sheen. Medium - high turbidity. Low sediment load.
		23/10/2019	2.090	4.450	0.712	6.81	1920	1248	NR	-73.8	125	22.2	Clear. Trace organic matter (grasses). No sheen. Slight hydrogen sulfide odour.
		27/02/2020	2.263	4.436	0.539	8.64	2868	1864	3.11	-127.8	71	23.8	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.180	4.436	0.622	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.244	4.432	0.558	6.88	5373	3492	0.66	-87.2	112	23.5	Clear, low turbidity, trace organic matter, no sheen/odour.
		22/08/2022	1.990	4.479	0.812	6.89	5175	3364	45.70	58.4	257	15.6	Black, no odour, no sheen, moderate turbidity, low-medium sediment load, trace rootlets.
		11/05/2023	2.100	4.440	0.702	6.97	3138	2040	0.49	-23.9	175	22.8	Clear, no odour, low sediment.

Groundwater Samples

Client: South Australian Metropolitan Fire Service (MFS)
Project: Groundwater Investigation (May 2023)
Job No.: 3319080
Location: Largs North Station
WL Meter Type: Int.Fce

Location ID	TOC Elevation surveyed (mAHD)	Sample Date	SWL (mTOC)	Depth of Well (mTOC)	RWL (mAHD)	pH	EC (µs/cm)	TDS (mg/L)	DO (mg/L)	Redox field (mV)	Redox SHE (mV)	Temp. °c	Sample Description
MW14	2.854	23/10/2019	2.120	4.390	0.734	7.10	2750	1788	NR	-60.1	139	21.2	Clear. Low turbidity. No sheen. Hydrogen sulfide odour.
		27/02/2020	2.291	4.378	0.563	8.01	2731	1775	1.58	-269.1	-70	22.5	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.220	4.378	0.634	-	-	-	-	-	-	-	Good condition
		19/04/2021	2.263	4.372	0.591	6.97	3314	2154	1.31	-186.5	13	22.4	Clear/straw, low turbidity, no sheen, surfactant on top of water in hydrosleeve, H_2S odour, trace organic matter.
		23/08/2022	2.080	4.355	0.774	10.29	4593	2985	50.88	-241.7	-43	16.1	Pale yellow, very slight hydrocarbon odour (rotten egg), moderate turbidity, low sediment load , trace rootlets.
		11/05/2023	2.350	4.370	0.504	7.20	2026	1317	1.22	-242.8	-44	21.7	Clear, no odour, low - medium sediment.
MW15	2.945	23/10/2019	2.220	4.390	0.725	6.87	2765	1797	11.70	-53.2	146	21.5	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.389	4.376	0.556	7.54	1762	1145	1.94	-93.3	106	24.4	Clear / pale brown. No odour. No sheen. Low turbidity. Low sediment load.
		29/04/2020	2.310	4.376	0.635	-	-	-	-	-	-	-	Good condition.
		19/04/2021	2.366	4.374	0.579	6.81	3079	2001	0.46	-99.3	100	23.4	Clear, low turbidity, surfuctant on top of water in hydrosleeve, no sheen, H_2S odour, trace organic matter.
		22/08/2022	2.107	4.382	0.838	6.65	1702	1106	36.50	103.9	303	15.5	Pale yellow, no odour, no sheen, low-medium turbidity, low sediment load.
		11/05/2023	2.140	4.480	0.805	7.34	706	459	0.99	-23.9	175	22.5	Pale brown, no odour, low sediment.
MW18	3.079	23/10/2019	2.270	4.390	0.809	7.89	461	300	NR	90.0	289	22.0	Clear. Low turbidity. No odour. No sheen.
		27/02/2020	2.435	4.362	0.644	8.21	707	460	1.61	38.8	238	22.0	Pale brown / clear. Low turbidity. No sheen. No odour.
		29/04/2020	2.210	4.362	0.869	-	-	-	-	-	-	-	Good condition.
		20/04/2021	2.383	4.364	0.696	7.63	214	139	39.80	39.8	239	22.2	Pale brown, low - medium turbidity, no sheen, no odour.
		22/08/2022	2.030	4.390	1.049	6.62	624	406	42.79	73.0	272	14.2	Pale brown, no odour, no sheen, medium turbidity, low-med sediment load.
		11/05/2023	2.150	4.350	0.929	8.72	267	174	0.66	-14.6	184	20.9	Clear, no odour, no sheen, low sediment.
MW20	2.683	27/02/2020	2.701	4.454	-0.018	7.90	1269	825	1.20	130.0	329	21.2	Clear. No odour. No sheen. Low turbidity.
		29/04/2020	2.460	4.460	0.223	7.17	1646	1070	0.31	83.8	283	19.1	Clear, no odour, no sheen.
		19/04/2021	2.031	4.447	0.652	7.04	1356	881	0.86	-56.6	142	21.9	Clear/pale brown, low - medium turbidity, no sheen. H2S odour, trace organic matter.
		23/08/2022	1.743	4.470	0.940	8.15	1940	1261	45.70	-73.4	126	13.8	Grey, no odour, no sheen, high turbidity, medium sediment load.
		11/05/2023	1.770	4.400	0.913	7.58	584	380	0.49	-104.4	95	21.9	Clear, organic matter, rootlets.
MW21	2.217	27/02/2020	1.676	4.670	0.541	8.58	1449	942	1.40	67.8	267	23.3	Clear / pale brown. No odour. No sheen. No turbidity.
		29/04/2020	2.480	4.450	-0.263	7.02	2337	1519	0.09	80.9	280	24.3	Clear, no odour, no sheen.
		19/04/2021	1.616	4.441	0.601	7.03	1443	938	0.52	-90.3	109	24.4	Clear, low turbidity, no sheen, H_2S odour.
		22/08/2022	1.340	4.470	0.877	6.79	1305	848	45.30	111.0	310	15.0	Clear to pale yellow, no odour, no sheen, low turbidity, low sediment load, trace rootlets.
		11/05/2023	1.350	4.450	0.867	7.73	491	319	2.20	-43.6	155	22.6	Clear, no odour, low sediment.
MW23	2.167	27/02/2020	1.639	4.436	0.528	7.91	1612	1048	0.94	124.4	323	24.8	Pale brown / clear. Low turbidity. No sheen. No odour.
		29/04/2020	2.540	4.460	-0.373	7.47	695	452	0.54	96.5	296	21.2	Clear, no odour, no sheen.
		19/04/2021	1.637	4.463	0.530	7.18	820	533	0.82	-23.9	175	22.6	Clear, low turbidity, no sheen, faint H2S odour.
		22/08/2022	1.310	4.404	0.857	7.45	861	560	39.90	92.6	292	14.2	Clear to pale yellow, no odour, low turbidity, no sheen, low sediment load.
		11/05/2023	1.430	4.450	0.737	7.53	402	261	0.25	-136.4	63	21.1	Clear, no odour, low sediment.

TOC denotes Top of Casing
SWL denotes Standing Water Level
RWL denotes Relative Water Level
Redox SHE denotes redox potential relative to the Standard Hydrogen Electrode

Table 3
Groundwater Analytical Results

		PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Fluorotelomer Sulfonic				PFAS - Sums		
		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)	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 PFHxSand PFOS	Sum of USEPA PFAS (PFOS+ PFOA)*	PFAS (Sum of Total)
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		0.0004	0.0005	0.0002	0.0005	0.0002	0.0005	0.002	0.0005	0.0004	0.0004	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0004	0.0004	0.001	0.0002	0.0002	0.0002
PFAS NEMP 2.0 2020 Recreational Water				2		2						10											2		
PFAS NEMP 2.0 2020 Health Drinking Water				0.07		0.07						0.56											0.07		
PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system						0.13						220													
Location Code	**Date**																								
MW04	11 May 2023	0.0075	0.012	0.18	0.016	0.32	< 0.002	0.01	0.006	0.013	0.003	0.0068	0.002	< 0.002	< 0.002	< 0.005	< 0.01	< 0.05	< 0.001	< 0.0004	0.001	< 0.002	0.49	0.32	0.57
MW08	11 May 2023	0.0076	0.013	0.22	0.025	0.53	< 0.002	0.01	0.005	0.013	0.003	0.0095	0.003	< 0.002	< 0.002	< 0.005	< 0.01	< 0.05	< 0.001	0.0005	0.002	< 0.002	0.75	0.54	0.85
MW09	11 May 2023	0.062	0.098	0.85	0.074	0.23	< 0.002	0.01	0.01	0.070	0.014	0.037	0.002	< 0.002	< 0.002	< 0.005	< 0.01	< 0.05	< 0.001	< 0.0004	0.001	< 0.002	1.1	0.26	0.75
MW10	11 May 2023	0.036	0.038	0.13	< 0.001	0.0080	< 0.002	< 0.02	0.007	0.028	0.003	0.0021	< 0.001	< 0.002	< 0.002	< 0.005	< 0.01	< 0.05	< 0.001	0.0008	< 0.0004	< 0.002	0.14	0.010	0.25
MW14	11 May 2023	0.017	0.022	0.16	0.009	0.049	< 0.002	0.005	0.006	0.023	0.003	0.0084	< 0.001	< 0.002	< 0.002	< 0.005	< 0.01	< 0.05	< 0.001	< 0.0004	< 0.0004	< 0.002	0.21	0.058	0.31
MW15	11 May 2023	0.0077	0.004	0.046	0.004	0.071	< 0.002	0.007	< 0.002	0.002	0.0006	0.0024	< 0.001	< 0.002	< 0.002	< 0.005	< 0.01	< 0.05	< 0.001	0.0049	< 0.0004	< 0.002	0.12	0.074	0.15
MW18	11 May 2023	0.001	< 0.001	0.0028	< 0.001	0.017	< 0.002	0.008	< 0.002	0.003	0.001	0.001	0.001	< 0.002	< 0.002	< 0.005	< 0.01	< 0.05	< 0.001	< 0.0004	< 0.0004	< 0.002	0.020	0.018	0.036
MW20	11 May 2023	0.0082	0.008	0.090	0.004	0.14	< 0.002	0.02	0.01	0.016	0.0051	0.011	0.006	0.01	< 0.002	< 0.005	< 0.01	< 0.05	< 0.001	< 0.0004	< 0.0004	< 0.002	0.23	0.15	0.33
MW21	11 May 2023	0.0045	< 0.001	0.0069	< 0.001	0.0042	< 0.002	0.01	< 0.002	0.002	0.001	0.0028	< 0.001	< 0.002	< 0.002	< 0.005	< 0.01	< 0.05	< 0.001	< 0.0004	< 0.0004	< 0.002	0.011	0.0070	0.033
MW23	11 May 2023	0.002	< 0.001	0.0043	< 0.001	0.015	< 0.002	< 0.004	< 0.002	0.002	0.0007	0.002	< 0.001	0.006	< 0.002	< 0.005	< 0.01	< 0.05	< 0.001	< 0.0004	< 0.0004	< 0.002	0.020	0.017	0.033

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water

		PFAS (short suite in water)							
		Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	PFAS (Sum of Total)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*
		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	0.01
PFAS NEMP 2.0 2020 Recreational Water		2	2	10				2	
PFAS NEMP 2.0 2020 Health Drinking Water		**0.07**	**0.07**	**0.56**				**0.07**	
PFAS NEMP 2.0 2020 Interim marine - 95%			*0.13*	*220*					
Location Code	**Date**								
MW01	13/02/2019	**0.20**	0.07	0.01	0.01	<0.01	0.3	**0.27**	0.08
	11/04/2019	**0.30**	0.07	0.02	<0.01	<0.01	0.39	**0.37**	0.09
	23/10/2019	**0.25**	0.04	0.01	<0.01	<0.01	0.30	**0.29**	0.05
	28/02/2020	**0.29**	0.07	0.03	<0.01	<0.01	0.39	**0.36**	0.10
	14/05/2021	**0.24**	0.05	0.02	<0.01	<0.02	0.31	**0.29**	0.07
MW02	13/02/2019	**4.3**	***8.5***	0.09	<0.01	<0.01	13	**13**	8.6
	11/04/2019	**3.4**	***9.0***	0.07	<0.01	<0.01	12	**12**	9.1
	23/10/2019	**3.3**	***9.1***	0.07	<0.01	<0.01	12	**12**	9.1
	28/02/2020	**3.7**	***9.7***	0.07	<0.01	<0.01	13	**13**	9.8
	20/04/2021	**4.5**	***7.1***	0.08	<0.01	<0.02	12	**12**	7.2
MW03	13/02/2019	**3.8**	***4.8***	0.09	<0.01	<0.01	8.7	**8.6**	4.9
	11/04/2019	**5.1**	***3.1***	0.13	<0.01	<0.01	8.3	**8.2**	3.2
	23/10/2019	**0.08**	***0.69***	<0.01	<0.01	<0.01	0.77	**0.77**	0.69
	28/02/2020	0.02	***0.56***	0.01	<0.01	<0.01	0.59	**0.58**	0.57
MW04	13/02/2019	**38**	***25***	**1.8**	4.6	0.13	70	**63**	27
	11/04/2019	**86**	***130***	**4.2**	4.9	0.36	230	**220**	130
	23/10/2019	**29**	***100***	**1.9**	4.0	0.44	140	**130**	110
	28/02/2020	**13**	***220***	**0.87**	1.9	0.67	240	**230**	220
	20/04/2021	**15**	***67***	**0.83**	1.6	0.37	85	**82**	68
	22/08/2022	**15**	**51**	**0.99**	1.8	0.95	89	**67**	52
	11/05/2023	**0.18**	**0.32**	0.0068	<0.01	0.001	0.57	**0.49**	0.32
MW05	11/04/2019	0.02	0.07	<0.01	<0.01	<0.01	0.09	**0.09**	0.07
	23/10/2019	<0.01	0.02	<0.01	<0.01	<0.01	0.02	0.02	0.02
	28/02/2020	0.06	0.04	<0.01	<0.01	<0.01	0.10	**0.10**	0.04
	20/04/2021	**0.61**	0.05	0.13	<0.01	<0.02	0.79	**0.66**	0.18
MW06	11/04/2019	0.04	**0.11**	<0.01	<0.01	<0.01	0.16	**0.16**	0.11
	23/10/2019	0.01	0.03	<0.01	<0.01	<0.01	0.04	0.04	0.03
	28/02/2020	0.06	0.04	0.02	<0.01	<0.01	0.12	**0.10**	0.06
	20/04/2021	0.06	0.05	0.01	<0.01	<0.02	0.13	**0.11**	0.07
MW07	11/04/2019	0.10	***0.39***	<0.01	<0.01	<0.01	0.48	**0.48**	0.39
	23/10/2019	0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01
	28/02/2020	0.01	0.02	<0.01	<0.01	<0.01	0.03	0.03	0.02
	20/04/2021	0.01	0.02	<0.01	<0.01	<0.02	0.03	0.03	0.02
MW08	11/04/2019	**0.77**	***0.15***	0.03	<0.01	<0.01	0.95	**0.92**	0.18
	23/10/2019	**0.33**	0.07	0.02	<0.01	<0.01	0.42	**0.40**	0.09
	27/02/2020	**0.25**	***0.15***	0.05	<0.01	<0.01	0.44	**0.40**	0.20
	19/04/2021	**0.40**	***0.27***	0.05	<0.01	<0.02	0.72	**0.67**	0.32
	23/08/2022	**0.37**	***0.15***	0.016	0.018	<0.0004	0.68	**0.52**	0.17
	11/05/2023	**0.22**	***0.53***	0.0095	0.0005	0.002	0.85	**0.75**	0.26
MW09	11/04/2019	**0.47**	0.02	0.02	<0.01	<0.01	0.51	**0.49**	0.03
	23/10/2019	**0.14**	0.05	<0.01	<0.01	<0.01	0.19	**0.19**	0.05
	27/02/2020	**0.43**	**0.11**	0.02	<0.01	<0.01	0.56	**0.53**	0.13
	19/02/2021	**0.89**	***0.35***	0.04	0.02	<0.02	1.3	**1.2**	0.39
	22/08/2022	**1.3**	***0.34***	0.042	0.018	<0.0004	2.1	**1.7**	0.38
	11/05/2023	**0.85**	***0.23***	0.037	<0.0004	0.001	**0.75**	**1.1**	0.26
MW10	11/04/2019	**0.13**	0.04	<0.01	<0.01	<0.01	0.17	**0.17**	0.04
	23/10/2019	0.06	<0.01	<0.01	<0.01	<0.01	0.06	0.06	<0.01
	27/02/2020	0.03	0.01	<0.01	<0.01	<0.01	0.04	0.04	0.01
	19/04/2021	**0.08**	0.04	<0.01	<0.01	<0.02	0.12	**0.12**	0.04
	22/08/2022	**0.075**	0.020	0.002	0.0094	<0.0004	0.18	**0.095**	0.022
	11/05/2023	**0.13**	0.0080	0.0021	0.0008	<0.0004	0.25	**0.14**	0.010
MW11	11/04/2019	**0.50**	0.02	0.03	<0.01	<0.01	0.54	**0.52**	0.05
	23/10/2019	0.06	<0.01	<0.01	<0.01	<0.01	0.06	0.06	<0.01
	27/02/2020	**0.12**	<0.01	0.01	<0.01	<0.01	0.14	**0.12**	0.01
	19/04/2021	0.04	<0.01	<0.01	<0.01	<0.02	0.04	0.04	<0.01
MW12	23/10/2019	**0.18**	***0.29***	0.02	0.03	<0.01	0.51	**0.47**	0.30
	27/02/2020	**0.21**	***0.29***	0.02	<0.01	<0.01	0.53	**0.50**	0.31
	19/04/2021	**0.19**	***0.33***	0.03	<0.01	<0.02	0.55	**0.52**	0.35
MW13	23/10/2019	**0.10**	<0.01	<0.01	<0.01	<0.01	0.10	**0.10**	<0.01
	27/02/2020	0.05	<0.01	<0.01	<0.01	<0.01	0.05	0.05	<0.01
	19/04/2021	**0.08**	<0.01	<0.01	<0.01	<0.02	0.08	**0.08**	<0.01
MW14	23/10/2019	**0.11**	<0.01	<0.01	<0.01	<0.01	0.11	**0.11**	<0.01
	27/02/2020	**0.15**	<0.01	<0.01	<0.01	<0.01	0.15	**0.15**	<0.01
	19/04/2021	**0.13**	<0.01	0.01	<0.01	<0.02	0.14	**0.13**	0.01
	23/08/2022	**0.14**	0.038	0.0073	0.0069	<0.0004	0.25	**0.18**	0.046
	11/05/2023	**0.16**	0.049	0.0084	<0.0004	<0.0004	0.31	**0.21**	0.058
MW15	23/10/2019	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	27/02/2020	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	19/04/2021	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
	22/08/2022	0.0024	0.011	0.0007	0.019	<0.0004	0.043	0.013	0.012
	11/05/2023	0.046	**0.071**	0.0024	0.0049	<0.0004	0.15	**0.12**	0.074

		PFAS (short suite in water)							
		Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	PFAS (Sum of Total)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW16	23/10/2019	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	28/02/2020	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	19/04/2021	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
MW17	23/10/2019	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	28/02/2020	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	19/04/2021	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
MW18	23/10/2019	0.01	0.04	<0.01	<0.01	<0.01	0.06	0.06	0.04
	28/02/2020	<0.01	0.04	<0.01	<0.01	<0.01	0.04	0.04	0.04
	20/04/2021	<0.01	***0.14***	<0.01	<0.01	<0.02	0.14	**0.14**	0.14
	22/08/2022	0.020	**0.073**	0.0051	0.0075	0.002	0.15	**0.093**	0.078
	11/05/2023	0.0028	0.017	0.001	<0.0004	<0.0004	0.036	0.020	0.018
MW19	28/02/2020	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	19/04/2021	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
MW20	27/02/2020	**0.15**	<0.01	<0.01	<0.01	<0.01	0.15	**0.15**	<0.01
	29/04/2020	**0.16**	0.06	<0.01	<0.01	<0.01	0.22	**0.22**	0.06
	19/04/2021	**0.17**	**0.08**	0.01	<0.01	<0.02	0.26	**0.24**	0.09
	23/08/2022	**0.093**	**0.037**	0.0056	0.003	<0.0004	0.21	**0.13**	0.043
	11/05/2023	**0.090**	**0.14**	0.011	<0.0004	<0.0004	0.33	**0.23**	0.15
MW21	27/02/2020	0.03	0.01	<0.01	<0.01	<0.01	0.04	0.04	0.01
	29/04/2020	0.05	0.02	0.01	0.02	<0.01	0.09	0.06	0.03
	19/04/2021	0.04	<0.01	<0.01	<0.01	<0.02	0.04	0.04	<0.01
	22/08/2022	0.011	0.023	0.0021	0.020	<0.0004	0.097	0.034	0.025
	11/05/2023	0.0069	0.0042	0.0028	<0.0004	<0.0004	0.033	0.011	0.0070
MW22	27/02/2020	<0.01	<0.01	<0.01	0.04	<0.01	0.04	<0.01	<0.01
	29/04/2020	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	19/04/2021	<0.01	<0.01	<0.01	0.01	<0.02	0.01	<0.01	<0.01
MW23	27/02/2020	<0.01	0.02	<0.01	<0.01	<0.01	0.02	0.02	0.02
	29/04/2020	<0.01	0.03	<0.01	<0.01	<0.01	0.03	0.03	0.03
	19/04/2021	0.02	0.04	0.01	<0.01	<0.02	0.07	0.06	0.06
	22/08/2022	0.0065	0.057	0.002	0.068	<0.0004	0.14	0.064	0.059
	11/05/2023	0.0043	0.015	0.002	<0.0004	<0.0004	0.033	0.020	0.017
MW24	29/04/2020	0.01	0.01	<0.01	<0.01	<0.01	0.03	0.03	0.01
	19/04/2021	<0.01	0.01	<0.01	<0.01	<0.02	0.01	0.01	0.01
MW25	29/04/2020	0.02	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01
MW26	29/04/2020	<0.01	0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01
	19/04/2021	<0.01	0.01	0.02	0.01	<0.02	0.04	0.01	0.03
PAE well	11/04/2019	<0.01	0.02	0.01	<0.01	<0.01	0.03	0.02	0.03

Table 5
RPD Results

MFS Largs North
Groundwater Monitoring Event
(May 2023)
3319080

						PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										PFAS - Perfluoroalkyl Sulfonamide					
						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)	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)
						µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL						0.0004	0.0005	0.0002	0.0005	0.0002	0.0005	0.002	0.0005	0.0004	0.0004	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.001	0.0005	0.001	0.001
Location C	**Date**	**Field ID**	**Matrix Type**	**Sample Type**	**Lab Report Number**																							
MW20	11 May 2023	MW20	Water	Normal	323174	0.0082	0.008	0.090	0.004	0.14	<0.002	0.02	0.01	0.016	0.0051	0.011	0.006	0.01	<0.002	<0.005	<0.01	<0.05	<0.01	<0.05	<0.1	<0.002	<0.05	<0.5
		FD01	Water	Field_D	323174	0.015	0.013	0.11	0.005	0.22	<0.002	0.02	0.01	0.016	0.0054	0.011	0.004	0.006	<0.002	<0.005	<0.01	<0.05	<0.01	<0.05	<0.1	<0.002	<0.05	<0.5
RPD						**59**	**48**	20	22	**44**	0	0	0	0	6	0	**40**	**50**	0	0	0	0	0	0	0	0	0	0
MW20	11 May 2023	MW20	Water	Normal	323174	0.0082	0.008	0.090	0.004	0.14	<0.002	0.02	0.01	0.016	0.0051	0.011	0.006	0.01	<0.002	<0.005	<0.01	<0.05	<0.01	<0.05	<0.1	<0.002	<0.05	<0.5
		FS01	Water	Interlab_D	ES2316216	0.0050	0.0035	0.0534	<0.0016	0.124	<0.0016	0.015	0.0112	0.0118	0.0042	0.0102	0.0042	0.0053	<0.0016	<0.0016	<0.0016	<0.0040	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004
RPD						**48**	**78**	**51**	-	12	0	29	11	30	19	8	**35**	**61**	0	0	0	0	0	0	0	0	0	0

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

Table 5
RPD Results

MFS Largs North
Groundwater Monitoring Event
(May 2023)
3319080

							PFAS - Fluorotelomer Sulfonic Acids				PFAS - Sums			
						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 US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
						µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL						0.0005	0.001	0.0004	0.0004	0.001	0.0002	0.0002	0.0002	0.0003
Location C	**Date**	**Field ID**	**Matrix Type**	**Sample Type**	**Lab Report N**									
MW20	11 May 2023	MW20	Water	Normal	323174	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.23	0.15	0.33	-
		FD01	Water	Field_D	323174	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.33	0.23	0.44	-
RPD						0	0	0	0	0	**36**	**42**	29	-
MW20	11 May 2023	MW20	Water	Normal	323174	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.23	0.15	0.33	-
		FS01	Water	Interlab_D	ES2316216	<0.0016	<0.002	<0.002	<0.002	<0.002	0.177	-	0.248	0.235
RPD						0	0	0	0	0	26	-	28	-

***RPDs have only been considered where a concentration is greater than 1 times**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs**
*****Interlab Duplicates are matched on a per compound basis as methods vary be**

Table 5
RPD Results

MFS Largs North
Groundwater Monitoring Event
(May 2023)
3319080

						PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										
						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
EQL						0.0004	0.0005	0.0002	0.0005	0.0002	0.0005	0.002	0.0005	0.0004	0.0004	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Location Code	**Date**	**Field ID**	**Matrix Type**	**Sample Type**	**Lab Report Number**																	
MW20	11 May 2023	MW20	Water	Normal	323174	0.0082	0.008	0.090	0.004	0.14	<0.002	0.02	0.01	0.016	0.0051	0.011	0.006	0.01	<0.002	<0.005	<0.01	<0.05
		FD01	Water	Field_D	323174	0.015	0.013	0.11	0.005	0.22	<0.002	0.02	0.01	0.016	0.0054	0.011	0.004	0.006	<0.002	<0.005	<0.01	<0.05
RPD						59	48	20	22	44	0	0	0	0	6	0	40	50	0	0	0	0
MW20	11 May 2023	MW20	Water	Normal	323174	0.0082	0.008	0.090	0.004	0.14	<0.002	0.02	0.01	0.016	0.0051	0.011	0.006	0.01	<0.002	<0.005	<0.01	<0.05
		FS01	Water	Interlab_D	ES2316216	0.0050	0.0035	0.0534	<0.0016	0.124	<0.0016	0.015	0.0112	0.0118	0.0042	0.0102	0.0042	0.0053	<0.0016	<0.0016	<0.0016	<0.0040
RPD						48	78	51	-	12	0	29	11	30	19	8	35	61	0	0	0	0

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs: 30 - 50%)**
*****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.

						PFAS - Perfluoroalkyl Sulfonamide							PFAS - Fluorotelomer Sulfonic Acids				PFAS - Sums			
						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 US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
						µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL						0.0005	0.001	0.001	0.0005	0.001	0.001	0.0005	0.001	0.0004	0.0004	0.001	0.0002	0.0002	0.0002	0.0003
Location Code	**Date**	**Field ID**	**Matrix Type**	**Sample Type**	**Lab Report Number**															
MW20	11 May 2023	MW20	Water	Normal	323174	<0.01	<0.05	<0.1	<0.002	<0.05	<0.5	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.23	0.15	0.33	-
		FD01	Water	Field_D	323174	<0.01	<0.05	<0.1	<0.002	<0.05	<0.5	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.33	0.23	0.44	-
RPD						0	0	0	0	0	0	0	0	0	0	0	36	42	29	-
MW20	11 May 2023	MW20	Water	Normal	323174	<0.01	<0.05	<0.1	<0.002	<0.05	<0.5	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.23	0.15	0.33	-
		FS01	Water	Interlab_D	ES2316216	<0.0016	<0.004	<0.004	<0.0016	<0.004	<0.004	<0.0016	<0.002	<0.002	<0.002	<0.002	0.177	-	0.248	0.235
RPD						0	0	0	0	0	0	0	0	0	0	0	26	-	28	-

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

Table 6
Rinsate Blank Analytical Results

MFS Largs North Station
Groundwater Monitoring Event
(May 2023)
3319080

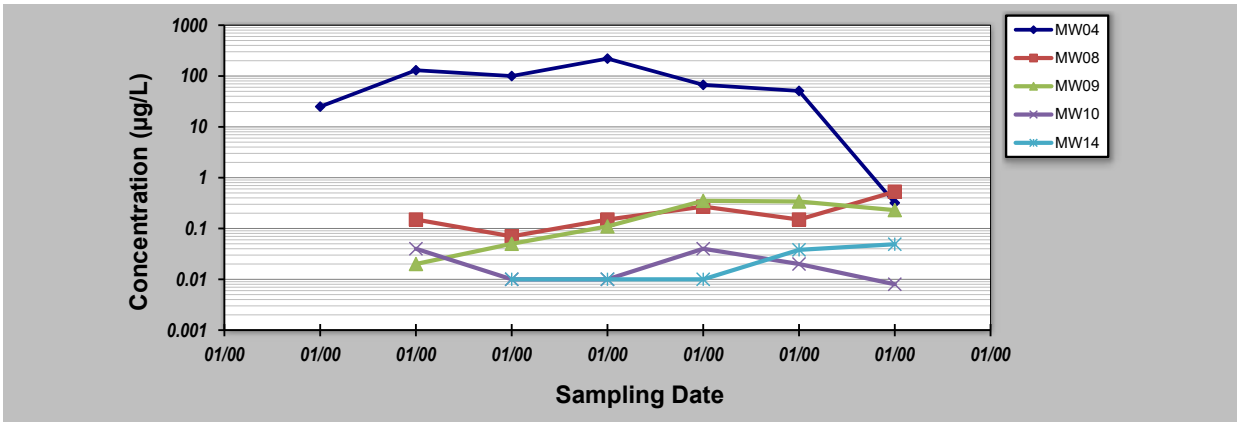
				PFAS - Perfluoroalkyl Sulfonic Acids		PFAS - Perfluoroalkyl Carboxylic Acids	PFAS - Fluorotelomer Sulfonic Acids		PFAS - Sums		
				Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)
				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	0.02	0.01	0.01	0.01
Matrix Type	**Field ID**	**Date**	**Sample Type**								
Water	FB01	11 May 2023	Field_B	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01

Table 7
Mann-Kendall Trend Analysis for PFOS

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	1-Aug-23	Job ID:	3319080
Facility Name:	MFS Largs North Fire Station	Constituent:	PFOS
Conducted By:	GHD	Concentration Units:	µg/L

Sampling Point ID:	MW04	MW08	MW09	MW10	MW14		
Sampling Event	Sampling Date	PFOS CONCENTRATION (µg/L)						
1	13-Feb-19	25						
2	11-Apr-19	130	0.15	0.02	0.04			
3	23-Oct-19	100	0.07	0.05	0.01	0.01		
4	27-28/02/202	220	0.15	0.11	0.01	0.01		
5	19-20/04/202	67	0.27	0.35	0.04	0.01		
6	22-23/08/202	51	0.15	0.34	0.02	0.038		
7	11-May-23	0.32	0.53	0.23	0.008	0.049		
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.87	0.75	0.79	0.71	0.80		
Mann-Kendall Statistic (S):		-7	8	9	-5	7		
Confidence Factor:		80.9%	89.8%	93.2%	76.5%	92.1%		
Concentration Trend:		Stable	No Trend	Prob. Increasing	Stable	Prob. Increasing		



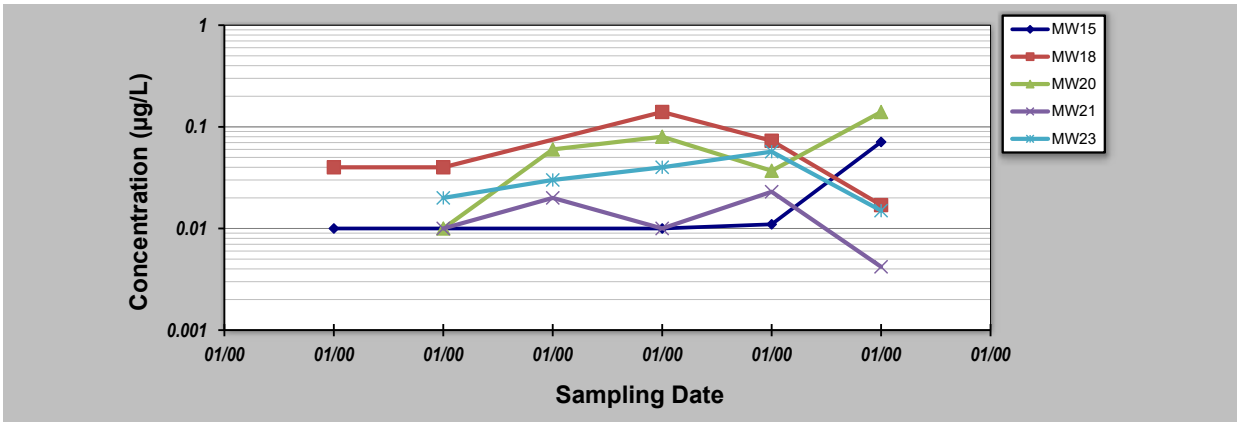
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	1-Aug-23	Job ID:	3319080
Facility Name:	MFS Largs North Fire Station	Constituent:	PFOS
Conducted By:	GHD	Concentration Units:	µg/L

Sampling Point ID:	MW15	MW18	MW20	MW21	MW23		
Sampling Event	Sampling Date	PFOS CONCENTRATION (µg/L)						
1	23-Oct-19	0.01	0.04					
2	27-28/02/202	0.01	0.04	0.01	0.01	0.02		
3	29-Apr-20			0.06	0.02	0.03		
4	19-20/04/202	0.01	0.14	0.08	0.01	0.04		
5	22-23-Aug-22	0.011	0.073	0.037	0.023	0.057		
6	11-May-23	0.071	0.017	0.14	0.0042	0.015		
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		1.21	0.77	0.75	0.58	0.52		
Mann-Kendall Statistic (S):		7	-1	6	-1	2		
Confidence Factor:		92.1%	50.0%	88.3%	50.0%	59.2%		
Concentration Trend:		Prob. Increasing	Stable	No Trend	Stable	No Trend		



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

Figures

Data Disclaimer

Paper Size ISO A3

0 20 40 60 80

Meters

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

N

GHD

South Australian Metropolitan Fire Service
Largs North Station Groundwater Investigation
May 2023

Site Location Plan

Project No. **33-19080**
Revision No. **A**
Date **30/05/2023**

FIGURE 1

N:\AU\Adelaide\Projects\33\19080\GIS\Maps\Deliverables\19080_LargsNorthStationSiteLocation.aprx - 19080_001_SiteLocationPlan
Print date: 30 May 2023 - 11:15

Data source: GHD: Site Boundary (2022); DPTI: Cadastre (2021), Roads, Railways (2019). MetroMap: Imagery (Imagery Date: 17/11/2022; Date Extracted: 29/05/2023) Created by: ejuan

Paper Size ISO A3

0 15 30 45 60

Meters

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

N

GHD

South Australian Metropolitan Fire Service
Largs North Station Groundwater Investigation
May 2023

Groundwater Monitoring Well Locations Plan

Project No. **33-19080**
Revision No. **B**
Date **30/05/2023**

FIGURE 2

N:\AU\Adelaide\Projects\33\19080\GIS\Maps\Deliverables\19080_LargsNorthStationSiteLocation.aprx - 19080_002_GWMonitoringWellLocationsPlan
Print date: 30 May 2023 - 12:36

Data source: GHD: GW Sampling Locations (2019). DPTI: Cadastre (2021), Roads, Railways (2019). MetroMap: Imagery (Imagery Date: 17/11/2022; Date Extracted: 29/05/2023) Created by: ejuan

Data Disclaimer

© 2023. Whilst every care has been taken to prepare this map, GHD, DPTI and MetroMap make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Paper Size ISO A3

0 10 20 30 40 50 60

Meters

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

N

GHD

South Australian Metropolitan Fire Service
Largs North Station Groundwater Investigation
May 2023

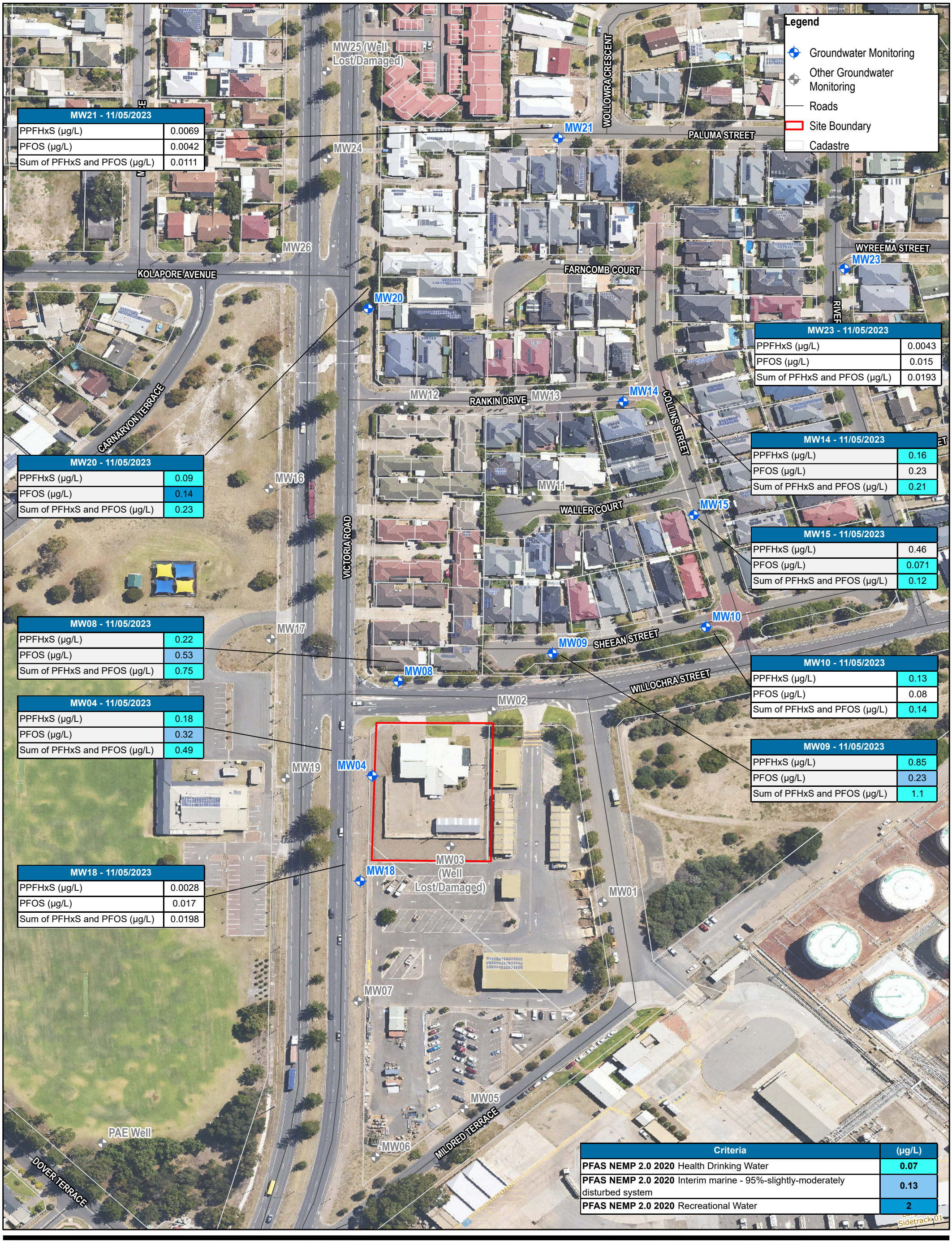
Groundwater Elevations and Inferred Flow Direction Plan

Project No. **33-19080**
Revision No. **A**
Date **30/05/2023**

FIGURE 3

N:\AU\Adelaide\Projects\33\19080\GIS\Maps\Deliverables\19080_LargsNorthStationSiteLocation.aprx - 19080_003_GWMonitoringElevations&InferredFlowDirectiongPlan
Print date: 30 May 2023 - 14:52

Data source: GHD: GW Sampling Locations (2019). DPTI: Cadastre (2021), Roads, Railways (2019). MetroMap: Imagery (Imagery Date: 17/11/2022; Date Extracted: 29/05/2023) Created by: ejuan



Data Disclaimer

Paper Size ISO A3

0 15 30 45 60

Meters

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

N

GHD

South Australian Metropolitan Fire Service
Largs North Station Groundwater Investigation
May 2023

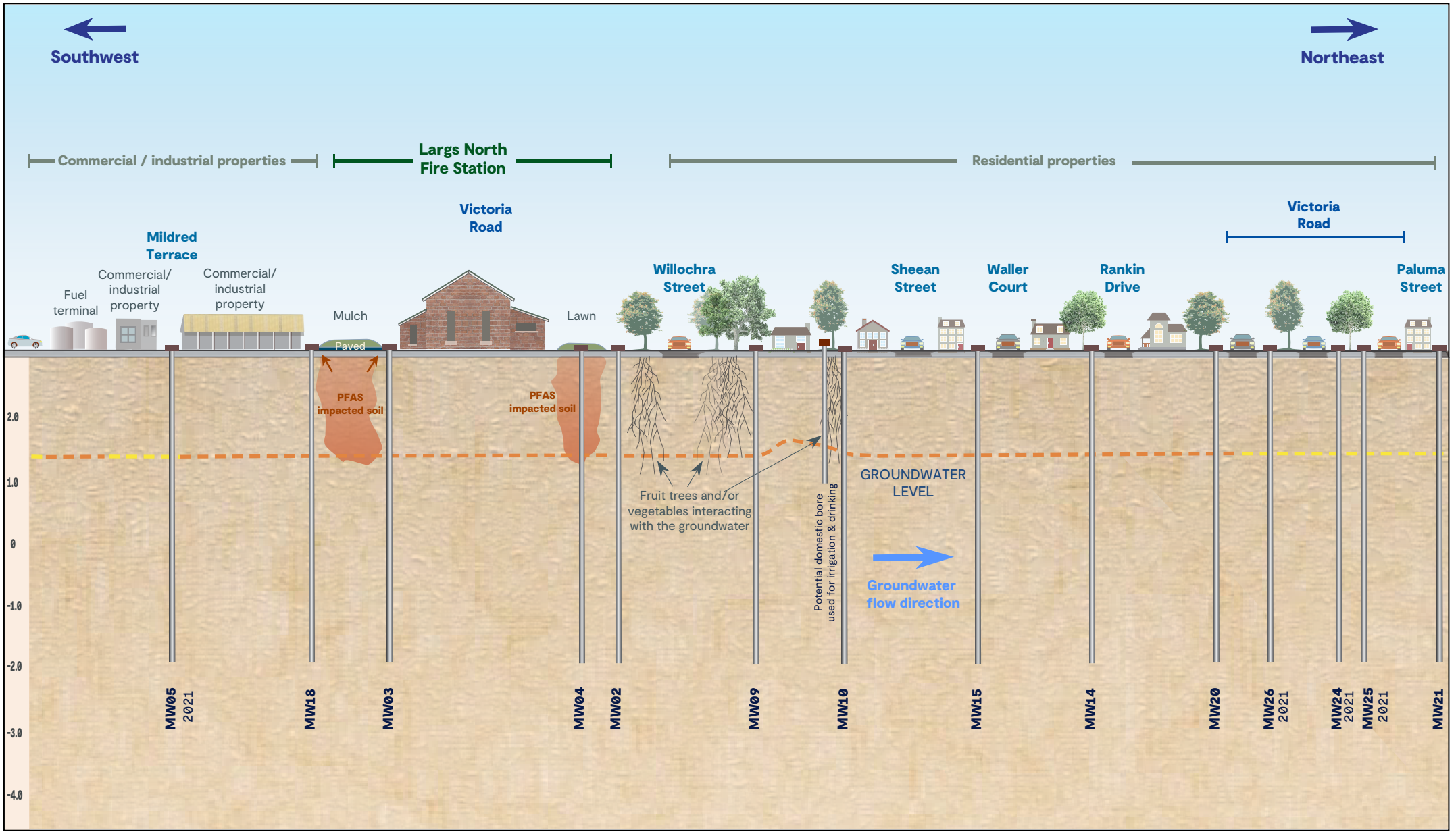
Groundwater Concentrations Exceedances Plan

Project No. **33-19080**
Revision No. **C**
Date **03/08/2023**

FIGURE 4

\\ghdnet\ghd\AU\Adelaide\Projects\33\19080\GIS\Maps\Deliverables\19080_LargsNorthStationSiteLocation.aprx - 19080_004_GWConcentrationExceedancesPlan1
Print date: 03 Aug 2023 - 00:26

Data source: GHD: GW Sampling Locations (2019). DPTI: Cadastre (2021), Roads, Railways (2019). MetroMap: Imagery (Imagery Date: 17/11/2022; Date Extracted: 29/05/2023) Created by: ejuan



LEGEND

- No criteria exceedances
- Exceeding PFAS NEMP 2018 Health Drinking Water Criteria
- Exceeding PFAS NEMP 2018 Health Recreational Water Criteria

South Australian Metropolitan Fire Service
Largs North Station Groundwater Investigation
May 2023

Conceptual Site Mode

Job Number	33-19080
Revision	A
Date	02 June 2023

Figure 5

N:\AU\Adelaide\Projects\33\19080\GIS\Maps\AI\ConceptualSiteModel_May2020.ai

Level 15, 133 Castlereagh Street Sydney NSW 2000 T 61 7 5557 1000 F 61 2 9239 7100 E 61 2 9239 7199 W www.ghd.com.au

Sum of PFHxS and PFOS (µg/L)		
MW25	Apr-20	0.02

Sum of PFHxS and PFOS (µg/L)		
MW24	Apr-20	0.03
	Apr-21	0.01

Sum of PFHxS and PFOS (µg/L)		
MW26	Apr-20	0.01
	Apr-21	0.01

Sum of PFHxS and PFOS (µg/L)		
MW20	Apr-20	0.22
	Apr-21	0.24
	Aug-22	0.13
	May-23	0.23

Sum of PFHxS and PFOS (µg/L)		
MW12	Oct-19	0.47
	Feb-20	0.50
	Apr-21	0.52

Sum of PFHxS and PFOS (µg/L)		
MW16	Oct-19	<0.01
	Feb-20	<0.01
	Apr-21	<0.01

Sum of PFHxS and PFOS (µg/L)		
MW11	Apr-19	0.52
	Oct-19	0.06
	Feb-20	0.12
	Apr-21	0.04

Sum of PFHxS and PFOS (µg/L)		
MW17	Oct-19	<0.01
	Feb-20	<0.01
	Apr-21	<0.01

Sum of PFHxS and PFOS (µg/L)		
MW08	Feb-20	0.40
	Apr-21	0.67
	Aug-22	0.52
	May-23	0.75

Sum of PFHxS and PFOS (µg/L)		
MW19	Feb-20	<0.01
	Apr-21	<0.01

Sum of PFHxS and PFOS (µg/L)		
MW04	Feb-20	230
	Apr-21	82
	Aug-22	67
	May-23	0.49

Sum of PFHxS and PFOS (µg/L)		
MW18	Feb-20	0.04
	Apr-21	0.14
	Aug-22	0.093
	May-23	0.020

Sum of PFHxS and PFOS (µg/L)		
MW07	Apr-19	0.48
	Oct-19	0.01
	Feb-20	0.03
	Apr-21	0.03

Sum of PFHxS and PFOS (µg/L)		
MW06	Apr-19	0.16
	Oct-19	0.04
	Feb-20	0.10
	Apr-21	0.11

Sum of PFHxS and PFOS (µg/L)		
MW21	Apr-20	0.06
	Apr-21	0.04
	Aug-22	0.034
	May-23	0.011

Sum of PFHxS and PFOS (µg/L)		
MW22	Feb-20	<0.01
	Apr-20	<0.01
	Apr-21	<0.01

Sum of PFHxS and PFOS (µg/L)		
MW23	Apr-20	0.03
	Apr-21	0.06
	Aug-22	0.064
	May-23	0.020

Sum of PFHxS and PFOS (µg/L)		
MW14	Feb-20	0.15
	Apr-21	0.13
	Aug-22	0.18
	May-23	0.21

Sum of PFHxS and PFOS (µg/L)		
MW13	Oct-19	0.10
	Feb-20	0.05
	Apr-21	0.08

Sum of PFHxS and PFOS (µg/L)		
MW15	Feb-20	<0.01
	Apr-21	<0.01
	Aug-22	0.013
	May-23	0.12

Sum of PFHxS and PFOS (µg/L)		
MW10	Feb-20	0.04
	Apr-21	0.12
	Aug-22	0.095
	May-23	0.14

Sum of PFHxS and PFOS (µg/L)		
MW09	Feb-20	0.53
	Apr-21	1.2
	Aug-22	1.7
	May-23	1.1

Sum of PFHxS and PFOS (µg/L)		
MW02	Apr-19	12
	Oct-19	12
	Feb-20	13
	Apr-21	12

Sum of PFHxS and PFOS (µg/L)		
MW03	Feb-19	8.6
	Apr-19	8.2
	Oct-19	0.77
	Feb-20	0.58

Sum of PFHxS and PFOS (µg/L)		
MW01	Apr-19	0.37
	Oct-19	0.29
	Feb-20	0.36
	May-21	0.29

Sum of PFHxS and PFOS (µg/L)		
MW05	Apr-19	0.09
	Oct-19	0.02
	Feb-20	0.10
	Apr-21	0.66

Criteria	(µg/L)
PFAS NEMP 2.0 2020 Health Drinking Water	**0.07**
PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system	**0.13**
PFAS NEMP 2.0 2020 Recreational Water	**2**

Paper Size ISO A3

0 15 30 45 60

Meters

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

N

GHD

South Australian Metropolitan Fire Service
Largs North Station Groundwater Investigation
May 2023

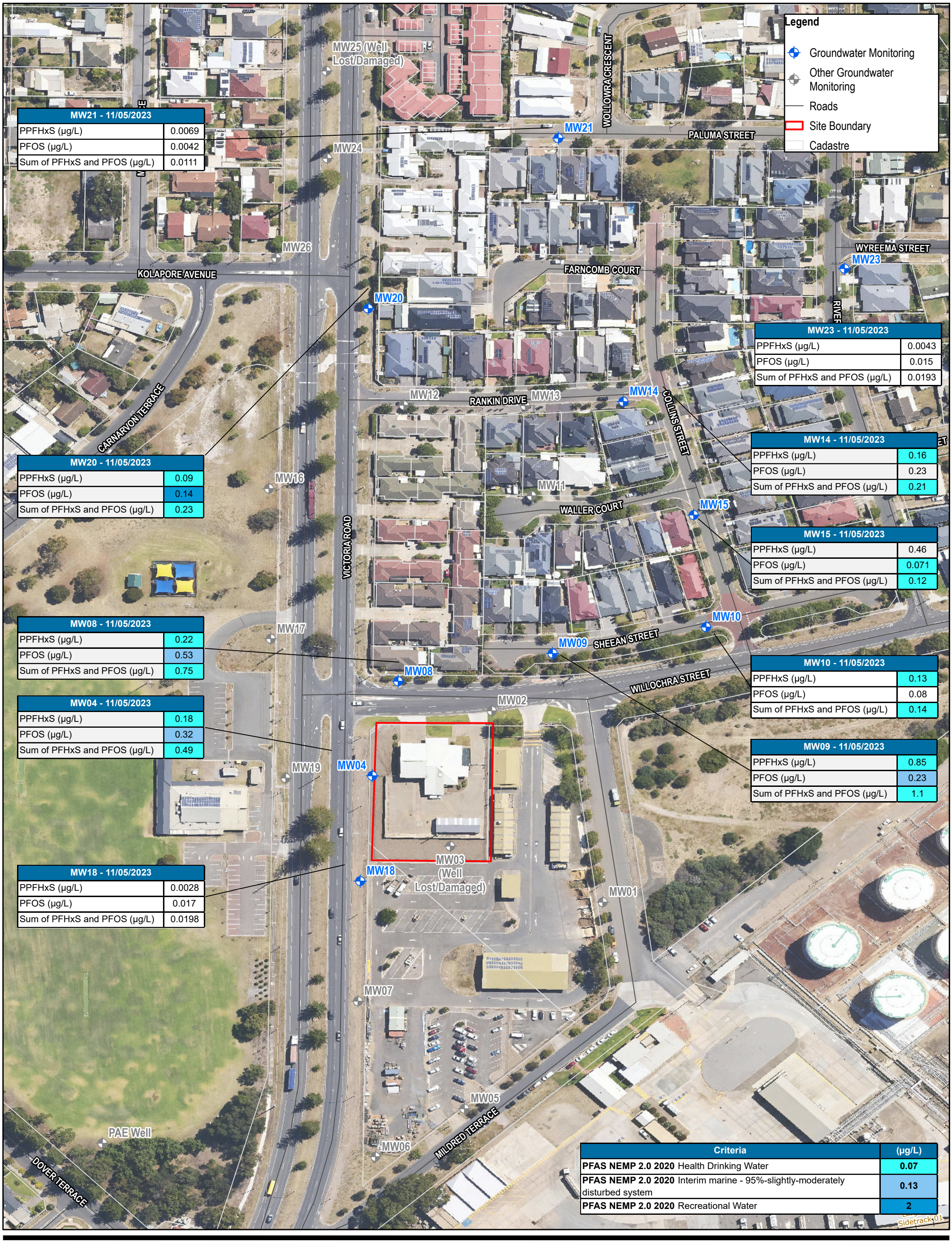
Historical Groundwater Results: PFOS + PFHxS

Project No. **33-19080**
Revision No. **A**
Date **05/09/2023**

FIGURE 6

\\ghdnet\ghd\AU\Adelaide\Projects\33\19080\GIS\Maps\Deliverables\19080_LargsNorthStationSiteLocation.aprx - 19080_006_SumofPFHxS&PFOSConcentrations_revA
Print date: 05 Sep 2023 - 16:34

Data source: GHD: GW Sampling Locations (2019). DPTI: Cadastre (2021), Roads, Railways (2019). MetroMap: Imagery (Imagery Date: 17/11/2022; Date Extracted: 29/05/2023) Created by: ejuan



Data Disclaimer

Paper Size ISO A3

0 15 30 45 60

Meters

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

N

GHD

South Australian Metropolitan Fire Service
Largs North Station Groundwater Investigation
May 2023

Groundwater Concentrations Exceedances Plan

Project No. **33-19080**
Revision No. **C**
Date **03/08/2023**

FIGURE 4

\\ghdnet\ghd\AU\Adelaide\Projects\33\19080\GIS\Maps\Deliverables\19080_LargsNorthStationSiteLocation.aprx - 19080_004_GWConcentrationExceedancesPlan1
Print date: 03 Aug 2023 - 00:26

Data source: GHD: GW Sampling Locations (2019). DPTI: Cadastre (2021), Roads, Railways (2019). MetroMap: Imagery (Imagery Date: 17/11/2022; Date Extracted: 29/05/2023) Created by: ejuan

Appendices

Appendix A

Registered Bore Search

WaterConnect

Groundwater Data Report

Government of South Australia
Department for Environment and Water

Circle Centre -34.817987,138.501742, Radius 2km

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-3	01/12/1931	92.96	92.96	3.05	01/12/1931	1	01/12/1931	1385	01/12/1931	EXP	Tomw(T1)	ABD					
6528-312	27/11/1968	143.26	0					34536	07/07/1976		Tomw(T1)	BKF	2178				
6528-313	31/08/1951	101.8	0	2.13	31/08/1951	10.1	01/01/1964	1642	12/02/1964		Tomw(T1)	BKF	91530				
6528-314	22/11/1934	102.11	0	6.1	22/11/1934	5.05	22/11/1934	1727	22/11/1934		Tomw(T1)	BKF					
6528-315	20/04/1972	127.5	0		04/07/2003	5	24/06/1980	2030	09/10/1991	OBS	Tomw(T1)	BKF	229825	PTA060	H	H	
6528-316		6.1	6.1	3.66	13/11/1967			645	15/11/1967	DOM	Qhcks	OPR					6.1
6528-317		3.66	3.66	2.44	18/08/1969	0.25	18/08/1969	830	18/08/1969	IRR	Qhcks	OPR					3.66
6528-318		6.1	6.1					471	01/12/1914		Qhcks						
6528-319		8.23	8.23								Qhcks						
6528-320		3.35	3.35	2.44	31/10/1934			956	31/10/1934		Qhcks						
6528-321		2.74	2.74	2.13	26/02/1964	0.19	26/02/1964	800	26/02/1964		Qhcks						
6528-322		7.62	7.62	4.27	02/12/1968			1016	02/12/1968	IRR	Qhcks	OPR					7.62
6528-326		6.4	6.4	1.85	09/11/1945			1113	09/11/1945	DOM	Qhcks	OPR					
6528-328		4.57	4.57	4.27	21/09/1934			4798	21/09/1934		Qhcks	OPR					
6528-539	01/06/1979							739	01/06/1979		Qhcks		5624				
6528-540	01/06/1979							1188	01/06/1979		Qhcks		5502				
6528-545	01/06/1979	5	5	3	01/06/1979	1	01/06/1979	1468	01/06/1979	DOM	Qhcks	OPR	5826				
6528-559	01/01/1981	6		3	01/01/1981	0.5	01/01/1981	882	18/02/1981		Qhcks		8130				
6528-560	01/01/1981	6		3	01/01/1981	0.5	01/01/1981	932	18/02/1981		Qhcks		7910				
6528-561	01/01/1981	6		3	01/01/1981	0.5	01/01/1981	1160	25/02/1981		Qhcks		8157				
6528-562	01/01/1981	6		3	01/01/1981	0.5	01/01/1981	805	18/02/1981		Qhcks		8363				
6528-563	01/01/1981	6	6	3	01/01/1981	0.5	01/01/1981	916	18/02/1981		Qhcks		8080				
6528-564	01/01/1981	6		3	01/01/1981	0.5	01/01/1981	950	18/02/1981		Qhcks		8228				
6528-565	01/01/1981	6		3	01/01/1981	0.5	01/01/1981	938	18/02/1981		Qhcks		8369				
6528-566	01/01/1981	6	6	3	01/01/1981	0.5	01/01/1981	1172	18/02/1981		Qhcks		7909				
6528-574	01/01/1981	6		4	01/01/1981	0.5	01/01/1981	761	25/02/1981		Qhcks		8067				
6528-575	01/01/1981	6		4	01/01/1981	0.5	01/01/1981	716	25/01/1981		Qhcks		8081				
6528-578	29/04/1981	3.4	3.4	2	29/04/1981	0.5	29/04/1981	683	29/04/1981		Qhcks		91361				2
6528-579	24/04/1981	4	4	2.6	24/04/1981	0.46	24/04/1981	1049	04/05/1981		Qhcks		8883				
6528-580	01/06/1979	6		4	01/06/1979	1	01/06/1979	728	01/06/1979		Qhcks		5793				
6528-583	01/03/1981	6	6	3	01/03/1981	0.5	01/03/1981				Qhcks		8917				
6528-584	01/03/1981	6	6	3	01/03/1981	0.5	01/03/1981				Qhcks		8610				
6528-589		6	6					910	01/06/1979		Qhcks		5331				
6528-590		4	4					938	23/08/1979		Qhcks		5890				
6528-591		4	4					1099	23/08/1979		Qhcks		5965				
6528-594	01/01/1981	5.49		3.35	01/01/1981	0.69	01/01/1981				Qhcks		8963				5.49
6528-595	01/01/1980							1452	10/01/1994		Qhcks		7041				

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-598	01/01/1981	6	6	3	01/01/1981	0.5	01/01/1981	827	25/02/1981	OBS	Qhcks		8432				6
6528-599	01/01/1981	6		3	01/01/1981	0.5	01/01/1981				Qhck		9396				
6528-602	01/01/1981	6	6	3	01/01/1981	0.5	01/01/1981	938	01/01/1981		Qhcks		8328				
6528-609	17/09/1981	3.5	3.5	2.4	17/09/1981	0.5	17/09/1981	600	30/09/1981		Qhcks		8983				2.7
6528-610	18/09/1981	3.9	3.9	2.4	18/09/1981	0.5	18/09/1981	841	30/09/1981		Qhcks		9366				2.7
6528-612	01/01/1980	6	6	3	01/01/1980	0.5	01/01/1980				Qhcks		7784				
6528-616	01/01/1980	6	6	4	01/01/1980	0.5	01/01/1980				Qhcks		7192				
6528-630	30/06/1981	6	6	3	30/06/1981	0.5	30/06/1981				Qhcks		9821				
6528-631	30/06/1981	6	6	3	30/06/1981	0.5	30/06/1981				Qhcks		9704				
6528-633	30/06/1981	6	6	3	30/06/1981	0.5	30/06/1981				Qhcks		9370				
6528-635	30/06/1981	6	6							DOM	Qhcks	OPR	10087				
6528-645	24/06/1982	175	155	7.35	14/03/2023	4.5	24/06/1982	2390	30/09/2022	OBS	Tomw(T1)	OPR	10538	PTA070	C	H	147
6528-648	02/10/1982	6	6	3	02/10/1982	0.5	02/10/1982				Qhcks		9448				
6528-649	27/08/1982	6	6			0.5	27/08/1982				Qhcks		10808				
6528-650	27/08/1982	6	6	0.5	27/08/1982						Qhcks		10807				
6528-651	30/07/1982	6	6			0.5	30/07/1982				Qhcks		10681				
6528-653	26/02/1982	6	6			0.5	26/02/1982				Qhcks		10251				
6528-654	26/02/1982	6	6			0.5	26/02/1982				Qhcks		10220				
6528-660	01/10/1982	6	6			0.5	01/10/1982				Qhcks		11142				
6528-661	01/10/1982	6	6			0.5	01/10/1982				Qhcks		11116				
6528-662	01/10/1982	6	6			0.5	01/10/1982				Qhcks		11117				
6528-663	01/10/1982	6	6			0.5	01/10/1982				Qhcks		11060				
6528-665	01/10/1982	6	6			0.5	01/10/1982				Qhcks		11062				
6528-666	01/10/1982	6	6			0.5	01/10/1982				Qhcks		11063				
6528-667	01/10/1982	6	6			0.5	01/10/1982				Qhcks		10987				
6528-673	03/11/1982	4.3	4.3	3.2	03/11/1982	0.6	03/11/1982				Qhcks		11180				3.2
6528-678	24/01/1983	4.4	4.4	2.9	24/01/1983	0.6	24/01/1983	910	04/02/1983		Qhcks		11877				3.1
6528-698	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11569				
6528-699	01/01/1983	6	6			0.5	01/01/1983				Qhcks		11568				
6528-700	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11567				
6528-702	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11533				
6528-704	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11477				
6528-705	01/12/1982	6	6	4.41	06/06/2019	0.5	01/12/1982				Qhcks		11476				
6528-706	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11475				
6528-708	01/01/1983	6	6			0.5	01/01/1983				Qhcks		11832				
6528-710	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11448				
6528-712	01/01/1983	6	6			0.5	01/01/1983				Qhcks		11714				
6528-713	01/01/1983	6	6			0.5	01/01/1983				Qhcks		11692				
6528-714	01/12/1982	6	6	3.14	18/06/2019	0.5	01/12/1982				Qhcks		11334				
6528-717	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11263				
6528-718	01/01/1983	6	6			0.5	01/01/1983				Qhcks		11688				
6528-720	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11386				

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-721	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11385				
6528-723	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11333				
6528-725	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11258				
6528-726	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11256				
6528-728	01/11/1982	6	6			0.5	01/11/1982				Qhcks		11207				
6528-729	01/12/1982	6	6			0.5	01/12/1982				Qhcks		11196				
6528-730	01/12/1982	6	6			0.5	01/12/1982				Qhcks		10986				
6528-737	10/03/1983	5.1	5.1	3.6	10/03/1983	0.6	10/03/1983	761	15/03/1983		Qhcks		11827				3.9
6528-738	04/03/1983	4.5	4.5	3	04/03/1983	0.6	04/03/1983	484	12/03/1983		Qhcks		12002				3.3
6528-743	16/03/1983	3.6		2.1	16/03/1983	0.6	16/03/1983	639	28/03/1983	DOM	Qhcks	OPR	12356				
6528-745	24/03/1983	2.7		1.3	24/03/1983	0.6	24/03/1983	1552	01/01/1983		Qhcks		12403				
6528-752	18/04/1983	4.5	4.5	3	18/04/1983	0.6	18/04/1983	827	29/04/1983		Qhcks		12198				3.3
6528-755	18/04/1983	4.3	4.3	2.8	18/04/1983	0.6	18/04/1983	956	07/01/1994		Qhcks		12560				3.1
6528-756	18/04/1983	3.5	3.5	2	18/04/1983	0.6	18/04/1983	1608	03/05/1983		Qhck		12544				2.3
6528-758		6	6					772	27/05/1982		Qhcks		92034				
6528-759	15/03/1983	6.9	6.9	5.4	15/03/1983	0.9	15/03/1983	860	28/03/1983		Qhcks		12042				
6528-761	10/11/1982	5	5					556	06/01/1983		Qhcks		11294				
6528-762	18/04/1983	4.5	4.5	2.1	18/04/1983	0.38	18/04/1983	1295	09/05/1983		Qhcks		12056				3
6528-764	15/02/1982	6	6	3	15/02/1982	0.5	15/02/1982				Qhcks		10224				6
6528-766	05/05/1983	6	6	3.55	18/06/2019	0.6	05/05/1983	1889	04/06/2019	DOM	Qhcks	OPR	12694				
6528-768	20/05/1983	5	5	3	20/05/1983	1	20/05/1983				Qhcks		12684				3
6528-769		4	4	3	15/07/1983	0.5	15/07/1983	2397	08/06/1983		Qhcks		12840				
6528-770	01/01/1983	4	4					705	01/01/1983		Qhcks		12516				
6528-771	20/07/1983	3.6	3.6	2.2	20/07/1983	0.6	20/07/1983	2113	27/07/1983	DOM	Qhcks	OPR	13029				2.5
6528-775	19/02/1983	8	8								Qhcks		12076				7.5
6528-777		6	6								Qhcks		10889				
6528-780	21/09/1983	4.5	4.5	3	21/09/1983	0.6	21/09/1983	1216	22/09/1983	DOM	Qhcks	OPR	13315				3.3
6528-781	19/09/1983	3.6	3.6	2.1	19/09/1983	0.6	19/09/1983	347	22/09/1983	DOM	Qhcks	OPR	12753				2.4
6528-788	27/10/1983	6	6								Qhcks	ABD	13304				
6528-791	20/12/1983	4.2	4.2	2.7	20/12/1983	0.6	20/12/1983			REC	Qhcks	OPR	13499				3
6528-792	14/12/1983	4.5	4.5	3	14/12/1983	0.6	14/12/1983	694	21/12/1983	DOM	Qhcks	OPR	13568				3.3
6528-793	14/12/1983	4.8	4.8	3.3	14/12/1983	8.6	14/12/1983	902	21/12/1983	DOM	Qhcks	OPR	13569				3.3
6528-804	20/03/1984	5.1	5.1	3.6	20/03/1984	0.6	20/03/1984	619	02/04/1984	IRR	Qhcks	OPR	14202				3.9
6528-805	25/03/1984	4.2	4.2	2.7	25/03/1984	0.6	25/03/1984	840	02/04/1984	IRR	Qhcks	OPR	14402				3
6528-808	23/04/1984	5.4	5.4	3.9	23/04/1984	0.6	23/04/1984	542	02/05/1984	DOM	Qhcks	OPR	14433				4.2
6528-809	18/04/1984	5	5	3.6	18/04/1984	0.6	18/04/1984	1061	02/05/1984	IRR	Qhcks	OPR	14548				3.9
6528-810	18/04/1984	5.4	5.4	3.8	18/04/1984	0.6	18/04/1984	927	02/05/1984	IRR	Qhcks	OPR	14549				4.2
6528-811	24/04/1984	4.5	4.5	3	24/04/1984	0.6	24/04/1984	1687	02/05/1984	IRR	Qhcks	OPR	14550				3.3
6528-813	26/04/1984	3.9	3.9	2.4	26/04/1984	0.6	26/04/1984	1351	02/05/1984	DOM	Qhcks	OPR	13955				2.7
6528-822	01/02/1983	6	6							DOM	Qhcks	OPR	11916				
6528-825	01/08/1983	6	6							DOM	Qhcks	OPR	13219				
6528-826	01/10/1983	6	6								Qhcks		13305				

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-827	01/09/1983	6	6					1457	22/02/1984	DOM	Qhcks	OPR	13307				
6528-828	01/10/1983	6	6							DOM	Qhcks	OPR	11570				
6528-829	01/05/1983	6	6							DOM	Qhcks	OPR	12754				
6528-830	01/10/1983	6	6							DOM	Qhcks	OPR	13433				
6528-833	11/05/1983	6	6					1018	07/01/1994	DOM	Qhcks	OPR	13539				
6528-834	01/11/1983	6	6							DOM	Qhcks	OPR	13566				
6528-836	01/12/1982	6	6							DOM	Qhcks	OPR	13709				
6528-841	01/01/1984	6	6							DOM	Qhcks	OPR	13845				
6528-842	01/01/1984	6	6							DOM	Qhcks	OPR	13887				
6528-845	01/03/1984	6	6							DOM	Qhcks	OPR	14144				
6528-846	01/03/1984	6	6							DOM	Qhcks	OPR	14235				
6528-859	06/06/1984	4	4					613	19/05/1984		Qhcks		14825				
6528-864	07/01/1984	6	6	4	07/01/1984	5	07/01/1984	1317	15/06/1984	IRR	Qhcks	OPR	13164				5
6528-866	01/07/1984	5	5								Qhcks		12251				
6528-867	15/08/1983	4.5	4.5							IRR	Qhcks	OPR	13152				
6528-871	01/07/1984	6	6					909	08/07/1984		Qhcks		14901				
6528-872	01/07/1984	12	12	10	01/07/1984			795	20/07/1984	DOM	Qhcks	OPR	15043				
6528-876	01/09/1984	6	6					995	14/09/1984	DOM	Qhcks	OPR	15157				
6528-878	01/06/1984	6	6					1362	20/09/1984	IRR	Qhcks	OPR	14826				
6528-880	01/08/1984	6	6					819	20/09/1984	DOM	Qhcks	OPR	12685				
6528-881	01/07/1984	5	5					1016	20/09/1984	DOM	Qhcks	OPR	15044				
6528-892	24/10/1984	9	9	7	24/10/1984	0.3	24/10/1984	325	24/10/1984	DOM	Qhcks	OPR	15427				
6528-900	19/10/1984	5.4	5.4	3.9	19/10/1984	0.7	19/10/1984	1272	01/11/1984	IRR	Qhcks	OPR	15207				4.2
6528-903	22/10/1984	4.2	4.2	2.7	22/10/1984	0.7	22/10/1984	912	01/11/1984	DOM	Qhcks	OPR	15361				3
6528-904	24/10/1984	3.9	3.9	2.4	24/10/1984	0.7	24/10/1984	630	01/11/1984	IRR	Qhcks	OPR	15275				3
6528-905	24/10/1984	3.9	3.9	2.4	24/10/1984	0.7	24/10/1984	495	01/11/1984	IRR	Qhcks	OPR	15276				3
6528-908	31/10/1984	3.6	3.6	2.1	31/10/1984	0.7	31/10/1984	1244	01/11/1984	DOM	Qhcks	OPR	15447				2.4
6528-909	31/10/1984	6	6	4	31/10/1984	0.4	31/10/1984	865	31/10/1984	DOM	Qhcks	OPR	15459				
6528-913	11/11/1984	6	6	3	11/11/1984			816	21/11/1984	DOM	Qhcks	OPR	15614				
6528-914	01/01/1984	10.6	10.6	6.7	01/01/1984	0.5	01/01/1984	1063	27/08/1984	DOM	Qhcks	OPR	15253				10.6
6528-916	28/11/1984	6	6	3	28/11/1984	0.5	28/11/1984	905	28/11/1984	DOM	Qhcks	OPR	15665				
6528-919	28/11/1984	7	7	5	28/11/1984	0.5	28/11/1984	770	28/11/1984	DOM	Qhcks	OPR	15667				
6528-920	28/11/1984	6	6	3	28/11/1984	0.5	28/11/1984	797	28/11/1984	DOM	Qhcks	OPR	15668				
6528-922	10/12/1984	4.5	4.5	1.5	10/12/1984			916	10/12/1984		Qhck		13766				4.5
6528-924	08/12/1984	6	6			0.5	08/12/1984	997	08/12/1984	DOM	Qhcks	OPR	15698				
6528-925	30/11/1984	6	6					930	02/12/1984	DOM	Qhcks	OPR	15658				
6528-928	07/01/1985	6	6	3	07/01/1985	0.5	07/01/1985	1636	08/01/1985	DOM	Qhcks	OPR	15792				
6528-929	30/12/1984	6	6	4	30/12/1984	0.5	30/12/1984	846	30/12/1984	DOM	Qhcks	OPR	15781				
6528-930	30/12/1984	7	7	5	30/12/1984	0.5	30/12/1984	576	30/12/1984	DOM	Qhcks	OPR	15777				
6528-931	30/12/1984	6	6					807	30/12/1984	DOM	Qhcks	OPR	15776				
6528-935	24/01/1985	6	6	3	24/01/1985	0.5	24/01/1985	1070	10/01/1994	DOM	Qhcks	OPR	15929				
6528-936	23/01/1985	7	7	5	23/01/1985	0.5	23/01/1985	1021	23/01/1985		Qhcks		15970				

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-937	24/01/1985	6	6	3	24/01/1985	0.5	24/01/1985	1278	24/01/1985	DOM	Qhcks	OPR	15973				
6528-942	27/12/1984	4.5	4.5	2	27/12/1984	1	27/12/1984	812	27/12/1984	IRR	Qhcks	OPR	15231				4.5
6528-944	07/02/1985	8	8	6	07/02/1985	0.5	07/02/1985	671	07/02/1985	DOM	Qhcks	OPR	16012				
6528-945	07/01/1985	6	6	3	07/01/1985	0.5	07/01/1985	1143	07/02/1985	DOM	Qhcks	OPR	15963				
6528-949	15/02/1985	6	6	3	15/02/1985	0.5	15/02/1985	625	15/02/1985	DOM	Qhcks	OPR	16100				
6528-950	10/01/1985	3.8	3.8	1.8	10/01/1985	0.43	10/01/1985			DOM	Qhcks	OPR	15254				3.2
6528-952	20/02/1985	6	6	4	20/02/1985	0.5	20/02/1985	1418	20/02/1985	DOM	Qhcks	OPR	16218				
6528-961	15/01/1985	4.5	0	3	15/01/1985	0.7	15/01/1985	674	15/01/1985	DOM	Qhcks	BKF	351053				
6528-962	19/12/1984	4.5	4.5	3	19/12/1984	0.7	19/12/1984	993	19/12/1984	DOM	Qhcks	OPR	15631				3.3
6528-963	19/12/1984	3.3	3.3	1.8	19/12/1984	0.7	19/12/1984	2295	19/12/1984		Qhcks		15569				2.1
6528-965	22/01/1985	4.2	4.2	2.7	22/01/1985	0.7	22/01/1985	1452	23/01/1985	IRR	Qhck	OPR	15372				3
6528-966	18/12/1984	4.5	4.5	3	18/12/1984	0.7	18/12/1984	1024	18/12/1984	IRR	Qhcks	OPR	15269				3.3
6528-967	18/12/1984	4.5	4.5	3	18/12/1984	0.7	18/12/1984	520	23/01/1985	DOM	Qhcks	OPR	15491				3.3
6528-968	07/03/1985	4.2	4.2	2.7	07/03/1985	0.6	07/03/1985	1239	12/03/1985	DOM	Qhcks	OPR	16106				3
6528-969	28/02/1985	6.3	6.3	4.8	28/02/1985	0.6	28/02/1985	1008	12/03/1985	DOM	Qhcks	OPR	16107				5.1
6528-970	07/03/1985	4.2	4.2	2.7	07/03/1985	0.6	07/03/1985	935	12/03/1985	DOM	Qhcks	OPR	16270				3
6528-972	18/03/1985	6	6	4	18/03/1985	0.5	18/03/1985	1070	18/03/1985	DOM	Qhcks	OPR	16174				
6528-975	18/03/1985	6	6	4	18/03/1985	0.5	18/03/1985	603	18/03/1985	DOM	Qhcks	OPR	16391				
6528-976	05/03/1985	3.9	3.9	2.4	05/03/1985	0.6	05/03/1985	1205	12/03/1985	DOM	Qhcks	OPR	16087				2.7
6528-981	28/03/1985	6	6	4	28/03/1985	0.5	28/03/1985	854	28/03/1985	DOM	Qhcks	OPR	16465				
6528-982	28/03/1985	6	6	4	28/03/1985	0.5	28/03/1985	725	28/03/1985	DOM	Qhcks	OPR	16388				
6528-987	18/04/1984	6	6	4	18/04/1984	0.5	18/04/1984	332	18/04/1984	DOM	Qhcks	OPR	16350				
6528-992	22/04/1985	7.8	7.8	6.3	22/04/1985	0.6	22/04/1985	801	07/05/1985	DOM	Qhcks	OPR	16136				6.6
6528-994	01/04/1985	8	8					742	28/04/1985	DOM	Qhcks	BKF	16610				8
6528-995	24/04/1985	3.6	3.6	2.1	24/04/1985	0.8	24/04/1985	772	07/05/1985	DOM	Qhcks	OPR	16608				
6528-999	05/05/1985	6	6	4	05/05/1985	0.5	05/05/1985	991	09/05/1985	DOM	Qhck	OPR	16717				
6528-1002	07/06/1985	6	6	3	07/06/1985	0.5	07/06/1985	921	30/05/1985	DOM	Qhcks	OPR	16926				
6528-1005	28/05/1985	6	6	3	28/05/1985	0.5	28/05/1985	828	30/05/1985		Qhck		16876				
6528-1007	20/05/1985	6	6	4	20/05/1985	0.5	20/05/1985	692	14/01/1994		Qhcks		16867				
6528-1010	15/07/1985	6	6	3	29/07/1985	0.5		1541	29/07/1985	DOM	Qhcks	OPR	17016				
6528-1011	15/07/1985	6	6	3	29/07/1985	0.5		1362	29/07/1985	DOM	Qhck	OPR	17015				
6528-1016	08/09/1985	6	6	3	11/09/1985	0.5		1479	11/09/1985	DOM	Qhcks	OPR	17159				
6528-1017	15/08/1985	4.2	4.2	2.7	04/09/1985	0.9		874	04/09/1985	IRR	Qhcks	OPR	17010				3
6528-1018	05/08/1985	6	0	3	04/09/1985	0.5		558	08/08/1985	DOM	Qhcks	BKF	390971				
6528-1027	08/10/1985	8	8	7	25/10/1985	0.5	08/10/1985	578	08/10/1985		Qhcks		17351				
6528-1028	08/10/1985	6	6	3	25/10/1985	0.5	08/10/1985	2171	07/10/1985		Qhcks		17380				
6528-1032	29/10/1985	6	6	3	29/10/1985	0.5		404	28/10/1985	DOM	Qhcks	OPR	17546				
6528-1033	27/10/1985	8	0	6.5	15/07/2019	0.5		836	28/10/1985	DOM	Qhcks	BKF	342212				7
6528-1035	27/10/1985	6	6	3	27/10/1985	0.5		751	28/10/1985	DOM	Qhcks	OPR	17459				
6528-1036	28/10/1985	6	6	3	05/11/1985	0.5		1468	25/10/1985	DOM	Qhcks	OPR	17512				
6528-1037	01/10/1985	3	3	1.8	01/10/1985	25		1765	04/11/1985	DOM	Qhcks	OPR	16231				
6528-1044	20/11/1985	6	6	4	20/12/1985	0.5	20/11/1985	1284	21/11/1985	DOM	Qhcks	OPR	17620				6

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-1047	21/11/1985	6	6	4	29/11/1985	0.5	21/11/1985	547	21/11/1985	DOM	Qhcks	OPR	17669				6
6528-1049	23/11/1985	6	6	4	29/11/1985	0.5	23/11/1985	765	21/11/1985	DOM	Qhcks	OPR	17684				6
6528-1050	25/11/1985	6	6	4	02/12/1985	0.5	25/11/1985	824	21/11/1985	DOM	Qhcks	OPR	17518				6
6528-1053	12/11/1985	4	4	2.4	26/11/1985	0.6	12/11/1985	622	25/11/1985	IRR	Qhcks	OPR	17631				4
6528-1054	12/11/1985	4.3	4.3	2.7	26/11/1985	0.6	12/11/1985	750	25/11/1985	IRR	Qhcks	OPR	17629				4.3
6528-1057	13/12/1985	6	6	4	07/01/1986	0.5	13/12/1985	969	13/12/1985	DOM	Qhcks	OPR	17737				6
6528-1058	12/12/1985	6	6	4	07/01/1986	0.5	12/12/1985	430	13/12/1985	DOM	Qhcks	OPR	17726				6
6528-1059	01/12/1985	6	6	4	07/01/1986	0.5	01/12/1985	952	13/12/1985	DOM	Qhcks	BKF	16999				6
6528-1060	12/12/1985	13	13	11	07/01/1986	0.5	12/12/1985	999	07/01/1986	DOM	Qhcks	OPR	17686				13
6528-1065	23/12/1985	6	6	4	16/01/1986	0.5	23/12/1985	1117	23/12/1985	DOM	Qhcks	OPR	17780				6
6528-1068	01/01/1985	6	6	4	01/01/1985	0.5	01/01/1985	1412	01/01/1985	DOM	Qhcks	OPR	15813				6
6528-1070	01/02/1986	6	6	4	25/02/1986	0.5	01/02/1986	1154	21/02/1986	DOM	Qhcks	OPR	17896				6
6528-1071	01/02/1986	6	6	4	25/02/1986	0.5	01/02/1986	812	21/02/1986	DOM	Qhcks	OPR	17929				6
6528-1075	01/02/1986	6	6	4	24/02/1986	0.5	01/02/1986	925	21/02/1986	DOM	Qhcks	OPR	17998				6
6528-1076	01/02/1986	6	6	4	25/02/1986	0.5	01/02/1986	959	21/02/1986	DOM	Qhcks	OPR	18007				6
6528-1077	01/02/1986	6	6	4	01/02/1986	0.5	01/02/1986			DOM	Qhcks	OPR	17973				6
6528-1079	22/01/1986	6.5	6.5	5	25/02/1986			1412	24/02/1986		Qhcks		17752				6.5
6528-1082	03/03/1986	4.3	4.3	2.8	25/03/1986	0.6	03/03/1986	2121	11/01/1994		Qhcks		18026				4.3
6528-1083	14/03/1986	4.5	4.5	3	25/03/1986	0.6	14/03/1986	857	19/03/1986		Qhcks		17775				4.5
6528-1084	01/03/1985	7	7	0		0.44	01/01/1986	780	14/01/1994		Qhcks		18184				
6528-1089	01/03/1986	6	6	3	16/04/1986	0.5	01/03/1986	451	07/04/1986		Qhcks		18143				6
6528-1090	04/04/1986	6	6	3	16/04/1986	0.5	04/04/1986	972	07/04/1986		Qhcks		18268				6
6528-1092	01/03/1986	6	6	3	16/04/1986	0.5	01/03/1986	948	07/04/1986		Qhcks		18235				6
6528-1093	01/03/1986	6	6	3	16/04/1986	0.5	01/03/1986	916	07/04/1986		Qhcks		18211				6
6528-1102	01/10/1986	6	6	4	08/10/1986	0.5	01/10/1986	1049	08/10/1986		Qhcks		18192				6
6528-1103	01/09/1986	6	6	4	08/10/1986	0.5	01/09/1986	1631	08/10/1986		Qhck		18425				6
6528-1115	05/10/1986	6	6	0	10/11/1986			1261	10/11/1986		Qhcks		18004				5
6528-1117	05/01/1987	4	4	4	17/02/1987	4	05/01/1987				Qhcks		19373				4
6528-1118	10/02/1987	4.8	4.8	3.3	18/02/1987	0.6	10/02/1987	802	18/02/1987		Qhcks		19352				4.48
6528-1130	11/02/1988	4.2	4.2	0	15/03/1988	0.6	15/03/1988	547	15/03/1988		Qhcks		20743				4.2
6528-1132	08/03/1988	4.8	4.8	2.1	05/05/1988	0.38	08/03/1988	1586	05/05/1988	DOM	Qhcks	OPR	21005				2.1
6528-1305	08/09/1988	6	6	2	19/01/1989			942	19/01/1989	DOM	Qhcks	OPR	21571				6
6528-1308	13/03/1984	10.5	10.5							INV	Qhcks	ABD					
6528-1309	14/03/1984	10.5	10.5							INV	Qhcks	ABD					
6528-1311	01/07/1988	7	7	4	01/07/1988					DOM	Qhcks	OPR	21895				
6528-1362	17/11/1989	7.5	7.5	3.5	17/11/1989					DOM	Qhcks	OPR	23500				3.7
6528-1366	03/11/1989	12	12	9	25/01/1990	0.18	03/11/1989	745	25/01/1990	DOM	Qhcks	OPR	22324				12
6528-1367	09/01/1990	6	6	2.62	04/06/2019			1157	10/01/1994	IRR	Qhcks	OPR	23694				3.5
6528-1370	07/03/1990	9.2	9.2	6.2	07/03/1990					IRR	Qhcks	OPR	23742				6.7
6528-1375	27/04/1990	5.7	5.7	2.6	27/04/1990					DOM	Qhck	OPR	24066				3.1
6528-1382	12/10/1990	7.62	7.62	3.05	12/10/1990			639	14/01/1994	DOM	Qhcks	OPR	24431				7.62
6528-1383	02/11/1990	6	6	2	02/11/1990					STK	Qhcks	OPR	24898				

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-1384	05/11/1990	5	0	2.42	04/06/2019			683	05/11/1990	DOM	Qhcks	BKF	380520				
6528-1386	10/12/1990	11	11	7	11/12/1990			906	11/12/1990	DOM	Qhcks	OPR	24923				11
6528-1388	28/12/1990	5.56	5.56	2.34	28/12/1990					DOM	Qhcks	OPR	24880				2.5
6528-1398	10/03/1991	9	9	6	15/05/1991			1144	15/05/1991	DOM	Qhcks	OPR	25384				
6528-1400	21/08/1991	6.4	6.4	2.1	21/08/1991	1.06	21/08/1991	1110	21/08/1991	DOM	Qhcks	OPR	25686				3.8
6528-1402	29/08/1991	6.7	6.7	2.98	10/02/1995	0.45	29/08/1991	1311	18/01/1994	DOM	Qhcks	OPR	25964				
6528-1403	28/08/1991	7.9	7.9	3.6	03/09/1991	0.93	28/08/1991	1357	03/09/1991	DOM	Qhcks	OPR	25615				
6528-1405	19/08/1991	10.2	10.2	5.5	03/09/1991	0.65	19/08/1991	605	03/09/1991	DOM	Qhcks	OPR	25722				
6528-1423	19/09/1991	7.9	7.9	3.6	19/09/1991	0.75	19/09/1991	407	19/09/1991		Qhcks		26161				
6528-1424	21/09/1991	11.6	11.6	7.95	10/02/1995	0.31	21/09/1991	449	17/01/1994	DOM	Qhcks	OPR	26143				
6528-1425	16/09/1991	8.5	8.5	4.3	16/09/1991	0.7	16/09/1991	994	16/09/1991	DOM	Qhcks	OPR	25101				
6528-1426	15/09/1991	8.5	8.5	4.3	15/09/1991	0.45	15/09/1991	578	15/09/1991	DOM	Qhcks	OPR	25948				
6528-1427	12/09/1991	7.3	7.3	3	04/06/2019	0.87	12/09/1991	945	07/01/1994	DOM	Qhcks	OPR	26071				
6528-1430	20/10/1991	5	5	3.5	20/10/1991			1272	20/10/1991	DOM	Qhcks	OPR	26263				
6528-1431	22/10/1991	8.5	8.5	7	22/10/1991					DOM	Qhcks	OPR	26278				
6528-1442	27/10/1991	6.4	6.4	2.1	27/10/1991			882	07/11/1991	DOM	Qhcks	OPR	26247				
6528-1449	03/11/1991	6.5	6.5	5	03/11/1991			805	11/11/1991	DOM	Qhcks	OPR	26369				
6528-1459	26/11/1991	7.6	7.6	3.3	26/11/1991	0.6	26/11/1991	629	26/11/1991	DOM	Qhcks	OPR	26396				
6528-1461	20/11/1991	6.4	6.4	2.8	20/11/1991	0.68	20/11/1991	1620	20/11/1991	DOM	Qhcks	OPR	26418				
6528-1464	28/11/1991	8	8	3.7	28/11/1991	0.8	28/11/1991	595	12/01/1994	DOM	Qhcks	OPR	25139				
6528-1465	23/11/1991	5.5	5.5	2.1	23/11/1991	0.92	23/11/1991	1234	23/11/1991	DOM	Qhcks	OPR	26537				
6528-1466	21/11/1991	8.5	8.5	4.2	21/11/1991	0.55	21/11/1991	1513	21/11/1991	DOM	Qhcks	OPR	26466				
6528-1467	01/01/1992	8	8	8	01/01/1992					DOM	Qhcks	OPR	26631				
6528-1472	25/11/1991	4.5	4.5	3.5	25/11/1991			760	19/01/1994	DOM	Qhcks	OPR	26480				
6528-1480	14/12/1991	5	5	3.5	24/01/1992			1401	24/01/1992	DOM	Qhcks	OPR	26462				
6528-1489	18/01/1992	6	6	2	31/01/1992	0.49	18/01/1992	3133	31/01/1992	DOM	Qhcks	OPR	26760				
6528-1490	12/01/1992	9.7	9.7	5.5	31/01/1992			866	31/01/1992	DOM	Qhcks	OPR	26569				
6528-1491	05/01/1992	8.5	8.5	4.2	31/01/1992	0.68	05/01/1992	881	31/01/1992	DOM	Qhcks	OPR	26607				
6528-1492	05/01/1992	9.7	9.7	5.5	31/01/1992	0.44	05/01/1992	677	31/01/1992	DOM	Qhcks	OPR	26632				
6528-1493	07/01/1992	6.7	6.7	2.4	31/01/1992	0.45	07/01/1992	1256	31/01/1992	DOM	Qhcks	OPR	26637				
6528-1494	10/01/1992	9.1	9.1	4.9	31/01/1992	0.45	10/01/1992	1017	31/01/1992		Qhcks		26675				
6528-1496	13/01/1992	7	7	2.7	31/01/1992	0.9	13/01/1992	945	31/01/1992	DOM	Qhcks	OPR	26726				
6528-1502	24/01/1992	5	5	3.5	04/03/1992			914	04/03/1992	DOM	Qhcks	OPR	26805				
6528-1512	07/02/1992	9.8	9.8	5.79	10/02/1995	0.44	07/02/1992	1407	18/03/1992	DOM	Qhcks	OPR	26911				
6528-1513	17/02/1992	11.5	11.5	7.9	16/03/1992	0.33	17/02/1992	862	16/03/1992	DOM	Qhcks	OPR	26955				
6528-1515	31/01/1992	7	7	3.7	18/03/1992	0.8	31/01/1992	838	18/03/1992	DOM	Qhcks	OPR	26980				
6528-1516	15/02/1992	9.1	9.1	4.9	16/03/1992	0.8	15/02/1992	805	16/03/1992	DOM	Qhcks	OPR	26635				
6528-1517	12/02/1992	9.1	9.1	4.9	16/03/1992	0.74	12/02/1992	660	16/03/1992	DOM	Qhcks	OPR	26785				
6528-1518	04/02/1992	9.1	9.1	4.9	16/03/1992	0.59	04/02/1992	1005	16/03/1992	DOM	Qhcks	OPR	26720				
6528-1519	13/02/1992	6	6	2.1	17/03/1992	0.62	13/02/1992	1519	17/03/1992	DOM	Qhck	OPR	27028				
6528-1520	16/02/1992	6.1	6.1	2.4	17/03/1992	0.68	16/02/1992	687	17/03/1992	DOM	Qhcks	OPR	26847				
6528-1521	20/02/1992	9.8	9.8	5.9	17/03/1992	0.56	20/02/1992	1311	11/01/1994	DOM	Qhcks	OPR	26721				

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-1526	04/06/1992	12.5	12.5	8.5	29/06/1992	0.63	04/06/1992	855	29/06/1992	DOM	Qhcks	OPR	27482				
6528-1527	03/06/1992	6.5	6.5	2.6	29/06/1992	0.89	03/06/1992	967	29/06/1992	DOM	Qhcks	OPR	27444				
6528-1529	07/06/1992	9.2	9.2	4.3	29/06/1992	0.68	07/06/1992	1367	29/06/1992	DOM	Qhcks	OPR	27265				
6528-1530	05/06/1992	8.5	8.5	4.2	29/06/1992	0.61	05/06/1992	734	29/06/1992	DOM	Qhcks	OPR	27378				
6528-1532	06/06/1992	8.5	8.5	4.3	29/06/1992	0.68	06/06/1992	944	14/01/1994	DOM	Qhcks	OPR	27143				
6528-1534	27/02/1992	7.4	7.4	5.4	03/07/1992			390	11/01/1994	DOM	Qhcks	OPR	27161				
6528-1536	02/06/1992	3	3	0.9	29/06/1992	0.3	02/06/1992	6242	29/06/1992	DOM	Qhck	OPR	27735				
6528-1543	21/02/1992	4.5	4.5	2.5	03/07/1992			1720	17/01/1994	DOM	Qhcks	OPR	27065				
6528-1547	20/03/1992	6	6	4.5	02/07/1992			478	02/07/1992	DOM	Qhcks	OPR	26417				
6528-1569		8.8		4.6	17/03/1993	0.67	10/02/1993	1077	17/03/1993	DOM	Qhcks		27341				
6528-1579	05/02/1993	4.3	4.3	0.85	17/03/1993	0.71	05/02/1993	583	17/03/1993	DOM	Qhck		28442				
6528-1580	11/02/1993	5.2	5.2	0.9	17/03/1993	0.92	11/02/1993	424	17/03/1993	DOM	Qhcks		28587				
6528-1581	01/12/1992	9	9	5	01/12/1992					DOM	Qhcks		27446				9
6528-1582	12/02/1993	5.8	5.8	2.15	18/06/2019	0.89	12/02/1993	517	17/03/1993	DOM	Qhcks		28510				
6528-1584	19/02/1993	10.9	10.9	6.7	18/05/1993	0.59	19/02/1993	805	18/05/1993	DOM	Qhcks		27546				
6528-1585	24/01/1993	8.8	8.8	4.8	18/05/1993	0.68	24/01/1993	755	18/05/1993	DOM	Qhcks		26947				
6528-1586	17/02/1993	9.2	9.2	5	17/03/1993	0.6	17/02/1993	666	17/03/1993	DOM	Qhcks		28964				
6528-1587	28/01/1993	6.5	6.5	3	18/05/1993	0.74	28/01/1993	1121	18/05/1993	DOM	Qhcks		28542				
6528-1588	02/03/1993	6.4	6.4	2.1	18/05/1993	0.89	02/03/1993	866	18/05/1993	DOM	Qhcks		28342				
6528-1590	09/02/1993	9	9	5.8	17/03/1993	0.45	09/02/1993	1373	17/03/1993	DOM	Qhcks		28489				
6528-1600	01/05/1993	6.1	6.1							DOM	Qhcks		29582				6.1
6528-1604	04/06/1993	10.3	10.3			0.7	04/06/1993	1138	05/07/1993	DOM	Qhcks		28588				
6528-1606	13/05/1993	9.1	9.1	4.8	05/07/1993	0.61	13/05/1993	745	05/07/1993	DOM	Qhcks		29229				
6528-1608	14/06/1993	7.6	7.6			0.8	14/06/1993	1042	05/07/1993	DOM	Qhcks		28724				
6528-1609	02/06/1993	10.9	10.9			0.5	02/06/1993	1222	05/07/1993	DOM	Qhcks		28484				
6528-1610	24/05/1993	9.4	9.4	4.8	05/07/1993	0.9	24/05/1993	898	05/07/1993	DOM	Qhcks		28312				
6528-1612	19/05/1993	7.7	7.7	3.3	05/07/1993	1.1	19/05/1993	1030	05/07/1993	DOM	Qhcks		28311				
6528-1620	18/08/1993	9.6	9.6			0.55	18/08/1993	736	07/09/1993	DOM	Qhcks		29920				
6528-1621	05/08/1993	11.3	11.3			0.57	05/08/1993	1255	07/09/1993	DOM	Qhcks		29533				
6528-1622	25/08/1993	13.3	13.3			0.25	25/08/1993	1244	07/09/1993	DOM	Qhcks		29489				
6528-1627	18/09/1993	6.6	6.6			1	18/09/1993	1183	19/11/1993	DOM	Qhcks		28895				6.6
6528-1628	06/10/1993	5.6	5.6			0.75	06/10/1993	1077	19/11/1993	DOM	Qhck		28931				
6528-1629	22/10/1993	11.3	11.3	6.61	06/06/2019	0.5	22/10/1993	1183	19/11/1993	DOM	Qhcks		29821				11.3
6528-1630	10/10/1993	6.6	6.6			0.9	10/10/1993	1143	10/10/1993	DOM	Qhcks		30061				
6528-1633	28/10/1993	8	8			0.93	28/10/1993	932	19/11/1993	DOM	Qhcks		30247				8
6528-1634	02/11/1993	8.1	8.1			0.9	02/11/1993	728	19/11/1993	DOM	Qhcks		30268				8.1
6528-1636	08/11/1993	11	11			0.68	08/11/1993	827	19/11/1993	DOM	Qhcks		30294				11
6528-1641	24/11/1993	9.4	9.4			0.68	24/11/1993	1055	28/01/1994	DOM	Qhcks		30372				
6528-1643	24/12/1993	7.3	7.3			0.9	24/12/1993	1233	28/01/1994	DOM	Qhcks		30657				
6528-1645	21/12/1993	8.8	8.8			0.8	21/12/1993	1049	28/01/1994	DOM	Qhcks		30717				
6528-1647	20/11/1993	11.5	11.5			0.5	20/11/1993	805	28/01/1994	DOM	Qhcks		29926				
6528-1648	15/11/1993	11	11			0.5	15/11/1993	1289	28/01/1994	DOM	Qhcks		30244				

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-1649	18/11/1993	6	6			0.9	18/11/1993	2047	28/01/1994	DOM	Qhcks	BKF	30323				
6528-1650	27/11/1993	5.2	5.2			0.9	27/11/1993	1177	28/01/1994	DOM	Qhcks		30426				
6528-1651	23/12/1993	6.7	6.7			0.9	23/12/1993	1272	28/01/1994	DOM	Qhcks		30649				
6528-1652	11/12/1993	6.4	6.4			0.85	11/12/1993	777	28/01/1994	DOM	Qhcks		30650				
6528-1654	15/12/1993	7.6	7.6			0.9	15/12/1993	805	28/01/1994	DOM	Qhcks		30709				7.6
6528-1655	20/12/1993	11.3	11.3			0.3	20/12/1993	600	20/12/1993	DOM	Qhcks		30726				11.3
6528-1656	22/12/1993	6.7	6.7			0.9	22/12/1993	865	28/01/1994	DOM	Qhcks		30744				
6528-1659	27/02/1994	7.4	7.2		06/06/2019			722	02/03/1994	DOM	Qhcks	DRY	31001				4.8
6528-1668	18/02/1994	6.6	6.6			0.9	18/02/1994	1340	19/05/1994	DOM	Qhcks		30832				
6528-1669	03/03/1994	5.6	5.6			0.8	03/03/1994	1636	19/05/1994	DOM	Qhcks		30848				
6528-1670	05/03/1994	10	10			0.67	05/03/1994	1452	19/05/1994	DOM	Qhcks		30894				
6528-1671	16/03/1994	6.3	6.3			0.9	16/03/1994	1166	19/05/1994	DOM	Qhcks		30930				
6528-1672	05/04/1994	6	6			0.8	05/04/1994	1166	19/05/1994	DOM	Qhcks		31219				
6528-1676	17/08/1994	6.6	6.6			0.9	17/08/1994	1154	17/08/1994	DOM	Qhcks		32166				
6528-1680	31/08/1994	5.1	5.1			0.8	31/08/1994	1351	31/08/1994	DOM	Qhck		32425				
6528-1681	05/09/1994	7.2	0			0.9	05/09/1994	955	05/09/1994	DOM	Qhcks	BKF	304925				
6528-1682	09/09/1994	6.1	6.1			0.9	09/09/1994	1306	09/09/1994	DOM	Qhcks		32499				
6528-1690	19/09/1994	4.2	4.2			0.93	19/09/1994	1412	19/09/1994	DOM	Qhcks		31382				
6528-1691	28/09/1994	7.2	7.2			0.9	28/09/1994	977	28/09/1994	DOM	Qhcks		31678				
6528-1692	13/09/1994	8.5	8.5			0.65	13/09/1994	1216	13/09/1994	DOM	Qhcks		32292				
6528-1693	16/09/1994	10	10			0.46	16/09/1994	882	16/09/1994	DOM	Qhcks		32559				
6528-1694	22/09/1994	8.1	8.1			0.9	22/09/1994	821	15/09/1994	DOM	Qhcks		32563				
6528-1698	23/09/1994	7.3	7.3			0.8	23/09/1994	2081	14/09/1994	DOM	Qhcks		31629				
6528-1699	07/10/1994	7.3	7.3			0.9	07/10/1994	1272	07/10/1994	DOM	Qhcks		32663				
6528-1705	28/01/1994	5	5	3	28/01/1994			699	28/01/1994	DOM	Qhcks		30378				
6528-1713	04/01/1993	4.5	4.5	2.5	04/01/1993			927	04/01/1993	DOM	Qhck		26916				
6528-1717	11/03/1994	6	6			0.8	11/03/1994	1056	02/06/1994	DOM	Qhcks		30920				
6528-1718	30/05/1994	9.4	9.4			0.8	30/05/1994	961	30/05/1994	DOM	Qhcks		31327				
6528-1720	04/05/1994	11.8	11.8	7.97	30/06/2019	0.37	04/05/1994	854	04/05/1994	DOM	Qhcks		31398				
6528-1721	03/06/1994	9.7	9.7	5.53	06/06/2019	0.61	03/06/1994	860	03/06/1994	DOM	Qhcks		31685				
6528-1722	25/05/1994	7.3	7.3			0.75	25/05/1994	1384	25/05/1994	DOM	Qhcks		31702				
6528-1723	19/05/1994	5.7	5.7			0.68	19/05/1994	1216	19/05/1994	IRR	Qhcks		31807				
6528-1735	09/02/1995	3.8	3.8	2.2	09/02/1995	0.6	09/02/1995	1205	09/02/1995	DOM	Qhck		33658				
6528-1737	04/11/1994	7.9	7.9			0.75	04/11/1994	1066	04/11/1994	DOM	Qhcks		32906				
6528-1738	02/11/1994	10.3	10.3			0.61	02/11/1994	854	02/11/1994	DOM	Qhcks		32849				
6528-1741	13/10/1994	5.2	5.2			0.44	13/10/1994	722	13/10/1994	DOM	Qhck		32653				
6528-1745	31/10/1994	10.3	10.3			0.68	31/10/1994	1105	31/10/1994	DOM	Qhcks		32750				
6528-1750	16/11/1994	6	6			0.8	16/11/1994	1199	16/11/1994	DOM	Qhcks		32935				
6528-1754		7.5	7.5								Qhcks						
6528-1798	06/01/1995	10	10					1303	06/01/1995	DOM	Qhcks		32992				10
6528-1799	11/12/1994	13.4	13.4			0.5	11/12/1994	1016	11/12/1994	DOM	Qhcks		33022				
6528-1802	06/12/1994	7.3	7.3			0.1	06/12/1994	788	06/12/1994	DOM	Qhcks		33063				

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-1805	13/01/1995	7.3	7.3			0.8	13/01/1995	783	13/01/1995	DOM	Qhcks		33255				
6528-1806	17/01/1995	9.1	9.1			0.75	17/01/1995	1250	17/01/1995	DOM	Qhcks		33467				
6528-1807	26/01/1995	11	11			0.5	26/01/1995	1049	26/01/1995	DOM	Qhcks		33581				
6528-1808	28/01/1995	6.7	6.7			0.9	28/01/1995	1244	28/01/1995	DOM	Qhcks		33595				
6528-1810	04/02/1995	9.4	9.4			0.61	04/02/1995	710	04/02/1995	DOM	Qhcks		33764				
6528-1811	06/01/1995	10.4	10.4			0.5	06/01/1995	999	06/01/1995	DOM	Qhcks		33770				
6528-1813	11/02/1995	9.1	9.1			0.75	11/02/1995	999	11/02/1995	DOM	Qhcks		33788				
6528-1815	03/03/1995	8.5	8.5			0.68	03/03/1995	977	03/03/1995	DOM	Qhcks		34112				
6528-1816	09/03/1995	8.2	8.2			0.75	09/03/1995	722	09/03/1995	DOM	Qhcks		34192				
6528-1817	25/02/1995	10	10			0.61	25/02/1995	728	25/02/1995	DOM	Qhcks		34238				
6528-1818	04/03/1995	7.9	7.9			0.75	04/03/1995	1049	04/03/1995	DOM	Qhcks		34261				
6528-1819	04/04/1995	11.6	11.6			0.35	04/04/1995	1216	04/04/1995	DOM	Qhcks		34609				
6528-1831	28/12/1994	8.5	8.5			0.9	28/12/1994	927	28/12/1994	DOM	Qhcks		33273				
6528-1837	19/12/1994	6.1	6.1			0.9	19/12/1994	1770	19/12/1994	DOM	Qhcks		33245				
6528-1838	04/01/1995	7.3	7.3	3.56	30/05/2019	0.9	04/01/1995	583	04/01/1995	DOM	Qhcks		33511				
6528-1839	24/12/1994	7.6	7.6			0.9	24/12/1994	1642	24/12/1994	DOM	Qhcks		33339				
6528-1840	03/01/1995	7	7			0.9	03/01/1995	894	03/01/1995	DOM	Qhcks		33189				
6528-1841	15/12/1994	8.5	8.5	4.31	18/06/2019	0.8	15/12/1994	1038	15/12/1994	DOM	Qhcks		33226				
6528-1847	14/12/1994	8.2	8.2			0.8	14/12/1994	843	14/12/1994	DOM	Qhcks		33069				
6528-1848	13/12/1994	9.15	9.15			0.8	13/12/1994	1094	13/12/1994	DOM	Qhcks		33264				
6528-1849	13/10/1994	8.5	8.5			0.75	13/10/1994	699	13/10/1994	DOM	Qhcks		32727				
6528-1850	16/12/1994	7	7			0.9	16/12/1994	1284	16/12/1994	DOM	Qhcks		33259				
6528-1851	23/12/1994	6.1	6.1			0.98	23/12/1994	1010	23/12/1994	DOM	Qhcks		33184				
6528-1857	26/12/1994	7.9	7.9			0.9	26/12/1994	1049	26/12/1994	DOM	Qhcks		33258				
6528-1858	21/12/1994	6.7	6.7	2.75	04/06/2019	0.9	21/12/1994	1508	21/12/1994	IRR	Qhcks		33158				
6528-1866	20/04/1995	6.9	6.9			0.9	20/04/1995	722	20/04/1995	DOM	Qhcks		33098				
6528-1867	06/09/1995	7	7			0.1	06/09/1995	1188	06/09/1995	DOM	Qhcks		34386				
6528-1868	14/09/1995	7.3	7.3			0.8	14/09/1995	644	13/09/1995	DOM	Qhcks		34576				
6528-1870	12/09/1995	11	11			0.5	12/09/1995	1508	12/09/1995	DOM	Qhcks		34592				
6528-1872	04/05/1995	5.4	5.4			0.37	04/05/1995	3252	04/05/1995	DOM	Qhcks		34735				
6528-1874	21/04/1995	8.5	8.5	4.86	06/06/2019	0.75	21/04/1995	342	04/06/2019	DOM	Qhcks		34739				
6528-1875	01/09/1995	8.85	8.85			0.8	01/09/1995	1105	01/09/1995	DOM	Qhcks		34810				
6528-1876	20/05/1995	5.5	5.5			0.02	20/05/1995	1440	20/05/1995	DOM	Qhcks		35043				
6528-1877	01/09/1995	5.5	5.5			0.55	01/09/1995	2545	01/09/1995	DOM	Qhcks		35046				
6528-1878	19/06/1995	7.3	7.3			0.89	19/06/1995	772	19/06/1995	DOM	Qhcks		35131				
6528-1879	27/05/1995	9.4	9.4			0.68	27/05/1995	772	27/05/1995	DOM	Qhcks		35148				
6528-1880	08/10/1995	8	8			0.86	08/10/1995	622	08/10/1995	DOM	Qhcks		35955				
6528-1886	01/12/1995	7.5	7.5	3.5	01/12/1995			783	01/12/1995	DOM	Qhcks		34758				3.5
6528-1892	22/11/1995	6	6			0.8	22/11/1995	1401	22/11/1995	DOM	Qhcks		34286				
6528-1893	25/10/1995	7	7			0.9	25/10/1995	772	25/10/1995	DOM	Qhcks		35044				
6528-1894	29/09/1995	6.5	6.5			0.8	29/09/1995	882	29/09/1995	DOM	Qhcks		35612				
6528-1896	17/11/1995	8.2	8.2			0.8	17/11/1995	788	17/11/1995	DOM	Qhcks		36204				

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-1897	29/11/1995	11.7	11.7			0.5	29/11/1995	799	29/11/1995	DOM	Qhcks		36222				
6528-1898	15/11/1995	9.8	9.8			0.52	15/11/1995	865	14/11/1995	DOM	Qhcks		36223				
6528-1901	26/11/1995	5.5	5.5			0.6	26/11/1995	1737	26/11/1995	DOM	Qhcks		36321				
6528-1902	28/11/1995	6.7	6.7			0.8	28/11/1995	788	28/11/1995	DOM	Qhcks		36329				
6528-1914	19/12/1995	7.6	7.6			0.8	19/12/1995	766	19/12/1995	DOM	Qhcks		36401				
6528-1916	08/01/1996	7.3	7.3			0.75	08/01/1996	594	08/01/1996	DOM	Qhcks		36667				
6528-1917	18/01/1996	7.6	7.6			0.8	18/01/1996	927	18/01/1996	DOM	Qhcks		36725				
6528-1918	14/01/1996	6	6							DOM	Qhcks		36749				2
6528-1925	25/01/1996	5.8	5.8			0.75	25/01/1996	932	25/01/1996	DOM	Qhcks		34113				
6528-1926	19/01/1996	6	6			0.8	19/01/1996	932	19/01/1996	DOM	Qhcks		36168				
6528-1927	13/02/1996	13.2	13.2			0.5	13/02/1996	1021	13/02/1996	DOM	Qhcks		36345				
6528-1928	06/02/1996	8.2	8.2			0.6	06/02/1996	1027	06/02/1996	DOM	Qhcks		36891				
6528-1929	24/01/1996	6	6			0.8	24/01/1996	1210	24/01/1996	DOM	Qhcks		36937				
6528-1930	08/02/1996	8.5	8.5			0.9	08/02/1996	639	08/02/1996	IRR	Qhcks		36973				
6528-1931	03/03/1996	7	7			0.8	03/03/1996	1154	03/03/1996	DOM	Qhcks		36994				
6528-1932	27/02/1996	10.7	10.7			0.4	27/02/1996	594	27/02/1996	DOM	Qhcks		37084				
6528-1935	03/01/1996	6	6			0.8	03/01/1996	1049	03/01/1996	DOM	Qhcks		34757				
6528-1936	20/12/1995	8.5	8.5			0.8	20/12/1995	1546	20/12/1995	DOM	Qhcks		36427				
6528-1937	02/01/1996	10	10			0.6	02/01/1996	1300	02/01/1996	DOM	Qhcks		36431				
6528-1938	11/11/1995	10	10			0.55	11/11/1995	916	10/11/1995	DOM	Qhcks		36188				
6528-1939	05/01/1996	9.5	9.5			0.6	05/01/1996	594	05/01/1996	DOM	Qhcks		36567				
6528-1950	12/12/1995	6	6	4	12/12/1995			1188	12/12/1995	DOM	Qhcks		36508				
6528-1965	11/10/1994	7.3				0.8	11/10/1995	755	11/10/1995	DOM	Qhcks		32994				
6528-1966	12/10/1995	12	12			0.5	12/10/1995	672	12/10/1995	DOM	Qhcks		36019				
6528-1967	13/12/1995	10	10			0.6	13/12/1995	910	13/12/1995	DOM	Qhcks		36290				
6528-1968	16/12/1995	5.2	5.2			0.45	16/12/1995	2323	16/12/1995	DOM	Qhck		36367				
6528-1969	04/12/1995	8.2	8.2			0.8	04/12/1995	722	04/12/1995	DOM	Qhcks		36440				
6528-1970	15/12/1995	9	9			0.7	15/12/1995	1083	15/12/1995	DOM	Qhcks		36447				
6528-1971	16/12/1995	5.2	5.2			0.8	16/12/1995	1132	16/12/1995	DOM	Qhcks		36497				
6528-1973	23/02/1996	8	8			0.8	23/02/1996	1266	23/02/1996	DOM	Qhcks		36805				
6528-1975	01/02/1996	7.6	7.6			0.75	01/02/1996	1776	01/02/1996	DOM	Qhcks		36824				
6528-1979	31/01/1996	4	4			0.6	31/01/1996	2103	31/01/1996	DOM	Qhck		36945				
6528-1980	09/02/1996	5	5			0.8	09/02/1996	1468	09/02/1996	DOM	Qhcks		36947				
6528-1987	21/05/1996	7.2	7.2			0.8	21/05/1996	1016	21/05/1996	DOM	Qhcks		37452				
6528-1988	12/04/1996	8.5	8.5			0.8	12/04/1996	988	12/04/1996	DOM	Qhcks		37543				
6528-1990	24/11/1995	14.3	14.3			0.5	24/11/1995	860	24/11/1995	DOM	Qhcks		36283				
6528-1991	27/03/1996	7	7			0.8	27/03/1996	1049	27/03/1996	DOM	Qhcks		37441				
6528-1992	12/04/1996	5	5			0.4	12/04/1996	3690	12/04/1996	DOM	Qhck		37463				
6528-1993	23/05/1996	7.3	7.3			0.8	23/05/1996	1519	23/05/1996	DOM	Qhcks		37774				
6528-1997	09/04/1996	6.5	6.5			0.75	09/04/1996	374	09/04/1996	DOM	Qhcks		37069				
6528-1998	14/05/1996	8.5	8.5			0.6	14/05/1996	655	14/05/1996	DOM	Qhcks		37077				
6528-2002	03/05/1996	8.8	8.8			0.6	03/05/1996	1519	02/05/1996	DOM	Qhcks		37672				

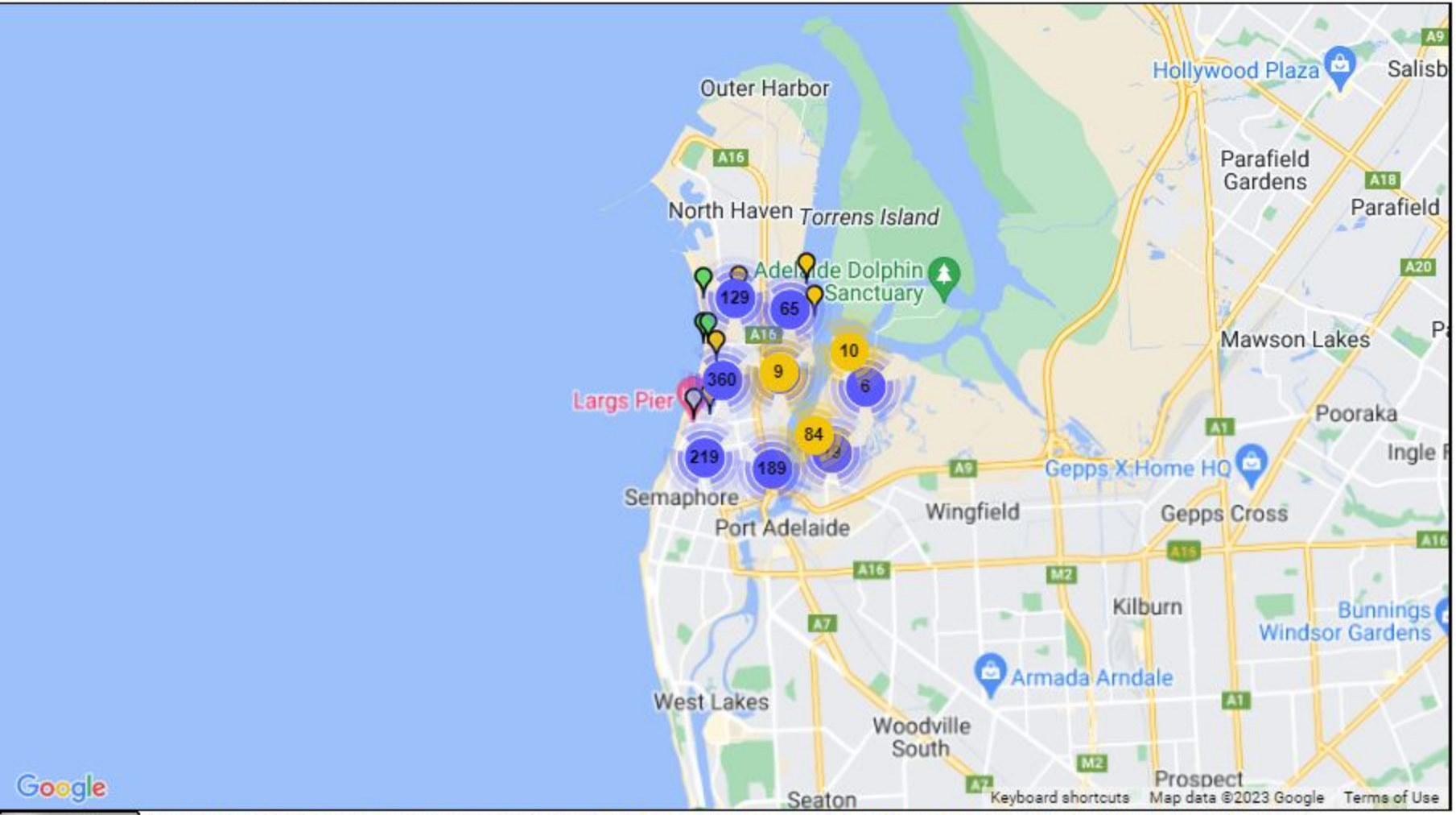
Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-2003	10/05/1996	7.3	7.3			0.75	10/05/1996	1116	10/05/1996	DOM	Qhcks		37755				
6528-2006	10/11/1996	9	9	7.5	10/11/1996	0.37	10/11/1996	966	10/11/1996	DOM	Qhcks		38999				10
6528-2013	17/10/1996	9.4	9.4	5.5	17/10/1996	0.8	17/10/1996	1367	17/10/1996	DOM	Qhcks		37181				
6528-2014	06/11/1996	6.4	6.4	2.4	06/11/1996	0.8	06/11/1996	1239	06/11/1996	DOM	Qhcks		37329				
6528-2015	27/09/1996	8.5	0	4.5	10/01/2020	0.8	27/09/1996	1373	27/09/1996	DOM	Qhcks	BKF	358942				
6528-2017	04/09/1996	7.3	7.3	3.3	04/09/1996	0.8	04/09/1996	1132	04/09/1996	DOM	Qhcks		38453				
6528-2018	09/10/1996	6	6	2.1	09/10/1996	0.75	09/10/1996	1328	09/10/1996	DOM	Qhcks		38561				
6528-2019	20/09/1996	10	10	5.5	20/09/1996	0.8	20/09/1996	783	19/09/1996	DOM	Qhcks		38562				
6528-2020	30/10/1996	6.3	6.3	1.8	30/10/1996	0.8	30/10/1996	1205	30/10/1996	DOM	Qhcks		39008				
6528-2022	22/11/1996	5.8	5.8	2.1	22/11/1996	0.55	22/11/1996	6062	22/11/1996	DOM	Qhcks		39050				
6528-2023	12/11/1996	5.5	5.5	1.8	12/11/1996	0.8	12/11/1996	1496	12/11/1996	DOM	Qhcks		39075				
6528-2024	02/12/1996	7	7	3.3	02/12/1996	0.8	02/12/1996	1239	02/12/1996	DOM	Qhcks		39185				
6528-2026	03/12/1996	7	7	3	03/12/1996	0.8	03/12/1996	1356	03/12/1996	DOM	Qhcks		39222				
6528-2027	06/12/1996	5.5	5.5	1.8	06/12/1996	0.68	06/12/1996	2132	06/12/1996	DOM	Qhck		39235				
6528-2032	30/01/1997	6	5.9	1.5	30/01/1997	1.5	30/01/1997	1255	30/01/1997	DOM	Qhcks		37044				5.9
6528-2046	07/10/1997	6	6	4	07/10/1997	0.8	07/10/1997	1440	07/10/1997	IRR	Qhcks	OPR	42441				6
6528-2047	07/10/1997	6	6	4	07/10/1997	0.8	07/10/1997	1440	07/10/1997	IRR	Qhcks	OPR	42442				6
6528-2048	08/10/1997	6	6	4	08/10/1997	0.8	08/10/1997	1429	08/10/1997	IRR	Qhcks	OPR	42443				6
6528-2049	08/10/1997	6	6	4	08/10/1997	0.8	08/10/1997	1429	08/10/1997	IRR	Qhcks	OPR	42444				6
6528-2053	03/11/1997	7.5	7.5	4.72	03/11/1997						Qhcks		43316				3.6
6528-2054	07/11/1997	6	6	4.68	07/11/1997					INV	Qhcks		43345				3
6528-2055	07/11/1997	6	6	4.74	07/11/1997					INV	Qhcks		43346				3
6528-2056	07/11/1997	6	6	4.87	07/11/1997					INV	Qhcks		43347				2.8
6528-2057	07/11/1997	6	6	4.39	07/11/1997					INV	Qhcks		43348				3
6528-2070	04/06/1998	5.5	5.5	1.5	04/06/1998	0.2	04/06/1998			MON	Qhcks		44607				5.5
6528-2071	04/06/1998	5.5	5.5	1.5	04/06/1998	0.2	04/06/1998			MON	Qhcks		44608				5.5
6528-2072	04/06/1998	5.5	5.5	1.5	04/06/1998	0.2	04/06/1998			MON	Qhcks		44609				5.5
6528-2073	04/06/1998	5.5	5.5	1.5	04/06/1998	0.2	04/06/1998			MON	Qhcks		44611				5.5
6528-2074	04/06/1998	5.5	5.5	1.5	04/06/1998	0.2	04/06/1998			MON	Qhcks		44612				5.5
6528-2097	26/11/1996	13.3	13.3	9.2	26/11/1996	0.6	26/11/1996	1049	26/11/1996	DOM	Qhcks		39394				
6528-2100	03/01/1997	6.1	6.1	2.1	03/01/1997	0.8	03/01/1997	2364	03/01/1997	DOM	Qhcks		39606				
6528-2101	12/01/1997	7.3	7.3	3.4	12/01/1997	0.8	12/01/1997	766	12/01/1997	DOM	Qhcks		39607				
6528-2102	19/12/1996	6.1	6.1	2.4	19/12/1996	0.75	19/12/1996	983	19/12/1996	DOM	Qhcks		39644				
6528-2103	27/12/1996	7	7	3.17	30/05/2019	0.8	27/12/1996	506	27/12/1996	IRR	Qhcks		39645				
6528-2104	08/01/1997	6.4	6.4	2.4	08/01/1997	0.8	08/01/1997	1066	08/01/1997	DOM	Qhcks		39655				
6528-2105	15/01/1997	7	7	3	15/01/1997	0.8	15/01/1997	843	15/01/1997	DOM	Qhcks Nds		39667				
6528-2106	13/01/1997	8.5	8.5	4.6	13/01/1997	0.75	13/01/1997	550	13/01/1997	IRR	Qhcks		39722				
6528-2107	16/01/1997	6.1	6.1	2.1	16/01/1997	0.8	16/01/1997	1205	16/01/1997	DOM	Qhck		39739				
6528-2108	19/01/1997	6	6	2.17	06/06/2019	0.8	19/01/1997	1021	19/01/1997	DOM	Qhcks		39761				
6528-2110	20/02/1997	7	7	3.4	20/02/1997	0.8	20/02/1997	999	20/02/1997	DOM	Qhcks		40272				
6528-2111	20/03/1997	10.1	10.1	6.1	20/03/1997	0.5	20/03/1997	1032	20/03/1997	DOM	Qhcks		40508				

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Purpose	Aquifer	Status	Permit No	Obs No	SWL Status	Salinity Status	Cased To (m)
6528-2112	11/04/1997	7.5	7.5	3.5	11/04/1997	0.86	11/04/1997	1328	11/04/1997	DOM	Qhcks		40911				
6528-2113	15/04/1997	5	5	1	15/04/1997	0.86	15/04/1997	1535	15/04/1997	DOM	Qhcks		40920				

500 records

Government of South Australia WaterConnect

Circle Centre -34.817987,138.501742, Radius 2km



Appendix B

Monitoring Well Logs

BOREHOLE LOG SHEET

GEO_BOREHOLE WELL INSTALLATION LOGS.GPJ GHD_GEO_TEMPLATE.GDT 15/3/19

Client : South Australian Metropolitan Fire Service
Project : MFS Largs North Testing
Location : Largs North, SA

HOLE No. MW01

SHEET 1 OF 1

Position : 271572.7 E 6144214.0 N MGA94 54 **Surface RL:** 3.08m AHD **Angle from Horiz. :** 90° **Processed :** TS
Rig Type : Hand auger **Mounting:** Land Rover **Contractor :** WB Drilling **Driller :** **Checked :** RW
Date Started : 1/2/2019 **Date Completed :** 1/2/2019 **Logged by :** JC/JK **Date:** 15/3/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL							BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
					0.50		SP	SAND, fine grained, pale brown, trace organic matter.	D	VS			Grout backfill
							SP	SAND, fine grained, well sorted, white/yellow.	D	VS			Bentonite
1	Push Tube	Nil	▽										Sand Backfill
2											Groundwater Encountered at 2.1m		
3					3.00		SP	SAND, fine grained, well sorted, grey.	M	VS			Screen
4					4.50			End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE WELL INSTALLATION LOGS.GPJ GHD_GEO_TEMPLATE.GDT 15/3/19

Client : South Australian Metropolitan Fire Service		**HOLE No. MW02**	
Project : MFS Largs North Testing			SHEET 1 OF 1
Location : Largs North, SA			
Position : 271523.7 E 6144310.1 N MGA94 54	**Surface RL:** 3.03m AHD	**Angle from Horiz. :** 90°	**Processed :** TS
Rig Type : Hand auger **Mounting:** Land Rover	**Contractor :** WB Drilling	**Driller :**	**Checked :** RW
Date Started : 1/2/2019	**Date Completed :** 1/2/2019	**Logged by :** JC/JK	**Date:** 15/3/2019

DRILLING					MATERIAL								Note: * indicates signatures on original issue of log or last revision of log BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
							SP-SM	Silty SAND, fine grained, poorly sorted, brown, some gravel.	D	S			
					0.40								Grout backfill
					0.50		GP	Sandy GRAVEL, medium	D	S			
							SP	grained sand, poorly sorted, pale brown.	D	S			
								SAND, medium grained, white/yellow.					Bentonite
1					1.00		SP	SAND, fine grained, pale brown.	D	S			
													Sand Backfill
	Push Tube												
2		Nil			2.00		SP	SAND, fine to medium grained, pale brown with orange mottling.	M	S			
			▽								Groundwater Encountered at 2.4m		
3					3.00		SP	SAND, fine grained, pale grey to grey.	M	S			Screen
4													
					4.50			End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE WELL INSTALLATION LOGS.GPJ GHD_GEO_TEMPLATE.GDT 15/3/19

Client : South Australian Metropolitan Fire Service
Project : MFS Largs North Testing
Location : Largs North, SA

HOLE No. MW03

SHEET 1 OF 1

Position : 271508.0 E 6144240.8 N MGA94 54 **Surface RL:** 3.56m AHD **Angle from Horiz. :** 90° **Processed :** TS
Rig Type : Hand auger **Mounting:** Land Rover **Contractor :** WB Drilling **Driller :** **Checked :** RW
Date Started : 1/2/2019 **Date Completed :** 1/2/2019 **Logged by :** JC/JK **Date:** 15/3/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL							BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Push Tube	Nil					SC	Clayey silty SAND, fine to medium grained, pale brown, low plasticity fines, trace organics.	SM	VS			Grout backfill Bentonite Sand Backfill
					1.70		CL	Sandy CLAY, fine grained, pale brown mottled orange.	D	VSt			
2					2.00		SP	SAND, fine grained, white/yellow.	D	VS			
3													Screen
4													
			GNE		4.50			End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE WELL INSTALLATION LOGS.GPJ GHD_GEO_TEMPLATE.GDT 15/3/19

Client : South Australian Metropolitan Fire Service
Project : MFS Largs North Testing
Location : Largs North, SA

HOLE No. MW04

SHEET 1 OF 1

Position : 271474.5 E 6144275.7 N MGA94 54 **Surface RL:** 3.29m AHD **Angle from Horiz. :** 90° **Processed :** TS
Rig Type : Hand auger **Mounting:** Land Rover **Contractor :** WB Drilling **Driller :** **Checked :** RW
Date Started : 1/2/2019 **Date Completed :** 1/2/2019 **Logged by :** JC/JK **Date:** 15/3/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL								BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations		BOREHOLE Log	Components
					0.20		ML	Sandy SILT, fine grained, pale brown, trace organics	D	VS	Organic odour			
					0.50		SP	SAND, fine grained, well sorted, pale brown.	D	VS				Grout backfill
							SP	SAND, fine grained, well sorted, brown.	D	VS				Bentonite
1					1.00		SP	As above but yellow to brown	D	VS				Sand Backfill
2	Push Tube	Nil	▽		2.50		SP	As above but yellow to brown to grey	M	VS	Groundwater Encountered at 2.5m			
3					3.00		SP	As above but grey	W	VS				Screen
4					4.50			End of borehole at 4.5 metres. Target Depth						
5														

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_WELL INSTALLATION LOGS.GPJ GHD_GEO_TEMPLATE 2.00.GDT 9/5/19

Client : South Australian Metropolitan Fire Service

Project : Largs North Station Off-site Groundwater Use Survey & Groundwater Investigation

Location : Off-site, Up hydraulic grad, SA

HOLE No. MW05

SHEET 1 OF 1

Position : 271517.3 E 6144107.6 N MGA94 54	**Surface RL:** 3.02m AHD	**Angle from Horiz. :** 90°	**Processed :** JC
Rig Type : Eziprobe	**Mounting:** Land Rover	**Contractor :** WB Drilling	**Driller :** IW	**Checked :** JK
Date Started : 2/4/2019	**Date Completed :** 2/4/2019	**Logged by :** JC	**Date:** 9/05/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL								BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description: SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger		▽		0.30			FILL; Silty sand, fine to medium grained, poorly sorted, pale brown, dry, non plastic silt with gravel.	D				Gatic
					0.60			FILL; Sandy silt, non plastic, poorly sorted, pale brown, dry, fine to medium grained sand.	D				Grout
					0.90		SW	SAND; fine to medium grained, moderately well sorted, pale brown, dry.	D				Bentonite
2	Push Tube				2.10		SW	SAND; fine grained, well sorted, yellow, dry.	D				
					2.40		SW	SAND; fine grained, well sorted, yellow with orange mottle, dry.	D				
					2.70		SW	SAND; fine to medium grained, well sorted, yellow with orange mottle, wet.	W				
3	Hollow Auger Screwing				4.50		SW	SAND; fine grained, well sorted, grey, wet	W				Filter Pack (Sand 2 - 3 mm)
4													Screen
								End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.
3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_WELL INSTALLATION LOGS.GPJ GHD_GEO_TEMPLATE 2.00.GDT 9/5/19

Client : South Australian Metropolitan Fire Service

Project : Largs North Station Off-site Groundwater Use Survey & Groundwater Investigation

Location : Off-site, Up hydraulic grad, SA

HOLE No. MW06

SHEET 1 OF 1

Position : 271480.6 E 6144082.1 N MGA94 54	**Surface RL:** 3.12m AHD	**Angle from Horiz. :** 90°	**Processed :** JC
Rig Type : Eziprobe	**Mounting:** Land Rover	**Contractor :** WB Drilling	**Driller :** IW	**Checked :** JK
Date Started : 2/4/2019	**Date Completed :** 2/4/2019	**Logged by :** JC	**Date:** 9/05/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL								BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description: SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger		▽		0.20			FILL; Sand, fine to medium grained, poorly sorted, pale grey, dry, sub - rounded, fine to medium grained gravel.	D				Gatic
					0.40			FILL; Sand, fine to medium grained, moderately well sorted, pale brown, dry.	D				Grout
								FILL; Sand, fine to medium grained, pale grey/brown, moderately well sorted, dry, sub - rounded, fine to medium grained gravel.	D				Bentonite
2	Push Tube				1.40			FILL; Clayey sand, fine to medium grained, pale brown with orange mottle, dry, medium plasticity clay.	D				
					1.80		SW	SAND; fine grained, well sorted, yellow with orange mottle, dry.	D				
					2.40		SW	SAND; fine grained, well sorted, pale brown with yellow/orange mottle, wet.	W				
3	Hollow Auger Screwing				2.70		SW	SAND; fine grained, well sorted, grey, wet.	W				Filter Pack (Sand 2 - 3 mm)
													Screen
4					4.50			End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.
3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_WELL INSTALLATION LOGS.GPJ GHD_GEO_TEMPLATE 2.00.GDT 9/5/19

Client : South Australian Metropolitan Fire Service

Project : Largs North Station Off-site Groundwater Use Survey & Groundwater Investigation

Location : Off-site, Up hydraulic grad, SA

HOLE No. MW07

SHEET 1 OF 1

Position : 271471.3 E 6144161.0 N MGA94 54	**Surface RL:** 3.16m AHD	**Angle from Horiz. :** 90°	**Processed :** JC
Rig Type : Eziprobe	**Mounting:** Land Rover	**Contractor :** WB Drilling	**Driller :** IW	**Checked :** JK
Date Started : 2/4/2019	**Date Completed :** 2/4/2019	**Logged by :** JC	**Date:** 9/05/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL								BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger				0.00			FILL; Silty sand, fine to medium grained, poorly sorted, pale brown, dry, sub - rounded, fine to medium grained gravel.	D				Gatic Grout Bentonite
					0.80		SW	SAND; fine to medium grained, moderately well sorted, pale brown, dry.	D				
2	Push Tube		▽		1.20		SW	SAND; fine to medium grained, moderately well sorted, pale grey/brown, dry.	D				
					2.40		SW	SAND; fine to medium grained, moderately well sorted, yellow, moist.	M				Filter Pack (Sand 2 - 3 mm)
3	Hollow Auger Screwing				3.20		SW	SAND; fine to medium grained, well sorted, pale yellow/brown, wet.	W				Screen
					3.80		SW	SAND; fine to medium grained, well sorted, pale grey, wet.	W				
4					4.50			End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.
3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_WELL INSTALLATION LOGS.GPJ GHD_GEO_TEMPLATE 2.00.GDT 9/5/19

Client : South Australian Metropolitan Fire Service

Project : Largs North Station Off-site Groundwater Use Survey & Groundwater Investigation

Location : Off-site, Dw hydraulic grad, SA

HOLE No. MW08

SHEET 1 OF 1

Position : 271484.1 E 6144324.0 N MGA94 54	**Surface RL:** 3.05m AHD	**Angle from Horiz. :** 90°	**Processed :** JC
Rig Type : Eziprobe	**Mounting:** Land Rover	**Contractor :** WB Drilling	**Driller :** IW	**Checked :** JK
Date Started : 1/4/2019	**Date Completed :** 1/4/2019	**Logged by :** JC	**Date:** 9/05/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL								BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger		▽		0.20			Fill; Sandy silt, non plastic, moderately well sorted, pale brown, dry, fine to medium grained sand.	D				Gatic
					0.30			FILL; Sandy silt, non plastic, poorly sorted, pale brown, dry, fine to medium grained sand, sub - rounded, fine to medium grained gravel.	D				Grout
					0.50				D				
					0.70		SW	FILL; Sandy silt, non plastic, moderately well sorted, pale brown, dry, fine to medium grained sand.	D				Bentonite
					0.90		SW	FILL; Sand, fine to medium grained, poorly sorted, pale brown, dry, sub - rounded, fine to medium grained gravel.	D				
2	Push Tube				1.80		SW	SAND; fine grained, well sorted, yellow and pale brown, dry. SAND; fine grained, well sorted, yellow and white, dry. SAND; fine grained, well sorted, orange mottle, dry.	D				
					2.60		SW	SAND; fine grained, well sorted, grey, wet.	W				Filter Pack (Sand 2 - 3 mm)
3	Hollow Auger Screwing				2.90		SW	SAND; fine grained, well sorted, dark grey, wet.	W				Screen
4					4.50			End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.
3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_WELL INSTALLATION LOGS.GPJ GHD_GEO_TEMPLATE 2.00.GDT 9/5/19

Client : South Australian Metropolitan Fire Service

Project : Largs North Station Off-site Groundwater Use Survey & Groundwater Investigation

Location : Off-site, Dw hydraulic grad, SA

HOLE No. MW09

SHEET 1 OF 1

Position : 271548.4 E 6144339.9 N MGA94 54	**Surface RL:** 3.06m AHD	**Angle from Horiz. :** 90°	**Processed :** JC
Rig Type : Eziprobe	**Mounting:** Land Rover	**Contractor :** WB Drilling	**Driller :** IW	**Checked :** JK
Date Started : 1/4/2019	**Date Completed :** 1/4/2019	**Logged by :** JC	**Date:** 9/05/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL								BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description: SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger				0.20			FILL; Sandy silt, non plastic, moderately well sorted, pale brown, dry, fine to medium grained sand.	D				Gatic
					0.40				D				Grout
							SW	FILL; Sandy silt, non plastic, poorly sorted, pale brown, dry, sub - rounded, fine to medium grained gravel.	D				
								SAND; fine to medium grained, moderately well sorted, light grey and pale brown, dry.					Bentonite
					1.00		SW	SAND; fine grained, well sorted, white/yellow, dry.	D				
2	Push Tube		▽		1.70		SW	SAND; fine grained, well sorted, yellow with orange/grey mottle, dry.	D				
					2.40		SW	SAND; fine grained, well sorted, yellow with orange/grey mottle, wet.	W				
3	Hollow Auger Screwing				2.70		SW	SAND; fine grained, well sorted, medium grey, wet.	W				Filter Pack (Sand 2 - 3 mm)
													Screen
4					4.50			End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.
3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_WELL INSTALLATION LOGS.GPJ GHD_GEO_TEMPLATE 2.00.GDT 9/5/19

Client : South Australian Metropolitan Fire Service

Project : Largs North Station Off-site Groundwater Use Survey & Groundwater Investigation

Location : Off-site, Dw hydraulic grad, SA

HOLE No. MW10

SHEET 1 OF 1

Position : 271612.5 E 6144354.9 N MGA94 54	**Surface RL:** 2.80m AHD	**Angle from Horiz. :** 90°		**Processed :** JC
Rig Type : Eziprobe	**Mounting:** Land Rover	**Contractor :** WB Drilling	**Driller :** IW	**Checked :** JK
Date Started : 1/4/2019	**Date Completed :** 1/4/2019		**Logged by :** JC	**Date:** 9/05/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL								BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description: SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger				0.60			FILL; Silty sand, fine to medium grained, poorly sorted, pale brown, dry, non plastic silt with gravel.	D				Gatic Grout
					1.10			FILL; Sandy silt, non plastic, moderately well sorted, pale brown, dry, fine grained sand.	D				Bentonite
					1.40		SW	SAND; fine to medium grained, moderately well sorted, light grey, dry.	D				
2	Push Tube		▽		1.90		SW	SAND; fine grained, moderately well sorted, white/yellow, dry.	D				
					2.00		SW	SAND; fine grained, moderately well sorted, yellow with orange mottle, dry.	D				
							SW	SAND; fine grained, moderately well sorted, yellow with orange mottle, moist.	M				
3	Hollow Auger Screwing				2.40		SW	SAND; fine grained, well sorted, medium grey, wet.	W				Filter Pack (Sand 2 - 3 mm) Screen
4					4.50			End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_WELL INSTALLATION LOGS.GPJ GHD_GEO_TEMPLATE 2.00.GDT 9/5/19

Client : South Australian Metropolitan Fire Service

Project : Largs North Station Off-site Groundwater Use Survey & Groundwater Investigation

Location : Off-site, Dw hydraulic grad, SA

HOLE No. MW11

SHEET 1 OF 1

Position : 271537.7 E 6144419.7 N MGA94 54	**Surface RL:** 3.19m AHD	**Angle from Horiz. :** 90°	**Processed :** JC
Rig Type : Eziprobe	**Mounting:** Land Rover	**Contractor :** WB Drilling	**Driller :** IW	**Checked :** JK
Date Started : 1/4/2019	**Date Completed :** 1/4/2019	**Logged by :** JC	**Date:** 9/05/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL								BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description: SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger		▽		0.00			FILL; Sandy silt, non plastic, poorly sorted, pale brown, dry, fine to medium grained sand, sub - rounded, fine to medium grained gravel.	D				Gatic
					0.40			FILL; Sandy silt, non plastic, poorly sorted, pale brown and yellow/brown, dry, fine to medium grained sand, sub - rounded, fine to medium grained gravel.	D				Grout
					0.60		SW		D				Bentonite
					0.90		SW	SAND; fine to medium grained, moderately well sorted, pale brown, dry.	D				
					1.10		SW	SAND; fine grained, well sorted, pale brown, dry.	D				
2	Push Tube							SAND; fine grained, well sorted, white/yellow, dry.					
					2.60		SW	SAND; fine grained, well sorted, white/yellow with orange mottle, wet.	W				Filter Pack (Sand 2 - 3 mm)
3					3.00		SW	SAND; fine grained, well sorted, medium grey, wet.	W				Screen
4	Hollow Auger Screwing				4.50			End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_AS1726 2017 3319080 MW12-MW18.GPJ GHD_GEO_TEMPLATE 2.00.GDT 18/11/19

Client :	South Australian Metropolitan Fire Service	**HOLE No. MW12**	
Project :	MFS Monitoring Wells		
Location :	Largs North, SA	**SHEET 1 OF 1**	
Position :	Refer to test location plan MGA94 54	**Surface RL:** -3.40m AHD	**Angle from Horiz. :** 90°	**Processed :** JC
Rig Type :	EziProbe	**Mounting:** Landcruiser	**Contractor :** WB Drilling	**Driller :** I & D Watt	**Checked :** DV
Date Started :	11/10/2019	**Date Completed :** 11/10/2019	**Logged by :** JC	**Date:** 04/11/2019

DRILLING					MATERIAL									Note: * indicates signatures on original issue of log or last revision of log BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric / texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger	Nil	▽		0.11		(SM)	FILL: Silty SAND, pale brown, fine to medium grained, moderately well sorted.	D	-	No odour		Gatic
					0.24		(ML)		D	-	No odour.		
					0.31		(SC)	FILL: Sandy SILT, brown to dark brown, non-plastic, fine grained, moderately well sorted sand, trace organics.	D	-			Grout
							SP		D	-	No odour.		
								FILL: Clayey SAND, pale brown, fine to coarse grained, well sorted, low plasticity fines, some gravel.					Bentonite
								SAND, pale brown, fine grained, well sorted.					
					1.15		SP	SAND, dark yellowish orange, fine grained, well sorted.	D	-	No odour.		
2	Push Tube		▽		2.03		SP	SAND, dark yellowish orange, fine grained, well sorted.	W	-	No odour. Groundwater Encountered at 2.03m.		
					2.75		SP	SAND, grey, fine grained, well sorted.	W	-	No odour.		Filter Pack (Sand 2 - 3 mm)
3													Screen
4	Hollow Flight Auger				4.50			End of borehole at 4.50 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_AS1726 2017 3319080 MW12-MW18.GPJ GHD_GEO_TEMPLATE 2.00.GDT 18/11/19

Client : South Australian Metropolitan Fire Service

Project : MFS Monitoring Wells

Location : Largs North, SA

HOLE No. MW13

SHEET 1 OF 1

Position : Refer to test location plan MGA94 54 **Surface RL:** -9.20m AHD **Angle from Horiz. :** 90° **Processed :** JC

Rig Type : EziProbe **Mounting:** Landcruiser **Contractor :** WB Drilling **Driller :** I & D Watt **Checked :** DV

Date Started : 11/10/2019 **Date Completed :** 11/10/2019 **Logged by :** JC **Date:** 04/11/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL								BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric / texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
0	Hand Auger	Nil	▽		0.00		(SP)	FILL: SAND, pale brown, fine to medium grained, poorly sorted, some gravel, trace organics.	D	-	No odour.		Gatic Grout
					0.60		(SP)	FILL: SAND, pale brown, fine to medium grained, poorly sorted, some calcareous content.	D	-	No odour.		Bentonite
1					1.38		SP	SAND, pale brown, fine grained, well sorted.	D	-	No odour.		
	Push Tube				1.85		SP	SAND, yellowish brown, fine grained, well sorted.	D	-	No odour.		
2			▽		2.10		SP	SAND, yellowish brown, fine grained, well sorted.	W	-	No odour. Groundwater encountered at 2.1m		
					2.70		SP	SAND, grey, fine grained, well sorted.	W	-	No odour.		Filter Pack (Sand 2 - 3 mm)
3	Hollow Flight Auger												Screen
4					4.50			End of borehole at 4.50 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_AS1726 2017 3319080 MW12-MW18.GPJ GHD_GEO_TEMPLATE 2.00.GDT 18/11/19

Client : South Australian Metropolitan Fire Service

Project : MFS Monitoring Wells

Location : Largs North, SA

HOLE No. MW14

SHEET 1 OF 1

Position : Refer to test location plan MGA94 54	**Surface RL:** 8.70m AHD	**Angle from Horiz. :** 90°	**Processed :** JC
Rig Type : EziProbe	**Mounting:** Landcruiser	**Contractor :** WB Drilling	**Driller :** I & D Watt	**Checked :** DV
Date Started : 11/10/2019	**Date Completed :** 11/10/2019	**Logged by :** JC	**Date:** 04/11/2019

DRILLING					MATERIAL								Note: * indicates signatures on original issue of log or last revision of log BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric / texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
0	Hand Auger	Nil	▼		0.31		(SP)	FILL: SAND, pale brown, fine grained, moderately well sorted, trace gravel and organics.	D	-	No odour		Gatic
							SP	SAND, pale brown, fine grained, well sorted.	D	-	No odour		Grout
					0.95		SP	SAND, yellowish brown, fine grained, well sorted.	D	-	No odour		Bentonite
1	Push Tube				2.10		SP	SAND, yellowish brown, fine grained, well sorted.	W	-	No odour. Groundwater encountered at 2.1m.		
2					2.35		SP	SAND, yellowish brown mottled orange, fine grained, well sorted.	W	-	No odour		
					2.80		SP	SAND, grey, fine grained, well sorted.	W	-			Filter Pack (Sand 2 - 3 mm)
3					3.15		SP	SAND, grey, fine grained, well sorted.	W	-	Sulphur odour. No visual evidence of contamination.		Screen
4	Hollow Flight Auger				4.50			End of borehole at 4.50 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_AS1726 2017 3319080 MW12-MW18.GPJ GHD_GEO_TEMPLATE 2.00.GDT 18/11/19

Client : South Australian Metropolitan Fire Service

Project : MFS Monitoring Wells

Location : Largs North, SA

HOLE No. MW15

SHEET 1 OF 1

Position : Refer to test location plan MGA94 54 **Surface RL:** -18.70m AHD **Angle from Horiz. :** 90° **Processed :** JC

Rig Type : EziProbe **Mounting:** Landcruiser **Contractor :** WB Drilling **Driller :** I & D Watt **Checked :** DV

Date Started : 11/10/2019 **Date Completed :** 11/10/2019 **Logged by :** JC **Date:** 04/11/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL								BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric / texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger	Nil	▽		0.34		(SP)	FILL: SAND, pale brown, fine to medium grained, poorly sorted, trace gravel and organics.	D	-	No odour.		Gatic
					0.98		SP	SAND, pale brown, fine to medium grained, well sorted.	D	-	No odour.		Grout
							SP	SAND, yellowish brown, fine to medium grained, well sorted.	D	-	No odour.		Bentonite
2	Push Tube		▽		2.00		SP	SAND, yellowish brown, fine to medium grained, well sorted.	W	-	No odour. Groundwater encountered at 2.0m. No odour.		
			▼		2.20		SP	SAND, yellowish brown mottled orange, fine to medium grained, well sorted.	W	-			
					2.70		SP	SAND, grey, fine grained, well sorted.	W	-	No odour.		Filter Pack (Sand 2 - 3 mm)
3	Hollow Flight Auger												Screen
4					4.50			End of borehole at 4.50 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_AS1726 2017 3319080 MW12-MW18.GPJ GHD_GEO_TEMPLATE 2.00.GDT 18/11/19

Client : South Australian Metropolitan Fire Service

Project : MFS Monitoring Wells

Location : Largs North, SA

HOLE No. MW16

SHEET 1 OF 1

Position : Refer to test location plan MGA94 54 **Surface RL:** 6.60m AHD **Angle from Horiz. :** 90° **Processed :** JC

Rig Type : EziProbe **Mounting:** Landcruiser **Contractor :** WB Drilling **Driller :** I & D Watt **Checked :** DV

Date Started : 10/10/2019 **Date Completed :** 10/10/2019 **Logged by :** JC **Date:** 04/11/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL							BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric / texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
					0.15		SP	SAND, pale brown, fine grained, moderately well sorted, trace organics.	D	-	No odour		Gatic
	Hand Auger				0.67		SP	SAND, pale brown, fine grained, well sorted.	D	-	No odour.		Grout
1							SP	SAND, yellowish brown, fine grained, well sorted.	D	-	No odour.		Bentonite
	Push Tube	Nil	▼		2.10		SP	SAND, yellowish brown, fine grained, well sorted.	W	-	No odour. Groundwater encountered at 2.1m.		
2					2.35		SP	SAND, yellowish brown mottled orange, fine grained, well sorted.	W	-	No odour.		
					2.65		SP	SAND, grey, fine grained, well sorted.	W	-	No odour		Filter Pack (Sand 2 - 3 mm)
3													Screen
	Hollow Flight Auger				4.50			End of borehole at 4.50 metres. Target Depth					
4													
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_AS1726 2017 3319080 MW12-MW18.GPJ GHD_GEO_TEMPLATE 2.00.GDT 18/11/19

Client : South Australian Metropolitan Fire Service

Project : MFS Monitoring Wells

Location : Largs North, SA

HOLE No. MW17

SHEET 1 OF 1

Position : Refer to test location plan MGA94 54	**Surface RL:** -2.70m AHD	**Angle from Horiz. :** 90°	**Processed :** JC
Rig Type : EziProbe	**Mounting:** Landcruiser	**Contractor :** WB Drilling	**Driller :** I & D Watt	**Checked :** DV
Date Started : 10/10/2019	**Date Completed :** 10/10/2019	**Logged by :** JC	**Date:** 04/11/2019

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL							BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric / texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger	Nil	▽		0.47		(SM)	FILL: Silty SAND, pale brown, fine to medium grained, poorly sorted, with gravel, shells and sandstone.	D	-	No odour.		Gatic Grout
					0.81		SP	SAND, pale yellowish brown, fine grained, well sorted.	D	-	No odour.		Bentonite
	Push Tube						SP	SAND, yellow-white, fine grained, well sorted.	D	-	No odour.		
2			▼		2.20		SP	SAND, yellowish brown mottled orange, fine grained, well sorted.	W	-	No odour. Groundwater encountered at 2.2m.		
3	Hollow Flight Auger				3.10		SP	SAND, grey, fine grained, well sorted.	W	-	No odour.		Filter Pack (Sand 2 - 3 mm) Screen
4					4.25		SP	SAND, grey mottled orange, fine grained, well sorted.	W	-	Sulphur odour.		
					4.50			End of borehole at 4.50 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_AS1726 2017 3319080 MW12-MW18.GPJ GHD_GEO_TEMPLATE 2.00.GDT 18/11/19

Client : South Australian Metropolitan Fire Service		**HOLE No. MW18**	
Project : MFS Monitoring Wells			
Location : Largs North, SA		**SHEET 1 OF 1**	
Position : Refer to test location plan MGA94 54	**Surface RL:** -5.30m AHD	**Angle from Horiz. :** 90°	**Processed :** JC
Rig Type : EziProbe **Mounting:** Landcruiser	**Contractor :** WB Drilling	**Driller :** I & D Watt	**Checked :** DV
Date Started : 10/10/2019 **Date Completed :** 10/10/2019		**Logged by :** JC	**Date:** 04/11/2019

DRILLING					MATERIAL									Note: * indicates signatures on original issue of log or last revision of log BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description [COBBLES/BOULDERS/FILL/TOPSOIL] then SOIL NAME: plasticity / primary particle characteristics, colour, secondary and minor components, zoning (origin) and ROCK NAME: grain size, colour, fabric / texture, inclusions or minor components, durability, strength, weathering / alteration, defects	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger	Nil	▽		0.26		(SC)	FILL: Clayey SAND, pale brown, fine to medium grained, poorly sorted, low plasticity fines, with gravel.	D	-	No odour		Gatic
					0.35		(SP)	FILL: SAND, pale brown, fine to medium grained, moderately sorted.	D	-	No odour.		Grout
							SP	SAND, pale brown, fine grained, well sorted.	D	-	No odour.		
					0.81		SP	SAND, yellowish brown, fine grained, well sorted.	D	-	No odour.		Bentonite
2	Push Tube		▽		2.00		SP	SAND, yellowish brown, fine grained, well sorted.	W	-	No odour. Groundwater encountered at 2.0m.		
					2.50		SP	SAND, yellowish brown mottled orange, fine grained, well sorted.	W	-	No odour.		Filter Pack (Sand 2 - 3 mm)
3													Screen
	Hollow Flight Auger				3.30		SP	SAND, grey, fine grained, well sorted.	W	-	No odour.		
					3.45		SP	SAND, grey, fine grained, well sorted.	W	-	HC/Sulphur odour. No visual evidence of contamination.		
4					4.50			End of borehole at 4.50 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. **3319080**

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW19

Well Permit No 360138

Client SA MFS	**Drill Co.** WB Drilling	**Easting, Northing** 271438.172, 6144273.771
Project Largs North GME	**Driller** IW	**Grid Ref** GDA94_MGA_zone_54
Project No. 3319080	**Rig Type** Eziprobe	**Elevation** 3.197
Site Largs North Station	**Drill Method** Pushtube/SFA	**Collar RL** 3.120
Location 2 Willochra St	**Total Depth (m)** 4.5	**Logged By** TW
Date Drilled 20/02/2020 - 24/02/2020	**Diameter (mm)** 50/100	**Checked By** RW

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

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	PT						FILL: Silty sand, fine to medium grained, well graded, pale brown	D			0
0.2											-0.2
0.4											-0.4
0.6											-0.6
0.8											-0.8
1							SAND, fine to medium grained, well graded, subrounded to rounded, pale brown				-1
1.2											-1.2
1.4			MW19					M			-1.4
1.6											-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							SAND, fine to medium grained, well graded, orange, yellow, pale grey, white				-3
3.2											-3.2
3.4											-3.4
3.6											-3.6
3.8											-3.8
4							SAND, fine to medium grained, well graded, dark grey				-4
4.2											-4.2
4.4											-4.4
4.6							Termination Depth at: 4.50 m. Target depth achieved.				-4.6
4.8											-4.8

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, 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 MW20

Well Permit No 360139

Client SA MFS	**Drill Co.** WB Drilling	**Easting, Northing** 271466.795, 6144513.299
Project Largs North GME	**Driller** IW	**Grid Ref** GDA94_MGA_zone_54
Project No. 3319080	**Rig Type** Eziprobe	**Elevation** 2.777
Site Largs North Station	**Drill Method** Pushtube/SFA	**Collar RL** 2.683
Location 2 Willochra St	**Total Depth (m)** 4.5	**Logged By** TW
Date Drilled 20/02/2020 - 24/02/2020	**Diameter (mm)** 50/100	**Checked By** RW

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

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	PT				MW19		FILL: Silty sand, fine to medium grained,	D			-0
0.2							FILL: Sand, fine to medium grained, well graded, pale brown, trace gravel, trace organic matter				-0.2
0.4							SAND, fine to medium grained, well graded, subrounded to rounded, yellow brown				-0.4
0.6											-0.6
0.8											-0.8
1											-1
1.2											-1.2
1.4							SAND, fine to medium grained, well graded, yellow white, pale grey, white				-1.4
1.6											-1.6
1.8							SAND, fine to medium grained, well graded, yellow brown mottled orange				-1.8
2			MW20					M			-2
2.2											-2.2
2.4											-2.4
2.6							SAND, fine to medium grained, well graded, pale brown				-2.6
2.8							SAND, fine to medium grained, well graded, dark grey				-2.8
3											-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							Termination Depth at: 4.50 m. Target depth achieved.				-4.6
4.8											-4.8

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, 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 MW21

Well Permit No 360140

Client SA MFS	**Drill Co.** WB Drilling	**Easting, Northing** 271544.384, 6144601.862
Project Largs North GME	**Driller** IW	**Grid Ref** GDA94_MGA_zone_54
Project No. 3319080	**Rig Type** Eziprobe	**Elevation** 2.281
Site Largs North Station	**Drill Method** Pushtube/SFA	**Collar RL** 2.217
Location 2 Willochra St	**Total Depth (m)** 4.5	**Logged By** TW
Date Drilled 20/02/2020 - 24/02/2020	**Diameter (mm)** 50/100	**Checked By** RW

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

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	PT				MW19		FILL: Silty sand, fine to medium grained, well graded, pale brown, trace organic matter	D			0
0.2							FILL: Sand, fine to medium grained, well graded, pale brown, trace gravel, trace organic matter				-0.2
0.4							SAND, fine to medium grained, well graded, subrounded to rounded, orange brown				-0.4
0.6											-0.6
0.8											-0.8
1											-1
1.2											-1.2
1.4											-1.4
1.6							SAND, fine to medium grained, well graded, brown grey				-1.6
1.8							SAND, fine to medium grained, well graded, pale brown mottled yellow orange				-1.8
2											-2
2.2											-2.2
2.4			MW21				SAND, fine to medium grained, well graded, dark grey	M			-2.4
2.6											-2.6
2.8											-2.8
3											-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							Termination Depth at: 4.50 m. Target depth achieved.				-4.6
4.8											-4.8

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, 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 MW22

Well Permit No 360141

Client SA MFS	**Drill Co.** WB Drilling	**Easting, Northing** 271646.040, 6144602.748
Project Largs North GME	**Driller** IW	**Grid Ref** GDA94_MGA_zone_54
Project No. 3319080	**Rig Type** Eziprobe	**Elevation** 2.115
Site Largs North Station	**Drill Method** Pushtube/SFA	**Collar RL** 2.054
Location 2 Willochra St	**Total Depth (m)** 4.5	**Logged By** TW
Date Drilled 20/02/2020 - 24/02/2020	**Diameter (mm)** 50/100	**Checked By** RW

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

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	PT				MW19		FILL: Silty sand, fine to medium grained, well graded, pale brown	D			0
0.2											-0.2
0.4											-0.4
0.6											-0.6
0.8											-0.8
1							SAND, fine to medium grained, well graded, subrounded to rounded, pale brown				-1
1.2											-1.2
1.4											-1.4
1.6											-1.6
1.8											-1.8
2											-2
2.2			MW22					M			-2.2
2.4											-2.4
2.6											-2.6
2.8											-2.8
3											-3
3.2											-3.2
3.4											-3.4
3.6							SAND, fine to medium grained, well graded, dark grey				-3.6
3.8											-3.8
4											-4
4.2											-4.2
4.4											-4.4
4.6							Termination Depth at: 4.50 m. Target depth achieved.				-4.6
4.8											-4.8

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, 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 MW23

Well Permit No 360142

Client SA MFS	**Drill Co.** WB Drilling	**Easting, Northing** 271666.025, 6144538.537
Project Largs North GME	**Driller** IW	**Grid Ref** GDA94_MGA_zone_54
Project No. 3319080	**Rig Type** Eziprobe	**Elevation** 2.246
Site Largs North Station	**Drill Method** Pushtube/SFA	**Collar RL** 2.167
Location 2 Willochra St	**Total Depth (m)** 4.5	**Logged By** TW
Date Drilled 20/02/2020 - 24/02/2020	**Diameter (mm)** 50/100	**Checked By** RW

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

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	PT				MW19		FILL: Silty sand, fine to medium grained, well graded, pale brown, trace gravel, trace organic matter	D			0
0.2							FILL: Sand, fine to medium grained, well graded, pale brown, trace gravel and calcrete				-0.2
0.4							SAND, fine to medium grained, well graded, subrounded to rounded, pale brown				-0.4
0.6											-0.6
0.8											-0.8
1											-1
1.2											-1.2
1.4											-1.4
1.6			MW23								-1.6
1.8											-1.8
2							SAND, fine to medium grained, well graded, dark grey				-2
2.2								M			-2.2
2.4											-2.4
2.6											-2.6
2.8											-2.8
3											-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							Termination Depth at: 4.50 m. Target depth achieved.				-4.6
4.8											-4.8

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, 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 SHEET

GEO_BOREHOLE_MW24 - MW26.GPJ GHD_GEO_TEMPLATE 2.00.GDT 28/4/20

Client : South Australian Metropolitan Fire Service	Well Permit Number: 362 458	**HOLE No. MW24**	
Project : MFS Monitoring Wells			**SHEET 1 OF 1**
Location : Largs North, SA			
Position : Refer to test location plan MGA94 54	**Surface RL:** AHD	**Angle from Horiz. :** 90°	**Processed :** MH
Rig Type : EziProbe	**Mounting:** Landcruiser	**Contractor :** WB Drilling	**Driller :** I & D Watt	**Checked :**
Date Started : 22/4/2020	**Date Completed :** 22/4/2020	**Logged by :** BB	**Date:**

DRILLING					MATERIAL								Note: * indicates signatures on original issue of log or last revision of log BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger	Nil	▽ GWO				SM	SAND, pale brown, fine to medium grained.	D	L			Gatic Grout Bentonite
2	Push Tube				2.50		SM	As above, grey to white.	D	L			Filter Pack (Sand 2 - 3 mm) Screen
3	Hollow Flight Auger												
4					4.50			End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.
3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_MW24 - MW26.GPJ GHD_GEO_TEMPLATE 2.00.GDT 28/4/20

Client : South Australian Metropolitan Fire Service
Project : MFS Monitoring Wells
Location : Largs North, SA

Well Permit Number: 362 459

HOLE No. MW25

SHEET 1 OF 1

Position : Refer to test location plan MGA94 54 **Surface RL:** AHD **Angle from Horiz. :** 90° **Processed :** MH
Rig Type : EziProbe **Mounting:** Landcruiser **Contractor :** WB Drilling **Driller :** I & D Watt **Checked :**
Date Started : 22/4/2020 **Date Completed :** 22/4/2020 **Logged by :** BB **Date:**

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL								BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations		BOREHOLE Log	Components
1	Hand Auger	Nil	▽ GWO				SM	SAND, pale brown, fine to medium grained.	D	L				Gatic Grout Bentonite
2	Push Tube				2.50		SM	As above, pale grey.	D	L				Filter Pack (Sand 2 - 3 mm) Screen
3														
4	Hollow Flight Auger				4.50			End of borehole at 4.5 metres. Target Depth						
5														

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 3319080

BOREHOLE LOG SHEET

GEO_BOREHOLE_MW24 - MW26.GPJ GHD_GEO_TEMPLATE 2.00.GDT 28/4/20

Client : South Australian Metropolitan Fire Service
Project : MFS Monitoring Wells
Location : Largs North, SA

Well Permit Number: 362 460

HOLE No. MW26

SHEET 1 OF 1

Position : Refer to test location plan MGA94 54 **Surface RL:** AHD **Angle from Horiz. :** 90° **Processed :** MH
Rig Type : EziProbe **Mounting:** Landcruiser **Contractor :** WB Drilling **Driller :** I & D Watt **Checked :**
Date Started : 22/4/2020 **Date Completed :** 22/4/2020 **Logged by :** BB **Date:**

Note: * indicates signatures on original issue of log or last revision of log

DRILLING					MATERIAL							BOREHOLE	
SCALE (m)	Drilling Method	Hole Support \ Casing	Water	Samples & Tests	Depth / (RL) metres	Graphic Log	USC Symbol	Description: SOIL TYPE, colour, structure, minor components (origin), and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Density Index	Comments/ Observations	BOREHOLE Log	Components
1	Hand Auger	Nil	GWO				SM	SAND, brown to white, fine to medium grained.	D	L			Gatic Grout Bentonite
2	Push Tube				2.00		SM	As above, grey to white.	D	L			Filter Pack (Sand 2 - 3 mm)
3													Screen
4	Hollow Flight Auger				4.50			End of borehole at 4.5 metres. Target Depth					
5													

See standard sheets for details of abbreviations & basis of descriptions

GHD
Level 4, 211 Victoria Square, Adelaide SA 5000 Australia
T: +61 8 8111 6600 F: +61 8 8111 6699 E: adlmail@ghd.com
CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.
3319080

Appendix C

Equipment Calibration Certificates

Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **12C101247**

Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. D.O					
2. Conductivity		2180 uS @ 14.0°C		396172	2183 uS
3. pH7		pH 7.00		393774	pH 7.00
4. pH4		pH 4.00		394432	pH 4.00
5. ORP mV		241.6 @ 14.5 °C		398884/395763	246.5 uS
6. Temp °C		14.5 °C		Multitherm	14.7 °C

Calibrated by: **Jeremy Callado**

Calibration date: **8-May-23**

Next calibration due: **4-Nov-23**

Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **11C100754**

Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. D.O		0 ppm		10640	0 ppm
2. Conductivity		2127 uS @ 13.0°C		385407	2127 uS
3. pH7					
4. pH4					
5. ORP mV					
7. Temp °C					

Calibrated by: **Trent Chase**

Calibration date: **8-May-23**

Next calibration due: **4-Nov-23**

Oil / Water Interface Meter

Instrument Interface Meter (60M)
Serial No. 485330

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	8.71 V
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

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

Calibrated by: Trent Chase

Calibration date: 3/05/2023

Next calibration due: 2/07/2023

Appendix D

Groundwater Sampling Records

Hydrasleeve Sampling Record

Project number:	42599	**Sampler initials**	CD
Client:	MFS	**PM initials**	
Site location:	Largs		

Well ID	MW09.	**Depth to Groundwater (mBTOC)**	2.40 (SWL)
Date		**Depth to top of sampler (mBTOC)**	
QC sample		**Well depth (mBTOC)**	4.45

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)
9.00	7.96	20.9	1173	-7.8	1.59

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☐ N ☐	clear, bubbles in sample bottle, looked like detergent bubbles.

Well ID	MW18	**Depth to Groundwater (mBTOC)**	2.15 (SWL)
Date		**Depth to top of sampler (mBTOC)**	
QC sample		**Well depth (mBTOC)**	4.35

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)
9.30	8.72	20.9	267.1	-14.6	0.66

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☐ N ☐	clear. samples taken

Well ID		**Depth to Groundwater (mBTOC)**	
Date		**Depth to top of sampler (mBTOC)**	
QC sample		**Well depth (mBTOC)**	

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☐ N ☐	

Hydrasleeve Sampling Record

Project number:	3319080	**Sampler initials**	CP
Client:	MFS Largs	**PM initials**	
Site location:			

Well ID	MW15	**Depth to Groundwater (mBTOC)**	2.14 (SWL)
Date	11/5	**Depth to top of sampler (mBTOC)**	
QC sample		**Well depth (mBTOC)**	4.48

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)
12.00	7.54	22.5	706	-6.3	0.33

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☐ N ☐	

Well ID	~~3~~ MW10	**Depth to Groundwater (mBTOC)**	2.10 (SWL)
Date	11/5	**Depth to top of sampler (mBTOC)**	
QC sample		**Well depth (mBTOC)**	4.44.

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)
12.15	6.97	22.8	3138	-23.9	0.49

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☐ N ☐	muddy / clear, brownish water

Well ID	MW14	**Depth to Groundwater (mBTOC)**	2.35 (SWL)
Date	11/5	**Depth to top of sampler (mBTOC)**	
QC sample		**Well depth (mBTOC)**	4.37

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)
12.40	7.20	21.7	2026	-242.8	1.22

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☐ N ☐	

Hydrasleeve Sampling Record

Project number:	3319980	Sampler initials	QD
Client:		PM initials	
Site location:	MFS.		

Well ID	MW21	Depth to Groundwater (mBTOC)	1.35 (SWL) ~~2.11 (SWL)~~
Date		Depth to top of sampler (mBTOC)	
QC sample		Well depth (mBTOC)	4.95

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)
1.40	7.73	22.6	491.4	-43.6	3.20

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☐ N ☐	

Well ID	MW23	Depth to Groundwater (mBTOC)	1.43 (SWL)
Date	11/5	Depth to top of sampler (mBTOC)	
QC sample		Well depth (mBTOC)	4.45

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)
1.20	7.53	21.1	401.5	-136.9	0.25

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☒ N ☐	clear.

Well ID		Depth to Groundwater (mBTOC)	
Date		Depth to top of sampler (mBTOC)	
QC sample		Well depth (mBTOC)	

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☐ N ☐	

Hydrasleeve Sampling Record

Project number:	3319080	Sampler initials	AP
Client:		PM initials	
Site location:			

duplicates/splits

Well ID	MW20	Depth to Groundwater (mBTOC)	1.77 (SWL)
Date		Depth to top of sampler (mBTOC)	
QC sample	FD01 / FS01	Well depth (mBTOC)	4.40

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)
2.00	7.58	21.9	584	-104.4	0.49

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y☐ N☐	organic matter, clear.

Well ID		Depth to Groundwater (mBTOC)	
Date		Depth to top of sampler (mBTOC)	
QC sample		Well depth (mBTOC)	

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y☐ N☐	

Well ID		Depth to Groundwater (mBTOC)	
Date		Depth to top of sampler (mBTOC)	
QC sample		Well depth (mBTOC)	

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y☐ N☐	

Hydrasleeve Sampling Record

Project number:	3319085	**Sampler initials**	CD
Client:	MFS	**PM initials**	
Site location:	Largs North		

Well ID	MW08	**Depth to Groundwater (mBTOC)**	2.~~94~~ (SWL)
Date	11/5	**Depth to top of sampler (mBTOC)**	
QC sample		**Well depth (mBTOC)**	2.52

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)
10.30	7.66	22.5	615	-120.6	2.59

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☐ N ☐	

Well ID	MW09	**Depth to Groundwater (mBTOC)**	2.27 (SWL)
Date	11/5	**Depth to top of sampler (mBTOC)**	
QC sample		**Well depth (mBTOC)**	4.32

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)
11.00	7.33	22.3	1477	-97.0	3.03

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☐ N ☐	

Well ID		**Depth to Groundwater (mBTOC)**	
Date		**Depth to top of sampler (mBTOC)**	
QC sample		**Well depth (mBTOC)**	

In situ downhole parameters (collect post sampling – ensure parameters have stabilised)

Time	pH	Temp (C)	EC (uS/cm)	Redox (mV)	DO (mg/L)

Comments (odour, colour, turbidity,sheen)

LNAPL Check Y ☐ N ☐	

GHD

Daily Record Sheet

001

Client: MFS		Job No: 3319080	
Job Name: Large North		Date: 11/5	
GHD Representative: Chelsie Davies		Arrival Time: 8:30	Departure Time: 3pm
Weather Conditions:	(Please circle) (Fine) Overcast Light Rain Heavy Rain Other_____		
Works Being Undertaken:	groundwater sampling		

Personnel/Contractor(s) Present (List all); Inducted into GHD H&SP?	Inducted	Arrival Time	Departure Time
Chelsie Davies	✓		

Photographs Taken: (Please circle) Yes No If Yes, list below or attach photo register.

Location	Time	Record of Activities / Issues Encountered / Discussions with Client/Contractors / Sketch / Notes
MW09	9:00	hydrasleeve lost in well, grab sample taken
MW18	9:30	sampled.
10am		Drove to BCF to get squid jig for hydrasleeve
MW28	10:50	Sampled
MW09	11:30	Sampled
MW5	12	sampled.
MW10	12:45	Sampled
MW14	1:30	sampled
MW20	2:00	Sampled - FD01, FD02, FS01, FS02, FB01, FB02
MW04	3:00	fishing for ~~sampled~~ hydrasleeve (unsuccessful).

Is a Notice of Proposed Variation, Variation Order or Site Instruction Required? (Please circle) Yes (No)

Provide Details:

Further Inspection and/or Testing Required on above Work:	

Are there any H&S requirements to be considered for future works?
Has the site been reinstated suitably (left clean and tidy)?

Appendix E

Chain of Custody Documentation and Laboratory Reports

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 323174

Client Details

Client	GHD Pty Ltd
Attention	Dilara Valiff
Address	GPO Box 2052, Adelaide, SA, 5001

Sample Details

Your Reference	**3319080**
Number of Samples	12 Water
Date samples received	15/05/2023
Date completed instructions received	15/05/2023

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	22/05/2023
Date of Issue	22/05/2023

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
Phalak Inthakesone, Organics Development Manager, Sydney

Authorised By
Nancy Zhang, Laboratory Manager

PFAS in Waters Trace Extended						
Our Reference		323174-1	323174-2	323174-3	323174-4	323174-5
Your Reference	UNITS	MW04	MW18	MW08	MW09	MW15
Date Sampled		11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/05/2023	16/05/2023	16/05/2023	16/05/2023	16/05/2023
Date analysed	-	16/05/2023	16/05/2023	16/05/2023	16/05/2023	16/05/2023
Perfluorobutanesulfonic acid	µg/L	0.0075	0.001	0.0076	0.062	0.0077
Perfluoropentanesulfonic acid	µg/L	0.012	<0.001	0.013	0.098	0.004
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.18	0.0028	0.22	0.85	0.046
Perfluoroheptanesulfonic acid	µg/L	0.016	<0.001	0.025	0.074	0.004
Perfluorooctanesulfonic acid PFOS	µg/L	0.32	0.017	0.53	0.23	0.071
Perfluorodecanesulfonic acid	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorobutanoic acid	µg/L	0.01	0.008	0.01	0.01	0.007
Perfluoropentanoic acid	µg/L	0.006	<0.002	0.005	0.01	<0.002
Perfluorohexanoic acid	µg/L	0.013	0.003	0.013	0.070	0.002
Perfluoroheptanoic acid	µg/L	0.003	0.001	0.003	0.014	0.0006
Perfluorooctanoic acid PFOA	µg/L	0.0068	0.001	0.0095	0.037	0.0024
Perfluorononanoic acid	µg/L	0.002	0.001	0.003	0.002	<0.001
Perfluorodecanoic acid	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluoroundecanoic acid	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorododecanoic acid	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Perfluorotridecanoic acid	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorotetradecanoic acid	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
4:2 FTS	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
6:2 FTS	µg/L	<0.0004	<0.0004	0.0005	<0.0004	0.0049
8:2 FTS	µg/L	0.001	<0.0004	0.002	0.001	<0.0004
10:2 FTS	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorooctane sulfonamide	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
N-Methyl perfluorooctane sulfonamide	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctanesulfon amide	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
N-Me perfluorooctanesulfonamid oethanol	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Et perfluorooctanesulfonamid oethanol	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
MePerfluorooctanesulf- amid oacetic acid	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
EtPerfluorooctanesulf- amid oacetic acid	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Surrogate $^{13}C_8$ *PFOS*	%	94	96	94	95	93
Surrogate $^{13}C_2$ *PFOA*	%	107	108	111	107	105
Extracted ISTD $^{13}C_3$ *PFBS*	%	85	90	89	85	90
Extracted ISTD $^{18}O_2$ *PFHxS*	%	103	88	106	104	88
Extracted ISTD $^{13}C_4$ *PFOS*	%	107	89	105	106	94
Extracted ISTD $^{13}C_4$ *PFBA*	%	41	69	50	38	48

PFAS in Waters Trace Extended						
Our Reference		323174-1	323174-2	323174-3	323174-4	323174-5
Your Reference	UNITS	MW04	MW18	MW08	MW09	MW15
Date Sampled		11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023
Type of sample		Water	Water	Water	Water	Water
Extracted ISTD $^{13}C_3$ *PFPeA*	%	92	124	106	78	91
Extracted ISTD $^{13}C_2$ *PFHxA*	%	91	108	88	76	98
Extracted ISTD $^{13}C_4$ *PFHpA*	%	82	92	81	59	86
Extracted ISTD $^{13}C_4$ *PFOA*	%	107	122	118	109	126
Extracted ISTD $^{13}C_5$ *PFNA*	%	65	80	63	77	82
Extracted ISTD $^{13}C_2$ *PFDA*	%	80	116	83	106	116
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	106	126	115	114	125
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	100	121	108	113	109
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	81	98	89	91	93
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	173	#	174	145	161
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	172	#	189	174	#
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	175	#	188	#	#
Extracted ISTD $^{13}C_8$ *FOSA*	%	60	75	68	61	68
Extracted ISTD d_3 *N MeFOSA*	%	99	101	97	95	97
Extracted ISTD d_5 *N EtFOSA*	%	94	96	88	94	92
Extracted ISTD d_7 *N MeFOSE*	%	104	108	106	104	105
Extracted ISTD d_9 *N EtFOSE*	%	118	129	119	121	124
Extracted ISTD d_3 *N MeFOSAA*	%	75	81	76	66	40
Extracted ISTD d_5 *N EtFOSAA*	%	126	183	136	112	110
Total Positive PFHxS & PFOS	µg/L	0.49	0.020	0.75	1.1	0.12
Total Positive PFOS & PFOA	µg/L	0.32	0.018	0.54	0.26	0.074
Total Positive PFAS	µg/L	0.57	0.036	0.85	1.5	0.15

PFAS in Waters Trace Extended						
Our Reference		323174-6	323174-7	323174-8	323174-9	323174-10
Your Reference	UNITS	MW10	MW14	MW20	MW21	MW23
Date Sampled		11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/05/2023	16/05/2023	16/05/2023	16/05/2023	16/05/2023
Date analysed	-	16/05/2023	16/05/2023	16/05/2023	16/05/2023	16/05/2023
Perfluorobutanesulfonic acid	µg/L	0.036	0.017	0.0082	0.0045	0.002
Perfluoropentanesulfonic acid	µg/L	0.038	0.022	0.008	<0.001	<0.001
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.13	0.16	0.090	0.0069	0.0043
Perfluoroheptanesulfonic acid	µg/L	<0.001	0.009	0.004	<0.001	<0.001
Perfluorooctanesulfonic acid PFOS	µg/L	0.0080	0.049	0.14	0.0042	0.015
Perfluorodecanesulfonic acid	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorobutanoic acid	µg/L	<0.02	0.005	0.02	0.01	<0.004
Perfluoropentanoic acid	µg/L	0.007	0.006	0.01	<0.002	<0.002
Perfluorohexanoic acid	µg/L	0.028	0.023	0.016	0.002	0.002
Perfluoroheptanoic acid	µg/L	0.003	0.003	0.0051	0.001	0.0007
Perfluorooctanoic acid PFOA	µg/L	0.0021	0.0084	0.011	0.0028	0.002
Perfluorononanoic acid	µg/L	<0.001	<0.001	0.006	<0.001	<0.001
Perfluorodecanoic acid	µg/L	<0.002	<0.002	0.01	<0.002	0.006
Perfluoroundecanoic acid	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorododecanoic acid	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Perfluorotridecanoic acid	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorotetradecanoic acid	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
4:2 FTS	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
6:2 FTS	µg/L	0.0008	<0.0004	<0.0004	<0.0004	<0.0004
8:2 FTS	µg/L	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
10:2 FTS	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorooctane sulfonamide	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
N-Methyl perfluorooctane sulfonamide	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctanesulfon amide	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
N-Me perfluorooctanesulfonamid oethanol	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Et perfluorooctanesulfonamid oethanol	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
MePerfluorooctanesulf- amid oacetic acid	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
EtPerfluorooctanesulf- amid oacetic acid	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Surrogate $^{13}C_8$ *PFOS*	%	94	96	95	93	99
Surrogate $^{13}C_2$ *PFOA*	%	110	105	106	106	109
Extracted ISTD $^{13}C_3$ *PFBS*	%	85	84	91	83	89
Extracted ISTD $^{18}O_2$ *PFHxS*	%	107	107	86	86	91
Extracted ISTD $^{13}C_4$ *PFOS*	%	93	92	104	95	92
Extracted ISTD $^{13}C_4$ *PFBA*	%	#	30	35	22	30

PFAS in Waters Trace Extended						
Our Reference		323174-6	323174-7	323174-8	323174-9	323174-10
Your Reference	UNITS	MW10	MW14	MW20	MW21	MW23
Date Sampled		11/05/2023	11/05/2023	11/05/2023	11/05/2023	11/05/2023
Type of sample		Water	Water	Water	Water	Water
Extracted ISTD $^{13}C_3$ *PFPeA*	%	49	67	84	112	118
Extracted ISTD $^{13}C_2$ *PFHxA*	%	62	59	74	95	98
Extracted ISTD $^{13}C_4$ *PFHpA*	%	67	64	74	82	85
Extracted ISTD $^{13}C_4$ *PFOA*	%	116	103	117	129	128
Extracted ISTD $^{13}C_5$ *PFNA*	%	78	69	66	96	93
Extracted ISTD $^{13}C_2$ *PFDA*	%	114	109	108	114	111
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	112	97	112	121	106
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	95	105	102	94	92
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	84	68	86	83	78
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	142	173	177	172	176
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	#	187	#	#	#
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	#	#	#	#	#
Extracted ISTD $^{13}C_8$ *FOSA*	%	64	53	58	47	44
Extracted ISTD d_3 *N MeFOSA*	%	96	96	101	94	92
Extracted ISTD d_5 *N EtFOSA*	%	93	92	97	93	89
Extracted ISTD d_7 *N MeFOSE*	%	108	104	103	106	103
Extracted ISTD d_9 *N EtFOSE*	%	126	120	125	121	117
Extracted ISTD d_3 *N MeFOSAA*	%	47	78	50	70	39
Extracted ISTD d_5 *N EtFOSAA*	%	115	97	111	139	95
Total Positive PFHxS & PFOS	µg/L	0.14	0.21	0.23	0.011	0.020
Total Positive PFOS & PFOA	µg/L	0.010	0.058	0.15	0.0070	0.017
Total Positive PFAS	µg/L	0.25	0.31	0.33	0.033	0.033

PFAS in Waters Trace Extended		
Our Reference		323174-11
Your Reference	UNITS	FD01
Date Sampled		11/05/2023
Type of sample		Water
Date prepared	-	16/05/2023
Date analysed	-	16/05/2023
Perfluorobutanesulfonic acid	µg/L	0.015
Perfluoropentanesulfonic acid	µg/L	0.013
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.11
Perfluoroheptanesulfonic acid	µg/L	0.005
Perfluorooctanesulfonic acid PFOS	µg/L	0.22
Perfluorodecanesulfonic acid	µg/L	<0.002
Perfluorobutanoic acid	µg/L	0.02
Perfluoropentanoic acid	µg/L	0.01
Perfluorohexanoic acid	µg/L	0.016
Perfluoroheptanoic acid	µg/L	0.0054
Perfluorooctanoic acid PFOA	µg/L	0.011
Perfluorononanoic acid	µg/L	0.004
Perfluorodecanoic acid	µg/L	0.006
Perfluoroundecanoic acid	µg/L	<0.002
Perfluorododecanoic acid	µg/L	<0.005
Perfluorotridecanoic acid	µg/L	<0.01
Perfluorotetradecanoic acid	µg/L	<0.05
4:2 FTS	µg/L	<0.001
6:2 FTS	µg/L	<0.0004
8:2 FTS	µg/L	<0.0004
10:2 FTS	µg/L	<0.002
Perfluorooctane sulfonamide	µg/L	<0.01
N-Methyl perfluorooctane sulfonamide	µg/L	<0.05
N-Ethyl perfluorooctanesulfon amide	µg/L	<0.1
N-Me perfluorooctanesulfonamid oethanol	µg/L	<0.05
N-Et perfluorooctanesulfonamid oethanol	µg/L	<0.5
MePerfluorooctanesulf- amid oacetic acid	µg/L	<0.002
EtPerfluorooctanesulf- amid oacetic acid	µg/L	<0.002
Surrogate $^{13}C_8$ *PFOS*	%	93
Surrogate $^{13}C_2$ *PFOA*	%	107
Extracted ISTD $^{13}C_3$ *PFBS*	%	85
Extracted ISTD $^{18}O_2$ *PFHxS*	%	100
Extracted ISTD $^{13}C_4$ *PFOS*	%	101
Extracted ISTD $^{13}C_4$ *PFBA*	%	36

PFAS in Waters Trace Extended		
Our Reference		323174-11
Your Reference	UNITS	FD01
Date Sampled		11/05/2023
Type of sample		Water
Extracted ISTD $^{13}C_3$ *PFPeA*	%	63
Extracted ISTD $^{13}C_2$ *PFHxA*	%	74
Extracted ISTD $^{13}C_4$ *PFHpA*	%	71
Extracted ISTD $^{13}C_4$ *PFOA*	%	112
Extracted ISTD $^{13}C_5$ *PFNA*	%	75
Extracted ISTD $^{13}C_2$ *PFDA*	%	105
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	104
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	90
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	79
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	154
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	#
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	#
Extracted ISTD $^{13}C_8$ *FOSA*	%	43
Extracted ISTD d_3 *N MeFOSA*	%	92
Extracted ISTD d_5 *N EtFOSA*	%	91
Extracted ISTD d_7 *N MeFOSE*	%	104
Extracted ISTD d_9 *N EtFOSE*	%	118
Extracted ISTD d_3 *N MeFOSAA*	%	54
Extracted ISTD d_5 *N EtFOSAA*	%	113
Total Positive PFHxS & PFOS	µg/L	0.33
Total Positive PFOS & PFOA	µg/L	0.23
Total Positive PFAS	µg/L	0.44

PFAS in Waters Short		
Our Reference		323174-12
Your Reference	UNITS	FB01
Date Sampled		11/05/2023
Type of sample		Water
Date prepared	-	16/05/2023
Date analysed	-	16/05/2023
Perfluorohexanesulfonic acid - PFHxS	µg/L	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01
6:2 FTS	µg/L	<0.01
8:2 FTS	µg/L	<0.02
Surrogate $^{13}C_8$ *PFOS*	%	101
Surrogate $^{13}C_2$ *PFOA*	%	112
Extracted ISTD $^{18}O_2$ *PFHxS*	%	104
Extracted ISTD $^{13}C_4$ *PFOS*	%	103
Extracted ISTD $^{13}C_4$ *PFOA*	%	108
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	112
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	124
Total Positive PFHxS & PFOS	µg/L	<0.01
Total Positive PFOA & PFOS	µg/L	<0.01
Total Positive PFAS	µg/L	<0.01

Method ID	Methodology Summary
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLPs/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 Waters Trace Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	323174-2
Date prepared	-			16/05/2023	1	16/05/2023	16/05/2023		16/05/2023	16/05/2023
Date analysed	-			16/05/2023	1	16/05/2023	16/05/2023		16/05/2023	16/05/2023
Perfluorobutanesulfonic acid	µg/L	0.0004	Org-029	<0.0004	1	0.0075	0.0069	8	98	100
Perfluoropentanesulfonic acid	µg/L	0.001	Org-029	<0.001	1	0.012	0.012	0	127	123
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.0002	Org-029	<0.0002	1	0.18	0.17	6	112	115
Perfluoroheptanesulfonic acid	µg/L	0.001	Org-029	<0.001	1	0.016	0.016	0	104	115
Perfluorooctanesulfonic acid PFOS	µg/L	0.0002	Org-029	<0.0002	1	0.32	0.33	3	113	93
Perfluorodecanesulfonic acid	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	76	73
Perfluorobutanoic acid	µg/L	0.002	Org-029	<0.002	1	0.01	0.01	0	106	106
Perfluoropentanoic acid	µg/L	0.002	Org-029	<0.002	1	0.006	0.006	0	102	103
Perfluorohexanoic acid	µg/L	0.0004	Org-029	<0.0004	1	0.013	0.013	0	105	107
Perfluoroheptanoic acid	µg/L	0.0004	Org-029	<0.0004	1	0.003	0.004	29	101	99
Perfluorooctanoic acid PFOA	µg/L	0.0002	Org-029	<0.0002	1	0.0068	0.0070	3	99	96
Perfluorononanoic acid	µg/L	0.001	Org-029	<0.001	1	0.002	0.002	0	127	130
Perfluorodecanoic acid	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	100	97
Perfluoroundecanoic acid	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	105	98
Perfluorododecanoic acid	µg/L	0.005	Org-029	<0.005	1	<0.005	<0.005	0	96	88
Perfluorotridecanoic acid	µg/L	0.01	Org-029	<0.01	1	<0.01	<0.01	0	74	88
Perfluorotetradecanoic acid	µg/L	0.05	Org-029	<0.05	1	<0.05	<0.05	0	114	112
4:2 FTS	µg/L	0.001	Org-029	<0.001	1	<0.001	<0.001	0	104	106
6:2 FTS	µg/L	0.0004	Org-029	<0.0004	1	<0.0004	<0.0004	0	94	93
8:2 FTS	µg/L	0.0004	Org-029	<0.0004	1	0.001	0.001	0	107	113
10:2 FTS	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	122	101
Perfluorooctane sulfonamide	µg/L	0.01	Org-029	<0.01	1	<0.01	<0.01	0	122	122
N-Methyl perfluorooctane sulfonamide	µg/L	0.05	Org-029	<0.05	1	<0.05	<0.05	0	126	119
N-Ethyl perfluorooctanesulfon amide	µg/L	0.1	Org-029	<0.1	1	<0.1	<0.1	0	127	114
N-Me perfluorooctanesulfonamid oethanol	µg/L	0.05	Org-029	<0.05	1	<0.05	<0.05	0	86	68
N-Et perfluorooctanesulfonamid oethanol	µg/L	0.5	Org-029	<0.5	1	<0.5	<0.5	0	99	87
MePerfluorooctanesulf- amid oacetic acid	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	125	116
EtPerfluorooctanesulf- amid oacetic acid	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	107	104
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	98	1	94	95	1	100	91
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	110	1	107	110	3	103	109

QUALITY CONTROL: PFAS in Waters Trace Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	323174-2
Extracted ISTD $^{13}C_3$ *PFBS*	%		Org-029	88	1	85	93	9	82	87
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	87	1	103	105	2	79	85
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	77	1	107	104	3	70	86
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	97	1	41	42	2	93	67
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	113	1	92	99	7	104	123
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	114	1	91	92	1	107	105
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	89	1	82	85	4	84	91
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	104	1	107	116	8	100	116
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	80	1	65	70	7	70	79
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	94	1	80	83	4	86	104
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	100	1	106	113	6	90	107
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	96	1	100	97	3	90	105
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	53	1	81	82	1	47	84
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	127	1	173	180	4	121	155
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	133	1	172	181	5	119	182
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	148	1	175	176	1	126	168
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	67	1	60	63	5	55	65
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	96	1	99	98	1	96	98
Extracted ISTD d_5 *N EtFOSA*	%		Org-029	95	1	94	92	2	97	89
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	99	1	104	103	1	95	102

QUALITY CONTROL: PFAS in Waters Trace Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	323174-2
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	101	1	118	122	3	99	123
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	96	1	75	76	1	90	69
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	122	1	126	133	5	115	130

QUALITY CONTROL: PFAS in Waters Trace Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	16/05/2023	16/05/2023		[NT]	[NT]
Date analysed	-			[NT]	11	16/05/2023	16/05/2023		[NT]	[NT]
Perfluorobutanesulfonic acid	µg/L	0.0004	Org-029	[NT]	11	0.015	0.015	0	[NT]	[NT]
Perfluoropentanesulfonic acid	µg/L	0.001	Org-029	[NT]	11	0.013	0.013	0	[NT]	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.0002	Org-029	[NT]	11	0.11	0.12	9	[NT]	[NT]
Perfluoroheptanesulfonic acid	µg/L	0.001	Org-029	[NT]	11	0.005	0.005	0	[NT]	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.0002	Org-029	[NT]	11	0.22	0.21	5	[NT]	[NT]
Perfluorodecanesulfonic acid	µg/L	0.002	Org-029	[NT]	11	<0.002	<0.002	0	[NT]	[NT]
Perfluorobutanoic acid	µg/L	0.002	Org-029	[NT]	11	0.02	0.02	0	[NT]	[NT]
Perfluoropentanoic acid	µg/L	0.002	Org-029	[NT]	11	0.01	0.01	0	[NT]	[NT]
Perfluorohexanoic acid	µg/L	0.0004	Org-029	[NT]	11	0.016	0.016	0	[NT]	[NT]
Perfluoroheptanoic acid	µg/L	0.0004	Org-029	[NT]	11	0.0054	0.0053	2	[NT]	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.0002	Org-029	[NT]	11	0.011	0.011	0	[NT]	[NT]
Perfluorononanoic acid	µg/L	0.001	Org-029	[NT]	11	0.004	0.004	0	[NT]	[NT]
Perfluorodecanoic acid	µg/L	0.002	Org-029	[NT]	11	0.006	0.005	18	[NT]	[NT]
Perfluoroundecanoic acid	µg/L	0.002	Org-029	[NT]	11	<0.002	<0.002	0	[NT]	[NT]
Perfluorododecanoic acid	µg/L	0.005	Org-029	[NT]	11	<0.005	<0.005	0	[NT]	[NT]
Perfluorotridecanoic acid	µg/L	0.01	Org-029	[NT]	11	<0.01	<0.01	0	[NT]	[NT]
Perfluorotetradecanoic acid	µg/L	0.05	Org-029	[NT]	11	<0.05	<0.05	0	[NT]	[NT]
4:2 FTS	µg/L	0.001	Org-029	[NT]	11	<0.001	<0.001	0	[NT]	[NT]
6:2 FTS	µg/L	0.0004	Org-029	[NT]	11	<0.0004	<0.0004	0	[NT]	[NT]
8:2 FTS	µg/L	0.0004	Org-029	[NT]	11	<0.0004	<0.0004	0	[NT]	[NT]
10:2 FTS	µg/L	0.002	Org-029	[NT]	11	<0.002	<0.002	0	[NT]	[NT]
Perfluorooctane sulfonamide	µg/L	0.01	Org-029	[NT]	11	<0.01	<0.01	0	[NT]	[NT]
N-Methyl perfluorooctane sulfonamide	µg/L	0.05	Org-029	[NT]	11	<0.05	<0.05	0	[NT]	[NT]
N-Ethyl perfluorooctanesulfon amide	µg/L	0.1	Org-029	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
N-Me perfluorooctanesulfonamid oethanol	µg/L	0.05	Org-029	[NT]	11	<0.05	<0.05	0	[NT]	[NT]
N-Et perfluorooctanesulfonamid oethanol	µg/L	0.5	Org-029	[NT]	11	<0.5	<0.5	0	[NT]	[NT]
MePerfluorooctanesulf- amid oacetic acid	µg/L	0.002	Org-029	[NT]	11	<0.002	<0.002	0	[NT]	[NT]
EtPerfluorooctanesulf- amid oacetic acid	µg/L	0.002	Org-029	[NT]	11	<0.002	<0.002	0	[NT]	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	[NT]	11	93	98	5	[NT]	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	[NT]	11	107	107	0	[NT]	[NT]

QUALITY CONTROL: PFAS in Waters Trace Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Extracted ISTD $^{13}C_3$ *PFBS*	%		Org-029	[NT]	11	85	81	5	[NT]	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	[NT]	11	100	101	1	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	[NT]	11	101	102	1	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	[NT]	11	36	36	0	[NT]	[NT]
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	[NT]	11	63	62	2	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	[NT]	11	74	73	1	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	[NT]	11	71	70	1	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	[NT]	11	112	106	6	[NT]	[NT]
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	[NT]	11	75	70	7	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	[NT]	11	105	100	5	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	[NT]	11	104	101	3	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	[NT]	11	90	84	7	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	[NT]	11	79	70	12	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	[NT]	11	154	144	7	[NT]	[NT]
Extracted ISTD$^{13}C_2$ *6:2FTS*	%		Org-029	[NT]	11	#	#		[NT]	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	[NT]	11	#	#		[NT]	[NT]
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	[NT]	11	43	42	2	[NT]	[NT]
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	[NT]	11	92	95	3	[NT]	[NT]
Extracted ISTD d_5 *N EtFOSA*	%		Org-029	[NT]	11	91	90	1	[NT]	[NT]
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	[NT]	11	104	103	1	[NT]	[NT]

QUALITY CONTROL: PFAS in Waters Trace Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	[NT]	11	118	118	0	[NT]	[NT]
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	[NT]	11	54	53	2	[NT]	[NT]
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	[NT]	11	113	106	6	[NT]	[NT]

QUALITY CONTROL: PFAS in Waters Short					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			16/05/2023	[NT]	[NT]	[NT]	[NT]	16/05/2023	[NT]
Date analysed	-			16/05/2023	[NT]	[NT]	[NT]	[NT]	16/05/2023	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	104	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	104	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	104	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	98	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	102	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	96	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	107	[NT]	[NT]	[NT]	[NT]	104	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	102	[NT]	[NT]	[NT]	[NT]	96	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	104	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	108	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	116	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	110	[NT]	[NT]	[NT]	[NT]	115	[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

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).

COC rec'd: 1709

CHAIN OF CUSTODY RECORD

GHD

Turnaround Requirement:
X STANDARD
☐ NON-STANDARD _____

Job Number	GHD Office	Relinquished By:	Received By:	Relinquished By:	Received By:
3319080	Adelaide	Chelsie Davis, GHD			
Project: Largs North GME		Date/Time: 12/05/2023, 9:30 am	Date/Time:	Date/Time:	Date/Time:

GHD Project Manager	GHD Contact
Dilara Valiff	Dilara.Valiff@ghd.com
Email Reports to: ghdlabreports@ghd.com, Dilara.valiff@ghd.com, ben.petticrew@ghd.com, chelsie.davies@ghd.com.	Quote

SEND TO:

☐ **ALS Laboratories**
Suite D, 32 West Thebarton Rd, Thebarton SA 5031
Ph: 08 8162 5130
Contact: Kieren Burns

■ **Envirolab Services**
7a The Parade, NORWOOD SA 5067
Ph: 08 7087 6800
Contact: Alex Stenta

☐ **Eurofins I Environment Testing**
6 Monterey Rd, DANDENONG SOUTH VIC 3175
Ph: 03 8564 5006
Contact: Rhonda Chouman

☐
Ph:
Contact:

Sample I.D.	Date	Time	Sample Matrix S: Soil SL: Sludge W: Water A: Air	Container Type J: Jar; B: Bag; V: Vial; G: Glass bottle; P: Plastic bottle	Analyses Required: PFAS extended suite ultra-trace LOR	Analyses Required: PFAS short standard LOR	Remarks
MW04 1	11/05/2023		W	P	X		
MW18 2	11/05/2023		W	P	X		
MW08 3	11/05/2023		W	P	X		
MW09 4	11/05/2023		W	P	X		
MW15 5	11/05/2023		W	P	X		
MW10 6	11/05/2023		W	P	X		
MW14 7	11/05/2023		W	P	X		
MW20 8	11/05/2023		W	P	X		
MW21 9	11/05/2023		W	P	X		
MW23 10	11/05/2023		W	P	X		
FD01 11	11/05/2023		W	P	X		
FS01 ~~12~~	11/05/2023		W	P	X		Forward to ALS
FB01 ~~13~~ 12	11/05/2023		W	P		X	

Chatswood
Ph: (02) 32374
Received: 11/5 1700
Time Received:
By: SD
Temp: Cool/Ambient
Cooling: Ice/Ice
Security: Intact/Broken

Remarks: esdat report format

Australian Laboratory Services Pty Ltd ABN 84 009 936 029. An ALS Limited Company

TAX INVOICE: 1151715103

GHD PTY LTD
DILARA VALIFF
Level 4, 211 VICTORIA SQUARE
ADELAIDE
SA, AUSTRALIA 5000

Work Order	Project / Overall Description	Site	Order number	C-O-C number	Contact
ES2316216	3319080 / ----	----	----	----	DILARA VALIFF

Issue Date : **23-May-2023**
Due Date : **22-Jun-2023**

Taxable value	: **AUD$**	**253.00**
Tax Incurred (GST)	: **AUD$**	**25.30**
Amount Payable	: **AUD$**	**278.30**

Work Order Breakdown

Method	Sale Item Descriptions	Quantity	Unit Value (AUD$)	Value (AUD$)	GST (AUD$)	Line Total (AUD$)
Work Order: **ES2316216**		Quote number: **EN/005**			Submatrix summary: **1 WATER**	
*Misc	Workorder Admin Fee	1.00	45.00	45.00	4.50	49.50
EP231X-ST	PFAS - Super Trace Waters Long Suite (28 analytes)	1.00	208.00	208.00	20.80	228.80

** denotes non-discountable item*

- **Please direct all queries to Environmental Division Sydney on +61-2-8784 8555.**

Summary of Sample(s)

ES2316216-001 : [11-May-2023] : FS01

REMITTANCE ADVICE

POST TO: Australian Laboratory Services Pty Ltd
P.O. Box 66 Everton Park
QLD 4053 Australia

EMAIL TO: remittances@alsglobal.com

Vendor bank details

Bank: **Westpac Banking Corporation**
BSB: **034 008**
Account: **464673**
Swift Code: **WPACAU2S**

or Credit Card *
Visa
Mastercard
American Express

or Cheque
Payable to Australian Laboratory Services Pty Ltd

*Surcharges apply:
Visa: 0.8%; Mastercard: 0.8%; American Express: 1.5%

Amount Payable
AUD$ 278.30
ALS Client Reference
GHDSER

TAX INVOICE
1151715103

CERTIFICATE OF ANALYSIS

Work Order	: **ES2316216**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: DILARA VALIFF	Contact	: Sarah Mathew
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 08 8111 6600	Telephone	: +61-2-8784 8555
Project	: 3319080	Date Samples Received	: 16-May-2023 14:30
Order number	: ----	Date Analysis Commenced	: 19-May-2023
C-O-C number	: ----	Issue Date	: 23-May-2023 13:27
Sampler	: ----		
Site	:		
Quote number	: EN/005		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- EP231X-ST: Poor matrix spike recoveries due to matrix interferences.
- EP231X-ST: Particular samples required dilution due to matrix interferences. LOR values have been adjusted accordingly.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	FS01	----	----	----	----
				Sampling date / time	11-May-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2316216-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L		**0.0050**	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L		**0.0035**	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L		**0.0534**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L		<0.0016	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L		**0.124**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L		<0.0016	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L		**0.015**	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L		**0.0112**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L		**0.0118**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L		**0.0042**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L		**0.0102**	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L		**0.0042**	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L		**0.0053**	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L		<0.0016	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L		<0.0016	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L		<0.0016	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L		<0.0040	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L		<0.0016	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L		<0.004	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L		<0.004	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	FS01	----	----	----	----
				Sampling date / time	11-May-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2316216-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L		<0.004	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L		<0.004	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L		<0.0016	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L		<0.0016	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L		<0.002	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L		<0.002	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L		<0.002	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L		<0.002	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0003	µg/L		**0.248**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0003	µg/L		**0.177**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0003	µg/L		**0.235**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0005	%		**101**	----	----	----	----
13C8-PFOA	----	0.0005	%		**96.0**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	***Low***	***High***
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: **ES2316216**	Page	: 1 of 7
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: DILARA VALIFF	Contact	: Sarah Mathew
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 08 8111 6600	Telephone	: +61-2-8784 8555
Project	: 3319080	Date Samples Received	: 16-May-2023
Order number	: ----	Date Analysis Commenced	: 19-May-2023
C-O-C number	: ----	Issue Date	: 23-May-2023
Sampler	: ----		
Site	:		
Quote number	: EN/005		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5059122)									
EM2308441-002	Anonymous	EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L	0.0405	0.0365	10.4	0% - 20%
		EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	0.0096	0.0080	18.2	No Limit
		EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	0.0040	0.0040	0.0	No Limit
		EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	0.0198	0.0158	22.4	0% - 50%
		EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
ES2316216-001	FS01	EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L	0.124	0.128	2.5	0% - 20%
		EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	0.0050	0.0058	14.9	No Limit
		EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	0.0035	0.0040	12.8	No Limit
		EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	0.0534	0.0622	15.2	0% - 20%
		EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5059122)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5059122) - continued									
EM2308441-002	Anonymous	EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	0.0160	0.0134	17.4	0% - 50%
		EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	0.0034	0.0032	4.9	No Limit
		EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	0.0198	0.0162	20.4	0% - 50%
		EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0040	<0.0040	0.0	No Limit
		EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	0.025	0.020	21.0	No Limit
ES2316216-001	FS01	EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	0.0112	0.0126	12.1	No Limit
		EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	0.0118	0.0136	13.8	No Limit
		EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	0.0042	0.0045	7.4	No Limit
		EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	0.0102	0.0117	13.1	No Limit
		EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	0.0042	0.0040	3.9	No Limit
		EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	0.0053	0.0050	6.2	No Limit
		EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0040	<0.0040	0.0	No Limit
		EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	0.015	0.013	14.5	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5059122)									
EM2308441-002	Anonymous	EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.004	<0.004	0.0	No Limit
ES2316216-001	FS01	EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5059122) - continued									
ES2316216-001	FS01	EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0016	<0.0016	0.0	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.004	<0.004	0.0	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.004	<0.004	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5059122)									
EM2308441-002	Anonymous	EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.002	<0.002	0.0	No Limit
ES2316216-001	FS01	EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.002	<0.002	0.0	No Limit
		EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.002	<0.002	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 5059122)									
EM2308441-002	Anonymous	EP231X-ST: Sum of PFAS	----	0.0003	µg/L	0.138	0.117	16.5	0% - 20%
ES2316216-001	FS01	EP231X-ST: Sum of PFAS	----	0.0003	µg/L	0.248	0.264	6.5	0% - 20%

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5059122)								
EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0005	0.004 µg/L	75.6	50.0	130
EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	0.004 µg/L	86.8	50.0	130
EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	0.004 µg/L	87.6	50.0	130
EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	0.004 µg/L	124	50.0	130
EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L	<0.0003	0.004 µg/L	105	50.0	130
EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	0.004 µg/L	92.4	50.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5059122)								
EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	<0.002	0.02 µg/L	103	30.0	130
EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0005	0.004 µg/L	100	50.0	130
EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0005	0.004 µg/L	95.6	50.0	130
EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0005	0.004 µg/L	96.4	50.0	130
EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	0.004 µg/L	108	50.0	130
EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	0.004 µg/L	98.4	50.0	130
EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	0.004 µg/L	88.0	50.0	130
EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	0.004 µg/L	113	40.0	130
EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	0.004 µg/L	120	40.0	130
EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	0.004 µg/L	92.0	40.0	130
EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	0.01 µg/L	116	40.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5059122)								
EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	0.004 µg/L	107	40.0	130
EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	0.01 µg/L	104	40.0	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	0.01 µg/L	105	40.0	130
EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	0.01 µg/L	96.2	40.0	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	0.01 µg/L	102	40.0	130
EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	0.004 µg/L	107	40.0	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	0.004 µg/L	98.4	40.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5059122)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5059122) - continued								
EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	0.004 µg/L	88.4	50.0	130
EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.001	0.004 µg/L	94.4	50.0	130
EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.001	0.004 µg/L	97.6	50.0	130
EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	0.004 µg/L	116	50.0	130
EP231P: PFAS Sums (QCLot: 5059122)								
EP231X-ST: Sum of PFAS	----	0.0003	µg/L	<0.0003	----	----	----	----

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5059122)							
EM2308441-003	Anonymous	EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.004 µg/L	# 204	50.0	130
		EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.004 µg/L	120	50.0	130
		EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.004 µg/L	104	50.0	130
		EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.004 µg/L	# 136	50.0	130
		EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.004 µg/L	# Not Determined	50.0	130
		EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.004 µg/L	96.0	30.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5059122)							
EM2308441-003	Anonymous	EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.02 µg/L	126	30.0	130
		EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.004 µg/L	80.0	50.0	130
		EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.004 µg/L	100	50.0	130
		EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.004 µg/L	# 140	50.0	130
		EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.004 µg/L	# Not Determined	50.0	130
		EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.004 µg/L	112	50.0	130
		EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.004 µg/L	120	50.0	130
		EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.004 µg/L	124	30.0	130
		EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.004 µg/L	116	30.0	130
		EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.004 µg/L	72.0	30.0	130
		EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.01 µg/L	68.8	30.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5059122)							
EM2308441-003	Anonymous	EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.004 µg/L	104	30.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5059122) - continued							
EM2308441-003	Anonymous	EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.01 µg/L	# 14.4	30.0	130
		EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.01 µg/L	# 24.0	30.0	130
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.01 µg/L	75.2	30.0	130
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.01 µg/L	70.4	30.0	130
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.004 µg/L	76.0	30.0	130
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.004 µg/L	# 16.0	30.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5059122)							
EM2308441-003	Anonymous	EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.004 µg/L	124	50.0	130
		EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.004 µg/L	128	50.0	130
		EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.004 µg/L	100	50.0	130
		EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.004 µg/L	116	50.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2316216**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: DILARA VALIFF	Telephone	: +61-2-8784 8555
Project	: 3319080	Date Samples Received	: 16-May-2023
Site	:	Issue Date	: 23-May-2023
Sampler	: ----	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EM2308441--003	Anonymous	**Perfluorobutane sulfonic acid (PFBS)**	375-73-5	204 %	50.0-130%	**Recovery greater than upper data quality objective**
EP231A: Perfluoroalkyl Sulfonic Acids	EM2308441--003	Anonymous	**Perfluoroheptane sulfonic acid (PFHpS)**	375-92-8	136 %	50.0-130%	**Recovery greater than upper data quality objective**
EP231A: Perfluoroalkyl Sulfonic Acids	EM2308441--003	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231B: Perfluoroalkyl Carboxylic Acids	EM2308441--003	Anonymous	**Perfluoroheptanoic acid (PFHpA)**	375-85-9	140 %	50.0-130%	**Recovery greater than upper data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EM2308441--003	Anonymous	**Perfluorooctanoic acid (PFOA)**	335-67-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231C: Perfluoroalkyl Sulfonamides	EM2308441--003	Anonymous	**N-Methyl perfluorooctane sulfonamide (MeFOSA)**	31506-32-8	14.4 %	30.0-130%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EM2308441--003	Anonymous	**N-Ethyl perfluorooctane sulfonamide (EtFOSA)**	4151-50-2	24.0 %	30.0-130%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EM2308441--003	Anonymous	**N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)**	2991-50-6	16.0 %	30.0-130%	**Recovery less than lower data quality objective**

Analysis Holding Time Compliance

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

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

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

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

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X-ST) FS01	**11-May-2023**	**19-May-2023**	07-Nov-2023	✓	**23-May-2023**	07-Nov-2023	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X-ST) FS01	**11-May-2023**	**19-May-2023**	07-Nov-2023	✓	**23-May-2023**	07-Nov-2023	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X-ST) FS01	**11-May-2023**	**19-May-2023**	07-Nov-2023	✓	**23-May-2023**	07-Nov-2023	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X-ST) FS01	**11-May-2023**	**19-May-2023**	07-Nov-2023	✓	**23-May-2023**	07-Nov-2023	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X-ST) FS01	**11-May-2023**	**19-May-2023**	07-Nov-2023	✓	**23-May-2023**	07-Nov-2023	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is concentrated, combined with an equal volume of reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

CHAIN OF CUSTODY RECORD

GHD

Turnaround Requirement:
X STANDARD
☐ NON-STANDARD _____

Job Number	GHD Office	Relinquished By:	Received By:	Relinquished By:	Received By:
3319080	Adelaide	Chelsie Davis, GHD / ELS SYD Sherry			
Project		Date/Time: 12/05/2023, 9:30 am 16/5/23	Date/Time:	Date/Time:	Date/Time:
Largs North GME					

GHD Project Manager	GHD Contact
Dilara Valiff	Dilara.Valiff@ghd.com
Email Reports to: ghdlabreports@ghd.com, Dilara.valiff@ghd.com, ben.petticrew@ghd.com, chelsie.davies@ghd.com,	Quote

SEND TO:

☐ **ALS Laboratories**
Suite D, 32 West Thebarton Rd, Thebarton SA 5031
Ph: 08 8162 5130
Contact: Kieren Burns

Envirolab Services
7a The Parade, NORWOOD SA 5067
Ph: 08 7087 6800
Contact: Alex Stenta

☐ **Eurofins | Environment Testing**
6 Monterey Rd, DANDENONG SOUTH VIC 3175
Ph: 03 8564 5006
Contact: Rhonda Chouman

☐
Ph:
Contact:

Sample I.D.	Date	Time	Sample Matrix S: Soil SL: Sludge W: Water A: Air	Container Type J: Jar; B: Bag; V: Vial; G: Glass bottle; P: Plastic bottle	Analyses Required: PFAS extended suite ultra-trace LOR	Analyses Required: PFAS short standard LOR	Remarks
MW04 1	11/05/2023		W	P	X		
MW18 2	11/05/2023		W	P	X		
MW08 3	11/05/2023		W	P	X		
MW09 4	11/05/2023		W	P	X		
MW15 5	11/05/2023		W	P	X		
MW10 6	11/05/2023		W	P	X		
MW14 7	11/05/2023		W	P	X		
MW20 8	11/05/2023		W	P	X		
MW21 9	11/05/2023		W	P	X		
MW23 10	11/05/2023		W	P	X		
FD01 11	11/05/2023		W	P	X		
FS01 ~~12~~	11/05/2023		W	P	X		Forward to ALS
FB01 ~~13~~ 12	11/05/2023		W	P		X	

(1)

Remarks: esdat report format

Rec: Jack 16/05/23 15cv

Environmental Division
Sydney
Work Order Reference
ES2316216

Telephone : + 61-2-8784 8555

Appendix F

Quality Assurance and Quality Control

Data quality objectives and quality assurance / quality control

Data quality objectives

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

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

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

An overview of the DQOs for the investigation is presented below.

Step 1: State the problem

The South Australian Metropolitan Fire Service (MFS) engaged GHD Pty Ltd (GHD) to undertake an environmental investigation in the vicinity of the Largs North Fire Station (the site) following the detection of elevated concentrations of per and poly-fluoroalkyl substances (PFAS) in groundwater beneath as well as up and down hydraulic gradient of the site. The investigation was initiated based on the findings of previous investigations conducted by GHD in December 2018–January 2019, March–November 2019, February 2020 and August 2022.

The results of these investigations confirmed that PFAS concentrations in groundwater exceeding the adopted assessment levels extended off-site down the inferred hydraulic gradient of the site, resulting in potential risk to future on- and off- site users as well as nearby properties. PFAS in groundwater was also identified up the hydraulic gradient of the site and is likely associated with an off-site source of PFAS to the south. The extent of PFAS in groundwater has not been delineated down hydraulic gradient to the north-west and north of the site.

These findings prompted the MFS, in consultation with the SA EPA and other stakeholders, to engage GHD to undertake an environmental investigation of groundwater to:

– Determine the nature and extent of off-site groundwater PFAS impact to the north and north-west associated with historical site activities.
– Identify and assess potential risks to human health and the environment from PFAS site contamination arising from historical site activities, in the context of continued industrial use of the site and for relevant land uses for any affected off-site properties.
– Provide appropriate information to revise the conceptual site model (CSM) and to enable the site contamination auditor to complete a site contamination audit.

Step 2: Identify the principal study question

The key study questions and goals to be answered were based upon the following objectives of the investigation:

– To assess the on- and off-site extent of groundwater PFAS impact associated with historical MFS site activities.
– To verify PFAS plume stability in the groundwater around the MFS site.

Step 3: Inputs to the decision

The following inputs are required for the decision:

– Quantitative and qualitative data gained through groundwater sampling, analytical works and general field observations.

Step 4: Boundaries of the study

The spatial boundaries for the assessment area are laterally defined by the extent of the on-site and off-site well network, which is represented by Figure 2 attached to the report. The vertical extent of the investigations limited to 4.5 m bgl. The temporal boundaries of the current investigation are 9 to 11 May 2023.

Step 5: Decision rules

Groundwater analytical data are assessed against the criteria adopted from relevant guidance as discussed in the report.

Step 6: Tolerable limits on decision errors

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

To assess the usability of the data prior to making decisions, the data were assessed against pre-determined DQIs. The DQIs, including precision, accuracy, representativeness, comparability and completeness, were reviewed at the completion of this environmental investigation to assess for the presence of decision errors. The pre-determined DQIs established for the investigation are discussed below and shown in Table E 1.

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

Table E 1 Summary of Quality Assurance / Quality Control Criteria

Activity	Description	
Precision		
Duplicates (Intra-Laboratory) Duplicates (Inter-Laboratory)	1 / 10 samples	The RPD values were compared to the 30–50% RPD acceptance criterion adopted from Australian Standard AS4482.1 (for non- and semi-volatiles). For volatile compounds, no published RPD acceptance criteria exist. However, RPDs of <100% are considered acceptable. RPDs for results less than the laboratory practical quantitation limits (PQL) and in instances where results were greater than the PQL for the one sample, but below the PQL for the corresponding primary or duplicate sample, RPDs were not calculated.
Accuracy		
Laboratory (Method) Blank	One sample per batch of 20 samples or fewer	Less than detection limit or limit of reporting (LOR) of the method used.
Laboratory Duplicates	One sample per batch of 10 samples or fewer	Laboratory duplicate samples should have RPDs within the ASC NEPM acceptance criteria of □30%. The laboratory RPDs have been assessed using the following ranges: Results <10 times LOR: no limits. Results between 10- and 20- times LOR 0% - 50%. Results >20 times LOR: 0% - 20%.
Trip blank	One sample per batch of 20 samples or fewer	Less than detection limit or limit of reporting (LOR) of the method used.
Rinsate blank	One sample per batch of 20 samples or fewer	Less than detection limit or limit of reporting (LOR) of the method used.
Representativeness		
Sampling appropriate for media and analytes Samples extracted and analysed within holding times	All samples All samples	- Organics (14 days) Inorganics (6 months)
LORs appropriate and consistent	All samples	All samples
Comparability		
Consistent field conditions, sampling staff and laboratory analysis	All samples	All samples
Standard operating procedures for sample collection & handling	All samples	All samples
Standard analytical methods used for all analyses	All samples	All samples
Completeness		
Sample description and COCs completed and appropriate	All Samples	All Samples
Appropriate documentation	All Samples	All Samples
Satisfactory frequency and result for QA/QC samples	All QA/QC samples	-
Notes:		

Activity	Description	
COC: Chain of Custody LOR: Limit of reporting PQL: Practical quantification limit QA/QC: Quality assurance / quality control		

Step 7: Optimisation of the data collection process

To optimise the design of the investigation, a sampling and analytical program was developed based on the results of previous investigations and in accordance with standard industry practices and SA EPA guidelines. Results (including QA/QC results) were reviewed as they were received from the laboratory and any inconsistencies or unexpected data were further investigated with the laboratory.

Field QA/QC

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

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

All field works were conducted by an GHD environmental scientist in accordance with GHD's Standard Operating Procedures.

QA/QC sampling

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

Table E 2 Field QA/QC Sample Details

Field QA/QC sample type	Details
Intra-Laboratory Duplicate (Blind)	Comprise a single sample that is divided into two separate sampling containers. Both samples are sent anonymously to the primary project laboratory. Blind duplicates provide an indication of the analytical precision of the laboratory but are inherently influenced by other factors such as sampling techniques and sample media heterogeneity.
Inter-Laboratory Duplicate (Split)	Inter-Laboratory Duplicate (Split) samples are two separate samples collected at the same location and analysed by two separate laboratories to determine the analytical proficiency of the primary laboratory.
Field blank	Analyte-free water that is subjected to all aspects of sample collection, field-processing preservation, transportation, and laboratory handling as an environmental sample. This is to assess whether contamination may have occurred in the field during sampling.

GHD adopts the AS4482.1 acceptance criteria of 30% – 50% RPD for field duplicates. However, it is noted that the criteria will not always be achieved, particularly in heterogeneous materials, or at low analyte concentrations.

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

Sample handling and preservation

All samples were immediately placed in an insulated cooler containing ice for storage and were delivered by GHD Field Staff to the laboratory upon the completion of field work as promptly as possible.

All samples were received intact as per the Sample Receipt Notification.

Chain of custody

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

Laboratory QA/QC

The primary laboratory (Envirolab) and secondary laboratory (ALS) were both subcontracted by GHD to analyse samples and are certified by the NATA for the required analysis. NATA certification provides for laboratory QA procedures to be in place and carried out on an ongoing basis.

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

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

Laboratory QAQC procedures

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

The individual analytical laboratories conduct an assessment of the laboratory QC program internally. The results are also reviewed and assessed by GHD.

Table E 3 Laboratory QC sample details

Laboratory QA/QC sample	Details
Laboratory (Method) Blank	Usually, an organic or aqueous solution that is as free as possible of analytes of interest to which is added all the reagents, in the same volume, as used in the preparation and subsequent analysis of the samples. The reagent blank is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample.
Laboratory Control Sample	A reference standard of known concentration is analysed along with a batch of samples. The Laboratory Control Sample provides an indication of the analytical accuracy and the precision of the test method and is used for inorganic analyses.
Laboratory Duplicates	The analytical laboratory collects duplicate sub-samples from one sample submitted for analytical testing at a rate equivalent to one in twenty samples per analytical batch, or one sample per batch if less than twenty samples are analysed in a batch. A laboratory duplicate provides data on the analytical precision and reproducibility of the test result. The precision of analysis performed by the laboratory is determined by the calculation of the relative percent difference (RPD). The RPD is calculated based on a comparison of an intra-laboratory split of the sample material with results representing the percent difference between the two sample concentrations for a specific contaminant. The RPD is calculated using the following formula: $RPD(\%) = \frac{\lvert C_o - C_d \rvert}{C_o + C_d} \times 200$

Laboratory QA/QC sample	Details
	Where Co = Analyte concentration of the original sample Cd = Analyte concentration of the duplicate sample

Field QC Results

The field QC results analysis below considers all sample types collected as part of the environmental investigation. The duplicate, split, trip blank sample results and RPD calculations are presented in the tables at the end of this appendix.

Groundwater

A total of ten primary samples, one intra-laboratory sample and one inter-laboratory sample were collected, submitted and analysed as part of the environmental investigation. The target frequency for analysis of field QC samples is one replicate pair per 10 primary samples (10%). In this instance, the frequency was acceptable.

RPD results are summarised in Table E4 below.

Table E 4 Groundwater RPD results

Sample pair	Pair type	RPD exceedances
MW20 / FD01	primary / intra-laboratory duplicate	1
MW20 / FS01	primary / inter-laboratory duplicate	3

After an investigation of the sample pairs that were outside the acceptance criteria of 50%, it was determined that a majority of the exceedances could be attributed to one following explanations.

– When low analyte concentrations are reported in primary sample and corresponding duplicate sample, these have exaggerated calculated RPDs with respective small total concentration differences.

Rinsate

One rinsate sample FB01 was analysed as part of the environmental investigation. The target frequency for rinsate samples is one per day of field works and in this instance, the target frequency was achieved. Laboratory analysis did not identify detectable concentrations of PFAS in the rinsate sample. There was no evidence of cross- contamination during sample collection. Rinsate results are presented in Table 6 of the report.

Laboratory program

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

Overall Assessment of Data Quality

The GHD QA/QC parameters were within the specified requirements. It is considered that the data are valid and of sufficient quality for the purposes of this environmental investigation.

ghd.com

→ The Power of Commitment