Largs North Fire Station Groundwater Investigation

(April 2021)

South Australian Metropolitan Fire Service

14 October 2021

The Power of Commitment
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Executive summary

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 substance (PFAS) in groundwater beneath as well as up and down hydraulic gradient of the site.

The investigation presented in this report is part of a staged investigations to delineate PFAS impact in groundwater identified during previous investigations undertaken between 2019 and 2020. The current investigation was carried out by GHD during April and May 2021. The works were undertaken in accordance with the methodology outlined in the GHD (2020e) SAQP for the Largs North Fire Station.

The objectives of the investigation were to confirm the on-site and off-site extent of groundwater PFAS impact and to confirm PFAS plume stability in the groundwater around the MFS site.

The scope of this groundwater investigation included sampling and testing of 26 existing on-site and off-site groundwater monitoring wells, subject to availability. This report is subject to, and must be read in conjunction with, the limitations set out in Section 3.2.

Based on this investigation, the following conclusions were made:

– The standing water levels (SWL) recorded during the April 2021 investigation ranged from 1.501m TOC (MW22) and 2.643m TOC (MW04). Groundwater elevations across the assessment area ranged between 0.530mAHD (MW23) and 0.712mAHD (MW06) and were generally consistent with expected seasonal groundwater level fluctuations and previous results.
– The groundwater is inferred to flow in the easterly direction towards the Port Adelaide River and was generally consistent with previous monitoring events.
– An assessment of groundwater salinity indicated that fresh groundwater beneath the site may be suitable for potable use and irrigation purposes (WQEPP, Gov SA 2015).
– 13 of the 24 wells reported concentrations of PFAS in groundwater above adopted drinking water assessment criteria.
– PFAS concentrations beneath the site at MW04 and directly down hydraulic gradient and adjacent the site at MW02 were generally two orders of magnitude higher than PFAS concentrations in the remaining onsite and offsite wells.
– The highest PFAS concentrations in groundwater continued to be reported in on-site well MW04, which is likely associated with drainage infrastructure beneath the site and historical use of PFAS containing foam. The next highest PFAS impact continued to be reported in immediately down hydraulic gradient of the site well MW02 and is likely a result of PFAS migration in groundwater from the source area.
– PFAS in groundwater has been practically delineated to below the nominated assessment criteria to the north, east and west. However, offsite sources of PFAS in groundwater located up the inferred hydraulic gradient are present.
– The current GME indicated that the PFAS plume is stable in extent and magnitude.
– The CSM indicates that the use of groundwater for domestic irrigation and / or drinking purposes is possible. However, groundwater use surveys undertaken within the assessment area indicate this exposure pathway is unlikely to be complete.
– Testing of fruit grown on properties down hydraulic gradient of the site indicated that PFAS concentrations in groundwater are not elevated to a level whereby PFAS is accumulating in fruit at detectable concentrations. As fruit trees have been removed from the site and sampling and analysis of fruit grown down hydraulic gradient of the site did not report elevated PFAS, this pathway is unlikely to be complete.

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
DEW	South Australian Department for Environment and Water
DO	Dissolved Oxygen
DQOs	Data quality objectives
EC	Electrical conductivity
GAR	South Australian *Guidelines for the Assessment and Remediation of Site Contamination 2019*
GHD	GHD Pty Ltd
HEPA	Heads of Environment Protection Authorities Australia
HDPE	High-Density Polyethylene
JSEA	Job safety and environment analysis
LDPE	Low-Density Polyethylene
LOR	Limit of reporting
m bgl	Metres below ground level
MFS	South Australian Metropolitan Fire Service
mg/L	milligrams / Litre
mV	millivolt
NATA	National Association of Testing Authorities
NEMP	PFAS National Environmental Management Plan 2018
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
ORP	Oxidation Reduction Potential
PFAS	Per- and poly-fluoroalkyl substances
PFHxS	Perfluorohexane sulfonate
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonate
PVC	Polyvinyl chloride
QA/QC	Quality assurance and quality control
SA EPA	South Australian Environment Protection Authority
SAQP	Sampling and analysis quality plan
SFOP	Standard Field Operating Procedures
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

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1. Introduction

1.1 General

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 identification of elevated concentrations of per- and poly-fluoroalkyl substances (PFAS) in groundwater beneath and surrounding the site.

This report documents the scope of work, methodology and findings of the additional on-site and off-site environmental investigations carried out by GHD during April and May 2021. The works were undertaken in accordance with the methodology outlined in the GHD (2020e) SAQP for the Largs North Fire Station, dated 17 February 2020.

1.2 Background

Historically the MFS used firefighting foam containing PFAS at the site during testing of delivery systems on firefighting appliances. Foam containing PFAS has not been used at Largs North Fire Station since 2016.

As part of the PFAS monitoring program MFS has 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 confidential blood samples, which caused concern.

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 10 May 2019 to the South Australian Environmental Protection Authority (SA EPA) and undertook remedial actions at the site, including removal and disposal of chickens, eggs, site vegetation (fruit trees and ornamental trees and shrubs) and fruit stored on site; covering accessible soil with geotextile fabric and mulch; cleaning the air conditioning system and replacement of the majority of ducts. The site is being audited by 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.

In addition to the on-site and off-site investigations, the MFS with the assistance of GHD undertook community engagement including Water Use and Home Grown Produce Survey of the surrounding properties and assisted the MFS to conduct a community drop-in session to provide the community with an update on the investigations being undertaken at the site.

Following the completion of the on- and off-site groundwater investigations (GHD, 2019a – 2020g) the MFS has been assessing additional remediation options for the site, which was reported in the GHD (2021) Remediation Options Assessment report.

A summary of previous investigations 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 groundwater investigation were to:

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

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 provided as Figure 1.

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 St
East and South	Combination of Light Industry and Industry. Immediately adjacent to the site is the Port Adelaide Enfield Council works depot with both sites bounded by Victoria Rd to the west, Willochra St to the north and Mildred Tce to the east and south. Beyond Mildred Tce is the BP Largs North petroleum terminal.
South	The area immediately south of the site, bounded by Mildred Tce and Victoria Rd is classified as Light Industry. The area beyond this to the south is classified as Industry.
West	Largs North Reserve and the local football club is beyond Victoria Road with residential properties approximately 200 m west, North West and south west of the MFS site over Carnarvon Tce and Dover Tce.

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.

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. The groundwater flows uniformly towards the northwest across the area of the Q1 Aquifer. The outflow from the Q1 Aquifer to Gulf St Vincent is small, as the gradient at the coast is flat and the transmissivity is relatively low.

In the Le Fevre Peninsula area where the Q1 Aquifer was overlain by dune sands, good quality water occurs 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

Water Connect was used to conduct a search of registered bores located within a 2 km radius of the site in February 2020. The results of the search indicated the following:

– A total of 1,267 registered bores were recorded within the survey area
– Of these:
    - 511 were identified as domestic bores
    - 317 were identified as investigation bores
    - 38 were identified as irrigation bores
    - 37 were identified as monitoring bores
    - 19 were identified as environmental bores
    - 5 were identified as observation bores
    - 3 were identified as industrial bores
    - 1 bore was identified for exploration
    - 1 bore was identified for irrigation/stock watering
    - 1 bore was identified for recreational
    - 1 bore was identified for stock watering
    - No purpose information was available for 333 registered bores.

Total dissolved solids (TDS) data was available for 761 bores, of these 451 reported TDS values below 1,200 mg/L.

The groundwater use survey conducted in March – April 2019 (GHD 2019b) showed no respondents indicated they possessed a groundwater bore.

A total of 3 registered bores have been identified in the residential area to the north of the site. All 3 bores are engineering bores constructed in 1965 – 1970 for unknown purpose and of unknown status.

The closest registered extractive bores are:

– 1 investigational bore, approximately 200 m to the south west of the site.
– 3 domestic bores, approximately 300 m to the north west of the site.
– 1 domestic bore, approximately 300 m to the south west of the site.

Plans showing the registered bores within a 2 km radius and 500 m radius of the site and the corresponding Water Connect 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 2019a, Largs North Station and Gallantry PFAS testing Detailed Site Investigation (DSI) Report for South Australian Metropolitan Fire Service, April 2019
- GHD 2019b, Largs North Station and Gallantry PFAS Testing, Site Groundwater Use Survey & Groundwater Investigation for South Australian Metropolitan Fire Service, 27 May 2019
- GHD 2019c, 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.

The soil borehole logs recorded during the monitoring wells drilling and installation between 2019 and 2020 are presented in Appendix B.

The findings summary of the latest GHD (2020d) February 2020 GME and GHD (2020f) April 2020 DSI / GME is provided below.

- The standing water levels (SWL) recorded during the April 2020 investigation ranged from 1.94 m TOC (MW26) and 2.70 m TOC (MW03) and were generally consistent with expected previous results.
- The groundwater flow direction was inferred to be east to north east towards the residential area located immediately north and north east of the Largs North Fire Station.
- An assessment of groundwater salinity indicated that fresh groundwater beneath the site may be suitable for potable use and irrigation purposes (WQEPP, Gov SA 2015).
- One of the seven wells (MW20) sampled in April 2020 reported concentrations of PFAS in groundwater above adopted Health Drinking Water assessment criteria.
- PFAS in groundwater has been delineated to the west by wells MW16, MW17 and MW19, to the east by MW10 and MW15 and to the north and north-east by MW23 – MW26.
- The highest PFAS concentrations was reported in groundwater well MW04, which was considered to be associated with drainage infrastructure beneath the site and historical use of PFAS containing foam. The next highest concentrations was reported in MW02 located immediately down hydraulic gradient of the site and is likely a result of PFAS migration in groundwater from the source area.

– Groundwater monitoring wells located up hydraulic gradient to the south of the site reported PFHxS/PFOS concentrations exceeding the drinking water criterion at MW01, MW05 and MW06, indicating that the fuel terminal was an off-site source of PFAS and that the delineation of PFAS to the south was not warranted.
– The CSM indicated that the use of groundwater for domestic irrigation and / or drinking purposes was possible. A complete exposure pathway based on groundwater use has not been confirmed. Testing of fruit grown on properties down hydraulic gradient of the site indicated that PFAS concentrations in groundwater were not elevated to a level whereby PFAS is accumulating in fruit (GHD, 2020b). As fruit trees have been removed from the site and sampling and analysis of fruit grown down hydraulic gradient of the site did not report elevated PFAS, this pathway was considered not complete.

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 the 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.

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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

A total of 26 existing on-site and off-site groundwater monitoring wells (MW01 - MW26) were nominated for sampling in April – May 2021 as part of this GME to assess the extent of PFAS impacts and confirm PFAS plume stability around the MFS site.

Monitoring wells MW03 and MW25 could not be sampled as part of this investigation due to the following:

– MW03 was covered with waste fill generated from building works at the station.

MW25 was destroyed by a pine tree which was planted over the well. The scope of the GME included the following:

– Gauging and sampling groundwater using no flow sampling techniques (HDPE Hydrasleeve™ samplers)
– Laboratory analysis of primary groundwater samples and quality control samples for PFAS short suite.

4.2 Community Engagement

In parallel with the groundwater investigations since 2019, GHD implemented the ongoing community engagement including establishment of the 1800 hot-line number available for members of the community to call with queries about the MFS investigations works.

5. Methodology

All field works were conducted by appropriately qualified and trained GHD environmental scientists, in accordance with GHD's Standard Field Operating Procedures (SFOP).

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. Prior to undertaking the fieldworks, the GHD field representatives and all subcontractors held a pre-start meeting on site. Daily GHD WHS forms were completed before commencement of work each day.

5.2 Groundwater Well Sampling Methodology

Groundwater sampling was undertaken on 19-20 April and 14 May 2021 (well MW01). The groundwater sampling methodology is summarised in Table 5.1.

Table 5.1 Groundwater Monitoring and Sampling Methodology

Activity	Details
Well Gauging	Prior to sampling each well, the standing water level (SWL) and bore depth were gauged and recorded using a calibrated Oil / Water Interface Probe (IP). The measurements were taken from the top of the bore casing (TOC). SWL and bore depths were recorded in PLog Data Collection Software on field tablets. Well gauging data is presented in Section 7.2 below. 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. When the sampler was full it was slowly raised to ensure the valve was closed. Samples were 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, electrical conductivity, 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. These parameters were recorded on field tablets using PLog Data Collection Software. A summary of the electronic 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 through 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 deionised water wash and a final 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 20 primary samples. The replicate pair included one intra-laboratory sample and one inter-laboratory sample.

Activity	Details
	Rinsate samples were collected from reusable equipment (IP) at a rate of one (1) per day sampling was conducted to assess the potential for cross contamination to occur from reusable sampling equipment.

Monitoring wells were sampled on 19 and 20 April 2021, with the exception of off-site well MW01 (located on Mildred Terrace) which was sampled on 14 May 2021 after a stockpile of mulch that covered the well was removed by the City of Port Adelaide Enfield personnel.

5.3 Laboratory Analysis Program

5.3.1 Analytical Laboratories

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

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

5.3.2 Sample Analysis

Groundwater samples collected as part of this environmental investigation were analysed for PFAS (Short Suite).

Table-5.2 summarises the sampling and analysis undertaken for groundwater samples.

Table-5.2 Laboratory Analytical Schedule

Sample type	No. primary samples		No. QA duplicate samples		No. rinsate samples		Analytical suite
	Collected	Analysed	Collected	Analysed	Collected	Analysed	
Groundwater	24	24	2	2	2	2	PFAS – Short Suite

6. Assessment Criteria

PFAS was the key contaminant of enquiry as part of this environmental investigation. As such, the assessment criteria adopted for this investigation 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 Polyfluoroalkyl (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 Guideline on the assessment and remediation of site contamination 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 April 2021 ranged between 139 mg/L and 3,492 mg/L, indicating fresh to brackish groundwater beneath the site that may be suitable for potable use and suitable for the irrigation purposes (SA EPA, 2019). The groundwater data in the WaterConnect data base (Step 3) indicates that out of 761 bores with available TDS data, 451 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 of St Vincent. The Port Adelaide River is the closest water body located approximately 700 m to the east and Gulf St Vincent is located approximately 1.3 km to the west. These water bodies are considered to represent a marine ecosystem.
Step 3: Review registered groundwater users in the WaterConnect database	The registered bore search identified 1,267 registered bores within a 2 km radius of the site. The registered bores consisted of 511 domestic bores, 317 investigation bores, 38 irrigation bores, 37 monitoring bores, 19 environmental bores, 5 observation bores, 3 industrial bores, 1 exploration, 1 irrigation/stock 1 recreational and 1 stock watering bore. 333 bores had no listed purpose. Remaining bores were either abandoned, backfilled or dry.
Step 4: Application of the 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%).

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 effects of PFAS chemicals on aquatic organisms.

The values for the adopted screening/investigation levels from this source, which are considered to protect potentially complete source receptor linkages, are summarised in Table 6.2.

Table 6.2 Adopted PFAS Interim 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 modified ecosystems	0.13 µg/L	-	220 µg/L	PFAS NEMP 2.0, 2020

*Notes:*Based on NHMRC 2019*

7. Groundwater Results

The following sections summarise the field observations and analytical results of the April – May 2021 groundwater investigation. Sample locations are shown in Figure 2 at the end of this report. Interpretation and discussion of the results is provided in Section 9.

7.1 Site Specific Geology

Soils encountered previously during the installation of groundwater monitoring wells were described and recorded on field tablets using PLog Data Collection Software. Soil borehole logs are presented in Appendix B.

Natural sols contained sand containing gravel and trace organic matter and in one instance shells and sandstone, Fill material at all locations was underlain by natural pale brown, dark yellow and grey sands to the base of investigations, which was consistent with the regional geology.

In general, the soils encountered during well installation comprised of pale brown silty sand fill layers that transitioned to natural soil between 0.1 m bgl and 0.9 m bgl. Monitoring wells MW20, MW21 and MW23 contained trace gravel in their respective fill layers ranging between 0.16 m bgl and 0.55 m bgl.

Fill material at all locations was underlain by natural pale brown sand, which transitioned into a darker grey sandy layer between 1.9 m bgl (MW23) and 3.6 m bgl (MW22) to the base of the investigation, which was consistent with the regional geology.

7.2 Site Specific Hydrogeology

Groundwater gauging data collected on 19 - 20 April 2021 and 14 May 2021 as part of this GME is presented in Table 7.1. Groundwater Gauging Results are presented in Table 1 and Historical Groundwater Gauging Results are presented in Table 2 at the end of this report. The groundwater field physiochemical parameters results were recorded on field tablets using PLog Data Collection Software, presented in Appendix D.

Table 7.1 Groundwater Gauging Data

Well ID	Top of casing (mAHD)	SWL (m TOC)	RSWL (mAHD)
MW01	3.082	2.506-	0.576-
MW02	3.028	2.461	0.567
MW03	3.560	-	-
MW04	3.293	2.643	0.650
MW05	3.020	2.447	0.573
MW06	3.117	2.405	0.712
MW07	3.157	2.460	0.697
MW08	3.045	2.456	0.589
MW09	3.055	2.490	0.565
MW10	2.802	2.244	0.558
MW11	3.192	2.598	0.594
MW12	3.044	2.414	0.630
MW13	3.095	2.491	0.604
MW14	2.854	2.263	0.591
MW15	2.945	2.366	0.579
MW16	2.859	2.216	0.643
MW17	3.068	2.427	0.641

Well ID	Top of casing (mAHD)	SWL (m TOC)	RSWL (mAHD)
MW18	3.079	2.383	0.696
MW19	3.120	2.465	0.655
MW20	2.683	2.031	0.652
MW21	2.217	1.616	0.601
MW22	2.054	1.501	0.553
MW23	2.167	1.637	0.530
MW24	3.03	2.376	0.654
MW25	3.00	-	-
MW26	2.71	2.009	0.70

Note:
- Monitoring well was damaged and unable to sample.

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

Table 7.2 Summary of Site-Specific Hydrogeology

Feature	Details
Groundwater Occurrence and Depth to Groundwater	The first regional aquifer is located at depths ranging between 1.501m bTOC (MW22) and 2.643 m bTOC (MW04). Groundwater elevations across the site ranged between 0.530mAHD (MW23) and 0.712mAHD (MW06).
Groundwater Flow Direction	Groundwater flow direction was inferred to be easterly towards the Port Adelaide River. Groundwater elevation contours and inferred flow direction are shown in Figure 3 at the end of this report.
Groundwater Gradient	The groundwater gradient was calculated to be 0.0007 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 1.3 $x10^{-2}$ m/year and 13 m/year, with an arithmetic mean of 1.9 m/year.
Groundwater Salinity	Total dissolved solids (TDS) within groundwater beneath the site, as an indicator of salinity, was calculated by applying a conversion factor of 0.65 to the electrical conductivity values at each well. The calculated TDS values ranged between 139mg/L (MW18) and 3,492mg/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 other contaminants not withstanding (SA EPA, 2019).

Groundwater field physiochemical parameters (pH, electrical conductivity (EC), dissolved oxygen (DO), field redox potential and temperature) were recorded during the gauging and sampling process. The groundwater field physicochemical results are summarised as follows:

– The groundwater pH results ranged between pH 6.62 (MW24) to pH 7.63 (MW18), indicating moderately acidic to moderately alkaline groundwater conditions.
– Field EC ranged from 213.5µS/cm (MW18) to 5,373µS/cm (MW10). The calculated TDS values indicated a minimum salinity of 139mg/L and a maximum of 3,492mg/L at the respective wells, indicating fresh to brackish groundwater beneath the investigation area.
– Dissolved oxygen ranged between 0.42mg/L (MW13) and 3.79mg/L (MW02).

– 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 -13mV (MW14) and 296mV (MW07), indicating reducing to oxidising conditions in the investigation area.
– Temperature ranged between 21.9°C (MW16 and MW20) and 24.8°C (MW22), which were considered within normal ranges for spring.

7.3 Analytical Results

The tabulated analytical groundwater results are presented in Table 3 at the end of this report and laboratory reports are provided in Appendix E. Twenty-three (23) primary groundwater samples were submitted for laboratory analysis with the results summarised in Table 7.3.

A figure showing groundwater concentrations / exceedances for PFOS, PFOA and the sum of PFHxS & PFOS is included as Figure 4 at the end of this report. Historical Groundwater Results are presented in Table 4 at the end of this report.

Table 7.3 Summary of Groundwater Analytical Results

No. of primary samples	Analyte	Min conc. µg/L	Max conc. µg/L	Samples exceeding criteria		
				Health Drinking Water	Health Recreational Water	Interim Marine 95%
24	PFHxS & PFOS	<0.01	82	MW01 MW02 MW04 MW05 MW06 MW08 MW09 MW10 MW12 MW13 MW14 MW18 MW20	MW02 MW04	NA
	PFOA	<0.01	0.83	MW04	0	0
	PFOS	<0.01	67	MW02 MW04 MW08 MW09 MW12 MW18	MW02 MW04	MW02 MW04 MW08 MW09 MW13 MW18

Note: NA indicates no guideline value for this analyte

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 April 2021 autumn groundwater elevations were generally slightly lower than the February 2020 groundwater elevations.

The inferred groundwater flow was inferred to be generally in the easterly direction towards the Port Adelaide River and generally consistent with previous monitoring events. The inferred groundwater flow direction may be variable as a result of tidal influences from the Port Adelaide River, the closest water body located approximately 700 m to the south east of the site.

9.2 Distribution of PFAS in Groundwater

As with previous groundwater monitoring rounds, PFAS concentrations beneath the site at MW04 and directly down hydraulic gradient and adjacent the site at MW02 were one to two orders of magnitude higher than PFAS concentrations in the remaining onsite and offsite wells. On-site monitoring well MW04 continued to report the highest PFAS concentration across the assessment area.

Groundwater monitoring wells to the south up/cross hydraulic gradient of the site, reported PFHxS/PFOS concentrations exceeding the adopted drinking water criterion (MW05, MW06 and MW18) and above the laboratory LOR at MW07. The extent of the PFAS concentrations in groundwater to the south remains undelineated, however, PFAS concentrations were considered to be associated with the offsite source sites, as reported previously.

Based on the results of this investigation, PFAS beneath the assessment area, associated with the site remains practically delineated to the north, east and west below the nominated assessment criteria. Groundwater data collected over time indicates some variation between sampling events however, the data indicates the plume is generally stable in magnitude and extent.

9.3 Conceptual Site Model (CSM)

A site-specific Conceptual Site Model (CSM) has been developed to identify various receptors (human health and environment) and potential exposure routes / pathways 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 conceptual site model uses information obtained throughout this investigation along with information obtained from the previous environmental investigations undertaken by GHD between 2019 and 2020.

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) assessing whether exposure pathway are complete or incomplete.

A tabular Conceptual Site Model (CSM) is presented in Table 9.1 below and a graphic CSM is presented as Figure 5.

Table 9.1 Conceptual Site Model (CSM)

Potential source	Receptor	Pathway	Pathway present?
PFAS impacted groundwater	People using groundwater for: domestic and drinking purposes.	Consumption of contaminated groundwater.	Possible Most TDS values in groundwater beneath the assessment area were 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 in 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 of the site where PFAS has been detected in groundwater. 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 1,198 mg/L, which is considered suitable for domestic and primary irrigation purposes (Gov SA, 2015). The results of the groundwater use survey results undertaken in March-April 2019 did not identify groundwater being used for irrigation purposes in the assessment area, however this cannot be ruled out. 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 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 of the site where PFAS has been detected in groundwater. It is considered unlikely groundwater in this area is used for recreational purposes where users would incidentally consume water (i.e. swimming).
	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 of St Vincent	Migration through porous media and	Unlikely

Potential source	Receptor	Pathway	Pathway present?
		discharge to water bodies / marine environments.	Gulf of 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 of 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 have been made:

- The standing water levels (SWL) recorded during the April 2021 investigation ranged from 1.501m TOC (MW22) and 2.643m TOC (MW04). Groundwater elevations across the assessment area ranged between 0.530mAHD (MW23) and 0.712mAHD (MW06) and were generally consistent with expected seasonal groundwater level fluctuations and previous results.
- The groundwater is inferred to flow in the easterly direction towards the Port Adelaide River and was generally consistent with previous monitoring events.
- An assessment of groundwater salinity indicated that fresh groundwater beneath the site may be suitable for potable use and irrigation purposes (WQEPP, Gov SA 2015).
- 13 of the 24 wells reported concentrations of PFAS in groundwater above adopted drinking water assessment criteria.
- PFAS concentrations beneath the site at MW04 and directly down hydraulic gradient and adjacent the site at MW02 were generally two orders of magnitude higher than PFAS concentrations in the remaining onsite and offsite wells.
- The highest PFAS concentrations in groundwater continued to be reported in on-site well MW04, which is likely associated with drainage infrastructure beneath the site and historical use of PFAS containing foam. The next highest PFAS impact continued to be reported in immediately down hydraulic gradient of the site well MW02 and is likely a result of PFAS migration in groundwater from the source area.
- PFAS in groundwater has been practically delineated to below the nominated assessment criteria to the north, east and west. However, offsite sources of PFAS in groundwater located up the inferred hydraulic gradient are present.
- The current GME indicated that the PFAS plume is generally stable in extent and magnitude.
- The CSM indicates that the use of groundwater for domestic irrigation and / or drinking purposes is possible. However, groundwater use surveys undertaken within the assessment area indicate this exposure pathway is unlikely to be complete.
- Testing of fruit grown on properties down hydraulic gradient of the site indicated that PFAS concentrations in groundwater are not elevated to a level whereby PFAS is accumulating in fruit at detectable concentrations. As fruit trees have been removed from the site and sampling and analysis of fruit grown down hydraulic gradient of the site did not report elevated PFAS, this pathway is unlikely to be complete.

11. References

Adelaide 1:250,000 SA Geological Atlas Series Sheet (SI 54-9) (1969), Geological Survey of South Australia

AS/NZS ISO 31000:2009 Risk management - Principles and guidelines

Australian Commonwealth Work Health and Safety Act 2011

Australian/New Zealand Standard (AS/NZ) 5667.1,1998. Water Quality – Sampling. Standards Australia

Australian Standard AS 1726:2017. Geotechnical site investigations, Standards Australia

Australian Standard AS 4482.1,2005. Guide to the investigation and sampling of sites with potentially contaminated soil - Part 1: Non-volatile and semi-volatile compounds, Standards Australia

Commonwealth Work Health and Safety Regulations 2011

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

Gov SA 1993, Environment Protection Act 1993, Version 22.2.2018, Government of South Australia

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

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

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

GHD 2019c, 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

HEPA 2018, PFAS National Environment Management Plan (PFAS NEMP), Heads of Environment Protection Authorities Australia, January 2018

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

NEPC 2013, National Environment Protection Council National Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM), as amended 2013, National Environment Protection Council

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

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

SA EPA 2019, Guidelines for the Assessment and Remediation (GAR) of Site Contamination, Environment Protection Authority, South Australia, November 2019

SA EPA 2018, Site Contamination Policy: Certification of practitioners, Environment Protection Authority, South Australia

URS 2010, BP Largs North Terminal, Detailed Risk Assessment, 42657409/R001/2 Final, URS Australia Pty Ltd, 22 June 2010.

Tables

Table 1 – Current Groundwater Gauging Data

Table 2 – Current and Historical Groundwater Gauging Data

Table 3 – Groundwater Analytical Results

Table 4 – Historical Groundwater Analytical Results

Table 5 – QA/QC Results

Table 6 – Rinsate Results

Figures

Figure 1 – Site Location Plan

Figure 2 – Site Layout and Groundwater Monitoring Well Locations Plan

Figure 3 – Groundwater Contours and Inferred Flow Direction Plan

Figure 4 – Groundwater PFAS Concentrations Plan

Figure 5 – Conceptual Site Model

Groundwater Samples

Client: South Australian Metropolitan Fire Service (MFS)
Project: Groundwater Investigation (April / May 2021)
Job No.: 3319080
Location: Largs North Station
WL Meter Type: Int.Fce

Location ID	TOC (mAHD)	Sample Date	SWL (mTOC)	Depth of Well (mTOC)	RWL (mAHD)	pH	EC (µs/cm)	TDS (mg/L)	DO (mg/L)	Redox (mV)	SHE Redox (mV)	Temperature	Sample Description
MW01	3.082	14/05/21	2.506	4.500	0.576	6.70	1570	1021	0.77	61	260	22.5	Clear, very low turbidity, no odour, no sheen. Some long, fine roots (>15 cm long, <1 mm diameter.)
MW02	3.028	19/04/21	2.461	4.404	0.567	7.15	1497	973	3.79	-42	157	23.5	Dark brown, high turbidity, no sheen, no odor
MW03	3.560	19/04/21	-	-	-	-	-	-	-	-	-	-	Good condition.
MW04	3.293	19/04/21	2.643	4.456	0.650	7.26	2084	1355	3.12	104	303	21.3	Pale brown, medium-high turbidity, no sheen, no odor, trace organic matter
MW05	3.020	19/04/21	2.447	4.431	0.573	7.40	493.5	321	1.37	-43	156	23.1	Clear, light grey, no sheen, no odour, low-medium turbidity
MW06	3.117	19/04/21	2.405	4.364	0.712	6.94	4853	3154	1.88	-39	160	22.1	Dark brown, high turbidity, no sheen, no odor, trace organic matter
MW07	3.157	19/04/21	2.460	4.394	0.697	7.10	4598	2989	1.56	97	296	22.2	Dark brown, medium turbidity, no sheen, no odor, surfactant on top of water in hydrosleeve.
MW08	3.045	19/04/21	2.456	4.422	0.589	7.12	1725	1121	0.79	41	240	23.7	Clear/pale brown, low - medium turbidity, nos sheen. H2S odour, trace organic matter
MW09	3.055	19/04/21	2.490	4.357	0.565	7.16	1540	1001	0.65	-50	149	23.3	Pale brown, no sheen, no odour, medium turbidity
MW10	2.802	19/04/21	2.244	4.432	0.558	6.88	5373	3492	0.66	-87	112	23.5	Clear, low turbidity, trace organic matter, no sheen/odour
MW11	3.192	19/04/21	2.598	4.426	0.594	7.07	2065	1342	0.79	-31	168	23.4	Likely rain/stormwater infiltration.
MW12	3.044	19/04/21	2.414	4.373	0.630	6.72	1760	1144	1.05	-118	81	22.3	Pale brown/straw, trace organic matter, no sheen, no odour, surfactant on top of water in hydrosleeve.
MW13	3.095	19/04/21	2.491	4.379	0.604	6.94	2348	1526	0.42	-102	97	24.2	Pale brown/straw, low - medium turbidity, surfactant on top of water in hydrosleeve, no sheen, H2S odour, trace organic matter.
MW14	2.854	19/04/21	2.263	4.372	0.591	6.97	3314	2154	1.31	-187	13	22.4	Clear/straw, low turbidity, no sheen, surfactant on top of water in hydrosleeve, H2S odour, trace organic matter.
MW15	2.945	19/04/21	2.366	4.374	0.579	6.81	3079	2001	0.46	-99	100	23.4	Clear, low turbidity, surfuctant on top of water in hydrosleeve, no sheen, H2S odour, trace organic matter
MW16	2.859	19/04/21	2.216	4.373	0.643	7.09	3152	2049	1.63	78	277	21.9	Clear/pale brown, low turbidity, trace organic matter, no sheen, H2S odour
MW17	3.068	19/04/21	2.427	4.377	0.641	7.10	2289	1488	0.68	-69	130	22.4	Clear/pale brown, trace organic matter, no sheen, low-turbidity, H2S odour
MW18	3.079	19/04/21	2.383	4.364	0.696	7.63	213.5	139	2.16	40	239	22.2	Pale brown, low - medium turbidity, no sheen, no odour
MW19	3.120	19/04/21	2.465	4.449	0.655	7.11	3809	2476	0.60	-91	108	23.0	Pale brown, medium turbidity, no sheen, no odour
MW20	2.683	19/04/21	2.031	4.447	0.652	7.04	1356	881	0.86	-57	142	21.9	Clear/pale brown, low - medium turbidity, no sheen. H2S odour, trace organic matter
MW21	2.217	19/04/21	1.616	4.441	0.601	7.03	1443	938	0.52	-90	109	24.4	Clear, low turbidity, no sheen, H2S odour
MW22	2.054	19/04/21	1.501	4.457	0.553	7.21	855.0	556	0.43	-80	119	24.8	Pale brown/orange, medium, - high turbidity, no sheen, surfuctant on top of water in hydrosleeve
MW23	2.167	19/04/21	1.637	4.463	0.530	7.18	820.0	533	0.82	-24	175	22.6	Clear, low turbidity, no sheen, faint H2S odour
MW24	3.034	19/04/21	2.376	4.447	0.658	6.62	2595	1687	1.05	-16	183	22.6	Plae brown, low - medium turbidity, trace organic matter, no sheen, faint H2S odour
MW25	3.000	19/04/21	-	-	-	-	-	-	-	-	-	-	-
MW26	2.713	19/04/21	2.009	4.436	0.704	7.31	471.7	307	1.05	7	206	22.4	Pale brown, medium turbidity, trace organic matter, no sheen, faint H2S odour

TOC denotes Top of casing
AHD denotes Australian Height Datum
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 (April/May 2021)
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	13/02/19	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.
		11/04/19	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.
		23/10/19	2.300	4.440	0.782	7.30	1610	1047	3.53	149	348	21.6	Clear. Low turbidity. No odour. No sheen.
		27/02/20	2.427	4.424	0.655	7.26	1836	1193	2.68	76	275	23.8	Clear. Low turbidity. No odour. No sheen.
		29/04/20	2.320	4.424	0.762	-	-	-	-	-	-	-	Good condition.
		14/05/21	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	13/02/19	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.
		11/04/19	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.
		23/10/19	2.350	4.420	0.678	7.45	1800	1170	2.50	143.3	342	23.1	Clear. Low turbidity. No odour. No sheen.
		27/02/20	2.476	4.403	0.552	7.78	1582	1028	0.66	-32.8	166	22.3	Clear. Low turbidity. No odour. No sheen.
		29/04/20	2.410	4.403	0.618	-	-	-	-	-	-	-	Good condition.
		20/04/21	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	13/02/19	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.
		11/04/19	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.
		23/10/19	2.740	4.440	0.820	8.12	970	631	2.59	127.0	326	22.3	Clear. Low turbidity. No odour. No sheen.
		27/02/20	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.
		29/04/20	2.700	4.420	0.860	-	-	-	-	-	-	-	Good condition.
		-	-	-	-	-	-	-	-	-	-	-	Not sampled
MW04	3.293	13/02/19	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.
		11/04/19	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.
		23/10/19	2.530	4.470	0.763	7.54	1550	1008	9.00	114.8	314	22.6	Clear. Low turbidity. No odour. No sheen.
		27/02/20	2.678	4.459	0.615	7.62	1484	965	0.60	71.4	270	22.0	Clear. Low turbidity. No odour. No sheen.
		29/04/20	2.580	4.459	0.713	-	-	-	-	-	-	-	Good condition.
		20/04/21	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	11/04/19	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.
		23/10/19	2.200	4.580	0.820	7.56	700	455	6.67	63.2	262	21.2	Clear. Low turbidity. No odour. No sheen.
		27/02/20	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.
		29/04/20	2.090	4.425	0.930	-	-	-	-	-	-	-	Good condition.
		20/04/21	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	11/04/19	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.
		23/10/19	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.
		27/02/20	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.
		29/04/20	2.340	4.367	0.777	-	-	-	-	-	-	-	Good condition.
		20/04/21	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	11/04/19	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.
		23/10/19	2.340	4.350	0.817	7.00	1250	813	2.33	103.2	302	21.9	Clear. Low turbidity. No odour. No sheen.
		27/02/20	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.
		29/04/20	2.370	4.331	0.787	-	-	-	-	-	-	-	Good condition.
		20/04/21	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	11/04/19	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.
		23/10/19	2.330	4.430	0.715	7.15	1570	1021	2.03	90.2	289	21.0	Clear. Low turbidity. No odour. No sheen.
		27/02/20	2.475	4.201	0.570	7.94	1990	1294	1.35	13.3	212	23.8	Clear. Low turbidity. No odour. No sheen.
		29/04/20	2.420	4.201	0.625	-	-	-	-	-	-	-	Good condition.
		19/04/21	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	11/04/19	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.
		23/10/19	2.360	4.380	0.695	7.26	1080	702	1.92	31.4	230	22.4	Clear. Low turbidity. No odour. No sheen.
		27/02/20	2.506	4.537	0.549	8.77	1790	1164	3.54	-22.1	177	23.1	Clear. Low turbidity. No odour. No sheen.
		29/04/20	2.450	4.537	0.605	-	-	-	-	-	-	-	Good condition.
		19/04/21	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	11/04/19	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.
		23/10/19	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.
		27/02/20	2.263	4.436	0.539	8.64	2868	1864	3.11	-127.8	71	23.8	Clear. Low turbidity. No odour. No sheen.
		29/04/20	2.180	4.436	0.622	-	-	-	-	-	-	-	Good condition.
		19/04/21	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	11/04/19	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.
		23/10/19	2.460	4.440	0.732	7.41	1640	1066	4.66	8.3	207	21.8	Clear. Low turbidity. No odour. No sheen.
		27/02/20	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.
		29/04/20	2.530	4.424	0.662	-	-	-	-	-	-	-	Likely rain/stormwater infiltration.
		19/04/21	2.598	4.426	0.594	7.07	2065	1342	0.79	-31.4	168	23.4	
MW12	3.044	23/10/19	2.260	4.390	0.784	6.98	1660	1079	5.23	10.2	209	20.2	Clear. Low turbidity. No odour. No sheen.
		27/02/20	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.
		29/04/20	2.350	4.378	0.694	-	-	-	-	-	-	-	Good condition.
		19/04/21	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	23/10/19	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.
		27/02/20	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.
		29/04/20	2.450	4.366	0.645	-	-	-	-	-	-	-	Good condition.
		19/04/21	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 (April/May 2021)
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	23/10/19	2.120	4.390	0.734	7.10	2750	1788	NR	-60.1	139	21.2	Clear. Low turbidity. No sheen. Hydrogen sulfide odour.
		27/02/20	2.291	4.378	0.563	8.01	2731	1775	1.58	-269.1	-70	22.5	Clear. Low turbidity. No odour. No sheen.
		29/04/20	2.220	4.378	0.634	-	-	-	-	-	-	-	Good condition
		19/04/21	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	23/10/19	2.220	4.390	0.725	6.87	2765	1797	11.70	-53.2	146	21.5	Clear. Low turbidity. No odour. No sheen.
		27/02/20	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.
		29/04/20	2.310	4.376	0.635	-	-	-	-	-	-	-	Good condition.
		19/04/21	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	23/10/19	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.
		27/02/20	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.
		29/04/20	2.150	4.370	0.709	-	-	-	-	-	-	-	Good condition.
		19/04/21	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	23/10/19	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.
		27/02/20	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.
		29/04/20	2.390	4.376	0.678	-	-	-	-	-	-	-	Good condition.
		19/04/21	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	23/10/19	2.270	4.390	0.809	7.89	461	300	NR	90.0	289	22.0	Clear. Low turbidity. No odour. No sheen.
		27/02/20	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.
		29/04/20	2.210	4.362	0.869	-	-	-	-	-	-	-	Good condition.
		20/04/21	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	27/02/20	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.
		29/04/20	2.410	4.448	0.710	-	-	-	-	-	-	-	Likely rainwater infiltration.
		19/04/21	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	27/02/20	2.701	4.454	-0.018	7.90	1269	825	1.20	130.0	329	21.2	Clear. No odour. No sheen. Low turbidity.
		29/04/20	2.460	4.460	0.223	7.17	1646	1070	0.31	83.8	283	19.13	Clear, no odour, no sheen.
		19/04/21	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	27/02/20	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.
		29/04/20	2.480	4.450	-0.263	7.02	2337	1519	0.09	80.9	280	24.27	Clear, no odour, no sheen.
		19/04/21	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	27/02/20	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.
		29/04/20	2.350	4.460	-0.296	7.12	1318	857	0.22	122.3	321	23.28	Clear, no odour, no sheen.
		19/04/21	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	27/02/20	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.
		29/04/20	2.540	4.460	-0.373	7.47	695	452	0.54	96.5	296	21.2	Clear, no odour, no sheen.
		19/04/21	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	29/04/20	2.300	4.460	0.734	6.9	3320	2158	0.19	19.7	219	21.6	Clear, no odour, no sheen.
		19/04/21	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	29/04/20	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	29/04/20	1.94	4.45	0.773	7.4	619	402	0.85	93.2	292	20.82	Clear, no odour, no sheen.
		19/04/21	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

		PFAS (short suite in water)							
		Perfluorooctanoic acid (PFOA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	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
PFAS NEMP 2.0 2020 Recreational Water		10	2	2			2		
PFAS NEMP 2.0 2020 Health Drinking Water		**0.56**	**0.07**	**0.07**			**0.07**		
PFAS NEMP 2.0 2020 Interim marine - 95%		*220*		*0.13*					
Location Code	**Date**								
MW01	14/05/21	0.02	**0.24**	0.05	<0.01	<0.02	**0.29**	0.07	0.31
MW02	20/04/21	0.08	**4.5**	***7.1***	<0.01	<0.02	**12**	7.2	12
MW04	20/04/21	**0.83**	**15**	***67***	1.6	0.37	**82**	68	85
MW05	20/04/21	0.13	**0.61**	0.05	<0.01	<0.02	**0.66**	0.18	0.79
MW06	20/04/21	0.01	0.06	0.05	<0.01	<0.02	**0.11**	0.07	0.13
MW07	20/04/21	<0.01	0.01	0.02	<0.01	<0.02	0.03	0.02	0.03
MW08	19/04/21	0.05	**0.40**	***0.27***	<0.01	<0.02	**0.67**	0.32	0.72
MW09	19/04/21	0.04	**0.89**	***0.35***	0.02	<0.02	**1.2**	0.39	1.3
MW10	19/04/21	<0.01	**0.08**	0.04	<0.01	<0.02	**0.12**	0.04	0.12
MW11	19/04/21	<0.01	0.04	<0.01	<0.01	<0.02	0.04	<0.01	0.04
MW12	19/04/21	0.03	**0.19**	***0.33***	<0.01	<0.02	**0.52**	0.35	0.55
MW13	19/04/21	<0.01	**0.08**	<0.01	<0.01	<0.02	**0.08**	<0.01	0.08
MW14	19/04/21	0.01	**0.13**	<0.01	<0.01	<0.02	**0.13**	0.01	0.14
MW15	19/04/21	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
MW16	19/04/21	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
MW17	19/04/21	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
MW18	20/04/21	<0.01	<0.01	***0.14***	<0.01	<0.02	**0.14**	0.14	0.14
MW19	19/04/21	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
MW20	19/04/21	0.01	**0.17**	**0.08**	<0.01	<0.02	**0.24**	0.09	0.26
MW21	19/04/21	<0.01	0.04	<0.01	<0.01	<0.02	0.04	<0.01	0.04
MW22	19/04/21	<0.01	<0.01	<0.01	0.01	<0.02	<0.01	<0.01	0.01
MW23	19/04/21	0.01	0.02	0.04	<0.01	<0.02	0.06	0.06	0.07
MW24	19/04/21	<0.01	<0.01	0.01	<0.01	<0.02	0.01	0.01	0.01
MW26	19/04/21	0.02	<0.01	0.01	0.01	<0.02	0.01	0.03	0.04

		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	13/02/19	**0.20**	0.07	0.01	0.01	<0.01	0.3	**0.27**	0.08
	11/04/19	**0.30**	0.07	0.02	<0.01	<0.01	0.39	**0.37**	0.09
	23/10/19	**0.25**	0.04	0.01	<0.01	<0.01	0.30	**0.29**	0.05
	28/02/20	**0.29**	0.07	0.03	<0.01	<0.01	0.39	**0.36**	0.10
	14/05/21	**0.24**	0.05	0.02	<0.01	<0.02	0.31	**0.29**	0.07
MW02	13/02/19	**4.3**	***8.5***	0.09	<0.01	<0.01	13	**13**	8.6
	11/04/19	**3.4**	***9.0***	0.07	<0.01	<0.01	12	**12**	9.1
	23/10/19	**3.3**	***9.1***	0.07	<0.01	<0.01	12	**12**	9.1
	28/02/20	**3.7**	***9.7***	0.07	<0.01	<0.01	13	**13**	9.8
	20/04/21	**4.5**	***7.1***	0.08	<0.01	<0.02	12	**12**	7.2
MW03	13/02/19	**3.8**	***4.8***	0.09	<0.01	<0.01	8.7	**8.6**	4.9
	11/04/19	**5.1**	***3.1***	0.13	<0.01	<0.01	8.3	**8.2**	3.2
	23/10/19	**0.08**	***0.69***	<0.01	<0.01	<0.01	0.77	**0.77**	0.69
	28/02/20	0.02	***0.56***	0.01	<0.01	<0.01	0.59	**0.58**	0.57
MW04	13/02/19	**38**	***25***	**1.8**	4.6	0.13	70	**63**	27
	11/04/19	**86**	***130***	**4.2**	4.9	0.36	230	**220**	130
	23/10/19	**29**	***100***	**1.9**	4.0	0.44	140	**130**	110
	28/02/20	**13**	***220***	**0.87**	1.9	0.67	240	**230**	220
	20/04/21	**15**	***67***	**0.83**	1.6	0.37	85	**82**	68
MW05	11/04/19	0.02	0.07	<0.01	<0.01	<0.01	0.09	**0.09**	0.07
	23/10/19	<0.01	0.02	<0.01	<0.01	<0.01	0.02	0.02	0.02
	28/02/20	0.06	0.04	<0.01	<0.01	<0.01	0.10	**0.10**	0.04
	20/04/21	**0.61**	0.05	0.13	<0.01	<0.02	0.79	**0.66**	0.18
MW06	11/04/19	0.04	**0.11**	<0.01	<0.01	<0.01	0.16	**0.16**	0.11
	23/10/19	0.01	0.03	<0.01	<0.01	<0.01	0.04	0.04	0.03
	28/02/20	0.06	0.04	0.02	<0.01	<0.01	0.12	**0.10**	0.06
	20/04/21	0.06	0.05	0.01	<0.01	<0.02	0.13	**0.11**	0.07
MW07	11/04/19	0.10	***0.39***	<0.01	<0.01	<0.01	0.48	**0.48**	0.39
	23/10/19	0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01
	28/02/20	0.01	0.02	<0.01	<0.01	<0.01	0.03	0.03	0.02
	20/04/21	0.01	0.02	<0.01	<0.01	<0.02	0.03	0.03	0.02
MW08	11/04/19	**0.77**	***0.15***	0.03	<0.01	<0.01	0.95	**0.92**	0.18
	23/10/19	**0.33**	0.07	0.02	<0.01	<0.01	0.42	**0.40**	0.09
	27/02/20	**0.25**	***0.15***	0.05	<0.01	<0.01	0.44	**0.40**	0.20
	19/04/21	**0.40**	***0.27***	0.05	<0.01	<0.02	0.72	**0.67**	0.32
MW09	11/04/19	**0.47**	0.02	0.02	<0.01	<0.01	0.51	**0.49**	0.03
	23/10/19	**0.14**	0.05	<0.01	<0.01	<0.01	0.19	**0.19**	0.05
	27/02/20	**0.43**	**0.11**	0.02	<0.01	<0.01	0.56	**0.53**	0.13
	19/02/21	**0.89**	***0.35***	0.04	0.02	<0.02	1.3	**1.2**	0.39
MW10	11/04/19	**0.13**	0.04	<0.01	<0.01	<0.01	0.17	**0.17**	0.04
	23/10/19	0.06	<0.01	<0.01	<0.01	<0.01	0.06	0.06	<0.01
	27/02/20	0.03	0.01	<0.01	<0.01	<0.01	0.04	0.04	0.01
	19/04/21	**0.08**	0.04	<0.01	<0.01	<0.02	0.12	**0.12**	0.04
MW11	11/04/19	**0.50**	0.02	0.03	<0.01	<0.01	0.54	**0.52**	0.05
	23/10/19	0.06	<0.01	<0.01	<0.01	<0.01	0.06	0.06	<0.01
	27/02/20	**0.12**	<0.01	0.01	<0.01	<0.01	0.14	**0.12**	0.01
	19/04/21	0.04	<0.01	<0.01	<0.01	<0.02	0.04	0.04	<0.01
MW12	23/10/19	**0.18**	***0.29***	0.02	0.03	<0.01	0.51	**0.47**	0.30
	27/02/20	**0.21**	***0.29***	0.02	<0.01	<0.01	0.53	**0.50**	0.31
	19/04/21	**0.19**	***0.33***	0.03	<0.01	<0.02	0.55	**0.52**	0.35
MW13	23/10/19	**0.10**	<0.01	<0.01	<0.01	<0.01	0.10	**0.10**	<0.01
	27/02/20	0.05	<0.01	<0.01	<0.01	<0.01	0.05	0.05	<0.01
	19/04/21	**0.08**	<0.01	<0.01	<0.01	<0.02	0.08	**0.08**	<0.01
MW14	23/10/19	**0.11**	<0.01	<0.01	<0.01	<0.01	0.11	**0.11**	<0.01
	27/02/20	**0.15**	<0.01	<0.01	<0.01	<0.01	0.15	**0.15**	<0.01
	19/04/21	**0.13**	<0.01	0.01	<0.01	<0.02	0.14	**0.13**	0.01

		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
MW15	23/10/19	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	27/02/20	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	19/04/21	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
MW16	23/10/19	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	28/02/20	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	19/04/21	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
MW17	23/10/19	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	28/02/20	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	19/04/21	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
MW18	23/10/19	0.01	0.04	<0.01	<0.01	<0.01	0.06	0.06	0.04
	28/02/20	<0.01	0.04	<0.01	<0.01	<0.01	0.04	0.04	0.04
	20/04/21	<0.01	***0.14***	<0.01	<0.01	<0.02	0.14	**0.14**	0.14
MW19	28/02/20	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	19/04/21	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
MW20	27/02/20	**0.15**	<0.01	<0.01	<0.01	<0.01	0.15	**0.15**	<0.01
	29/04/20	**0.16**	0.06	<0.01	<0.01	<0.01	0.22	**0.22**	0.06
	19/04/21	**0.17**	**0.08**	0.01	<0.01	<0.02	0.26	**0.24**	0.09
MW21	27/02/20	0.03	0.01	<0.01	<0.01	<0.01	0.04	0.04	0.01
	29/04/20	0.05	0.02	0.01	0.02	<0.01	0.09	0.06	0.03
	19/04/21	0.04	<0.01	<0.01	<0.01	<0.02	0.04	0.04	<0.01
MW22	27/02/20	<0.01	<0.01	<0.01	0.04	<0.01	0.04	<0.01	<0.01
	29/04/20	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	19/04/21	<0.01	<0.01	<0.01	0.01	<0.02	0.01	<0.01	<0.01
MW23	27/02/20	<0.01	0.02	<0.01	<0.01	<0.01	0.02	0.02	0.02
	29/04/20	<0.01	0.03	<0.01	<0.01	<0.01	0.03	0.03	0.03
	19/04/21	0.02	0.04	0.01	<0.01	<0.02	0.07	0.06	0.06
MW24	29/04/20	0.01	0.01	<0.01	<0.01	<0.01	0.03	0.03	0.01
	19/04/21	<0.01	0.01	<0.01	<0.01	<0.02	0.01	0.01	0.01
MW25	29/04/20	0.02	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01
MW26	29/04/20	<0.01	0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01
	19/04/21	<0.01	0.01	0.02	0.01	<0.02	0.04	0.01	0.03
PAE well	11/04/19	<0.01	0.02	0.01	<0.01	<0.01	0.03	0.02	0.03

				PFAS in WaterShort							
				Perfluorooctanoic acid (PFOA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	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	0.01	0.01	0.01	0.01
Location Code	**Sample Date**	**Field ID**	**Sample Type**								
MW08	19/04/21	MW08	Normal	0.05	0.40	0.27	<0.01	<0.02	0.67	0.32	0.72
	19/04/21	FD01	Field_D	0.05	0.40	0.25	<0.01	<0.02	0.65	0.30	0.70
RPD				0	0	8			3	6	3
MW04	20/04/21	MW04	Normal	0.83	15	67	1.6	0.37	82	68	85
	20/04/21	FS01	Interlab_D	0.78	14	60	1.5	0.31	74	61	76
RPD				6	7	11	6	18	10	11	11
MW01	14/05/21	MW01	Normal	0.02	0.24	0.05	<0.01	<0.02	0.29	0.07	0.31
	14/05/21	FD02	Field_D	0.02	0.25	0.05	<0.01	<0.02	0.30	0.07	0.32
RPD				0	4	0			3	0	3

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: unlimited (1 - 10 x EQL) and 50 (> 10 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

		PFAS							
		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
Date	**Field ID**								
19/04/21	RB01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
20/04/21	RB02	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01

Figures

Figure 1 – Site Location Plan

Figure 2 – Site Layout and Groundwater Monitoring Well Locations Plan

Figure 3 – Groundwater Contours and Inferred Flow Direction Plan

Figure 4 – Groundwater PFAS Concentrations Plan

Figure 5 – Conceptual Site Model

Paper Size ISO A4

0 60 120 180

Meters

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

N

South Australian Metropolitan Fire Service
Largs North Station Groundwater Investigation
April - May 2021

Site Location Plan

Project No. **33-19080**
Revision No. **A**
Date **18/ 06/ 2021**

FIGURE 1

N:\AU\Adelaide\Projects\33\19080\GIS\Maps\Deliverables\33-19080_Z002_SiteLocation_RevA.mxd
Print date: 28 Feb 2019 - 12:17

Data source: SA Government: Cadastre (2010), Roads (2010), Railways (2013). Image © Google Earth, Image Date: 10/15/2017; Date Extracted: 26/02/2019 Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community. Created by: dbbanatin

Paper Size ISO A4

0 20 40 60 80

Meters

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

N

South Australian Metropolitan Fire Service
Largs North Station Groundwater Investigations
April - May 2021

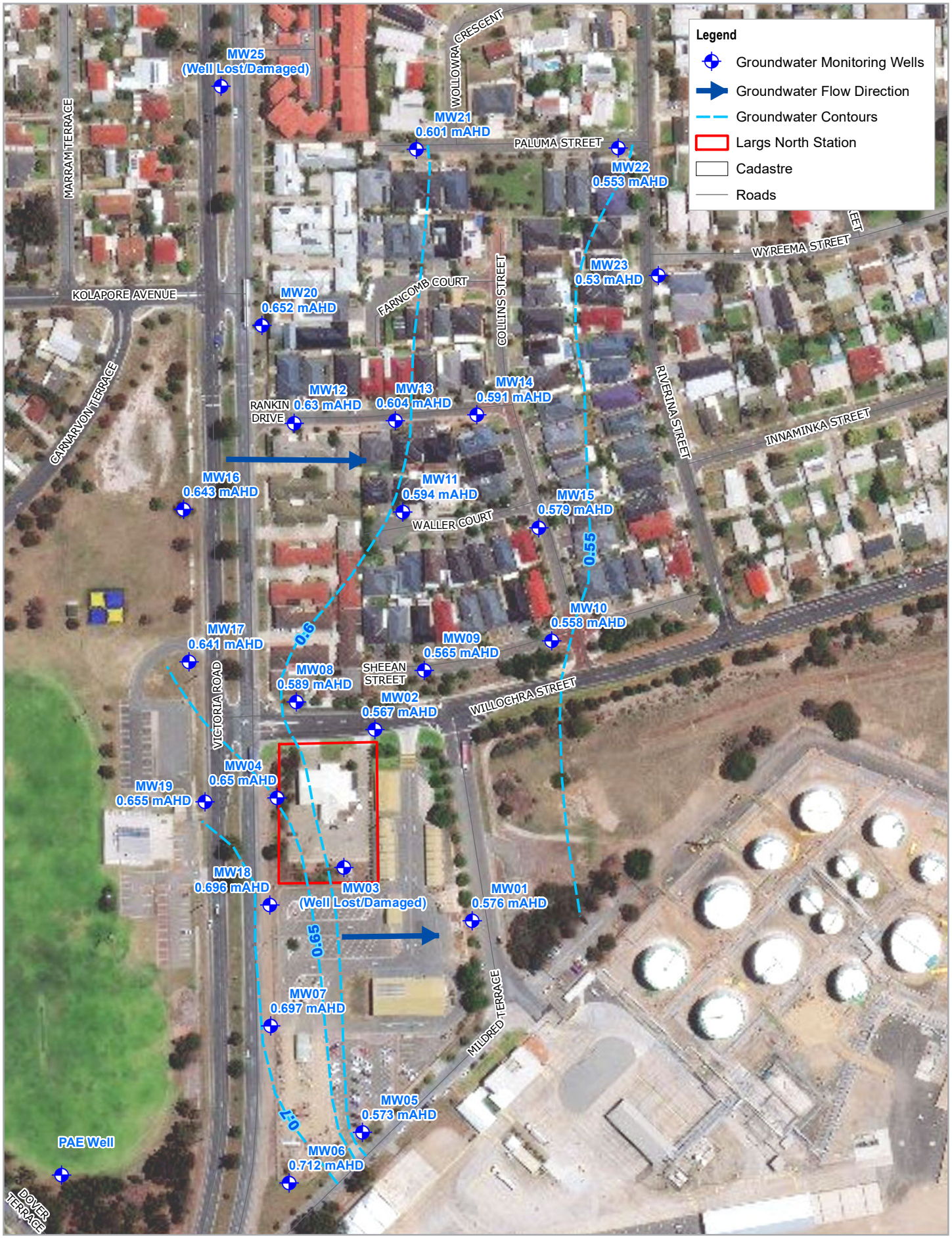
Groundwater Monitoring Well Locations Plan

Project No. **33-19080**
Revision No. **B**
Date **18/ 06/ 2021**

FIGURE 2

\\ghdnet\ghd\AU\Adelaide\Projects\33\19080\GIS\Maps\Deliverables\33-19080_Z021_SiteLayoutGroundwaterWellsSAQP_RevB.mxd
Print date: 18 Jun 2021 - 14:22

Data source: GHD: GW Sampling Locations (2019). SA Government: Cadastre (2010), Roads (2010), Railways (2013). Satellite Imagery - ESRI Basemap, Date Extracted: 11/07/2019Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: morfanos



Paper Size ISO A4

0 20 40 60 80

Meters

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

N

South Australian Metropolitan Fire Service
Largs North Station Groundwater Investigations
April - May 2021

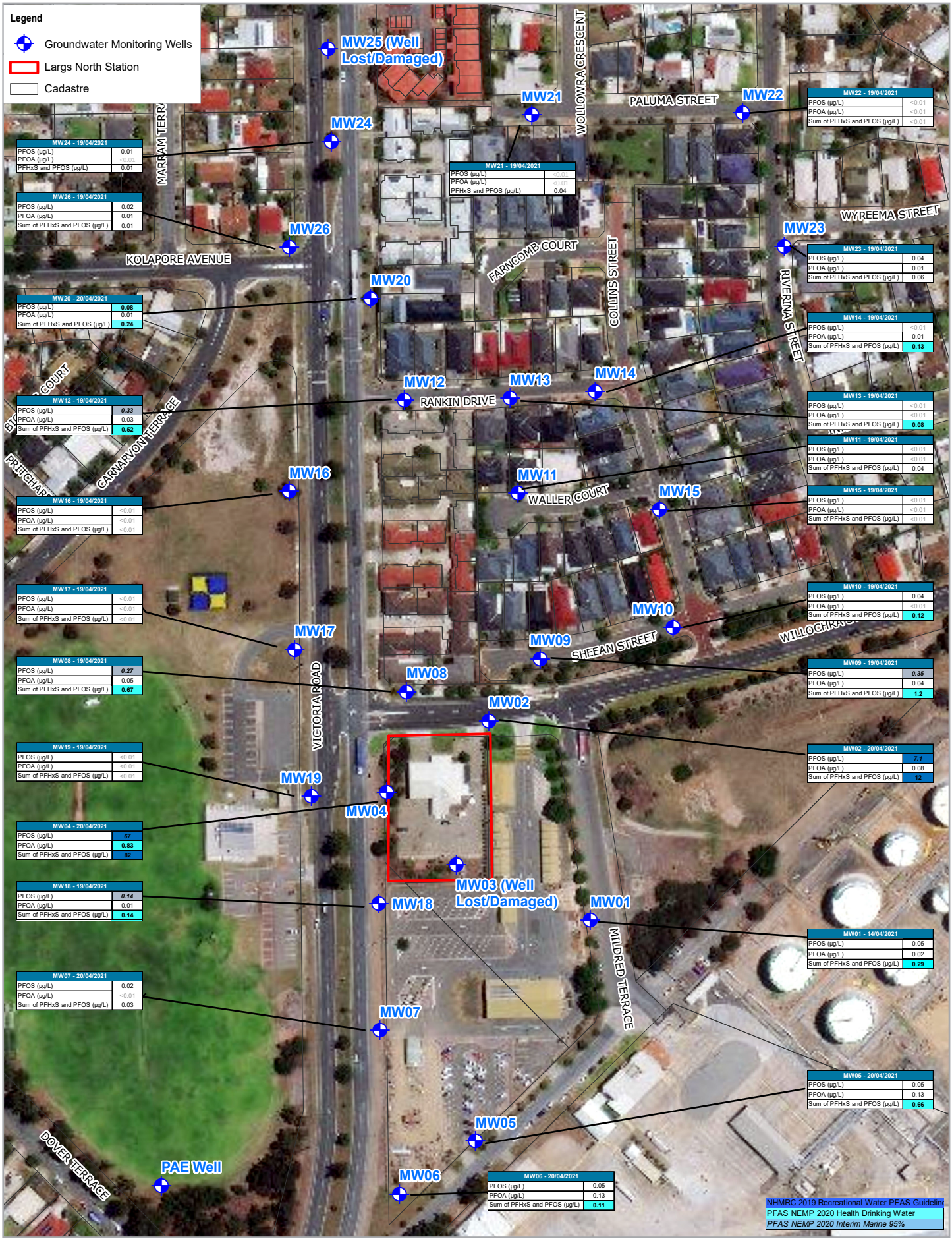
Groundwater Contours & Inferred Flow Direction Plan

Project No. **33-19080**
Revision No. **B**
Date **21/ 06/ 2021**

FIGURE 3

\\ghdnet\ghd\AU\Adelaide\Projects\33\19080\GIS\Maps\Deliverables\33-19080_Z019_GroundwaterContours_RevB.mxd
Print date: 21 Jun 2021 - 10:27

Data source: GHD: GW Sampling Locations (2019), Groundwater Contours (2020). SA Government: Cadastre (2010), Roads (2010), Railways (2013). Satellite Imagery - ESRI Basemap, Date Extracted: 11/07/2019. Created by: morfanos



0 20 40 60 80

Meters
1:2,400 at A4 Approximate
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
April - May 2021

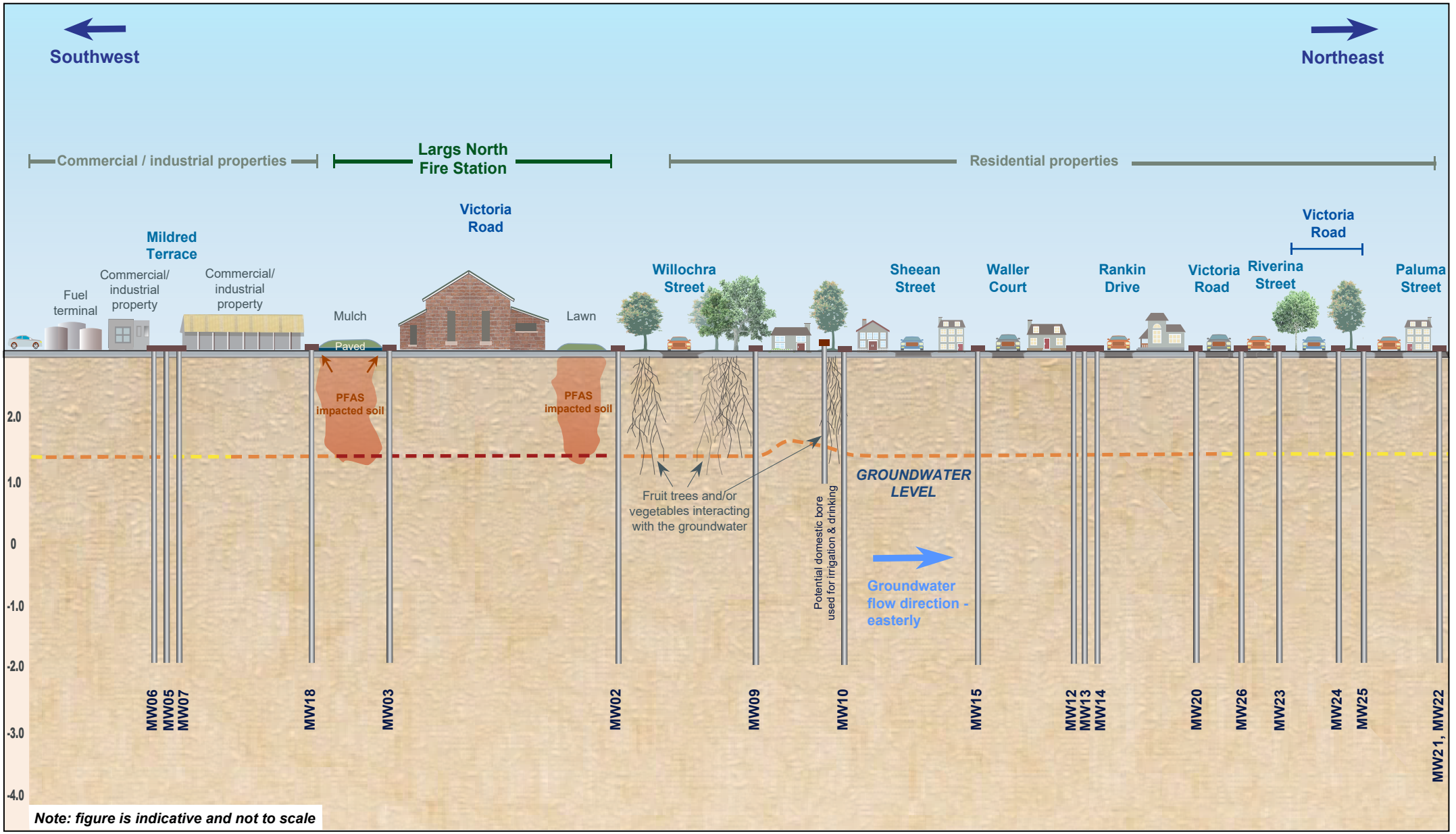
Groundwater Concentrations Exceedances Plan

Project No. **33-19080**
Revision No. **D**
Date **18/ 06/ 2021**

FIGURE 4

\\ghdnet\ghd\AU\Adelaide\Projects\33\19080\GIS\Maps\Deliverables\33-19080_Z020_GroundwaterExceedancePlan_RevD.mxd
Print date: 18 Jun 2021 - 14:27

Data source: GHD: GW Sampling Locations (2019). SA Government: Cadastre (2010), Roads (2010), Railways (2013). Satellite Imagery - ESRI Basemap, Date Extracted: 11/07/2019. Created by: morfanos



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 April-May 2021

Job Number	33-19080
Revision	A
Date	21 June 2021

Conceptual Site Model

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

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Appendices

Appendix A

Registered Bore Search

WaterConnect

Groundwater Data Report

Government of South Australia
Department for Environment and Water

Circle Centre -34.818182,138.501802, 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	102.11	6.1	22/11/1934	5.05	22/11/1934	1727	22/11/1934		Tomw(T1)	ABD					
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						
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				
6528-633	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	8.84	26/09/2019	4.5	24/06/1982	2409	09/09/2019	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				
6528-709	01/01/1983	6	6			0.5	01/01/1983				Qhcks		11828				
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				

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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				

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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	6	3	04/09/1985	0.5		558	08/08/1985	DOM	Qhcks	OPR	16956				
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	6	0	3	27/10/1985	0.5		836	28/10/1985	DOM	Qhcks	BKF	342212				
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				
6528-1361	14/05/1989	5	5	2.4	06/11/1989			2551	06/11/1989	DOM	Qhck	OPR	22880				3
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

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)
6528-1383	02/11/1990	6	6	2	02/11/1990					STK	Qhcks	OPR	24898				
6528-1384	05/11/1990	5	4.8	2.42	04/06/2019			683	05/11/1990	DOM	Qhcks	OPR	24902				5
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				

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)
6528-1521	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				
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				

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)
6528-1648	15/11/1993	11	11			0.5	15/11/1993	1289	28/01/1994	DOM	Qhcks		30244				
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				

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)
6528-1802	06/12/1994	7.3	7.3			0.1	06/12/1994	788	06/12/1994	DOM	Qhcks		33063				
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				
6528-1872	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				
6528-1976	23/01/1996	5.8	5.8			0.8	23/01/1996	578	23/01/1996	DOM	Qhcks		36901				
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				

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)
6528-2002	03/05/1996	8.8	8.8			0.6	03/05/1996	1519	02/05/1996	DOM	Qhcks		37672				
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
6528-2045	07/10/1997	6	6	4	07/10/1997	0.8	07/10/1997	1440	07/10/1997	IRR	Qhcks		42440				6
6528-2046	07/10/1997	6	6	4	07/10/1997	0.8	07/10/1997	1440	07/10/1997	IRR	Qhcks		42441				6
6528-2047	07/10/1997	6	6	4	07/10/1997	0.8	07/10/1997	1440	07/10/1997	IRR	Qhcks		42442				6
6528-2048	08/10/1997	6	6	4	08/10/1997	0.8	08/10/1997	1429	08/10/1997	IRR	Qhcks		42443				6
6528-2049	08/10/1997	6	6	4	08/10/1997	0.8	08/10/1997	1429	08/10/1997	IRR	Qhcks		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	0.5	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	Nds Qhcks		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				

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)
6528-2110	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				

500 records

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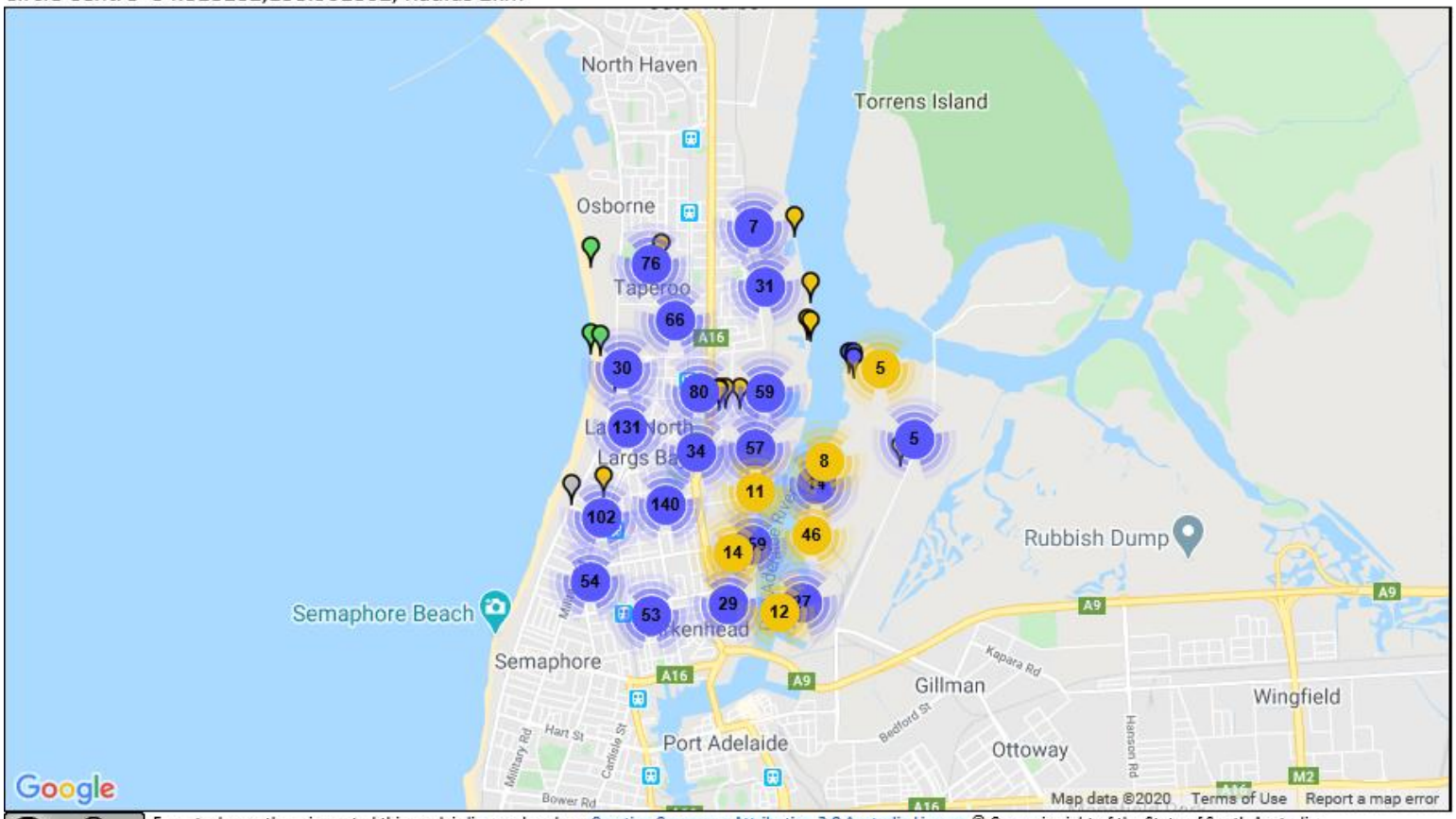
Figure 2: Registered bore search 2km

Government of South Australia

WaterConnect

Circle Centre -34.818182,138.501802, Radius 2km



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Notes: The blue icons represent 'Water Wells'. The yellow icons represent 'Engineering Wells' which have been backfilled and decommissioned.

WaterConnect

Groundwater Data Report

Government of South Australia
Department for Environment and Water

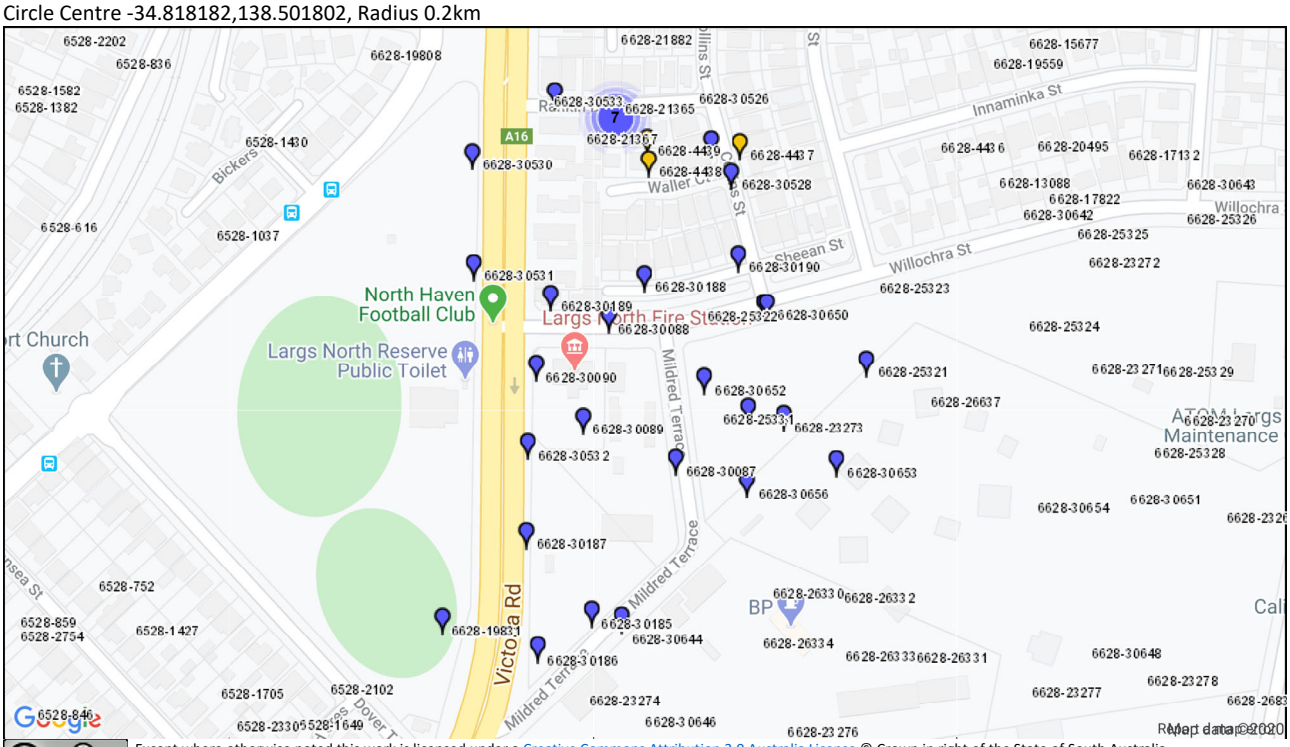
Circle Centre -34.818182,138.501802, Radius 0.2km

Unit No	Date	Max Depth (m)	Latest Depth (m)	TDS (mg/L)	TDS Date	Aquifer	Status	Cased To (m)	Yield (L/sec)	Yield Date	Purpose	Permit No	SWL (m)	SWL Date
6628-4437	19/02/1965	18.29	18.29	2830	19/02/1965	Qhcks	UKN							
6628-4438	08/10/1970	15.65	15.65	28991	06/10/1970	Qhcks	UKN							
6628-4439	09/10/1970	15.7	15.7			Qhcks	UKN							
6628-19831	16/01/1996	6	6	1423	16/01/1996	Qhcks		6	1	16/01/1996	IRR	36763		
6628-21365	04/03/2003	5	5	1276	11/03/2003	Qhcks		1.5	0.01	04/03/2003	INV	61203	2.2	11/03/2003
6628-21366	04/03/2003	5	5	999	11/03/2003	Qhcks		1.5	0.01	04/03/2003	INV	61204	2.41	11/03/2003
6628-21367	04/03/2003	5	5	1759	11/03/2003	Qhcks		1.5	0.01	04/03/2003	INV	61205	2.43	11/03/2003
6628-22635	10/04/2006	4.5	4.5			Qhcks		1.5			INV	116767	3.1	10/04/2006
6628-22636	10/04/2006	4.5	4.5			Qhcks		1.5			INV	116768	2.91	10/04/2006
6628-22637	10/04/2006	4	4			Qhcks		1			INV	116766	2.25	10/04/2006
6628-23273	07/11/2007	4	4	650	20/11/2007	Qhck		1			INV	138279	2.71	07/11/2007
6628-25321	17/02/2010	4	4	1019	08/11/2018	Qhck		1			INV	185660	2.53	05/11/2018
6628-25322	16/02/2010	4	4	1306	26/02/2010	Qhcks		1			INV	185661	1.98	05/12/2017
6628-25331	16/02/2010	4	4	249	08/11/2018	Qhcks		1			INV	187259	1.81	05/11/2018
6628-30087	01/02/2019	4.5	4.5	1180	11/04/2019	Qhcks	OPR				INV	339288	2.34	10/07/2019
6628-30088	01/02/2019	4.5	4.5	606	11/04/2019	Qhcks					INV	339289	2.41	10/07/2019
6628-30089	01/02/2019	4.5	4.5	1127	11/04/2019	Qhcks					INV	339290	2.74	10/07/2019
6628-30090	07/02/2019	4.5	4.5	928	11/04/2019	Qhcks					INV	339291	2.61	10/07/2019
6628-30185	01/04/2019	4.5	4.5	459	11/04/2019	Qhcks					INV	340202	2.27	10/07/2019
6628-30186	01/04/2019	4.5	4.5	1660	11/04/2019	Qhcks					INV	340203	2.4	10/07/2019
6628-30187	01/04/2019	4.5	4.5	805	11/04/2019	Qhcks					INV	340204	2.42	10/07/2019
6628-30188	02/04/2019	4.5	4.5	673	11/04/2019	Qhcks					INV	340206	2.46	10/07/2019
6628-30189	01/04/2019	4.5	4.5	1391	11/04/2019	Qhcks					INV	340205	2.43	10/07/2019
6628-30190	02/04/2019	4.5	4.5	1479	11/04/2019	Qhcks					INV	340207	2.16	10/07/2019
6628-30191	02/04/2019	4.5	4.5	1415	11/04/2019	Qhcks					INV	340208	2.54	10/07/2019
6628-30527	11/10/2019	4.5	4.5				DRY				INV	351376		11/10/2019
6628-30528	11/10/2019	4.5	4.5				DRY				INV	351378		11/10/2019
6628-30530	10/10/2019	4.5	4.5				DRY				INV	351379		10/10/2019
6628-30531	10/10/2019	4.5	4.5				DRY				INV	351380		10/10/2019
6628-30532	10/10/2019	4.5	4.5				DRY				INV	351381		10/10/2019
6628-30533	11/10/2019	4.5	4.5				DRY				INV	351375		11/10/2019
6628-30644	13/02/2020	4.5	4.5				DRY				INV	359387		13/02/2020
6628-30650	11/12/2019	4.5	4.5				DRY				INV	358007		11/12/2019
6628-30652	11/12/2019	4.5	4.5				DRY				INV	358005		11/12/2019
6628-30653	11/02/2020	4.5	4.5				DRY				INV	358002		11/02/2020
6628-30656	11/12/2019	4.5	4.5				DRY				INV	358001		11/12/2019

Government of South Australia

WaterConnect

Circle Centre -34.818182,138.501802, Radius 0.2km



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Appendix B

Monitoring Wells Log

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

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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													

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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													

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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														

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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													

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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													

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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

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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													

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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													

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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													

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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													

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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													

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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													Screen
	Hollow Flight Auger												
4					4.50			End of borehole at 4.50 metres. Target Depth					
5													

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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													

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BOREHOLE LOG SHEET

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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													

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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													

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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

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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

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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

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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

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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

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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No.
3319080

Appendix C

Equipment Calibration Certificate

Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **14D101791**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH 7.00		330737	pH 6.99
2. pH 4.00		pH 4.00		330734	pH 3.99
3. ORP		231mV		333082/329762	236.20 mV
4. EC		2.76 mS		329027	2.76mS
5. D.O		0 ppm		10465	0 ppm
6. Temp		25.5		MultiTherm	19

Calibrated by: **Giovanni Pambuan**

Calibration date: **16/04/2021**

Oil / Water Interface Meter

Instrument Geotech Interface Meter (30m)
Serial No. 4095

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	9.3V
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

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

Calibrated by: Anoop Kumar

Calibration date: 14/042021

Appendix D

Groundwater Sampling Records

Groundwater Samples

Client: South Australian Metropolitan Fire Service (MFS)
Project: Groundwater Investigation (April 2021)
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	-127.9	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	31.6	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	149.0	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	76.4	275	23.8	Clear. Low turbidity. No odour. No sheen.
		29/04/2020	2.320	4.424	0.762	-	-	-	-	-	-	-	Good condition.
		-	-	-	-	-	-	-	-	-	-	-	
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.
		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.

Groundwater Samples

Client: South Australian Metropolitan Fire Service (MFS)
Project: Groundwater Investigation (April 2021)
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	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

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW02

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type: 451
Flow Cell: Y / N
Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ✓

Bore Information
SWL: 2.461 m
Date: 20/04/2021
Ref.datum: —
Bore Depth: 4.404 m
Screen From: — to — m
Logic Check: —
Time: 11:15
Stick Up: — m
Bore Diam.: 50 mm
Well Cap Secure?

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable			
11:15	—	23.5	7.15	1497 SPC	3.79 mg/L	-41.7	—	—	gatic 2/2 bolts Well cap secure
				15.18 C	44 %				Dark brown High turbidity No sheen no odour

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

PV = [(H x π x r²) + 0.2 (h x π x (R² - r²))] x 1000
PV =
=
=
= 1 well volume = 3 well vols

Purge Volumes

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

*Double for gravel pack

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purging and Sampling Record

Bore ID: MW04

Job Information
Client: MES
Project: GME April 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type: 45
Flow Cell: Y / N
Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ✓

Bore Information
SWL: 2.643 m
Date: 20/04/2021
Ref.datum: —
Bore Depth: 4.456 m
Screen From: — to — m
Logic Check: —
Time: 09:15
Stick Up: — m
Bore Diam.: 50 mm
Well Cap Secure?

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH		+/- 3%	+/- 10%	+/- 10 mV	stable		
09:15	—	21.3	7.26	2,084	3.12	104.2	—	—	Gatic
				SPC	mg/L				2/2 bolts
									well cap secure
				1942	34.8				FS01
				C	-1.				Dale brown
									medium - high turbidity
									no sheen
									no odor
									Trace organic matter

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
=
= 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc.
1 x PFAS (2 60ml bottles)
FS01

Purge Volumes

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

*Double for gravel pack

GHD | MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW05

Job Information

Client: MFS
Project: GME Apm 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information

Sample Method: H/S
WQ Meter Type: YSI
Flow Cell: Y / N (Y) Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Int.Fce)
NAPL Check: ✓

Bore Information

SWL: 2.447 m Logic Check: —
Date: 20/04/2021 Time: 11:00
Ref.datum: — Stick Up: — m
Bore Depth: 4.431 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH		+/- 3%	+/- 10%	+/- 10 mV	stable		
11:00	—	23.1	7.4	493.5 SPC	1.37 mg/L	-42.6	—	—	Gatic 2/2 bolts well cap secure
				484.5 C	14.2 %				clear / light grey no sheen no odour low-medium turbidity

Field QA Checks:

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

Well Volume Calculations

r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
=
= 1 well volume = 3 well vols

Purge Volumes

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

*Double for gravel pack

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

1 x PFAS (2 60ml bottles)

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW06

Job Information
Client: MFS
Project: GME Apm 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type: 45i
Flow Cell: Y / N (N) Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Int.Fce)
NAPL Check: ✓

Bore Information
SWL: 2.405 m Logic Check: —
Date: 20/04/2021 Time: 10:25
Ref.datum: — Stick Up: — m
Bore Depth: 4.364 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH		+/- 3%	+/- 10%	+/- 10 mV	stable		
10:25	—	22.1	6.94	4,853 SPC	1.88 mg/L	-39.4	—	—	Gabi 2 1/2 bolts well cap secure.
				4,604 C	18.9 -1.				Dark brown High turbidity No sheen No odour Trace organic matter

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

PV = [(H x π x r²) + 0.2 (h x π x (R² - r²))] x 1000
PV =
=
= 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

Purging and Sampling Record

Bore ID: MW07

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: HS
WQ Meter Type: YSI
Flow Cell: Y / N Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ✓

Bore Information
SWL: 2.460 m Logic Check: —
Date: 20/04/2021 Time: 10:00
Ref.datum: — Stick Up: — m
Bore Depth: 4.344 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable			
10:00	—	22.2	7.1	4,598	1.56	97.3	—	—	Gatic, 2/2 bolts well cap secure
				SPC	mg/L				
				4376	17				
				C	%				Pale brown medium turbidity no sheen no odour
									Surfactant on top of water in HS

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
= = 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW08

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: LS
WQ Meter Type: YSI
Flow Cell: Y / N
Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ✓

Bore Information
SWL: 2.456 m
Date: 19/04/2021
Ref.datum: —
Bore Depth: 4.422 m
Screen From: — to — m
Logic Check: —
Time: 15:10
Stick Up: — m
Bore Diam.: 50 mm
Well Cap Secure? Y

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH		+/- 3%	+/- 10%	+/- 10 mV	stable		
15:10	—	23.7	7.12	1725 SPC	0.79 mg/L	40.9	—	—	Gatic
									well cap secure
				1687 C	9.4 -1.				212 bolts.
									FD01
									clear / pale brown
									low - medium turbidity
									no sheen
									H2S odour
									trace organic matter

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
=
= 1 well volume = 3 well vols

Purge Volumes

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

*Double for gravel pack

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles) FD01

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW09

Job Information
Client: MFS
Project: GME Apm1 2021
Proj. No.: 331980
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type: 451
Flow Cell: Y / N (N) Pump Depth: 7.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Dip)
NAPL Check: ✓

Bore Information
SWL: 2.490 m Logic Check: —
Date: 19/04/2021 Time: 15:30
Ref.datum: — Stick Up: — m
Bore Depth: 4.357 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable			
15:30	—	23.3	7.16	1,540	0.65	-49.8	—	—	gatic
				SPC	mg/L				2/2 bolts
									well cap secure
				1491	7				
				C	1.				Pale brown
									no sheen
									no odour
									medium turbidity

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

PV = [(H x π x r²) + 0.2 (h x π x (R² - r²))] x 1000
PV =
=
= = 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

Purging and Sampling Record

Bore ID: MW10

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 319080
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type:
Flow Cell: Y / N (N) Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Dip)
NAPL Check: ✓

Bore Information
SWL: 2.244 m Logic Check: —
Date: 19/04/2021 Time: 15:40
Ref.datum: — Stick Up: — m
Bore Depth: 4.432 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*			
15:40	—	23.5	6.88	5,373 SPC	0.66 mg/L	-87.2	—	—	gatic 2x2 bolts well cap secure
				5,242 C	7.2 -1.				clear low turbidity trace organic matter no sheen / odour

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
= = 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW11

Job Information
Client: MES
Project: GME Apm1 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type: 451
Flow Cell: Y / N (N) Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Int.Fce)
NAPL Check: ✓

Bore Information
SWL: 2.598 m Logic Check: —
Date: 19/04/2021 Time: 13:01
Ref.datum: Stick Up: — m
Bore Depth: 4.426 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure?

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable			
13:04	—	23.4	7.07	7065	0.79	-31.4	—	—	Gatic
				SPC	mg/L				2/2 bolts
				2011					well cap secure.
				C	8.2				
					-1.				Clear / pale brown
									trace organic matter
									Surfactant on top of
									water in HS.
									No sheen
									H2S odor.
									low-medium turbidity

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
= = 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD | MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW12

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 331980
Sampler: Joel Chance

Sampling Information
Sample Method: HS
WQ Meter Type: YSI
Flow Cell: Y / N (N) Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Dip)
NAPL Check: ✓

Bore Information
SWL: 2.414 m Logic Check: —
Date: 19/04/2021 Time: 12:15
Ref.datum: — Stick Up: — m
Bore Depth: 4.373 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? Y

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*			
12:15	—	22.3	6.72	1760 SPC	1.05 mg/L	-118.1	—		Gatic 2/2 bolts well cap secure.
				1730 C	10.9 %				Pale brown / straw trace organic matter no sheen surfactant on top of water in HS. NO odour.

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
=
= 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW13

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type:
Flow Cell: Y / N (N) Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Dip)
NAPL Check: ✓

Bore Information
SWL: 2.491 m Logic Check: —
Date: 19/04/2021 Time: 12:35
Ref.datum: — Stick Up: — m
Bore Depth: 4.379 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? Y

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable			
12:35	—	24.2	6.94	2,348 SPC	0.42 mg/L	-102.2	—		Gatic
									2/2 bolts
									well cap secure
				2,341 C	4.6 %				well buried with mulch
									Pale brown / straw
									low medium turbidity
									surfactant on top of
									water in H/S
									No sheen
									trace organic matter
									H2S odor.

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
= 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD | MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW14

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type: YSI
Flow Cell: Y / N (N) Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Int.Fce)
NAPL Check: ✓

Bore Information
SWL: 2.268 m Logic Check: —
Date: 19/04/2021 Time: 12:50
Ref.datum: — Stick Up: — m
Bore Depth: 4.372 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? Y

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*			
12:50	—	22.4	6.97	3,314 SPC	1.3 / mg/L	-186.5	—	—	Gatic
									well cap secure 2/2 bolts.
				3,150 C	14.3 / .				
									Clear / straw low turbidity no sheen surfactant on top of water in H/S H2S odour trace organic matter

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
= = 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

Purging and Sampling Record

Bore ID: MW15

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type: YSI
Flow Cell: Y / N (N) Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Dip)
NAPL Check: ✓

Bore Information
SWL: 2.366 m Logic Check: —
Date: 19/04/2021 Time: 13:25
Ref.datum: — Stick Up: — m
Bore Depth: 4.374 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable			
13:25	—	23.4	6.81	3079	0.46	-99.3	—	—	Gatic
				SPC	mg/L				2/2 bolts
									well cap secure
				2986	5.6				
				C	-1.				Clear
									low turbidity
									Surfactant on top of
									water in H/S.
									no sheen
									trace organic matter /
									H2S odour

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
= = 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

Purging and Sampling Record

Bore ID: MW16.

Job Information

Client: MFS
Project: GME April 2021
Proj. No.: 331980
Sampler: Joel Chance

Sampling Information

Sample Method: H/S
WQ Meter Type: 451
Flow Cell: Y / N
Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ✓

Bore Information

SWL: 2.216 m
Date: 19/04/2021
Ref.datum: —
Bore Depth: 4.373 m
Screen From: — to — m
Logic Check: —
Time: 15:00
Stick Up: — m
Bore Diam.: 50 mm
Well Cap Secure? Y

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH		+/- 3%	+/- 10%	+/- 10 mV	stable		
15:00	—	21.9	7.09	3151	1.63	77.8	—	—	Gatic
				SPC	mg/L				2/2 bolts
									well cap secure
				2964	17.8				
				C	1.				clear / pale brown
									low turbidity
									trace organic matter
									No Sheen /
									H2S odour.

Field QA Checks:

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

Well Volume Calculations

r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$

PV =
=
=

= 1 well volume = 3 well vols

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

1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD | MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW17

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 331980
Sampler: Joel Chance

Sampling Information
Sample Method: HS
WQ Meter Type: 451
Flow Cell: Y / N (N) Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Dip)
NAPL Check: ✓

Bore Information
SWL: 2.427 m Logic Check: —
Date: 19/04/2021 Time: 14:38
Ref.datum: — Stick Up: — m
Bore Depth: 4.377 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure?

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable			
14:38	—	22.4	7.10	2,289 mg/L	0.68 mg/L	-69.3	—	—	gatic 2/2 bolts well cap secure
				2,176 C	9				clear / pale brown trace organic matter No sheen low - medium turbidity. H2S odour.

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
=
= 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD | MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW18

Job Information
Client: MES
Project: GME Apm 2021
Proj. No.: 3319980
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type: 451
Flow Cell: Y / N Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ✓

Bore Information
SWL: 2.383 m Logic Check: —
Date: 20/04/2021 Time: 09:45
Ref.datum: — Stick Up: — m
Bore Depth: 4.364 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-		+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable		
09:45	—	22.2	7.63	613.5	2.16	39.8	—	—	Gatic
				SPC	mg/L				2/2 bolts
									well cap secure.
				198.6	23.2				
				C	-1.				Pale brown
									low - medium turbidity
									no sheen
									no odour.

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
=
= 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

Purging and Sampling Record

Bore ID: MW19

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type: 451
Flow Cell: Y / N Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ✓

Bore Information
SWL: 2.465 m Logic Check: —
Date: 19/04/2021 Time: 14:20
Ref.datum: — Stick Up: — m
Bore Depth: 4.449 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure?

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable			
14:20	—	23	7.11	3809	0.6	-91.2	—	—	Gatic
				SPC	mg/L				2 12 bolts
									Well cap secure.
				3664	6.1				
				C	-1.				Pale brown
									medium turbidity
									no sheen
									no odour.

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
= = 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD | MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW20

Job Information
Client: MFS
Project: GME Apm 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: HS
WQ Meter Type:
Flow Cell: Y / N (N) Pump Depth: 3 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Dip)
NAPL Check: ✓

Bore Information
SWL: 2.031 m Logic Check: —
Date: 19/04/2021 Time: 12:00
Ref.datum: — Stick Up: — m
Bore Depth: 4.447 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH		+/- 3%	+/- 10%	+/- 10 mV	stable		
12:00	—	21.9	7.04	1,356 (SPC)	0.86 mg/L	-56.6	—		Gatic 2/2 bolts well cap secure
				1,275 C	9.3 T.				clear / pale brown low - medium turbidity no sheen no odour trace organic matter

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

PV = [(H x π x r²) + 0.2 (h x π x (R² - r²))] x 1000
PV =
=
= 1 well volume = 3 well vols

Purge Volumes

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

*Double for gravel pack

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW2

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 31908O
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type: 451
Flow Cell: Y / N
Pump Depth: 2.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ✓

Bore Information
SWL: 1.616 m
Date: 19/04/2021
Ref.datum: —
Bore Depth: 4.441 m
Screen From: — to — m
Logic Check: —
Time: 11:24
Stick Up: — m
Bore Diam.: 50 mm
Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH		+/- 3%	+/- 10%	+/- 10 mV	stable		
11.24	—	24.4	7.03	1443 (SPC)	0.52 mg/L	-90.3			Gatic 2/2 bolts well cap secure
				1427 (C)	6.1 1.				Clear low turbidity no sheen H2S odour.

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
= 1 well volume = 3 well vols

Purge Volumes

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

*Double for gravel pack

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW22

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: F/S
WQ Meter Type: 45i
Flow Cell: Y / N
Pump Depth: 3.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ✓

Bore Information
SWL: 1.501 m
Date: 19/04/2021
Ref.datum: —
Bore Depth: 4.457 m
Screen From: — to — m
Logic Check: —
Time: 11:11
Stick Up: — m
Bore Diam.: 50 mm
Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable			
11:11	—	24.8	7.21	855 (SPC)	0.43 mg/L	-80.3			Gatic 2/2 bolts well cap secure.
				854 (C)	3.21				Pale brown / orange Medium - High turbidity No sheen
									Surfectant on top of water in 1-4.

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
=
= 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW23

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type:
Flow Cell: Y / N (N) Pump Depth: 2.5 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Int.Fce)
NAPL Check: ✓

Bore Information
SWL: 1.637 m Logic Check: —
Date: 19/04/2021 Time: 11:45
Ref.datum: — Stick Up: — m
Bore Depth: 4.463 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? Y

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH		+/- 3%	+/- 10%	+/- 10 mV	stable		
11:45	—	22.6	7.18	820	0.82	-23.9			Gatic
				SPC	mg/L				2/2 bolts
									well cap secure.
				785	9				Clear
				C	%				low turbidity
									no sheen
									Faint H2S odour.

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
= 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW24

Job Information
Client: MFS
Project: GME Apm1 2021
Proj. No.: 331980
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type:
Flow Cell: Y / N (N) Pump Depth: 35 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge (Fox)
NAPL Check: ✓

Bore Information
SWL: 2.376 m Logic Check: —
Date: 19/04/2021 Time: 10:41
Ref.datum: — Stick Up: — m
Bore Depth: 4.447 m Bore Diam.: 50 mm
Screen From: — to — m Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable			
10:41		22.6	6.62	2,595 (SPC)	1.05 mg/L	-105.6			Gatic 2/2 bolts well cap secure
				2,476 (C)	11.1 %				Dark brown low-medium turbidity trace organic matter no sheen faint H2S odor.

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$
PV =
=
= 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD | MANAGEMENT ENGINEERING ENVIRONMENT

Purging and Sampling Record

Bore ID: MW26

Job Information
Client: MFS
Project: GME April 2021
Proj. No.: 3319080
Sampler: Joel Chance

Sampling Information
Sample Method: H/S
WQ Meter Type: YSI
Flow Cell: Y / N
Pump Depth: 3.7 m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
NAPL Check: ✓

Bore Information
SWL: 2.009 m
Date: 19/04/2021
Ref.datum: —
Bore Depth: 4.436 m
Screen From: — to — m
Logic Check: —
Time: 09:58
Stick Up: — m
Bore Diam.: 50 mm
Well Cap Secure? ✓

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable			
09:58		22.4	7.31	471.7 (SPC)	1.05 mg/L	7.3			Gatic
									2/2 bolts
									Well Cap Secure
				447.2 (C)	11.1 %				Dole brown
									trace organic matter
									No sheen
									Faint H2S odour
									Medium turbidity

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

Well Volume Calculations
r = 0.025m H =
R = 0.05 m h =
H = height of water col (m) R = Bore Radius
h = thickness of sat. filterpack (m) r = PVC radius (m)

$PV = [(H \times \pi \times r^2) + 0.2 (h \times \pi \times (R^2 - r^2))] \times 1000$

PV =
=
=
= 1 well volume = 3 well vols

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
1 x PFAS (2 60ml bottles)

Purge Volumes

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

*Double for gravel pack

GHD

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180 Lonsdale Street Melbourne Vic 3000

Groundwater Gauging Sheet

Client: MFS	WL Meter Type: Dip / Fox / Int.Fce / Gge
Project: April 2021 GME	Date: 19-04-2021
Job No.: 33190080	Time: 08:00 - 09:30
Location: Largs North	Sampler: Joel Chance

Location / Bore ID	SWL (mbTOC)	LNAPL level (mbTOC)	Total Depth (mbTOC)	Thickness of NAPL (mm)	Stick up (m)	Comment
MW09	2.490		4.357			
MW10	2.244		4.432			
MW13	2.491		4.379			
MW11	2.598		4.426			
MW15	2.366		4.374			
MW12	2.414		4.373			
MW14	2.288		4.372			
MW17	2.427		4.377			
MW19	2.465		4.449			
MW16	2.216		4.373			
MW18	2.383		4.364			
MW02	2.461		4.404			
MW20	2.031		4.447			
MW04	2.643		4.456			
MW05	2.447		4.431			
MW21	1.616		4.441			
MW07	2.460		4.394			
MW06	2.405		4.364			
MW22	1.501		4.457			
MW08	2.456		4.422			
MW23	1.637		4.463			
MW24	2.376		4.447			
MW26	2.009		4.436			

Appendix E

Chain of Custody Documentation and Laboratory Reports

CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
✆ 02 9910 6200 | ✉ sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
✆ 08 9317 2505 | ✉ lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
✆ 03 9763 2500 | ✉ melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
✆ 08 7087 6800 | ✉ adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
✆ 07 3266 9532 | ✉ brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
✆ 08 8967 1201 | ✉ darwin@envirolab.com.au

Client: GHD			Client Project Name/Number/Site etc (ie report title): 3319080
Contact Person: Dilara Valiff			
Project Mgr: Dilara Valiff			PO No.: 3319080
Sampler: Vera Biermann			Envirolab Quote No. :
Address: Level 4, 211 Victoria Square, Adelaide SA 5000			Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone:	(08) 81116572	Mob: 420959236	Additional report format: esdat
Email:	GHDLabReports@ghd.com Dilara.valiff@ghd.com vera.biermann@ghd.com		Lab Comments:

Sample Information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	PFAS Short Screen (Std LOR)	Hold													Provide as much information about the sample as you can
1	MW01		14/05/21	Water	X														
2	FD02		14/05/21	Water	X														
3	FS02		14/05/21	Water		X													please hold

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

Job No: 25896
Date Received: 17/5
Time Received: 8:45am
Received By: CS
Temp: Cool/Ambient 13.2°C
Cooling: Ice/Icepack
Security: Intact/Broken/None

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): GHD Pty Ltd		Received by (Company): ES	Lab Use Only
Print Name:	Vera Biermann	Print Name: Alex Stanton	Job number: 25896 / Cooling: Ice / Ice pack / None
Date & Time:	14/05/21	Date & Time: 14/5/21 @	Temperature: 13.2 / Security seal: Intact / Broken / None
Signature:		Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

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

CERTIFICATE OF ANALYSIS 25896

Client Details

Client	GHD SA
Attention	Dilara Valiff
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**3319080**
Number of Samples	3 Water
Date samples received	17/05/2021
Date completed instructions received	17/05/2021

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	21/05/2021
Date of Issue	20/05/2021

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Results Approved By
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Water Short			
Our Reference		25896-1	25896-2
Your Reference	UNITS	MW01	FD02
Date Sampled		14/05/2021	14/05/2021
Type of sample		Water	Water
Date prepared	-	19/05/2021	19/05/2021
Date analysed	-	19/05/2021	19/05/2021
Perfluorohexanesulfonic acid PFHxS	µg/L	0.24	0.25
Perfluorooctanesulfonic acid PFOS	µg/L	0.05	0.05
Perfluorooctanoic acid PFOA	µg/L	0.02	0.02
6:2 FTS	µg/L	<0.01	<0.01
8:2 FTS	µg/L	<0.02	<0.02
Surrogate $^{13}C_8$ PFOS	%	95	96
Surrogate $^{13}C_2$ PFOA	%	98	99
Extracted ISTD $^{18}O_2$ PFHxS	%	108	105
Extracted ISTD $^{13}C_4$ PFOS	%	99	95
Extracted ISTD $^{13}C_4$ PFOA	%	107	107
Extracted ISTD $^{13}C_2$ 6:2FTS	%	190	174
Extracted ISTD $^{13}C_2$ 8:2FTS	%	95	100
Total Positive PFHxS & PFOS	µg/L	0.29	0.30
Total Positive PFOS & PFOA	µg/L	0.07	0.07
Total Positive PFAS	µg/L	0.31	0.32

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. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 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 Water Short					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	87	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	89	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	97	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	89	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	104	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	103	[NT]
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	85	[NT]	[NT]	[NT]	[NT]	89	[NT]
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	93	[NT]	[NT]	[NT]	[NT]	97	[NT]
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	145	[NT]	[NT]	[NT]	[NT]	158	[NT]
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	90	[NT]	[NT]	[NT]	[NT]	86	[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.

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

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

Envirolab Services Pty Ltd
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customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 267377

Client Details

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

Sample Details

Your Reference	**3319080**
Number of Samples	27 Water
Date samples received	22/04/2021
Date completed instructions received	22/04/2021

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	29/04/2021
Date of Issue	28/04/2021

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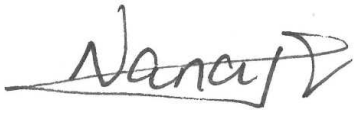
Results Approved By
Josh Williams, LC Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

PFAS in Waters Short						
Our Reference		267377-1	267377-2	267377-3	267377-4	267377-5
Your Reference	UNITS	MW02	MW04	MW05	MW06	MW07
Date Sampled		-	-	-	-	-
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Perfluorohexanesulfonic acid - PFHxS	µg/L	4.5	15	0.61	0.06	0.01
Perfluorooctanesulfonic acid PFOS	µg/L	7.1	67	0.05	0.05	0.02
Perfluorooctanoic acid PFOA	µg/L	0.08	0.83	0.13	0.01	<0.01
6:2 FTS	µg/L	<0.01	1.6	<0.01	<0.01	<0.01
8:2 FTS	µg/L	<0.02	0.37	<0.02	<0.02	<0.02
Surrogate $^{13}C_8$ *PFOS*	%	88	100	94	88	92
Surrogate $^{13}C_2$ *PFOA*	%	82	83	83	84	83
Extracted ISTD $^{18}O_2$ *PFHxS*	%	99	103	101	96	101
Extracted ISTD $^{13}C_4$ *PFOS*	%	93	98	92	94	101
Extracted ISTD $^{13}C_4$ *PFOA*	%	110	111	111	103	112
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	112	105	113	107	110
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	122	121	119	104	125
Total Positive PFHxS & PFOS	µg/L	12	82	0.66	0.11	0.03
Total Positive PFOA & PFOS	µg/L	7.2	68	0.18	0.07	0.02
Total Positive PFAS	µg/L	12	85	0.79	0.13	0.03

PFAS in Waters Short						
Our Reference		267377-6	267377-7	267377-8	267377-9	267377-10
Your Reference	UNITS	MW08	MW09	MW10	MW11	MW12
Date Sampled		-	-	-	-	-
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.40	0.89	0.08	0.04	0.19
Perfluorooctanesulfonic acid PFOS	µg/L	0.27	0.35	0.04	<0.01	0.33
Perfluorooctanoic acid PFOA	µg/L	0.05	0.04	<0.01	<0.01	0.03
6:2 FTS	µg/L	<0.01	0.02	<0.01	<0.01	<0.01
8:2 FTS	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Surrogate $^{13}C_8$ *PFOS*	%	90	89	95	98	93
Surrogate $^{13}C_2$ *PFOA*	%	84	83	82	84	83
Extracted ISTD $^{18}O_2$ *PFHxS*	%	105	102	99	103	102
Extracted ISTD $^{13}C_4$ *PFOS*	%	100	94	90	90	93
Extracted ISTD $^{13}C_4$ *PFOA*	%	114	112	108	111	111
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	108	109	100	111	111
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	125	116	111	135	131
Total Positive PFHxS & PFOS	µg/L	0.67	1.2	0.12	0.04	0.52
Total Positive PFOA & PFOS	µg/L	0.32	0.39	0.04	<0.01	0.35
Total Positive PFAS	µg/L	0.72	1.3	0.12	0.04	0.55

PFAS in Waters Short						
Our Reference		267377-11	267377-12	267377-13	267377-14	267377-15
Your Reference	UNITS	MW13	MW14	MW15	MW16	MW17
Date Sampled		-	-	-	-	-
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.08	0.13	<0.01	<0.01	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01	0.01	<0.01	<0.01	<0.01
6:2 FTS	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
8:2 FTS	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Surrogate $^{13}C_8$ *PFOS*	%	92	87	91	94	89
Surrogate $^{13}C_2$ *PFOA*	%	81	80	80	82	80
Extracted ISTD $^{18}O_2$ *PFHxS*	%	100	103	108	100	101
Extracted ISTD $^{13}C_4$ *PFOS*	%	95	97	94	89	96
Extracted ISTD $^{13}C_4$ *PFOA*	%	109	114	117	108	113
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	116	107	119	103	105
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	141	133	133	116	117
Total Positive PFHxS & PFOS	µg/L	0.08	0.13	<0.01	<0.01	<0.01
Total Positive PFOA & PFOS	µg/L	<0.01	0.01	<0.01	<0.01	<0.01
Total Positive PFAS	µg/L	0.08	0.14	<0.01	<0.01	<0.01

PFAS in Waters Short						
Our Reference		267377-16	267377-17	267377-18	267377-19	267377-20
Your Reference	UNITS	MW18	MW19	MW20	MW21	MW22
Date Sampled		-	-	-	-	-
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Perfluorohexanesulfonic acid - PFHxS	µg/L	<0.01	<0.01	0.17	0.04	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	0.14	<0.01	0.08	<0.01	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01	<0.01	0.01	<0.01	<0.01
6:2 FTS	µg/L	<0.01	<0.01	<0.01	<0.01	0.01
8:2 FTS	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Surrogate $^{13}C_8$ *PFOS*	%	95	89	91	90	90
Surrogate $^{13}C_2$ *PFOA*	%	80	83	82	80	83
Extracted ISTD $^{18}O_2$ *PFHxS*	%	105	100	98	101	100
Extracted ISTD $^{13}C_4$ *PFOS*	%	93	93	93	93	96
Extracted ISTD $^{13}C_4$ *PFOA*	%	114	107	108	108	112
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	106	100	109	102	109
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	108	113	113	115	124
Total Positive PFHxS & PFOS	µg/L	0.14	<0.01	0.24	0.04	<0.01
Total Positive PFOA & PFOS	µg/L	0.14	<0.01	0.09	<0.01	<0.01
Total Positive PFAS	µg/L	0.14	<0.01	0.26	0.04	0.01

PFAS in Waters Short						
Our Reference		267377-21	267377-22	267377-23	267377-24	267377-25
Your Reference	UNITS	MW23	MW24	MW26	RB01	RB02
Date Sampled		-	-	-	19/04/2021	20/04/2021
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.02	<0.01	<0.01	<0.01	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	0.04	0.01	0.01	<0.01	<0.01
Perfluorooctanoic acid PFOA	µg/L	0.01	<0.01	0.02	<0.01	<0.01
6:2 FTS	µg/L	<0.01	<0.01	0.01	<0.01	<0.01
8:2 FTS	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Surrogate $^{13}C_8$ *PFOS*	%	93	96	87	93	98
Surrogate $^{13}C_2$ *PFOA*	%	82	79	81	82	83
Extracted ISTD $^{18}O_2$ *PFHxS*	%	106	109	104	104	101
Extracted ISTD $^{13}C_4$ *PFOS*	%	96	93	101	95	90
Extracted ISTD $^{13}C_4$ *PFOA*	%	115	120	117	115	110
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	116	110	116	108	105
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	143	112	120	109	103
Total Positive PFHxS & PFOS	µg/L	0.06	0.01	0.01	<0.01	<0.01
Total Positive PFOA & PFOS	µg/L	0.06	0.01	0.03	<0.01	<0.01
Total Positive PFAS	µg/L	0.07	0.01	0.04	<0.01	<0.01

PFAS in Waters Short			
Our Reference		267377-26	267377-27
Your Reference	UNITS	FD01	FS01
Date Sampled		19/04/2021	20/04/2021
Type of sample		Water	Water
Date prepared	-	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.40	14
Perfluorooctanesulfonic acid PFOS	µg/L	0.25	60
Perfluorooctanoic acid PFOA	µg/L	0.05	0.78
6:2 FTS	µg/L	<0.01	1.5
8:2 FTS	µg/L	<0.02	0.31
Surrogate $^{13}C_8$ *PFOS*	%	92	96
Surrogate $^{13}C_2$ *PFOA*	%	83	79
Extracted ISTD $^{18}O_2$ *PFHxS*	%	102	108
Extracted ISTD $^{13}C_4$ *PFOS*	%	94	106
Extracted ISTD $^{13}C_4$ *PFOA*	%	110	111
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	107	102
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	117	138
Total Positive PFHxS & PFOS	µg/L	0.65	74
Total Positive PFOA & PFOS	µg/L	0.30	61
Total Positive PFAS	µg/L	0.70	76

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 5.3 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 Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	267377-2
Date prepared	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	23/04/2021
Date analysed	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	23/04/2021
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.01	Org-029	<0.01	1	4.5	4.5	0	108	##
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	1	7.1	7.1	0	104	##
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	1	0.08	0.08	0	104	109
6:2 FTS	µg/L	0.01	Org-029	<0.01	1	<0.01	<0.01	0	106	101
8:2 FTS	µg/L	0.02	Org-029	<0.02	1	<0.02	<0.02	0	118	117
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	93	1	88	91	3	89	91
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	85	1	82	82	0	85	83
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	107	1	99	98	1	99	89
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	94	1	93	91	2	95	61
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	114	1	110	112	2	112	105
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	111	1	112	113	1	106	104
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	110	1	122	128	5	104	120

QUALITY CONTROL: PFAS in Waters Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	267377-22
Date prepared	-			[NT]	11	23/04/2021	23/04/2021		23/04/2021	23/04/2021
Date analysed	-			[NT]	11	23/04/2021	23/04/2021		23/04/2021	23/04/2021
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.01	Org-029	[NT]	11	0.08	0.07	13	105	106
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	[NT]	11	<0.01	<0.01	0	109	112
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	[NT]	11	<0.01	<0.01	0	104	105
6:2 FTS	µg/L	0.01	Org-029	[NT]	11	<0.01	<0.01	0	108	114
8:2 FTS	µg/L	0.02	Org-029	[NT]	11	<0.02	<0.02	0	119	112
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	[NT]	11	92	92	0	90	98
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	[NT]	11	81	84	4	82	80
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	[NT]	11	100	105	5	100	103
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	[NT]	11	95	97	2	93	93
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	[NT]	11	109	113	4	109	114

QUALITY CONTROL: PFAS in Waters Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	267377-22
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	[NT]	11	116	122	5	101	106
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	[NT]	11	141	150	6	96	122

QUALITY CONTROL: PFAS in Waters Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	23/04/2021	23/04/2021		[NT]	[NT]
Date analysed	-			[NT]	21	23/04/2021	23/04/2021		[NT]	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.01	Org-029	[NT]	21	0.02	0.01	67	[NT]	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	[NT]	21	0.04	0.05	22	[NT]	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	[NT]	21	0.01	0.01	0	[NT]	[NT]
6:2 FTS	µg/L	0.01	Org-029	[NT]	21	<0.01	<0.01	0	[NT]	[NT]
8:2 FTS	µg/L	0.02	Org-029	[NT]	21	<0.02	<0.02	0	[NT]	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	[NT]	21	93	91	2	[NT]	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	[NT]	21	82	83	1	[NT]	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	[NT]	21	106	105	1	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	[NT]	21	96	102	6	[NT]	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	[NT]	21	115	117	2	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	[NT]	21	116	112	4	[NT]	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	[NT]	21	143	143	0	[NT]	[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.

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

Percent recovery is not possible to report due to the high concentration of the analytes in the samples. However an acceptable recovery was obtained for the LCS.

CHAIN OF CUSTODY FORM - Client

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Darwin Office - Envirolab Services
Unit 7, 17 Willes Rd, Berrimah, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title):
Contact Person: Joel Chance	
Project Mgr: Dilara Vliff	PO No.: 3319080
Sampler: Joel Chance	Envirolab Quote No.: 19SA002
Address: Level 4, 211 Victoria Square. Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: Mob: 439277657	Additional report format: esdat
Email: dilara.valiff@ghd.com	Lab Comments:

Sample Information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	PFAS Short - Suite														Provide as much information about the sample as you can
1	MW02	N/A		Water	X														
2	MW04	N/A		Water	X														
3	MW05	N/A		Water	X														
4	MW06	N/A		Water	X														
5	MW07	N/A		Water	X														
6	MW08	N/A		Water	X														
7	MW09	N/A		Water	X														
8	MW10	N/A		Water	X														
9	MW11	N/A		Water	X														
10	MW12	N/A		Water	X														
11	MW13	N/A		Water	X														
12	MW14	N/A		Water	X														
13	MW15	N/A		Water	X														
14	MW16	N/A		Water	X														
15	MW17	N/A		Water	X														
16	MW18	N/A		Water	X														
17	MW19	N/A		Water	X														
18	MW20	N/A		Water	X														
19	MW21	N/A		Water	X														
20	MW22	N/A		Water	X														
21	MW23	N/A		Water	X														
22	MW24	N/A		Water	X														
23	MW26	N/A		Water	X														
24	RB01	N/A	19/04/2021	Water	X														
25	RB02	N/A	20/04/2021	Water	X														
26	FD01	N/A	19/04/2021	Water	X														
27	FS01	N/A	20/04/2021	Water	X														

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company):	Received by (Company): ELS-SYD	Lab Use Only	
Print Name:	Print Name: V. VEGA	Job number: 207377	Cooling: Ice / Ice pack / None
Date & Time:	Date & Time: 22/4/21 @ 1215	Temperature: 17.C	Security Seal: Intact / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2116425**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: DILARA VALIFF	Contact	: Angus Harding
Address	: 2/11 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	: ----	Date Samples Received	: 03-May-2021 15:30
Order number	: 3319080	Date Analysis Commenced	: 10-May-2021
C-O-C number	: ----	Issue Date	: 11-May-2021 14:00
Sampler	: JOEL CHANCE		
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 Contact for details.

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

- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- 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	20-Apr-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2116425-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**5.81**	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**20.2**	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**78.8**	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		**1.4**	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**4.26**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**13.5**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**1.14**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**1.01**	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**1.74**	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		**0.29**	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**99.0**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**128**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**88.1**	----	----	----	----
13C8-PFOA	----	0.02	%		**99.5**	----	----	----	----

Surrogate Control Limits

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

CHAIN OF CUSTODY FORM - Client

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Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title):
Contact Person: Joel Chance	
Project Mgr: Dilara Vliff	PO No.: 3319080
Sampler: Joel Chance	Envirolab Quote No.: 19SA002
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: Mob: 439277657	Additional report format: esdat
Email: dilara.valiff@ghd.com	Lab Comments:

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	PFAS Short - Suite														Provide as much information about the sample as you can
1	MW02	N/A		Water	X														
2	MW04	N/A		Water	X														
3	MW05	N/A		Water	X														
4	MW06	N/A		Water	X														
5	MW07	N/A		Water	X														
6	MW08	N/A		Water	X														
7	MW09	N/A		Water	X														
8	MW10	N/A		Water	X														
9	MW11	N/A		Water	X														
10	MW12	N/A		Water	X														
11	MW13	N/A		Water	X														
12	MW14	N/A		Water	X														
13	MW15	N/A		Water	X														
14	MW16	N/A		Water	X														
15	MW17	N/A		Water	X														
16	MW18	N/A		Water	X														
17	MW19	N/A		Water	X														
18	MW20	N/A		Water	X														
19	MW21	N/A		Water	X														
20	MW22	N/A		Water	X														
21	MW23	N/A		Water	X														
22	MW24	N/A		Water	X														
23	MW26	N/A		Water	X														
24	RB01	N/A	19/04/2021	Water	X														
25	RB02	N/A	20/04/2021	Water	X														
26	FD01	N/A	19/04/2021	Water	X														
27	RS01	N/A	20/04/2021	Water	X														

Environmental Division
Sydney
Work Order Reference
ES2116425

Telephone : +61-2-8784 8555

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): EIS SYD	Received by (Company): ELS-SYD	Lab Use Only	
Print Name: Christine	Print Name: V. VEGA	Job number: 207377	Cooling: Ice / Ice pack / None
Date & Time: 03/04/21 12:45	Date & Time: 22/4/21 @ 1215	Temperature: 17.0	Security seal: Intact / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Rec-Soil 31/5/21 1600 9.8C

Login

From: Simon Song
Sent: Friday, 30 April 2021 1:57 PM
To: Login
Cc: Samplereceipt; Alex Stenta
Subject: FW: 267377 - FS01
Attachments: 267377-COC.pdf

Can you pls send FS01 267377-27 to ALS, inter lab

From: Alex Stenta <astenta@envirolab.com.au>
Sent: Friday, 30 April 2021 1:15 PM
To: Simon Song <SSong@envirolab.com.au>
Cc: Adelaide <adelaide@envirolab.com.au>; Samplereceipt Distribution <SamplereceiptDistribution@envirolab.com.au>
Subject: RE: 267377 - FS01

Hi Simon,

Yes he forgot to put the request on the COC when submitting the samples.

He was hoping that we still have the second bottle available for FS01 to forward to ALS.

I believe that there were 2 bottles received for that sample – hopefully we only used one bottle for our analysis...

Kind Regards,

Alex Stenta | BD Manager SA | Envirolab Services

Great Science. Great Service.

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

Follow us on: LinkedIn | Facebook | Twitter

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

From: Simon Song <SSong@envirolab.com.au>
Sent: Friday, 30 April 2021 12:28 PM
To: Alex Stenta <astenta@envirolab.com.au>; Samplereceipt Distribution <SamplereceiptDistribution@envirolab.com.au>
Cc: Adelaide <adelaide@envirolab.com.au>
Subject: RE: 267377 - FS01

No, we did here, no instruction on the CCO

Relinquished by Christine ECS YP
03/05/21 1245.

Kind Regards,

Simon Song | Senior Customer Service | Envirolab Services

Appendix F

Quality Assurance and Quality Control

Data quality objectives and quality assurance / quality control

J.1 Data quality objectives

The data quality objectives (DQOs) and investigation strategy were developed using the methodology discussed in NEPM Schedule B2 *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 Data Quality Objectives (DQOs) establish a framework for contamination investigations which incorporates a seven stepped continuum that defines the problem at the site. A series of stages then optimises the design of the investigation. 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.

J.1.1 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 and February 2020.

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-site users and off-site properties and users. 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 of the site. 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:

- To determine the nature and off-site extent of groundwater PFAS impact to the north and north west of the site associated with historical site activities

- Identify and assess any 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.

J.1.2 Step 2: Identify the principal study question

The Environmental Investigation was based on the objectives listed in Section 1.2 of the report.

J.1.3 Step 3: Inputs to the decision

The following inputs were required for the decision:

Quantitative and qualitative data gained through intrusive sampling, analytical works and observations during intrusive investigations.

J.1.4 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 study are 22 to 29 April 2020.

J.1.5 Step 5: Decision rules

Groundwater analytical data was assessed against the criteria adopted from relevant guidance as discussed in Section 5 of the report.

J.1.6 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 were adopted in accordance with the appropriate guidance from the AS4482.1-2005, which includes appropriate indicators of data quality [data quality indicators (DQIs) used to assess QA/QC and GHD's Standard Field Operating Procedures].

To assess the usability of the data prior to making decisions, the data was assessed against pre-determined DQIs. The DQIs including precision, accuracy, representativeness, comparability and completeness, were reviewed at the completion of the 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 J-1.

- Precision - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques was assessed by calculating the Relative Percentage Difference (RPD) of duplicate samples.
- Accuracy - measures the bias in a measurement system. The accuracy of the laboratory data 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 was assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.

- Representativeness - expresses the degree to which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness was achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy
- Comparability - expresses the confidence with which one data set can be compared with another. This was achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analytical laboratories used consistent analysis techniques and reporting methods
- Completeness - is defined as the percentage of measurements made which are judged to be valid measurements.

Table J-1 Summary of quality assurance / quality control criteria

Data quality indicator	Frequency	Data quality acceptance criteria
Precision		
Duplicates (Intra-Laboratory) Duplicates (Inter-Laboratory)	1 / 20 samples 1 / 20 samples	Field duplicates should have a RPD of 30% - 50% of mean concentration of analyte, however, this variation can be expected to be higher for organic analyses than for inorganics, and for low concentrations of analytes.
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 Control Spike		Dynamic Limits varying on previous laboratory data.
Laboratory Spike (Surrogate and Matrix)		Percent recovery is used to assess spiked samples and surrogate standards. Percent recovery is dependent on the type of analyte tested, the concentrations of analytes, and the sample matrix. For matrix spikes Eurofins adopts a matrix spike recovery range of 70-130%. For surrogate spikes Eurofins adopts static limits that vary dependant on matrix and surrogate compounds.
Laboratory Duplicates	One sample per batch of 10 samples or fewer	Laboratory duplicate samples should have RPD's within the 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%.
Representativeness		
Sampling appropriate for media and analytes Samples extracted and analysed within holding times	All samples All samples	- Organics (14 days) Inorganics (6 months)

Data quality indicator	Frequency	Data quality acceptance criteria
LORs appropriate and consistent	All samples	All samples
Comparability		
Consistent field conditions, sampling staff and laboratory analysis	All samples	All samples
Standard operating procedures for sample collection & handling	All samples	All samples
Standard analytical methods used for all analyses	All samples	All samples
Completeness		
Sample description and COCs completed and appropriate	All Samples	All Samples
Appropriate documentation	All Samples	All Samples
Satisfactory frequency and result for QA/QC samples	All QA/QC samples	-
Data from critical samples is considered valid	-	Critical samples valid
Notes: COC: Chain of custody LOR: Limit of reporting QA/QC: Quality assurance / quality control RPD: Relative percentage difference (see Table J-3)		

J.1.7 Step 7: Optimisation of the data collection process

To optimise the design of the Environmental Investigation, a sampling and analytical program was undertaken. 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. Corrective actions were implemented as required.

J.2 Field QA/QC

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

- Collection of QC Samples
- Use of standard sampling procedures
- Use of standard field sampling forms included in the PLog Data Collection Software on field tablets and Chain of Custody (COC) forms
- Documenting the calibration and use of field equipment.

All field works were conducted by appropriately qualified and trained GHD environmental scientists in accordance with GHD's *Standard Field Operating Procedures* (SFOP).

J.2.1 QA/QC sampling

Field QA/QC samples were collected and analysed. Field QC sampling was conducted in reference to AS 4482.1: 2005 and NEPM 2013 Schedule B3 requirements and included the analyses of the following types of samples included in Table J-2.

Table J-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.
Rinsate	A sample of analyte free water poured over or through decontaminated field sampling equipment prior to the collection of environmental samples to assess the adequacy of the decontamination process.

GHD adopted the AS4482.1:2005 acceptance criteria of 30% and 50% relative percentage difference (RPD) for field duplicates of inorganics and organics, respectively. Blind duplicate and split samples should have RPDs less than the criteria in each instance. However it is noted that the criteria will not always be achieved, particularly in heterogeneous materials, or at low analyte concentrations.

GHD consigned all primary groundwater, rinsate and intra-laboratory field duplicate (blind) samples to Envirolab Group for analysis. The analysis of the inter-laboratory duplicate (split) samples, for QC purposes, was completed by MGT Eurofins. The results of the sample analyses have been represented in Figure 4 of the report.

In the instance where one or both samples of a primary sample – duplicate sample pair had concentrations of target analytes less than the laboratory LOR, no quantitative comparison could be carried out and therefore the RPD was undefined. In situations where both sample results for a primary-duplicate pair were less than ten times the laboratory LOR the RPD was calculated but no acceptance criterion was applied.

Duplicate, split and rinsate sample results and Relative Percentage Difference (RPD) calculations are presented in Table 5 and Table 6 in the Analytical Results Tables at the end of the report.

J.2.2 Sample handling and preservation

The sample collection methodology, including sample handling and preservation, is documented in Section 6 of the report.

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 on a daily basis.

All primary and intra laboratory duplicate samples were analysed within the specified holding times.

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

J.2.3 Chain of custody

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

J.3 Laboratory QA/QC

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

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

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

J.3.1 Laboratory QA/QC procedures

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

Table J-3 Laboratory QC sample details

Laboratory QA/QC sample	Details
Laboratory (Method) Blank	Usually an organic or aqueous solution that is as free as possible of analytes of interest to which is added all the reagents, in the same volume, as used in the preparation and subsequent analysis of the samples. The reagent blank is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample.
Laboratory Control Sample	A reference standard of known concentration is analysed along with a batch of samples. The Laboratory Control Sample provides an indication of the analytical accuracy and the precision of the test method and is used for inorganic analyses.
Laboratory Spike	An authentic field sample is 'spiked' by adding an aliquot of known concentration of the target analyte(s) prior to sample extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques. Spiked samples will be analysed for each batch where samples are analysed for organic chemicals of concern.
Surrogate Samples	These are organic compounds which are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time), but which are not normally found in environmental samples. These surrogate compounds are 'spiked' into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques prior to sample extraction. Surrogate Standard / Spikes provide a means of checking that no gross errors have occurred during any stage of the test method leading to significant analyte loss.

Laboratory Duplicates	The analytical laboratory collects duplicate sub samples from one sample submitted for analytical testing at a rate equivalent to one in twenty samples per analytical batch, or one sample per batch if less than twenty samples are analysed in a batch. A laboratory duplicate provides data on the analytical precision and reproducibility of the test result. The precision of analysis performed by the laboratory is determined by the calculation of the relative percent difference (RPD). The RPD is calculated based on a comparison of an intra-laboratory split of the sample material with results representing the percent difference between the two sample concentrations for a specific contaminant. The RPD is calculated using the following formula: $RPD(\%) = \frac{\lvert C_o - C_d \rvert}{C_o + C_d} \times 200$ Where Co = Analyte concentration of the original sample Cd = Analyte concentration of the duplicate sample

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

J.4 Field QC Results

The field QC results analysis below considered the groundwater samples collected as part of this environmental investigation.

J.4.1 Duplicate Samples

A total of twenty-three (23) primary groundwater samples were collected, submitted and analysed as part of the environmental investigation.

One (1) field duplicate (intra-laboratory) and one (1) split (inter-laboratory) sample were collected and analysed as part of the investigation. The target frequency for analysis of field QC samples was two (2) replicate samples in 20 primary samples (10%). In this instance, this frequency was not achieved for analysis and collection.

The collected field QC samples are listed in Table J-4. All calculated RPDs were within the acceptable range. There were no RPD exceedances. Primary and duplicate sample results with calculated RPDs are presented in Table 5 at the end of this report.

Table J-4 Analysed field QC samples for groundwater

QA sample	QA/QC sample	Primary sample
QA01	Intra-laboratory	MW20
QA02	Inter-laboratory	MW20

J.4.3 Rinsate

Two (2) rinsate samples were 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 at the end of the report.

J.5 Laboratory program

The NATA certified laboratories utilised for this assessment (Envirolab Group and MGT Eurofins) 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.

J.6 Overall Assessment of Data Quality

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

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