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Manildra – Port Kembla Bulk Liquid Terminal Bulk Liquid Terminal

Groundwater Assessment and Management Report

Client Reference No. 30013038-R06
Prepared for: Manildra Group Pty Ltd
19 August 2022

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This report is confidential and is provided solely for the purposes of documenting a Groundwater Assessment and Management Report for Part of Lot 6 DP1236743 and Part of Lot 2 DP 1182823 Foreshore Road, Port Kembla This report is provided pursuant to a Consultancy Agreement between SMEC Australia Pty Limited ("SMEC") and Manildra Group Pty Ltd, under which SMEC undertook to perform a specific and limited task for Manildra Group Pty Ltd. This report is strictly limited to the matters stated in it and subject to the various assumptions, qualifications and limitations in it and does not apply by implication to other matters. SMEC makes no representation that the scope, assumptions, qualifications and exclusions set out in this report will be suitable or sufficient for other purposes nor that the content of the report covers all matters which you may regard as material for your purposes.

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The findings of this this report are the result of methodologies used in accordance with normal practices and standards. We consider that they represent a reasonable interpretation of the general conditions of the Site at the time they were assessed and at the time of writing this report, but under no circumstances, can it be considered that these findings represent the actual state of the Site in all areas.

In preparing this report, current guidelines for assessment and management of groundwater were followed. This work has been conducted in good faith in accordance with SMECs understanding of the client's brief and general accepted practice for environmental consulting.

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Executive Summary

Manildra Group Pty Ltd (Manildra) is proposing to construct an ethanol storage facility and pipeline located on Part of Lot 6 DP1236743 and Part of Lot 2 DP 1182823, Foreshore Road, Port Kembla (herein known as 'the Site').

This report presents a Groundwater Assessment and Management Report prepared by SMEC Australia Pty Ltd (SMEC) in support of the State Significant Development application for the proposed redevelopment of Manildra - Port Kembla Bulk Liquid Terminal ('the Project'). This report is written to address the Secretary Environmental Assessment Requirements (SEARs) and specifically to provide advice relating to potential groundwater interactions (dewatering) during construction. The Site is currently leased by Manildra from NSW Ports.

SMEC undertook groundwater investigations including:

- Desktop review of Site information sources pertaining to groundwater
- Installation of five groundwater wells to supplement existing available onsite wells within the Site main terminal
- Continuous water level logging for a period of 3 months (April to July 2022) within eight available wells
- One groundwater monitoring event carried out at eight wells. This constituted the third baseline monitoring event, supplementing two previous rounds (April and October 2021).

SMEC consider that the main development activities which could impact upon groundwater are three localised deep excavations for installation of stormwater features (including gross pollutant traps and an underground storage tank) and linear excavations for installation of gravity retaining wall foundations and underground stormwater pipework. In most cases, excavations and foundations would be installed 'wet' or using prefabricated material. A single excavation for installation of proposed stormwater underground storage tank (identified as 'Excavation 3') would have a significant interaction with groundwater requiring dewatering.

Remaining construction activities within the main terminal and pipeline route are not expected to involve direct interaction below the groundwater table. Driven piles foundations would not involve excavation but may displace sediments and groundwater.

The 'baseline' groundwater quality at the Site main terminal is characterised by elevated concentrations of heavy metals and nutrients (nitrogen and phosphorus) which exceeded adopted groundwater investigation levels at the 95% protection level. The groundwater quality considered a regional issue related to long term historical industrial activities and land reclamation with poorer quality fill in Port Kembla, including beneath and surrounding the Site. The quality of the groundwater is not likely to have an impact to the proposed development itself, but there is potential for impact to downgradient ecological receptors.

Site information was used to input to numerical modelling to inform the excavation strategy for 'Excavation 3'. Based on the modelling results, SMEC recommended sheet piles be installed to the depth of the basal clay layer (i.e. bottom of the aquifer at -7.5m AHD) in order to limit drawdown and the volume of water required to be pumped and treated. The likely volume of water which may be required to be pumped and treated is estimated to be as little as 500 m^3 and less than 2000 m^3 over a five-day installation period excluding installation of the sheet pile wall.

This Groundwater Management Procedures contained in this report includes proposed mitigation measures for excavations and dewatering which have potential for groundwater interaction during construction. Water quality monitoring would be carried out on a minimum quarterly basis during and post-construction to assess potential impacts to groundwater quality.

Impacts on groundwater are less likely to occur during operation of the proposed development. This assumes all plant and equipment designed, commissioned, operated and maintained to prevent and capture spills and leakages of bulk liquids during normal operational. Operational requirements consider exceptional events outside of normal operation as triggers for additional (event based) monitoring to enable further assessment of potential impacts.

Abbreviations

Abbreviation / Acronym	Description
AHD	Australian Height Datum
ASS	Acid sulfate soils
ASSMP	Acid Sulfate Soils Management Plan
BTEX	Benzene, toluene, ethylbenzene and xylenes
CEMP	Construction Environmental Management Plan
CoC	Chain of Custody
DO	Dissolved Oxygen
DQI	Data Quality Indicators
DQO	Data Quality Objectives
DSI	Detailed Site Investigation
EC	Electrical Conductivity
EPA	Environment Protection Authority
GIL	Groundwater investigation level
LCS	Laboratory Control Sample
LOR	Limit of reporting
m	Metres
m bgl	Metres below ground level
m bTOC	Metres below top of casing
mg/L	milligrams per litre
mV	milli-volts
µg/L	micrograms per litre
µS/cm	micro siemens per centimetre
ML	Megalitres
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Assessment of Site Contamination) Measure
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyls
PFAS	Per- and Poly- Fluoro Alkyl Substances
PFOA	Perflourooctanoic Acid
PFOS	Perfluorooctane sulfonic acid
PPE	Personal protective equipment
RAP	Remedial Action Plan
RPD	Relative percent difference
SFA	Solid Flight Auger
SOP	Standard Operating Procedure
SPW	Sheet pile wall
SRA	Sample Receipt Advice

Abbreviation / Acronym	Description
SWL	Standing Water Level
SWMS	Safe work method statement
TEQ	Toxic Equivalency Quotient
TRH	Total recoverable hydrocarbons
TPH	Total Petroleum Hydrocarbons
VHC	Volatile halogenated compounds

1. Introduction

1.1 General

Manildra Group Pty Ltd (Manildra) is proposing to construct an ethanol storage facility and pipeline located on Part of Lot 6 DP1236743 and Part of Lot 2 DP 1182823, Foreshore Road, Port Kembla (herein known as 'the Site'). The Site locality is shown on Figure 1, Appendix A.

The proposed development will consist of installation of six above ground storage tanks, associated bunds and features, construction of a new bridge crossing, a gravity retaining wall adjacent the existing tidal stormwater channel, installation of buried stormwater infrastructure including an underground storage tank and two stormwater treatment devices, construction of service road and driveway pavements, drainage and grading features. Earthworks activities associated with the development are expected to include deep excavations for stormwater infrastructure, a network of linear utilities trenches and foundation excavations for gravity retaining wall, and shallow site recontouring and timber driven piles beneath bridge and tank structures. The development includes construction of a new pipeline route connecting to existing Jetty No. 4. The Site layout is shown on Figure 2, Appendix A.

This report presents a Groundwater Assessment and Management Report prepared by SMEC Australia Pty Ltd (SMEC) in support of the State Significant Development application for the proposed redevelopment of Manildra - Port Kembla Bulk Liquid Terminal ('the Project'). This report is written to address the Secretary Environmental Assessment Requirements (SEARs) and specifically to provide advice relating to potential groundwater interactions (dewatering) during construction. The Site is currently leased by Manildra from NSW Ports. The scope of works was carried out in general accordance with SMEC's '*Fee Proposal – Groundwater assessment, Part of Lot 6 DP1236743, Foreshore Road, Port Kembla NSW*', dated 07/03/2022 (ref: 30013038-V05 Rev 2).

1.2 Project background

SMEC has previously undertaken investigations at two portions of the Site (identified herein as the 'main terminal' and 'pipeline route') to fulfil the planning process and requirements of NSW Ports Development Code, pertaining to contamination assessment and acid sulfate soils assessment information for the proposed design. These include:

- Preliminary Geotechnical and Contamination Investigation (SMEC, 2021a), ref: 30013028-R01)
- Detailed Site Investigation (DSI) (main terminal) in December 2021 (SMEC, 2021b, ref: 30013038-R04)
- Targeted Site Investigation (pipeline route) in April 2022 (SMEC, 2022a, ref: 30013038-R05)
- Acid Sulfate Soils Management Plan (ASSMP) (SMEC, 2022b, ref: 30013038-R03)
- Remedial Action Plan (RAP) (SMEC, 2022c, ref: 30013038-R02)

The Planning Secretary's Environmental Assessment Requirements (SEARS) were issued on 23 December 2021. The SEARs have identified several key issues including a groundwater assessment which are outlined in Table 1-1:. This Groundwater Assessment and Management Report was written to address the SEARs and specifically to provide advice relating to groundwater dewatering during construction.

Table 1-1: Summary of issues required by SEARs

Item	Key Issues required by SEARS	Where addressed in report
18	Soils and Water – a surface and groundwater assessment, including:	
18.1	an assessment of potential surface and groundwater impacts associated with the development, including potential impacts on receiving waters	Section 3
18.2	an assessment of contaminated groundwater and acid sulfate soils	Section 2.4 and 2.5
18.3	details of all proposed mitigation, monitoring and management measures	Section 7
18.4	characterisation of water quality at the point of discharge to surface and/or groundwater against the relevant NSW Water Quality Objectives and values for the waters of Port Kembla and demonstrate how the project will be designed and operated to protect, maintain or restore these requirements	Section 5

1.3 Project objectives

The objectives of this Groundwater Assessment and Management Report include:

- Carrying out a groundwater baseline characterisation assessment
- Identification of possible impacts to and develop proposed mitigation, monitoring and management measures for groundwater; and
- Prepare a dewatering strategy associated with installation of a proposed underground stormwater storage tank (UST).

Key issues identified by the SEARs relating to surface water are dealt with by others are therefore beyond the scope of this report.

1.4 Scope of work

To fulfill the above objectives, SMEC carried out the following scope:

- Desktop review of Site information sources pertaining to groundwater information including previous investigations by SMEC
- Installation of five groundwater wells (designated SMW02 to SMW06) to supplement existing available onsite wells within the Site main terminal
- Continuous water level logging for a period of 3 months (April to July 2022) within eight available wells
- One groundwater monitoring event carried out to supplement previous groundwater monitoring at three existing wells (OHMW20, OHMW28 and SMW01) and including five installed wells (SMW02 to SMW06). This constituted the third baseline monitoring event, supplementing two previous rounds (April and October 2021).
- Modelling of groundwater to inform the dewatering strategy associated with installation of one underground storage tank within the Site main terminal.
- Groundwater assessment and interpretation discussing potential impacts on groundwater and waters of Port Kembla, stating the proposed mitigation, monitoring and management measures to be implemented during construction and operation stages.

2. Site information

2.1 Site identification and description

The proposed development is located at Part of Lot 6 DP1236743 and Part of Lot 2 DP 1182823 Foreshore Road, Port Kembla, NSW. The Site consists of two portions identified as 'main terminal' and 'pipeline route' as shown on Figure 2, Appendix A.

Figure 1 and Figure 2, Appendix A show the Site locality and Site layout, respectively.

A summary of Site information is presented below in Table 2-1:.

Table 2-1: Summary of Site information

Aspect	Details
Title identifier	Part of Lot 6 DP1236743 and Part of Lot 2 DP 1182823 (pipeline route only)
Address	Foreshore Road, Port Kembla NSW
Area	Main terminal Manildra supplied drawings showing a Site area of approximately 2.3ha (which excludes the stormwater channel). It is noted that the stormwater channel (approx. 0.14ha) is excluded from the lease. For Site description purposes, the Site has been divided into the three portions shown below on Figure 2–1including: • Western portion – Areas west of the stormwater channel (0.83ha) • Central portion – A centrally located area east of the stormwater channel (0.44 ha) differentiated by a historical property boundary • Eastern portion – An easterly located area east of the stormwater channel (1.02 ha). Pipeline route Manildra supplied drawings showing a proposed linear pipeline route of approximately 460m between the main terminal and Jetty No. 4 west to east with a 4m corridor along the route. The pipeline route occupies an area of approximately 0.18 ha.
Zoning	The Site is located within Port Kembla state significant precinct in NSW. The State Environmental Planning Policy (Three Ports) 2013 is the principal environmental planning instrument applying to the Site.
Current Land use	Main terminal The Site currently consists of vacant industrial land previously used for storage of miscellaneous maritime/port equipment. An open concrete lined stormwater channel passes through the Site, which discharges to the Port Kembla Outer Harbour immediately north of the Site (but does not form part of the lease area). A relatively large crushed or coarse fill stockpile up to about 11m high above current land platform level currently occupies most of the eastern portion of the Site. The coarse fill stockpile appears to comprise largely coarse sandstone boulders up to about 1m diameter. Pipeline route The pipeline route part of the Site is currently unused part of industrial foreshore land in the vicinity of harbour jetty operations.
Proposed land use	The proposed land use is for a bulk liquid (beverage grade ethanol) storage facility and product pipeline route as described further in Section 3.1
Surrounding land use	Main terminal The Site is presently surrounded by: • Remaining NSW Ports foreshore land on Lot 6 (west) currently containing several large soil stockpiles • Foreshore Road (south), then beyond this and further south various industrial facilities including: – Ixom (sulfuric acid plant)

Aspect	Details
	– Cleanaway waste recycling facility – Morgan Cement International Pty Ltd (cement manufacturing and grinding facility) • Other former industrial facilities such as the former copper smelter and fertiliser production facilities • Remaining stockpiled material and vacant land on Lot 6 (east) • Port Kembla Outer Harbour shoreline (north). Pipeline route The Site is surrounded by: • Vacant foreshore land, a sandstone stockpile and paved road to former jetty No. 3 on Part of Lot 6 • Vacant foreshore land, training conference centres, marine compounds/equipment stores and paved road/carparking areas on Part of Lot 2 • An acid production pipeline route bisects the Site (Chainage 390m) and diverts in similar alignment towards Jetty No. 4 (Chainage 390m to 460m) • Port Kembla Outer Harbour shoreline is north approximately between 5m and 25m from the centreline of the pipeline route.

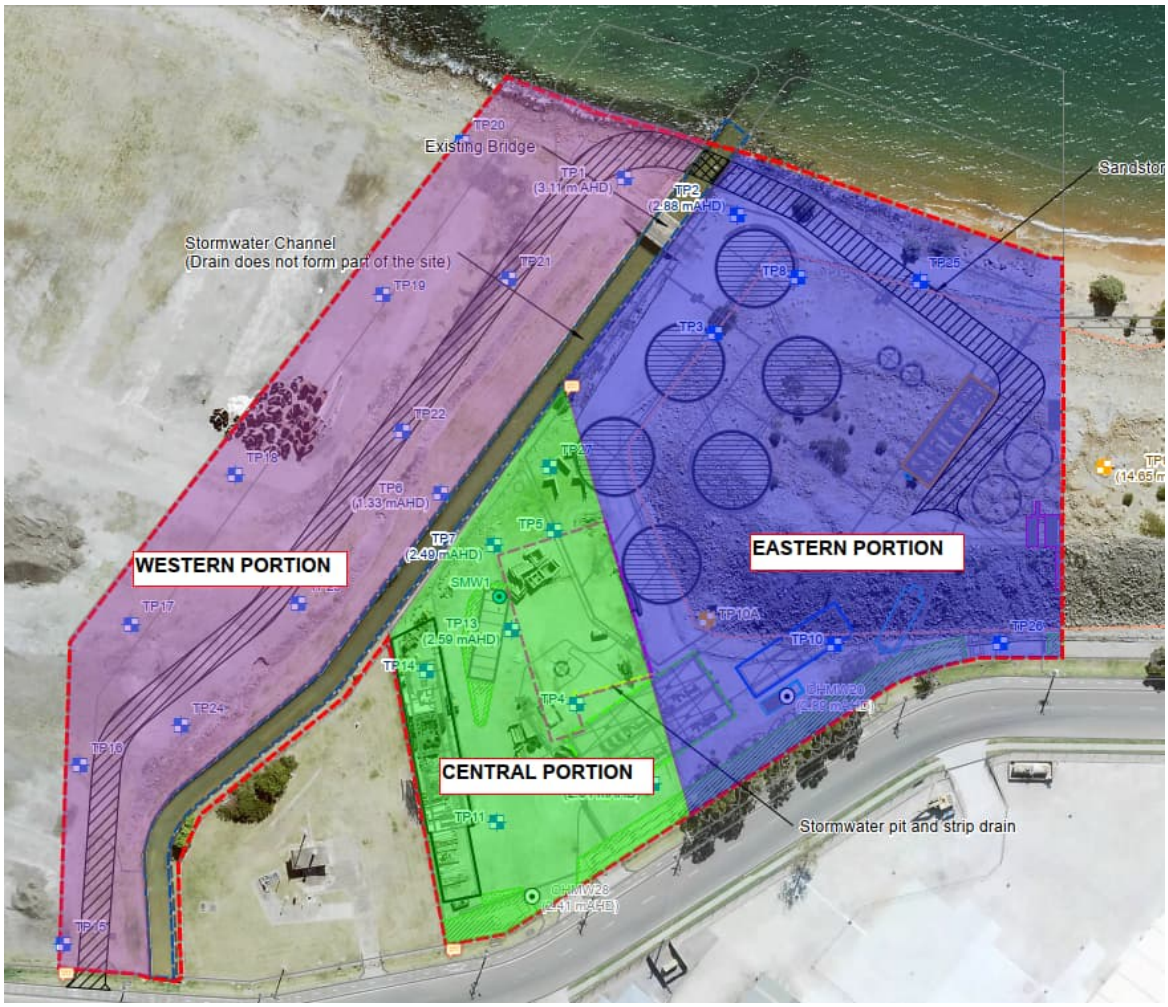

Figure 2–1: Site portions for description purposes – Main terminal

2.2 Previous reports

Background information contained in this Groundwater Assessment and Monitoring Report was sourced from the following previous reports:

- SMEC Australia Pty Ltd (2021a) Preliminary Geotechnical and Contamination Investigation, Part of Lot 6 DP1236743 Foreshore Road, Port Kembla, prepared for Manildra Group Pty Ltd, ref: 30013038-R01, Revision 2, dated 05 May 2021
- SMEC Australia Pty Ltd (2021b) Detailed Site Investigation, Part of Lot 6 DP1236743 Foreshore Road, Port Kembla, prepared for Manildra Group Pty Ltd, ref: 30013038-R04, Revision 1, dated 22 December 2021
- SMEC Australia Pty Ltd (2022a) Targeted Site Investigation – Pipeline Route, Part of Lot 6 DP1236743 and Part of Part of Lot 2 DP 1182823, Foreshore Road, Port Kembla, prepared for Manildra Group Pty Ltd, ref: 30013038-R05, Revision 1, dated 02 May 2022
- SMEC Australia Pty Ltd (2022b) Acid Sulfate Soil Management Plan, Manildra – Port Kembla Bulk Liquid Terminal, prepared for Manildra Group Pty Ltd, ref: 30013038-R03, Revision 2, dated 06 May 2022
- SMEC Australia Pty Ltd (2022c) Remedial Action Plan, Manildra – Port Kembla Bulk Liquid Terminal, prepared for Manildra Group Pty Ltd, ref: 30013038-R02, Revision 1, dated 9 May 2022
- SMEC Australia Pty Ltd (2022d) Additional Site Investigation, Manildra – Port Kembla Bulk Liquid Terminal, prepared for Manildra Group Pty Ltd, ref: 30013038-R07, Revision 1, dated 19 August 2022.

A summary of relevant information from these reports are included in this Groundwater Assessment and Management Report. SMEC (2021b) also previously undertook a review of several environmental reports pertaining to the Site and nearby surrounding areas. Reference should be made to the original reports for further detailed information.

2.3 Site information

Relevant Site information is summarised in Table 2-2 below.

Table 2-2: Site information summary

Aspect	Description
Topography	Main terminal The Site terrain appears to have been filled and levelled with a surface elevation between 3.5-4.5 metres above Australian Height Datum (m AHD). The Site surface is predominantly hardstand granulated slag material except for a concrete slab present in the central portion of the Site, and some localised grassed terrain. Other features of the Site include: • A large rock stockpile with steep batters (to a height of approximately +14m AHD) within the eastern portion • East and west of the channel there are localised steep slopes down to the edges of the concrete lined stormwater channel (approximately +2m AHD) • A fill embankment is noted west of the stormwater channel approximately 1.5m to 2m above top of the stormwater channel, indicating the Site terrain appears to have been filled and levelled. Pipeline route Based on survey carried out by Masters Surveying (Drawing 64146-2), the Site is relatively flat with some slight undulations at elevations ranging between 2.9m AHD (Chainage 90) and 4.3m AHD (Chainage 340m).
Vegetation	Main terminal The Site contains a stand of mature trees on the southern Site boundary adjacent to Foreshore Road. Sparsely scattered trees were noted elsewhere, noting most of the Site is hardstand gravel and pavements with some patches of exotic grass vegetation. Pipeline route

Aspect	Description
	Except some minor areas of grass coverage, the Site is mainly hardstand gravel and pavements with little or no vegetation.
Geology	The 1:100,000 scale geological series sheet of Wollongong to Port Hacking indicates that the Site is underlain by Quaternary quartz and lithic fluvial sand, silt and clay which most likely will overlay either or both the rock formations of: • The Dapto Latite Member, comprising of a melanocratic coarse grained to porphyritic latite • The Budgong Sandstone formation, comprising red-brown and grey volcanic sandstones. Reference to previous drilling in the area of Port Kembla Outer Harbour indicates that the Site is likely underlain by the Budgong Sandstone Formation. However, the Site is also located very close to the boundary between the overlying Dapto Latite, and it is possible that some Dapto Latite could be encountered in some parts of this Site particularly towards the southern portion of the Site.
Soil Landscape	Reference to the 1:100,000 Soil Landscape Series Sheet for Central and Eastern NSW (OEH 2019) indicates the Site is within the disturbed terrain soil landscape.
Acid Sulfate Soil	Reference to Acid Sulfate Soil (ASS) risk mapping (NSW Government eSPADE, accessed 23/03/2021) indicates that the Site is located within areas mapped as 'disturbed terrain' with an unknown probability of ASS occurrence. Risk map guidance indicates *that 'disturbed terrain may include filled areas, which often occur during reclamation of low-lying swamps for urban development. Other disturbed terrain includes areas which have been mined or dredged or have undergone heavy development or construction of dams or levees. Soil investigations are required to assess these areas for acid sulfate potential.*' Figure 3, Appendix A shows the acid sulfate soils risk mapping for the Site and surrounding areas. The map indicates the following: Main terminal • The Site western, central and eastern portion is primarily underlain by disturbed terrain (X) at an elevation (2) of 2 to 4m AHD • A relatively smaller northern portion of the Site identifies disturbed terrain (X) at an elevation (1) of 1 to 2m AHD. From preliminary investigation by SMEC (2021a), acid sulfate soils were assessed to be present at the main terminal portion of the Site within relatively thin layers of natural estuarine soils beneath the fill. Further consideration and management of acid sulfate soils was recommended where these soils are to be intersected via excavation or if dewatering will occur which could lower the water table and expose soils to oxidation. Pipeline route • Between Chainage 0 to 180m, the Site is underlain by disturbed terrain (X) at an elevation (2) of 2 to 4m AHD • Between Chainage 180 to 430m, the Site is underlain by disturbed terrain (X) at an elevation (2) of greater than 4m AHD. Based on the Site topography and proposed disturbance depths (refer to Section 3.1), excavations depths were assessed as: • Base level 1.9 to 2.6m AHD (Above ground section of pipeline route - Shallow concrete footings, approximately 1m deep) • Base level 2.3 to 3.3m AHD (Underground section of pipeline route – Cut and cover trenching, approximately 1.8m deep). At these earthworks' levels, acid sulfate soils (if present) within the Site area were assessed to be greater than the depth of proposed disturbance.
Groundwater	Main terminal Based on previous groundwater monitoring that has occurred at the Site, groundwater beneath the Site were historically recorded typically between 1.5m and 3.0m below ground surface with an inferred groundwater flow in a north-easterly direction towards Port Kembla Outer Harbour. Groundwater depths and directions may vary based on Site specific conditions, including tidal influences.

Aspect	Description
	A search of the Department of Water and Energy Online Database [accessed 22 March 2021] was carried out to identify registered groundwater bores within the vicinity of the Site. The search indicated multiple registered bores are within industrial properties for monitoring purposes located within 500m of the Site including: • One registered bore (GW114085) located 100m south of the Site (within Morgan Cement International property) • Greater than 50 registered bores between 300m and 600m south of the Site (former Port Kembla Copper Smelter) • Six registered bores 450m south-east of the Site (Vesuvius manufacturing facility. Pipeline route Based on Site topography, the depth of groundwater along the pipeline route is expected to be at depths between 2-3m below ground level based on the proximity to the open harbour environment. Groundwater within the Site area is assessed to be greater than the depth of proposed disturbance.
Surface Water	Main terminal Surface water at the main terminal Site is likely to infiltrate into Site soils or shed as runoff partly to Foreshore Road (south), partly to Port Kembla harbour (north) and partly into the adjacent open concrete lined drain (west). The open drain receives stormwater from upslope areas offsite and runs through the Ixom sulfuric acid plant as an open drain, and underground beyond, including through the former copper smelter land further upslope. Pipeline route Surface water runoff from the Site (pipeline route) is likely to shed from hardstand areas directly towards Port Kembla harbour. At asphalt paved areas (Chainage 320 to 460m), surface water runoff is expected to enter urban stormwater drainage pits and pipework prior to discharge at the harbour.
Contamination	From previous investigations by SMEC (2021a, 2021b,2022a and 2022d), contamination was identified in soils and groundwater beneath the site including: • Soil recorded elevated concentrations of heavy metals (including lead and arsenic) within fill and underlying natural soils at six test locations (TP5, TP6, TP13, TP14 and TP23 and TP33 – main terminal) and one test location (BH06 – pipeline route) exceeding human health investigation levels for the proposed industrial land use. Depths of contamination appeared to be within fill/natural clayey soils (typically between 0.1m bgl and 2.2m bgl) except at one location (TP13) where elevated lead concentrations were recorded within natural sand at a depth of at least 3.0 m bgl (TP13) suggesting deeper lead impact in this area. • The results of two groundwater monitoring events in March and October 2021 recorded elevated concentrations of heavy metals (including cadmium, copper, lead, nickel and zinc) and ammonia which exceeded adopted groundwater investigation levels for protection of marine aquatic ecosystems at the 95% species protection level. Existing soil contamination issues at the Site will be managed under the RAP (SMEC, 2022c).

2.4 Groundwater contamination

2.4.1 Historic monitoring – 1996 to 2011

Groundwater monitoring events were carried out previously for broader foreshore lands which included the Site (main terminal only), between 1996 and 2011. The monitoring data is presented within reports by Groundwater Technology Australia (1996), Flour Daniel GTI (1996 to 1997), IT Environmental (2001 and 2002), URS (2004 to 2006), Douglas Partners (DP, 2009) and SLR (2011). During this period, at least seven groundwater monitoring wells have been installed and monitored at the Site, some of which have now been lost.

The following relevant summary information is noted for this assessment:

- Groundwater monitoring data is available on selected monitoring reports for up to 7 onsite monitoring wells (MW4, MW5, MW7, OHMW20, OHMW28, OHMW26 and MW317) and one nearby offsite monitoring well (MW3) located just down-gradient. Figure 4A, Appendix A shows the historic groundwater well locations and details are summarised below:

  - In 1996, one onsite well (MW7) was installed within the western portion of the Site, two onsite wells (MW4 and MW5) were installed with the eastern and central portions of the Site, respectively, and one offsite well (MW3) was installed just east at down gradient location (GTA, 1996). Note: Monitoring at MW5 and MW7 appeared to have discontinued after 1997 and 2006 respectively.
  - Prior to 2003, two onsite wells (OHMW28* and OHMW26) were installed in the eastern and northern portion of the Site (URS, 2006). (*Note: The original location indicated on the URS 2006 plan shows OHMW28 in the eastern portion of the Site).
  - In 2009, an onsite well (OHMW28-1**) was reinstalled in the central portion of the Site (Douglas Partners, 2009). A second onsite well designated (OHMW20) was sampled in the eastern portion of the Site. (**Note: The revised location indicated on the DP 2009 plan shows OHMW28 in the central portion of the Site, the original location now appears to be identified as OHMW20 in subsequent rounds).
  - In 2011, an onsite well (MW317) in the eastern portion of the Site was monitored (SLR, 2011). Monitoring at offsite monitoring well (MW3) and onsite monitoring well (OHMW26) appeared to have discontinued.

- Groundwater samples were analysed for selected heavy metals including arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), mercury (Hg) and zinc (Zn), selenium (Se), antimony (Sb), polycyclic aromatic hydrocarbons (PAH), total recoverable hydrocarbons (TRH) and/or benzene, toluene, ethylbenzene, xylene (BTEX). During DP (2009) and SLR (2011) Arsenic speciation was carried out on selected samples (OHMW28 and MW3).
- Table 2-3 includes a summary of historical groundwater monitoring data, including the highest recorded heavy metals concentrations recorded by each consultant within onsite or nearby offsite (less than 10m) well locations (including arsenic, cadmium, chromium, copper, lead, nickel, antimony, selenium, and zinc). They provided an indication for preliminary comparison purposes to monitoring data obtained during further baseline groundwater quality assessment (Refer to Section 5.5).
- During Douglas Partners (2009) and SLR (2011) Arsenic speciation was carried out on selected samples indicating the main components was Arsenous Acid (As III) followed by Arsenic Acid (As V). It is noted that ANZG (2018) 95% protection levels criteria for As III and As V apply to freshwater only and have not been assigned for marine ecosystems. The report concluded that some of the metal exceedances may be representative of contamination that may warrant further investigation.

SMEC (2021b) concluded the findings of the desktop contamination study indicated widespread historical industrial land use in the surrounds and elevated concentrations of contaminants of potential concern (particularly heavy metals) within groundwater beneath the Site from past monitoring.

Table 2-3: Summary of site historical groundwater monitoring data

Source reference	Details of groundwater monitoring locations	Contaminants of concern	Contaminant concentrations (highest recorded) (mg/L)								Inferred groundwater flow direction
			As	Cd	Cr	Cu	Pb	Other	Ni	Zn	
Groundwater Technology Australia Pty Ltd (1996)	Onsite wells (3): (MW4 MW5, MW7)	TRH, BTEX, Heavy metals (As, Cd, Cr, Cu, Pb, Zn) (+ Bi, Hg, Sb) (1997 only)	0.190	<LOR	0.002	0.006	0.029	0.010 (Sb)	-	0.458	North-east
Fluor Daniel GTI (1997) *2 monitoring events*	Offsite wells (1): (MW3) - near eastern Site boundary (inferred down-gradient)		0.170	0.003	0.003	0.122	0.020	0.004 (Sb)	-	3.250	
IT Environmental Pty Ltd (2002)	Onsite wells (2): (MW4, MW7)	TRH, BTEX, Heavy metals (As, Cd, Cr, Cu, Pb, Zn, Hg)	0.270	<LOR	0.006	0.003	0.001	-	-	0.170	Not indicated
1 monitoring event	Offsite wells (1): (MW3) - near eastern Site boundary (inferred down-gradient)		0.008	0.002	ND	0.190	0.069	-	-	2.200	
URS (2006) – Note: *3 monitoring events in 2003, 2004 and 2006 (summary data)*	Onsite wells (4): (MW4, MW7, OHMW28, OHMW26)	TRH, BTEX, Heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg) + Hexavalent Cr6+	0.273	0.002 (note 4)	ND	0.150	ND	-	0.312	1.41	North North-east
	Offsite wells (1): (MW3) - near eastern Site boundary (inferred down-gradient)		0.011	0.004	<LOR	0.293	0.101	-	0.307	3.54	

Source reference	Details of groundwater monitoring locations	Contaminants of concern	Contaminant concentrations (highest recorded) (mg/L)								Inferred groundwater flow direction
			As	Cd	Cr	Cu	Pb	Other	Ni	Zn	
Douglas Partners (2009)	Onsite wells (3): (OHMW28, OHMW26 and OHMW20 – see note 3)	TRH, BTEX, PAH, Heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg + Se) Arsenic speciation As (III) and As(V) – See note 2	0.094 *(0.055 As III)* *(0.007 As V)*	0.0004	<LOR	0.013	0.0011	0.019 (Se)	0.023	0.420	Not specified
	Offsite wells (1): (MW3) - near eastern Site boundary (inferred down-gradient)		0.036* *(0.037 As III)* *(0.055 As V)*	0.0015	<LOR	0.055	ND	0.025 (Se)	0.150	0.170	
SLR (2011)	Onsite wells (3): (OHMW28, OHMW20 and MW317)	TRH, BTEX, PAH, Heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg + Se) Arsenic speciation As (III) and As(V)	0.058 *(0.056 As III)* *0.013 As V)*	0.0023	<LOR	0.160	ND	0.019 (Se)	0.260	0.880	North-east
	Offsite wells (0): Nil		-	-	-	-	-	-	-	-	

Note 1: Highest recorded heavy metals concentrations are included for summary purposes noting this may represent more than one monitoring location or groundwater monitoring event. No detections above the laboratory reporting limit were recorded for remaining heavy metals (including mercury), TRH, BTEX and/or PAHs (where tested).

Note 2: DP (2009) noted that speciated arsenic samples were not field filtered. This explains comparatively higher concentration than dissolved arsenic which were field filtered.

Note 3: DP (2009) indicates another onsite well identified on map as MW317 however this was not sampled.

Note 4: URS (2006) recorded a cadmium result of 0.0684mg/L within the primary sample, but not the corresponding duplicate 0.0001mg/L. The primary has been disregarded based on historical trends.

LOR – Limit of reporting

2.4.2 Baseline monitoring – 2021

Baseline groundwater quality and levels were assessed at the Site (main terminal) by SMEC during two previous groundwater monitoring events; one in March 2021 during the preliminary investigation (SMEC, 2021a) and an additional groundwater monitoring event in October 2021 (SMEC, 2021b).

During one or both rounds, contamination laboratory testing of groundwater samples was carried out at three wells (OHMW28, OHMW20 and SMW01) for potential contaminants of concern and additional 'baseline' monitoring parameters including:

- Total recoverable hydrocarbons (TRH)
- Benzene, Toluene, Ethylbenzene, Xylenes (BTEX),
- Polycyclic aromatic hydrocarbons (PAH)
- Speciated Phenols
- Organochlorine pesticides (OCP) and organophosphorus pesticides (OPP) and Polychlorinated Biphenyls (PCB)
- Volatile halogenated compounds (VHCs)
- Nitrogen (ammonia, nitrate, nitrite)
- Total phosphorus*, Reactive phosphorus
- Hardness, Total Dissolved Solids (TDS)
- Major cations (calcium, magnesium, potassium, sodium)
- Major anions (chloride, sulphate and fluoride)
- Alkalinity
- Dissolved heavy metals (aluminium, arsenic, cadmium, chromium (total), cobalt*, copper, iron, lead, mercury, nickel, selenium, uranium* and zinc)
- Total heavy metals (aluminium*, manganese* and iron*)
- Ammonium ion*
- Total acidity*
- Per and poly fluoro alkyl substances (PFAS)

*Note: In October 2021, additional groundwater analysis was also carried out for baseline parameters recommended in the Acid Sulfate Soil Management Plan (SMEC, 2021c) including selected additional dissolved heavy metals (cobalt, uranium), total metals (aluminium, iron and manganese), ammonium ion and total phosphorus, and total acidity.

Table E1, Appendix E includes a laboratory summary table for previous groundwater samples sampled and tested during the March and October 2021 events. Figure 4A, Appendix A shows the baseline monitoring 2021 locations and previous monitoring results. Reference should be made to the DSI (SMEC, 2021b) for factual details on monitoring data, including laboratory reports and quality assurance and quality control data evaluation.

2.5 Acid sulfate soils

Acid sulfate soil (ASS) materials are naturally occurring soil and sediment, distinguished from other soil or sediment materials by having properties and behaviour that have either:

1. Been affected considerably by the oxidation of Reduced Inorganic Sulfur (RIS) (principally the mineral iron pyrite), or
2. The capacity to be affected considerably by the oxidation of their RIS constituents.

The factor common to all ASS materials is that RIS components have either had, or may have, a major influence on the properties or behaviour of these soil materials. These soils are typically found in low-lying coastal areas and saline inland areas; however, they have been identified in a wide range of environmental settings.

Acid sulfate soil materials include Potential acid sulfate soils (PASS or sulfidic soil materials) and Actual acid sulfate soils (AASS or sulfuric soil materials). These are often found in the same profile, with AASS overlying PASS.

2.5.1 Subsurface conditions

The subsurface soil conditions across the Site have been summarised by SMEC (2021a, 2021b and 2022a) with five main lithological units, summarised below.

Unit 1	Fill, which is divided into the following main subunits – Unit 1A (Filling Cemented slag), Unit 1B (General fill) within the main terminal, Unit 1C (Stockpile fill) over the eastern portion, Unit 1D (Inferred location of PAH contamination) localised in the western portion. Along the pipeline route, fill consisted of topsoil, Unit 1A (Cemented slag) and Fill (variable)
Unit 2	Aeolian Sands consisting typically of poorly graded, fine to coarse grained sand with some black carbonaceous and dark grey clay laminations, moist to wet. Prior to land reclamation, these materials are inferred to have been deposited in a combination of beach and dune environments. This unit is inferred to be generally in a loose to medium dense condition.
Unit 3	Estuarine soils (sand and clay) high plasticity, firm and loose to medium dense, fine to coarse grained sand with some black carbonaceous and dark grey clay laminations, moist to wetter than the plastic limit. Estuarine clays were typically encountered as a relatively thin layer (typically less than 0.3m thick) from depths of 1.2m bgl, whereas estuarine sands were typically encountered beyond depths of 2.4 m bgl.
Unit 5	Residual Soil which is clay/gravelly clay/sandy clay derived from in-situ weathered latite. The consistency of this unit ranges from very stiff to hard. This unit tends to grade from residual soil to extremely weathered rock with increasing depth. Residual clays were typically encountered during preliminary geotechnical boreholes SMEC (2021a) at depths below 8.5 to 9.0m bgl.
Unit 6	Extremely weathered rock, consisting of extremely to distinctly weathered Latite.

For further details, reference should be made to engineering logs presented within previous investigation reports by SMEC (2021a, 2021b and 2022a).

2.5.2 ASS occurrence and extent

SMEC (2021a) previously carried out soil sampling and testing to assess the potential for ASS within two suspected units based on geological origin; Unit 2 (Aeolian sands) and Unit 3 (Estuarine soils). A summary of ASS laboratory soil data is presented on Figure 4B, Appendix A and factual details are included within the Acid Sulfate Soils Management Plan (ASSMP) (SMEC, 2022b). In summary:

- Potential ASS was likely to be present within:
  - A relatively thin estuarine layer (Unit 3) described as dark grey/grey sandy clay/clay at depths between 1.9-2.2 m bgl.
  - Deeper estuarine sand layers (Unit 3) described as pale grey, medium to coarse grained sand encountered within BH5 and BH7 at depths of 6.0-6.45m bgl and 7.2-7.65 m bgl. Relatively high acid neutralising capacity was noted within these sands, suggesting the potential ASS may be self-buffering.
- The upper natural layers inferred to be Unit 2 (Aeolian sands) in origin (described as pale brown, fine to coarse grained) were not considered to be ASS.
- Due to the expected reduced scale of the soil earthworks, delineation of ASS lateral extents was not assessed as part of SMEC's preliminary investigation. For the purposes of the ASSMP (SMEC, 2022b), the inferred extents of ASS have been assessed from previous investigation findings as follows:
  - Horizontally: Site wide within the extent of works
  - Vertically: At depths greater than 1.2m below ground level (m bgl) within estuarine clays and sands (Unit 3). Previous survey shows the top of Unit 3 (Estuarine soils) is expected to be in the general range of about +1.2 mAHD to 0 mAHD.
- SMEC (2021a) previously recommended that further consideration and management of ASS should be implemented during Site development where the above soils are to be intersected via excavation or if dewatering will occur which could lower the water table and expose soils to oxidation. Groundwater table drawdown can occur from excavation dewatering and affect ASS as they can be exposed to oxygen and oxidise.

2.6 Groundwater wells

Twelve groundwater monitoring wells are onsite (including six existing historic wells and six new wells installed by SMEC 2021-2022). Eleven wells appear to be still useable for monitoring and one well was damaged and partially buried under a drum ('MW damaged' shown on Figure 4A, Appendix A). Where previous survey was carried out to some of the monitoring wells, a summary of survey details is provided in Table 2-4.

Table 2-4 Summary of groundwater wells onsite

Well no.	Inferred monitoring well ID	Easting	Northing	Reduced Level (m AHD)			Details
				Ground level	Top of well casing	Well stickup (m)	
1	MW316 (note 1)	307769.09	6183022.99	2.54	2.46	-0.12	Gatic well - Hex-key metal gatic flush with ground surface
2	MW5 (Note 2)	NS	NS	NS	NS	NS	Gatic well – 'Older style' metal gatic flush with ground surface
3	OHMW28 (Note 3)	307778.51	6182987.64	2.41	3.09	0.68	Monument Well
4	ID Unknown (Note 4)	307814.26	6183015.20	2.66	3.23	0.57	Monument Well
5	OHMW20 (Note 3)	307832.75	6183030.30	2.89	3.83	0.94	Monument Well
6	*MW Damaged* (Note 4)	307826.72	6183045.32	3.31	NS	NS	Monument Well – Well damaged
7	SMW01	307771.69	6183048.65	2.57	3.33	0.76	Monument Well
8	SMW02	307889.38	6183043.42	NS	3.63	0.74	Monument Well
9	SMW03	307881.90	6183114.52	NS	3.78	0.69	Monument Well
10	SMW04	307848.12	6183124.30	NS	3.61	0.65	Monument Well
11	SMW05	307825.76	6183134.07	NS	3.58	0.72	Monument Well
12	SMW06	307734.25	6183055.70	NS	4.17	0.76	Monument Well

Note 1: Well location MW316 was labelled on the well cap, noting this location was not formerly shown on historical monitoring reports.

Note 2: Well locations MW5 was inferred from maps within contamination assessment (CMPS&F, 1996).

Note 3: Well location OHMW28 and OHMW20 were inferred from maps within historical groundwater monitoring report (DP, 2009 and SLR, 2011).

Note 4: Remaining well identification remains unknown.

NS – Not surveyed

Gatic well = well finished level with ground surface with a steel gatic type cover

Monument well = well finished above ground surface with a steel monument

3. Environmental activities and impacts

3.1 Proposed development

3.1.1 Main terminal

Manildra propose to lease and redevelop the Site into an ethanol storage facility. Based on information provided by Manildra, the proposed development is expected to comprise:

- Six above ground storage tanks (2.5ML to 5ML capacity for beverage grade alcohol) located inside a raised bunded area, plus two slops tanks
- Demolition of existing bridge and construction of one new proposed bridge crossing over the adjacent stormwater channel to the west, to connect to a service road with Foreshore Road
- A gravity retaining wall installed along the boundary with the stormwater channel (approx. 220m length) including either side of the proposed bridge and along the western Site boundary adjacent to the adjoining sewer pump station (offsite)
- New stormwater network including pipework, underground storage tank, two stormwater treatment devices and outlet structures
- Perimeter roadways/pavements
- Firefighting system including foam suppressant system and water supply tanks
- Ancillary features such as substation, workshop and sheds which would be small and single storey.

Figure 2, Appendix A shows the approximate position of proposed Site development features relative to the Site boundaries.

Some Site recontouring involving both 'cut to fill' earthworks are required to achieve design ground levels. SMEC understand 'site won' excavated soils are proposed for reuse with the balance imported material proposed to be used to raise existing ground levels as fill. Alternatively, if contaminated, onsite containment of soils in designated areas is proposed as outlined in the RAP (SMEC, 2022c). It is understood the proposed development layout includes Site earthworks which seek to minimise ground and groundwater disturbance by minimising the quantity and depth of excavations/cuts. An exception applies to deeper localised excavations associated with stormwater pipework, underground tank and gross pollutant traps; these areas will generate surplus excavated spoil to be managed onsite.

SMEC understand that timber driven piles will be used for foundations of the tank structures. Except for minor disturbances at the surface, these are expected to result in minimal ground disturbance as soils are displaced laterally to accommodate the pile.

A Fire Safety Study prepared by Pinnacle Risk Management Pty Ltd (2022), indicates the proposed facility would be also equipped with a foam suppressant system at the bulk ethanol storage facility which will contain Per and Poly Fluoro Alkyl Substances (PFAS). The Site will also store non-PFAS (fluorine free) firefighting foam for certain applications and scenarios where effective. The Fire Safety Study indicates that no PFAS foam would be used for testing, training and commissioning but only for an actual fire event. Firewater in the tank farm will be contained in the bunds and pumped to the slops tank for offsite disposal at the Shoalhaven Starches facility.

Regarding the foam chemical constituents, the current excerpt from the Fire Safety Study is below:

'All firefighting foams will be stored in containers within the foam house near the fire tanks to east of the site. This store will include secondary containment for potential loss of foam from any container. The type of foam will be a 3/3 alcohol resistant foam suitable for the application required. Under the Environment Protection Authority (EPA) regulations, firefighting foams are expected to be PFAS (per and polyfluoroalkyl substances) free unless needed for 'catastrophic fires'. As such, the site will store non PFAS (fluorine free) firefighting foam for all applications for which this foam has been shown to have adequate efficacy. This will be applied to the truck loading bays, transfer pumps, monitors at the tank bund and the marine berth area.

However, for the potential larger fires such as the large storage tanks, the use of PFAS free foam is still being trialled. As such it is proposed to use a current PFAS foam for this purpose unless evidence is provided that would prove efficacy for this application such as planned to be carried out by LASTFire in April 2022. To reduce environmental exposure, no

*PFAS foam will be used for testing, training or commissioning but only for an actual fire event. To achieve this the type of proportioner (FireDOS) will enable proof of foam mixing ratio without the need to transfer the foam into a water solution. All testing will be done using water only simulating foam/water pressures and only controlled samples will be produced in a contained area to provide foam test records.' (*Pinnacle Risk Management Pty Ltd, 2022, pp30)

Regarding the management of contaminated firewater retained at the Site, the First Safety Study stated, '*Firewater in the tank farm will be contained in the bunds and pumped to the slops tank for offsite disposal at the Shoalhaven Starches facility.' (*Pinnacle Risk Management Pty Ltd, 2022, pp16).

3.1.2 Pipeline route

The Site boundary extends to the east of the main terminal along a 4m wide easement for construction of a new pipeline route connecting to existing Jetty No. 4, including a parcel of land within Part of Lot 2 DP 1182823 owned by Transport for NSW (TfNSW).

Based on the current set of design drawings (20399-DA-P01 to P05, dated 10 March 2022) prepared by TFA Group Pty Ltd., the pipeline route would consist of:

- Approximately 180m above-ground pipeline mounted on footings between the main terminal (Chainage 0m) and a dive thrust block (Chainage 180m). Along this portion, shallow foundation excavations are anticipated to be 1.0m deep (each 0.4m wide x 1.0m length) at regular intervals (roughly every 5-6m spacing)
- Approximately 280m underground pipeline between dive thrust block (Chainage 180m) and Jetty No. 4 (Chainage 460m) – Trench excavations are anticipated to be 1.8m deep by 2.0m wide. Installation is expected to involve 'cut and cover' trenches reusing materials excavated during backfill (minimum 1.2m compacted backfill) and removal of surplus spoil material for reuse/containment within main terminal.

Figure 2, Appendix A shows the proposed layout of the pipeline route (including marking of Chainage 0 to 460m) relative to the Site boundaries.

3.2 Construction details

3.2.1 Construction activities

The Project's construction activities can have a direct impact on the environment and can contribute to a larger environmental change.

SMEC consider that the main development activities which could impact upon groundwater are localised deep excavation for installation of stormwater features and linear excavation for installation of gravity retaining wall foundations and underground stormwater pipework.

3.2.2 Excavations

SMEC consider the following expected areas and scale of groundwater interaction disturbance based on preliminary drawings provided by Manildra:

- Three localised deeper excavations to depths between 3.0m and 4.5 m bgl for installation of stormwater treatment devices and an underground storage tank are likely to extend below the current groundwater table. Specifically, the underground storage tank (Excavation 3) which requires dewatering. Based on information supplied to SMEC, preliminary estimated dimensions for excavations are included within Table 3-1 below.

Table 3-1 Summary of proposed deep excavations

Excavation ID	Proposed feature	Dimensions	Estimated depth below water table	Dewatering required
Excavation 1	Excavation 1- Stormwater Gross Pollutant Trap (GPT 1/D Southern)	Approximately 3m x 3m x 3.3m depth	Less than 0.5m	No – Short duration wet installation (< 1 day)
Excavation 2	Excavation 2 – Stormwater Gross Pollutant Trap (GPT 1/A Northern)	Approximately 3m x 3m x 3.0m depth	Less than 0.5m	No – Short duration wet installation (< 1 day)
Excavation 3	Stormwater underground storage tank	Approximately 10m x 5m x 4.5m depth	Approximately 2.0m	Yes – Extended duration dry installation (estimated 3-5 days)

- Multiple linear excavations up to 2 m bgl allowing for installation of gravity retaining wall foundations and underground stormwater pipework. Linear excavations and installations have potential to extend slightly below the groundwater table (less than 0.5m) and not expected to require dewatering. Concreting of foundation piers /shallow piles may be required below groundwater table.
- Multiple driven timber piles (approximately 700) are to be installed for foundations for bridge and tanks, with some potential additional screw piles or steel posts (along proposed retaining walls, if required) are expected to extend to bedrock to below current groundwater table. No dewatering activities or disturbances are proposed at individual pile locations.

Figure 5, Appendix A shows the indicative locations of deeper excavations.

Except for the above, remaining construction activities within the main terminal are not expected to involve direct interaction below the groundwater table. Site recontouring will involve sitewide shallow excavation (typically less than 1m bgl) and therefore interacting with groundwater is unlikely.

Along the pipeline route, groundwater was not intersected by the Targeted Site Investigation (SMEC, 2022a) and is unlikely to be intersected as part of the proposed development based on Site topography and subsurface observations. An assessment of groundwater was therefore not carried out or considered relevant in these areas.

3.2.3 Dewatering

Dewatering is likely to be required for installation of the underground storage tank (Excavation 3) which occurs below the groundwater level (Excavation 3 shown on Figure 5, Appendix A). This excavation is expected to be approximately 4.5m below the existing ground level, noting standing water levels are expected at around 1.8 m bgl based on previous groundwater monitoring near this proposed excavation. Dewatering may be required for a period of less than 5 days to facilitate excavation, installation/commissioning and backfilling following initial excavation to base depth (estimated between 2-5 days subject to confirmation of installer methods and requirements). Based on discussions with Manildra, temporary shoring/retention of the excavation (Excavation 3) would include sheet piles to minimise:

- inflows to the excavation;
- drawdown of the surrounding aquifer; and
- changes to the groundwater flow regime.

An assessment of the potential dewatering requirements for Excavation 3 is included based on modelling in Section 6. Manildra has indicated a preliminary estimated duration for each excavation is between two and five days (subject to confirmation of installer methods and requirements).The excavation strategy includes modelling to assess the potential radius of influence and inflows based on proposed mitigation measures consisting of sheet piling.

Dewatering is unlikely to be required for remaining installations of gross pollutant traps (Excavation 1 and Excavation 2) which may occur below groundwater levels, noting these will be installed as ‘wet installations’ without the need for dewatering. Stormwater pipework excavations are not expected to extend below groundwater levels and do not require dewatering.

SMEC note that if retention systems such as sheet piles that limit impacts from drawdown are not used, then to address impacts of deeper dewatering, a further assessment of the implications of dewatering on groundwater would need to be carried out. Where the results of assessment indicate further control measures beyond those described in this ASSMP, then an addendum will be required.

3.3 Construction impacts

If construction activities are not managed correctly, potential impacts on groundwater may include:

- Lowering of groundwater table during dewatering
- Impacts to groundwater quality from excavations/disturbances:
  - Draw down of groundwater table below depths of PASS with the potential to generate acid upon exposure to oxygen and acidify
  - Increase acidity from ASS disturbance (i.e. low pH groundwater) or
  - Decreased acidity from concreting (i.e. higher pH groundwater)
  - Change to existing groundwater contaminant concentrations (i.e. increased dissolved metals)
  - Mobilisation/leaching of contaminated soil disturbed during development
- Impacts to groundwater quality from other Site activities:
  - Spillage/uncontrolled release of chemicals stored at the Site
- Impacts to receiving waters (i.e. Port Kembla harbour) during groundwater dewatering
  - Spillage/uncontrolled release of contaminated groundwater during 'dewatering'
  - Uncontrolled discharges of extracted groundwater via stormwater drains affecting surface water quality.

Management procedures have been developed to mitigate these potential impacts and are outlined in Section 7. A construction water quality monitoring programme, including groundwater monitoring during and post construction, has been recommended to compare to baseline (refer to Section 7.2).

3.4 Operational impacts

Impacts on groundwater are less likely to occur during operation of the proposed development. SMEC understand that the proposed development includes all plant and equipment designed, commissioned, operated and maintained to prevent and capture spills and leakages of bulk liquids during normal operational. The ethanol storage tanks will be within a fully bunded area with greater than 100% capacity to contain any spills. Storm water within the bunded areas is captured assessed and treated if required before disposal.

In exceptional circumstances, such as an emergency fire, controlled releases of firefighting foams (non PFAS based) from the fire suppressant system are expected to occur. The potential release of firefighting foams (containing PFAS) is possible in certain circumstances such as 'catastrophic fire'. Such an event is expected to trigger an environmental site condition assessment, including additional groundwater quality assessment.

If operational activities are not managed correctly, potential impacts on groundwater may include:

- Impacts to groundwater quality from Site operational activities:
  - Spillage/uncontrolled release of chemicals stored at the Site
  - Discharge of firefighting foams from fire suppressant systems (potentially containing PFAS)
- Impacts to groundwater quality from non-Site activities (i.e. offsite development/ operational activities)
  - Migration of offsite groundwater contamination

In the case of certain events, additional 'operational' groundwater monitoring requirements are proposed to be implemented to monitor possible impacts to groundwater as outlined in Section 7.3.

4. Field investigations

4.1 General

SMEC undertook field investigations in April 2022 to inform this Groundwater Assessment and Management Report, which consisted of:

- Five new groundwater monitoring well installations (SMW02 to SMW06) in April 2022
- One additional groundwater monitoring event carried out at eight well locations, including three existing monitored wells (OHMW20, OHMW28 and SMW01) and five additional wells (SMW02 to SMW06). This was considered a third 'baseline' water quality monitoring event, supplementing two previous rounds (April and October 2021).
- Continuous water level logging for a period of three months (April to July 2022) within eight available wells
- Permeability testing to assess groundwater flow characteristics.

Figure 2, Appendix A shows the location of existing and new wells utilised during the field investigations. Details of well locations are summarised in Table 2-4.

Prior to the commencement of fieldwork, SMEC prepared a Safe Work Method Statement (SWMS) to manage the potential risks to Work Health and Safety (WHS) associated with the fieldwork. Subcontractor drillers were engaged who were approved under SMEC's supplier register.

Drilling and logging were undertaken under the constant observation of SMEC engineer/geologists. Groundwater monitoring was undertaking by a trained and experienced graduate environmental scientist (Mr Joel Reynolds). Test location coordinates were undertaken by SMEC surveyors.

4.2 Well installation and development

Five boreholes (SMW02 to SMW06) were drilled to facilitate installation of new monitoring wells including:

- Two boreholes (SMW02 and SMW06) were drilled using hollow flight auger (SFA) techniques through clayey fill and sandy natural soils.
- Three boreholes (SMW03, SMW04 and SMW05) were drilled using sonic drilling techniques to penetrate through a buried layer of boulders encountered approximately 3.0m bgl near the harbour foreshore. Casing was used to retain the hole during well installation where collapsing sandy soils were encountered.

The boreholes were logged in general accordance with AS 1726-2017 and in conjunction with SMEC's geotechnical explanatory notes, as provided in Appendix D together with piezometer details. In summary, the subsurface conditions encountered were generally consistent with that of previous geotechnical studies by SMEC (2021a and 2021b), comprising layers of fill, aeolian sand and/or estuarine sand deposit.

Installation of monitoring wells occurred following the drilling of boreholes. The monitoring wells were constructed generally as per the *'Minimum Construction Requirements for Water Bores in Australia, 3rd ED 2012'* using Class 18 uPVC casing and machine slotted screens, clean washed 2 mm to 4 mm bagged sand, bentonite seals and a grouted collar with lockable steel monument. Details of installation are included within Table 4-1 below.

Following installation, wells were developed to remove sediment/debris from the well by purging at least 40 litres of water (minimum 3 well volumes) using a decontaminated stainless-steel bailer. The groundwater recharge was observed to be relatively rapid with a minimal drop in groundwater level during well development.

The spatial position of existing/new groundwater wells were captured by Masters Surveying on 26 April 2022 noting coordinates are in GDA94. Easting, northing and reduced levels were reported on the borehole logs in Appendix D and included in summary Table 2-4.

Table 4-1 Summary of well installation details

Monitoring Well ID	Date installed	Total well Depth (m bgl)	Screened Interval (m bgl)	Groundwater inflow (m bgl)
SMW01	3 March 2021 (SMEC, 2021a)	4.5	1.5-4.5	2.5
SMW02	5 April 2022	4.0	1.0-4.0	1.5
SMW03	20 April 2022	4.5	1.5-4.5	2.6
SMW04	20 April 2022	4.5	1.5-4.5	2.5
SMW05	20 April 2022	4.5	1.5-4.5	2.7
SMW06	5 April 2022	4.5	1.5-4.5	2.5

4.3 Groundwater monitoring event

4.3.1 Monitoring objectives

A groundwater monitoring event was carried out on 26 April 2022 to assess the groundwater quality across the main terminal Site and compare with adopted assessment criteria applicable to the relevant NSW Water Quality Objectives and values for the waters of Port Kembla.

This was also considered a third 'baseline' water quality monitoring event, supplementing two previous rounds (April and October 2021) reported within the DSI (SMEC, 2021b) (refer to Section 2.4.2). Table 4-2 includes a summary of previous / current groundwater monitoring events carried out by SMEC at the Site include.

Table 4-2 Summary of groundwater monitoring events

Round	Date	Purpose	Wells monitored
Round 1	10 March 2021	Baseline	3 (SMW01, OHMW20 and OHMW28)
Round 2	21 October 2021	Baseline	3 (SMW01, OHMW20 and OHMW28)
Round 3 (this 'Groundwater monitoring event')	26 April 2022	Baseline and Characterisation of groundwater	8 (SMW01 to SMW)6, OHMW20 and OHMW28)

4.3.2 Sampling and analysis plan

The groundwater monitoring event was carried out generally consistent with the previous Sampling and Analysis Plan outlined in Section 5 of the DSI (SMEC, 2021b) which was based on the requirements described in ASC NEPM (1999). Data Quality Indicators (DQIs) are included in Appendix C.

The following changes were adopted during this monitoring round 3:

- Five additional groundwater monitoring wells were monitored with the three existing wells
- Adjustment to monitoring suite by removal of pesticides (OCP/OPP) and PCB –
- Adjust to adopted assessment criteria - Following initial liaison with NSW Ports and NSW EPA, adopted assessment criteria were confirmed to be protective of 'slightly to moderately disturbed ecosystems' apply to Port Kembla outer harbour waters.

Further details on sampling methodology are provided in subsequent sections.

4.3.3 Monitoring locations

One groundwater monitoring event was carried out at eight wells (SMW01 to SMW06, OHMW20 and OHMW28) on 26 April 2022, approximately one week after installation/development of the five new wells (SMW02 to SMW06).

The sampling design including locating wells 'judgmentally', targeting areas surrounding the proposed development features and to provide spatial coverage across the Site. The sampling design consisted of monitoring locations at both 'control' (inferred upgradient monitoring locations) and 'impact' (inferred down-gradient monitoring locations) relative to the Site main terminal features and existing known contaminated areas.

Table 4-3 below outlines the selected monitoring locations and rationale. Figure 2, Appendix A includes the groundwater monitoring locations.

Table 4-3 Summary of monitoring locations – Groundwater quality

Location ID	Location relative to Site main terminal features	Control or impact
SMW01	East of the tidal stormwater channel. Up-gradient of proposed ethanol tanks / Down-gradient of proposed gantry	Impact
SMW02	Southern Site boundary Up-gradient of the Site main terminal	Control
SMW03	Northern Site boundary Down-gradient of proposed ethanol tanks	Impact
SMW04	Northern Site boundary Down-gradient of proposed ethanol tanks	Impact
SMW05	Northern Site boundary Down-gradient of proposed ethanol tanks	Impact
SMW06	West of the tidal stormwater channel. Note: Location is down-gradient of an inferred location of PAH site contamination identified previously within the DSI (SMEC, 2021b)	Impact
OHMW28	Southern Site boundary Up-gradient of the Site main terminal	Control
OHMW20	Southern Site boundary Up-gradient of the Site main terminal	Control

4.3.4 Water Quality Objectives and assessment criteria

SMEC note that Illawarra Water Quality Objectives for harbours, including Port Kembla harbour, (URL Water Qualtiy Objectives - Illawarra (nsw.gov.au) Water Quality Objectives - Illawarra (nsw.gov.au) access 22/04/2022) includes:

- Aquatic ecosystems - Maintaining or improving the ecological condition of waterbodies and their riparian zones over the long term
- Visual amenity - The objective applies to all waters, particularly those used for aquatic recreation and where scenic qualities are important.

On 3 May 2022, SMEC liaised with a representative of NSW EPA (Chris Kelly) who confirmed NSW EPA's position to assess Port Kembla Outer Harbour under water quality criteria protective of 'slightly to moderately disturbed ecosystems', with the aim for improvement to the water quality even though the area has historically been disturbed.

Groundwater quality assessment criteria were therefore adopted for 'slightly moderately disturbed systems' for groundwater assessment based on the receiving environment (Port Kembla Outer Harbour). The adopted Groundwater Investigation Levels (GILs) were generally consistent with previous assessment criteria and rationale outlined the DSI (SMEC, 2021b) which were based on the following assumptions:

- Default Guideline Values for toxicants applying to 'marine' aquatic ecosystems were considered most applicable for the Site which is adjacent to Port Kembla Outer Harbour
- Based on the industrial setting of the Site, the 95% level of species protection applying to slightly moderately disturbed systems was considered applicable for initial screening. Where available, low or unknown reliability trigger values were adopted from ANZG (2018) for toxicants assigning protection 95% of species (or unknown).

Furthermore, where toxicants are noted to be potentially bio-accumulative (i.e. cadmium, mercury), the trigger value for the protection of 99% of species was adopted.

- The ANZG (2018) have not yet published default guideline values for Physical and Chemical Stressors for all Australian inland waters and bioregions (http://waterquality.gov.au/anz-guidelines/your-location/australia-inland). Therefore, this assessment adopts the previous ANZECC & ARMCANZ (2000) Default trigger values for physical and chemical stressors for South-east Australia for slightly disturbed marine ecosystems (applying to estuaries).
- ANZECC & ARMCANZ (2000) have not published guidelines for total petroleum hydrocarbons or total recoverable hydrocarbons in groundwater. For this assessment, the laboratory limits of reporting have been adopted as initial screening criteria.
- The PFAS National Environment Plan (Version 2.0 – January 2020) interim ecological water quality guideline values were adopted for the groundwater assessment at the Site. SMEC adopted the 95% criteria for species protection within a slightly to moderately disturbed system for the receiving environment (Outer Harbour). It is noted that the PFAS NEMP (2020) considers the bio accumulative nature of PFAS and suggests that 99% be used for slightly to moderately disturbed ecosystems. Due to the extremely low laboratory limits of reporting required to assess with respect to these criteria, SMEC have adopted 95% protection levels as Tier 1 investigation levels. Where investigation levels are exceeded, the bioaccumulation potential of this contaminant would be considered as part of a Tier 2 assessment (if required).

Adopted groundwater assessment criteria for this Site is included within Appendix B.

4.3.5 Monitoring methods

Groundwater samples were collected using low flow sampling techniques in general accordance with Victoria EPA (2000) Groundwater sampling guidelines. The sampling method was as follows:

- The depth to groundwater standing water level (SWL) was gauged using a water interface probe meter, accurate to the nearest 0.01m. The total well depth and 'well stickup' relative to ground surface were also measured. Observations were made for visual or olfactory evidence of contamination such as Light/Dense Non-aqueous Phase Liquids (LNAPL/DNAPL), oily sheens or hydrocarbon odours.
- A peristaltic pump with dedicated tubing at each sample point was used to collect a representative water sample
  - Prior to sample collection, 3 consecutive field parameter readings were recorded, along with several 'equipment' volumes being purged from the well
  - Field parameters were measured at volume intervals using a calibrated water quality meter which included dissolved oxygen (DO), electrical conductivity (EC), pH, redox potential, and temperature.
  - Groundwater samples were then collected once groundwater parameters had stabilised, using a new clean pair of nitrile gloves.
  - Samples were transferred directly into sampling containers supplied by contract laboratories which contained appropriate preservatives for the analysis undertaken. Sample containers were filled to the brim and sample lids were sealed to prevent exposure to atmosphere. Samples requiring analysis of heavy metals and cations were field filtered to 45µm prior to filling sample containers.
  - Samples were then immediately placed in an ice-filled chest to keep the samples chilled until transport to the laboratory.
- Observations of groundwater were also made including water clarity, colour, odours, presence of staining and groundwater recharge.

4.3.6 Laboratory analysis

Laboratory analysis for environmental testing was carried out by the following contract laboratories which are NATA accredited for the tests performed.

- ALS Environmental Laboratory, Smithfield NSW (Primary laboratory)

- Eurofins Environmental Laboratories, West Lane Cove NSW (Secondary laboratory)

Eight primary samples were selected for laboratory analysis of the groundwater contaminants of potential concern identified within the DSI (SMEC, 2021b). An exception was analysis of pesticides (OCP, OPP) and polychlorinated biphenyls (PCB) were excluded during this groundwater monitoring event. Based on the findings of the DSI, these contaminants of potential concern were considered less likely based on desktop site history information and soil contamination data at the Site.

Additional laboratory analysis of the following parameters was also carried out for 'baseline' purposes:

- Per- and Poly-Fluor Alkyl Substances (PFAS) - Due to the proposed firefighting sprinkler system including foam suppressant system, analysis of PFAS was recommended to Manildra as part of 'baseline' groundwater quality testing.
- Heavy metals (Al, Fe, Mn – total unfiltered), Heavy metals (Co, U – dissolved), total phosphorus, ammonium and total acidity – These additional groundwater analysis parameters was carried out concurrently to supplement 'baseline' parameters recommended in the Acid Sulfate Soil Management Plan (SMEC, 2022b).

In addition to the primary samples, an additional intra-laboratory duplicate (QA1) and inter-laboratory duplicate (QA1A) duplicates were collected and submitted to the primary and secondary laboratory respectively. These quality assurance samples were analysed for the same suite of contaminants as the primary samples. Table 4-4 presents a summary of laboratory analysis carried out during Round 3.

Table 4-4 Summary of laboratory analysis

Analytes	No. of Primary analysis		
	Primary sample	Intra-laboratory duplicate	Inter-laboratory duplicate (Eurofins)
Heavy metals (Al, As, Cd, Cr, Co, Cu, Fe, Pb, Hg, Ni, Se, U, Zn) - dissolved	8	1	1
Heavy metals (Al, Fe, Mn) – total unfiltered	8	1	1
TRH, BTEX, PAH	8	1	1
Phenolic compounds	8	1	1
VHCs	8	1	1
Nitrogen compounds (Ammonia, Nitrite, Nitrate, Ammonium ion)	8	1	1
Other inorganics (TDS, Hardness, Total Phosphorus Reactive Phosphorus	8	1	1
Major cations (Calcium, magnesium, potassium, sodium)	8	1	1
Major anions (Chloride, fluoride, sulphate)	8	1	1
Alkalinity	8	1	1
Total acidity	8	1	1
Per- and Poly-Fluor Alkyl Substances (PFAS)	8	1	1

4.3.7 Quality assurance and quality control

4.3.7.1 QAQC plan

The following quality assurance and quality control (QAQC) plan was adopted for the work in general accordance with the Assessment of Site Contamination – National Environment Protection Measure 2013:

- Field monitoring instruments used to collect data were calibrated in accordance with manufacturers calibration requirements. Calibration certificates are included in Appendix F.

- Well installations and sampling of groundwater was carried out by trained and experienced environmental staff using sampling protocols which minimise potential cross contamination occurring in between sampling locations. The following was carried out during field investigations:
  - During well installation, the drill rods were decontaminated between sample locations by removing soil, particles, washing in a solution with Liquinox detergent and rinsing with potable water using a high-pressure gurney. Drillers handled well installation materials in original sealed packaging and/or wearing nitrile gloves during installation.
  - During well development and groundwater sampling, reusable sampling equipment (including stainless steel bailer and interface probe to gauge wells) were decontaminated between sample locations by removing soil particles, washing in a solution with Liquinox detergent, rinsing with potable water and then rinsing with distilled water.
  - A rinsate blank was collected from the interface probe and tested to assess the effectiveness of decontamination for heavy metals and PFAS only (results are presented within Table E3, Appendix E)
  - Equipment rinsate samples were collected from reusable sampling equipment to assess the effectiveness of decontamination. Rinsate samples were collected off Stainless steel bailer (2 samples), Drillers rod (1 sample) and interface probe (1 sample). Rinsates were analysed for heavy metals and PFAS only (results are presented within Table E3, Appendix E)
  - Groundwater samples were collected with dedicated disposable tubing for each monitoring location.
- As the investigation involved sampling for PFAS analysis in groundwater, additional precautions outlined within Section 18 of the PFAS NEMP (2020) were adopted. In summary:
  - Prior to sample collection, any personnel that handled decontaminated groundwater sampling equipment that directly contacted the environmental media to be sampled washed their hands with plain soap and rinse thoroughly with tap water before donning a clean, new pair of disposable nitrile gloves.
  - A selection of PFAS-suitable sampling equipment was used including HDPE tubing for low flow sampling and PFAS-free detergents (i.e. Liquinox detergent). Sampling containers for PFAS analysis were supplied by the laboratory (no Teflon lined).
  - Care was taken to avoid the handling of additional sources of PFAS within the sampling area (such as sunscreen, Teflon products, aluminium foil, stain/water resistant fabrics and ice bricks) as per the requirements of the PFAS NEMP (2020).
  - Field blank samples were collected from drillers tank water to assess the potential for PFAS to have been introduced whilst drilling. Field blank samples were analysed for PFAS only (results are presented within Table E3, Appendix E).
- During fieldworks, all samples were placed in an ice-filled chest to keep the samples cool. Samples were kept on ice until delivered to the testing laboratory.
- Samples were then transported to the laboratory with relevant Chain of Custody (CoC) documentation. The CoC form was completed with the sample names, sampling date and required analyses. The samples were sent to the laboratory for analysis within the prescribed analyte holding times
- Duplicate samples were collected and tested for each analyte to assess precision in field sampling techniques and laboratory methods. Duplicate samples (comprising both intra-laboratory duplicates and intra-laboratory duplicates) were analysed at a frequency of 1 in every 20 samples (minimum 5%) as recommended in NEPM. The duplicate analysis summary is summarised in Table 4-4. Relative precent differences (RPD) were calculated using the method in Section 8.2.6 of AS4482.1-2005 and presented in Table E2, Appendix E.

4.3.7.2 QAQC Data evaluation

Quality assurance and quality controls (QAQC) data evaluation was carried out in general accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999. The results were assessed with respect to predetermined DQIs as referenced in the in the ASC NEPM, 2013 and as presented in Appendix C.

The following non-compliances were noted:

- Due to incomplete field records retain for groundwater sampling location SMW06, field parameters were not recorded. This is unlikely to affect the useability of the data for baseline characterisation.
- Trip spike and trip blank samples were not analysed together with samples collected during the groundwater quality monitoring event. The potential for loss of volatiles during transport was therefore unable to be assessed. The omission of these samples is unlikely to affect usability of the data noting samples were transported to the primary laboratory at recommended temperatures and sample concentrations indicated a low likelihood for volatile contaminants to be present.
- Some samples were noted as being analysed outside of holding times, including;
  - Primary sample batch (ALS - EW2201994) – Primary samples were analysed outside of holding times for pH (overdue by 3 days) and Nitrite as N and Reactive Phosphorus as P (overdue by 1 day). The analysis of pH by the laboratory has been omitted in preference for field measured pH The results of Nitrite as N and Reactive Phosphorus appeared similar to previous monitoring concentrations at the same locations (refer to Table E1, Appendix E).
  - Secondary sample batch (Eurofins – 884366) – This single sample was analysed outside of holding times for analysis of TRH, VOCs, PAHs, Phenols (non-halogenated) (overdue by 2 days) and Nitrite as N and Reactive Phosphorus as P (overdue by 6 days).Secondary sample analysis results are considered useable for purposes of precision assessment, noting concentrations of these parameters appeared similar to corresponding primary and duplicate samples.
- Some sample batches were noted as being received with temperatures higher than 6°C upon receipt at the laboratory, including Eurofins batch 882352 (Equipment rinsate - Well installation second round) and Eurofins batch 884366 (QA1A - Round 3 inter-laboratory duplicate) with temperatures of 10.3°C and 18.7°C respectively. Elevated sample temperatures are unlikely to affect useability of data in these batches, noting PFAS and heavy metals within rinsates data are not volatile (batch 882352). In Eurofins batch 884366, the concentrations recorded within QA1A appeared similar to corresponding primary and duplicate samples (refer to Table E2, Appendix E).
- Equipment rinsate samples in Eurofins batch 882352 returned detectable concentrations of heavy metals during the second round of well installation of wells SMW03, SMW04 and SMW05. The sample taken from the drilling rod (Rinsate 01 – Drill rod) recorded detections of heavy metals (aluminium, copper and iron) and the sample taken from the stainless-steel bailer (Rinsate 02 – Bailer) recorded detections of heavy metals (aluminium, chromium, copper, iron, lead, manganese and nickel). Slight detections of heavy metals in equipment rinsates may have originated from ineffective equipment decontamination (i.e. groundwater or soil residues) or from within the rinsate water itself.

  SMEC consider rinsate detects are minor and unlikely to indicate potential cross contamination to have occurred based on the following:
  - Potential for cross contamination was minimised between groundwater sampling locations, noting decontamination procedures were implemented in between well installations and well development (refer to Section 4.3.7.1).
  - Groundwater sample concentrations at these locations during the April 2022 monitoring event recorded elevated heavy metals (including aluminium, copper and manganese) above adopted GILs, suggesting a source of these contaminants in groundwater. Remaining heavy metals (including nickel, chromium and lead) were either below criteria or not detected suggesting a low potential for cross contamination to have occurred.
- Field and laboratory groundwater duplicates recorded relative percentage differences (RPDs) outside of adopted control limits (30%) for some analytes, including:

  - Field duplicate RPDs ranging from 59% to 74% for Ammonia and Ammonium ion as N between the primary sample (OHMW28) and corresponding intra-laboratory duplicate (QA1) and inter-laboratory duplicate (QA1A) samples. Some variability is noted for ammonia.
  - Field duplicate RPDs ranging from 99% to 154% for other inorganic analytes between the primary sample (OHMW28) and corresponding inter-laboratory duplicate (QA1A) sample, including Total Phosphorus as P (99%), Nitrite + Nitrate as N (152%) and Nitrate as N (154%). RPDs were within control limits between corresponding primary (OHMW28) and intra-laboratory duplicate (QA1) suggesting slight variability for these groundwater analytes between laboratory test methods.
  - Field duplicate RPD of 196% was recorded for iron (total) between the primary sample (OHMW28) and corresponding inter-laboratory duplicate (QA1A) sample. Upon query with the laboratory, Eurofins indicated that the sample container submitted for total metals analysis appear of much greater clarity than corresponding bottles, suggesting sample heterogeneity may be reason for variability. The interlaboratory duplicate data for iron (total) (QA1A) has therefore been disregarded (not useable), noting remaining total metals analysed (manganese and aluminium) recorded RPDs within control limits and appear useable
  - In batch 884366, laboratory duplicate RPDs recorded from 40% to 73% above the control limit of 30% for several PAH compounds. Further analysis indicated that sample heterogeneity was the cause of the PAH exceedances. It is noted this sample corresponded to another project Site and has therefore been disregarded.
  - Several RPDs which were recorded above the field or laboratory acceptance limits have been disregarded where sample concentrations were less than 10 times the laboratory limit of reporting.
- Laboratory quality assurance and quality control testing was carried out and the following was noted:
  - In batch 882352, a reduced frequency of laboratory duplicates and matrix spikes were analysed for heavy metals due to small batch size. The omission of these tests is unlikely to affect useability of these rinsate samples.
  - In batch 884366, a reduced frequency of matrix spikes was analysed for BTEX and VOC due to small batch size. A sufficient number of laboratory control spikes were analysed, and recoveries were within laboratory acceptance limits.
  - In batch EW2201994, matrix spike recoveries were unable to be determined in Sulfate and Nitrite + Nitrite as N due to background levels being greater than or equal to 4x spike level in both cases. A sufficient number of laboratory control spikes were analysed, and recoveries were within laboratory acceptance limits.

Based on the above data evaluation, SMEC consider the remaining data to be useable for the objectives of this assessment to assess the baseline groundwater quality.

4.4 Groundwater level monitoring

Continuous groundwater level monitoring was carried out at eight wells (SMW01 to SMW06, OHMW20 and OHMW28) for a period of up to three months. Additional monitoring was carried out at an available onsite well (ID unknown) for a period of 2 weeks. Table 4-5 provides a summary of monitoring locations and periods.

Table 4-5 Summary of monitoring locations – Groundwater levels

Location ID	Date commenced	Date ended	Period (weeks)
SMW01	6/04/22	12/07/22	14
SMW02	6/04/22	12/07/22	14
SMW03	20/04/22	12/07/22	12
SMW04	27/04/22	12/07/22	11
SMW05	20/04/22	12/07/22	12
SMW06	6/04/22	12/07/22	14
OHMW28	6/04/22	12/07/22	14
OHMW20	6/04/22	12/07/22	14
ID Unknown	6/04/22	20/04/22	2

Continuous water level monitoring was carried out at the wells by the following method:

- Loggers were initially setup to record at 1-hour recording intervals, recorded on the hour.
- Loggers were installed to approximately 0.5m above the base of the well. A single logger was installed at the top of the well for atmospheric correction.
- Manuel water level measurements were carried out over three discrete events; approximately 3 weeks, 5 weeks and 14 weeks and from logger installation.
- Manual water level measurements we carried out with a water dip meter to measure standing water levels to the nearest 0.01m, below the top of well casing (m bTOC). Water level measurements were corrected to reduced level (mAHD) using well survey information.
- Continuous logger data was processed within Excel and presented on groundwater hydrographs.

4.5 Permeability testing

Permeability testing was carried out at selected wells (including SMW01, SMW02, SMW05, SMW06 and OHMW20) using the rising head test method as follows:

- Loggers were initially setup to record at 1-second recording intervals, recorded every second
- Loggers were installed to approximately 0.5m above the base of the well.
- Twin bailers were inserted and used to rapidly remove 2L of water from the well
- Discrete water level measurements were carried out within a water dip meters to measure SWLs at regular intervals (typically every 30s) or until the water had return to original level

Permeability tests were inconclusive with recovery of the water level almost instantaneous in all tested wells. The permeability of the sand aquifer was estimated to be over 10 m/day.

5. Characterisation of Groundwater

5.1 Standing water level

Groundwater depths to standing water level (SWL) recorded during the water level monitoring (discrete measurements) are summarised in Table 5-1. Hydrographs showing standing water levels (continuous) for each of the wells are included in Appendix I.

Depths to standing water level appeared relatively consistent between monitoring rounds typically within ±0.1m, suggesting groundwater level changes do appear to change. The following was observed from hydrographs in Appendix I:

- Tidal influences appear the more dominant factor on SWLs within wells along the northern boundary of the Site (i.e. SMW03 to SMW05) with obvious periodic fluctuations (typically ±0.5m). Groundwater SWLs in the southern part of the Site (i.e. OHMW28, OHMW20, SMW02) appear relatively stable noting tidal influences appear to have minimal influence on water levels in these wells.
- Rainfall influences appear more dominant factor on SWLs within wells within the centre and southern part of the Site (SMW01, SMW02, SMW06, OHMW28 and OHMW20). For example, an increase of between 0.3 and 0.7mAHD in water level was noted in response to heavy rainfall in early April and an increase of between 0.7 and 1.1m AHD in water level was noted in response to heavy rainfall in early July 2022.

Table 5-1 Summary of groundwater standing water level

Location ID	Date / Time	Standing water level	
		m bTOC	m AHD
SMW01	10/03/21 11:33	2.83	0.50
	21/10/21 13:05	2.87	0.46
	26/04/2022 12:26	2.73	0.60
	11/05/2022 10:52	2.73	0.60
	12/07/2022 11:50	2.63	0.70
SMW02	26/04/2022 11:30	2.78	0.85
	11/05/2022 8:04	2.82	0.81
	12/07/2022 12:14	2.57	1.07
SMW03	26/04/2022 13:06	3.49	0.29
	11/05/2022 14:40	3.33	0.45
	12/07/2022 11:56	3.29	0.49
SMW04	26/04/2022 13:19	3.46	0.16
	27/04/2022 8:14	3.15	0.47
	11/05/2022 14:30	3.28	0.33
	12/07/2022 11:50	3.45	0.16
SMW05	26/04/2022 13:00	3.57	0.00
	11/05/2022 13:31	3.39	0.19
	12/07/2022 11:45	3.45	0.13
SMW06	26/04/2022 11:06	3.56	0.61
	11/05/2022 12:28	3.55	0.63
	12/07/2022 11:20	3.47	0.71

Location ID	Date / Time	Standing water level	
		m bTOC	m AHD
OHMW28	10/03/21 13:19	2.44	0.65
	21/10/2021 10:00	2.53	0.56
	26/04/2022 12:10	2.10	0.98
	11/05/2022 15:30	2.14	0.96
	12/07/2022 12:32	1.86	1.24
OHMW20	10/03/21 13:59	3.30	0.53
	21/10/21 12:00	3.36	0.47
	26/04/2022 11:50	3.00	0.83
	11/05/2022 9:50	*3.05*	0.79
	12/07/2022 12:20	2.79	1.04
ID Unknown	20/04/2022 15:35	2.29	0.94
	26/04/2022 12:15	2.32	0.90
	11/05/2022 15:40	2.38	0.85
	12/07/2022 12:28	2.13	1.10
m bTOC – Metres below top of casing m AHD – Metres above Australian Height Datum			

5.2 Groundwater flow direction

Figure 6, Appendix A shows the inferred groundwater contours and flow direction based on well gauging data during groundwater monitoring event on 26 April 2022.

Inferred groundwater contours indicate flow in a northerly direction towards the Port Kembla Outer Harbour. Groundwater levels beneath the Site ranged between 0.98m AHD (OHMW28) at the southern boundary and 0.01mAHD (SMW05) at the northern boundary. By comparison, a similar north-easterly groundwater flow direction was noted from historic monitoring by others (refer to Section 2.4.1).

5.3 Permeability observation

A rising head recovery test was undertaken on fives bores (including SMW01, SMW02, SMW05, SMW06 and OHMW20) on the 11 May 2022. At each well, the groundwater level was reduced by removing 2L of water and the change in groundwater level over time was monitored. The recovery was nearly 'instantaneous' indicating a high permeability sand aquifer, as observed in the subsurface logs. Analysis of the data was not carried out as the limited recovery data provided a low level of confidence in the results; suffice to say they indicate permeabilities well over 10 m/day. Modelling inputs were based on assumed hydraulic conductivities typical of 'beach sand' (refer to Section 6.2) and adjusted during calibration to the observed heads.

5.4 Groundwater quality

5.4.1 Field observation

Field observations during groundwater monitoring did not observe evidence of contamination such as hydrocarbon odours, oily sheen or evidence of phase separate hydrocarbons (i.e. Light Non-Aqueous Phase Liquids/Dense Non-Aqueous Phase Liquids).

5.4.2 Laboratory results

A laboratory summary table is included within Table E1, Appendix E, including the previous results (Rounds 1 and 2) and current April 2022 results (Round 3). Laboratory analytical reports from April 2022 (Round 3 only) are included within Appendix G. Groundwater sampling locations are shown on Figure 2, Appendix A.

The analytical results across each Rounds 1 to Round 2 are summarised below:

- Physical parameters typically exceeded adopted ANZECC 2000 threshold ranges for physical and chemical stressors (applying to estuaries) including:
  - pH concentrations were less than 7 (lower limit) within some wells
  - Dissolved oxygen concentrations were below 90-110% (range)
- Nutrient concentrations exceeded adopted ANZECC 2000 threshold for physical and chemical stressor (applying to estuaries) including Nitrate/Nitrite (NOx), Ammonium ion (as N), Reactive phosphorus (FRP) and/or Total Phosphorus (TP) at several sampling locations.
- Electrical conductivity ranged between 1,840 and 2,880µs/cm within most groundwater well locations (excluding OHMW20 which ranged 14,274 and 23,158 µs/cm). The data suggest a lower electrical conductivity at wells located in the central and western portion (<3,000 µS/cm) and higher conductivity localised at well OHMW20 located in the eastern portion (>14,000µS/cm) suggesting likely saline influences.
- PFAS compounds did not exceed adopted PFAS NEMP (2020) Ecological (interim marine) 95% protection level at all groundwater location for PFOS and PFOA criteria. Slight detections of PFOS were noted to exceed the adopted limit of reporting (0.01µg/L) at four wells (SMW01, SMW03, SMW05 and SMW06).
- Ammonia was recorded at 0.85-1.3mg/L[1] slightly above the adopted GIL (95% protection level) at OHMW28 only, including corresponding inter-laboratory duplicate data (QA1A – October 2021). Further testing at this location during October 2021 recorded ammonium ion between 0.81-1.4mg/L, suggesting the ammonia is mainly present in the ionised ammonium ion form. The ANZG (2018) states 'The toxicity of ammonia is primarily attributed to the un-ionised ammonia NH3…however, ammonium ion can also contribute significantly to ammonia toxicity under certain conditions.' (ANZG, 2018, URL Ammonia in freshwater and marine water (waterquality.gov.au)). It is also noted that a lower pH (pH<8), the marine trigger value for total ammonia-N increases.
- Elevated concentrations of dissolved heavy metals (including aluminium, cadmium, cobalt, copper, lead, nickel, selenium, uranium and zinc) and total heavy metals (including aluminium and manganese) were recorded which exceeded adopted GILs at the 95% protection level.
- Organic compounds were typically below laboratory detection limits and did not exceed adopted ANZG 95% protection level (or 99% bio accumulative) including TRH, BTEX, PAHs*, Phenolic compounds and VHC. *The exception was for detections of PAHs above laboratory limits of reporting.
- Some limitations are noted for comparison of groundwater concentrations reported to laboratory limits of reporting which exceed adopted GILs for selected PAHs (Anthracene), dissolved heavy metal (Aluminium and Uranium), ammonium ion as N, nitrate and nitrite as N, Filterable Reactive Phosphorus due to (refer to Section 4.3.7.2).

Table 5-2 presents a summary of monitoring parameters and monitoring points which exceeded the adopted assessment criteria during both rounds of the DSI. Bold text indicates concentration exceeded.

Table 5-2 Summary of analysis concentration ranges and criteria exceedances

Analyte	Concentrations of contaminant (mg/L) (Note 1)		Assessment criteria summary	
	Min	Max	Locations exceeded criteria	Criteria exceeded / comment
Field parameters				

[1] Inter-laboratory duplicate data included for ammonia and ammonium ion (QA1A, duplicate of OHMW28 – October 2021).

Analyte	Concentrations of contaminant (mg/L) (Note 1)		Assessment criteria summary	
	Min	Max	Locations exceeded criteria	Criteria exceeded / comment
pH (units)	6.38	7.40	OHMW20, OHMW28, SMW01	ANZECC (2000) *Lower pH noted
Electrical conductivity (specific) (µS/cm))	1,840	23,158	N/A	*Saline influences at OHMW20 noted
Dissolved oxygen (%)	0.9	18.7	Nil	ANZECC (2000)
Inorganic compounds				
Ammonia (as N)	<0.01	1.33	OHMW28 (March and October 2021 only) **Included inter-laboratory duplicate date (QA1A – October 2021)*	ANZG (2018)
Ammonium ion (as N)	<0.01	0.81	OHMW20, OHMW28, SMW01, SMW03,	ANZECC (2000)
Nitrate and Nitrite (as N)	<0.01	7.77	OHMW20, OHMW28, SMW01, SMW02, SMW03, SMW04, SMW05, SMW06	ANZECC (2000)
Filterable reactive phosphorus (as P)	<0.01	0.17	SMW02 (April 26 only)	ANZECC (2000)
Total Phosphorus (as P)	0.02	0.39	OHMW20, OHMW28, SMW01, SMW02, SWM05, SMW06	ANZECC (2000)
Total Hardness (as CaCO3)	458	3040	N/A	
Total Acidity (as CaCO3)	1	57	N/A	
Total Dissolved Solids	610	14,800	N/A	
Calcium	111	567	N/A	
Magnesium	25	525	N/A	
Sodium	24	5,000	N/A	
Potassium	4	95	N/A	
Chloride	9	7,550	N/A	
Fluoride	1.3	8.1	N/A	
Sulphate as SO4	45	2,080	N/A	
Total Alkalinity (as CaC03)	214	489	Alkalinity consists of Bicarbonate alkalinity only.	
Metals				
Aluminium	<0.005	0.030	OHM28, SMW01, SMW02, SMW05, SMW06	ANZG (2018)
Aluminium (total)	0.02	0.93	OHMW20, OHMW28, SMW01, SMW02, SMW03, SMW04, SMW05, SMW06	ANZG (2018)

Analyte	Concentrations of contaminant (mg/L) (Note 1)		Assessment criteria summary	
	Min	Max	Locations exceeded criteria	Criteria exceeded / comment
Arsenic	<0.001	0.068	N/A	ANZG (2018)
Cadmium	<0.0001	0.0053	OHMW20, SMW01, SMW02, SMW06	ANZG (2018)
Chromium (III+IV)	<0.001	0.002	Nil	ANZG (2018)
Cobalt	<0.001	0.137	OHMW20, OHMW28, SMW01,	ANZG (2018)
Copper	<0.001	0.036	OHMW20, OHMW28, SMW01, SMW02, SMW03, SMW04, SMW05, SMW06	ANZG (2018)
Iron	<0.05	17.4	N/A	
Iron (total)	<0.05	20.2	N/A	
Lead	<0.001	0.016	SMW01, SMW02	ANZG (2018)
Manganese	0.021	3.72	OHMW20, OHMW28, SMW01, SMW03, SMW04, SMW05	ANZG (2018)
Manganese (total)	0.036	6.71	OHMW20, OHMW28, SMW01, SMW03, SMW04, SMW05	ANZG (2018)
Mercury	Not detected (<0.0001)		Nil	ANZG (2018)
Nickel	0.005	0.127	SMW01	ANZG (2018)
Selenium	<0.0002	0.144	OHMW28. SMW01, SMW02, SMW03, SMW04, SMW05, SMW06	ANZG (2018)
Uranium	0.00021	0.00811	OHMW28. SMW01, SMW02, SMW03, SMW04, SMW05, SMW06	ANZG (2018)
Zinc	<0.005	0.849	OHMW20, SMW01, SMW02, SMW03, SMW04, SMW05, SMW06	ANZG (2018)
Organic compounds				
BTEX	Not detected (<0.001 to <0.002)		Nil	ANZG (2018)
TRH	Not detected (<0.02 to <0.1)		Nil	ANZG (2018)
Polycyclic aromatic hydrocarbons (PAHs)	<0.000001	0.000183	Nil	ANZG (2018)
Phenolic compounds	Not detected (<0.001 to <0.002)		Nil	ANZG (2018)
Volatile Halogenated Compounds (VHC)	Not detected (<0.005)		Nil	ANZG (2018)
PFAS				
PFOS	<0.01	0.08	Nil	PFAS NEMP (2020)

Analyte	Concentrations of contaminant (mg/L) (Note 1)		Assessment criteria summary	
	Min	Max	Locations exceeded criteria	Criteria exceeded / comment
Sum of PFHxS and PFOS	<0.01	0.09	Nil	PFAS NEMP (2020)
PFOA	<0.01	<0.01	Nil	PFAS NEMP (2020)
Note 1: Units are milligrams per litre (mg/L) unless otherwise specified.				

5.5 Groundwater quality summary

The 'baseline' groundwater quality at the Site main terminal is characterised by elevated concentrations of heavy metals and nutrients (nitrogen and phosphorus) which exceeded adopted GILs.

The results of groundwater monitoring events in March, October 2021 and April 2022 recorded elevated concentrations of heavy metals (including aluminium, cadmium, cobalt, copper, lead, manganese, nickel, selenium and zinc) which exceeded adopted GILs for protection of marine aquatic ecosystems at the 95% species protection level (ANZG 2018). Total Ammonia (as N) also slightly exceeded adopted GIL (95% protection level) at one location OHMW28 during both March and October 2021 events.

Nutrient concentrations exceeded adopted ANZECC 2000 threshold for physical and chemical stressor (applying to estuaries) including Nitrate/Nitrite (NOx), Ammonium ion (as N), Reactive phosphorus (FRP) and/or Total Phosphorus (TP).

As identified in the DSI (SMEC, 2021b), heavy metal concentrations in groundwater were typically below or within the range of historical groundwater monitoring data (refer to Table 2-3), with exception of slightly higher selenium. Heavy metal exceedances have also been recorded in the broader Port Kembla foreshore lands. The groundwater quality considered a regional issue related to long term historical industrial activities and land reclamation with poorer quality fill in Port Kembla, including beneath and surrounding the Site. The quality of the groundwater is not likely to have an impact to the proposed development itself, but there is potential for impact to downgradient ecological receptors.

PFAS compounds did not exceed adopted PFAS NEMP (2020) Ecological (interim marine) 95% protection level at all groundwater locations for PFOS and PFOA criteria. Slight detections of PFOS were noted to exceed the adopted laboratory limit of reporting (0.01µg/L) at four wells (SMW01, SMW03, SMW05 and SMW06). It is noted the bioaccumulation potential of this contaminant has not been assessed, for which lower laboratory limits of reporting are required to assess with respect to 99% protection levels in accordance with PFAS NEMP (2020).

SMEC recommend NSW Ports should be made aware of the results of the groundwater quality and as the landowner, they should confirm their acceptance of the development given these groundwater conditions. We understand the pre-existing groundwater contamination (if any) is the responsibility of NSW Ports and may be required to be assessed or managed at a later stage. With respect to baseline conditions, SMEC note that groundwater concentrations can fluctuate over time and during different temporal conditions.

It was beyond the scope of this groundwater assessment to assess the risks currently posed to the aquatic ecosystems by existing groundwater quality conditions. The proposed development activities should be managed to minimise groundwater interaction, thereby reducing potential exacerbation of existing contamination issues. Further it is recommended that groundwater quality monitoring would be carried out during construction stages to assess potential changes in groundwater quality through direct or indirect interactions from the development.

6. Excavation strategy

6.1 General

Based on Site information and results of field investigation, SMEC undertook numerical modelling to inform the excavation strategy for Excavation 3 installation of proposed stormwater underground storage tank. Key assumptions of numerical model were based on agreed inputs from Manildra regarding assumed excavation dimensions and duration as outlined within Table 6-1.

Table 6-1 Excavation 3 modelling assumptions

Modelling input	Assumption
Size of excavation	5m wide x 10m long
Depth of excavation	5m (max) below ground level (Ground level 2.9m AHD, Excavation base -2.1m AHD)
Depth of sheet piling	Variable - To be assessed
Depth of groundwater	Assume 1.835m bgl (highest recorded 6/04 - subject to variability once water level logger data is obtained)
Duration of open excavation	5 days (maximum)
Soil profile	Modelling assumes simplified soil layers at this excavation would include: • Fill -0.0 to 1.5m bgl* (1.5m thick) • Beach Sand (unit identified as 'Aeolian/Estuarine') – 1.5 to 10.5m bgl* (9m thickness) • Clay (unit identified as 'Residual Soil' layer) – 10.5 to 23.5m bgl* (13m thickness) *Depths based on previous borehole logs at the Site and as per generalised subsurface conditions (Section 2.5.1)

6.2 Methodology

A numerical three-dimensional model has been developed using FEFLOW code (Version 7.5) in saturated mode to assess:

- The impact of excavation of a pit (Excavation 3) for the installation of a below ground storage tank on the local groundwater system; and
- Estimate the groundwater inflow to the pit during excavation under different sheet pile wall (SPW) design scenarios; being
  - fully drained (no sheet pile wall);
  - sheet pile wall to 2m below the excavation depth; and
  - sheet pile wall to the bottom of the aquifer (-7.5m AHD)

The adopted model domain extends 200 m to the East and South of the project site to capture the extent of drawdown impact of pit excavation on the groundwater system. The model mesh is shown on Figure 6–1with mesh sizes around 8 m over most of the model domain and refined to 1 m around the proposed excavation.

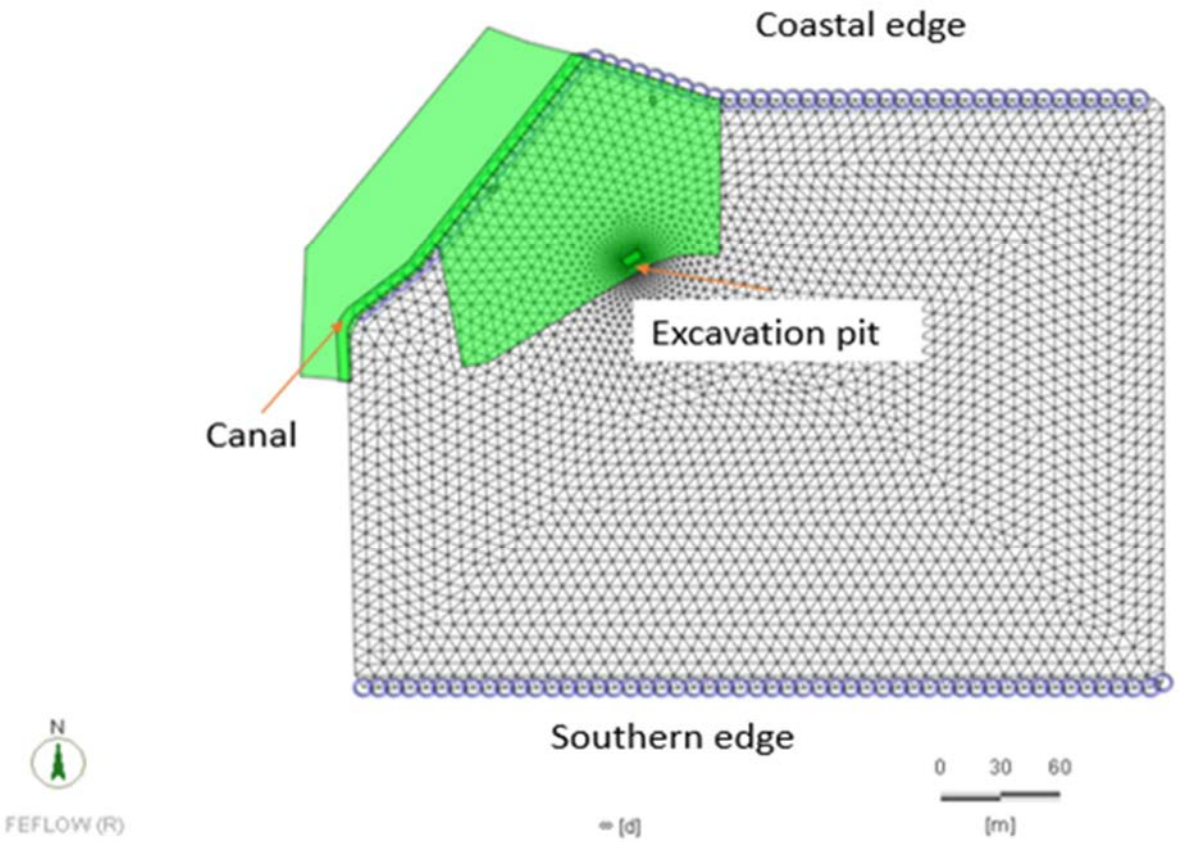

Figure 6–1: Model domain, mesh and boundaries

The hydrogeological layers and elevation of each unit were based on a review of available borehole logs for the Site during Preliminary Geotechnical investigations (SMEC, 2021a) and generalised subsurface conditions (refer to Section 2.5.1). Three hydrogeological layers are included in the model, including Fill, Beach Sand (unit identified as 'Aeolian/Estuarine') and Clay (unit identified as 'Residual Soil' layer). The bottom elevation is assumed to be -20 mAHD. The average thickness of the three layers are 1.5 m, 9 m and 13 m respectively from top to bottom. The hydrogeological parameters used for each hydrogeological unit are based on literature (A.R.Costall, et al 2020, Duffield,G, 2019), and summarised in Table 6-2.

Constant Head Boundary Conditions are defined on the coast (Northern), canal and Southern edges of the model domain to allow exchange of groundwater between the model and its surroundings, as shown on Figure 6–1. The constant head value assigned to the coastal edge and canal edge is 0 mAHD, representing mean sea level. For the Southern edge, the constant head value is based on groundwater head measurements and adjusted in the model calibration.

Table 6-2 Hydrogeological parameters for each layer

Layer	Material	Horizontal Hydraulic Conductivity (m/d)		Porosity (%)	Specific Storage (1/m)
		Min	Max		
Fill	Fill Gravelly silt with sand Fill clayey sand	0.0005	0.5	30	0.000005
Beach sand	Beach fine sand with gravel	5	3000	25	0.000005
Clay	Clayey sand, gravelly clay with sand	0.0005	0.5	30	0.000005

The average rainfall for the site area is 1,272 mm/year based on rainfall record from Port Kembla Signal station (068053) from Bureau of Meteorology.

The model has been calibrated manually in steady state and the calibrated hydraulic head distribution is assigned as the initial head condition for excavation simulation. The Southern boundary head and hydrogeological parameters were adjusted through trial and error to obtain a reasonable match between calculated groundwater level and observed groundwater level measurements collected on 26/04/2022.

The modelling relies on the following assumptions:

- The excavation is assumed to be 5 m below ground elevation (-2.1 m AHD)
- Is wished in place instantly and
- Is open for 5 days.

To simulate the excavation, the Constant Head Boundary Condition is assigned to the nodes within the excavation, and active for 5 days. After 5 days, the groundwater head around the pit will recover to its natural condition over time. Three design options have been simulated as below:

- Scenario A: Without sheet pile wall around the excavation considered the base (worst) case
- Scenario B: With sheet pile wall around the pit extending from ground surface to 2 m below bottom of excavation (-4.1 mAHD)
- Scenario C: With sheet pile wall around the excavation extending from ground surface to the bottom of sand layer (-7.5 mAHD, within Clay)

The hydraulic conductivity of sheet pile wall is assumed to be 0.001 m/d (ArcelorMittal Sheet Piling), representing an impermeable barrier with small gaps between each sheet. The thickness of sheet pile wall is assumed to be 0.1 m for modelling purposes.

6.3 Results and discussion

6.3.1 Calibration results

The Southern edge boundary head is calibrated to be 4 mAHD, and the recharge rate is 0.1 mm/d (16% of rainfall). For hydraulic conductivity, the upper range values of Table 6-2 are used for a conservative assessment. Calibrated hydraulic conductivity are summarized in Table 6-3. The calibrated hydraulic head distribution contour and scatter plot of observed and calculated head is shown on Figure 6–2. The calculated heads match with the observed heads reasonably well.

Table 6-3 Calibrated hydraulic conductivity

Layer	Horizontal Hydraulic Conductivity (m/d)	Vertical Hydraulic Conductivity (m/d)
Fill	0.5	0.05
Beach sand	100	20
Clay	0.5	0.05

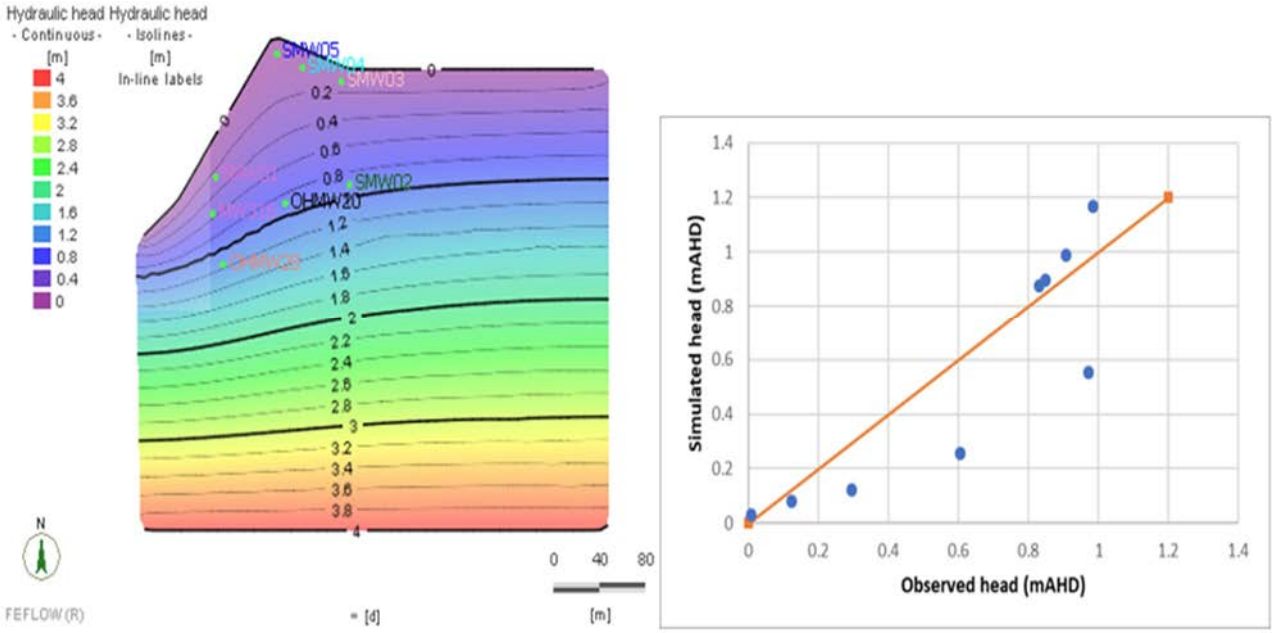

Figure 6–2: Calibrated hydraulic head distribution map and scatter plot

6.3.2 Groundwater inflow to the excavation

The cumulative groundwater inflows to the excavation, are 16,868m^3, 13,917m^3 and 2,008 m^3 for the three scenarios (Scenario A, B and C respectively) and are plotted on Figure 6–3. The average inflow rates are 39L/s, 32.2 L/s and 4.6 L/s respectively. These results are considered conservative as the excavation is wished in place and remains open for five days. In reality inflow would not commence until the excavation reaches the water table at day two and would peak when the excavation reaches maximum depth at day three and cease on or about day five when the excavation is closed.

The simulated scenarios clearly indicate the benefit of sheet pile wall installation in controlling inflows with Scenarios B and C effectively reducing groundwater inflow by 18% and 89%, respectively, effectively cutting off the lateral and vertical flow.

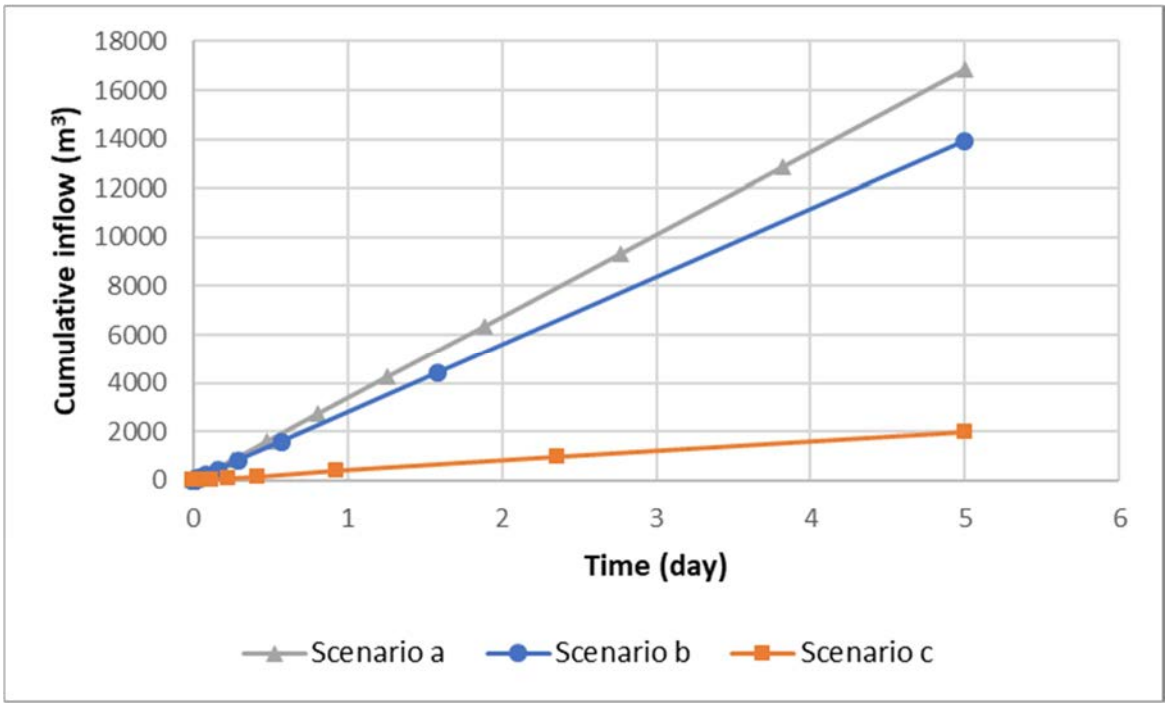

Figure 6–3: Cumulative groundwater inflow to the pit during excavation for the three SPW design scenarios

6.3.3 Drawdown

The drawdown contours at end of excavation for the three Scenarios are shown for Scenario 1 (Figure 6–4), Scenario 2 (Figure 6–5), and Scenario 3 (Figure 6–6). As the drawdown extent is restricted by the coast and canal in the Northern and Western direction and groundwater flows towards the North, it extends further in the Eastern direction. For Scenario A, B and C, the 0.2 m drawdown contour line extends out to 160 m, 150 m and 10 m, respectively, from the excavation. The drawdown adjacent to the excavation outside the SPW is estimated to be approximately 2.8 m, 2.2 m and 0.6 m respectively for scenarios A to C.

As with the inflows this is considered conservative and likely overestimates the drawdown.

6.4 Discussion

The modelling undertaken demonstrates the benefit of installing sheet piles to support the excavation, limit inflows and reduce drawdown. The results provided are considered conservative, that is they overestimate the inflows and associated drawdown as the assessment assumes the excavation reaches full depth at time zero and inflows are consistent over the modelled five days. In reality, inflows will not commence till the excavation intercepts the water table likely on day two and would increase to reach a maximum when the excavation reaches full depth on day three. The tank would be installed, and the excavation backfilled on days four and five.

It is recommended that Scenario C, sheet piles installed to the basal clay layer, will be employed as the management and mitigation measures for the excavation in order to limit drawdown and the volume of water required to be pumped and treated. The likely volume of water which may be required to be pumped and treated is estimated to be as little as 500 m^3 and less than 2000 m^3 over a five-day installation period excluding installation of the sheet pile wall. If the excavation remains open for more than five days additional inflows are likely to be realised.

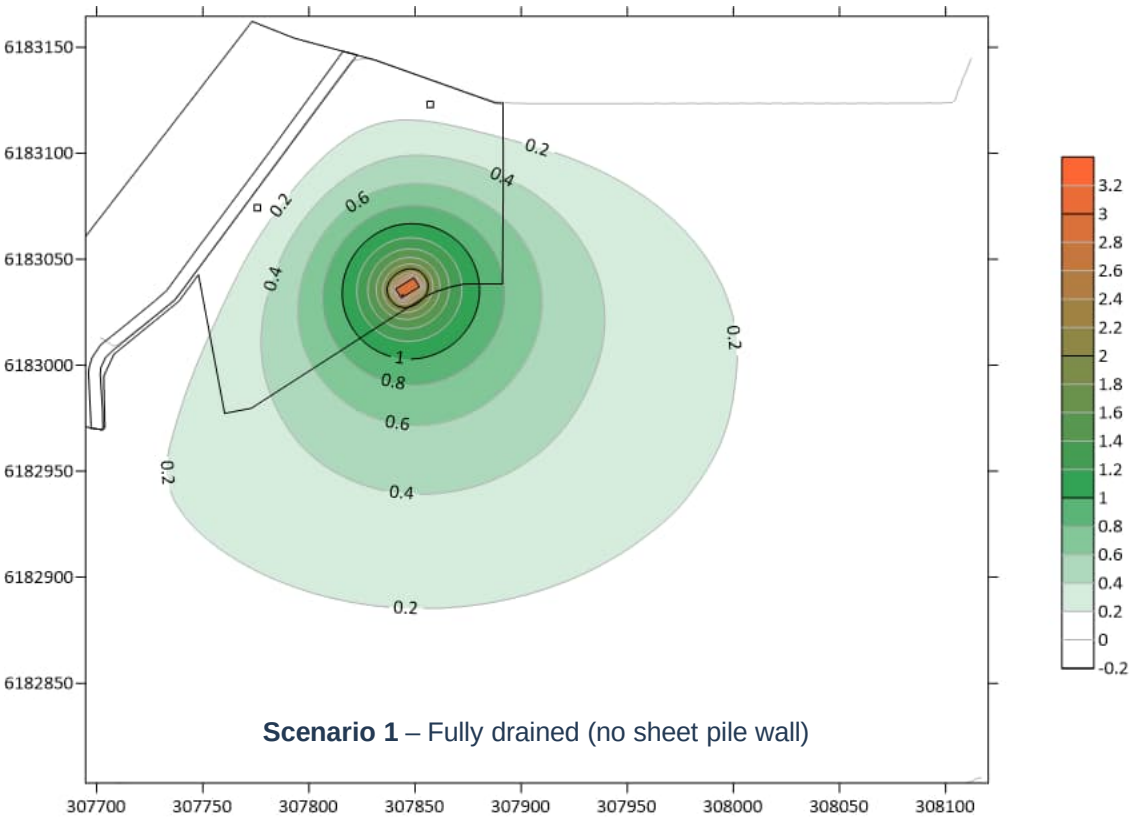

Figure 6–4: Drawdown contour (m) map at end of excavation for scenario 1

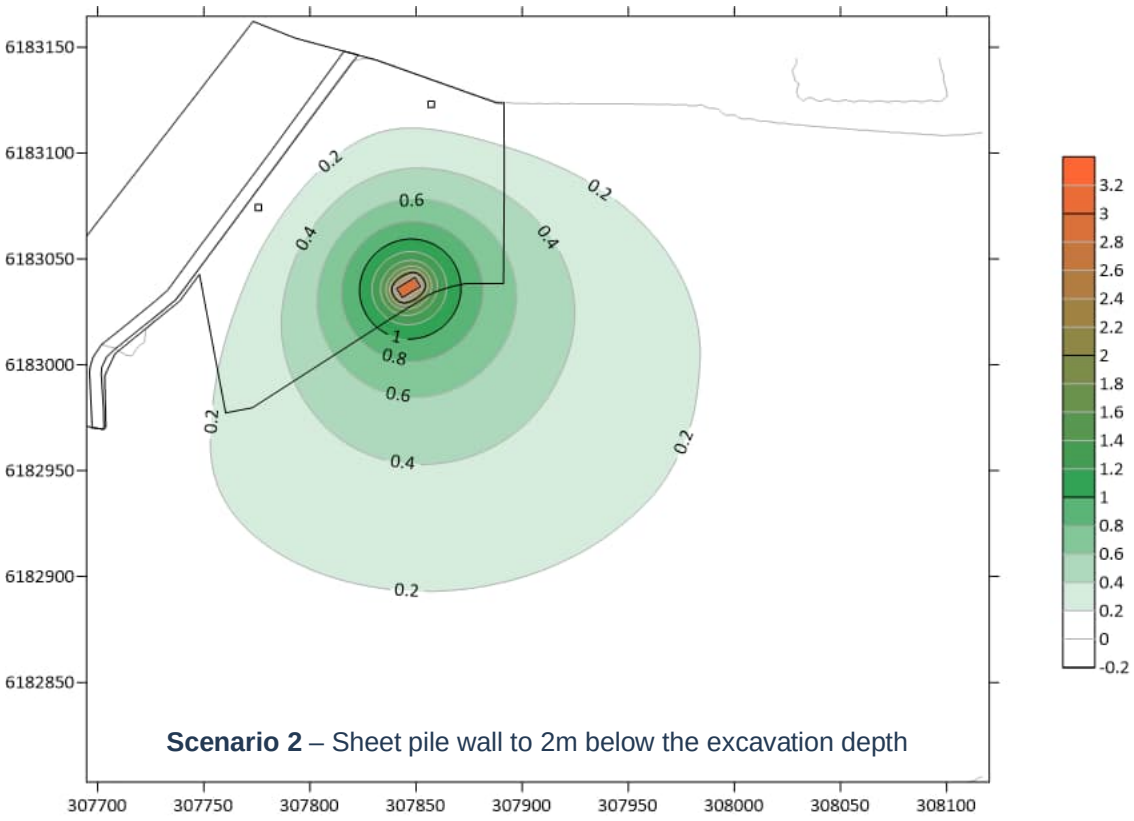

Figure 6–5: Drawdown contour (m) map at end of excavation for scenario 2

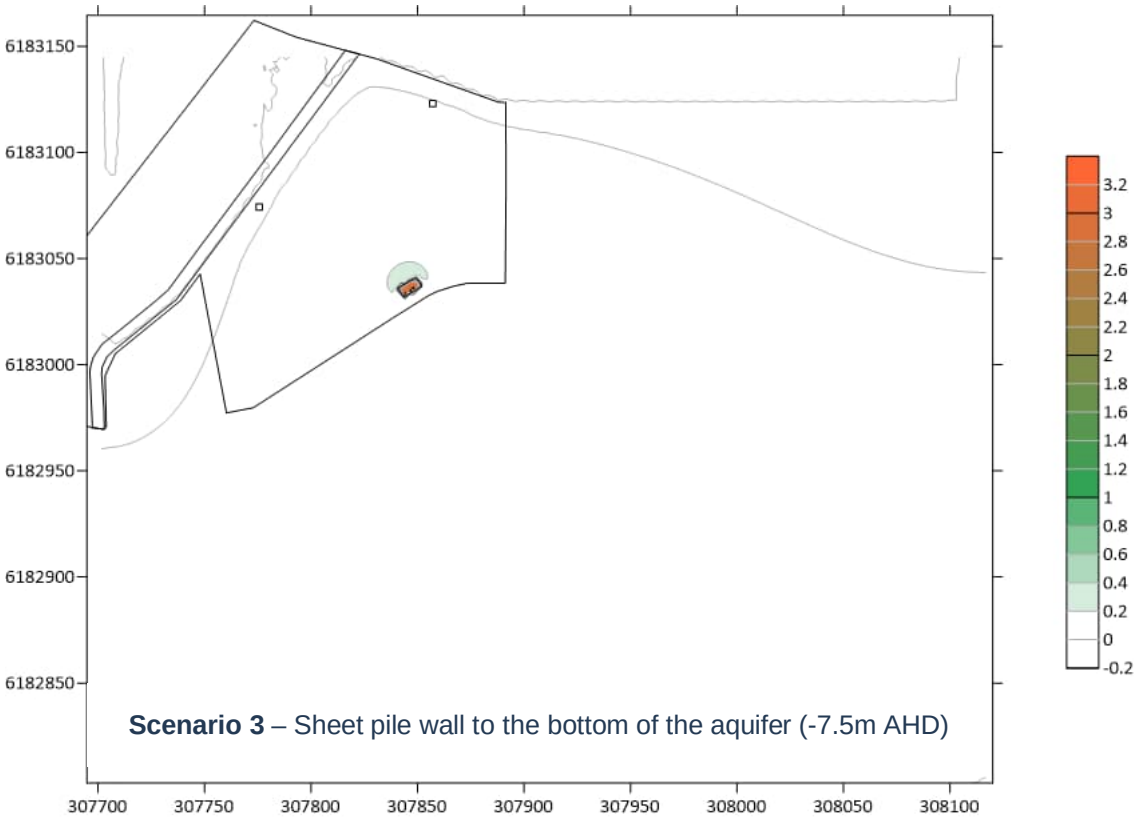

Figure 6–6: Drawdown contour (m) map at end of excavation for scenario 3

7. Groundwater Management Procedures

The details of all proposed mitigation, monitoring and management measures are outlined in this section based on the identified activities and impacts for both construction and operation (Section 3) and findings of the groundwater assessment.

7.1 Construction

The construction methodology to be adopted by Manildra is to minimise interactions with groundwater where possible. To achieve this construction would be undertaken at ground surface above the water table with the exception of three excavations, the gravity retaining wall and driven timber piles (refer to Section 3.2.2).

Driven piles would not involve excavation but may displace sediments and groundwater and yet will maintain saturated conditions. The gravity retaining wall would be excavated and foundations installed 'wet' or using prefabricated material. Of the three excavations, only Excavation 3 (stormwater underground storage tank) would have a significant interaction with groundwater. To minimise the interaction, the excavation would have a sheet pile cut off wall installed.

7.1.1 General

Environmental management measures would be employed during construction to mitigate potential impacts on groundwater including, but not limited to, the following:

- A Construction Environmental Management Plan (CEMP) should be prepared outlining the environmental management measures to be adopted during construction, including any groundwater management procedures outlined in the following sections of this report.
- Plant and machinery refuelling should be carried out at designated areas to prevent uncontrolled discharges to the groundwater.
- Fuels and chemicals should be sealed in labelled container and stored within suitable bunded storage areas with construction compound.
- Emergency spill response equipment and procedures should be implemented during all construction, installation and commissioning activities to contain liquid spillages.
- Groundwater abstraction should not be carried out except as outlined for construction dewatering within Excavation 3 (refer to Section 7.1.3)
- Uncontrolled discharges to groundwater should not be permitted during construction.
- All groundwater monitoring locations are required to be maintained and protected during construction to enable continued groundwater monitoring as required (Section 7.2).

7.1.2 Excavation

Excavations would be carried out to facilitate the construction of the proposed development features as outlined within Section 3.2.2.

The following mitigation measures would be employed to minimise impacts to groundwater:

- Excavations should be limited to required depth of installations to avoid direct interaction below the groundwater table within the design requirements.
- Excavations for installation of proposed development features which are slightly below water table should adopt methods which avoid the need for groundwater dewatering including:
  - Gross pollutant traps (Excavation 1 and Excavation 2) which are slightly below water table, would be installed as 'wet installations' within relative short duration (estimated less than 1 day each)
  - Construction of gravity retaining wall foundations would be constructed using either 'wet concreting' methods and/or using prefabricated materials

- Excavations of contaminated soil materials should be carried out in accordance with requirements of the RAP (SMEC, 2022c) to assess, treat and/or manage surplus soils for onsite reuse and/or containment, where appropriate. In particular, excavated contaminated soils are required to be placed within designated onsite containment locations at depths no greater than 1.5m below ground surface or below 1m AHD, whichever is shallower as outlined within the RAP.
- Excavations of acid sulfate soil (ASS) should be carried out in accordance with requirements of Acid Sulfate Soils Management Plan (SMEC, 2022b) to assess, treat and/or manage surplus soils for onsite reuse, where appropriate. In particular, excavated ASS impacted materials are required to be stockpiled within a containment area, treated using lime neutralisation and validated prior to onsite reuse as backfill within excavations.

7.1.3 Dewatering

Groundwater dewatering is likely to be required to facilitate the installation of the underground storage tank (Excavation 3 only) which occurs below the groundwater levels as outlined within Section 3.2.3. An assessment of the potential dewatering requirements for Excavation 3 is included based on modelling in Section 6 based on stated assumptions.

The following mitigation measures would be employed to minimise impacts to groundwater:

- Temporary shoring/retention of Excavation 3 using sheet piles installed be installed to the depth of the basal clay layer (i.e. bottom of the aquifer at -7.5m AHD), designed and installed to minimise:
  - inflows to the excavation;
  - drawdown of the surrounding aquifer; and
  - changes to the groundwater flow regime.
- Dewatering activities would be carried out in accordance with the planning approval conditions. Dewatering activities are not expected to trigger a need for licence/permits considering the anticipated small volume of groundwater expected (estimated less than 2000m^3). WaterNSW website states construction dewatering may trigger the need for a water access licence (WAL), unless an exemption applies. The WaterNSW factsheet *Water access licence exemption for aquifer interference activities taking 3ML or less of groundwater per year*, Factsheet 250920 (copy in Appendix H) further outlines when a small volume of groundwater may be taken through certain aquifer interference activities without the need for a water access licence.
- Details of proposed sheet piling and groundwater dewatering methods should be documented within the CEMP. Based on current information, it is understood that the following procedure (or similar) would generally be adopted for dewatering:
  1. Installation of temporary sheet piles to required depth
  2. Excavate soil materials inside sheet piling. Once below water table, wet soils removed to required depth should be placed in bunded stockpile area and water runoff retained.
  3. Commence monitoring of groundwater inflow volumes and quality
  4. Submersible pump (or equivalent) installed to extract the groundwater from excavation prior to facilitate dry installation activities (i.e. underground storage tank and foundations etc).
  5. Retain the pumped water within holding tank
  6. Following installation, backfill excavation with suitable backfill materials
  7. Remove temporary sheet piles
  8. Complete dewatering record forms as required by the CEMP including record groundwater dewatering volumes, quality and disposal method.
- All wastewater generated from dewatering the excavations should be contained within suitable capacity holding tanks to prevent runoff into creeks and drainage lines or return to the groundwater system. Wastewater should be tested and disposed offsite appropriately which may include:
  - Disposal via a licensed liquid waste contractor to an appropriate facility
  - Disposal to stormwater under relevant guidelines and approval from Council or relevant Authority with any supporting testing and monitoring requirements.

7.2 Water monitoring

7.2.1 Water quality monitoring

SMEC recommend that a construction water quality monitoring programme be carried out to comply with the planning approval conditions and NSW Ports specific requirements (refer to Section 11 Water Quality and Stormwater of Port Kembla Development Code – June 2021). The construction water quality monitoring programme should be developed and documented within the CEMP (or sub plan) along with monitoring criteria and response actions. It should also address any additional construction water quality monitoring requirements required by a licence or approval which are not specified here.

The following groundwater monitoring would be carried out to monitor impacts to groundwater during construction stage:

- Monitoring objectives: Groundwater monitoring events would be carried out during and post-construction with the monitoring objectives to:
  - Monitor for potential changes in groundwater quality by comparison pre-construction baselines
  - Monitoring water table changes during dewatering activities
  - Assess potential impacts associated with construction activities
  - Decide whether additional monitoring (post-construction) is required to further assess impacts (if any).
- Sampling and analysis plan: Table 7-1 outlines the proposed minimum frequency and number of groundwater monitoring events during construction/post-construction stages of the proposed development. Groundwater monitoring events would be generally consistent with Section 4.3.2 to Section 4.3.7 to enable comparison with the baseline groundwater quality data. Predetermined DQIs would continue to be adopted consistent with Appendix C of this report.

Table 7-1 Summary of proposed groundwater monitoring

Development stage	Frequency (no. of monitoring)	Monitored parameters
During construction/	Quarterly During construction (minimum. 4 quarterly events) – Assumes at least 1-year construction period. One round is recommended within 2 weeks after deep excavations and/or dewatering activities	Field parameters + Water quality analysis
	Dewatering-specific During dewatering of Excavation 3 – Additional specific monitoring to include: • Field measurements using calibrated water quality meter short intervals during dewatering (Daily - minimum 5 daily) • Continuous water level monitoring should commence during and after dewatering (Hourly - minimum 14 days) Assumes groundwater returns to original water level within approximately within 1 week after dewatering of Excavation 3. Continued measurements at longer intervals (e.g. weekly) is required until groundwater returns to original water level and no impacts observed.	Field parameters + Water level (continuous)
Post-construction	Post-construction (min. 2 rounds) – Monitoring to continue for a minimum 6 months beyond construction subject to the final assessment.	Field parameters + Water quality analysis

- Monitoring locations: Groundwater monitoring event locations would include at a minimum the eight monitoring locations (SMW01 to SMW06, OHMW20 and OHMW28) adopted within Section 4.3.3 to enable comparison with baseline groundwater quality data. Further, the following is noted during construction:
  - Any construction activities requiring placement of additional fill materials adjacent to selected monitoring locations should ensure protection, access and modifications can be carried out by a licensed driller (i.e. increasing the height of the well standpipe to new ground level)

  - NSW Ports should be consulted on the need for Manildra to protect, retain or appropriately decommission remaining existing wells during development (refer to Section 2.6). Unless required for ongoing monitoring, wells should be decommissioned in accordance with Guidelines on Minimum Construction Requirements for Water Bores in Australia, 3rd ED 2012' so that they do not act as a direct pathway for groundwater contamination during Manildra's lease of the Site.

- Monitoring Parameters: Table 7-2 outlines the proposed monitoring parameters to be carried out during groundwater monitoring events. Laboratory analysis would be adopted the same as Section 4.3.6 to enable comparison with baseline groundwater quality data.

Table 7-2 Proposed monitoring parameters

Monitoring parameters	Description
Water level (continuous)	Continuous standing water level measurement using data loggers (recorded hourly) to be carried out during the dewatering activities as per Section 4.4
Field parameters	Field measurements including: • Discrete measurements of standing water level using water level dipper • Water quality parameter using a calibrated water quality meter at short intervals during dewatering (e.g. daily) including pH, specific electrical conductivity, redox potential, dissolved oxygen and redox potential. • Visual observations including olfactory (odour) observations of noxious gases.
Water quality analysis	Groundwater sampling and testing for same laboratory analytical suite adopted for the baseline water quality parameters outlined within Table 4-4.

- Reporting: Groundwater monitoring and assessment would be reported according to the following minimum reporting frequency:
  - Following each groundwater monitoring events, monitoring results should be presented within brief factual monitoring reports and include a comparison to baseline groundwater characteristics (water level and groundwater quality) within Section 5of this report. The report should include an assessment of potential change from baseline conditions.
  - A groundwater assessment report should be prepared to summarise findings of all groundwater monitoring events and assessment of potential impacts. The assessment should conclude whether additional monitoring (post-construction) is required to further assess impacts.

7.2.2 Visual monitoring

Due to proximity of works to Port Kembla Outer Harbour, the CEMP should also include regular visual monitoring inspections of sensitive nearby water receptors (including adjacent harbour, stormwater drains and onsite/nearby stormwater pits) to enable early detection of possible impacts. These should be carried out at frequent intervals (e.g. daily) during excavations, dewatering, stockpiling, lime neutralisation/treatment where ASS is disturbed. Outside of these activities, the frequency may be reduced (e.g. weekly or monthly) checks as required by the CEMP.

The CEMP (or subplan) should include contingency response actions for addressing any visual signs of unusual discolouration, odour or significant change to baseline water quality within sensitive nearby water receptors as a result of construction activities

7.3 Operational requirements

As outlined within Section 3.4, impacts on groundwater are less likely to occur during operation of the proposed development. This assumes all plant and equipment designed, commissioned, operated and maintained to prevent and capture spills and leakages of bulk liquids during normal operational.

To account for possible groundwater impacts following exceptional events outside of normal operation, additional groundwater monitoring would be carried out to monitor possible impacts to groundwater. Additional 'event based' groundwater monitoring event(s) would be employed following one of the trigger events including:

- Trigger 1 – A product or chemical spillage* or uncontrolled discharge exceeding 100L to ground outside of bunded areas *(*Sampling and analysis requirements would be adjusted to suit likely chemical constituents of the spill).*
- Trigger 2 – A product or chemical spillage* or uncontrolled discharge exceeding 50% bund capacity inside of tank bunded areas *(*Sampling and analysis requirements would be adjusted to suit likely chemical constituents of the spill).*
- Trigger 3 - Following activation of firefighting systems in an emergency fire scenario and/or as required to inform an environmental condition assessment (event-based).
- Trigger 4 – At a minimum once prior to change of lease arrangements and/or to fulfil environmental requirements of the lease.

Additional monitoring would be carried out as per Section 7.2.1 and a groundwater assessment report would be prepared to summarise findings of the additional groundwater monitoring events and assessment of potential impacts. The assessment should conclude whether additional monitoring (post-event) is required to further assess impacts.

8. References

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Appendix A

Figures

FIG NO. 1	**FIGURE TITLE** Site Locality Plan	**DATE** 17/05/2022	0 25 50 100 150 200 Metres 1:6,000	**PAGE SIZE** A3	**COORDINATE SYSTEM** GDA 1994 MGA Zone 56
PROJECT NO. 30013038	**PROJECT TITLE** Groundwater Assessment and Management Report, Manildra - Port Kembla Bulk Liquid Terminal	**CREATED BY** FA13847	**SOURCES** Roadnet MDS 2020, MetroMap Imagery © Aerometrex Pty Ltd		

SMEC
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Location: V:\Projectz\30013038 - Ethanol Tank Farm, Port Kembla\Maps\GAMR\30013038_GAMR_F001_SiteLocality.mxd

Last updated by: FA13847 on 17/05/2022 at 15:27

LEGEND

- Site Boundary

Proposed Pipeline Centreline

- Aboveground pipeline centreline
- Underground pipeline centreline
- Design
- Proposed Underground Storage Tank

Proposed Site Features

- Drainage Swale
- Ethanol Tanks
- Service Road
- Bridge
- Office
- Car Parking
- Channel
- Gantry
- Landscape
- Tanks
- Station
- Wash Bund
- Fire Pump
- Feature

SMEC Monitoring locations (main terminal only)

- Groundwater Monitoring Well (SMEC)
- Existing Groundwater Monitoring Wells
- Historical Groundwater Monitoring Wells (not sampled)

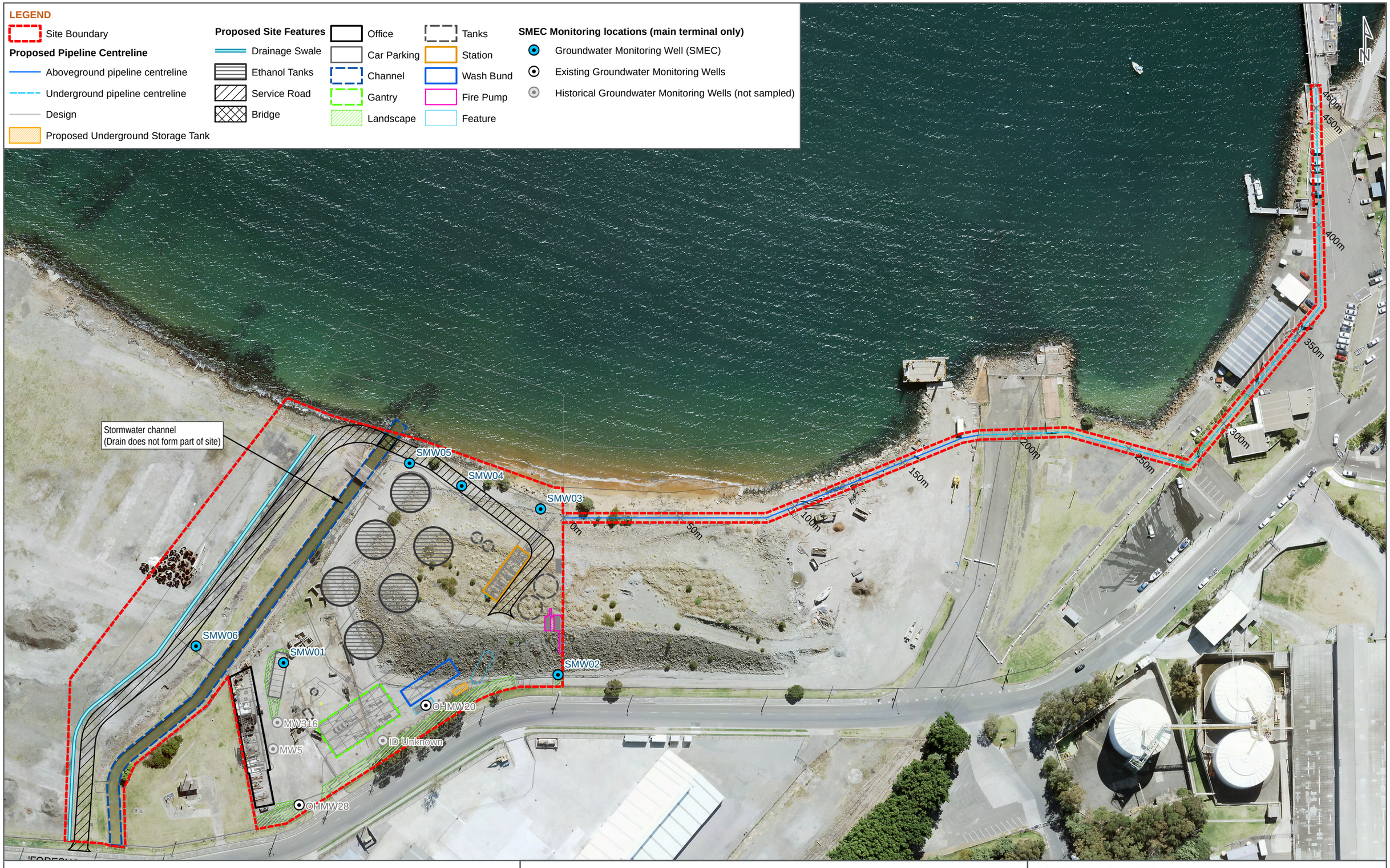

FIG NO. 2	**FIGURE TITLE** Site Layout and Test Location Plan Foreshore Road, Port Kembla	**DATE** 17/05/2022	0 25 50 1:1,500 Metres	**PAGE SIZE** A3	**COORDINATE SYSTEM** GDA 1994 MGA Zone 56
PROJECT NO. 30013038	**PROJECT TITLE** Groundwater Assessment and Management Report, Manildra - Port Kembla Bulk Liquid Terminal	**CREATED BY** FA13847	**SOURCES** Roadnet MDS 2020, Design supplied by client, MetroMap Imagery © Aerometrex Pty Ltd		

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Location: V:\Projectz\30013038 - Ethanol Tank Farm, Port Kembla\Maps\GAMR\30013038_GAMR_F002_SiteLayout.mxd

Last updated by: FA13847 on 17/05/2022 at 15:40

LEGEND

Site Location

Acid Sulfate Soil Probability

Disturbed Terrain

Beach

Note:
X1 denotes ground elevation between 1-2m AHD
X2 denotes ground elevation between 2-4m AHD
X4 denotes greater than 4m AHD

B

X2

X1

X2

X4

B

FIG NO. 3	**FIGURE TITLE** Acid Sulfate Soils Risk Map	**DATE** 17/05/2022	0 25 50 100 Metres 1:3,000	**PAGE SIZE** A3	**COORDINATE SYSTEM** GDA 1994 MGA Zone 56
PROJECT NO. 30013038	**PROJECT TITLE** Groundwater Assessment and Management Report, Manildra - Port Kembla Bulk Liquid Terminal	**CREATED BY** FA13847	**SOURCES** Roadnet MDS 2020, MetroMap Imagery © Aerometrex Pty Ltd		

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LEGEND

Site Location

Former Site Features

- Former quarantine area (circa 1977 to 1986)
- Former scrap metal yard (circa 1977)
- Former timber yard (circa 1977)
- Former building structure (removed prior to 2001)
- Inferred location of PAH site contamination (CMPS&F 1994)
- Remaining area to be assessed

Test Locations

- Groundwater Monitoring Well (SMEC)
- Historical Groundwater Monitoring Locations
- Historical groundwater monitoring wells (not sampled)
- Historical groundwater well inferred location (not observed)

Round	Location ID	Analyte
Date measured/ sampled	Standing water level (m AHD)	Concentration (mg/L) exceeds GIL (95%)
		Concentration (mg/L) exceeds GIL (80%)
		Concentration (mg/L) recorded below GIL (95%)
EC (electrical conductivy) in microsiemens per centimetre		

Outer Harbour

Round	SMW01	pH	EC	Al	As	Cd	Cr (tot)	Cu	Fe	Pb	Hg	Ni	Se	Zn	Ammonia
10/03/2021	0.504	6.46	2,019	**0.03**	**0.044**	**0.0034**	<0.001	**0.019**	**0.57**	**0.016**	<0.0001	**0.127**	**0.05**	**0.494**	<0.01
21/10/2021	0.464	7.71	1,890	0.02	0.017	**0.003**	<0.001	**0.036**	**0.18**	**0.014**	<0.0001	**0.094**	**0.06**	**0.849**	<0.01

Stormwater Channel

Sandstone Stockpile

MW4

OHMW26

MW7

SMW1

MW317

MW3

MW (damage)

MW5 inspected 21/10/21
(no odours or sheen observed)

MW5

MW316

MW?

OHMW20

OHMW28

Foreshore Road

FORESHORE ROAD

Round	OHMW20	pH	EC	Al	As	Cd	Cr (tot)	Cu	Fe	Pb	Hg	Ni	Se	Zn	Ammonia
10/03/2021	0.51	6.82	14,224	<0.01	<0.001	**0.0053**	<0.001	<0.001	**0.19**	<0.001	<0.0001	**0.010**	<0.01	**0.034**	0.69
21/10/2021	0.45	7.53	22,800	<0.01	<0.001	**0.0007**	<0.001	**0.026**	**4.31**	<0.001	<0.0001	**0.013**	<0.01	<0.005	0.77

Round	OHMW28	pH	EC	Al	As	Cd	Cr (tot)	Cu	Fe	Pb	Hg	Ni	Se	Zn	Ammonia
10/03/2021	0.64	6.48	2,880	<0.01	**0.066**	<0.0001	<0.001	**0.004**	**15.4**	<0.001	<0.0001	**0.019**	<0.01	<0.005	0.99
21/10/2021	0.55	7.46	2,890	<0.01	**0.052**	<0.0001	<0.001	<0.001	**17.4**	<0.001	<0.0001	**0.027**	<0.01	<0.005	0.85 (1.3*)

FIG NO. 4A

FIGURE TITLE Groundwater Contamination - Previous DSI summary

DATE 07/12/2021

1:1,000 (0 5 10 20 30 40 50 Metres)

PAGE SIZE A3

COORDINATE SYSTEM GDA 1994 MGA Zone 56

PROJECT NO. 30013038

PROJECT TITLE Groundwater Assessment and Management Report - Manildra Port Kembla Bulk Liquid Terminal

CREATED BY FA13847

SOURCES Roadnet MDS 2020, Design supplied by client, MetroMap Imagery © Aerometrex Pty Ltd

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Location: V:\Projectz\30013038 - Ethanol Tank Farm, Port Kembla\Maps\DSI\30013038_DSI_F004B_AEC_GWSummary.mxd

Last updated by: FA13847 on 7/12/2021 at 15:40

LEGEND

Site Boundary

Proposed Site Features

- Ethanol Tanks
- Service Road
- Bridge
- Office
- Car Parking
- Channel
- Gantry
- Landscape
- Tanks
- Station
- Wash Bund
- Fire Pump
- Feature
- Design

SMEC Test Locations - Main Terminal

- Boreholes (SMEC)
- Test pit - sample locations
- Test pit - stockpile observations only
- Groundwater Monitoring Well (SMEC)
- Existing Groundwater Monitoring Locations
- Historical Groundwater Monitoring Wells (not sampled)

Note:
Brackets show existing ground elevation (m AHD)

Location ID	Analyte
Depth (m)	Concentration (%S w/w)
Concentration exceeds action criteria* (0.03% S - Coarse texture soils)	
Concentration exceeds action criteria* (0.1% S -Fine texture soils)	

Existing Bridges
Stormwater Channel
(Drain does not form part of the site)
Sandstone stockpile
Shed
Stormwater pit and strip drain
ID Unknown
MW (damage)
'FORESHORE ROAD'

TP1 (3.11 mAHD)
TP2 (2.88 mAHD)
BH2
TP8
TP3
TP9 (14.65 mAHD)
TP6 (1.33 mAHD)
BH5 (2.82m AHD)
TP5
TP7 (2.49 mAHD)
BH7
SMW06
TP10A
TP13 (2.59 mAHD)
TP14
TP10 (2.93m AHD)
SMW02
OHMW20 (2.89 mAHD)
TP4
MW316
MW5
TP12 (2.64 mAHD)
TP11
OHMW28 (2.41 mAHD)

BH5	Net Acidity excluding ANC (Sulfur Units)
4.2-4.65	0.024
7.2-7.65	0.055

BH7	Net Acidity excluding ANC (Sulfur Units)
3-3.45	0.012
4.5-4.95	0.021
6.0-6.45	0.020-0.034

TP13	Net Acidity excluding ANC (Sulfur Units)
2.0-2.2	2.803

TP10	Net Acidity excluding ANC (Sulfur Units)
1.9-2.1	2.02

FIG NO. 4B

FIGURE TITLE Acid sulfate soils - Previous ASSMP summary

DATE 06/05/2022

0 20 40
1:1,000 Metres

PAGE SIZE A3

COORDINATE SYSTEM GDA 1994 MGA Zone 56

PROJECT NO. 30013038

PROJECT TITLE Groundwater Assessment and Management Report, Manildra - Port Kembla Bulk Liquid Terminal

CREATED BY FA13847

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Last updated by: FA13847 on 6/05/2022 at 11:33

LEGEND

- Site Location
- Design

Proposed Utilities

- Proposed Stormwater
- Proposed Drainage to Holding Tank
- Proposed Valve Controlled Drainage

Proposed Site Features

- Channel
- Retaining Wall Excavation
- Proposed Deep Excavation Sites

Outer Harbour

N

Retaining Wall
(Approx. 220m x 1.3m x 1-2m depth)

Stormwater Channel
(Drain does not form part of the site)

Excavation 1 -
Proposed stormwater treatment unit
(Approx. 3m x 3m X 3.3m deep)

Excavation 2 -
Proposed stormwater treatment unit
(Approx. 3m x 3m x 3.0m deep)

Sandstone Stockpile

Foreshore Road

Excavation 3 -
Proposed underground storage tank
(Approx. 10m x 5m x 4.5m deep)

FORESHORE ROAD

FIG NO. 5	**FIGURE TITLE** Proposed Deep Excavations	**DATE** 06/05/2022	**PAGE SIZE** A3	**COORDINATE SYSTEM** GDA 1994 MGA Zone 56
PROJECT NO. 30013038	**PROJECT TITLE** Groundwater Assessment and Management Report, Manildra - Port Kembla Bulk Liquid Terminal	**CREATED BY** FA13847	**SOURCES** Roadnet MDS 2020, Design supplied by client, MetroMap Imagery © Aerometrex Pty Ltd	

0 5 10 20 30 40 50
1:1,000 Metres

SMEC
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Location: V:\Projectz\30013038 - Ethanol Tank Farm, Port Kembla\Maps\ASSMP\30013038_ASSMP_F005_RAP.mxd

Last updated by: FA13847 on 6/05/2022 at 11:43

LEGEND

Site Boundary

Proposed Pipeline Centreline

Aboveground pipeline centreline

Design

Proposed Underground Storage Tank

Proposed Site Features

Drainage Swale

Ethanol Tanks

Service Road

Bridge

Office

Car Parking

Channel

Gantry

Landscape

Tanks

Station

Wash Bund

Fire Pump

Feature

SMEC Monitoring locations (main terminal only)

Groundwater Monitoring Well (SMEC)

Existing Groundwater Monitoring Wells

Historical Groundwater Monitoring Wells (not sampled)

Groundwater Contour 0.05m

(0.60) Brackets indicate standing water level (m AHD)

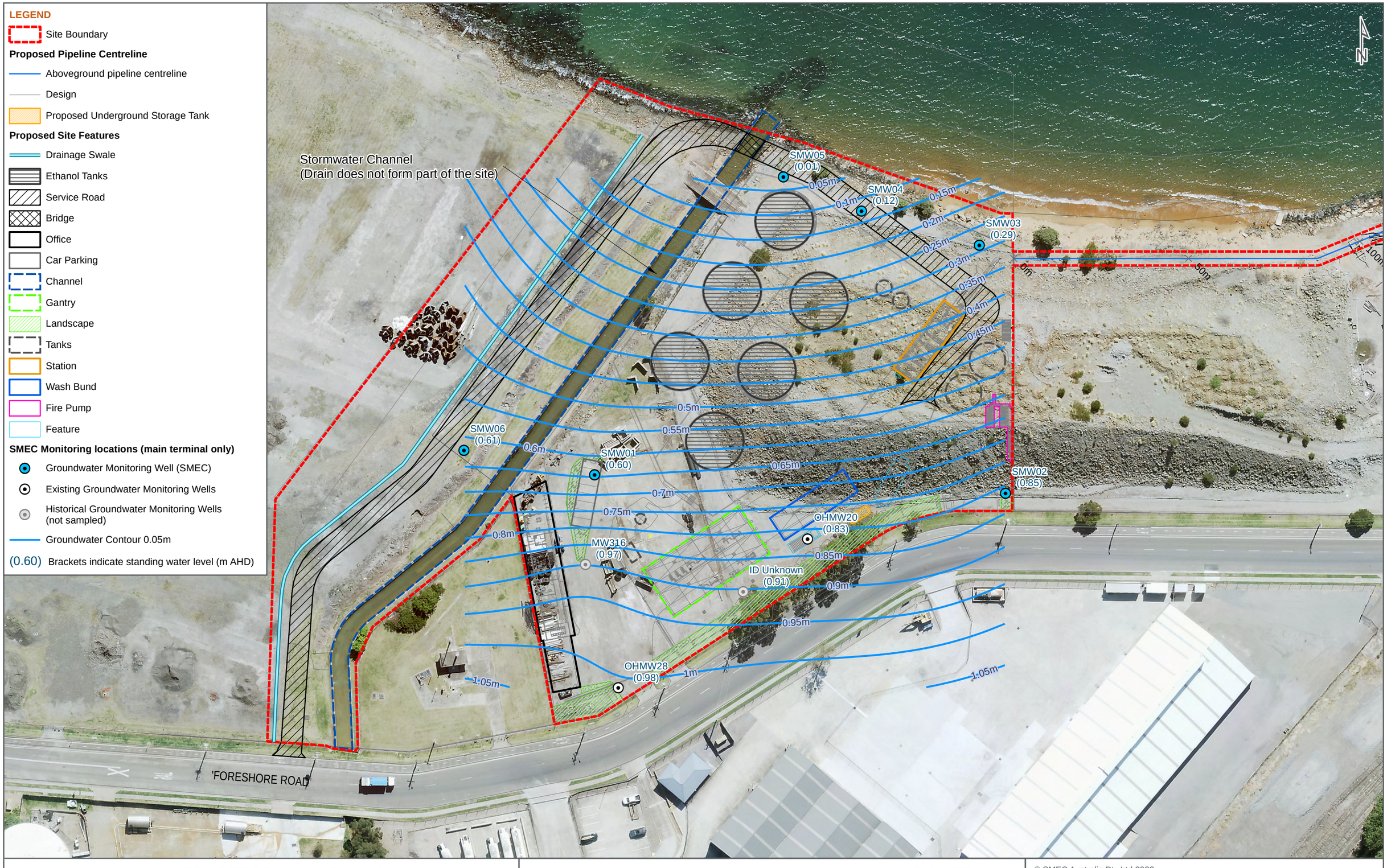

FIG NO. 6	**FIGURE TITLE** Groundwater Contour Map	**DATE** 17/05/2022	0 20 40 Metres 1:1,000	**PAGE SIZE** A3	**COORDINATE SYSTEM** GDA 1994 MGA Zone 56
PROJECT NO. 30013038	**PROJECT TITLE** Groundwater Assessment and Management Report, Manildra - Port Kembla Bulk Liquid Terminal	**CREATED BY** FA13847	**SOURCES** Roadnet MDS 2020, Design supplied by client, MetroMap Imagery © Aerometrex Pty Ltd		

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Location: V:\Projectz\30013038 - Ethanol Tank Farm, Port Kembla\Maps\GAMR\30013038_GAMR_F004_Groundwater.mxd

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Appendix B

Assessment criteria

Category	Analyte	Units of measurement	Laboratory limits of reporting - adopted screening level for Total Recoverable Hydrocarbons	PFAS NEMP 2020 Table 5 Ecological water quality guideline values developed by water regulators (Interim Marine water – 95% species protection)	NEPM SchB1 Table 1A(4) Groundwater HSLs for vapour intrusion (Commercial /industrial, 2-<4m AND 4m-<8m, Sand)	ANZG 2018 Default Guidelines Values for toxicants (Marine water – 99% species protection)	ANZG 2018 Default Guidelines Values for toxicants (Marine water – 95% species protection)	ANZECC & ARMCANZ (2000) Default trigger values for physical and chemical stressors for South-east Australia for slightly disturbed marine ecosystems, applying to estuaries	Adopted Assessment Criteria
Field parameters	pH							7.0-8.5	7.0-8.5
	Specific Conductivity (Ec @ 25°C)	µS/cm							
	Temperature	°C							
	Dissolved Oxygen	%						80-110	80-110
	Redox Potential	mv							
PFAS	PFOS	µg/L		0.13					0.13
	Sum of PFHxS and PFOS	µg/L							
	PFOA	µg/L		220					220
Nutrients	Ammonia (as N)	mg/L					0.91		0.91
	Ammonium ion (as N)	mg/L						0.015	0.015
	Nitrate & Nitrite (as N)	mg/L						0.015	0.015
	Nitrate (as N)	mg/L							
	Nitrite (as N)	mg/L							
	Organic Nitrogen (as N)	mg/L							
	Phosphate total (as P)	mg/L						0.030	0.030
	Filterable reactive phosphorus (as P)	mg/L						0.005	0.005
	Total Kjeldahl Nitrogen (as N)	mg/L							
	Total Nitrogen (as N)	mg/L						0.300	0.300
Inorganic	Total Dissolved Solids	mg/L							
	Hardness (as CaC03)	mg/L							
Cations/Anions	Chloride	mg/L							
	Fluoride	mg/L							
	Sulphate (as SO4)	mg/L							
	Calcium	mg/L							
	Magnesium	mg/L							
	Potassium	mg/L							
	Sodium	mg/L							
	Bicarbonate Alkalinity (as CaCO3)	mg/L							
	Carbonate Alkalinity (as CaCO3)	mg/L							
	Hydroxide Alkalinity (as CaCO3)	mg/L							
	Total Alkalinity (as CaCO3)	mg/L							
BTEX	Benzene	mg/L			5		0.7		0.7
	Toluene	mg/L			NL		0.18[B]		0.180
	Ethylbenzene	mg/L			NL		0.08[B]		0.080
	m+p-xylene	mg/L					0.075[B]		0.075
	o-xylene	mg/L					0.35[B]		0.350
	Xylenes (total)	mg/L			NL				NL
TPH	TRH C6 - C9	mg/L	0.02						0.02
	TRH C10 - C14	mg/L	0.05						0.05
	TRH C15 - C28	mg/L	0.1						0.1
	TRH C29 - C36	mg/L	0.1						0.1
	Sum of TPH C10-C36	mg/L	0.1						0.1
TRH - 2013 fractions	TRH C6 - C10	mg/L	0.02						
	TRH C6 - C10 less BTEX (F1)	mg/L	0.02		6				6
	TRH >C10 - C16	mg/L	0.1						
	TRH >C10 - C16 less Naphthalene (F2)	mg/L	0.1		NL				NL
	TRH >C16 - C34	mg/L	0.1						
	TRH >C34 - C40	mg/L	0.1						
Metals (GW dissolved)	Aluminium	mg/L					0.0005[B,E]		0.0005
	Arsenic	mg/L					0.0023[B,C,E]		0.0023
	Cadmium	mg/L				0.0007[A]	0.0055[A]		0.0007
	Chromium (total)	mg/L					0.0044[D]		0.0044
	Cobalt	mg/L					0.001		0.001
	Copper	mg/L					0.0013		0.0013
	Iron	mg/L							
	Lead	mg/L					0.0044		0.0044
	Manganese	mg/L					0.08[B,E]		0.08
	Mercury	mg/L				0.0001[A]	0.0004[A]		0.0001
	Nickel	mg/L					0.07		0.07
	Selenium	mg/L				0.005[A]	0.011[A]		0.005
	Uranium	mg/L					0.0005[B, E]		0.0005
	Zinc	mg/L					0.008		0.008
Metals (Total)	Aluminium	mg/L					0.0005[B,E]		0.0005
	Iron	mg/L							
	Manganese	mg/L					0.08[B,E]		0.08

Category	Analyte	Units of measurement	Laboratory limits of reporting - adopted screening level for Total Recoverable Hydrocarbons	PFAS NEMP 2020 Table 5 Ecological water quality guideline values developed by water regulators (Interim Marine water – 95% species protection)	NEPM SchB1 Table 1A(4) Groundwater HSLs for vapour intrusion (Commercial /industrial, 2-<4m AND 4m-<8m, Sand)	ANZG 2018 Default Guidelines Values for toxicants (Marine water – 99% species protection)	ANZG 2018 Default Guidelines Values for toxicants (Marine water – 95% species protection)	ANZECC & ARMCANZ (2000) Default trigger values for physical and chemical stressors for South-east Australia for slightly disturbed marine ecosystems, applying to estuaries	Adopted Assessment Criteria
PAHs	Acenaphthene	µg/L							
	Acenaphthylene	µg/L							
	Anthracene	µg/L				0.01[AB]	0.4[B]		0.01
	Benz(a)anthracene	µg/L							
	Benzo(a)pyrene	µg/L				0.1[AB]	0.2[B]		0.1
	Benzo(b&j)fluoranthene	µg/L							
	Benzo(g.h.i)perylene	µg/L							
	Benzo(k)fluoranthene	µg/L							
	Chrysene	µg/L							
	Dibenz(a.h)anthracene	µg/L							
	Fluoranthene	µg/L				1.0[AB]	1.4[B]		1.0
	Fluorene	µg/L							
	Indeno(1.2.3-cd)pyrene	µg/L							
	Naphthalene	µg/L			NL	50[A]	70[A]		50
	Phenanthrene	µg/L				0.6[AB]	2.0[B]		0.6
	Pyrene	µg/L							
	Total PAH	µg/L							
Phenols	2,3,4,6-Tetrachlorophenol	µg/L				10[A,B,E]	20		10
	2,4,6-Trichlorophenol	µg/L				3[A,B,E]	20		3
	2,4-Dichlorophenol	µg/L					160[B,E]		160
	2,4-Dimethylphenol	µg/L					20[A,B,E]		20
	2,6-Dichlorophenol	µg/L					34[A,B,E]		34
	2-Chlorophenol	µg/L					490[A,B,E]		490
	4-Chlorophenol	µg/L					220[A,B,E]		220
	Pentachlorophenol	µg/L				11[A]	22[A]		11
	Phenol	µg/L					400[A]		400

Notes

[A] ANZG recommend taking into account potential bioaccumulative effects
[B] Low or unknown reliability value
[C] Based on As (III) (lower of the AS(III) and As(V) criteria)
[D] Default guideline value assumes chromium (VI)
[E] Level of species protection unknown

Appendix C

Data Quality Indicators

Data Quality Indicators

DQIs for the project will be based on the field and laboratory considerations in NEPM Schedule B2 Appendix B, (NEPC 1999), which include:

- Completeness – a measure of the amount of useable data (expressed as %) from a data collection activity
- Comparability – the confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event
- Representativeness – the confidence (expressed qualitatively) that data are representative of each media present on the site
- Precision – A quantitative measure of the variability (or reproducibility) of data
- Accuracy – a quantitative measure of the closeness of reported data to the true value.

The DQIs adopted for this assessment and checking of compliance is discussed in Table C-1 to C-5 below.

Table C-1: Data quality indicators - Completeness

Completeness					
Field considerations	DQI	DQI Compliance	Laboratory considerations	DQI	DQI Compliance
All critical locations will be sampled	Samples will be collected as per Section 4.3	Yes	All critical samples analysed.	Samples will be analysed as per Section 4.3	Yes
All samples collected	Samples will be collected from relevant media as per Section 4.3	Yes	All analytes analysed according to sampling plan	Samples will be analysed as per Section 4.3	Yes
SOPs appropriate and complied with	SMEC SOPs/Field instructions will be implemented	Yes	Appropriate methods and limits of reporting	Samples will be analysed by laboratories NATA accredited for the analyses to be performed and appropriate methods will be used. LORs will be less than or equal to the assessment criteria.	Yes (minor exceptions noted in Section 4.3.7.1)
Experienced sampler	An experienced SMEC environmental consultant will conduct the sampling	Yes (refer to Section 4.1).	Sample documentation complete	CoCs will be returned, signed, and dated by laboratory. NATA endorsed laboratory certificates will be completed in accordance with NEPC (1999). Field documentation will be completed in accordance with SMEC SOPs.	Yes
Documentation correct	Samples will be handled and transported under appropriate chain of custody documentation. Sample Receipt Advice (SRA) (or equivalent) from the laboratory will be reviewed to assess that samples are received cool and in good condition. Calibration certificates for the field instruments will be provided daily (or in accordance with manufacturers recommended calibration interval).	Yes Equipment calibration (refer to Section 4.3.7.1) Minor exception for missing field parameters for SMW06 (Section 4.3.7.1)	Sample holding times complied with	Samples will be analysed within holding times specified by NEPC (1999, amended 2013)	Yes (minor exceptions noted in Section 4.3.7.1)

Table C-2: Data quality indicators - Comparability

Comparability					
Field considerations	DQI	DQI Compliance	Laboratory considerations	DQI	DQI Compliance
Same SOPs used on each occasion	SMEC SOPs/field instructions will be implemented	Yes	Same sample analytical methods used	The same NATA accredited laboratory will be used to undertake analyses of all primary samples collected for this study. The laboratory will use the same analytical methods for each sample for each analytical parameter	Yes
Experienced sampler	An experienced SMEC environmental consultant will conduct the sampling.	Yes (refer to Section 4.1).	Same sample limits of reporting (LOR)		Yes (minor exceptions noted in Section 4.3.7.1)
Climatic conditions (temperature, rainfall, wind…)	Sampling for this work will be completed when necessary. Climatic conditions are not expected to cause issues for comparability of data	Yes.	Same laboratories (justify/quantify if different)		Yes (refer to Section 4.3).
Same types of samples collected	Samples will be collected in the appropriate laboratory supplied container specific to the analyses performed.	Yes	Same units (justify/quantify if different)		Yes

Table C-3: Data quality indicators – Representativeness

Representativeness					
Field considerations	DQI	DQI Compliance	Laboratory considerations	DQI	DQI Compliance
Appropriate media sampled according to sample plan	Samples will be collected and analysed as listed in Section 4.3. Any variations will be justified.	Yes	All samples analysed according to sample plan	Samples will be collected and analysed as listed in Section 4.3. NATA accredited environmental testing laboratories will implement a quality control plan conforming to Schedule B (3) 'Guideline on Laboratory Analysis of Potentially Contaminated Soils' of the National Environment Protection (Assessment of Site Contamination) Measure 1999.	Yes
All media identified in sample plan sampled	Samples will be collected and analysed as listed in Section 4.3	Yes	All samples analysed according to sample plan	Samples will be collected and analysed as listed in Section 4.3	Yes

Table C-4: Data quality indicators – Precision

Precision					
Field considerations	DQI	DQI Compliance	Laboratory considerations	DQI	DQI Compliance
SOPs appropriate and complied with	SMEC SOPs/field instructions will be implemented	Yes	Analysis of laboratory duplicates	The number of duplicate analyses should be the smaller of one per process batch or one per 10 samples.	Yes (refer to Section 4.3
Analysis of: field duplicates	Collection of field duplicate samples including: • Field intra-laboratory duplicate samples (1 in 20 samples). • Field inter-laboratory duplicate samples (1 in 20 samples).	Yes (refer to Section 4.3 and Table 4-4)	Analysis of: field duplicates	Field duplicates have relative percentage difference (RPD) control limits: • Less than 30% (groundwater), where result is greater than 10 times limit of reporting (LOR). • No limit where result is less than 10 times LOR.	No (refer to Section 4.3.7.2)
	Experienced and trained staff to carry out sampling. Sampling methodologies appropriate and complied with.	Yes (refer to Section 4.1)	Analysis of: laboratory duplicates	Laboratory duplicates have relative percentage difference (RPD) control limits: • Results <10 times the LOR: No Limit • Results between 10-20 times the LOR: RPD must lie between 0-50% • Results >20 times the LOR: RPD must lie between 0-30% In accordance with laboratory specific QC Acceptance criteria.	No (refer to Section 4.3.7.2)
			Analysis of: laboratory-prepared volatile trip spikes	Trip spikes recoveries were recorded between 60% and 110% for volatile contaminants (TRHC6-C10/BTEX)	No – Trip spike not analysed (refer to Section 4.3.7.2)
			Analysis of: laboratory-prepared volatile trip blanks	Trip blanks were free of detectable concentrations of volatile contaminants (TRHC6-C10/BTEX)	No – Trip blank not analysed (refer to Section 4.3.7.2)

Table C-5: Data quality indicators - Accuracy (Bias)

Accuracy (bias)					
Field considerations	DQI	DQI Compliance	Laboratory considerations	DQI	DQI Compliance
SOP appropriate and complied with	SMEC SOPs/field instructions will be implemented	Yes	Analysis of field blanks	A laboratory prepared trip blank will be analysed for soil sampling (as defined in AS4482.2-1999 and NEPC (1999). Results are to be less than the LOR	No – Trip blank not analysed (refer to Section 4.3.7.2)
Rinsate blank	Where reusable sampling equipment is utilised (if any) a rinsate blank will be analysed and results compared against the PQL	Yes (Refer to Section 4.3.7.2)	Analysis of method blank	Method blanks will be analysed as per NEPC (1999) at least 1 per process batch (typically 1 in 20). Results to be less than LOR	Yes
Trip spike	Trip spikes are collected and analysed together with samples	No – Trip spike not analysed (refer to Section 4.3.7.2)	Analysis of matrix spike	Matrix spikes will be analysed as per NEPC (1999) (one matrix spike per soil type per process batch). Results to be within laboratory acceptance limits based on NEPC (1999). Acceptance limits are on the laboratory certificates (typically 70-130%, depends on analyte. A lower range typically accepted for phenols 30%-130%)	Yes (minor exceptions, refer to Section 4.3.7.2)
Preservation, transport, and storage	Samples appropriately preserved in laboratory supplied containers, stored, and transported correctly and within holding times	Yes (minor exceptions, Refer to Section 4.3.7.2	Analysis of surrogate spike	Surrogates will be analysed as per NEPC Schedule B3 (1999). All samples spiked where appropriate (e.g. chromatographic analysis of organics). Acceptance limits 70% to 130% (inorganics), or 50% to 150% (organics).	Yes
			Analysis of laboratory control samples	Laboratory control samples (LCS) will be analysed as per NEPC Schedule B3 (1999) (at least 1 per batch). Results to be within laboratory acceptance limits based on NEPC (1999). Acceptance limits are on the laboratory certificates (typically 70-130%, depends on analyte)	Yes
			Analysis of laboratory-prepared spikes	Spikes will be analysed as per NEPC Schedule B3 (1999). Recovery results to be within laboratory acceptance limits based on NEPC Schedule B3 (1999). Acceptance limits are on the laboratory certificates.	Yes

Appendix D

Borehole logs

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Explanatory Notes of Abbreviations and Terms

Used on Borehole and Excavation Logs

General

The “Geological and Engineering Log” presents data from drilling or excavation operations where material recovery is soil and or rock. Data presented is a combination of material recovered, regular sampling and in-situ testing. Excavations may present data obtained on the subsurface profile from observations of natural or man-made excavations. Logs may contain scaled graphical presentations, photography, or downhole imagery results. Logs may not contain all data types presented in these notes.

The “Non Core Drill Hole Engineering Log” presents data from drilling operations where a core barrel has not been used. The material is penetrated using methods other than those designed to recover core and is commonly soil or extremely to highly weathered. The “Cored Drill Hole Engineering Log” presents data from drilling operations where a core barrel has been used. The “Excavation - Geological Log” presents data obtained on the subsurface profile from observations of excavations, either natural or anthropogenic.

As far as is practicable, the data contained on the log sheet is factual. Some interpretation is inevitable with respect to the:

a. assessment of material boundaries in areas of partial sampling and recovery,

b. location of areas of core loss,

c. description and classification of material,

d. estimate of field strength, and

e. identification of drilling induced fractures.

Material description and classification is generally based on AS1726-2017 (as amended).

Drilling Method

Code	Description
ADT	Auger drilling with TC-bit
ADV	Auger drilling V-bit
AS	Auger screwing
AT	Air track
CA	Casing advancer
CC	Concrete core
CTR	Cable tool rig
DB	Wash bore drag bit
HA	Hand auger
HAND	Hand methods
HF	Hollow flight auger
HMLC	Diamond core 63.5 mm diameter
HQ / HRQ	Wire line core barrel 63.5 mm diameter
HQ3	Wire line core barrel 61.1 mm diameter
NDD	Non destructive drilling
NMLC	Diamond core 51.9 mm diameter
NQ	Wire line core barrel 47.6 mm diameter
NQ3	Wire line core barrel 45.1 mm diameter
PT	Continuous push tube
PQ	Wire line core barrel 85.0 mm diameter
RAB	Rotary air blast
RC	Reverse circulation
RD	Rotary blade or drag bit
RR	Rock roller
RT	Rotary tricone bit
SD	Sonic drilling
TBX	Tube-X
VC	Vibro-core drilling
WB	Wash bore drilling

Drilling Penetration

Ease of penetration in non-core drilling

Term	Description
VE	Very easy
E	Easy
F	Firm
H	Hard
VH	Very hard

Support and Casing

Code	Description	Code	Description
C	Casing	Hw	114.3 mm
M	Mud	Nw	88.9 mm
W	Water	PVC 150	150 mm

Core Run

Core lifts are identified by a line and depth with core loss per run as a percentage. Core loss is shown in the core run unless otherwise indicated.

Defect Spacing

The average distance between defects is measured parallel to the core axis in mm and may be expressed as a range or average.

Angle / Orientation

Angle from horizontal and orientation to magnetic north.

For inclined cored boreholes the Alpha and Beta angles are presented for orientated core. Alpha (α) is measured relative to the core axis, whilst Beta (β) is measured clockwise from the reference line looking down the core axis in the direction of drilling.

Excavation Method

Term	Definition
N	Natural exposure
X	Existing excavation
BB	Tractor mounted backhoe bucket
EX	Hydraulic excavator
EH	Hydraulic excavator with hammer
B	Bulldozer blade
R	Ripper

Water / Drilling Fluid

The drilling fluid used is identified and loss of return to the surface is estimated as a percentage, generally of each core lift.

Symbol	Description
	Water inflow
	Water outflow
	Water level: during drilling or immediately after completion of drilling
	Groundwater level with date observed prior to introduction of fluids or after standpipe construction
Not observed	The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole / test pit.
Not encountered	The borehole / test pit was dry soon after excavation, however groundwater could be present in less permeable strata. Inflow may have been observed had the borehole / test pit been left open for a longer period.

Colour

The colour of a soil or rock is described in a moist/wet condition using simple terms, such as black, white, grey, red, brown, orange, yellow green or blue. These are modified as necessary by 'pale', 'dark' or 'mottled'. Borderline colours are described as a combination of these colours (e.g. orange-brown). Where a soil or rock consists of a primary colour with a secondary mottling it is described as (primary colour) mottled (first colour) and (secondary colour). Where colour is described outside of the material description it is for the interval.

Description of Soil

vi. Soil name (BLOCK LETTERS)

vii. Plasticity or particle size of soil

viii. Colour (i.e. dominant colour of material)

ix. Secondary soil components names & estimated proportions, including their plasticity / particle characteristics, colour

x. Minor soil components name, estimated proportions, including their plasticity / particle characteristics, colour

xi. Other minor soil components

xii. Moisture condition

xiii. Consistency / density

xiv. Structure of soil, geological origin

xv. Additional observations

Particle Size

Term		Grain Size
Clay		< 2 µm
Silt		2 – 75 µm
Sand	Fine	0.075 – 0.21 mm
	Medium	0.21 – 0.6 mm
	Coarse	0.6 – 2.36 mm
Gravel	Fine	2.36 – 6.7 mm
	Medium	6.7 – 19 mm
	Coarse	19 – 63 mm
Cobbles		63 – 200 mm
Boulders		> 200 mm

Fine Grained and Coarse Grained Soils

Term	Description
Fine Grained Soil (cohesive)	More than 35% of the material less than 63 mm is smaller than 0.075 mm (silts and clays)
Coarse Grained Soil	More than 65% of the material less than 63 mm is larger than 0.075 mm (sands, gravels and cobbles)

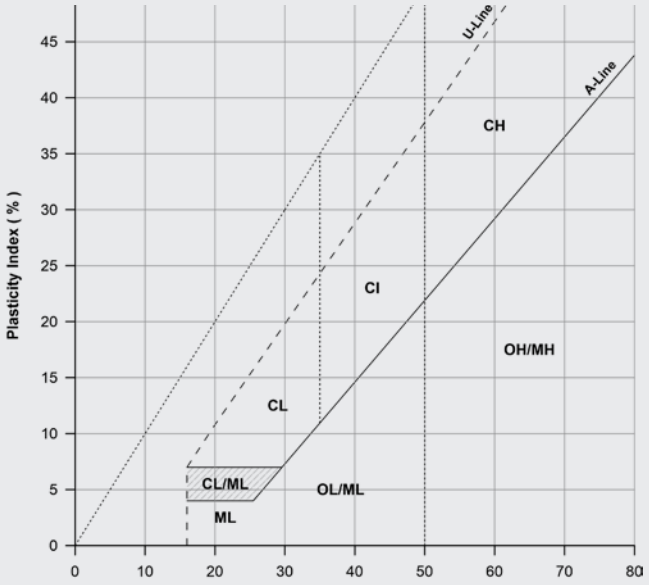
Descriptive Terms for Secondary and Minor Components

Designation of Components	In coarse grained soils				In fine grained soils	
	% Fines	Terminology	% Accessory coarse fraction	Terminology	% Sand / Gravel	Terminology
Minor	≤5	trace	≤ 15	trace	≤ 15	trace
	> 5, ≤ 12	with	> 15, ≤ 30	with	> 15, ≤ 30	with
Secondary	> 12	prefix	> 30	prefix	> 30	prefix

Plasticity – Fine Grained Soils

Liquid Limit (LL) %	Description
≤ 35	Low plasticity (L)
> 35 to ≤ 50	Medium plasticity (I)
> 50	High plasticity (H)

Plasticity Chart– Fine Grained Soils



Consistency Terms – Fine Grained Soils

Term	Undrained shear strength (kPa)	Indicative SPT (N) Blow Count	Field Guide to Consistency
Very Soft (VS)	< 12	0 – 2	Easily penetrated several centimetres by fist, exudes between fingers when squeezed in fist
Soft (S)	12 – 25	2 – 4	Easily penetrated several centimetres by thumb, easily moulded by light finger pressure
Firm (F)	25 – 50	4 – 8	Can be penetrated several centimetres by thumb with moderate effort, and moulded between the fingers by strong pressure
Stiff (St)	50 – 100	8 – 15	Readily indented by thumb but penetrated only with difficultly. Cannot be moulded by fingers
Very Stiff (VSt)	100 – 200	15 – 30	Readily indented by thumb nail, still very tough
Hard (H)	> 200	> 30	Indented with difficulty by thumb nail, brittle
Friable (Fr)	-		Can be easily crumbled or broken into small pieces

Density Terms – Coarse Grained Soils

Term	Density Index (%)	SPT (N) Blow Count
Very Loose (VL)	< 15	0 – 4
Loose (L)	15 – 35	4 – 10
Medium Dense (MD)	35 – 65	10 – 30
Dense (D)	65 – 85	30 – 50
Very Dense (VD)	> 85	> 50

Particle Characteristics – Coarse Grained Soils

Term	Description
Well graded	Having good representation of all particle sizes
Poorly graded	With one or more intermediate size poorly represented
Gap graded	With one or more intermediate sizes absent
Uniform	Essentially of one size

Angularity – Coarse Grained Soils

	Rounded
	Sub-rounded
	Angular
	Sub-angular

Origin of Soil

Fill	Formed by anthropogenic activity
Aeolian	Formed by wind
Alluvial	Formed by streams and rivers
Colluvial	Formed on slopes (talus)
Estuarine	Formed in marine environments
Lacustrine	Formed in lakes
Residual	Formed by weathering insitu

Soil Moisture

	Term	Code	Description
Coarse Grained	Dry	D	Looks and feels dry and free running
	Moist	M	Soil feels cool, darkened in colour, soils tend to stick together, soil grains do not run freely through fingers and no visible free water
	Wet	W	Soil feels cool, darkened in colour, soils tend to stick together, free water on remoulding
Fine Grained	Moist, Less than Plastic Limit	W < PL	Hard and friable or powdery, moisture content well below Plastic Limit
	Moist, Near Plastic Limit	W ≈ PL	Soil feels cool, darkened in colour, can be moulded, near Plastic Limit
	Moist, Wet of Plastic Limit	W > PL	Soil feels cool, dark, usually weakened, free water, moisture content well above Plastic Limit
	Wet, Near Liquid Limit	W ≈ LL	Soil exudes easily
	Wet, Wet of Liquid Limit	W > LL	Soil behaves as a liquid

Boundary Classifications

Soils possessing characteristics of two groups are designated by combinations of group symbols. For example, GW-GC, well graded gravel-sand mixture with clay binder.

Graphic Symbols

	Asphalt		MH
	CH		ML
	CI		OH
	CL		OL
	Concrete		PT
	Fill		SC
	GC		SM
	GM		SP
	GP		SW
	GW		Topsoil

Soil Classification

Soils are described in general accordance with AS1726-2017 as shown below.

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 63 mm and basing fractions on estimated mass)						GROUP SYMBOL	PRIMARY NAME
COARSE GRAINED SOILS More than 65% of the material is less than 63 mm and is larger than 0.075 mm	A particle size of 0.075 is about the smallest size distinguishable to the naked eye	**GRAVELS** More than half of coarse fraction is larger than 2.36 mm	**CLEAN GRAVELS** (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines		GW	GRAVEL
				Predominantly one size or a range of sizes with more intermediate sizes missing, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines		GP	GRAVEL
			GRAVELS w/ FINES (Appreciable amount of fines)	'Dirty' materials with excess of non-plastic fines, none to medium dry strength; ≥ 12% silty fines		GM	SILTY GRAVEL
				'Dirty' materials with excess of plastic fines, medium to high dry strength; ≥ 12% clayey fines		GC	CLAYEY GRAVEL
		SANDS More than half of coarse fraction is smaller than 2.36 mm	**CLEAN SANDS** (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines		SW	SAND
				Predominantly one size or a range of sizes with more intermediate sizes missing, not enough fines to bind coarse grains, no dry strength; ≤ 5% fines		SP	SAND
			SANDS w/ FINES (Appreciable amount of fines)	'Dirty' materials with excess of non-plastic fines, none to medium dry strength; ≥ 12% silty fines		SM	SILTY SAND
				'Dirty' materials with excess of plastic fines, medium to high dry strength; ≥ 12% clayey fines		SC	CLAYEY SAND
FINE GRAINED SOILS More than 35% of the material less than 63 mm is less than 0.075 mm		**IDENTIFICATION PROCEDURES ON FRACTIONS** < 0.075 mm					
		SILTS AND CLAYS Liquid Limit < 50%	**DRY STRENGTH**	**DILATANCY**	**TOUGHNESS**	**GROUP SYMBOL**	**PRIMARY NAME**
			None to low	Slow to rapid	Low	ML	SILT
			Medium to high	≥ 12% clayey fines	Medium	CL, CI*	CLAY
			Low to medium	Slow	Low	OL	ORGANIC SILT
		SILTS AND CLAYS Liquid Limit > 50%	Low to medium	None to slow	Low to medium	MH	SILT
			High to very high	None	High	CH	CLAY
			Medium to high	None to very slow	Low to medium	OH	ORGANIC CLAY
HIGHLY ORGANIC SOILS: readily identified by colour, odour, spongy feel and frequently fibrous texture						PT	PEAT

* CL is low plasticity clay, CI is medium plasticity clay

Description of Rock

i. Rock name (BLOCK LETTERS)
ii. Grain size and mineralogy
iii. Colour (i.e. dominant colour of material)
iv. Fabric and texture
v. Features, inclusions, minor components, moisture content and durability
vi. Strength
vii. Weathering and/or alteration
viii. Rock mass properties – discontinuities and structure of rock
ix. Interpreted stratigraphic unit
x. Additional observations including geological structure

Simple rock names are used to provide a reasonable engineering description, rather than a precise geological classification. The rock name is chosen by considering the nature and shape of the grains or crystals, the texture and fabric of the rock material, the geological structure and setting, and information from the geological map of the area. Further guidance on the naming of rocks can be found in AS1726-2017, Tables 15, 16, 17 and 18. Typical rock types are described below, though subject to site specific variations.

Rock Type	Description	Example of Rock Name
Sedimentary	Formed by deposited beds of sediments, have grains that are cemented together and often rounded. Significant porosity	COMMON: Conglomerate, Breccia, Sandstone, Mudstone, Siltstone, Claystone ≥90% CARBONATE: Limestone, Dolomite, Calcirudite, Calcarenite, Calcisiltite, Calcilutite PYROCLASTIC: Agglomerate, Volcanic Breccia, Tuff
Igneous	Formed from molten rock and have a crystalline texture. Typically massive and low porosity. Rock types are from coarse to fine grained.	HIGH QUARTZ CONTENT: Granite, Microgranite, Rhyolite MODERATE QUARTZ CONTENT: Diorite, Microdiorite, Andesite LOW QUARTZ CONTENT: Gabbro, Dolerite, Basalt
Metamorphic	Formed when rocks are subject to heat and/or pressure and have typically have directional fabric. Typically have low porosity and crystalline structure. Rock types are from coarse to fine grained	FOLIATED: Gneiss, Schist, Phyllite, Slate NON-FOLIATED: Marble, Quartzite, Serpentinite, Hornfels
Duricrust	Formed as part of a weathering profile and show evidence of being cemented in situ. Cementation is typically irregular and exhibits replacement textures.	Ferricrete (Iron oxides and hydroxides) Silicrete (Silica) Calcrete (Calcium carbonate) Gypcrete (Gypsum)

Note: ( ) denotes dominant cementing mineralogy

Grain Size

Terms describing dominate grain size in sedimentary rocks.

Term	Grain size
Coarse	Mainly 0.6 mm to 2.0 mm
Medium	Mainly 0.2 mm to 0.6 mm
Fine	Mainly 0.06 mm (just visible) to 0.2 mm

Terms describing dominate grain size in igneous and metamorphic rocks

Term	Grain size
Coarse	Mainly greater than 2 mm
Medium	0.06 mm to 2 mm
Fine	Mainly less than 0.06 mm (just visible) to 0.2 mm

Texture and Fabric

Sedimentary rocks

Thickness	Bedding Term
< 6 mm	Thinly laminated
6 – 20 mm	Laminated
20 – 60 mm	Very thinly bedded
60 – 200 mm	Thinly bedded
0.2 – 0.6 m	Medium bedding
0.6 – 2 m	Thickly bedded
> 2 m	Very thickly bedded

Igneous rocks

Term	Definition
Amorphous	Indicates that the rock has no obvious crystalline structure
Crystalline	A regular molecular structure, showing crystal structure and symmetry.
Cryptocrystalline	The texture comprises crystals that are too small to recognise under an ordinary microscope. Indistinctly crystalline.
Porphyritic	Indicates the presence of phenocrysts (relatively large crystals in a fine grained ground mass) in igneous rocks.
Flow banded	Indicates visible flow lines in volcanic rocks and some intrusive rocks
Glassy	Entirely glass like. No crystalline units and without crystalline structure.
Vesicular	A texture of volcanic rocks that indicates the presence of vesicles (small gas bubbles). Where the vesicles are filled with a mineral substance they are termed Amygdales and the texture is Amygdaloidal.

Metamorphic

Term	Definition
Foliation	The parallel arrangement of minerals due to metamorphic process, which shall be defined by the terms in weak, moderate and strongly foliated.
Porphyroblastic	A texture indicating the presence of porphyroblasts (larger crystals formed by recrystallization during metamorphism, such as garnet or staurolite in a mica schist).
Cleavage	A type of foliation developed in fine grained metamorphic rocks such as slates.

Bedding and Fabric Development

Type	Definition
Massive	No obvious development of bedding – rock appears homogeneous
Poorly Developed	Bedding is barely obvious as faint mineralogical layering or grain size banding, but bedding planes are poorly defined.
Well Developed	Bedding is apparent in outcrops or drill core as distinct layers or lines marked by mineralogical or grain size layering.
Very Well Developed	Bedding is often marked by a distinct colour banding as well as by mineralogical or grain size layering.
Indistinct Fabric	There is little effect on strength properties
Distinct Fabric	The rock may break more easily parallel to the fabric

Rock Strength

Term (Code)	UCS (MPa)	$Is_{(50)}$ (MPa)	Field Guide to Strength
Very Low (VL)	0.6 - 2	> 0.03 to ≤ 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 3 cm thick can be broken by finger pressure.
Low (L)	2 - 6	> 0.1 to ≤ 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blow of the pick point; has dull sound under hammer. A piece of core 150 mm long 50 mm in diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium (M)	6 - 20	> 0.3 to ≤ 1.0	Readily scored with a knife; a piece of core 150 mm long by 50 mm in diameter can be broken by hand with difficulty.
High (H)	20 - 60	> 1 to ≤ 3	A piece of core 150 mm long by 50 mm in diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High (VH)	60 - 200	> 3 to ≤ 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High (EH)	> 200	> 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Rock strength is assessed by laboratory Uniaxial Compressive Strength (UCS) testing and/or Point Load Strength Index (PLT) testing to obtain the $Is_{(50)}$ the strength table implies a 20 times correlation between $Is_{(50)}$ and UCS used for classification. Note however, multiplier may range from 4 (e.g. some carbonated and low strength rocks) to 40 (e.g. some igneous rocks and/or some high strength rocks). A site specific correlation based on testing, previous investigation or literature may be used where available. These terms refer to the strength of the rock material and not to the strength of the rock mass which may be considered weaker due to the effect of rock defects.

Visual Log

A diagrammatic plot of defects showing type, spacing and orientation in relation to the core axis.

- Defects open in situ or clay sealed
- Defects closed in-situ
- Drill induced fractures or handling breaks
- Infilled seam

Rock Weathering and or Alteration Classification

Term (Code)		Definition	
Residual soil (RS)		Soil developed on extremely weathered rock. The rock mass structure and substance fabric are no longer evident but the soil has not been significantly transported.	
Extremely weathered (XW) Extremely altered (XA)		Rock is weathered to such an extent that it has 'soil' properties, i.e, it either disintegrates or can be remoulded in water, but the texture of original rock is still evident.	
Highly weathered (HW) Highly Altered (HA)	Distinctly weathered (DW)* Distinctly Altered (DA)	Whole rock material is discoloured usually by extent that iron staining or bleaching and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original rock substance is no longer recognisable	*Where is it not practical to distinguish between 'HW' and MW'. Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores
Moderately weathered (MW) Moderately Altered (MA)		Whole rock material is discoloured usually by staining that original colour of the fresh rock is no longer recognisable	
Slightly weathered (SW) Slightly altered (SA)		Rock is slightly discoloured but shows little or no change of strength from fresh rock	
Fresh rock (FR)		Rock shows no sign of decomposition or staining.	

Rock Core Recovery

TCR = Total Core Recovery (%)

$$\frac{\text{Length of Core Recovered}}{\text{Length of Core run}} \times 100$$

SCR = Solid Core Recovery (%)

$$\frac{\text{Sum Length of Cylindrical Core Recovered}}{\text{Length of Core run}} \times 100$$

RQD = Rock Quality Designation (%)

$$\frac{\text{Sum Length of Sound Core Pieces > 100mm in length}}{\text{Length of Core run}} \times 100$$

Types of Defects

Term		Code	Description
Parting		PT	A surface or crack across which the rock has little or no tensile strength. Parallel or sub-parallel to layering (e.g. bedding) or a planar anisotropy in the rock material (i.e. cleavage). May be opened or closed.
Joint		JT	A surface or crack with no apparent shear displacement and across which the rock has little or no tensile strength, but which is not parallel or sub-parallel to layering or to planar anisotropy in the rock material. May be open or closed.
Sheared Surface		SR	A near planar, curved or undulating surface which is usually smooth, polished or slickensided and which shows evidence of shear displacement.
Sheared Zone		SZ	Zone of rock material with roughly parallel, near planar, curved, or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge-shaped blocks.
Crushed Zone [a]		CZ	A zone of broken and disturbed ground containing more than one identifiable Crushed Seam.
Fracture Zone [a]		FZ	A zone of broken ground with parallel to opposing boundaries dominated by abundant, extremely closely to closely spaced defects, which may be intact or open, and planar, curved, undulating, irregular, or stepped, resulting in a dissected rock mass of angular trapezoidal, triangular or rectangular fragments.
Seam (SE)	Sheared Seam	SS	Seam of soil material with roughly parallel almost planar boundaries, composed of soil materials with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge-shaped blocks.
	Crushed Seam	CS	Seam of soil material with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock material which may be more weathered than the host rock. The seam has soil properties.
	Infilled Seam	IS	Seam of soil material usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams less than 1 mm thick may be described as a veneer or coating on a joint surface.
	Extremely Weathered Seam	XS	Seam of soil material, often with gradational boundaries. Formed by weathering of the rock material in place.
Fault [b]		FT	A fracture (defect) or fracture zone along which there has been an observable amount of displacement.
Vein [c]		VE	Any fracture that contains mineralized material. Veins can display either crack-normal extension or shear displacement coupled with crack-normal extension.
Vugh [a]		VG	An open void with secondary crystallisation which may be coated, partly or nearly completely filled.
Void [a]		VO	An open space created through natural or anthropogenic processes, including, but not limited to, caves, kettles, tunnels, mines, pipes, piping, landslides, faulting, shearing, dissolution, & erosion.
Mechanical Break		MB	A fracture or break induced or created by the sampling process (i.e. drilling (DB) handling (HB), drill lift (DL), excavation, or blasting).

All definitions as per AS1726-2017, except:

[a] SMEC Field Manual,
[b] British Standard BS 5930:2015, and
[c] Glossary of Geology (Fifth Edition - revised) (2011), American Geosciences Institute.

Defect Planarity

Code	Description
CR	Curved – A defect with a gradual change in orientation
IR	Irregular – A defect with many sharp changes in orientation
PL	Planar – Defect forms a continuous plane without variation in orientation
ST	Stepped – A defect with distinct sharp steps or step
UN	Undulose – A defect with undulations

Defect Roughness

Code	Description
RO	Rough – Many small surface irregularities generally related to the grain size of the parent rock
SM	Smooth – Few or no surface irregularities related to the grain size of the parent rock
PO	Polished – Planes have a distinct sheen or a smoothness
SL	Slickensided – Planes have a polished, grooved or striated surface consistent with differential movement of the parent rock along the plane
VR	Very rough – many large surface irregularities, amplitude generally more than 1mm

Type of Structures

Term	Code	Description
Bedding	BD	A layered arrangement of minerals parallel to the surface of deposition which has caused planar anisotropy in the rock substance.
Cleavage	CV	An alignment of fine grained minerals caused by deformation.
Schistosity	SH	A layered arrangement of minerals to each other
Foliation	FO	A planar alignment of minerals caused by deformation.
Void	VO	A completely empty space
Dyke	DK	Sheet-like bodies of igneous rock that cut across sedimentary bedding or foliations in rocks. They may be single or multiple in nature
Sill	SL	A sill is an intrusion of magma that spreads underground between the layers of another kind of rock
Contact	CX	A contact between intrusive and stratigraphic units.
Boundary	BN	A distinct boundary between two stratigraphic units
Vugh	VG	An open void with crystalisation

Note: Drill breaks (DB) and handling breaks (HB) are not included as natural discontinuity.

Discontinuity Spacing

Spacing (mm)	Description
> 6000	Extremely Widely Spaced
2000 - 6000	Very Widely Spaced
600 - 2000	Widely Spaced
200 - 600	Medium Spaced
60 - 200	Closely Spaced
20 - 60	Very Closely Spaced
< 20	Extremely Closely Spaced

Infill Material

Code	Name	Code	Name
Ap	Apatite	Ga	Galena
Ca	Calcite	Gp	Gypsum
Ch	Chlorite	Mn	Manganese
Cl	Clay	MnO	Manganese Oxide
Co	Coal	MS	Secondary mineral
Ep	Epidote	Py	Pyrite
Fe	Limonite/ Ironstone/ Goethite	Um	Unidentified mineral
FeO	Iron oxide	Qz	Quartz
Fs	Feldspar	X	Carbonaceous
		Ze	Zeolite

Discontinuity Observation

Term	Code	Description
Clean	CN	No visible coating or infill
Stain	SN	No visible coating or infill but surfaces are discoloured by mineral staining
Veneer < 1 mm	VN	A visible coating or soil or mineral substance but usually unable to be measured. If discontinuous over the plane, patchy veneer.
Coating > 1 mm to < 10 mm	CT	A visible coating or infilling of soil or mineral substance. Describe composition and thickness.
Filling (Filled) > 10 mm	FD	A visible filling of soil or mineral substance. Describe composition and thickness.

Discontinuity Orientation

Code	Description
VT	Vertical
HO	Horizontal
RL	Top right to bottom left
LR	Top left to bottom right

Samples and Field Tests

Code	Description
B	Bulk disturbed sample
BLK	Block sample
C	Core sample
CBR	CBR Mould Sample
CPT_u	Cone Penetration Test (with pore pressure)
DT	Dilatometer
DS	Small disturbed sample
ES	Soil sample for environmental testing
EW	Water sample for environmental testing
FP	Pressuremeter
G	Gas sample
H	Hydraulic fracturing
HP	Hand penetrometer test
I	Impression device
$Is_{(50)}$	Point Load Index
K	Permeability
LB	Large bulk disturbed sample
N	Standard penetration test result (N* denotes SPT sample recovery)
O	Core orientation
P	Piston sample
PID	Photoionisation detector reading in ppm
PP	Penetrometer
R	Hammer bouncing / refusal
SPT	Standard Penetration Test
U	Undisturbed push in sample
UCS	Uniaxial Compressive Strength
U50	Undisturbed tube sample (50 mm diameter)
U75	Undisturbed tube sample (75 mm diameter)
U100	Undisturbed tube sample (100 mm diameter)
VS	Vane shear test
● (A)	Axial Test
○ (D)	Diametral Test
□	Irregular Lump test

Laboratory Tests

Code	Description
ACM	Asbestos Containing Material
CD	Consolidated Drained
CU	Consolidated Undrained
LL	Liquid Limit
LS	Linear Shrinkage
MC	Moisture Content
MDD	Maximum Dry Density
OMC	Optimum Moisture Content
PBT	Plate Bearing Test
PI	Plasticity Index
PL	Plastic Limit
PSD	Particle Size Distribution
ρ_b	Bulk Density
ρ_p	Particle Density
ρ_d	Dry Density
UU	Undrained Unconsolidated

Backfill / Standpipe Detail

Symbol	Description	Symbol	Description
	Cement seal		Filter pack: sand filter
	Grout backfill GP -Cement BE - Bentonite Cement		Filter pack: gravel filter
	Un-slotted pipe		Bentonite seal
	Slotted pipe		Cutting – excavated material backfill
	Surface Completion: Monument Above Ground		Surface Completion: Gatic Ground Monument

Completion Details

Type	Description
Collapse	Exploratory hole collapsed before reaching planned depth
Equipment Failure	Boring or excavator equipment operational failure
Flooding	Flooding of excavation
Machine Limit	Limit of machine capability reached
Obstruction	Obstruction preventing further advancement
Operator Limit	Limit of operator limit/safety reached
Possible services	Indication of possible services below
Services present	Services encountered during exploratory hole
Squeezing	Hole squeezing boring equipment
Target Depth	Depth reached as planned
Target Depth (Instrumentation Installed)	Depth reached as planned instrumentation installed
Target Depth (Standpipe Installed)	Depth reached as planned open standpipe constructed
Material Refusal	Material preventing further advancement

Status

Code	Description
-2	Historic
-1	For information
0	Preliminary
1	Checked
2	Draft
3	Final

Geological & Engineering Log

Project	Pipeline Route TSI	East	307771.690 m	Start Date	03/03/2021	Contractor	Numac
Client	Manildra Group	North	6183048.650 m	End Date	03/03/2021	Rig Type	Comacchio 205
Site	Port Kembla	Elevation	2.570 m			Mounting	Track
Job No	30013174	Datum	MGA94 Zone 56/AHD				

Inclination	90°	
Azimuth		
North		
Survey		

SMEC
Member of the Surbana Jurong Group

Borehole Identifier: **SMW01**

Method	Casing	Support	Water (Gain/Loss)	Run (TCR)	Sampling	Testing: SPT	Testing: PP (kPa) VS (kPa) Peak / Remoulded PID (ppm)	Testing: DCP	Water Level & Inflow
ADT, WB	Steel Casing - HW (114.3 mm)								03/03/21

Depth (m) Elevation	Graphic Log	Soil Code	Depth RL	Soil / Rock Material Description	Moisture Condition	Consistency Density	Alteration	Weathering	Rock Strength	Origin, Stratigraphic Unit & General Observations	Installation
0.0 2.6			2.57 0.20	FILL GRAVEL: fine to medium grained, angular, pale grey, grey.						FILL (CEMENTED SLAG)	WELL01
			2.37 0.50	FILL Gravelly CLAY trace cobbles: medium plasticity, dark grey, dark brown, gravel is fine to coarse grained, angular, iron slag.						FILL	
			2.07	FILL Sandy GRAVEL with clay: fine to coarse grained, poorly graded, brown, gravel is iron slag, sand is medium to coarse grained.							
1.0 1.6											1.0
											1.5
2.0 0.6		SC	2.00 0.57	Clayey SAND clay: fine to coarse grained, dark grey, black, material smelling of hydrocarbons.	M	L - MD				ESTUARINE?	2.0
			2.50 0.07	SAND: fine to coarse grained, pale grey, grey, slight hydrocarbon odour.	W						
3.0 -0.4		SP									3.0
4.0 -1.4			4.50	Hole Terminated at 4.50 m Target depth							4.0 4.5
5.0											

Observations and Comments

Possible hydrocarbon contaminants encountered at 2-2.5m.
Protecive steel monument cemented in place, 0.73m stick up above surface level.

Notes

Classifications compliant with AS1726-2017: Geotechnical Site Investigations unless otherwise noted.
Defect Log Abridged. Additional detail in digital dataset. Lugeon: BS5930:1999
For Inclined Holes: Angles reported in defects are apparent dip from core horizontal unless as α or β.
Refer to explanatory notes for SMEC logs for details of abbreviations or basis of description.

Logged By	TH	Date	03/03/2021
Approved By	SRM	Date	31/03/2021
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Geological & Engineering Log

Project	Pipeline Route TSI	East	307889.380 m	Start Date	04/06/2022	Contractor	Epoca
Client	Manildra Group	North	6183043.420 m	End Date	04/06/2022	Rig Type	Geoprobe 7822DT
Site	Port Kembla	Elevation	2.890 m			Mounting	
Job No	30013174	Datum	MGA94 Zone 56/AHD				

Inclination	90°
Azimuth	
North	
Survey	

SMEC
Member of the Surbana Jurong Group

Borehole Identifier: **SMW02**

Method	Casing	Support	Water (Gain/Loss)	Run (TCR)	Sampling	Testing: SPT	Testing: PP (kPa) VS (kPa) Peak / Remoulded PID (ppm)	Testing: DCP	Water Level & Inflow	Depth (m) *Elevation*	Graphic Log	Soil Code	Depth *RL*	Soil / Rock Material Description	Moisture Condition	Consistency Density	Alteration	Weathering	Rock Strength	Origin, Stratigraphic Unit & General Observations	Installation
										0.0 *2.9*			0.10 *2.79*	FILL SLAG: grey, fine to coarse grained, angular sand matrix.	W<PL	VL				FILL (CEMENTED SLAG)	
														FILL CLAY: high plasticity, brown to black, trace fine to coarse grained sand, angular to sub-rounded gravel.		VS				FILL	SMW02 0.7 1.0
										1.0 *1.9*				1.10: increasing brown		L					
										2.0 *0.9*			2.90 *-0.01*	FILL Clayey Silty SAND: fine to medium grained, sub-rounded, black, low plasticity clay.							2.0 3.0
										3.0 *-0.1*			4.00								4.0
										4.0 *-1.1*				Hole Terminated at 4.00 m Target Depth (standpipe installed)							
										5.0											

Observations and Comments
PVC pipe stick up 0.74m

Notes
Classifications compliant with AS1726-2017: Geotechnical Site Investigations unless otherwise noted.
Defect Log Abridged. Additional detail in digital dataset. Lugeon: BS5930:1999
For Inclined Holes: Angles reported in defects are apparent dip from core horizontal unless as α or β.
Refer to explanatory notes for SMEC logs for details of abbreviations or basis of description.

Logged By	BP	Date	04/06/2022
Approved By	AW	Date	27/04/2022
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Geological & Engineering Log

Project	Pipeline Route TSI	East	307881.900 m	Start Date	20/04/2022	Contractor	Numac Drilling
Client	Manildra Group	North	6183114.520 m	End Date	20/04/2022	Rig Type	Sonic
Site	Port Kembla	Elevation	3.090 m			Mounting	Track
Job No	30013174	Datum	MGA94 Zone 56/AHD				

Inclination 90°
Azimuth
North
Survey

SMEC
Member of the Surbana Jurong Group

Borehole Identifier: **SMW03**

Method	Casing	Support	Water (Gain/Loss)	Run (TCR)	Sampling	Testing: SPT	Testing: PP (kPa) VS (kPa) Peak / Remoulded PID (ppm)	Testing: DCP	Water Level & Inflow
SD	Casing								20/04/22

Depth (m) Elevation	Graphic Log	Soil Code	Depth RL	Soil / Rock Material Description	Moisture Condition	Consistency Density	Alteration	Weathering	Rock Strength	Origin, Stratigraphic Unit & General Observations
0.0 3.1			3.09	FILL Gravelly CLAY: low to medium plasticity, pale brown, fine to coarse grained, angular gravel, with fine to coarse grained sand, with cobbles (60-80mm) comprising sandstone.	M	F				FILL
			0.80							
1.0 2.1			2.29	FILL Sandy CLAY: low to medium plasticity, brown mottled orange, fine to coarse grained sand, with fine to medium grained gravel.						1.50: Driller noted some resistance
2.0 1.1				2.00-2.30: SAND, medium grained, pale brown observed						
			2.30							
			0.79	FILL Gravelly SILT: low plasticity, dark grey, fine to coarse grained gravel, with cobbles and boulders comprising latite (dark grey-black with shiny inclusions).		St				
3.0 0.1				3.00-3.30: Boulder encountered/penetrated						3.00-3.30: Driller cored through boulder
			3.30							
			-0.21	SAND: medium grained, yellow-red.		L				ESTUARINE
4.0 -0.9		SP		4.00-4.50: becoming pale yellow						
			4.50							
5.0				Hole Terminated at 4.50 m Target Depth (standpipe installed)						

Installation: SMW03 — 0.3, 1.0, 1.5, 2.0, 3.0, 4.0, 4.5

Observations and Comments

Standpipe Surface Completion: Monument; Hole Flushed, PVC pipe stick up 0.69m; No Water Sample collected
Development Method: Bailer; Well Development - Purged 40L, brown, torbid water; Well Volume ~13L

Notes

Classifications compliant with AS1726-2017: Geotechnical Site Investigations unless otherwise noted.
Defect Log Abridged. Additional detail in digital dataset. Lugeon: BS5930:1999
For Inclined Holes: Angles reported in defects are apparent dip from core horizontal unless as α or β.
Refer to explanatory notes for SMEC logs for details of abbreviations or basis of description.

Logged By	AW	Date	20/04/2022
Approved By	AW	Date	27/04/2022
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Geological & Engineering Log

Project	Pipeline Route TSI
Client	Manildra Group
Site	Port Kembla
Job No	30013174

East	307848.120 m	Start Date	20/04/2022
North	6183124.300 m	End Date	20/04/2022
Elevation	2.960 m		
Datum	MGA94 Zone 56/AHD		

Contractor	Numac Drilling
Rig Type	Sonic
Mounting	Track

Inclination	90°
Azimuth	
North	
Survey	

SMEC
Member of the Surbana Jurong Group

Borehole Identifier: **SMW04**

Method	Casing	Support	Water (Gain/Loss)	Run (TCR)	Sampling	Testing: SPT	Testing: PP (kPa) VS (kPa) Peak / Remoulded PID (ppm)	Testing: DCP	Water Level & Inflow	Depth (m) Elevation	Graphic Log	Soil Code	Depth RL	Soil / Rock Material Description	Moisture Condition	Consistency Density	Alteration	Weathering	Rock Strength	Origin, Stratigraphic Unit & General Observations	Installation
SD	Casing								20/04/22	0.0 3.0			2.96	FILL Gravelly SAND: fine to coarse grained, brown, fine to coarse grained gravel.	M	MD				FILL	0.3 SMW04 1.0
										1.0 2.0			1.00 1.96	FILL Sandy CLAY: low to medium plasticity, brown, medium to coarse grained sand, with fine to medium grained gravel.		F				1.00: Driller noted increased resistance (possible boulders)	1.5
										2.0 1.0				2.30-2.50: Boulder encountered, Latite, dark grey, angular borken edges							2.0
													2.70 0.26	SAND: medium grained, yellow-red.		L				ESTUARINE	
										3.0 0.0		SP		3.50-4.50: becoming pale yellow							3.0
										4.0 -1.0			4.50	Hole Terminated at 4.50 m Target Depth (standpipe installed)							4.0 4.5
										5.0											

Observations and Comments

PVC Pipe Stick Up: 0.65m; Hole Flushed; No Water Sample collected
Development Method: Bailer; Well Volume ~13.4L
Well Development - Purged 40L, brown, torbid water 0-20L; pale brown, slightly cloudy 20-40L (improved clarity)

Notes

Classifications compliant with AS1726-2017: Geotechnical Site Investigations unless otherwise noted.
Defect Log Abridged. Additional detail in digital dataset. Lugeon: BS5930:1999
For Inclined Holes: Angles reported in defects are apparent dip from core horizontal unless as α or β.
Refer to explanatory notes for SMEC logs for details of abbreviations or basis of description.

Logged By	AW	Date	20/04/2022
Approved By	AW	Date	27/04/2022
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Geological & Engineering Log

Project	Pipeline Route TSI	East	307825.760 m	Start Date	20/04/2022	Contractor	Numac Drilling
Client	Manildra Group	North	6183134.070 m	End Date	20/04/2022	Rig Type	Sonic
Site	Port Kembla	Elevation	2.860 m			Mounting	Track
Job No	30013174	Datum	MGA94 Zone 56/AHD				

Inclination 90°
Azimuth North
Survey

SMEC
Member of the Surbana Jurong Group

Borehole Identifier: **SMW05**

Method	Casing	Support	Water (Gain/Loss)	Run (TCR)	Sampling	Testing: SPT	Testing: PP (kPa) VS (kPa) Peak / Remoulded PID (ppm)	Testing: DCP	Water Level & Inflow
SD	Casing								20/04/22

Depth (m) Elevation	Graphic Log	Soil Code	Depth RL	Soil / Rock Material Description	Moisture Condition	Consistency Density	Alteration	Weathering	Rock Strength	Origin, Stratigraphic Unit & General Observations	Installation
0.0 2.9			0.10 2.76	FILL SILT with gravel: with fine to coarse grained gravel, trace coarse grained, sub-angular to angular gravel.	D	L				FILL	
			0.40	FILL CEMENTED SLAG.		VD				FILL (CEMENTED SLAG) 0.10-0.40: heavily pulverised cemented material	0.3
			2.46	FILL Gravelly CLAY: black, pale grey, fine to coarse, sub-angular to sub-rounded gravel, with sand, trace rootlets.	M	F				FILL	1.0
1.0 1.9			1.70 1.16	FILL Clayey GRAVEL: fine to coarse grained, sub-angular, black, yellow brown, with sand.	D						1.5
2.0 0.9			2.30 0.56	FILL Gravelly SAND: fine to coarse grained, brown, red brown, fine grained, sub-angular to sub-rounded gravel, trace pebbles, trace clay.	M	L					2.0
3.0 -0.1			3.00 -0.14	LATITE BOULDERS / COBBLES.	W	VD				PULVERISED MATERIAL AROUND FRAGMENTS	3.0
		SP	3.20 -0.34	SAND: fine grained, red, yellow, pale brown.	M	L				ESTUARINE (QUARTZ BASED)	
4.0 -1.1		SP	3.70 -0.84	SAND: fine grained, yellow, pale brown to pale grey.	W						4.0
			4.50	Hole Terminated at 4.50 m Target Depth (standpipe installed)							4.5
5.0											

SMW05

Observations and Comments

PVC Pipe Stick Up: 0.72m; Hole Flushed; No Water Sample collected
Development Method: Bailer; Well Volume 13.4L

Notes

Classifications compliant with AS1726-2017: Geotechnical Site Investigations unless otherwise noted.
Defect Log Abridged. Additional detail in digital dataset. Lugeon: BS5930:1999
For Inclined Holes: Angles reported in defects are apparent dip from core horizontal unless as α or β.
Refer to explanatory notes for SMEC logs for details of abbreviations or basis of description.

Logged By	KH	Date	20/04/2022
Approved By	AW	Date	27/04/2022
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Geological & Engineering Log

Project	Pipeline Route TSI	East	307734.250 m	Start Date	04/06/2022	Contractor	Epoca	Inclination	90°
Client	Manildra Group	North	6183055.700 m	End Date	04/06/2022	Rig Type	Geoprobe 7822DT	Azimuth	
Site	Port Kembla	Elevation	3.410 m			Mounting		North	
Job No	30013174	Datum	MGA94 Zone 56/AHD					Survey	

SMEC
Member of the Surbana Jurong Group

Borehole Identifier: **SMW06**

Depth (m) / Elevation	Graphic Log	Soil Code	Depth / RL	Soil / Rock Material Description	Moisture Condition	Origin, Stratigraphic Unit & General Observations
0.0 / 3.4				FILL Silty SAND: grey, abundant grass.	M	FILL (TOPSOIL) 0.00: 0.76m standpipe stick up
			3.31	FILL Clayey SAND: fine to coarse grained, sub-rounded to sub-angular, grey, trace gravel.		
			0.30 / 3.11	FILL Silty Gravelly SAND: fine to coarse grained, sub-rounded to sub-angular, black, coalwash.		FILL
			0.50 / 2.91	FILL Sandy Gravelly CLAY: red brown, fine to coarse grained, sub-angular to rounded sand, rounded coarse furnace slag gravel.	W<PL	
1.0 / 2.4				FILL Silty SAND: grey.	M	
2.0 / 1.4			2.00 / 1.41	SAND: fine to coarse grained, angular to rounded, yellow, quartz/lithic.	W	AEOLIAN
3.0 / 0.4		SP				
4.0 / -0.6			4.50	Hole Terminated at 4.50 m Target Depth (standpipe installed)		
5.0						

Installation: SMW06 (1.0, 1.5, 2.0, 3.0, 4.0, 4.5)

Observations and Comments
PVC pipe stick up 0.76m

Notes
Classifications compliant with AS1726-2017: Geotechnical Site Investigations unless otherwise noted.
Defect Log Abridged. Additional detail in digital dataset. Lugeon: BS5930:1999
For Inclined Holes: Angles reported in defects are apparent dip from core horizontal unless as α or β.
Refer to explanatory notes for SMEC logs for details of abbreviations or basis of description.

Logged By	BP	Date	04/06/2022
Approved By	AW	Date	27/04/2022
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Appendix E

Laboratory summary tables

					Field parameters					Inorganics																				
					pH	Specific Conductivity (Ec @ 25°C)	Temperature	Dissolved Oxygen	Redox Potential	Ammonia as N	Ammonium as N	Nitrate and Nitrite as N (Sum)	Nitrite as N	Nitrate as N	Reactive Phosphorus as P	Total Phosphorus as P	Total Hardness as CaCO3	Total Acidity as CaCO3	Total Dissolved Solids (Calc.)	Calcium	Magnesium	Sodium	Potassium	Chloride	Fluoride	Sulphate as SO4 - Turbidimetric	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Hydroxide Alkalinity as CaCO3	Total Alkalinity as CaCO3
Units of measurement						µS/cm	°C	%	mv	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Limit of reporting (ALS laboratory)					0.01	1	0.1	0.1	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1	1	1	1	1	1	1	0.1	1	1	1	1	1
Limit of reporting (Eurofins laboratory)					--	--	--	--	--	0.01	0.01	0.02	0.02	0.02	0.01	0.01	5	10	10	0.5	0.5	0.5	0.5	1	0.5	5	20	10	20	20
Assessment criteria																														
Laboratory limits of reporting - adopted screening level for Total Recoverable Hydrocarbons																														
PFAS NEMP (2020) Ecological water quality guideline values (Table 5 Interim Marine - 95% Species Protection)																														
Friebel & Nadebaum 2011 Table A2 Groundwater HSLs for vapour intrusion (Commercial /industrial, 2-<4m Sand)																														
ANZG 2018 Default Guidelines Values for toxicants (Marine water – 95% species protection)										0.91																				
ANZECC & ARMCANZ (2000) Default trigger values for physical and chemical stressors for South-east Australia for slightly disturbed marine ecosystems, applying to estuaries					7.0-8.5			80-110			0.015	0.015			0.005	0.03														
Water Sample ID	Sample Date	Lab Batch	Observations	Standing water level: Depth (m bgl)	Standing water level: Reduced Level (m AHD)	Evidence of oily sheen or NAPL?																								
OHMW20	10/03/2021	EW2101111	Clear, no odour	2.36	0.53	N	6.82	14,224	21.8	5.9	129.8	0.69	--	0.11	0.02	0.09	<0.01	--	1720	--	10,100	227	279	2950	73	4770	3.2	1560	475	<1	<1	475
OHMW20	21/10/2021	EW2104433 / ES2140160	Slight yellowish colour, slight rotten egg odour	2.42	0.47	N	6.38	23,158	20.6	4.8	72.16	0.77	0.71	0.05	<0.01	0.05	<0.01	0.07	3040	53	14,800	354	525	5000	95	7550	2.2	2080	428	<1	<1	428
OHMW20	26/04/2022	EW2201994	Very slightly turbid, grey, sweet (possible hydrocarbon) odour	2.06	0.83	N	6.78	18,390	21.6	1.2	-97.5	0.67	0.67	<0.01	<0.01	<0.01	<0.01	0.22	1,640	3	9,820	204	274	2,880	76	4,490	4	1,670	436	<1	<1	436
OHMW28	10/03/2021	EW2101111	Clear, no odour	1.76	0.65	N	6.48	2,880	23.6	3.7	-72.6	0.99	--	0.12	<0.01	0.12	<0.01	--	1460	--	1960	503	50	108	29	45	7.4	1460	398	<1	<1	398
OHMW28	21/10/2021	EW2104433 / ES2140160	Clear- moderate rotten egg odour	1.85	0.56	N	6.61	2,960	20.6	3.0	-75.4	0.85-1.33 Note1	0.81	0.03	<0.01	0.03	<0.02	0.22	1600	57	1880	567	46	102	29	38	6.6	1570	402	<1	<1	402
OHMW28	26/04/2022	EW2201994	Clear, very mild organic odour	1.43	0.98	N	6.67	2,577	23.1	2.2	-81.6	0.22	0.22	1.98	<0.01	1.98	<0.01	0.24	1,470	2	1,720	489	60	122	24	40	7.8	1,170	383	<1	<1	383
SMW01	10/03/2021	EW2101111	Slightly turbid brown, no odour	2.07	0.50	N	6.46	2,019	23.9	5.6	122.8	<0.01	--	2.33	1.03	1.3	<0.01	--	1120	--	1380	396	33	52	12	38	7.5	692	489	<1	<1	489
SMW01	21/10/2021	EW2104433 / ES2140160	Clear, no odour	2.11	0.46	N	6.75	1,901	20.8	2.1	137	<0.01	<0.01	3.82	0.06	3.76	0.02	0.19	1070	44	1230	383	28	49	8	37	8.1	721	459	<1	<1	459
SMW01	26/04/2022	EW2201994	--	1.97	0.60	N	6.79	1,840	23.3	0.9	-86.5	0.04	0.04	2.82	0.03	2.79	<0.01	0.11	1,060	2	1,180	385	25	33	8	27	8.1	670	379	<1	<1	379
SMW02	26/04/2022	EW2201994	Modertately turbid, brown/grey colour, no odour	2.04	0.85	N	7.11	2,065	20.8	1.1	-102.4	<0.01	<0.01	6.82	0.03	6.79	0.17	0.39	1,030	2	1,280	309	62	105	6	33	1.3	825	214	<1	<1	214
SMW03	26/04/2022	EW2201994	Mild turbidity (cloudy), grey, no odour	2.80	0.29	N	7.4	1,913	19.7	18.7	-92.9	0.02	0.02	7.77	0.06	7.71	<0.01	0.02	610	3	1,230	175	42	186	8	198	3	445	266	<1	<1	266
SMW04	26/04/2022	EW2201994	Clear, no odour	2.81	0.16	N	7.11	2,488	19.4	12.7	-99.3	<0.01	<0.01	4.56	0.17	4.39	0.01	0.02	1,120	2	1,600	332	72	170	8	91	2.4	930	329	<1	<1	329
SMW05	26/04/2022	EW2201994	Mild turbidity (cloudy), grey, no odour	2.85	0.01	N	7.35	2,249	20.1	14.8	-91.2	0.01	<0.01	0.83	0.05	0.78	<0.01	0.14	1,160	1	1,480	320	89	129	10	52	3.5	981	227	<1	<1	227
SMW06	26/04/2022	EW2201994	--	2.80	0.62	N	#	#	#	#	#	<0.01	<0.01	4.08	<0.01	4.08	0.01	0.1	458	2	610	111	44	24	4	9	1.5	45	410	<1	<1	410
										Min	6.38	1840	19.4	0.9	-102.4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	458	1	610	111	25	24	4	9	1.3	45	214	<1	<1	214
										Max	7.4	23,158	23.9	18.7	137	1.33	0.81	7.77	1.03	7.71	0.17	0.39	3,040	57	14,800	567	525	5,000	95	7550	8.1	2,080	489	<1	<1	489

Colour legend:

- Concentration exceeds HSLs Friebel & Nadebaum (2011) Human-health
- Concentration exceeds ANZG (2018) Aquatic ecosystems - 95% species protection
- Concentration exceeds ANZG (2018) Aquatic ecosystems - 80% species protection
- Concentration exceeds ANZECC / & ARMCANZ (2000) Physical and chemical stressors
- Concentration exceeds PFAS NEMP
- Laboratory limits of reporting exceed adopted criteria

Table Notes:

Friebel & Nadebaum (2011) Friebel & Nadebaum (2011) Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater (technical paper No.10) Guidelines, CRC for Contamination Assessment and Remediation of the Environment (CRC CARE)

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018), accessed 8 October 2018, URL: http://waterquality.gov.au/anz-guidelines

ANZECC & ARMCANZ (2000) ANZECC & ARMCANZ 2000, National Water Quality Management Strategy, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Protection of Aquatic Ecosystems

PFAS NEMP (2020) PFAS National Environmental Management Plan, Version 2.0 - January 2020, National Chemicals Working Group of the Heads of EPAs Australia and New Zealand

[A] No hardness corrections applied to default guideline values. Assumed 30mg/L CaCO3 applies.

[B] 99% protection of species adopted to account for potential bioaccumulative effects

Field parameters not recorded for SMW06 on 26 April 2022

Note1 Includes corresponding inter-laboratory duplicate data (QA1A – October 2021)

									BTEXN							TRH - 1999 fractions					TRH - 2013 fractions					
									Benzene	Toluene	Ethylbenzene	m+p-xylene	o-xylene	Xylenes (total)	Naphthalene	TRH C6 - C9	TRH C10 - C14	TRH C15 - C28	TRH C29 - C36	Sum of TPH C10-C36	TRH C6 - C10	TRH C6 - C10 less BTEX (F1)	TRH >C10 - C16	TRH >C10 - C16 less Naphthalene (F2)	TRH >C16 - C34	TRH >C34 - C40
Units of measurement									mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Limit of reporting (ALS laboratory)									0.001	0.002	0.002	0.002	0.001	0.002	0.005	0.02	0.05	0.1	0.1	0.1	0.02	0.02	0.1	0.1	0.1	0.1
Limit of reporting (Eurofins laboratory)									0.001	0.001	0.001	0.002	0.001	0.003	0.01	0.02	0.05	0.1	0.1	0.1	0.02	0.02	0.05	0.05	0.1	0.1
Assessment criteria																										
Laboratory limits of reporting - adopted screening level for Total Recoverable Hydrocarbons															0.005	0.02	0.05	0.1	0.1	0.1	0.02	0.02	0.1	0.1	0.1	0.1
PFAS NEMP (2020) Ecological water quality guideline values (Table 5 Interim Marine - 95% Species Protection)																										
Friebel & Nadebaum 2011 Table A2 Groundwater HSLs for vapour intrusion (Commercial /industrial, 2-<4m Sand)									4.9	NL	NL			NL								6.2		NL		
ANZG 2018 Default Guidelines Values for toxicants (Marine water – 95% species protection)									0.7	0.18	0.08	0.075	0.35		0.050[B]											
ANZECC & ARMCANZ (2000) Default trigger values for physical and chemical stressors for South-east Australia for slightly disturbed marine ecosystems, applying to estuaries																										
Water Sample ID	Sample Date	Lab Batch	Observations	Standing water level		Evidence of oily sheen or NAPL?																				
				Depth (m bgl)	Reduced Level (m AHD)																					
OHMW20	10/03/2021	EW2101111	Clear, no odour	2.36	0.53	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
OHMW20	21/10/2021	EW2104433 / ES2140160	Slight yellowish colour, slight rotten egg odour	2.42	0.47	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
OHMW20	26/04/2022	EW2201994	Very slightly turbid, grey, sweet (possible hydrocarbon) odour	2.06	0.83	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
OHMW28	10/03/2021	EW2101111	Clear, no odour	1.76	0.65	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
OHMW28	21/10/2021	EW2104433 / ES2140160	Clear- moderate rotten egg odour	1.85	0.56	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
OHMW28	26/04/2022	EW2201994	Clear, very mild organic odour	1.43	0.98	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
SMW01	10/03/2021	EW2101111	Slightly turbid brown, no odour	2.07	0.50	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
SMW01	21/10/2021	EW2104433 / ES2140160	Clear, no odour	2.11	0.46	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
SMW01	26/04/2022	EW2201994	--	1.97	0.60	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
SMW02	26/04/2022	EW2201994	Modertately turbid, brown/grey colour, no odour	2.04	0.85	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
SMW03	26/04/2022	EW2201994	Mild turbidity (cloudy), grey, no odour	2.80	0.29	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
SMW04	26/04/2022	EW2201994	Clear, no odour	2.81	0.16	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
SMW05	26/04/2022	EW2201994	Mild turbidity (cloudy), grey, no odour	2.85	0.01	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
SMW06	26/04/2022	EW2201994	--	2.80	0.62	N	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
						Min	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1
						Max	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.02	<0.05	<0.1	<0.05	<0.05	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1

Colour legend:

- Concentration exceeds HSLs Friebel & Nadebaum (2011) Human-health
- Concentration exceeds ANZG (2018) Aquatic ecosystems - 95% species protection
- Concentration exceeds ANZG (2018) Aquatic ecosystems - 80% species protection
- Concentration exceeds ANZECC / & ARMCANZ (2000) Physical and chemical stressors
- Concentration exceeds PFAS NEMP
- Laboratory limits of reporting exceed adopted criteria

Table Notes:

Friebel & Nadebaum (2011) Friebel & Nadebaum (2011) Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater (technical paper No.10) Guidelines, CRC for Contamination Assessment and Remediation of the Environment (CRC CARE)

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018), accessed 8 October 2018, URL: http://waterquality.gov.au/anz-guidelines

ANZECC & ARMCANZ (2000) ANZECC & ARMCANZ 2000, National Water Quality Management Strategy, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Protection of Aquatic Ecosystems

PFAS NEMP (2020) PFAS National Environmental Management Plan, Version 2.0 - January 2020, National Chemicals Working Group of the Heads of EPAs Australia and New Zealand

[A] No hardness corrections applied to default guideline values. Assumed 30mg/L CaCO3 applies.

[B] 99% protection of species adopted to account for potential bioaccumulative effects

Note1

									Heavy Metals (Dissolved)								Heavy Metals (Total, unfiltered)			PAHs						Phenolic compounds		
									Aluminium	Arsenic	Cadmium	Chromium (total)	Cobalt (filtered)	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Uranium (filtered)	Zinc	Aluminium	Iron	Manganese	Anthracene	Benzo(a)pyrene	Fluoranthene	Naphthalene	Phenanthrene	Total PAH	Pentachlorophenol	Phenol	Other Phenols
Units of measurement									mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Limit of reporting (ALS laboratory)									0.01 /0.005	0.001	0.0001	0.001	0.001	0.001	0.05	0.001	0.001	0.0001	0.001	0.01/ 0.0002	0.001	0.005	0.01	0.05	0.001	0.1	0.05	0.1	0.1	0.1	0.1	0.05	0.1	0.05 to 0.1
Limit of reporting (Eurofins laboratory)									0.05	0.001	0.0002	0.001	0.001	0.001	0.05	0.001	0.005	0.0001	0.001	0.001	0.005	0.005	0.05	0.05	0.005	0.01	0.01	0.01	0.01	0.01	0.01	--	--	--
Assessment criteria																																		
Laboratory limits of reporting - adopted screening level for Total Recoverable Hydrocarbons																																		
PFAS NEMP (2020) Ecological water quality guideline values (Table 5 Interim Marine - 95% Species Protection)																																		
Friebel & Nadebaum 2011 Table A2 Groundwater HSLs for vapour intrusion (Commercial /industrial, 2-<4m Sand)																													NL					
ANZG 2018 Default Guidelines Values for toxicants (Marine water – 95% species protection)									0.0005		0.0007[B]	0.0044	0.001	0.0013		0.0044[C]	0.08	0.0001[B]	0.07	0.005[B]	0.0005	0.008	0.0005		0.08	0.01[B]	0.1[B]	1.0[B]	50[B]	0.6[B]		11[B]	400	
ANZECC & ARMCANZ (2000) Default trigger values for physical and chemical stressors for South-east Australia for slightly disturbed marine ecosystems, applying to estuaries																																		
Water Sample ID	Sample Date	Lab Batch	Observations	Standing water level		Evidence of oily sheen or NAPL?																													
				Depth (m bgl)	Reduced Level (m AHD)																														
OHMW20	10/03/2021	EW2101111	Clear, no odour	2.36	0.53	N	<0.01	<0.001	0.0053	<0.001	--	<0.001	0.19	<0.001	--	<0.0001	0.010	<0.01	--	0.034	--	--	--	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<LOR
OHMW20	21/10/2021	EW2104433 / ES2140160	Slight yellowish colour, slight rotten egg odour	2.42	0.47	N	<0.01	<0.001	0.0007	<0.001	0.137	0.026	4.31	<0.001	--	<0.0001	0.013	<0.01	<0.001	<0.005	0.13	4.78	6.71	<0.001	<0.001	<0.001	<0.004	<0.002	<0.001	<0.05	<0.1	<LOR
OHMW20	26/04/2022	EW2201994	Very slightly turbid, grey, sweet (possible hydrocarbon) odour	2.06	0.83	N	<0.005	<0.001	0.0003	<0.001	0.053	0.001	4.07	<0.001	3.72	<0.0001	0.005	<0.0002	0.00021	<0.005	0.67	5.45	4.18	<0.001	<0.001	<0.001	<0.004	<0.002	<0.001	<2.0	<1.0	<LOR
OHMW28	10/03/2021	EW2101111	Clear, no odour	1.76	0.65	N	<0.01	0.066	<0.0001	<0.001	--	0.004	15.4	<0.001	--	<0.0001	0.019	<0.01	--	<0.005	--	--	--	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<LOR
OHMW28	21/10/2021	EW2104433 / ES2140160	Clear- moderate rotten egg odour	1.85	0.56	N	<0.01	0.052	<0.0001	<0.001	0.006	<0.001	17.4	<0.001	--	<0.0001	0.027	<0.01	0.001	<0.005	0.07	20.2	1.15	<0.001	<0.001	<0.001	<0.004	<0.002	<0.001	<0.05	<0.1	<LOR
OHMW28	26/04/2022	EW2201994	Clear, very mild organic odour	1.43	0.98	N	0.006	0.068	<0.0001	<0.001	0.012	<0.001	12.6	<0.001	0.86	<0.0001	0.066	0.0061	0.00072	<0.005	0.07	12.4	0.922	<0.001	<0.001	<0.001	<0.004	<0.002	<0.001	<2.0	<1.0	<LOR
SMW01	10/03/2021	EW2101111	Slightly turbid brown, no odour	2.07	0.50	N	0.03	0.044	0.0034	<0.001	--	0.019	0.57	0.016	--	<0.0001	0.127	0.05	--	0.494	--	--	--	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<LOR
SMW01	21/10/2021	EW2104433 / ES2140160	Clear, no odour	2.11	0.46	N	0.02	0.017	0.0030	<0.001	0.008	0.036	0.18	0.014	--	<0.0001	0.094	0.06	0.008	0.849	0.66	2.38	0.072	<0.001	<0.001	<0.001	<0.004	<0.002	<0.001	<0.05	<0.1	<LOR
SMW01	26/04/2022	EW2201994	--	1.97	0.60	N	0.017	0.036	0.0014	<0.001	0.003	0.032	0.48	0.010	0.174	<0.0001	0.043	0.0636	0.00811	0.708	0.21	1.39	0.192	0.002	<0.001	0.008	0.004	0.003	0.029	<2.0	<1.0	<LOR
SMW02	26/04/2022	EW2201994	Modertately turbid, brown/grey colour, no odour	2.04	0.85	N	0.005	0.038	0.0028	<0.001	0.001	0.007	<0.05	0.010	0.039	<0.0001	0.018	0.0348	0.00101	0.448	0.84	2.08	0.047	0.008	0.009	0.047	0.006	0.017	0.183	<2.0	<1.0	<LOR
SMW03	26/04/2022	EW2201994	Mild turbidity (cloudy), grey, no odour	2.80	0.29	N	<0.005	0.005	0.0001	<0.001	<0.001	0.004	<0.05	<0.001	0.121	<0.0001	0.017	0.144	0.00185	0.031	0.27	0.61	0.125	0.001	0.002	0.007	<0.004	0.004	0.027	<2.0	<1.0	<LOR
SMW04	26/04/2022	EW2201994	Clear, no odour	2.81	0.16	N	<0.005	0.009	0.0003	<0.001	<0.001	0.014	<0.05	<0.001	0.114	<0.0001	0.042	0.0889	0.00343	0.112	0.02	<0.05	0.107	0.001	<0.001	0.004	<0.004	0.005	0.015	<2.0	<1.0	<LOR
SMW05	26/04/2022	EW2201994	Mild turbidity (cloudy), grey, no odour	2.85	0.01	N	0.010	0.007	0.0002	<0.001	<0.001	0.004	0.47	<0.001	0.102	<0.0001	0.030	0.0817	0.00364	0.048	0.93	3.49	0.158	0.002	<0.001	0.014	<0.004	0.014	0.047	<2.0	<1.0	<LOR
SMW06	26/04/2022	EW2201994	--	2.80	0.62	N	0.006	0.016	0.0016	0.002	<0.001	0.028	0.06	0.004	0.021	<0.0001	0.022	0.0365	0.00177	0.078	0.44	1.02	0.036	0.002	<0.001	0.005	0.005	0.006	0.030	<2.0	<1.0	<LOR
						Min	<0.005	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.021	<0.0001	0.005	<0.0002	0.00021	<0.005	0.02	<0.05	0.036	<0.001	<0.001	<0.001	<0.004	<0.002	<0.001	<2.0	<1.0	<LOR
						Max	0.03	0.068	0.0053	0.002	0.137	0.036	17.4	0.016	3.72	<0.0001	0.127	0.144	0.00811	0.849	0.93	20.2	6.71	0.008	0.009	0.047	0.006	0.017	0.183	<2.0	<1.0	<LOR

Colour legend:

- Concentration exceeds HSLs Friebel & Nadebaum (2011) Human-health
- Concentration exceeds ANZG (2018) Aquatic ecosystems - 95% species protection
- Concentration exceeds ANZG (2018) Aquatic ecosystems - 80% species protection
- Concentration exceeds ANZECC / & ARMCANZ (2000) Physical and chemical stressors
- Concentration exceeds PFAS NEMP
- Laboratory limits of reporting exceed adopted criteria

Table Notes:

Friebel & Nadebaum (2011) Friebel & Nadebaum (2011) Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater (technical paper No.10) Guidelines, CRC for Contamination Assessment and Remediation of the Environment (CRC CARE)

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PFAS NEMP (2020) PFAS National Environmental Management Plan, Version 2.0 - January 2020, National Chemicals Working Group of the Heads of EPAs Australia and New Zealand

[A] No hardness corrections applied to default guideline values. Assumed 30mg/L CaCO3 applies.

[B] 99% protection of species adopted to account for potential bioaccumulative effects

Note1

							OCP										OPP				PCBs	Volatile Halogenated Compounds (aka Volatile Organic Compounds)				PFAS			
							Aldrin	Chlordane	DDT	Endosulfan	Endrin	Heptachlor	Lindane	Methoxychlor	Toxaphene	Total OCP	Chlorpyrifos	Fenitrothion	Temephos	Other OPP	Total PCBs	Total Fumigants	Halogenated Aliphatic Compounds	Halogenated Aromatic Compounds	Trihalomethanes	PFOS	Sum of PFHxS and PFOS	PFOA	Sum of PFAS (WA DER List)
Units of measurement							µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Limit of reporting (ALS laboratory)							0.01	0.01	0.01	0.01	0.01	0.005	--	0.01	--	0.005-0.1	0.02	2	0.02	0.2 to 10	0.1	5	5 to 50	5	5	0.01	0.01	0.01	0.01
Limit of reporting (Eurofins laboratory)							--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01	0.01	0.01	0.05
Assessment criteria																													
Laboratory limits of reporting - adopted screening level for Total Recoverable Hydrocarbons																													
PFAS NEMP (2020) Ecological water quality guideline values (Table 5 Interim Marine - 95% Species Protection)																									0.13		220		
Friebel & Nadebaum 2011 Table A2 Groundwater HSLs for vapour intrusion (Commercial /industrial, 2-<4m Sand)																													
ANZG 2018 Default Guidelines Values for toxicants (Marine water – 95% species protection)							0.003[F]	0.001[F]	0.0004[F]	0.005[B]	0.004[B]	0.0004[F]	0.007[F]	0.004[F]	0.0006[F]		0.009	0.001[F]	0.05										
ANZECC & ARMCANZ (2000) Default trigger values for physical and chemical stressors for South-east Australia for slightly disturbed marine ecosystems, applying to estuaries																													
Water Sample ID	Sample Date	Lab Batch	Observations	Standing water level		Evidence of oily sheen or NAPL?																							
				Depth (m bgl)	Reduced Level (m AHD)																									
OHMW20	10/03/2021	EW2101111	Clear, no odour	2.36	0.53	N	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	--	<0.01	--	<LOR	<0.02	<2	<0.02	<LOR	<0.1	<5	<LOR	<5	<5	--	--	--	--
OHMW20	21/10/2021	EW2104433 / ES2140160	Slight yellowish colour, slight rotten egg odour	2.42	0.47	N	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	--	<0.01	--	<LOR	<0.02	<2	<0.02	<LOR	<0.1	<5	<LOR	<5	<5	<0.01	<0.01	<0.01	<0.01
OHMW20	26/04/2022	EW2201994	Very slightly turbid, grey, sweet (possible hydrocarbon) odour	2.06	0.83	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<LOR	<5	<5	<0.01	<0.01	<0.01	<0.01
OHMW28	10/03/2021	EW2101111	Clear, no odour	1.76	0.65	N	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	--	<0.01	--	<LOR	<0.02	<2	<0.02	<LOR	<0.1	<5	<LOR	<5	<5	--	--	--	--
OHMW28	21/10/2021	EW2104433 / ES2140160	Clear- moderate rotten egg odour	1.85	0.56	N	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	--	<0.01	--	<LOR	<0.02	<2	<0.02	<LOR	<0.1	<5	<LOR	<5	<5	<0.01	<0.01	<0.01	<0.01
OHMW28	26/04/2022	EW2201994	Clear, very mild organic odour	1.43	0.98	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<LOR	<5	<5	<0.01	<0.01	<0.01	0.02
SMW01	10/03/2021	EW2101111	Slightly turbid brown, no odour	2.07	0.50	N	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	--	<0.01	--	<LOR	<0.02	<2	<0.02	<LOR	<0.1	<5	<LOR	<5	<5	--	--	--	--
SMW01	21/10/2021	EW2104433 / ES2140160	Clear, no odour	2.11	0.46	N	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	--	<0.01	--	<LOR	<0.02	<2	<0.02	<LOR	<0.1	<5	<LOR	<5	<5	0.08	0.08	<0.01	0.08
SMW01	26/04/2022	EW2201994	--	1.97	0.60	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<LOR	<5	<5	0.06	0.06	<0.01	0.06
SMW02	26/04/2022	EW2201994	Modertately turbid, brown/grey colour, no odour	2.04	0.85	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<LOR	<5	<5	<0.01	<0.01	<0.01	<0.01
SMW03	26/04/2022	EW2201994	Mild turbidity (cloudy), grey, no odour	2.80	0.29	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<LOR	<5	<5	0.01	0.01	<0.01	0.01
SMW04	26/04/2022	EW2201994	Clear, no odour	2.81	0.16	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<LOR	<5	<5	<0.01	<0.01	<0.01	<0.01
SMW05	26/04/2022	EW2201994	Mild turbidity (cloudy), grey, no odour	2.85	0.01	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<LOR	<5	<5	<0.01	0.02	<0.01	0.02
SMW06	26/04/2022	EW2201994	--	2.80	0.62	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<LOR	<5	<5	0.07	0.09	<0.01	0.09
						Min	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	--	<0.01	--	<LOR	<0.02	<2	<0.02	<LOR	<0.1	<5	<LOR	<5	<5	<0.01	<0.01	<0.01	<0.01
						Max	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	--	<0.01	--	<LOR	<0.02	<2	<0.02	<LOR	<0.1	<5	<LOR	<5	<5	0.08	0.09	<0.01	0.09

Colour legend:

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Note1

			Date	26/04/2022	26/04/2022		26/04/2022	26/04/2022	
			Field ID	OHMW28	QA1		OHMW28	QA1A	
			Lab Report Number	EW2201994	EW2201994		EW2201994	884366	
			Matrix Type	Water	Water	RPD	Water	Water	RPD
	Unit	EQL							
Inorganics									
Ammonium Ion (as N)	mg/L	0.01		0.22	0.12	59	0.22	0.48	74
Total Phosphorus as P (Organic	mg/L	0.01		0.24	0.18	29	0.24	0.71	99
Sulfate as SO4 - Turbidimetric (filtered)	mg/L	1		1,170	1,200	3	1,170	-	-
Nitrite + Nitrate as N	mg/L	0.01		1.98	1.78	11	1.98	0.27	152
Alkalinity (Bicarbonate as CaCO3)	mg/L	1		383	398	4	383	390	2
Alkalinity (Carbonate as CaCO3)	mg/L	1		<1	<1	0	<1	<10	0
Alkalinity (Hydroxide) as CaCO3	mg/L	1		<1	<1	0	<1	<20	0
Alkalinity (total) as CaCO3	mg/L	1		383	398	4	383	390	2
Ammonia as N	mg/L	0.01		0.22	0.12	59	0.22	0.45	69
Anions Total	meq/L	0.01		33.1	34.0	3	33.1	-	-
Cations Total	meq/L	0.01		35.2	34.4	2	35.2	-	-
Chloride	mg/L	1		40	37	8	40	49	20
Electrical Conductivity (Lab)	µS/cm	1		2,640	2,610	1	2,640	-	-
Fluoride	mg/L	0.1		7.8	8.3	6	7.8	6.2	23
Ionic Balance	%	0.01		3.10	0.58	137	3.10	-	-
Kjeldahl Nitrogen Total	mg/L	0.2		-	-	-	-	<0.2	-
Nitrate (as N)	mg/L	0.01		1.98	1.78	11	1.98	0.26	154
Nitrite (as N)	mg/L	0.01		<0.01	<0.01	0	<0.01	<0.02	0
Organic Nitrogen as N	mg/L	0.2		-	-	-	-	<0.2	-
Nitrogen (Total)	mg/L	0.2		-	-	-	-	0.27	-
pH (Lab)	-	0.01		7.78	7.76	0	7.78	-	-
Reactive Phosphorus as P	mg/L	0.01		<0.01	<0.01	0	<0.01	0.01	0
Sodium	mg/L	0.5		-	-	-	-	110	-
Sodium (filtered)	mg/L	0.5		122	118	3	122	-	-
Sulphate	mg/L	5		-	-	-	-	1,200	-
Total Dissolved Solids (Inorganic)	mg/L	1		1,720	1,700	1	1,720	1,600	7
Hardness as CaCO3	mg/L	1		-	-	-	-	1,400	-
Hardness as CaCO3 (filtered)	mg/L	1		1,470	1,430	3	1,470	-	-
Metals									
Aluminium	mg/L	0.005		0.073	0.064	13	0.073	<0.05	37
Aluminium (filtered)	mg/L	0.005		0.006	0.005	18	0.006	<0.05	0
Arsenic	mg/L	0.001		-	-	-	-	0.002	-
Arsenic (filtered)	mg/L	0.001		0.068	0.064	6	0.068	0.068	0
Cadmium	mg/L	0.0001		-	-	-	-	<0.0002	-
Cadmium (filtered)	mg/L	0.0001		<0.0001	<0.0001	0	<0.0001	<0.0002	0
Calcium	mg/L	0.5		-	-	-	-	470	-
Calcium (filtered)	mg/L	0.5		489	477	2	489	-	-
Chromium (III+VI)	mg/L	0.001		-	-	-	-	<0.001	-
Chromium (III+VI) (filtered)	mg/L	0.001		<0.001	<0.001	0	<0.001	<0.001	0
Cobalt	mg/L	0.001		-	-	-	-	0.014	-
Cobalt (filtered)	mg/L	0.001		0.012	0.011	9	0.012	0.010	18
Copper	mg/L	0.001		-	-	-	-	<0.001	-
Copper (filtered)	mg/L	0.001		<0.001	<0.001	0	<0.001	<0.001	0
Iron	mg/L	0.05		12.4	12.6	2	12.4	0.12	196
Iron (filtered)	mg/L	0.05		12.6	11.7	7	12.6	12	5
Lead	mg/L	0.001		-	-	-	-	<0.001	-
Lead (filtered)	mg/L	0.001		<0.001	<0.001	0	<0.001	<0.001	0
Magnesium	mg/L	0.5		-	-	-	-	59	-
Magnesium (filtered)	mg/L	0.5		60	59	2	60	-	-
Manganese	mg/L	0.001		0.922	0.900	2	0.922	1.1	18
Manganese (filtered)	mg/L	0.001		0.860	0.874	2	0.860	0.79	8
Mercury	mg/L	0.0001		-	-	-	-	<0.0001	-
Mercury (filtered)	mg/L	0.0001		<0.0001	<0.0001	0	<0.0001	<0.0001	0
Nickel	mg/L	0.001		-	-	-	-	0.093	-
Nickel (filtered)	mg/L	0.001		0.066	0.075	13	0.066	0.060	10
Potassium	mg/L	0.5		-	-	-	-	22	-
Potassium (filtered)	mg/L	0.5		24	23	4	24	-	-
Selenium	mg/L	0.0002		-	-	-	-	0.003	-
Selenium (filtered)	mg/L	0.0002		0.0061	0.0072	17	0.0061	0.005	20
Uranium	µg/L	0.05		-	-	-	-	<5	-
Uranium (filtered)	µg/L	0.05		0.72	0.78	8	0.72	<5	0
Zinc	mg/L	0.005		-	-	-	-	<0.005	-
Zinc (filtered)	mg/L	0.005		<0.005	<0.005	0	<0.005	<0.005	0
BTEX									
Naphthalene (VOC)	mg/L	0.01		-	-	-	-	<0.01	-
Benzene	µg/L	1		<1	<1	0	<1	<1	0
Toluene	µg/L	1		<2	<2	0	<2	<1	0
Ethylbenzene	µg/L	1		<2	<2	0	<2	<1	0
Xylene (m & p)	µg/L	2		<2	<2	0	<2	<2	0
Xylene (o)	µg/L	1		<2	<2	0	<2	<1	0
Xylene Total	µg/L	2		<2	<2	0	<2	<3	0
Total BTEX	µg/L	1		<1	<1	0	<1	-	-
TPH									
C6-C9 Fraction	µg/L	20		<20	<20	0	<20	<20	0
C10-C14 Fraction	µg/L	50		<50	<50	0	<50	<50	0
C15-C28 Fraction	µg/L	100		<100	<100	0	<100	<100	0
C29-C36 Fraction	µg/L	50		<50	<50	0	<50	<100	0
C10-C36 Fraction (Sum)	µg/L	50		<50	<50	0	<50	<100	0
TRH									
C6-C10 Fraction (F1)	µg/L	20		<20	<20	0	<20	<20	0
C6-C10 (F1 minus BTEX)	µg/L	20		<20	<20	0	<20	<20	0
>C10-C16 Fraction (F2)	µg/L	50		<100	<100	0	<100	<50	0
>C10-C16 Fraction (F2 minus	µg/L	50		<100	<100	0	<100	<50	0
>C16-C34 Fraction (F3)	µg/L	100		<100	<100	0	<100	<100	0
>C34-C40 Fraction (F4)	µg/L	100		<100	<100	0	<100	<100	0
>C10-C40 Fraction (Sum)	µg/L	100		<100	<100	0	<100	<100	0
VOCs									
cis-1,4-Dichloro-2-butene	µg/L	5		<5	<5	0	<5	-	-
trans-1,4-Dichloro-2-butene	µg/L	5		<5	<5	0	<5	-	-
Pentachloroethane	µg/L	5		<5	<5	0	<5	-	-
Chlorinated Hydrocarbons									

			Date	26/04/2022	26/04/2022		26/04/2022	26/04/2022	
			Field ID	OHMW28	QA1		OHMW28	QA1A	
			Lab Report Number	EW2201994	EW2201994		EW2201994	884366	
			Matrix Type	Water	Water	RPD	Water	Water	RPD
	Unit	EQL							
Other chlorinated hydrocarbons EPAVic	µg/L	5		-	-	-	-	<5	-
Chlorinated hydrocarbons EPAVic	µg/L	5		-	-	-	-	<5	-
1,1,1,2-tetrachloroethane	µg/L	1		<5	<5	0	<5	<1	0
1,1,1-trichloroethane	µg/L	1		<5	<5	0	<5	<1	0
1,1,2,2-tetrachloroethane	µg/L	1		<5	<5	0	<5	<1	0
1,1,2-trichloroethane	µg/L	1		<5	<5	0	<5	<1	0
1,1-dichloroethane	µg/L	1		<5	<5	0	<5	<1	0
1,1-dichloroethene	µg/L	1		<5	<5	0	<5	<1	0
1,1-dichloropropene	µg/L	5		<5	<5	0	<5	-	-
1,2,3-trichloropropane	µg/L	1		<5	<5	0	<5	<1	0
1,2-dibromo-3-chloropropane	µg/L	5		<5	<5	0	<5	-	-
1,2-dichloroethane	µg/L	1		<5	<5	0	<5	<1	0
1,2-dichloropropane	µg/L	1		<5	<5	0	<5	<1	0
1,3-dichloropropane	µg/L	1		<5	<5	0	<5	<1	0
2,2-dichloropropane	µg/L	5		<5	<5	0	<5	-	-
Bromochloromethane	µg/L	1		-	-	-	-	<1	-
Bromodichloromethane	µg/L	1		<5	<5	0	<5	<1	0
Bromoform	µg/L	1		<5	<5	0	<5	<1	0
Carbon tetrachloride	µg/L	1		<5	<5	0	<5	<1	0
Chlorodibromomethane	µg/L	1		<5	<5	0	<5	<1	0
Chloroethane	µg/L	5		<50	<50	0	<50	<5	0
Chloroform	µg/L	5		<5	<5	0	<5	<5	0
Chloromethane	µg/L	5		<50	<50	0	<50	<5	0
cis-1,2-dichloroethene	µg/L	1		<5	<5	0	<5	<1	0
cis-1,3-dichloropropene	µg/L	1		<5	<5	0	<5	<1	0
Dibromomethane	µg/L	1		<5	<5	0	<5	<1	0
Dichloromethane	µg/L	5		-	-	-	-	<5	-
Hexachlorobutadiene	µg/L	5		<5	<5	0	<5	-	-
Trichloroethene	µg/L	1		<5	<5	0	<5	<1	0
Tetrachloroethene	µg/L	1		<5	<5	0	<5	<1	0
trans-1,2-dichloroethene	µg/L	1		<5	<5	0	<5	<1	0
trans-1,3-dichloropropene	µg/L	1		<5	<5	0	<5	<1	0
Vinyl chloride	µg/L	5		<50	<50	0	<50	<5	0
Halogenated Benzenes									
1,2,3-trichlorobenzene	µg/L	5		<5	<5	0	<5	-	-
1,2,4-trichlorobenzene	µg/L	5		<5	<5	0	<5	-	-
1,2-dichlorobenzene	µg/L	1		<5	<5	0	<5	<1	0
1,3-dichlorobenzene	µg/L	1		<5	<5	0	<5	<1	0
1,4-dichlorobenzene	µg/L	1		<5	<5	0	<5	<1	0
2-chlorotoluene	µg/L	5		<5	<5	0	<5	-	-
4-chlorotoluene	µg/L	1		<5	<5	0	<5	<1	0
Bromobenzene	µg/L	1		<5	<5	0	<5	<1	0
Chlorobenzene	µg/L	1		<5	<5	0	<5	<1	0
Halogenated Hydrocarbons									
1,2-dibromoethane	µg/L	1		<5	<5	0	<5	<1	0
Bromomethane	µg/L	5		<50	<50	0	<50	<5	0
Dichlorodifluoromethane	µg/L	5		<50	<50	0	<50	<5	0
Iodomethane	µg/L	1		<5	<5	0	<5	<1	0
Trichlorofluoromethane	µg/L	5		<50	<50	0	<50	<5	0
Herbicides									
Dinoseb	µg/L	100		-	-	-	-	<100	-
MAH									
Total MAH	mg/L	0.003		-	-	-	-	<0.003	-
1,2,4-trimethylbenzene	µg/L	1		-	-	-	-	<1	-
1,3,5-trimethylbenzene	µg/L	1		-	-	-	-	<1	-
Isopropylbenzene	µg/L	1		-	-	-	-	<1	-
Styrene	µg/L	1		-	-	-	-	<1	-
Other									
Acidity (as CaCO3)	mg/L	1		2	3	40	2	100	192
PAH									
Sum of 16 USEPA Priority PAHs	µg/L	0.001		<0.001	<0.001	0	<0.001	-	-
Benzo(b+j+k)fluoranthene	mg/L	0.000004		<0.000004	<0.000004	0	<0.000004	-	-
2-methylnaphthalene	µg/L	0.002		<0.002	<0.002	0	<0.002	-	-
3-methylcholanthrene	µg/L	0.004		<0.004	<0.004	0	<0.004	-	-
7,12-dimethylbenz(a)anthracene	µg/L	0.001		<0.001	<0.001	0	<0.001	-	-
Acenaphthene	µg/L	0.002		<0.002	<0.002	0	<0.002	<0.01	0
Acenaphthylene	µg/L	0.002		<0.002	<0.002	0	<0.002	<0.01	0
Anthracene	µg/L	0.001		<0.001	<0.001	0	<0.001	<0.01	0
Coronene	µg/L	0.002		<0.002	<0.002	0	<0.002	-	-
Benz(a)anthracene	µg/L	0.002		<0.002	<0.002	0	<0.002	<0.01	0
Benzo(a) pyrene	µg/L	0.001		<0.001	<0.001	0	<0.001	<0.01	0
Benzo(b+j)fluoranthene	mg/L	0.000004		<0.000004	<0.000004	0	<0.000004	<0.00001	0
Benzo(e)pyrene	µg/L	0.001		<0.001	<0.001	0	<0.001	-	-
Benzo(g,h,i)perylene	µg/L	0.002		<0.002	<0.002	0	<0.002	<0.01	0
Benzo(k)fluoranthene	µg/L	0.004		<0.004	<0.004	0	<0.004	<0.01	0
Chrysene	µg/L	0.001		<0.001	<0.001	0	<0.001	<0.01	0
Dibenz(a,h)anthracene	µg/L	0.001		<0.001	<0.001	0	<0.001	<0.01	0
Fluoranthene	µg/L	0.001		<0.001	<0.001	0	<0.001	<0.01	0
Fluorene	µg/L	0.002		<0.002	<0.002	0	<0.002	<0.01	0
Indeno(1,2,3-c,d)pyrene	µg/L	0.002		<0.002	<0.002	0	<0.002	<0.01	0
Naphthalene	µg/L	0.004		<0.004	<0.004	0	<0.004	<0.01	0
Phenanthrene	µg/L	0.002		<0.002	<0.002	0	<0.002	<0.01	0
Perylene	µg/L	0.002		<0.002	<0.002	0	<0.002	-	-
Pyrene	µg/L	0.001		<0.001	<0.001	0	<0.001	<0.01	0
Benzo(a)pyrene TEQ calc (Half)	mg/L	0.000001		<0.000001	<0.000001	0	<0.000001	-	-
Benzo(a)pyrene TEQ (LOR)	mg/L	0.000001		<0.000001	<0.000001	0	<0.000001	-	-
Benzo(a)pyrene TEQ calc (Zero)	mg/L	0.000001		<0.000001	<0.000001	0	<0.000001	-	-
PAHs (Sum of total)	µg/L	0.01		-	-	-	-	<0.01	-
Perfluoroalkane Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	µg/L	0.1		<0.1	<0.1	0	<0.1	-	-
Perfluorohexanoic acid (PFHxA)	µg/L	0.02		<0.02	<0.02	0	<0.02	-	-
Perfluoropentanoic acid (PFPeA)	µg/L	0.02		0.02	0.02	0	0.02	-	-

			Date	26/04/2022	26/04/2022		26/04/2022	26/04/2022	
			Field ID	OHMW28	QA1		OHMW28	QA1A	
			Lab Report Number	EW2201994	EW2201994		EW2201994	884366	
			Matrix Type	Water	Water	RPD	Water	Water	RPD
	Unit	EQL							
Perfluoroheptanoic acid (PFHpA)	µg/L	0.02		<0.02	<0.02	0	<0.02	-	-
Perfluorooctanoic acid (PFOA)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.01	0
Perfluoroalkane Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.02		<0.02	<0.02	0	<0.02	-	-
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.01	0
PFAS									
Sum of PFHxS and PFOS	µg/L	0.01		<0.01	<0.01	0	<0.01	<0.01	0
Sum of PFAS (WA DER List)	µg/L	0.01		0.02	0.02	0	0.02	-	-
Sum of enHealth PFAS (PFHxS + PFOS +	µg/L	0.01		-	-	-	-	<0.01	-
Sum of PFAS (PFOS + PFOA)	µg/L	0.01		-	-	-	-	<0.01	-
(n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.05		<0.05	<0.05	0	<0.05	-	-
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05		<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.05		<0.05	<0.05	0	<0.05	-	-
FTS)	µg/L	0.05		<0.05	<0.05	0	<0.05	-	-
Phenols									
3&4-Methylphenol (m&p-cresol)	µg/L	2		<2.0	<2.0	0	<2.0	<6	0
2,4,5-Trichlorophenol	µg/L	1		<1.0	<1.0	0	<1.0	<10	0
2,4,6-Trichlorophenol	µg/L	1		<1.0	<1.0	0	<1.0	<10	0
2,4-Dichlorophenol	µg/L	1		<1.0	<1.0	0	<1.0	<3	0
2,4-Dimethylphenol	µg/L	1		<1.0	<1.0	0	<1.0	<3	0
2,4-Dinitrophenol	mg/L	0.03		-	-	-	-	<0.03	-
2,6-Dichlorophenol	µg/L	1		<1.0	<1.0	0	<1.0	<3	0
2-Chlorophenol	µg/L	1		<1.0	<1.0	0	<1.0	<3	0
2-Methylphenol	µg/L	1		<1.0	<1.0	0	<1.0	<3	0
2-Nitrophenol	µg/L	1		<1.0	<1.0	0	<1.0	<10	0
4,6-Dinitro-2-methylphenol	µg/L	30		-	-	-	-	<30	-
4,6-Dinitro-o-cyclohexyl phenol	µg/L	100		-	-	-	-	<100	-
4-chloro-3-methylphenol	µg/L	1		<1.0	<1.0	0	<1.0	<10	0
4-Nitrophenol	µg/L	30		-	-	-	-	<30	-
Cresol Total	mg/L	0.01		-	-	-	-	<0.01	-
Pentachlorophenol	µg/L	2		<2.0	<2.0	0	<2.0	<10	0
Tetrachlorophenols	µg/L	30		-	-	-	-	<30	-
Phenol	µg/L	1		<1.0	<1.0	0	<1.0	<3	0
Phenols (Total Halogenated)	mg/L	0.01		-	-	-	-	<0.01	-
Phenols (Total Non Halogenated)	mg/L	0.1		-	-	-	-	<0.1	-
Solvents									
Methyl Ethyl Ketone	µg/L	5		-	-	-	-	<5	-
4-Methyl-2-pentanone	µg/L	5		-	-	-	-	<5	-
Acetone	mg/L	0.005		-	-	-	-	<0.005	-
Allyl chloride	mg/L	0.001		-	-	-	-	<0.001	-
Carbon disulfide	µg/L	1		-	-	-	-	<1	-

*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: 999 (1 - 10 x EQL); 50 (10 - 20 x EQL); 50 (> 20 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

				Metals																										
				Aluminium	Aluminium (filtered)	Arsenic	Arsenic (filtered)	Cadmium	Cadmium (filtered)	Chromium (III+VI)	Chromium (III+VI) (filtered)	Cobalt	Cobalt (filtered)	Copper	Copper (filtered)	Iron	Iron (filtered)	Lead	Lead (filtered)	Manganese	Manganese (filtered)	Mercury	Nickel	Nickel (filtered)	Selenium	Selenium (filtered)	Uranium	Uranium (filtered)	Zinc	Zinc (filtered)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mg/L
EQL				0.005	0.005	0.001	0.001	0.0001	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.05	0.05	0.001	0.001	0.001	0.001	0.0001	0.001	0.001	0.0002	0.0002	0.05	0.05	0.005	0.005
Lab Report Number	Field ID	QC Type	Date																											
878309	BAILER	Rinsate - Stainless steel bailer	6/04/2022	<0.05	-	<0.001	-	<0.0002	-	<0.001	-	<0.001	-	<0.001	-	<0.05	-	<0.001	-	<0.005	-	<0.0001	<0.001	-	<0.001	-	<5	-	<0.005	-
878309	TAP	Field blank - Drill tank water	6/04/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
882352	BLANK 01 - TANK	Field blank - Drill tank water	20/04/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
882352	RINSATE 01 - DRILL ROD	Rinsate - Drill rods	20/04/2022	0.06	-	<0.001	-	<0.0002	-	<0.001	-	<0.001	-	0.001	-	0.12	-	<0.001	-	<0.005	-	<0.0001	<0.001	-	<0.001	-	<5	-	<0.005	-
882352	RINSATE 02 - BAILER	Rinsate - Stainless steel bailer	20/04/2022	0.08	-	<0.001	-	<0.0002	-	0.004	-	<0.001	-	0.002	-	0.20	-	0.005	-	0.006	-	<0.0001	0.003	-	<0.001	-	<5	-	<0.005	-
EW2201994	Rinsate 01	Rinsate - Interface probe	26/04/2022	-	<0.005	-	<0.001	-	<0.0001	-	<0.001	-	<0.001	-	<0.001	-	<0.05	-	<0.001	-	<0.001	-	-	<0.001	-	<0.0002	-	<0.05	-	<0.005

				PFAS				(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkane Carboxylic Acids					Perfluoroalkane Sulfonic		
				Sum of PFHxS and PFOS	Sum of PFAS (WA DER List)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	Sum of PFAS (PFOS + PFOA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorobutane sulfonic acid (PFBS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.01	0.01	0.01	0.01	0.05	0.05	0.05	0.05	0.1	0.02	0.02	0.02	0.01	0.02	0.01	0.01
Lab Report Number	Field ID	QC Type	Date																
878309	BAILER	Rinsate - Stainless steel bailer	6/04/2022	<0.01	-	<0.01	<0.01	-	<0.05	-	-	-	-	-	-	<0.01	-	<0.01	<0.01
878309	TAP	Field blank - Drill tank water	6/04/2022	<0.01	-	<0.01	<0.01	-	<0.05	-	-	-	-	-	-	<0.01	-	<0.01	<0.01
882352	BLANK 01 - TANK	Field blank - Drill tank water	20/04/2022	<0.01	-	<0.01	<0.01	-	<0.05	-	-	-	-	-	-	<0.01	-	<0.01	<0.01
882352	RINSATE 01 - DRILL ROD	Rinsate - Drill rods	20/04/2022	<0.01	-	<0.01	<0.01	-	<0.05	-	-	-	-	-	-	<0.01	-	<0.01	<0.01
882352	RINSATE 02 - BAILER	Rinsate - Stainless steel bailer	20/04/2022	<0.01	-	<0.01	<0.01	-	<0.05	-	-	-	-	-	-	<0.01	-	<0.01	<0.01
EW2201994	Rinsate 01	Rinsate - Interface probe	26/04/2022	<0.01	<0.01	-	-	<0.05	<0.05	<0.05	<0.05	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01

Appendix F

Equipment calibration certificates

WAMSCIENTIFIC
Your water and air monitoring equipment specialists

Certificate of Service and Calibration
Water Quality Meter
YSI Professional Plus

Company Name	WAM Scientific
Office Address	26 Bungarra Crescent, Chipping Norton NSW 2170
Phone Number	+61 405 241 484
Contact Name	William Pak
Instrument	YSI Professional Plus Water Quality Meter w/ 1m Quatro Cable
Serial Number	21A102653
Client Name	Joel Reynolds (SMEC Australia)
Project Number	30013174
Comments	-

Instrument Check

Item	Test	Test Passed	Comments
2 x Alkaline C-size Batteries	Klein Tools MM300 Multimeter	✓	Both batteries reading above 2.9V
Battery Saver Function	Operation	✓	Automatically turns off after 60 minutes if idle
Unit Display	Operation	✓	Screen visible, no damage
Keypad	Operation	✓	Responsive, no damage
Connection Port and Cable	Condition/Check	✓	Clean, no damage
Monitor Housing	Condition/Check	✓	No damage
Firmware	Version	✓	4.0.0
pH Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
pH millivolts for pH 7.00	Calibration	✓	pH 7.00 calibration range between 0 mV ± 50 mV
pH millivolts for pH 4.00	Calibration	✓	pH 4 mV range +165 to +180 from 7 buffer mV value
pH slope	Calibration	✓	Range between 55 to 60 mV/pH (ideal value 59 mV)
Response time < 90 seconds	Calibration	✓	Responds to correct value within 90 seconds
ORP Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
ORP Reading	Calibration	✓	Within ± 80 mV of reference Zobell Reading
Response time < 90 seconds	Calibration	✓	Responds to correct value within 90 seconds
Conductivity/Temp Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
Conductivity Cell	Calibration	✓	Conductivity cell constant 5.0 ± 1.0 in GLP file
Clean Sensor Readings	Calibration	✓	Clean sensor reads less than 3 uS/cm in dry air
Dissolved Oxygen Probe	Condition/Calibration	✓	Calibrated and conforms to manufacturer's specs
DO Cap	Condition/Calibration	✓	1.25 mil PE membrane (yellow membrane)
DO Sensor in Use	Condition	✓	Polarographic DO sensor
DO Sensor Value	Calibration	✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA

Instrument Readings

Parameter	Standard Used	Reference No.	Calibration Value	Observed	Actual	Units
Temperature	Centre 370 Thermometer	Room Temp.	19.2	19.0	19.2	°C
pH	pH 4.00	351750	4.01	3.94	4.01	pH
pH	pH 7.00	351621	7.00	7.09	7.00	pH
Conductivity	2760 µs/cm at 25°C	362912	2760	2650	2760	µs/cm
ORP (Ref. check only)	Zobell A & B	364644/363903	239.5	224.1	239.5	mV
Zero Dissolved O_2	$NaSO_3$ in Distilled H_2O	362832	0.0	-2.3	0.0	%
100% Dissolved O_2	100% Air Saturated H_2O	Fresh Air	100.0	93.0	100.0	%

Declaration

WAM Scientific certifies that the above instrument was successfully tested according to manufacturer's standards and all necessary checks were conducted to ensure the instrument was fully operational prior to dispatch. The calibration data supplied was obtained in accordance with manufacturer's specifications using solutions of known values.

Calibrated By	William Pak
Calibration Date	21/04/2022
Calibration Due	21/10/2022

WAM Scientific:
26 Bungarra Crescent
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E: accounts@wamscientific.com.au

WAMSCIENTIFIC
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Certificate of Service and Calibration
Peristaltic Pump
Geotech Geopump 2

Company Name	WAM Scientific
Office Address	26 Bungarra Crescent, Chipping Norton NSW 2170
Phone Number	+61 405 241 484
Contact Name	William Pak
Instrument	Geotech Geopump Peristaltic Pump
Cable Length	4.5m
Serial Number	Pump: 6496
Serial Number	Head: -
Client Name	Joel Reynolds (SMEC Australia)
Project Number	30013174

Instrument Check			
Item	Test	Test Passed	Comments
2 x 12V Batteries	Klein Tools MM300 Multimeter	✓	Both batteries reading above 12V
Battery Terminals	Check	✓	No damage
Charger	Condition/Check	✓	Functioning
Cabling	Check	✓	No damage
Alligator Clips	Check	✓	Protected, no damage
Casing	Check	✓	Clean, no damage
Handle	Check	✓	No damage
Pump Head	Check	✓	EZ2 Head, no damage
Pump Condition	Decontamination	✓	Decontaminated
Pump Operation	Operation	✓	Peristaltic pump functional
Pump Tubing	Replacement	✓	New 0.5m ¼" OD LDPE silicon tubing
Pump Speed	Operation	✓	Speed knob functional

Inclusions
2 x Sealed lead acid 12V batteries included 1x Carry case for 12V batteries included 1x Intrinsically safe charger (clips) included

Declaration
WAM Scientific certifies that the above instrument was successfully tested according to manufacturer's standards and all necessary checks were conducted to ensure the instrument was fully operational prior to dispatch. The pump has been decontaminated and cleaned upon return from the previous hire and is in good working order.

Checked By	William Pak
Calibration Date	21/04/2022
Calibration Due	21/10/2022

WAMSCIENTIFIC
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Appendix G

Laboratory reports

SMEC Australia Pty Ltd (WOLL)
Level 2, 6-8 Regent Street
Wollongong
NSW 2500

Attention: **Alexander Williams**

Report **878309-W**
Project name PORT KEMBLA MANILDRA
Project ID 30013174
Received Date Apr 07, 2022

Client Sample ID			**TAP**	**BAILER**
Sample Matrix			**Water**	**Water**
Eurofins Sample No.			**W22-Ap0016360**	**W22-Ap0016361**
Date Sampled			**Apr 06, 2022**	**Apr 06, 2022**
Test/Reference	LOR	Unit		
Per- and Polyfluoroalkyl Substances (PFASs) - Short				
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05	< 0.05
13C2-6:2 FTSA (surr.)	1	%	117	75
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	< 0.01	< 0.01
18O2-PFHxS (surr.)	1	%	93	89
13C8-PFOS (surr.)	1	%	96	88
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	< 0.01	< 0.01
13C8-PFOA (surr.)	1	%	106	98
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01	< 0.01
Heavy Metals				
Aluminium	0.05	mg/L	-	< 0.05
Cobalt	0.001	mg/L	-	< 0.001
Iron	0.05	mg/L	-	< 0.05
Manganese	0.005	mg/L	-	< 0.005
Selenium	0.001	mg/L	-	< 0.001
Uranium	0.005	mg/L	-	< 0.005
Metals M8				
Arsenic	0.001	mg/L	-	< 0.001
Cadmium	0.0002	mg/L	-	< 0.0002
Chromium	0.001	mg/L	-	< 0.001
Copper	0.001	mg/L	-	< 0.001
Lead	0.001	mg/L	-	< 0.001
Mercury	0.0001	mg/L	-	< 0.0001
Nickel	0.001	mg/L	-	< 0.001
Zinc	0.005	mg/L	-	< 0.005

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluoroalkyl Substances (PFASs) - Short	Sydney	Apr 13, 2022	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Heavy Metals	Sydney	Apr 13, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Metals M8	Sydney	Apr 13, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

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NATA # 1261 Site # 18217

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NATA # 1261 Site # 20794

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Company Name: SMEC Australia Pty Ltd (WOLL)
Address: Level 2, 6-8 Regent Street
Wollongong
NSW 2500

Project Name: PORT KEMBLA MANILDRA
Project ID: 30013174

Order No.:
Report #: 878309
Phone: 02 4243 4405
Fax:

Received: Apr 7, 2022 3:07 PM
Due: Apr 14, 2022
Priority: 5 Day
Contact Name: Alexander Williams

Eurofins Analytical Services Manager : Emma Beesley

Sample Detail						Aluminium	Cobalt	Iron	Manganese	Selenium	Uranium	Metals M8	Per- and Polyfluoroalkyl Substances (PFASs) - Short
Melbourne Laboratory - NATA # 1261 Site # 1254													
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X	X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794													
Mayfield Laboratory - NATA # 1261 Site # 25079													
Perth Laboratory - NATA # 2377 Site # 2370													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	TAP	Apr 06, 2022		Water	W22-Ap0016360								X
2	BAILER	Apr 06, 2022		Water	W22-Ap0016361	X	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1	2

Date Reported:Apr 13, 2022

Date Reported:Apr 13, 2022

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

Units

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

Terms

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

QC - Acceptance Criteria

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

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

Results <10 times the LOR: No Limit

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

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

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

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

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

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QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Per- and Polyfluoroalkyl Substances (PFASs) - Short							
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Heavy Metals							
Aluminium	mg/L	< 0.05			0.05	Pass	
Cobalt	mg/L	< 0.001			0.001	Pass	
Iron	mg/L	< 0.05			0.05	Pass	
Manganese	mg/L	< 0.005			0.005	Pass	
Selenium	mg/L	< 0.001			0.001	Pass	
Uranium	mg/L	< 0.005			0.005	Pass	
Method Blank							
Metals M8							
Arsenic	mg/L	< 0.001			0.001	Pass	
Cadmium	mg/L	< 0.0002			0.0002	Pass	
Chromium	mg/L	< 0.001			0.001	Pass	
Copper	mg/L	< 0.001			0.001	Pass	
Lead	mg/L	< 0.001			0.001	Pass	
Mercury	mg/L	< 0.0001			0.0001	Pass	
Nickel	mg/L	< 0.001			0.001	Pass	
Zinc	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Per- and Polyfluoroalkyl Substances (PFASs) - Short							
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	97			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	95			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	97			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	106			50-150	Pass	
LCS - % Recovery							
Heavy Metals							
Aluminium	%	108			80-120	Pass	
Cobalt	%	109			80-120	Pass	
Iron	%	109			80-120	Pass	
Manganese	%	108			80-120	Pass	
Selenium	%	109			80-120	Pass	
Uranium	%	113			80-120	Pass	
LCS - % Recovery							
Metals M8							
Arsenic	%	106			80-120	Pass	
Cadmium	%	107			80-120	Pass	
Chromium	%	108			80-120	Pass	
Copper	%	107			80-120	Pass	
Lead	%	104			80-120	Pass	
Mercury	%	103			80-120	Pass	
Nickel	%	110			80-120	Pass	
Zinc	%	109			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Per- and Polyfluoroalkyl Substances (PFASs) - Short				Result 1					
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S22-Ap0026391	NCP	%	98			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S22-Ap0026391	NCP	%	92			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	S22-Ap0026391	NCP	%	102			50-150	Pass	
Perfluorooctanoic acid (PFOA)	S22-Ap0026391	NCP	%	107			50-150	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Aluminium	W22-Ap0016361	CP	%	106			75-125	Pass	
Cobalt	W22-Ap0016361	CP	%	107			75-125	Pass	
Iron	W22-Ap0016361	CP	%	107			75-125	Pass	
Manganese	W22-Ap0016361	CP	%	107			75-125	Pass	
Selenium	W22-Ap0016361	CP	%	102			75-125	Pass	
Uranium	W22-Ap0016361	CP	%	110			75-125	Pass	
Spike - % Recovery									
Metals M8				Result 1					
Arsenic	S22-Ma00300	NCP	%	97			75-125	Pass	
Cadmium	S22-Ma00300	NCP	%	100			75-125	Pass	
Chromium	S22-Ma00300	NCP	%	96			75-125	Pass	
Copper	S22-Ma00300	NCP	%	98			75-125	Pass	
Lead	S22-Ma00300	NCP	%	93			75-125	Pass	
Mercury	S22-Ma00300	NCP	%	95			75-125	Pass	
Nickel	S22-Ma00300	NCP	%	97			75-125	Pass	
Zinc	S22-Ma00300	NCP	%	94			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Per- and Polyfluoroalkyl Substances (PFASs) - Short				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S22-Ap0026390	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S22-Ap0026390	NCP	ug/L	0.02	0.02	1.0	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	S22-Ap0026390	NCP	ug/L	0.22	0.22	1.0	30%	Pass	
Perfluorooctanoic acid (PFOA)	S22-Ap0026390	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	S22-Ap0026388	NCP	mg/L	0.63	0.63	1.0	30%	Pass	
Cobalt	S22-Ap0026388	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Iron	S22-Ap0026388	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Manganese	S22-Ap0026388	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Selenium	S22-Ap0026388	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Uranium	S22-Ap0026388	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Metals M8				Result 1	Result 2	RPD			
Arsenic	S22-Ap0026388	NCP	mg/L	0.002	0.002	4.0	30%	Pass	
Cadmium	S22-Ap0026388	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	S22-Ap0026388	NCP	mg/L	0.006	0.005	2.0	30%	Pass	
Copper	S22-Ap0026388	NCP	mg/L	0.004	0.004	1.0	30%	Pass	
Lead	S22-Ap0026388	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury	S22-Ap0026388	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	S22-Ap0026388	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc	S22-Ap0026388	NCP	mg/L	< 0.005	0.005	33	30%	Fail	Q15

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Temperature of Chilled samples on receipt	4.1°C
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Emma Beesley	Analytical Services Manager
Gabriele Cordero	Senior Analyst (NSW)
Charl Du Preez	Senior Analyst (NSW)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

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NATA # 1261 Site # 18217

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Sample Receipt Advice

Company name:	SMEC Australia Pty Ltd (WOLL)
Contact name:	Alexander Williams
Project name:	PORT KEMBLA MANILDRA
Project ID:	30013174
Turnaround time:	5 Day
Date/Time received	Apr 7, 2022 3:07 PM
Eurofins reference	878309

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 4.1 degrees Celsius.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

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

Emma Beesley on phone : or by email: EmmaBeesley@eurofins.com

Results will be delivered electronically via email to Alexander Williams - alex.williams@smec.com.

Note: A copy of these results will also be delivered to the general SMEC Australia Pty Ltd (WOLL) email address.

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email: EnviroSales@eurofins.com

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Company Name: SMEC Australia Pty Ltd (WOLL)
Address: Level 2, 6-8 Regent Street
Wollongong
NSW 2500

Project Name: PORT KEMBLA MANILDRA
Project ID: 30013174

Order No.:
Report #: 878309
Phone: 02 4243 4405
Fax:

Received: Apr 7, 2022 3:07 PM
Due: Apr 14, 2022
Priority: 5 Day
Contact Name: Alexander Williams

Eurofins Analytical Services Manager : Emma Beesley

Sample Detail						Aluminium	Cobalt	Iron	Manganese	Selenium	Uranium	Metals M8	Per- and Polyfluoroalkyl Substances (PFASs) - Short
Melbourne Laboratory - NATA # 1261 Site # 1254													
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X	X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794													
Mayfield Laboratory - NATA # 1261 Site # 25079													
Perth Laboratory - NATA # 2377 Site # 2370													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	TAP	Apr 06, 2022		Water	W22-Ap0016360								X
2	BAILER	Apr 06, 2022		Water	W22-Ap0016361	X	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1	2

SMEC
Member of the Surbana Jurong Group

CHAIN OF CUSTODY FORM

SMEC OFFICE: Wollongong
PROJECT: Port Kembla Manildra
PROJECT NUMBER: 30013174
PROJECT MANAGER: Alexander Williams
SAMPLED BY: Ben Potter
DATE SAMPLED: 06/04/2022
Email Reports and Invoice to: alex.williams@smec.com, elvis.dsouza@smec.com

TURNAROUND REQUIREMENTS : Standard Turnaround time
Non-Standard Turnaround time
LAB QUOTE NO.: SMEC 2022 Pricelist
CONTACT PH: 0415 188 089 (Alex Williams)

RELINQUISHED BY: SMEC Elvis DSouza
DATE/ TIME:07/04/2022

COC SEQUENCE NUMBER (Circle)
COC: 4
OF: 4

RECEIVED BY: Eurofins
DATE/TIME:

RELINQUISHED BY:
DATE/TIME:

LAB: Eurofins Laboratory - Wollongong
ATTENTION: Sample Receipt - Hannah Mawbey
DISPATCH TO (ADDRESS & PHONE NO.):
Eurofins Laboratory
Unit 16/7 Investigator Dr
Unanderra NSW 2526
Mobile : +61 459 816 743 (John)

RECEIVED BY: Lily Cains
DATE/TIME:
7/4/22 @ 3:07pm

Special Laboratory Instructions: Heavy metals (Al, As, Cd, Cr, Co, Cu, Fe, Pb, Hg, Mn Ni, Se, U, Z)

SAMPLE DETAILS								Contamination analysis requested:										COMMENTS
LAB ID	SAMPLE ID	Depth (m)	DATE / TIME	SAMPLE MATRIX		CONTAINER TYPE & PRESERVATIVE	TOTAL NO. CONTAINERS	PFAS Short Suite #2 Standard	Heavy metals (14)									
	TAP	-	6/04/2022	Water	☐rock	1x PFAS Bottle	1	X										
	BAILER	-	6/04/2022	Water	☐rock	1x amber, 2x vials, 1x metals, 1x PFAS	5	X	X									
						TOTAL		2	1	0	0	0	0	0	0	0	0	0

Notes:

Temp: 4.1°C Report: 878309 Lily Cains

SMEC Australia Pty Ltd (WOLL)
Level 2, 6-8 Regent Street
Wollongong
NSW 2500

NATA Accredited
Accreditation Number 1261
Site Number 18217

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

Attention: **Alexander Williams**

Report **882352-W**
Project name PORT KEMBLA MANILDRA
Project ID 30013174
Received Date Apr 22, 2022

Client Sample ID			**RINSATE 01 - DRILL ROD**	**RINSATE 02 - BAILER**	**BLANK 01 - TANK**
Sample Matrix			**Water**	**Water**	**Water**
Eurofins Sample No.			**S22-Ap0047955**	**S22-Ap0047956**	**S22-Ap0047957**
Date Sampled			**Apr 20, 2022**	**Apr 20, 2022**	**Apr 20, 2022**
Test/Reference	LOR	Unit			
Heavy Metals					
Aluminium	0.05	mg/L	0.06	0.08	-
Arsenic	0.001	mg/L	< 0.001	< 0.001	-
Cadmium	0.0002	mg/L	< 0.0002	< 0.0002	-
Chromium	0.001	mg/L	< 0.001	0.004	-
Cobalt	0.001	mg/L	< 0.001	< 0.001	-
Copper	0.001	mg/L	0.001	0.002	-
Iron	0.05	mg/L	0.12	0.20	-
Lead	0.001	mg/L	< 0.001	0.005	-
Manganese	0.005	mg/L	< 0.005	0.006	-
Mercury	0.0001	mg/L	< 0.0001	< 0.0001	-
Nickel	0.001	mg/L	< 0.001	0.003	-
Selenium	0.001	mg/L	< 0.001	< 0.001	-
Uranium	0.005	mg/L	< 0.005	< 0.005	-
Zinc	0.005	mg/L	< 0.005	< 0.005	-
Per- and Polyfluoroalkyl Substances (PFASs) - Short					
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05
13C2-6:2 FTSA (surr.)	1	%	174	145	INT
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01
18O2-PFHxS (surr.)	1	%	128	108	103
13C8-PFOS (surr.)	1	%	122	98	97
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C8-PFOA (surr.)	1	%	141	116	113
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01	< 0.01	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01	< 0.01	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01	< 0.01	< 0.01

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Heavy Metals	Sydney	May 09, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Metals M8	Sydney	May 09, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Per- and Polyfluoroalkyl Substances (PFASs) - Short	Sydney	May 09, 2022	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

eurofins | Environment Testing

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Eurofins Environment Testing Australia Pty Ltd
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NATA # 1261 Site # 1254

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Girraween NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
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Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Newcastle
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Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

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43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: SMEC Australia Pty Ltd (WOLL)
Address: Level 2, 6-8 Regent Street
Wollongong
NSW 2500

Project Name: PORT KEMBLA MANILDRA
Project ID: 30013174

Order No.:
Report #: 882352
Phone: 02 4243 4405
Fax:

Received: Apr 22, 2022 12:00 PM
Due: May 9, 2022
Priority: Same day
Contact Name: Alexander Williams

Eurofins Analytical Services Manager : Emma Beesley

Sample Detail						Aluminium	Cobalt	Iron	Manganese	Selenium	Uranium	Metals M8	Per- and Polyfluoroalkyl Substances (PFASs) - Short
Melbourne Laboratory - NATA # 1261 Site # 1254													
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X	X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794													
Mayfield Laboratory - NATA # 1261 Site # 25079													
Perth Laboratory - NATA # 2377 Site # 2370													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	RINSATE 01 - DRILL ROD	Apr 20, 2022		Water	S22-Ap0047955	X	X	X	X	X	X	X	X
2	RINSATE 02 - BAILER	Apr 20, 2022		Water	S22-Ap0047956	X	X	X	X	X	X	X	X
3	BLANK 01 - TANK	Apr 20, 2022		Water	S22-Ap0047957								X
Test Counts						2	2	2	2	2	2	2	3

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

Units

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

Terms

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

QC - Acceptance Criteria

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

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

Results <10 times the LOR: No Limit

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

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

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

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

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

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QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Heavy Metals							
Aluminium	mg/L	< 0.05			0.05	Pass	
Arsenic	mg/L	< 0.001			0.001	Pass	
Cadmium	mg/L	< 0.0002			0.0002	Pass	
Chromium	mg/L	< 0.001			0.001	Pass	
Cobalt	mg/L	< 0.001			0.001	Pass	
Copper	mg/L	< 0.001			0.001	Pass	
Iron	mg/L	< 0.05			0.05	Pass	
Lead	mg/L	< 0.001			0.001	Pass	
Manganese	mg/L	< 0.005			0.005	Pass	
Mercury	mg/L	< 0.0001			0.0001	Pass	
Nickel	mg/L	< 0.001			0.001	Pass	
Selenium	mg/L	< 0.001			0.001	Pass	
Uranium	mg/L	< 0.005			0.005	Pass	
Method Blank							
Per- and Polyfluoroalkyl Substances (PFASs) - Short							
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Heavy Metals							
Aluminium	%	95			80-120	Pass	
Arsenic	%	95			80-120	Pass	
Cadmium	%	100			80-120	Pass	
Chromium	%	100			80-120	Pass	
Cobalt	%	105			80-120	Pass	
Copper	%	98			80-120	Pass	
Iron	%	110			80-120	Pass	
Lead	%	108			80-120	Pass	
Manganese	%	98			80-120	Pass	
Mercury	%	104			80-120	Pass	
Nickel	%	100			80-120	Pass	
Uranium	%	116			80-120	Pass	
Zinc	%	99			80-120	Pass	
LCS - % Recovery							
Per- and Polyfluoroalkyl Substances (PFASs) - Short							
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	102			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	94			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	96			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	102			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Per- and Polyfluoroalkyl Substances (PFASs) - Short				Result 1					
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S22-Ap0047956	CP	%	90			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S22-Ap0047956	CP	%	88			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	S22-Ap0047956	CP	%	84			50-150	Pass	
Perfluorooctanoic acid (PFOA)	S22-Ap0047956	CP	%	94			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Per- and Polyfluoroalkyl Substances (PFASs) - Short				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S22-Ap0047955	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S22-Ap0047955	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	S22-Ap0047955	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	S22-Ap0047955	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Temperature of Chilled samples on receipt	10.3°C
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
Q02	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause

Authorised by:

Emma Beesley	Analytical Services Manager
Charl Du Preez	Senior Analyst (NSW)
Gabriele Cordero	Senior Analyst (NSW)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

eurofins | Environment Testing

www.eurofins.com.au EnviroSales@eurofins.com

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43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name:	SMEC Australia Pty Ltd (WOLL)
Contact name:	Alexander Williams
Project name:	PORT KEMBLA MANILDRA
Project ID:	30013174
Turnaround time:	10 Day
Date/Time received	Apr 22, 2022 12:00 PM
Eurofins reference	882352

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 10.3 degrees Celsius.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Analysis updated as per provided COC.

Contact

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

Emma Beesley on phone : or by email: EmmaBeesley@eurofins.com

Results will be delivered electronically via email to Alexander Williams - alex.williams@smec.com.

Note: A copy of these results will also be delivered to the general SMEC Australia Pty Ltd (WOLL) email address.

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

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Company Name: SMEC Australia Pty Ltd (WOLL)
Address: Level 2, 6-8 Regent Street
Wollongong
NSW 2500

Project Name: PORT KEMBLA MANILDRA
Project ID: 30013174

Order No.:
Report #: 882352
Phone: 02 4243 4405
Fax:

Received: Apr 22, 2022 12:00 PM
Due: May 9, 2022
Priority: Same day
Contact Name: Alexander Williams

Eurofins Analytical Services Manager : Emma Beesley

Sample Detail						Aluminium	Cobalt	Iron	Manganese	Selenium	Uranium	Metals M8	Per- and Polyfluoroalkyl Substances (PFASs) - Short
Melbourne Laboratory - NATA # 1261 Site # 1254													
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X	X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794													
Mayfield Laboratory - NATA # 1261 Site # 25079													
Perth Laboratory - NATA # 2377 Site # 2370													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	RINSATE 01 - DRILL ROD	Apr 20, 2022		Water	S22-Ap0047955	X	X	X	X	X	X	X	X
2	RINSATE 02 - BAILER	Apr 20, 2022		Water	S22-Ap0047956	X	X	X	X	X	X	X	X
3	BLANK 01 - TANK	Apr 20, 2022		Water	S22-Ap0047957								X
Test Counts						2	2	2	2	2	2	2	3

CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 005 085 521

☐ **Sydney Laboratory** Unit F3 Bld.F 16 Mars Road Lane Cove West NSW 2066 02 9900 8400 EnviroSampleNSW@eurofins.com

☐ **Brisbane Laboratory** Unit 1 21 Smallwood Place Murarrie QLD 4172 07 3902 4600 EnviroSampleQLD@eurofins.com

☐ **Perth Laboratory** Unit 2 91 Leach Highway Kewdale WA 6105 08 9251 9600 EnviroSampleWA@eurofins.com

☐ **Melbourne Laboratory** 6 Monterey Road Dandenong South VIC 3175 03 8564 5000 EnviroSampleVic@eurofins.com

Company	SMEC AUSTRALIA P/L
Address	6-8 Regent St, Level 2 WOLLONGONG
Contact Name	Alex Williams
Phone №	0415 188 089
Special Directions	
Purchase Order	
Quote ID №	
Project №	30013174
Project Name	Port Kembla Monitoring
Project Manager	Alex Williams
EDD Format (ESdat, EQuIS etc)	Yes
Sampler(s)	Alexander Williams
Handed over by	" "
Email for Invoice	alex.williams@smec.com
Email for Results	" "

Analyses (Where metals are requested, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing): ANALYSIS TBA VIA EMAIL

Containers (Change container type & size if necessary)

Required Turnaround Time (TAT) (Default will be 5 days if not ticked.) ♦Surcharge will apply

- ☐ Overnight (reporting by 9am)♦
- ☐ Same day♦
- ☐ 1 day♦
- ☐ 2 days♦
- ☐ 3 days♦
- ☑ 5 days (Standard)
- ☐ Other( )

№	Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix (Solid (S) Water (W))	500mL Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
1	Rinsate 01-Drill rod	20/4/22	WATER	X			/	/	/			Part filled 500mL
2	Rinsate 02-Bailer	20/4/22	WATER	/			/	/	/			
3	Blank 01 - Tank	20/4/22	WATER	/			/	/	/			
4												
5												
6												
7												
8												
9												
10												
	Total Counts											

Method of Shipment: ☐ Courier (#) ☐ Hand Delivered ☐ Postal Name Signature Date Time

Laboratory Use Only									
Received By	Hannah M	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature	HM	Date	21/04/22	Time	2:00PM	Temperature 10.3
Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date		Time		Report №

Eurofins Environment Testing Australia Pty Ltd

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | Environment Testing Standard Terms and Conditions unless agreed otherwise. A copy is available on request.

882352

CHAIN OF CUSTODY FORM

SMEC
Member of the Surbana Jurong Group

SMEC OFFICE: Wollongong	**TURNAROUND REQUIREMENTS :** Standard Turnaround time Non-Standard Turnaround time		**LAB:** Eurofins Laboratory - Wollongong **ATTENTION:** Sample Receipt - Hannah Mawbey **DISPATCH TO (ADDRESS & PHONE NO.):**
PROJECT: Port Kembla Manildra			Eurofins Laboratory
PROJECT NUMBER: 30013174	**LAB QUOTE NO.:** SMEC 2022 Pricelist	**COC SEQUENCE NUMBER (Circle)**	Unit 16/7 Investigator Dr
PROJECT MANAGER: Alexander Williams	**CONTACT PH:** 0415 188 089 (Alex Williams)	**COC: 5**	Unanderra NSW 2526
SAMPLED BY: Alexander Williams		**OF: 5**	Mobile : +61 459 816 743 (John)
DATE SAMPLED: 20/04/2022	**RELINQUISHED BY:** SMEC Alexander Williams	**RECEIVED BY:** Eurofins	**RELINQUISHED BY:** / **RECEIVED BY:**
Email Reports and Invoice to: elvis.dsouza@smec.com	DATE/ TIME:21/04/2022	DATE/TIME:	DATE/TIME:

Special Laboratory Instructions: Heavy metals (Al, As, Cd, Cr, Co, Cu, Fe, Pb, Hg, Mn Ni, Se, U, Z)

SAMPLE DETAILS							Contamination analysis requested:											COMMENTS
LAB ID	**SAMPLE ID**	**Depth (m)**	**DATE / TIME**	**SAMPLE MATRIX**	**CONTAINER TYPE & PRESERVATIVE**	**TOTAL NO. CONTAINERS**	**PFAS Short Suite #2 Standard**	**Heavy metals (14)**										
	Rinsate 01 - Drill rod	-	20/04/2022	Water	1x amber, 2x vials, 1x metals, 1x PFAS, 500mL unpreserved, 100ml purple	7	X	X										
	Rinsate 02 - Bailer	-	20/04/2022	Water	1x amber, 2x vials, 1x metals, 1x PFAS, 500mL unpreserved, 100ml purple	7	X	X										
	Blank 01 - Tank	-	20/04/2022	Water	1x amber, 2x vials, 1x metals, 1x PFAS, 500mL unpreserved, 100ml purple	7	X											
					TOTAL		3	1	0	0	0	0	0	0	0	0	0	

Notes:

SMEC Australia Pty Ltd (WOLL)
Level 2, 6-8 Regent Street
Wollongong
NSW 2500

Attention: **Alexander Williams**

Report **884366-W**
Project name PORT KEMBLA MANILDRA
Project ID 30013174
Received Date Apr 28, 2022

Client Sample ID			**QA1A**
Sample Matrix			**Water**
Eurofins Sample No.			**S22-My0002668**
Date Sampled			**Apr 26, 2022**
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons			
TRH C6-C9	0.02	mg/L	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1
TRH C10-C36 (Total)	0.1	mg/L	< 0.1
Naphthalene[N02]	0.01	mg/L	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02
TRH >C10-C16	0.05	mg/L	< 0.05
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1
BTEX			
Benzene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
o-Xylene	0.001	mg/L	< 0.001
Xylenes - Total*	0.003	mg/L	< 0.003
4-Bromofluorobenzene (surr.)	1	%	78
Volatile Organics			
1.1-Dichloroethane	0.001	mg/L	< 0.001
1.1-Dichloroethene	0.001	mg/L	< 0.001
1.1.1-Trichloroethane	0.001	mg/L	< 0.001
1.1.1.2-Tetrachloroethane	0.001	mg/L	< 0.001
1.1.2-Trichloroethane	0.001	mg/L	< 0.001
1.1.2.2-Tetrachloroethane	0.001	mg/L	< 0.001
1.2-Dibromoethane	0.001	mg/L	< 0.001
1.2-Dichlorobenzene	0.001	mg/L	< 0.001
1.2-Dichloroethane	0.001	mg/L	< 0.001
1.2-Dichloropropane	0.001	mg/L	< 0.001
1.2.3-Trichloropropane	0.001	mg/L	< 0.001
1.2.4-Trimethylbenzene	0.001	mg/L	< 0.001
1.3-Dichlorobenzene	0.001	mg/L	< 0.001

Client Sample ID			QA1A
Sample Matrix			Water
Eurofins Sample No.			S22-My0002668
Date Sampled			Apr 26, 2022
Test/Reference	LOR	Unit	
Volatile Organics			
1.3-Dichloropropane	0.001	mg/L	< 0.001
1.3.5-Trimethylbenzene	0.001	mg/L	< 0.001
1.4-Dichlorobenzene	0.001	mg/L	< 0.001
2-Butanone (MEK)	0.005	mg/L	< 0.005
2-Propanone (Acetone)	0.005	mg/L	< 0.005
4-Chlorotoluene	0.001	mg/L	< 0.001
4-Methyl-2-pentanone (MIBK)	0.005	mg/L	< 0.005
Allyl chloride	0.001	mg/L	< 0.001
Benzene	0.001	mg/L	< 0.001
Bromobenzene	0.001	mg/L	< 0.001
Bromochloromethane	0.001	mg/L	< 0.001
Bromodichloromethane	0.001	mg/L	< 0.001
Bromoform	0.001	mg/L	< 0.001
Bromomethane	0.005	mg/L	< 0.005
Carbon disulfide	0.001	mg/L	< 0.001
Carbon Tetrachloride	0.001	mg/L	< 0.001
Chlorobenzene	0.001	mg/L	< 0.001
Chloroethane	0.005	mg/L	< 0.005
Chloroform	0.005	mg/L	< 0.005
Chloromethane	0.005	mg/L	< 0.005
cis-1.2-Dichloroethene	0.001	mg/L	< 0.001
cis-1.3-Dichloropropene	0.001	mg/L	< 0.001
Dibromochloromethane	0.001	mg/L	< 0.001
Dibromomethane	0.001	mg/L	< 0.001
Dichlorodifluoromethane	0.005	mg/L	< 0.005
Ethylbenzene	0.001	mg/L	< 0.001
Iodomethane	0.001	mg/L	< 0.001
Isopropyl benzene (Cumene)	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
Methylene Chloride	0.005	mg/L	< 0.005
o-Xylene	0.001	mg/L	< 0.001
Styrene	0.001	mg/L	< 0.001
Tetrachloroethene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
trans-1.2-Dichloroethene	0.001	mg/L	< 0.001
trans-1.3-Dichloropropene	0.001	mg/L	< 0.001
Trichloroethene	0.001	mg/L	< 0.001
Trichlorofluoromethane	0.005	mg/L	< 0.005
Vinyl chloride	0.005	mg/L	< 0.005
Xylenes - Total*	0.003	mg/L	< 0.003
Total MAH*	0.003	mg/L	< 0.003
Vic EPA IWRG 621 CHC (Total)*	0.005	mg/L	< 0.005
Vic EPA IWRG 621 Other CHC (Total)*	0.005	mg/L	< 0.005
4-Bromofluorobenzene (surr.)	1	%	78
Toluene-d8 (surr.)	1	%	77

Client Sample ID			QA1A
Sample Matrix			Water
Eurofins Sample No.			S22-My0002668
Date Sampled			Apr 26, 2022
Test/Reference	LOR	Unit	
Phenols (Halogenated)			
2-Chlorophenol	0.003	mg/L	< 0.003
2.4-Dichlorophenol	0.003	mg/L	< 0.003
2.4.5-Trichlorophenol	0.01	mg/L	< 0.01
2.4.6-Trichlorophenol	0.01	mg/L	< 0.01
2.6-Dichlorophenol	0.003	mg/L	< 0.003
4-Chloro-3-methylphenol	0.01	mg/L	< 0.01
Pentachlorophenol	0.01	mg/L	< 0.01
Tetrachlorophenols - Total	0.03	mg/L	< 0.03
Total Halogenated Phenol*	0.01	mg/L	< 0.01
Phenols (non-Halogenated)			
2-Cyclohexyl-4.6-dinitrophenol	0.1	mg/L	< 0.1
2-Methyl-4.6-dinitrophenol	0.03	mg/L	< 0.03
2-Nitrophenol	0.01	mg/L	< 0.01
2.4-Dimethylphenol	0.003	mg/L	< 0.003
2.4-Dinitrophenol	0.03	mg/L	< 0.03
2-Methylphenol (o-Cresol)	0.003	mg/L	< 0.003
3&4-Methylphenol (m&p-Cresol)	0.006	mg/L	< 0.006
Total cresols*	0.01	mg/L	< 0.01
4-Nitrophenol	0.03	mg/L	< 0.03
Dinoseb	0.1	mg/L	< 0.1
Phenol	0.003	mg/L	< 0.003
Phenol-d6 (surr.)	1	%	47
Total Non-Halogenated Phenol*	0.1	mg/L	< 0.1
Polycyclic Aromatic Hydrocarbons (Trace level)			
Acenaphthene	0.00001	mg/L	< 0.00001
Acenaphthylene	0.00001	mg/L	< 0.00001
Anthracene	0.00001	mg/L	< 0.00001
Benz(a)anthracene	0.00001	mg/L	< 0.00001
Benzo(a)pyrene	0.00001	mg/L	< 0.00001
Benzo(b&j)fluoranthene	0.00001	mg/L	< 0.00001
Benzo(g.h.i)perylene	0.00001	mg/L	< 0.00001
Benzo(k)fluoranthene	0.00001	mg/L	< 0.00001
Chrysene	0.00001	mg/L	< 0.00001
Dibenz(a.h)anthracene	0.00001	mg/L	< 0.00001
Fluoranthene	0.00001	mg/L	< 0.00001
Fluorene	0.00001	mg/L	< 0.00001
Indeno(1.2.3-cd)pyrene	0.00001	mg/L	< 0.00001
Naphthalene	0.00001	mg/L	< 0.00001
Phenanthrene	0.00001	mg/L	< 0.00001
Pyrene	0.00001	mg/L	< 0.00001
Total PAH*	0.00001	mg/L	< 0.00001
2-Fluorobiphenyl (surr.)	1	%	66
p-Terphenyl-d14 (surr.)	1	%	76
Acidity (as CaCO3)	10	mg/L	100
Ammonia (as N)	0.01	mg/L	[R09]0.45
Ammonium Ion (as N)	0.01	mg/L	0.48
Chloride	1	mg/L	49
Fluoride (Total)	0.5	mg/L	6.2

Client Sample ID			QA1A
Sample Matrix			Water
Eurofins Sample No.			S22-My0002668
Date Sampled			Apr 26, 2022
Test/Reference	LOR	Unit	
Nitrate & Nitrite (as N)	0.05	mg/L	0.27
Nitrate (as N)	0.02	mg/L	0.26
Nitrite (as N)	0.02	mg/L	< 0.02
Organic Nitrogen (as N)*	0.2	mg/L	< 0.2
Phosphate total (as P)	0.01	mg/L	0.71
Phosphorus reactive (as P)	0.01	mg/L	0.01
Sulphate (as SO4)	5	mg/L	1200
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	1600
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	[R09]< 0.2
Total Nitrogen (as N)*	0.2	mg/L	0.27
Hardness mg equivalent CaCO3/L	5	mg/L	1400
Alkalinity (speciated)			
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	390
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20
Total Alkalinity (as CaCO3)	20	mg/L	390
Heavy Metals			
Aluminium	0.05	mg/L	< 0.05
Aluminium (filtered)	0.05	mg/L	< 0.05
Arsenic	0.001	mg/L	0.002
Arsenic (filtered)	0.001	mg/L	0.068
Cadmium	0.0002	mg/L	< 0.0002
Cadmium (filtered)	0.0002	mg/L	< 0.0002
Chromium	0.001	mg/L	< 0.001
Chromium (filtered)	0.001	mg/L	< 0.001
Cobalt	0.001	mg/L	0.014
Cobalt (filtered)	0.001	mg/L	0.010
Copper	0.001	mg/L	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001
Iron	0.05	mg/L	0.12
Iron (filtered)	0.05	mg/L	12
Lead	0.001	mg/L	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001
Manganese	0.005	mg/L	1.1
Manganese (filtered)	0.005	mg/L	0.79
Mercury	0.0001	mg/L	< 0.0001
Mercury (filtered)	0.0001	mg/L	< 0.0001
Nickel	0.001	mg/L	0.093
Nickel (filtered)	0.001	mg/L	0.060
Selenium	0.001	mg/L	0.003
Selenium (filtered)	0.001	mg/L	0.005
Uranium	0.005	mg/L	< 0.005
Uranium (filtered)	0.005	mg/L	< 0.005
Zinc	0.005	mg/L	< 0.005
Zinc (filtered)	0.005	mg/L	< 0.005
Alkali Metals			
Calcium	0.5	mg/L	470
Magnesium	0.5	mg/L	59
Potassium	0.5	mg/L	22
Sodium	0.5	mg/L	110

Client Sample ID			QA1A
Sample Matrix			**Water**
Eurofins Sample No.			**S22-My0002668**
Date Sampled			**Apr 26, 2022**
Test/Reference	LOR	Unit	
Per- and Polyfluoroalkyl Substances (PFASs) - Short			
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05
13C2-6:2 FTSA (surr.)	1	%	158
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	< 0.01
18O2-PFHxS (surr.)	1	%	100
13C8-PFOS (surr.)	1	%	99
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	< 0.01
13C8-PFOA (surr.)	1	%	103
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B1			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	May 05, 2022	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	May 05, 2022	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	May 05, 2022	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Sydney	May 05, 2022	14 Days
- Method: LTM-ORG-2010 BTEX and Volatile TRH			
Volatile Organics	Sydney	May 05, 2022	7 Days
- Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices			
Polycyclic Aromatic Hydrocarbons (Trace level)	Melbourne	May 04, 2022	7 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water (trace)			
Acidity (as CaCO3)	Melbourne	May 04, 2022	14 Days
- Method: LTM-INO-4210 Acidity			
Ammonium Ion (as N)	Melbourne	May 05, 2022	28 Days
- Method: APHA 4500-NH3 Ammonia Nitrogen by FIA			
Phosphate total (as P)	Melbourne	May 05, 2022	28 Days
- Method: LTM-INO-4040 Phosphate by CFA			
Phosphorus reactive (as P)	Melbourne	May 04, 2022	2 Days
- Method: APHA 4500-P			
Heavy Metals	Sydney	May 05, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Heavy Metals (filtered)	Sydney	May 05, 2022	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Metals M8	Sydney	May 05, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Metals M8 filtered	Sydney	May 02, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Eurofins Suite B11C: Na/K/Ca/Mg	Melbourne	May 05, 2022	180 Days
- Method: LTM-MET-3010 Alkali Metals by ICP-AES			
Per- and Polyfluoroalkyl Substances (PFASs) - Short	Sydney	May 05, 2022	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Phenols (Halogenated)	Sydney	May 02, 2022	7 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Phenols (non-Halogenated)	Sydney	May 05, 2022	7 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Nitrogens (speciated)			
Ammonia (as N)	Melbourne	May 05, 2022	28 Days
- Method: APHA 4500-NH3 Ammonia Nitrogen by FIA			
Nitrate & Nitrite (as N)	Melbourne	May 05, 2022	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Nitrate (as N)	Melbourne	May 05, 2022	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Nitrite (as N)	Melbourne	May 05, 2022	2 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Organic Nitrogen (as N)*	Melbourne	May 02, 2022	7 Days
- Method: APHA 4500 Organic Nitrogen (N)			
Total Kjeldahl Nitrogen (as N)	Melbourne	May 04, 2022	28 Days
- Method: APHA 4500-Norg B,D Total Kjeldahl Nitrogen by FIA			
Eurofins Suite B11F: Cl/SO4/Alkalinity/Total F			

Description	Testing Site	Extracted	Holding Time
Chloride	Melbourne	May 05, 2022	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Fluoride (Total)	Melbourne	May 04, 2022	28 Days
- Method: APHA 4500 F-C Fluoride by Ion Selective Electrode			
Sulphate (as SO4)	Melbourne	May 05, 2022	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Melbourne	May 04, 2022	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	May 05, 2022	28 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Hardness Set			
Hardness mg equivalent CaCO3/L	Melbourne	May 05, 2022	28 Days
- Method: APHA 2340B Hardness by Calculation			

eurofins | Environment Testing

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Wollongong
NSW 2500

Project Name: PORT KEMBLA MANILDRA
Project ID: 30013174

Order No.:
Report #: 884366
Phone: 02 4243 4405
Fax:

Received: Apr 28, 2022 6:08 PM
Due: May 6, 2022
Priority: 2 Day
Contact Name: Alexander Williams

Eurofins Analytical Services Manager : Emma Beesley

Sample Detail	Acidity (as CaCO3)	Aluminium	Aluminium (filtered)	Ammonium Ion (as N)	Cobalt	Cobalt (filtered)	Iron	Iron (filtered)	Manganese	Manganese (filtered)	Phosphate total (as P)	Phosphorus reactive (as P)	Selenium	Selenium (filtered)	Uranium	Uranium (filtered)	Metals M8	Metals M8 filtered	Phenols (Speciated)	Hardness Set	Nitrogens (speciated)	Volatile Organics	Eurofins Suite B1	Eurofins Suite B11F: Cl/SO4/Alkalinity/Total F	Per- and Polyfluoroalkyl Substances (PFASs) - Short	Eurofins Suite B11C: Na/K/Ca/Mg	Polycyclic Aromatic Hydrocarbons (Trace level)	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA # 1261 Site # 1254	X			X							X	X								X	X			X		X	X	X
Sydney Laboratory - NATA # 1261 Site # 18217		X	X		X	X	X	X	X	X			X	X	X	X	X	X	X			X	X		X			
Brisbane Laboratory - NATA # 1261 Site # 20794																												
Mayfield Laboratory - NATA # 1261 Site # 25079																												
Perth Laboratory - NATA # 2377 Site # 2370																												
External Laboratory																												

No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID																										
1	QA1A	Apr 26, 2022		Water	S22-My0002668	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

Units

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

Terms

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

QC - Acceptance Criteria

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

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

Results <10 times the LOR: No Limit

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

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

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

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

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

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QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total*	mg/L	< 0.003			0.003	Pass	
Method Blank							
Volatile Organics							
1.1-Dichloroethane	mg/L	< 0.001			0.001	Pass	
1.1-Dichloroethene	mg/L	< 0.001			0.001	Pass	
1.1.1-Trichloroethane	mg/L	< 0.001			0.001	Pass	
1.1.1.2-Tetrachloroethane	mg/L	< 0.001			0.001	Pass	
1.1.2-Trichloroethane	mg/L	< 0.001			0.001	Pass	
1.1.2.2-Tetrachloroethane	mg/L	< 0.001			0.001	Pass	
1.2-Dibromoethane	mg/L	< 0.001			0.001	Pass	
1.2-Dichlorobenzene	mg/L	< 0.001			0.001	Pass	
1.2-Dichloroethane	mg/L	< 0.001			0.001	Pass	
1.2-Dichloropropane	mg/L	< 0.001			0.001	Pass	
1.2.3-Trichloropropane	mg/L	< 0.001			0.001	Pass	
1.2.4-Trimethylbenzene	mg/L	< 0.001			0.001	Pass	
1.3-Dichlorobenzene	mg/L	< 0.001			0.001	Pass	
1.3-Dichloropropane	mg/L	< 0.001			0.001	Pass	
1.3.5-Trimethylbenzene	mg/L	< 0.001			0.001	Pass	
1.4-Dichlorobenzene	mg/L	< 0.001			0.001	Pass	
2-Butanone (MEK)	mg/L	< 0.005			0.005	Pass	
2-Propanone (Acetone)	mg/L	< 0.005			0.005	Pass	
4-Chlorotoluene	mg/L	< 0.001			0.001	Pass	
4-Methyl-2-pentanone (MIBK)	mg/L	< 0.005			0.005	Pass	
Allyl chloride	mg/L	< 0.001			0.001	Pass	
Bromobenzene	mg/L	< 0.001			0.001	Pass	
Bromochloromethane	mg/L	< 0.001			0.001	Pass	
Bromodichloromethane	mg/L	< 0.001			0.001	Pass	
Bromoform	mg/L	< 0.001			0.001	Pass	
Bromomethane	mg/L	< 0.005			0.005	Pass	
Carbon disulfide	mg/L	< 0.001			0.001	Pass	
Carbon Tetrachloride	mg/L	< 0.001			0.001	Pass	
Chlorobenzene	mg/L	< 0.001			0.001	Pass	
Chloroethane	mg/L	< 0.005			0.005	Pass	
Chloroform	mg/L	< 0.005			0.005	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chloromethane	mg/L	< 0.005			0.005	Pass	
cis-1.2-Dichloroethene	mg/L	< 0.001			0.001	Pass	
cis-1.3-Dichloropropene	mg/L	< 0.001			0.001	Pass	
Dibromochloromethane	mg/L	< 0.001			0.001	Pass	
Dibromomethane	mg/L	< 0.001			0.001	Pass	
Dichlorodifluoromethane	mg/L	< 0.005			0.005	Pass	
Iodomethane	mg/L	< 0.001			0.001	Pass	
Isopropyl benzene (Cumene)	mg/L	< 0.001			0.001	Pass	
Methylene Chloride	mg/L	< 0.005			0.005	Pass	
Styrene	mg/L	< 0.001			0.001	Pass	
Tetrachloroethene	mg/L	< 0.001			0.001	Pass	
trans-1.2-Dichloroethene	mg/L	< 0.001			0.001	Pass	
trans-1.3-Dichloropropene	mg/L	< 0.001			0.001	Pass	
Trichloroethene	mg/L	< 0.001			0.001	Pass	
Trichlorofluoromethane	mg/L	< 0.005			0.005	Pass	
Vinyl chloride	mg/L	< 0.005			0.005	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons (Trace level)							
Acenaphthene	mg/L	< 0.00001			0.00001	Pass	
Acenaphthylene	mg/L	< 0.00001			0.00001	Pass	
Anthracene	mg/L	< 0.00001			0.00001	Pass	
Benz(a)anthracene	mg/L	< 0.00001			0.00001	Pass	
Benzo(a)pyrene	mg/L	< 0.00001			0.00001	Pass	
Benzo(b&j)fluoranthene	mg/L	< 0.00001			0.00001	Pass	
Benzo(g.h.i)perylene	mg/L	< 0.00001			0.00001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.00001			0.00001	Pass	
Chrysene	mg/L	< 0.00001			0.00001	Pass	
Dibenz(a.h)anthracene	mg/L	< 0.00001			0.00001	Pass	
Fluoranthene	mg/L	< 0.00001			0.00001	Pass	
Fluorene	mg/L	< 0.00001			0.00001	Pass	
Indeno(1.2.3-cd)pyrene	mg/L	< 0.00001			0.00001	Pass	
Naphthalene	mg/L	< 0.00001			0.00001	Pass	
Phenanthrene	mg/L	< 0.00001			0.00001	Pass	
Pyrene	mg/L	< 0.00001			0.00001	Pass	
Total PAH*	mg/L	-			0.00001	N/A	
Method Blank							
Acidity (as CaCO3)	mg/L	< 10			10	Pass	
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Ammonium Ion (as N)	mg/L	< 0.01			0.01	Pass	
Chloride	mg/L	< 1			1	Pass	
Fluoride (Total)	mg/L	< 0.5			0.5	Pass	
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Nitrite (as N)	mg/L	< 0.02			0.02	Pass	
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Phosphorus reactive (as P)	mg/L	0.01			0.01	Pass	
Sulphate (as SO4)	mg/L	< 5			5	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO3)	mg/L	< 10			10	Pass	
Hydroxide Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Total Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Heavy Metals							
Aluminium	mg/L	< 0.05			0.05	Pass	
Arsenic	mg/L	< 0.001			0.001	Pass	
Cadmium	mg/L	< 0.0002			0.0002	Pass	
Chromium	mg/L	< 0.001			0.001	Pass	
Cobalt	mg/L	< 0.001			0.001	Pass	
Copper	mg/L	< 0.001			0.001	Pass	
Iron	mg/L	< 0.05			0.05	Pass	
Lead	mg/L	< 0.001			0.001	Pass	
Manganese	mg/L	< 0.005			0.005	Pass	
Mercury	mg/L	< 0.0001			0.0001	Pass	
Nickel	mg/L	< 0.001			0.001	Pass	
Selenium	mg/L	< 0.001			0.001	Pass	
Uranium	mg/L	< 0.005			0.005	Pass	
Zinc	mg/L	< 0.005			0.005	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Per- and Polyfluoroalkyl Substances (PFASs) - Short							
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons							
TRH C6-C9	%	123			70-130	Pass	
TRH C10-C14	%	74			70-130	Pass	
Naphthalene	%	101			70-130	Pass	
TRH C6-C10	%	113			70-130	Pass	
TRH >C10-C16	%	97			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	99			70-130	Pass	
Toluene	%	94			70-130	Pass	
Ethylbenzene	%	92			70-130	Pass	
m&p-Xylenes	%	92			70-130	Pass	
o-Xylene	%	92			70-130	Pass	
Xylenes - Total*	%	92			70-130	Pass	
LCS - % Recovery							
Volatile Organics							
1.1-Dichloroethene	%	98			70-130	Pass	
1.1.1-Trichloroethane	%	106			70-130	Pass	
1.2-Dichlorobenzene	%	118			70-130	Pass	
1.2-Dichloroethane	%	113			70-130	Pass	
Trichloroethene	%	98			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons (Trace level)							
Acenaphthene	%	78			70-130	Pass	
Acenaphthylene	%	95			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Anthracene	%	87			70-130	Pass	
Benz(a)anthracene	%	77			70-130	Pass	
Benzo(a)pyrene	%	108			70-130	Pass	
Benzo(b&j)fluoranthene	%	86			70-130	Pass	
Benzo(g.h.i)perylene	%	103			70-130	Pass	
Benzo(k)fluoranthene	%	98			70-130	Pass	
Chrysene	%	92			70-130	Pass	
Dibenz(a.h)anthracene	%	94			70-130	Pass	
Fluoranthene	%	91			70-130	Pass	
Fluorene	%	97			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	87			70-130	Pass	
Naphthalene	%	82			70-130	Pass	
Phenanthrene	%	87			70-130	Pass	
Pyrene	%	92			70-130	Pass	
LCS - % Recovery							
Acidity (as CaCO3)	%	95			70-130	Pass	
Ammonia (as N)	%	97			70-130	Pass	
Chloride	%	103			70-130	Pass	
Fluoride (Total)	%	82			70-130	Pass	
Nitrate & Nitrite (as N)	%	98			70-130	Pass	
Nitrate (as N)	%	98			70-130	Pass	
Nitrite (as N)	%	99			70-130	Pass	
Phosphate total (as P)	%	121			70-130	Pass	
Phosphorus reactive (as P)	%	118			70-130	Pass	
Sulphate (as SO4)	%	109			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	118			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO3)	%	96			70-130	Pass	
Total Alkalinity (as CaCO3)	%	103			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Aluminium	%	111			80-120	Pass	
Arsenic	%	105			80-120	Pass	
Cadmium	%	99			80-120	Pass	
Chromium	%	96			80-120	Pass	
Cobalt	%	94			80-120	Pass	
Copper	%	90			80-120	Pass	
Iron	%	99			80-120	Pass	
Lead	%	92			80-120	Pass	
Manganese	%	98			80-120	Pass	
Mercury	%	93			80-120	Pass	
Nickel	%	93			80-120	Pass	
Selenium	%	93			80-120	Pass	
Uranium	%	95			80-120	Pass	
Zinc	%	94			80-120	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	105			80-120	Pass	
Magnesium	%	104			80-120	Pass	
Potassium	%	95			80-120	Pass	
Sodium	%	101			80-120	Pass	
LCS - % Recovery							
Per- and Polyfluoroalkyl Substances (PFASs) - Short							

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	96			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)			%	96			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)			%	94			50-150	Pass	
Perfluorooctanoic acid (PFOA)			%	102			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons				Result 1					
TRH C10-C14	S22-Ap0059356	NCP	%	114			70-130	Pass	
TRH >C10-C16	S22-Ap0059356	NCP	%	117			70-130	Pass	
Spike - % Recovery									
				Result 1					
Ammonia (as N)	S22-My0003260	NCP	%	73			70-130	Pass	
Ammonium Ion (as N)	M22-My0002843	NCP	%	122			70-130	Pass	
Nitrate & Nitrite (as N)	S22-My0003260	NCP	%	91			70-130	Pass	
Nitrate (as N)	S22-My0003260	NCP	%	91			70-130	Pass	
Nitrite (as N)	S22-My0003260	NCP	%	85			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	M22-My0005753	NCP	%	115			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Aluminium	S22-My0002668	CP	%	99			75-125	Pass	
Aluminium (filtered)	S22-My0002668	CP	%	91			75-125	Pass	
Arsenic	S22-My0002668	CP	%	105			75-125	Pass	
Arsenic (filtered)	S22-My0002668	CP	%	96			75-125	Pass	
Cadmium	S22-My0002668	CP	%	106			75-125	Pass	
Cadmium (filtered)	S22-My0002668	CP	%	95			75-125	Pass	
Chromium	S22-My0002668	CP	%	93			75-125	Pass	
Chromium (filtered)	S22-My0002668	CP	%	90			75-125	Pass	
Cobalt	S22-My0002668	CP	%	94			75-125	Pass	
Cobalt (filtered)	S22-My0002668	CP	%	88			75-125	Pass	
Copper	S22-My0002668	CP	%	90			75-125	Pass	
Copper (filtered)	S22-My0002668	CP	%	85			75-125	Pass	
Iron	S22-My0007021	NCP	%	104			75-125	Pass	
Lead	S22-My0002668	CP	%	99			75-125	Pass	
Lead (filtered)	S22-My0002668	CP	%	90			75-125	Pass	
Manganese	S22-Ap0054745	NCP	%	107			75-125	Pass	
Mercury	S22-My0002668	CP	%	109			75-125	Pass	
Mercury (filtered)	S22-My0002668	CP	%	102			75-125	Pass	
Nickel	S22-My0002668	CP	%	95			75-125	Pass	
Nickel (filtered)	S22-My0002668	CP	%	84			75-125	Pass	
Selenium	S22-My0002668	CP	%	84			75-125	Pass	
Selenium (filtered)	S22-My0002668	CP	%	87			75-125	Pass	
Uranium	S22-My0002668	CP	%	117			75-125	Pass	
Uranium (filtered)	S22-My0002668	CP	%	100			75-125	Pass	
Zinc	S22-My0002668	CP	%	90			75-125	Pass	
Zinc (filtered)	S22-My0002668	CP	%	86			75-125	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	B22-My0005495	NCP	%	105			75-125	Pass	
Magnesium	B22-My0005495	NCP	%	87			75-125	Pass	
Potassium	B22-My0005495	NCP	%	86			75-125	Pass	
Sodium	B22-My0005495	NCP	%	97			75-125	Pass	
Spike - % Recovery									

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Per- and Polyfluoroalkyl Substances (PFASs) - Short				Result 1					
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S22-My0009541	NCP	%	100			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S22-My0009541	NCP	%	95			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	S22-My0009541	NCP	%	97			50-150	Pass	
Perfluorooctanoic acid (PFOA)	S22-My0009541	NCP	%	105			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	S22-My0002625	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	S22-Ap0059355	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	S22-Ap0059355	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	S22-Ap0059355	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Naphthalene	S22-My0002625	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
TRH C6-C10	S22-My0002625	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH >C10-C16	S22-Ap0059355	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C16-C34	S22-Ap0059355	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	S22-Ap0059355	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S22-My0002625	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total*	S22-My0002625	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Volatile Organics				Result 1	Result 2	RPD			
1.1-Dichloroethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.1-Dichloroethene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.1.1-Trichloroethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.1.1.2-Tetrachloroethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.1.2-Trichloroethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.1.2.2-Tetrachloroethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2-Dibromoethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2-Dichlorobenzene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2-Dichloroethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2-Dichloropropane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2.3-Trichloropropane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.2.4-Trimethylbenzene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.3-Dichlorobenzene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.3-Dichloropropane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.3.5-Trimethylbenzene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
1.4-Dichlorobenzene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
2-Butanone (MEK)	S22-My0002625	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
2-Propanone (Acetone)	S22-My0002625	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
4-Chlorotoluene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
4-Methyl-2-pentanone (MIBK)	S22-My0002625	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Allyl chloride	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Bromobenzene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Bromochloromethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Bromodichloromethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	

Duplicate									
Volatile Organics				Result 1	Result 2	RPD			
Bromoform	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Bromomethane	S22-My0002625	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Carbon disulfide	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Carbon Tetrachloride	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chlorobenzene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chloroethane	S22-My0002625	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Chloroform	S22-My0002625	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Chloromethane	S22-My0002625	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
cis-1.2-Dichloroethene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
cis-1.3-Dichloropropene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dibromochloromethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dibromomethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dichlorodifluoromethane	S22-My0002625	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Iodomethane	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Isopropyl benzene (Cumene)	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Methylene Chloride	S22-My0002625	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Styrene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Tetrachloroethene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
trans-1.2-Dichloroethene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
trans-1.3-Dichloropropene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Trichloroethene	S22-My0002625	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Trichlorofluoromethane	S22-My0002625	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Vinyl chloride	S22-My0002625	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons (Trace level)				Result 1	Result 2	RPD			
Acenaphthene	M22-Ap0045599	NCP	mg/L	0.00040	0.00030	40	30%	Fail	Q02
Acenaphthylene	M22-Ap0045599	NCP	mg/L	0.0026	0.0012	73	30%	Fail	Q02
Anthracene	M22-Ap0045599	NCP	mg/L	0.0040	0.0022	59	30%	Fail	Q02
Benz(a)anthracene	M22-Ap0045599	NCP	mg/L	0.0089	0.0052	53	30%	Fail	Q02
Benzo(a)pyrene	M22-Ap0060546	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Benzo(b&j)fluoranthene	M22-Ap0045599	NCP	mg/L	0.0063	0.0039	48	30%	Fail	Q02
Benzo(g.h.i)perylene	M22-Ap0045599	NCP	mg/L	0.0093	0.0051	58	30%	Fail	Q02
Benzo(k)fluoranthene	M22-Ap0045599	NCP	mg/L	0.0055	0.0034	48	30%	Fail	Q02
Chrysene	M22-Ap0045599	NCP	mg/L	0.014	0.0086	44	30%	Fail	Q02
Dibenz(a.h)anthracene	M22-Ap0045599	NCP	mg/L	0.00080	0.00040	59	30%	Fail	Q02
Fluoranthene	M22-Ap0045599	NCP	mg/L	0.016	0.0097	49	30%	Fail	Q02
Fluorene	M22-Ap0045599	NCP	mg/L	0.0019	0.0012	45	30%	Fail	Q02
Indeno(1.2.3-cd)pyrene	M22-Ap0045599	NCP	mg/L	0.0040	0.0023	55	30%	Fail	Q02
Naphthalene	M22-Ap0045599	NCP	mg/L	0.0010	0.00050	73	30%	Fail	Q02
Phenanthrene	M22-Ap0045599	NCP	mg/L	0.014	0.0080	52	30%	Fail	Q02
Pyrene	M22-Ap0045599	NCP	mg/L	0.014	0.0079	55	30%	Fail	Q02
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	S22-My0003260	NCP	mg/L	0.02	0.01	44	30%	Fail	Q15
Ammonium Ion (as N)	S22-My0003260	NCP	mg/L	0.02	0.01	44	30%	Fail	Q15
Chloride	M22-My0001173	NCP	mg/L	550	550	<1	30%	Pass	
Fluoride (Total)	S22-My0002668	CP	mg/L	6.2	5.7	9.0	30%	Pass	
Nitrate & Nitrite (as N)	S22-My0003260	NCP	mg/L	0.30	0.29	1.0	30%	Pass	
Nitrate (as N)	S22-My0003260	NCP	mg/L	0.29	0.29	<1	30%	Pass	
Nitrite (as N)	S22-My0003260	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Phosphate total (as P)	B22-My0003282	NCP	mg/L	4.6	4.3	7.0	30%	Pass	
Sulphate (as SO4)	M22-My0001173	NCP	mg/L	30	30	1.0	30%	Pass	
Total Kjeldahl Nitrogen (as N)	M22-My0005203	NCP	mg/L	18	22	18	30%	Pass	

Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	M22-My0000769	NCP	mg/L	280	270	3.0	30%	Pass	
Carbonate Alkalinity (as CaCO3)	M22-My0000769	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO3)	M22-My0000769	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO3)	M22-My0000769	NCP	mg/L	280	270	3.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	S22-Ap0055433	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Aluminium (filtered)	S22-Ap0060536	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Arsenic	S22-Ap0055433	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Arsenic (filtered)	S22-Ap0060536	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium	S22-Ap0055433	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Cadmium (filtered)	S22-Ap0060536	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	S22-Ap0055433	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chromium (filtered)	S22-Ap0060536	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cobalt	S22-Ap0055433	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cobalt (filtered)	S22-Ap0060536	NCP	mg/L	0.004	0.004	2.0	30%	Pass	
Copper	S22-Ap0055433	NCP	mg/L	0.001	0.001	17	30%	Pass	
Copper (filtered)	S22-Ap0060536	NCP	mg/L	0.002	0.002	1.0	30%	Pass	
Iron	S22-Ap0055433	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Iron (filtered)	S22-Ap0060536	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Lead	S22-Ap0055433	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Lead (filtered)	S22-Ap0060536	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Manganese	S22-Ap0055433	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Manganese (filtered)	S22-Ap0060536	NCP	mg/L	0.38	0.38	1.0	30%	Pass	
Mercury	S22-Ap0055433	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Mercury (filtered)	S22-Ap0060536	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	S22-Ap0055433	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Nickel (filtered)	S22-Ap0060536	NCP	mg/L	0.006	0.006	<1	30%	Pass	
Selenium	S22-Ap0055433	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Selenium (filtered)	S22-Ap0060536	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Uranium	S22-Ap0055433	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Uranium (filtered)	S22-Ap0060536	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Zinc	S22-Ap0055433	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Zinc (filtered)	S22-Ap0060536	NCP	mg/L	0.072	0.080	11	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	B22-My0005495	NCP	mg/L	38	51	30	30%	Pass	
Magnesium	B22-My0005495	NCP	mg/L	19	21	9.0	30%	Pass	
Potassium	B22-My0005495	NCP	mg/L	6.4	6.9	6.0	30%	Pass	
Sodium	B22-My0005495	NCP	mg/L	370	370	<1	30%	Pass	
Duplicate									
Per- and Polyfluoroalkyl Substances (PFASs) - Short				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S22-My0009540	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S22-My0009540	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	S22-My0009540	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	S22-My0009540	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Temperature of Chilled samples on receipt	18.7°C
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
Q02	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.
R09	Theoretically the TKN result should be greater or equal to the ammonia concentration. However the difference reported is within the measurement uncertainty of the individual tests

Authorised by:

Emma Beesley	Analytical Services Manager
Caitlin Breeze	Senior Analyst (VIC)
Mary Makarios	Senior Analyst (NSW)
Charl Du Preez	Senior Analyst (NSW)
Roopesh Rangarajan	Senior Analyst (NSW)
Joseph Edouard	Senior Analyst (VIC)
Raymond Siu	Senior Analyst (NSW)
Scott Beddoes	Senior Analyst (NSW)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

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IANZ # 1290

Sample Receipt Advice

Company name:	SMEC Australia Pty Ltd (WOLL)
Contact name:	Alexander Williams
Project name:	PORT KEMBLA MANILDRA
Project ID:	30013174
Turnaround time:	5 Day
Date/Time received	Apr 28, 2022 6:08 PM
Eurofins reference	884366

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	Sample Temperature of chilled sample on the batch as recorded by Eurofins Sample Receipt : 18.7 degrees Celsius.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Samples received by the laboratory after 5.30pm are deemed to have been received the following working day.

Contact

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

Emma Beesley on phone : or by email: EmmaBeesley@eurofins.com

Results will be delivered electronically via email to Alexander Williams - alex.williams@smec.com.

Note: A copy of these results will also be delivered to the general SMEC Australia Pty Ltd (WOLL) email address.

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

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Company Name: SMEC Australia Pty Ltd (WOLL)
Address: Level 2, 6-8 Regent Street
Wollongong
NSW 2500

Project Name: PORT KEMBLA MANILDRA
Project ID: 30013174

Order No.:
Report #: 884366
Phone: 02 4243 4405
Fax:

Received: Apr 28, 2022 6:08 PM
Due: May 6, 2022
Priority: 2 Day
Contact Name: Alexander Williams

Eurofins Analytical Services Manager : Emma Beesley

Sample Detail	Acidity (as CaCO3)	Aluminium	Aluminium (filtered)	Ammonium Ion (as N)	Cobalt	Cobalt (filtered)	Iron	Iron (filtered)	Manganese	Manganese (filtered)	Phosphate total (as P)	Phosphorus reactive (as P)	Selenium	Selenium (filtered)	Uranium	Uranium (filtered)	Metals M8	Metals M8 filtered	Phenols (Speciated)	Hardness Set	Nitrogens (speciated)	Volatile Organics	Eurofins Suite B1	Eurofins Suite B11F: Cl/SO4/Alkalinity/Total F	Per- and Polyfluoroalkyl Substances (PFASs) - Short	Eurofins Suite B11C: Na/K/Ca/Mg	Polycyclic Aromatic Hydrocarbons (Trace level)	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA # 1261 Site # 1254	X			X							X	X								X	X			X		X	X	X
Sydney Laboratory - NATA # 1261 Site # 18217		X	X		X	X	X	X	X	X			X	X	X	X	X	X	X			X	X		X			
Brisbane Laboratory - NATA # 1261 Site # 20794																													
Mayfield Laboratory - NATA # 1261 Site # 25079																													
Perth Laboratory - NATA # 2377 Site # 2370																													
External Laboratory																													

No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID																											
1	QA1A	Apr 26, 2022		Water	S22-My0002668	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

CHAIN OF CUSTODY FORM

SMEC
Member of the Surbana Jurong Group

SMEC OFFICE: Wollongong	**TURNAROUND REQUIREMENTS :** Standard Turnaround time / Non-Standard Turnaround time		**LAB:** Eurofins Laboratory - Wollongong **ATTENTION:** Sample Receipt **DISPATCH TO (ADDRESS & PHONE NO.):**
PROJECT: Port Kembla Manildra			
PROJECT NUMBER: 30013174	**LAB QUOTE NO.:** SMEC 2022 Pricelist	**COC SEQUENCE NUMBER (Circle)** **COC: 6** **OF: 6**	Eurofins Laboratory Unit F3, 16 Mars Road, WEST LANE COVE NSW
PROJECT MANAGER: Alexander Williams	**CONTACT PH:** 0415 188 089 (Alex Williams)		
SAMPLED BY: Joel Reynolds			
DATE SAMPLED: 26/04/2022	**RELINQUISHED BY:** SMEC Joel Reynolds DATE/ TIME: 27/04/2022	**RECEIVED BY:** ALS DATE/TIME: 27/04/2022	**RELINQUISHED BY: ALS** DATE/TIME: Timing to be confirmed
Email Reports and Invoice to: joel.reynolds@smec.com, alex.williams@smec.com			**RECEIVED BY:** DATE/TIME:

Special Laboratory Instructions: Dissolved Heavy metals (Al, As, Cd, Cr, Co, Cu, Fe, Pb, Hg, Mn Ni, Se, U Zn). *Trace requested for Al, Se, U only*

SAMPLE DETAILS							Contamination analysis requested:										COMMENTS
LAB ID	SAMPLE ID	Depth (m)	DATE / TIME	SAMPLE MATRIX	CONTAINER TYPE & PRESERVATIVE	TOTAL NO. CONTAINERS	Selected analytes in Table 1										
	QA1A		26/04/2022	Water	1x amber 100mL, 2x vials H2S04, 1x metals (filtered), 1 x metal (unfiltred), 2x PFAS 20mL HDPE, 500mL unpreserved, 100ml purple	9	X	**Table 1 Port Kembla Triplicate analysis** Acidity Ammonium Ion (as N) Eurofins Suite B11C Na/K/Ca/Mg Eurofins Suite B11G Cl/SO4/Alkalinity/Total F Hardness Set Total metals - Al, Fe, Mn Filtered metals - M8 + Al Co, Fe, Mn, Se, U *Trace analysis requested for Al, Se and U* Nitrogens (speciated) PFAS Short Suite #2 Standard Total phosphate (Total) Reactive Phosphorus PAH (Trace level) Phenols speciated (Standard) TDS B1 (TRH/BTEX) VOC										
					Total		1	0	0	0	0	0	0	0	0	0	0	

Notes:

J. DALL 28/4/22 6108m # 884366

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2201994**	Page	: 1 of 23
Amendment	: **1**		
Client	: **SMEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division NSW South Coast
Contact	: JOEL REYNOLDS	Contact	: Katie Davis
Address	: LEVEL 2 6-8 REGENT STREET WOLLONGONG 2500	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: 02 42253125
Project	: Port Kembla GME	Date Samples Received	: 27-Apr-2022 15:30
Order number	: -	Date Analysis Commenced	: 29-Apr-2022
C-O-C number	: 36757	Issue Date	: 16-May-2022 13:05
Sampler	: JOEL REYNOLDS		
Site	: Port Kembla Manildra April 2022		
Quote number	: SY/080/21 V3		
No. of samples received	: 13		
No. of samples analysed	: 10		

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*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, 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.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- 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.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP074: Where reported, Total Trihalomethanes is the sum of the reported concentrations of all Trihalomethanes at or above the LOR.
- EP074: Where reported, Total Trimethylbenzenes is the sum of the reported concentrations of 1.2.3-Trimethylbenzene, 1.2.4-Trimethylbenzene and 1.3.5-Trimethylbenzene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG020: It is recognised that total concentration is less than dissolved for some metal analytes. However, the difference is within experimental variation of the methods.
- Amendment (16/05/2022): This report has been amended following the removal of analytes not required per Alex Williams. All other analysis results are as per the previous report.
- EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- 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: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	OHMW28 additional pfas bottles for lab qaqc	SMW02	OHMW20	SMW05	SMW03
				Sampling date / time	26-Apr-2022 10:02	26-Apr-2022 12:17	26-Apr-2022 12:51	26-Apr-2022 13:26	26-Apr-2022 14:08
					EW2201994-001	EW2201994-002	EW2201994-003	EW2201994-004	EW2201994-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.78**	**7.81**	**7.99**	**7.93**	**7.98**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**2640**	**1970**	**15100**	**2280**	**1890**
EA016: Calculated TDS (from Electrical Conductivity)									
Total Dissolved Solids (Calc.)	----	1	mg/L		**1720**	**1280**	**9820**	**1480**	**1230**
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		**1470**	**1030**	**1640**	**1160**	**610**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**383**	**214**	**436**	**227**	**266**
Total Alkalinity as CaCO3	----	1	mg/L		**383**	**214**	**436**	**227**	**266**
ED038: Acidity									
Acidity as CaCO3	----	1	mg/L		**2**	**2**	**3**	**1**	**3**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**1170**	**825**	**1670**	**981**	**445**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**40**	**33**	**4490**	**52**	**198**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**489**	**309**	**204**	**320**	**175**
Magnesium	7439-95-4	1	mg/L		**60**	**62**	**274**	**89**	**42**
Sodium	7440-23-5	1	mg/L		**122**	**105**	**2880**	**129**	**186**
Potassium	7440-09-7	1	mg/L		**24**	**6**	**76**	**10**	**8**
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.068**	**0.038**	<0.001	**0.007**	**0.005**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	**0.0028**	**0.0003**	**0.0002**	**0.0001**
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	**0.007**	**0.001**	**0.004**	**0.004**
Cobalt	7440-48-4	0.001	mg/L		**0.012**	**0.001**	**0.053**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		**0.066**	**0.018**	**0.005**	**0.030**	**0.017**
Lead	7439-92-1	0.001	mg/L		<0.001	**0.010**	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.448**	<0.005	**0.048**	**0.031**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	OHMW28 additional pfas bottles for lab qaqc	SMW02	OHMW20	SMW05	SMW03
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					EW2201994-001	EW2201994-002	EW2201994-003	EW2201994-004	EW2201994-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Manganese	7439-96-5	0.001	mg/L		**0.860**	**0.039**	**3.72**	**0.121**	**0.114**
Iron	7439-89-6	0.05	mg/L		**12.6**	<0.05	**4.07**	**0.47**	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.07**	**0.84**	**0.67**	**0.93**	**0.27**
Manganese	7439-96-5	0.001	mg/L		**0.922**	**0.047**	**4.18**	**0.158**	**0.125**
Iron	7439-89-6	0.05	mg/L		**12.4**	**2.08**	**5.45**	**3.49**	**0.61**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS									
Aluminium	7429-90-5	5	µg/L		**6**	**5**	<5	**10**	<5
Selenium	7782-49-2	0.2	µg/L		**6.1**	**34.8**	<0.2	**81.7**	**144**
Uranium	7440-61-1	0.05	µg/L		**0.72**	**1.01**	**0.21**	**3.64**	**1.85**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**7.8**	**1.3**	**4.0**	**3.5**	**3.0**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.22**	<0.01	**0.67**	**0.01**	**0.02**
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**0.22**	<0.01	**0.67**	<0.01	**0.02**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	**0.03**	<0.01	**0.05**	**0.06**
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**1.98**	**6.79**	<0.01	**0.78**	**7.71**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**1.98**	**6.82**	<0.01	**0.83**	**7.77**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.24**	**0.39**	**0.22**	**0.14**	**0.02**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	**0.17**	<0.01	<0.01	<0.01
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**33.1**	**22.4**	**170**	**26.4**	**20.2**
ø Total Cations	----	0.01	meq/L		**35.2**	**25.2**	**160**	**29.2**	**20.5**
ø Ionic Balance	----	0.01	%		**3.10**	**6.00**	**3.09**	**4.92**	**0.78**

Analytical Results

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

				Sample ID	OHMW28 additional pfas bottles for lab qaqc	SMW02	OHMW20	SMW05	SMW03
				Sampling date / time	26-Apr-2022 10:02	26-Apr-2022 12:17	26-Apr-2022 12:51	26-Apr-2022 13:26	26-Apr-2022 14:08
Compound	CAS Number	LOR	Unit		EW2201994-001	EW2201994-002	EW2201994-003	EW2201994-004	EW2201994-005
					Result	Result	Result	Result	Result
EP074D: Fumigants									
2.2-Dichloropropane	594-20-7	5	µg/L		<5	<5	<5	<5	<5
1.2-Dichloropropane	78-87-5	5	µg/L		<5	<5	<5	<5	<5
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L		<5	<5	<5	<5	<5
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L		<5	<5	<5	<5	<5
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L		<5	<5	<5	<5	<5
EP074E: Halogenated Aliphatic Compounds									
Dichlorodifluoromethane	75-71-8	50	µg/L		<50	<50	<50	<50	<50
Chloromethane	74-87-3	50	µg/L		<50	<50	<50	<50	<50
Vinyl chloride	75-01-4	50	µg/L		<50	<50	<50	<50	<50
Bromomethane	74-83-9	50	µg/L		<50	<50	<50	<50	<50
Chloroethane	75-00-3	50	µg/L		<50	<50	<50	<50	<50
Trichlorofluoromethane	75-69-4	50	µg/L		<50	<50	<50	<50	<50
1.1-Dichloroethene	75-35-4	5	µg/L		<5	<5	<5	<5	<5
Iodomethane	74-88-4	5	µg/L		<5	<5	<5	<5	<5
trans-1.2-Dichloroethene	156-60-5	5	µg/L		<5	<5	<5	<5	<5
1.1-Dichloroethane	75-34-3	5	µg/L		<5	<5	<5	<5	<5
cis-1.2-Dichloroethene	156-59-2	5	µg/L		<5	<5	<5	<5	<5
1.1.1-Trichloroethane	71-55-6	5	µg/L		<5	<5	<5	<5	<5
1.1-Dichloropropylene	563-58-6	5	µg/L		<5	<5	<5	<5	<5
Carbon Tetrachloride	56-23-5	5	µg/L		<5	<5	<5	<5	<5
1.2-Dichloroethane	107-06-2	5	µg/L		<5	<5	<5	<5	<5
Trichloroethene	79-01-6	5	µg/L		<5	<5	<5	<5	<5
Dibromomethane	74-95-3	5	µg/L		<5	<5	<5	<5	<5
1.1.2-Trichloroethane	79-00-5	5	µg/L		<5	<5	<5	<5	<5
1.3-Dichloropropane	142-28-9	5	µg/L		<5	<5	<5	<5	<5
Tetrachloroethene	127-18-4	5	µg/L		<5	<5	<5	<5	<5
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L		<5	<5	<5	<5	<5
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L		<5	<5	<5	<5	<5
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L		<5	<5	<5	<5	<5
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L		<5	<5	<5	<5	<5
1.2.3-Trichloropropane	96-18-4	5	µg/L		<5	<5	<5	<5	<5
Pentachloroethane	76-01-7	5	µg/L		<5	<5	<5	<5	<5
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L		<5	<5	<5	<5	<5

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	OHMW28 additional pfas bottles for lab qaqc	SMW02	OHMW20	SMW05	SMW03
				Sampling date / time	26-Apr-2022 10:02	26-Apr-2022 12:17	26-Apr-2022 12:51	26-Apr-2022 13:26	26-Apr-2022 14:08
					EW2201994-001	EW2201994-002	EW2201994-003	EW2201994-004	EW2201994-005
					Result	Result	Result	Result	Result
EP074E: Halogenated Aliphatic Compounds - Continued									
Hexachlorobutadiene	87-68-3	5	µg/L		<5	<5	<5	<5	<5
EP074F: Halogenated Aromatic Compounds									
Chlorobenzene	108-90-7	5	µg/L		<5	<5	<5	<5	<5
Bromobenzene	108-86-1	5	µg/L		<5	<5	<5	<5	<5
2-Chlorotoluene	95-49-8	5	µg/L		<5	<5	<5	<5	<5
4-Chlorotoluene	106-43-4	5	µg/L		<5	<5	<5	<5	<5
1.3-Dichlorobenzene	541-73-1	5	µg/L		<5	<5	<5	<5	<5
1.4-Dichlorobenzene	106-46-7	5	µg/L		<5	<5	<5	<5	<5
1.2-Dichlorobenzene	95-50-1	5	µg/L		<5	<5	<5	<5	<5
1.2.4-Trichlorobenzene	120-82-1	5	µg/L		<5	<5	<5	<5	<5
1.2.3-Trichlorobenzene	87-61-6	5	µg/L		<5	<5	<5	<5	<5
EP074G: Trihalomethanes									
Chloroform	67-66-3	5	µg/L		<5	<5	<5	<5	<5
Bromodichloromethane	75-27-4	5	µg/L		<5	<5	<5	<5	<5
Dibromochloromethane	124-48-1	5	µg/L		<5	<5	<5	<5	<5
Bromoform	75-25-2	5	µg/L		<5	<5	<5	<5	<5
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	95-57-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	95-48-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	1319-77-3	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	105-67-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	87-65-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100

Analytical Results

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

				Sample ID	OHMW28 additional pfas bottles for lab qaqc	SMW02	OHMW20	SMW05	SMW03
				Sampling date / time	26-Apr-2022 10:02	26-Apr-2022 12:17	26-Apr-2022 12:51	26-Apr-2022 13:26	26-Apr-2022 14:08
Compound	CAS Number	LOR	Unit		EW2201994-001	EW2201994-002	EW2201994-003	EW2201994-004	EW2201994-005
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.004	µg/L		<0.004	**0.006**	<0.004	<0.004	<0.004
2-Methylnaphthalene	91-57-6	0.002	µg/L		<0.002	**0.002**	<0.002	<0.002	<0.002
Acenaphthylene	208-96-8	0.002	µg/L		<0.002	**0.002**	<0.002	<0.002	<0.002
Acenaphthene	83-32-9	0.002	µg/L		<0.002	**0.003**	<0.002	<0.002	<0.002
Fluorene	86-73-7	0.002	µg/L		<0.002	**0.003**	<0.002	**0.002**	<0.002
Phenanthrene	85-01-8	0.002	µg/L		<0.002	**0.017**	<0.002	**0.014**	**0.004**
Anthracene	120-12-7	0.001	µg/L		<0.001	**0.008**	<0.001	**0.002**	**0.001**
Fluoranthene	206-44-0	0.001	µg/L		<0.001	**0.047**	<0.001	**0.014**	**0.007**
Pyrene	129-00-0	0.001	µg/L		<0.001	**0.041**	<0.001	**0.010**	**0.006**
Benz(a)anthracene	56-55-3	0.002	µg/L		<0.002	**0.010**	<0.002	**0.002**	**0.003**
Chrysene	218-01-9	0.001	µg/L		<0.001	**0.010**	<0.001	**0.003**	**0.002**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	OHMW28 additional pfas bottles for lab qaqc	SMW02	OHMW20	SMW05	SMW03
				Sampling date / time	26-Apr-2022 10:02	26-Apr-2022 12:17	26-Apr-2022 12:51	26-Apr-2022 13:26	26-Apr-2022 14:08
					EW2201994-001	EW2201994-002	EW2201994-003	EW2201994-004	EW2201994-005
					Result	Result	Result	Result	Result
EP132B: Polynuclear Aromatic Hydrocarbons - Continued									
7.12-Dimethylbenz(a)anthracene	57-97-6	0.001	µg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.004	µg/L		<0.004	**0.008**	<0.004	<0.004	<0.004
Benzo(k)fluoranthene	207-08-9	0.004	µg/L		<0.004	**0.005**	<0.004	<0.004	<0.004
Benzo(e)pyrene	192-97-2	0.001	µg/L		<0.001	**0.006**	<0.001	<0.001	**0.001**
Benzo(a)pyrene	50-32-8	0.001	µg/L		<0.001	**0.009**	<0.001	<0.001	**0.002**
Perylene	198-55-0	0.002	µg/L		<0.002	**0.002**	<0.002	<0.002	<0.002
3-Methylcholanthrene	56-49-5	0.004	µg/L		<0.004	<0.004	<0.004	<0.004	<0.004
Indeno(1.2.3.cd)pyrene	193-39-5	0.002	µg/L		<0.002	**0.005**	<0.002	<0.002	<0.002
Dibenz(a.h)anthracene	53-70-3	0.001	µg/L		<0.001	**0.002**	<0.001	<0.001	<0.001
Benzo(g.h.i)perylene	191-24-2	0.002	µg/L		<0.002	**0.007**	<0.002	<0.002	**0.002**
Coronene	191-07-1	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	<0.002
^ Sum of 16 US EPA Priority PAHs	----	0.001	µg/L		<0.001	**0.183**	<0.001	**0.047**	**0.027**
^ Benzo(a)pyrene TEQ (zero)	----	0.001	µg/L		<0.001	**0.014**	<0.001	<0.001	**0.002**
^ Benzo(a)pyrene TEQ (half LOR)	----	0.001	µg/L		<0.001	**0.014**	<0.001	<0.001	**0.002**
^ Benzo(a)pyrene TEQ (LOR)	----	0.001	µg/L		<0.001	**0.014**	<0.001	<0.001	**0.002**
EP132B: Polynuclear Aromatic Hydrocarbons (super trace)									
^ Benzo(b+j) & Benzo(k)fluoranthene	205-99-2 207-08-9	0.004	µg/L		<0.004	**0.013**	<0.004	<0.004	<0.004
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	<0.01	<0.01	**0.02**	<0.01
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**0.01**
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.02**	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231D: (n:2) Fluorotelomer Sulfonic Acids									

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	OHMW28 additional pfas bottles for lab qaqc	SMW02	OHMW20	SMW05	SMW03
				Sampling date / time	26-Apr-2022 10:02	26-Apr-2022 12:17	26-Apr-2022 12:51	26-Apr-2022 13:26	26-Apr-2022 14:08
					EW2201994-001	EW2201994-002	EW2201994-003	EW2201994-004	EW2201994-005
					Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	**0.02**	**0.01**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.02**	<0.01	<0.01	**0.02**	**0.01**
EP074S: VOC Surrogates									
1.2-Dichloroethane-D4	17060-07-0	5	%		**101**	**95.9**	**109**	**90.4**	**88.9**
Toluene-D8	2037-26-5	5	%		**119**	**109**	**125**	**104**	**104**
4-Bromofluorobenzene	460-00-4	5	%		**111**	**106**	**118**	**99.9**	**101**
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		**22.0**	**24.3**	**21.7**	**25.2**	**27.4**
2-Chlorophenol-D4	93951-73-6	1.0	%		**47.0**	**50.4**	**45.0**	**53.0**	**57.4**
2.4.6-Tribromophenol	118-79-6	1.0	%		**51.8**	**45.8**	**47.6**	**62.0**	**60.6**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		**56.8**	**60.6**	**54.9**	**69.7**	**72.5**
Anthracene-d10	1719-06-8	1.0	%		**75.7**	**74.1**	**67.4**	**81.8**	**88.0**
4-Terphenyl-d14	1718-51-0	1.0	%		**73.2**	**67.7**	**64.7**	**81.6**	**85.2**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**102**	**96.6**	**110**	**90.8**	**89.5**
Toluene-D8	2037-26-5	2	%		**120**	**110**	**126**	**104**	**104**
4-Bromofluorobenzene	460-00-4	2	%		**121**	**116**	**127**	**110**	**109**
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	0.002	%		**84.0**	**92.1**	**80.6**	**90.9**	**87.1**
Anthracene-d10	1719-06-8	0.002	%		**109**	**112**	**110**	**105**	**107**
4-Terphenyl-d14	1718-51-0	0.002	%		**98.6**	**93.1**	**98.6**	**92.6**	**95.5**
EP231S: PFAS Surrogate									

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	OHMW28 additional pfas bottles for lab qaqc	SMW02	OHMW20	SMW05	SMW03
				Sampling date / time	26-Apr-2022 10:02	26-Apr-2022 12:17	26-Apr-2022 12:51	26-Apr-2022 13:26	26-Apr-2022 14:08
					EW2201994-001	**EW2201994-002**	**EW2201994-003**	**EW2201994-004**	**EW2201994-005**
					Result	Result	Result	Result	Result
EP231S: PFAS Surrogate - Continued									
13C4-PFOS	----	0.02	%		**102**	**89.4**	**101**	**102**	**106**
13C8-PFOA	----	0.02	%		**104**	**99.2**	**106**	**109**	**97.9**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SMW04	SMW01	SMW06 additional pfas bottles for lab qaqc	QA1 additional pfas bottles for lab qaqc	----
				Sampling date / time	26-Apr-2022 14:39	26-Apr-2022 15:10	26-Apr-2022 16:09	26-Apr-2022 18:56	----
					EW2201994-006	EW2201994-007	EW2201994-008	EW2201994-009	--------
					Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.98**	**7.93**	**7.99**	**7.76**	**----**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**2460**	**1810**	**938**	**2610**	**----**
EA016: Calculated TDS (from Electrical Conductivity)									
Total Dissolved Solids (Calc.)	----	1	mg/L		**1600**	**1180**	**610**	**1700**	**----**
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		**1120**	**1060**	**458**	**1430**	**----**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	**----**
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	**----**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**329**	**379**	**410**	**398**	**----**
Total Alkalinity as CaCO3	----	1	mg/L		**329**	**379**	**410**	**398**	**----**
ED038: Acidity									
Acidity as CaCO3	----	1	mg/L		**2**	**2**	**2**	**3**	**----**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**930**	**670**	**45**	**1200**	**----**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**91**	**27**	**9**	**37**	**----**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**332**	**385**	**111**	**477**	**----**
Magnesium	7439-95-4	1	mg/L		**72**	**25**	**44**	**59**	**----**
Sodium	7440-23-5	1	mg/L		**170**	**33**	**24**	**118**	**----**
Potassium	7440-09-7	1	mg/L		**8**	**8**	**4**	**23**	**----**
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.009**	**0.036**	**0.016**	**0.064**	**----**
Cadmium	7440-43-9	0.0001	mg/L		**0.0003**	**0.0014**	**0.0016**	<0.0001	**----**
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	**0.002**	<0.001	**----**
Copper	7440-50-8	0.001	mg/L		**0.014**	**0.032**	**0.028**	<0.001	**----**
Cobalt	7440-48-4	0.001	mg/L		<0.001	**0.003**	<0.001	**0.011**	**----**
Nickel	7440-02-0	0.001	mg/L		**0.042**	**0.043**	**0.022**	**0.075**	**----**
Lead	7439-92-1	0.001	mg/L		<0.001	**0.010**	**0.004**	<0.001	**----**
Zinc	7440-66-6	0.005	mg/L		**0.112**	**0.708**	**0.078**	<0.005	**----**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SMW04	SMW01	SMW06 additional pfas bottles for lab qaqc	QA1 additional pfas bottles for lab qaqc	----
				Sampling date / time	26-Apr-2022 14:39	26-Apr-2022 15:10	26-Apr-2022 16:09	26-Apr-2022 18:56	----
					EW2201994-006	EW2201994-007	EW2201994-008	EW2201994-009	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Manganese	7439-96-5	0.001	mg/L		**0.102**	**0.174**	**0.021**	**0.874**	**----**
Iron	7439-89-6	0.05	mg/L		<0.05	**0.48**	**0.06**	**11.7**	**----**
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.02**	**0.21**	**0.44**	**0.05**	**----**
Manganese	7439-96-5	0.001	mg/L		**0.107**	**0.192**	**0.036**	**0.900**	**----**
Iron	7439-89-6	0.05	mg/L		<0.05	**1.39**	**1.02**	**12.6**	**----**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	**----**
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS									
Aluminium	7429-90-5	5	µg/L		<5	**17**	**6**	**5**	**----**
Selenium	7782-49-2	0.2	µg/L		**88.9**	**63.6**	**36.5**	**7.2**	**----**
Uranium	7440-61-1	0.05	µg/L		**3.43**	**8.11**	**1.77**	**0.78**	**----**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**2.4**	**8.1**	**1.5**	**8.3**	**----**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	**0.04**	<0.01	**0.12**	**----**
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**----**	**----**	<0.01	**----**	**----**
Ammonium as N	14798-03-9_N	0.01	mg/L		<0.01	**0.04**	**----**	**0.12**	**----**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.17**	**0.03**	<0.01	<0.01	**----**
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**4.39**	**2.79**	**4.08**	**1.78**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**4.56**	**2.82**	**4.08**	**1.78**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.11**	**0.10**	**0.18**	**----**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		**0.01**	<0.01	**0.01**	<0.01	**----**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**28.5**	**22.3**	**9.38**	**34.0**	**----**
ø Total Cations	----	0.01	meq/L		**30.1**	**22.9**	**10.3**	**34.4**	**----**

Analytical Results

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

			Sample ID	SMW04	SMW01	SMW06 additional pfas bottles for lab qaqc	QA1 additional pfas bottles for lab qaqc	----
			Sampling date / time	26-Apr-2022 14:39	26-Apr-2022 15:10	26-Apr-2022 16:09	26-Apr-2022 18:56	----
Compound	CAS Number	LOR	Unit	EW2201994-006	EW2201994-007	EW2201994-008	EW2201994-009	--------
				Result	Result	Result	Result	----
EN055: Ionic Balance - Continued								
ø Ionic Balance	----	0.01	%	**2.71**	**1.38**	**4.69**	**0.58**	**----**
EP074D: Fumigants								
2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	<5	<5	----
1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	<5	<5	----
cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	<5	<5	----
trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	<5	<5	----
1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	<5	<5	----
EP074E: Halogenated Aliphatic Compounds								
Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	<50	<50	----
Chloromethane	74-87-3	50	µg/L	<50	<50	<50	<50	----
Vinyl chloride	75-01-4	50	µg/L	<50	<50	<50	<50	----
Bromomethane	74-83-9	50	µg/L	<50	<50	<50	<50	----
Chloroethane	75-00-3	50	µg/L	<50	<50	<50	<50	----
Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	<50	<50	----
1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	<5	<5	----
Iodomethane	74-88-4	5	µg/L	<5	<5	<5	<5	----
trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	<5	<5	----
1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	<5	<5	----
cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	<5	<5	----
1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	<5	<5	----
1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	<5	<5	----
Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	<5	<5	----
1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	<5	<5	----
Trichloroethene	79-01-6	5	µg/L	<5	<5	<5	<5	----
Dibromomethane	74-95-3	5	µg/L	<5	<5	<5	<5	----
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	<5	----
1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	<5	<5	----
Tetrachloroethene	127-18-4	5	µg/L	<5	<5	<5	<5	----
1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	<5	<5	----
trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	<5	<5	----
cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	<5	<5	----
1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	<5	<5	----
1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	<5	<5	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	SMW04	SMW01	SMW06 additional pfas bottles for lab qaqc	QA1 additional pfas bottles for lab qaqc	----
				Sampling date / time	26-Apr-2022 14:39	26-Apr-2022 15:10	26-Apr-2022 16:09	26-Apr-2022 18:56	----
Compound	CAS Number	LOR	Unit		EW2201994-006	EW2201994-007	EW2201994-008	EW2201994-009	--------
					Result	Result	Result	Result	----
EP074E: Halogenated Aliphatic Compounds - Continued									
Pentachloroethane	76-01-7	5	µg/L		<5	<5	<5	<5	----
1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L		<5	<5	<5	<5	----
Hexachlorobutadiene	87-68-3	5	µg/L		<5	<5	<5	<5	----
EP074F: Halogenated Aromatic Compounds									
Chlorobenzene	108-90-7	5	µg/L		<5	<5	<5	<5	----
Bromobenzene	108-86-1	5	µg/L		<5	<5	<5	<5	----
2-Chlorotoluene	95-49-8	5	µg/L		<5	<5	<5	<5	----
4-Chlorotoluene	106-43-4	5	µg/L		<5	<5	<5	<5	----
1.3-Dichlorobenzene	541-73-1	5	µg/L		<5	<5	<5	<5	----
1.4-Dichlorobenzene	106-46-7	5	µg/L		<5	<5	<5	<5	----
1.2-Dichlorobenzene	95-50-1	5	µg/L		<5	<5	<5	<5	----
1.2.4-Trichlorobenzene	120-82-1	5	µg/L		<5	<5	<5	<5	----
1.2.3-Trichlorobenzene	87-61-6	5	µg/L		<5	<5	<5	<5	----
EP074G: Trihalomethanes									
Chloroform	67-66-3	5	µg/L		<5	<5	<5	<5	----
Bromodichloromethane	75-27-4	5	µg/L		<5	<5	<5	<5	----
Dibromochloromethane	124-48-1	5	µg/L		<5	<5	<5	<5	----
Bromoform	75-25-2	5	µg/L		<5	<5	<5	<5	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
2-Chlorophenol	95-57-8	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
2-Methylphenol	95-48-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	----
2-Nitrophenol	88-75-5	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L		<1.0	<1.0	<1.0	<1.0	----
Pentachlorophenol	87-86-5	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	----

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SMW04	SMW01	SMW06 additional pfas bottles for lab qaqc	QA1 additional pfas bottles for lab qaqc	----
				Sampling date / time	26-Apr-2022 14:39	26-Apr-2022 15:10	26-Apr-2022 16:09	26-Apr-2022 18:56	----
					EW2201994-006	EW2201994-007	EW2201994-008	EW2201994-009	--------
					Result	Result	Result	Result	----
EP080/071: Total Petroleum Hydrocarbons - Continued									
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	----
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.004	µg/L		<0.004	**0.004**	**0.005**	<0.004	----
2-Methylnaphthalene	91-57-6	0.002	µg/L		<0.002	<0.002	**0.003**	<0.002	----
Acenaphthylene	208-96-8	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Acenaphthene	83-32-9	0.002	µg/L		<0.002	**0.002**	**0.003**	<0.002	----
Fluorene	86-73-7	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Phenanthrene	85-01-8	0.002	µg/L		**0.005**	**0.003**	**0.006**	<0.002	----
Anthracene	120-12-7	0.001	µg/L		**0.001**	**0.002**	**0.002**	<0.001	----
Fluoranthene	206-44-0	0.001	µg/L		**0.004**	**0.008**	**0.005**	<0.001	----
Pyrene	129-00-0	0.001	µg/L		**0.004**	**0.008**	**0.005**	<0.001	----

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SMW04	SMW01	SMW06 additional pfas bottles for lab qaqc	QA1 additional pfas bottles for lab qaqc	----
				Sampling date / time	26-Apr-2022 14:39	26-Apr-2022 15:10	26-Apr-2022 16:09	26-Apr-2022 18:56	----
					EW2201994-006	EW2201994-007	EW2201994-008	EW2201994-009	--------
					Result	Result	Result	Result	----
EP132B: Polynuclear Aromatic Hydrocarbons - Continued									
Benz(a)anthracene	56-55-3	0.002	µg/L		<0.002	<0.002	**0.002**	<0.002	----
Chrysene	218-01-9	0.001	µg/L		**0.001**	**0.002**	**0.002**	<0.001	----
7.12-Dimethylbenz(a)anthracene	57-97-6	0.001	µg/L		<0.001	<0.001	<0.001	<0.001	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.004	µg/L		<0.004	<0.004	<0.004	<0.004	----
Benzo(k)fluoranthene	207-08-9	0.004	µg/L		<0.004	<0.004	<0.004	<0.004	----
Benzo(e)pyrene	192-97-2	0.001	µg/L		<0.001	<0.001	<0.001	<0.001	----
Benzo(a)pyrene	50-32-8	0.001	µg/L		<0.001	<0.001	<0.001	<0.001	----
Perylene	198-55-0	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
3-Methylcholanthrene	56-49-5	0.004	µg/L		<0.004	<0.004	<0.004	<0.004	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Dibenz(a.h)anthracene	53-70-3	0.001	µg/L		<0.001	<0.001	<0.001	<0.001	----
Benzo(g.h.i)perylene	191-24-2	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Coronene	191-07-1	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
^ **Sum of 16 US EPA Priority PAHs**	----	0.001	µg/L		**0.015**	**0.029**	**0.030**	<0.001	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.001	µg/L		<0.001	<0.001	<0.001	<0.001	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.001	µg/L		<0.001	<0.001	<0.001	<0.001	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.001	µg/L		<0.001	<0.001	<0.001	<0.001	----
EP132B: Polynuclear Aromatic Hydrocarbons (super trace)									
^ **Benzo(b+j) & Benzo(k)fluoranthene**	205-99-2 207-08-9	0.004	µg/L		<0.004	<0.004	<0.004	<0.004	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	<0.01	**0.02**	<0.01	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	**0.06**	**0.07**	<0.01	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	**0.02**	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	SMW04	SMW01	SMW06 additional pfas bottles for lab qaqc	QA1 additional pfas bottles for lab qaqc	----
				Sampling date / time	26-Apr-2022 14:39	26-Apr-2022 15:10	26-Apr-2022 16:09	26-Apr-2022 18:56	----
Compound	CAS Number	LOR	Unit		EW2201994-006	EW2201994-007	EW2201994-008	EW2201994-009	--------
					Result	Result	Result	Result	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	**0.06**	**0.09**	<0.01	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	**0.06**	**0.09**	**0.02**	----
EP074S: VOC Surrogates									
1.2-Dichloroethane-D4	17060-07-0	5	%		**111**	**99.3**	**83.4**	**100**	----
Toluene-D8	2037-26-5	5	%		**115**	**114**	**95.1**	**119**	----
4-Bromofluorobenzene	460-00-4	5	%		**104**	**106**	**95.0**	**111**	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		**26.3**	**24.8**	**25.3**	**26.0**	----
2-Chlorophenol-D4	93951-73-6	1.0	%		**56.2**	**53.9**	**53.1**	**56.4**	----
2.4.6-Tribromophenol	118-79-6	1.0	%		**58.1**	**59.5**	**52.7**	**62.6**	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		**68.8**	**69.7**	**64.4**	**71.7**	----
Anthracene-d10	1719-06-8	1.0	%		**80.3**	**80.9**	**81.5**	**87.9**	----
4-Terphenyl-d14	1718-51-0	1.0	%		**79.0**	**78.6**	**74.9**	**79.4**	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**99.2**	**99.9**	**83.6**	**101**	----
Toluene-D8	2037-26-5	2	%		**105**	**114**	**95.4**	**119**	----
4-Bromofluorobenzene	460-00-4	2	%		**112**	**116**	**102**	**121**	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	0.002	%		**93.3**	**82.6**	**91.4**	**81.3**	----
Anthracene-d10	1719-06-8	0.002	%		**107**	**104**	**105**	**87.7**	----
4-Terphenyl-d14	1718-51-0	0.002	%		**104**	**97.0**	**96.6**	**84.5**	----
EP231S: PFAS Surrogate									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	SMW04	SMW01	SMW06 additional pfas bottles for lab qaqc	QA1 additional pfas bottles for lab qaqc	----
				Sampling date / time	26-Apr-2022 14:39	26-Apr-2022 15:10	26-Apr-2022 16:09	26-Apr-2022 18:56	----
Compound	CAS Number	LOR	Unit		EW2201994-006	EW2201994-007	EW2201994-008	EW2201994-009	--------
					Result	Result	Result	Result	----
EP231S: PFAS Surrogate - Continued									
13C4-PFOS	----	0.02	%		97.5	100	101	104	----
13C8-PFOA	----	0.02	%		97.9	105	102	105	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Rinsate 01	----	----	----	----
				Sampling date / time	26-Apr-2022 19:29	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2201994-013	--------	--------	--------	--------
					Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	----	----	----	----
Manganese	7439-96-5	0.001	mg/L		<0.001	----	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	----	----	----	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS									
Aluminium	7429-90-5	5	µg/L		<5	----	----	----	----
Selenium	7782-49-2	0.2	µg/L		<0.2	----	----	----	----
Uranium	7440-61-1	0.05	µg/L		<0.05	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
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		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**Rinsate 01**	**----**	**----**	**----**	**----**
			Sampling date / time	26-Apr-2022 19:29	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2201994-013**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
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	<0.01	**----**	**----**	**----**	**----**
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	**----**	**----**	**----**	**----**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**91.1**	**----**	**----**	**----**	**----**
13C8-PFOA	----	0.02	%	**96.6**	**----**	**----**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	78	133
Toluene-D8	2037-26-5	79	129
4-Bromofluorobenzene	460-00-4	81	124
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	70	130
Anthracene-d10	1719-06-8	70	130
4-Terphenyl-d14	1718-51-0	70	130
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

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

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP074E: Halogenated Aliphatic Compounds
(WATER) EP074F: Halogenated Aromatic Compounds
(WATER) EP074G: Trihalomethanes
(WATER) EP074S: VOC Surrogates
(WATER) EG035F: Dissolved Mercury by FIMS
(WATER) EP080/071: Total Petroleum Hydrocarbons
(WATER) EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions
(WATER) EP080: BTEXN
(WATER) EP080S: TPH(V)/BTEX Surrogates
(WATER) EG020F: Dissolved Metals by ICP-MS
(WATER) EK067G: Total Phosphorus as P by Discrete Analyser
(WATER) EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS
(WATER) EP075(SIM)A: Phenolic Compounds
(WATER) EP075(SIM)T: PAH Surrogates
(WATER) EP075(SIM)S: Phenolic Compound Surrogates
(WATER) EG020T: Total Metals by ICP-MS
(WATER) EA005P: pH by PC Titrator
(WATER) ED037P: Alkalinity by PC Titrator
(WATER) EA016: Calculated TDS (from Electrical Conductivity)
(WATER) EA010P: Conductivity by PC Titrator
(WATER) EK040P: Fluoride by PC Titrator
(WATER) ED045G: Chloride by Discrete Analyser
(WATER) ED041G: Sulfate (Turbidimetric) as SO4 2- by DA
(WATER) EK071G: Reactive Phosphorus as P by discrete analyser
(WATER) EK055G: Ammonia as N by Discrete Analyser
(WATER) EN055: Ionic Balance
(WATER) EK058G: Nitrate as N by Discrete Analyser
(WATER) EK057G: Nitrite as N by Discrete Analyser
(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser
(WATER) ED093F: Dissolved Major Cations
(WATER) EA065: Total Hardness as CaCO3
(WATER) EK055G-NH4: Ammonium as N by DA
(WATER) ED038: Acidity
(WATER) EP132B: Polynuclear Aromatic Hydrocarbons
(WATER) EP132B: Polynuclear Aromatic Hydrocarbons (super trace)
(WATER) EP132T: Base/Neutral Extractable Surrogates
(WATER) EP231A: Perfluoroalkyl Sulfonic Acids
(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

(WATER) EP074D: Fumigants

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2201994**	Page	: 1 of 22
Amendment	: **1**		
Client	: **SMEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division NSW South Coast
Contact	: JOEL REYNOLDS	Contact	: Katie Davis
Address	: LEVEL 2 6-8 REGENT STREET WOLLONGONG 2500	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: 02 42253125
Project	: Port Kembla GME	Date Samples Received	: 27-Apr-2022
Order number	: -	Date Analysis Commenced	: 29-Apr-2022
C-O-C number	: 36757	Issue Date	: 16-May-2022
Sampler	: JOEL REYNOLDS		
Site	: Port Kembla Manildra April 2022		
Quote number	: SY/080/21 V3		
No. of samples received	: 13		
No. of samples analysed	: 10		

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Accreditation No. 825
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This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
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General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 4310930)									
ES2214511-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.01	6.99	0.3	0% - 20%
ES2214511-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.16	7.11	0.7	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 4310933)									
EW2201994-008	SMW06 additional pfas bottles for lab qaqc	EA005-P: pH Value	----	0.01	pH Unit	7.99	8.01	0.2	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 4310929)									
ES2214490-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1000	1000	0.0	0% - 20%
EW2201994-002	SMW02	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1970	1970	0.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 4310932)									
ES2214511-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	74	66	11.5	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	74	66	11.5	0% - 20%
EW2201994-002	SMW02	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	214	204	5.2	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	214	204	5.2	0% - 20%
ED038: Acidity (QC Lot: 4310924)									
ES2214322-008	Anonymous	ED038-P: Acidity as CaCO3	----	1	mg/L	2	2	0.0	No Limit
EW2201994-002	SMW02	ED038-P: Acidity as CaCO3	----	1	mg/L	2	2	0.0	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4312125)									
EW2201994-006	SMW04	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	930	932	0.2	0% - 20%
ME2200630-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	39	38	0.0	0% - 20%

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED045G: Chloride by Discrete Analyser (QC Lot: 4312126)									
EW2201994-006	SMW04	ED045G: Chloride	16887-00-6	1	mg/L	91	91	0.0	0% - 20%
ME2200630-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	4	4	0.0	No Limit
ED093F: Dissolved Major Cations (QC Lot: 4315683)									
ES2214512-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	109	108	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	152	154	0.9	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	565	566	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	24	24	0.0	0% - 20%
ES2214636-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	39	40	3.9	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	227	235	3.3	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1670	1710	2.6	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	30	31	3.3	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 4315688)									
EW2201994-008	SMW06 additional pfas bottles for lab qaqc	ED093F: Calcium	7440-70-2	1	mg/L	111	109	1.3	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	44	44	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	24	24	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.0	No Limit
EW2202001-010	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	9	9	0.0	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4315684)									
ES2214512-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.195	0.196	0.6	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.029	0.028	0.0	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.015	0.015	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.22	0.22	0.0	No Limit
ES2214636-004	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0002	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.036	0.038	3.6	0% - 20%
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.023	0.024	4.4	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.313	0.328	4.5	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.020	0.020	0.0	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4315684) - continued									
ES2214636-004	Anonymous	EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.021	0.018	17.5	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4315687)									
EW2201994-008	SMW06 additional pfas bottles for lab qaqc	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0016	0.0016	0.0	0% - 50%
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.016	0.016	0.0	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.028	0.028	0.0	0% - 20%
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.004	0.003	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.021	0.021	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.022	0.021	0.0	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.078	0.078	0.0	0% - 50%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.06	0.06	0.0	No Limit
EW2202001-010	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.048	0.048	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.008	0.007	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.37	0.36	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4320315)									
ES2215204-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.009	0.009	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.010	0.010	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.23	0.23	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4315511)									
ES2214932-001	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.582	0.568	2.5	0% - 20%
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	4.61	4.37	5.3	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	16.3	15.6	4.1	0% - 20%
EW2201977-003	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	3.50	3.48	0.5	0% - 20%

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020T: Total Metals by ICP-MS (QC Lot: 4315511) - continued									
EW2201977-003	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	10.6	10.6	0.2	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	645	641	0.6	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 4317383)									
ES2214892-002	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.623	0.620	0.5	0% - 20%
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	1.22	1.16	4.8	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	1.91	1.89	1.2	0% - 20%
EW2202001-004	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.054	0.056	4.4	0% - 20%
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.68	0.68	0.0	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	1.61	1.68	4.4	0% - 20%
EG035F: Dissolved Mercury by FIMS (QC Lot: 4315685)									
ES2214512-004	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2214636-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4315689)									
EW2201994-009	QA1 additional pfas bottles for lab qaqc	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EW2202009-008	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 4310821)									
ES2214228-001	Anonymous	EG094A-F: Uranium	7440-61-1	0.05	µg/L	2.54	2.52	1.1	0% - 20%
		EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	<5	0.0	No Limit
EW2201994-003	OHMW20	EG094A-F: Uranium	7440-61-1	0.05	µg/L	0.21	0.21	0.0	No Limit
		EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	<5	0.0	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 4310822)									
ES2214228-001	Anonymous	EG094B-F: Selenium	7782-49-2	0.2	µg/L	<0.2	<0.2	0.0	No Limit
EW2201994-003	OHMW20	EG094B-F: Selenium	7782-49-2	0.2	µg/L	<0.2	<0.2	0.0	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 4310823)									
WN2204899-004	Anonymous	EG094A-F: Uranium	7440-61-1	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	<5	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 4310931)									
ES2214511-002	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EW2201994-002	SMW02	EK040P: Fluoride	16984-48-8	0.1	mg/L	1.3	1.0	26.8	0% - 50%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4317604)									
EW2201976-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.12	0.12	0.0	0% - 50%
EW2201992-014	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.17	0.17	0.0	0% - 50%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4317606)									
EW2201994-002	SMW02	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4312124)									
ES2214469-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EW2201994-006	SMW04	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.17	0.17	0.0	0% - 50%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4317605)									
EW2201994-005	SMW03	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	7.77	7.89	1.5	0% - 20%
EW2201994-002	SMW02	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	6.82	6.84	0.3	0% - 20%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 4317601)									
EW2201994-001	OHMW28 additional pfas bottles for lab qaqc	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.24	0.26	9.1	0% - 20%
EW2201992-024	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	3.68	3.95	7.0	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 4312123)									
ES2214466-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.11	0.11	0.0	0% - 50%
ES2214466-010	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.07	0.06	16.9	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 4312127)									
EW2201994-006	SMW04	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.01	0.01	0.0	No Limit
EP074D: Fumigants (QC Lot: 4311096)									
ES2214286-002	Anonymous	EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	0.0	No Limit
EW2201994-005	SMW03	EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	<5	0.0	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 4311096)									
ES2214286-002	Anonymous	EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Iodomethane	74-88-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP074E: Halogenated Aliphatic Compounds (QC Lot: 4311096) - continued									
ES2214286-002	Anonymous	EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloromethane	74-87-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: Bromomethane	74-83-9	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloroethane	75-00-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	0.0	No Limit
EW2201994-005	SMW03	EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Iodomethane	74-88-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	<5	0.0	No Limit
		EP074: Trichloroethene	79-01-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromomethane	74-95-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	<5	0.0	No Limit
		EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	<5	0.0	No Limit
		EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Pentachloroethane	76-01-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloromethane	74-87-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Vinyl chloride	75-01-4	50	µg/L	<50	<50	0.0	No Limit
		EP074: Bromomethane	74-83-9	50	µg/L	<50	<50	0.0	No Limit
		EP074: Chloroethane	75-00-3	50	µg/L	<50	<50	0.0	No Limit
		EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	<50	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP074F: Halogenated Aromatic Compounds (QC Lot: 4311096)									
ES2214286-002	Anonymous	EP074: Chlorobenzene	108-90-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	0.0	No Limit
EW2201994-005	SMW03	EP074: Chlorobenzene	108-90-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromobenzene	108-86-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	<5	0.0	No Limit
		EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	<5	0.0	No Limit
EP074G: Trihalomethanes (QC Lot: 4311096)									
ES2214286-002	Anonymous	EP074: Chloroform	67-66-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromoform	75-25-2	5	µg/L	<5	<5	0.0	No Limit
EW2201994-005	SMW03	EP074: Chloroform	67-66-3	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	<5	0.0	No Limit
		EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	<5	0.0	No Limit
		EP074: Bromoform	75-25-2	5	µg/L	<5	<5	0.0	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 4311086)									
EW2201994-002	SMW02	EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	<2.0	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	<2.0	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4311087)									
EW2201994-002	SMW02	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 4311097)									
ES2214286-002	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EW2201994-005	SMW03	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4311087)									
EW2201994-002	SMW02	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 4311097)									
ES2214286-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EW2201994-005	SMW03	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 4311097)									
ES2214286-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EW2201994-005	SMW03	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (super trace) (QC Lot: 4311093)									
EW2201994-001	OHMW28 additional pfas bottles for lab qaqc	EP132-ST: Anthracene	120-12-7	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP132-ST: Benzo(a)pyrene	50-32-8	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP132-ST: Benzo(e)pyrene	192-97-2	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP132-ST: Chrysene	218-01-9	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP132-ST: Dibenz(a.h)anthracene	53-70-3	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP132-ST: Fluoranthene	206-44-0	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP132-ST: Pyrene	129-00-0	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP132-ST: Sum of 16 US EPA Priority PAHs	----	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP132-ST: Benzo(a)pyrene TEQ (zero)	----	0.001	µg/L	<0.001	<0.001	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP132B: Polynuclear Aromatic Hydrocarbons (super trace) (QC Lot: 4311093) - continued									
EW2201994-001	OHMW28 additional pfas bottles for lab qaqc	EP132-ST: Benzo(a)pyrene TEQ (half LOR)	----	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP132-ST: Benzo(a)pyrene TEQ (LOR)	----	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP132-ST: Acenaphthene	83-32-9	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP132-ST: Acenaphthylene	208-96-8	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP132-ST: Benz(a)anthracene	56-55-3	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP132-ST: Benzo(g.h.i)perylene	191-24-2	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP132-ST: Coronene	191-07-1	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP132-ST: 7.12-Dimethylbenz(a)anthracene	57-97-6	0.002	µg/L	<0.001	<0.001	0.0	No Limit
		EP132-ST: Fluorene	86-73-7	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP132-ST: Indeno(1.2.3.cd)pyrene	193-39-5	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP132-ST: 2-Methylnaphthalene	91-57-6	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP132-ST: Phenanthrene	85-01-8	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP132-ST: Perylene	198-55-0	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP132-ST: Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.004	µg/L	<0.004	<0.004	0.0	No Limit
		EP132-ST: Benzo(k)fluoranthene	207-08-9	0.004	µg/L	<0.004	<0.004	0.0	No Limit
		EP132-ST: 3-Methylcholanthrene	56-49-5	0.004	µg/L	<0.004	<0.004	0.0	No Limit
		EP132-ST: Naphthalene	91-20-3	0.004	µg/L	<0.004	<0.004	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 4313023)									
EP2204836-001	Anonymous	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	0.10	0.11	0.0	0% - 50%
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.02	0.02	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EW2201994-001	OHMW28 additional pfas bottles for lab qaqc	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 4313420)									
EP2204981-001	Anonymous	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	0.05	0.05	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.08	0.08	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 4313023)									
EP2204836-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EW2201994-001	OHMW28 additional pfas bottles for lab qaqc	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.02	<0.02	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 4313023) - continued									
EW2201994-001	OHMW28 additional pfas bottles for lab qaqc	EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 4313420)									
EP2204981-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 4313023)									
EP2204836-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EW2201994-001	OHMW28 additional pfas bottles for lab qaqc	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 4313420)									
EP2204981-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 4310930)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.8	101
				----	7 pH Unit	100	99.2	101
EA005P: pH by PC Titrator (QCLot: 4310933)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.8	101
				----	7 pH Unit	100	99.2	101
EA010P: Conductivity by PC Titrator (QCLot: 4310929)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	220 µS/cm	99.6	89.9	110
				<1	2100 µS/cm	101	90.2	111
ED037P: Alkalinity by PC Titrator (QCLot: 4310932)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	88.6	81.0	111
				----	50 mg/L	112	80.0	120
ED038: Acidity (QCLot: 4310924)								
ED038-P: Acidity as CaCO3	----	1	mg/L	<1	100 mg/L	86.7	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4312125)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	107	82.0	122
				<1	500 mg/L	97.6	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 4312126)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	95.8	80.9	127
				<1	1000 mg/L	94.6	80.9	127
ED093F: Dissolved Major Cations (QCLot: 4315683)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.5	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	106	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	107	85.0	113
ED093F: Dissolved Major Cations (QCLot: 4315688)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	104	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	109	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	108	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	110	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 4315684)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	103	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	102	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	102	85.0	111

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4315684) - continued								
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	102	82.0	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	102	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	99.6	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	100	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	100	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	102	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	101	82.0	112
EG020F: Dissolved Metals by ICP-MS (QCLot: 4315687)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	108	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	105	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	106	85.0	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	107	82.0	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	104	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	103	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	103	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	104	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	105	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	105	82.0	112
EG020F: Dissolved Metals by ICP-MS (QCLot: 4320315)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	103	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	102	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	102	85.0	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	101	82.0	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	100	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	102	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	100	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	101	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	101	81.0	117
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	99.6	82.0	112
EG020T: Total Metals by ICP-MS (QCLot: 4315511)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	97.5	82.0	120
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	98.4	85.0	113
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	100	85.0	117
EG020T: Total Metals by ICP-MS (QCLot: 4317383)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	105	82.0	120
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	105	85.0	113
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	106	85.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 4315685)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 4315685) - continued								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	90.5	83.0	105
EG035F: Dissolved Mercury by FIMS (QCLot: 4315689)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	86.8	83.0	105
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 4310821)								
EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	50 µg/L	106	89.0	117
EG094A-F: Uranium	7440-61-1	0.05	µg/L	<0.05	10 µg/L	94.8	70.0	130
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 4310822)								
EG094B-F: Selenium	7782-49-2	0.2	µg/L	<0.2	10 µg/L	100	70.0	122
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 4310823)								
EG094A-F: Aluminium	7429-90-5	5	µg/L	<5	50 µg/L	102	89.0	117
EG094A-F: Uranium	7440-61-1	0.05	µg/L	<0.05	10 µg/L	92.7	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4310931)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	103	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4317604)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	98.5	90.0	114
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4317606)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	95.7	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4312124)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	98.9	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4317605)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	101	91.0	113
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4317601)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	98.3	71.3	126
				<0.01	0.442 mg/L	105	71.3	126
				<0.01	1 mg/L	104	71.3	126
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4312123)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	95.1	85.0	117
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4312127)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	94.0	85.0	117
EP074D: Fumigants (QCLot: 4311096)								
EP074: 2.2-Dichloropropane	594-20-7	5	µg/L	<5	10 µg/L	92.9	68.0	122
EP074: 1.2-Dichloropropane	78-87-5	5	µg/L	<5	10 µg/L	88.5	76.0	118
EP074: cis-1.3-Dichloropropylene	10061-01-5	5	µg/L	<5	10 µg/L	87.6	62.0	120
EP074: trans-1.3-Dichloropropylene	10061-02-6	5	µg/L	<5	10 µg/L	90.1	60.0	114
EP074: 1.2-Dibromoethane (EDB)	106-93-4	5	µg/L	<5	10 µg/L	95.2	69.0	117
EP074E: Halogenated Aliphatic Compounds (QCLot: 4311096)								
EP074: Dichlorodifluoromethane	75-71-8	50	µg/L	<50	100 µg/L	96.5	60.6	138

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP074E: Halogenated Aliphatic Compounds (QCLot: 4311096) - continued								
EP074: Chloromethane	74-87-3	50	µg/L	<50	100 µg/L	88.9	67.4	130
EP074: Vinyl chloride	75-01-4	50	µg/L	<50	100 µg/L	95.9	69.4	129
EP074: Bromomethane	74-83-9	50	µg/L	<50	100 µg/L	90.0	56.0	140
EP074: Chloroethane	75-00-3	50	µg/L	<50	100 µg/L	100	61.0	139
EP074: Trichlorofluoromethane	75-69-4	50	µg/L	<50	100 µg/L	86.8	69.0	131
EP074: 1.1-Dichloroethene	75-35-4	5	µg/L	<5	10 µg/L	87.7	70.0	124
EP074: Iodomethane	74-88-4	5	µg/L	<5	10 µg/L	87.7	70.2	128
EP074: trans-1.2-Dichloroethene	156-60-5	5	µg/L	<5	10 µg/L	97.3	74.0	118
EP074: 1.1-Dichloroethane	75-34-3	5	µg/L	<5	10 µg/L	96.1	74.0	120
EP074: cis-1.2-Dichloroethene	156-59-2	5	µg/L	<5	10 µg/L	98.6	77.0	119
EP074: 1.1.1-Trichloroethane	71-55-6	5	µg/L	<5	10 µg/L	88.0	67.0	119
EP074: 1.1-Dichloropropylene	563-58-6	5	µg/L	<5	10 µg/L	93.3	73.0	119
EP074: Carbon Tetrachloride	56-23-5	5	µg/L	<5	10 µg/L	90.3	62.0	120
EP074: 1.2-Dichloroethane	107-06-2	5	µg/L	<5	10 µg/L	99.2	73.0	123
EP074: Trichloroethene	79-01-6	5	µg/L	<5	10 µg/L	87.2	76.0	118
EP074: Dibromomethane	74-95-3	5	µg/L	<5	10 µg/L	86.5	73.0	119
EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	10 µg/L	93.0	72.0	126
EP074: 1.3-Dichloropropane	142-28-9	5	µg/L	<5	10 µg/L	89.3	71.0	129
EP074: Tetrachloroethene	127-18-4	5	µg/L	<5	10 µg/L	105	72.0	124
EP074: 1.1.1.2-Tetrachloroethane	630-20-6	5	µg/L	<5	10 µg/L	93.0	66.0	114
EP074: trans-1.4-Dichloro-2-butene	110-57-6	5	µg/L	<5	10 µg/L	87.9	60.0	120
EP074: cis-1.4-Dichloro-2-butene	1476-11-5	5	µg/L	<5	10 µg/L	96.8	70.6	128
EP074: 1.1.2.2-Tetrachloroethane	79-34-5	5	µg/L	<5	10 µg/L	91.6	70.0	124
EP074: 1.2.3-Trichloropropane	96-18-4	5	µg/L	<5	10 µg/L	86.1	74.0	126
EP074: Pentachloroethane	76-01-7	5	µg/L	<5	10 µg/L	86.1	71.8	126
EP074: 1.2-Dibromo-3-chloropropane	96-12-8	5	µg/L	<5	10 µg/L	98.5	66.4	136
EP074: Hexachlorobutadiene	87-68-3	5	µg/L	<5	10 µg/L	88.0	58.0	130
EP074F: Halogenated Aromatic Compounds (QCLot: 4311096)								
EP074: Chlorobenzene	108-90-7	5	µg/L	<5	10 µg/L	95.6	79.0	117
EP074: Bromobenzene	108-86-1	5	µg/L	<5	10 µg/L	88.5	76.0	116
EP074: 2-Chlorotoluene	95-49-8	5	µg/L	<5	10 µg/L	92.0	73.0	119
EP074: 4-Chlorotoluene	106-43-4	5	µg/L	<5	10 µg/L	86.7	73.0	119
EP074: 1.3-Dichlorobenzene	541-73-1	5	µg/L	<5	10 µg/L	88.4	75.0	117
EP074: 1.4-Dichlorobenzene	106-46-7	5	µg/L	<5	10 µg/L	92.6	74.0	118
EP074: 1.2-Dichlorobenzene	95-50-1	5	µg/L	<5	10 µg/L	87.2	75.0	117
EP074: 1.2.4-Trichlorobenzene	120-82-1	5	µg/L	<5	10 µg/L	86.8	61.0	125
EP074: 1.2.3-Trichlorobenzene	87-61-6	5	µg/L	<5	10 µg/L	89.3	67.0	123
EP074G: Trihalomethanes (QCLot: 4311096)								
EP074: Chloroform	67-66-3	5	µg/L	<5	10 µg/L	93.8	72.0	120

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP074G: Trihalomethanes (QCLot: 4311096) - continued								
EP074: Bromodichloromethane	75-27-4	5	µg/L	<5	10 µg/L	87.2	64.0	118
EP074: Dibromochloromethane	124-48-1	5	µg/L	<5	10 µg/L	85.7	65.0	115
EP074: Bromoform	75-25-2	5	µg/L	<5	10 µg/L	90.4	73.5	126
EP075(SIM)A: Phenolic Compounds (QCLot: 4311086)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	40.5	24.5	61.9
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	67.4	52.0	90.0
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	71.6	51.0	91.0
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	68.4	44.0	88.0
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	71.9	48.0	100
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	76.5	49.0	99.0
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	82.4	53.0	105
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	69.7	57.0	105
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	80.2	53.0	99.0
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	76.7	50.0	106
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	73.8	51.0	105
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	10 µg/L	40.5	10.0	95.0
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4311087)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	66.1	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	88.7	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	89.9	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4311097)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	79.9	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4311087)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	71.2	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	93.0	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	76.8	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4311097)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	85.1	75.0	127
EP080: BTEXN (QCLot: 4311097)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	81.8	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	95.2	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	99.0	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	96.7	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	101	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	105	70.0	120
EP132B: Polynuclear Aromatic Hydrocarbons (super trace) (QCLot: 4311093)								
EP132-ST: Acenaphthene	83-32-9	0.002	µg/L	<0.002	0.01 µg/L	95.7	70.0	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP132B: Polynuclear Aromatic Hydrocarbons (super trace) (QCLot: 4311093) - continued								
EP132-ST: Acenaphthylene	208-96-8	0.002	µg/L	<0.002	0.01 µg/L	100.0	70.0	130
EP132-ST: Anthracene	120-12-7	0.001	µg/L	<0.001	0.01 µg/L	101	70.0	130
EP132-ST: Benz(a)anthracene	56-55-3	0.002	µg/L	<0.002	0.01 µg/L	100	70.0	130
EP132-ST: Benzo(a)pyrene	50-32-8	0.001	µg/L	<0.001	0.01 µg/L	90.3	70.0	130
EP132-ST: Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.004	µg/L	<0.004	0.01 µg/L	92.0	70.0	130
EP132-ST: Benzo(e)pyrene	192-97-2	0.001	µg/L	<0.001	0.01 µg/L	108	70.0	130
EP132-ST: Benzo(g.h.i)perylene	191-24-2	0.002	µg/L	<0.002	0.01 µg/L	90.9	70.0	130
EP132-ST: Benzo(k)fluoranthene	207-08-9	0.004	µg/L	<0.004	0.01 µg/L	93.3	70.0	130
EP132-ST: Chrysene	218-01-9	0.001	µg/L	<0.001	0.01 µg/L	99.2	70.0	130
EP132-ST: Coronene	191-07-1	0.002	µg/L	<0.002	0.01 µg/L	99.3	70.0	130
EP132-ST: Dibenz(a.h)anthracene	53-70-3	0.001	µg/L	<0.001	0.01 µg/L	95.3	70.0	130
EP132-ST: 7.12-Dimethylbenz(a)anthracene	57-97-6	0.002	µg/L	<0.002	0.01 µg/L	89.1	70.0	130
EP132-ST: Fluoranthene	206-44-0	0.001	µg/L	<0.001	0.01 µg/L	105	70.0	130
EP132-ST: Fluorene	86-73-7	0.002	µg/L	<0.002	0.01 µg/L	96.5	70.0	130
EP132-ST: Indeno(1.2.3.cd)pyrene	193-39-5	0.002	µg/L	<0.002	0.01 µg/L	95.9	70.0	130
EP132-ST: 3-Methylcholanthrene	56-49-5	0.004	µg/L	<0.004	0.01 µg/L	92.4	70.0	130
EP132-ST: 2-Methylnaphthalene	91-57-6	0.002	µg/L	<0.002	0.01 µg/L	96.2	70.0	130
EP132-ST: Naphthalene	91-20-3	0.004	µg/L	<0.004	0.01 µg/L	111	70.0	130
EP132-ST: Phenanthrene	85-01-8	0.002	µg/L	<0.002	0.01 µg/L	104	70.0	130
EP132-ST: Perylene	198-55-0	0.002	µg/L	<0.002	0.01 µg/L	89.6	70.0	130
EP132-ST: Pyrene	129-00-0	0.001	µg/L	<0.001	0.01 µg/L	108	70.0	130
EP132-ST: Sum of 16 US EPA Priority PAHs	----	0.001	µg/L	<0.001	----	----	----	----
EP132-ST: Benzo(a)pyrene TEQ (zero)	----	0.001	µg/L	<0.001	----	----	----	----
EP132-ST: Benzo(a)pyrene TEQ (half LOR)	----	0.001	µg/L	<0.001	----	----	----	----
EP132-ST: Benzo(a)pyrene TEQ (LOR)	----	0.001	µg/L	<0.001	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4313023)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	110	72.0	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.25 µg/L	108	68.0	131
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	113	65.0	140
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4313420)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	108	72.0	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.25 µg/L	107	68.0	131
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	115	65.0	140
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4313023)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	107	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	123	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	115	72.0	129

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4313023) - continued								
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	116	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	121	71.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4313420)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	105	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	117	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	120	71.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4313023)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	121	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	112	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	116	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	94.2	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4313420)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	116	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	112	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	103	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	88.8	71.4	144

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4312125)							
EW2201994-006	SMW04	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4312126)							
EW2201994-006	SMW04	ED045G: Chloride	16887-00-6	50 mg/L	120	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4315684)							
ES2214512-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	101	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	96.3	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	97.6	70.0	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	98.5	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	98.9	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	95.6	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4315684) - continued							
ES2214512-002	Anonymous	EG020A-F: Manganese	7439-96-5	1 mg/L	96.1	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	96.0	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	97.2	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4315687)							
EW2201994-009	QA1 additional pfas bottles for lab qaqc	EG020A-F: Arsenic	7440-38-2	1 mg/L	100	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	97.0	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	97.5	70.0	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	98.4	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	99.4	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	97.0	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	95.6	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	96.3	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	97.3	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4320315)							
ES2215204-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	93.1	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	95.9	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	95.2	70.0	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	93.5	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	95.8	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	97.5	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	98.2	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	93.0	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	94.7	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4315511)							
ES2214932-002	Anonymous	EG020A-T: Manganese	7439-96-5	1 mg/L	87.5	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4317383)							
ES2214994-001	Anonymous	EG020A-T: Manganese	7439-96-5	1 mg/L	99.8	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 4315685)							
ES2214512-003	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	78.5	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 4315689)							
EW2201994-008	SMW06 additional pfas bottles for lab qaqc	EG035F: Mercury	7439-97-6	0.01 mg/L	82.6	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4310931)							
ES2214511-002	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	89.8	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4317604)							
EW2201976-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	88.6	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4317606)							

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4317606) - continued							
EW2201994-002	SMW02	EK055G: Ammonia as N	7664-41-7	1 mg/L	98.1	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4312124)							
ES2214469-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	106	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4317605)							
EW2201994-002	SMW02	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	# Not Determined	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 4317601)							
EW2201992-027	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	105	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4312123)							
ES2214466-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	93.2	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 4312127)							
EW2201994-006	SMW04	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	95.8	70.0	130
EP074E: Halogenated Aliphatic Compounds (QCLot: 4311096)							
ES2214286-002	Anonymous	EP074: 1.1-Dichloroethene	75-35-4	25 µg/L	109	70.0	130
		EP074: Trichloroethene	79-01-6	25 µg/L	84.0	70.0	130
EP074F: Halogenated Aromatic Compounds (QCLot: 4311096)							
ES2214286-002	Anonymous	EP074: Chlorobenzene	108-90-7	25 µg/L	96.0	70.0	130
EP075(SIM)A: Phenolic Compounds (QCLot: 4311086)							
EW2201994-008	SMW06 additional pfas bottles for lab qaqc	EP075(SIM): Phenol	108-95-2	20 µg/L	34.3	20.0	130
		EP075(SIM): 2-Chlorophenol	95-57-8	20 µg/L	76.0	60.0	130
		EP075(SIM): 2-Nitrophenol	88-75-5	20 µg/L	72.6	60.0	130
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	20 µg/L	82.8	70.0	130
		EP075(SIM): Pentachlorophenol	87-86-5	20 µg/L	47.5	20.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4311087)							
EW2201994-008	SMW06 additional pfas bottles for lab qaqc	EP071: C10 - C14 Fraction	----	200 µg/L	103	70.0	130
		EP071: C15 - C28 Fraction	----	250 µg/L	124	71.0	130
		EP071: C29 - C36 Fraction	----	200 µg/L	85.4	67.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 4311097)							
ES2214286-002	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	93.6	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4311087)							
EW2201994-008	SMW06 additional pfas bottles for lab qaqc	EP071: >C10 - C16 Fraction	----	250 µg/L	101	70.0	130
		EP071: >C16 - C34 Fraction	----	350 µg/L	105	75.0	130
		EP071: >C34 - C40 Fraction	----	150 µg/L	93.6	67.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 4311097)							
ES2214286-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	99.5	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 4311097)							
ES2214286-002	Anonymous	EP080: Benzene	71-43-2	25 µg/L	88.2	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	99.1	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	98.7	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	97.5	70.0	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	101	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	78.0	70.0	130
EP132B: Polynuclear Aromatic Hydrocarbons (super trace) (QCLot: 4311093)							
EW2201994-003	OHMW20	EP132-ST: Acenaphthene	83-32-9	0.01 µg/L	116	70.0	130
		EP132-ST: Acenaphthylene	208-96-8	0.01 µg/L	119	70.0	130
		EP132-ST: Anthracene	120-12-7	0.01 µg/L	117	70.0	130
		EP132-ST: Benz(a)anthracene	56-55-3	0.01 µg/L	118	70.0	130
		EP132-ST: Benzo(a)pyrene	50-32-8	0.01 µg/L	108	70.0	130
		EP132-ST: Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.01 µg/L	100	70.0	130
		EP132-ST: Benzo(e)pyrene	192-97-2	0.01 µg/L	106	70.0	130
		EP132-ST: Benzo(g.h.i)perylene	191-24-2	0.01 µg/L	106	70.0	130
		EP132-ST: Benzo(k)fluoranthene	207-08-9	0.01 µg/L	111	70.0	130
		EP132-ST: Chrysene	218-01-9	0.01 µg/L	107	70.0	130
		EP132-ST: Coronene	191-07-1	0.01 µg/L	95.9	70.0	130
		EP132-ST: Dibenz(a.h)anthracene	53-70-3	0.01 µg/L	102	70.0	130
		EP132-ST: 7.12-Dimethylbenz(a)anthracene	57-97-6	0.01 µg/L	107	70.0	130
		EP132-ST: Fluoranthene	206-44-0	0.01 µg/L	111	70.0	130
		EP132-ST: Fluorene	86-73-7	0.01 µg/L	115	70.0	130
		EP132-ST: Indeno(1.2.3.cd)pyrene	193-39-5	0.01 µg/L	105	70.0	130
		EP132-ST: 3-Methylcholanthrene	56-49-5	0.01 µg/L	115	70.0	130
		EP132-ST: 2-Methylnaphthalene	91-57-6	0.01 µg/L	97.5	70.0	130
		EP132-ST: Naphthalene	91-20-3	0.01 µg/L	101	70.0	130
		EP132-ST: Phenanthrene	85-01-8	0.01 µg/L	112	70.0	130
		EP132-ST: Perylene	198-55-0	0.01 µg/L	102	70.0	130
		EP132-ST: Pyrene	129-00-0	0.01 µg/L	118	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4313023)							
EP2204837-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	107	72.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	107	68.0	131
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	102	65.0	140
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4313420)							
EP2204981-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	110	72.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	100	68.0	131

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4313420) - continued							
EP2204981-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	121	65.0	140
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4313023)							
EP2204837-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	104	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	119	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	121	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	119	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	116	71.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4313420)							
EP2204981-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	100	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	118	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	118	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	118	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	117	71.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4313023)							
EP2204837-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	120	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	118	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	113	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	94.4	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4313420)							
EP2204981-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	106	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	122	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	119	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	90.8	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2201994**	Page	: 1 of 16
Amendment	: **1**		
Client	: **SMEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division NSW South Coast
Contact	: JOEL REYNOLDS	Telephone	: 02 42253125
Project	: Port Kembla GME	Date Samples Received	: 27-Apr-2022
Site	: Port Kembla Manildra April 2022	Issue Date	: 16-May-2022
Sampler	: JOEL REYNOLDS	No. of samples received	: 13
Order number	: -	No. of samples analysed	: 10

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EW2201994--006	SMW04	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	EW2201994--002	SMW02	**Nitrite + Nitrate as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
OHMW28 - additional pfas bottles for lab qaqc,	SMW02,	----	----	----	30-Apr-2022	27-Apr-2022	**3**
OHMW20,	SMW05,						
SMW03,	SMW04,						
SMW01,	SMW06 - additional pfas bottles for lab qaqc,						
QA1 - additional pfas bottles for lab qaqc							
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural							
OHMW28 - additional pfas bottles for lab qaqc,	SMW02,	----	----	----	29-Apr-2022	28-Apr-2022	**1**
OHMW20,	SMW05,						
SMW03,	SMW04,						
SMW01,	SMW06 - additional pfas bottles for lab qaqc,						
QA1 - additional pfas bottles for lab qaqc							
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural							
OHMW28 - additional pfas bottles for lab qaqc,	SMW02,	----	----	----	29-Apr-2022	28-Apr-2022	**1**
OHMW20,	SMW05,						
SMW03,	SMW04,						
SMW01,	SMW06 - additional pfas bottles for lab qaqc,						
QA1 - additional pfas bottles for lab qaqc							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Quality Control Specification
Matrix Spikes (MS)					
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	0	28	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**30-Apr-2022**	27-Apr-2022	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**30-Apr-2022**	24-May-2022	✓
EA065: Total Hardness as CaCO3							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**03-May-2022**	24-May-2022	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**30-Apr-2022**	10-May-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED038: Acidity							
Clear Plastic Bottle - Natural (ED038-P)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**02-May-2022**	10-May-2022	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**29-Apr-2022**	24-May-2022	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**29-Apr-2022**	24-May-2022	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**03-May-2022**	24-May-2022	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**03-May-2022**	23-Oct-2022	✓
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-F)							
Rinsate 01	**26-Apr-2022**	**----**	----	----	**05-May-2022**	23-Oct-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05	**26-Apr-2022**	**03-May-2022**	23-Oct-2022	✓	**03-May-2022**	23-Oct-2022	✓
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**04-May-2022**	23-Oct-2022	✓	**04-May-2022**	23-Oct-2022	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**03-May-2022**	24-May-2022	✓
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG094B-F)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**29-Apr-2022**	23-Oct-2022	✓
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG094B-F)							
Rinsate 01	**26-Apr-2022**	**----**	----	----	**29-Apr-2022**	23-Oct-2022	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**30-Apr-2022**	24-May-2022	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**04-May-2022**	24-May-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**29-Apr-2022**	28-Apr-2022	×
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**04-May-2022**	24-May-2022	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**04-May-2022**	24-May-2022	✓	**04-May-2022**	24-May-2022	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**----**	----	----	**29-Apr-2022**	28-Apr-2022	×
EP074D: Fumigants							
Amber VOC Vial - Sulfuric Acid (EP074)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**03-May-2022**	10-May-2022	✓	**03-May-2022**	10-May-2022	✓
EP074E: Halogenated Aliphatic Compounds							
Amber VOC Vial - Sulfuric Acid (EP074)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**03-May-2022**	10-May-2022	✓	**03-May-2022**	10-May-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP074F: Halogenated Aromatic Compounds							
Amber VOC Vial - Sulfuric Acid (EP074)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**03-May-2022**	10-May-2022	✓	**03-May-2022**	10-May-2022	✓
EP074G: Trihalomethanes							
Amber VOC Vial - Sulfuric Acid (EP074)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**03-May-2022**	10-May-2022	✓	**03-May-2022**	10-May-2022	✓
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**02-May-2022**	03-May-2022	✓	**05-May-2022**	11-Jun-2022	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**02-May-2022**	03-May-2022	✓	**04-May-2022**	11-Jun-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**03-May-2022**	10-May-2022	✓	**03-May-2022**	10-May-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**02-May-2022**	03-May-2022	✓	**04-May-2022**	11-Jun-2022	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**03-May-2022**	10-May-2022	✓	**03-May-2022**	10-May-2022	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**03-May-2022**	10-May-2022	✓	**03-May-2022**	10-May-2022	✓
EP132B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP132-ST)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**02-May-2022**	03-May-2022	✓	**02-May-2022**	11-Jun-2022	✓
EP132B: Polynuclear Aromatic Hydrocarbons (super trace)							
Amber Glass Bottle - Unpreserved (EP132-ST)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**02-May-2022**	03-May-2022	✓	**02-May-2022**	11-Jun-2022	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
Rinsate 01	**26-Apr-2022**	**03-May-2022**	23-Oct-2022	✓	**03-May-2022**	23-Oct-2022	✓
HDPE (no PTFE) (EP231X)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**30-Apr-2022**	23-Oct-2022	✓	**03-May-2022**	23-Oct-2022	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
Rinsate 01	**26-Apr-2022**	**03-May-2022**	23-Oct-2022	✓	**03-May-2022**	23-Oct-2022	✓
HDPE (no PTFE) (EP231X)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**30-Apr-2022**	23-Oct-2022	✓	**03-May-2022**	23-Oct-2022	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
Rinsate 01	**26-Apr-2022**	**03-May-2022**	23-Oct-2022	✓	**03-May-2022**	23-Oct-2022	✓
HDPE (no PTFE) (EP231X)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**30-Apr-2022**	23-Oct-2022	✓	**03-May-2022**	23-Oct-2022	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
Rinsate 01	**26-Apr-2022**	**03-May-2022**	23-Oct-2022	✓	**03-May-2022**	23-Oct-2022	✓
HDPE (no PTFE) (EP231X)							
OHMW28 - additional pfas bottles for lab qaqc, SMW02, OHMW20, SMW05, SMW03, SMW04, SMW01, SMW06 - additional pfas bottles for lab qaqc, QA1 - additional pfas bottles for lab qaqc	**26-Apr-2022**	**30-Apr-2022**	23-Oct-2022	✓	**03-May-2022**	23-Oct-2022	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038-P	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	3	28	**10.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	4	31	**12.90**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	5	44	**11.36**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	3	28	**10.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH Compounds in Water	EP132-ST	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	3	18	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	3	24	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	4	28	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038-P	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	2	17	**11.76**	**8.33**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	3	44	**6.82**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH Compounds in Water	EP132-ST	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	4	18	**22.22**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	19	**15.79**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Acidity as Calcium Carbonate	ED038-P	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by Auto Titrator	EA010-P	1	17	**5.88**	**1.67**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	3	44	**6.82**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH Compounds in Water	EP132-ST	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	3	44	**6.82**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	0	28	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH Compounds in Water	EP132-ST	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Volatile Organic Compounds	EP074	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by Auto Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by Auto Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Calculated TDS (from Electrical Conductivity)	EA016	WATER	In house: Calculation from Electrical Conductivity (APHA 2510 B) using a conversion factor specified in the analytical report. This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Acidity as Calcium Carbonate	ED038-P	WATER	In house: Referenced to APHA 2310 B Acidity is determined by titration automated titration (e.g. by PC Titrate) of a settled supernatant aliquot of the sample with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS	EG094A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM Schedule B(3).
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS	EG094B-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM Schedule B(3).
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ammonium as N	EK055G-NH4	WATER	Ammonium in the sample is reported as the ionised / unionised fractions by the use of a nomograph and the initial pH and Temperature. Ammonia is determined by direct colorimetry by Discrete Analyser according to APHA 4500-NH3 G. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
Volatile Organic Compounds	EP074	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270 Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
PAH Compounds in Water	EP132-ST	WATER	In house, Samples are extracted into solvent in original containers. Determination by large volume injection GCMS in selected ion monitoring (SIM) mode.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Digestion for Total Recoverable Metals - ORC	EN25-ORC	WATER	In house: Referenced to USEPA SW846-3005. This is an Ultrapure Nitric acid digestion procedure used to prepare surface and ground water samples for analysis by ORC- ICPMS. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Liquid Liquid Extraction (in-bottle - trace) -	ORG14-IB-ST	WATER	In house: A 50 mL of representative portion of a 500 mL sample is discarded. A portion of solvent (less dense than water) is used to extract the sample (horizontal shaker for 30 minutes) and a portion of the extract analysed directly.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

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

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EW2201994**		
Client	: **SMEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division NSW South Coast
Contact	: JOEL REYNOLDS	Contact	: Katie Davis
Address	: LEVEL 2 6-8 REGENT STREET WOLLONGONG 2500	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
E-mail	: Joel.Reynolds@smec.com	E-mail	: katie.davis@alsglobal.com
Telephone	: ----	Telephone	: 02 42253125
Facsimile	: ----	Facsimile	: W 02 42253128 N 02 44232083
Project	: Port Kembla GME	Page	: 1 of 4
Order number	: -	Quote number	: ES2021SMEAUS0001 (SY/080/21 V3)
C-O-C number	: 36757	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: Port Kembla Manildra April 2022		
Sampler	: JOEL REYNOLDS		

Dates

Date Samples Received	: 27-Apr-2022 15:30	Issue Date	: 04-May-2022
Client Requested Due Date	: 06-May-2022	Scheduled Reporting Date	: **06-May-2022**

Delivery Details

Mode of Delivery	: Pickup	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 2.6'C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 12 / 10
		No. of samples NOT collected	1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- This is an updated SRN which indicates the addition of metals and PFAS analysis on RInsate sample.
- **TB and TS received damaged, unable to conduct analysis.**
- **Unable to conduct NT-13 analysis on Rinsate sample as no green bottle received.**
- **Analytical work for this work order will be conducted at ALS Sydney.**
- Sample QA1A PLEASE SEND TO EUROFINS FOR ANALYSIS was not received due to the following reason: Sample Not Received
- **Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.**
- **Please direct any queries you have regarding this work order to the above ALS laboratory contact.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

Sample Container(s)/Preservation Non-Compliances

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

Method Sample ID	Sample Container Received	Preferred Sample Container for Analysis
Dissolved Metals by ICP-MS - Suite A : EG020A-F		
Rinsate 01	- Clear Plastic Bottle - Nitric Acid; Unfiltered	- Clear Plastic Bottle - Nitric Acid; Filtered
Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS : EG094A-F		
Rinsate 01	- Clear Plastic Bottle - Nitric Acid; Unfiltered	- Clear Plastic Bottle - Nitric Acid; Filtered
Dissolved Metals in Fresh Water -Suite B by ORC-ICPMS : EG094B-F		
Rinsate 01	- Clear Plastic Bottle - Nitric Acid; Unfiltered	- Clear Plastic Bottle - Filtered; Lab-acidified

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

EW2201994-001 : 26-Apr-2022 10:02 : OHMW28 - additional pfas bottles for lab qaqc
EW2201994-008 : 26-Apr-2022 16:09 : SMW06 - additional pfas bottles for lab qaqc
EW2201994-009 : 26-Apr-2022 18:56 : QA1 - additional pfas bottles for lab qaqc

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EG020F Dissolved Metals by ICP/MS	WATER - EG094-T Total Metals by ORC - Ultra Trace in Fresh Water	WATER - EK067G Total Phosphorus as P By Discrete Analyser	WATER - EP074DEFG VOC - Fumigants, Hal Aliphatics, Hal Aromatics,	WATER - EP080 BTEXN	WATER - W-05 TRH/BTEXN/8 Metals	WATER - W-18 TRH(C6 - C9)/BTEXN
EW2201994-001	26-Apr-2022 10:02	OHMW28 additional p...	✓	✓	✓	✓	✓	✓	✓
EW2201994-002	26-Apr-2022 12:17	SMW02	✓	✓	✓	✓	✓	✓	✓
EW2201994-003	26-Apr-2022 12:51	OHMW20	✓	✓	✓	✓	✓	✓	✓
EW2201994-004	26-Apr-2022 13:26	SMW05	✓	✓	✓	✓	✓	✓	✓
EW2201994-005	26-Apr-2022 14:08	SMW03	✓	✓	✓	✓	✓	✓	✓
EW2201994-006	26-Apr-2022 14:39	SMW04	✓	✓	✓	✓	✓	✓	✓
EW2201994-007	26-Apr-2022 15:10	SMW01	✓	✓	✓	✓	✓	✓	✓
EW2201994-008	26-Apr-2022 16:09	SMW06 additional pf...	✓	✓	✓	✓	✓	✓	✓
EW2201994-009	26-Apr-2022 18:56	QA1 additional pfas...	✓	✓	✓	✓	✓	✓	✓
EW2201994-013	26-Apr-2022 19:29	Rinsate 01	✓						

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - ED038P CaCO3 Acidity as CaCO3 only	WATER - EG020T Total Metals by ICP/MS (including digestion)	WATER - EG094-F Dissolved Metals by ORC - Ultra Trace in Fresh	WATER - EK055G-NH4 Ammonium as N	WATER - EP075 SIM Phenols only SIM - Phenols only	WATER - EP132-ST Super Trace PAHs	WATER - NT-13 Extended Water Suite A
EW2201994-001	26-Apr-2022 10:02	OHMW28 additional p...	✓	✓	✓	✓	✓	✓	✓
EW2201994-002	26-Apr-2022 12:17	SMW02	✓	✓	✓	✓	✓	✓	✓
EW2201994-003	26-Apr-2022 12:51	OHMW20	✓	✓	✓	✓	✓	✓	✓
EW2201994-004	26-Apr-2022 13:26	SMW05	✓	✓	✓	✓	✓	✓	✓
EW2201994-005	26-Apr-2022 14:08	SMW03	✓	✓	✓	✓	✓	✓	✓
EW2201994-006	26-Apr-2022 14:39	SMW04	✓	✓	✓	✓	✓	✓	✓
EW2201994-007	26-Apr-2022 15:10	SMW01	✓	✓	✓	✓	✓	✓	✓
EW2201994-008	26-Apr-2022 16:09	SMW06 additional pf...	✓	✓	✓	✓	✓	✓	✓
EW2201994-009	26-Apr-2022 18:56	QA1 additional pfas...	✓	✓	✓	✓	✓	✓	✓
EW2201994-013	26-Apr-2022 19:29	Rinsate 01			✓				

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	(On Hold) WATER No analysis requested	WATER - EP231 PFAS - Short Suite (12 analytes)
EW2201994-001	26-Apr-2022 10:02	OHMW28 additional p...		✓
EW2201994-002	26-Apr-2022 12:17	SMW02		✓
EW2201994-003	26-Apr-2022 12:51	OHMW20		✓
EW2201994-004	26-Apr-2022 13:26	SMW05		✓
EW2201994-005	26-Apr-2022 14:08	SMW03		✓
EW2201994-006	26-Apr-2022 14:39	SMW04		✓
EW2201994-007	26-Apr-2022 15:10	SMW01		✓
EW2201994-008	26-Apr-2022 16:09	SMW06 additional pf...		✓
EW2201994-009	26-Apr-2022 18:56	QA1 additional pfas...		✓
EW2201994-011	26-Apr-2022 19:23	Trip blank	✓	
EW2201994-012	26-Apr-2022 19:24	Trip Spike	✓	
EW2201994-013	26-Apr-2022 19:29	Rinsate 01		✓

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS INVOICES

- A4 - AU Tax Invoice (INV)	Email	accounts.payable@smec.com

Elvis Dsouza

- *AU Certificate of Analysis - NATA (COA)	Email	Elvis.Dsouza@smec.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	Elvis.Dsouza@smec.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	Elvis.Dsouza@smec.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	Elvis.Dsouza@smec.com
- A4 - AU Tax Invoice (INV)	Email	Elvis.Dsouza@smec.com
- Chain of Custody (CoC) (COC)	Email	Elvis.Dsouza@smec.com
- EDI Format - ENMRG (ENMRG)	Email	Elvis.Dsouza@smec.com
- EDI Format - ESDAT (ESDAT)	Email	Elvis.Dsouza@smec.com
- Purchase Order Request Letter (PO_Request)	Email	Elvis.Dsouza@smec.com

CHAIN OF CUSTODY

(ALS) COC#: 36757 *ALS Laboratory:* EW Wollongong

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 23/4/22 1850	DATE TIME:	DATE TIME:

CLIENT: SMEAUS - SMEC AUSTRALIA PTY LTD

PROJECT: Port Kembla GME

SITE: Port Kembla Manildra April 2022

ORDER NO:

PROJECT MANAGER: Joel Reynolds
PRIMARY SAMPLER: Joel Reynolds

CONTACT PH:
QUOTE NO: SY/080/21

SAMPLER MOBILE:
/ ES2021SMEAUS0001

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No (N/A)

Free ice / frozen ice bricks present upon receipt? (Yes) No N/A

Random Sample Temperature on Receipt: 2.6 °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Port Kembla WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	OHMW28	additional pfas bottles for lab qaqc	26/04/2022 10:02 AM	Water	ALS: 11 Non ALS: 2	No		X		
002	SMW02		26/04/2022 12:17 PM	Water	ALS: 18 Non ALS: 0	No		X		
003	OHMW20		26/04/2022 12:51 PM	Water	ALS: 9 Non ALS: 2	No		X		
004	SMW05		26/04/2022 01:26 PM	Water	ALS: 9 Non ALS: 2	No		X		
005	SMW03		26/04/2022 02:08 PM	Water	ALS: 9 Non ALS: 2	No		X		
006	SMW04		26/04/2022 02:39 PM	Water	ALS: 9 Non ALS: 2	No		X		
007	SMW01		26/04/2022 03:10 PM	Water	ALS: 14 Non ALS: 0	No		X		
008	SMW06	additional pfas bottles for lab qaqc	26/04/2022 04:09 PM	Water	ALS: 21 Non ALS: 0	No		X		
009	QA1	additional pfas bottles for lab qaqc	26/04/2022 06:56 PM	Water	ALS: 11 Non ALS: 1	No		X		

Environmental Division
Wollongong
Work Order Reference
EW2201994

Telephone : 02 42253125

CHAIN OF CUSTODY

ALS COC#: 36757 *ALS Laboratory:* EW Wollongong

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 22/4/22 1850	DATE TIME:	DATE TIME:

CLIENT: SMEAUS - SMEC AUSTRALIA PTY LTD

PROJECT: Port Kembla GME

SITE: Port Kembla Manildra April 2022

ORDER NO:

PROJECT MANAGER: Joel Reynolds
PRIMARY SAMPLER: Joel Reynolds

CONTACT PH:
QUOTE NO: SY/080/21

SAMPLER MOBILE:
/ ES2021SMEAUS0001

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free Ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: 2.6 °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Port Kembla WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	QA1A SNR	PLEASE SEND TO EUROFINS FOR ANALYSIS	26/04/2022 07:07 PM	Water	ALS: 9 Non ALS: 1	No		X	PLEASE SEND TO EUROFINS FOR ANALYSIS	PLEASE SEND TO EUROFINS FOR ANALYSIS
011	Trip blank	Broben	26/04/2022 07:23 PM	Water	ALS: 1 Non ALS: 0	No	-		BTEX Trip Blank	
012	Trip Spike	Broben	26/04/2022 07:24 PM	Water	ALS: 1 Non ALS: 0	No	-			
013	Rinsate 01		26/04/2022 07:29 PM	Water	ALS: 12 Non ALS: 0	No		X		

CHAIN OF CUSTODY

ALS COC#: 36757 ALS Laboratory: EW Wollongong

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 28/4/22 1830	DATE TIME:	DATE TIME:

CLIENT: SMEAUS - SMEC AUSTRALIA PTY LTD

PROJECT: Port Kembla GME

SITE: Port Kembla Manildra April 2022

ORDER NO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

PROJECT MANAGER: Joel Reynolds CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Joel Reynolds QUOTE NO: SY/080/21 / ES2021SMEAUS0001

EMAIL REPORTS TO:

EMAIL INVOICES TO:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No (N/A)

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: 2.6 °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	OHMW28	Clear Plastic Bottle - Nitric Acid; Filtered	60 mL	00121121035922	Red	Yes	
001	OHMW28	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121056554	Purple	No	
001	OHMW28	HDPE (no PTFE)	20 mL	00350621010804	Grey	No	
001	OHMW28	HDPE (no PTFE)	20 mL	00350621010597	Grey	No	
001	OHMW28	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121035822	Red	No	
001	OHMW28	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038153	Purple	No	
001	OHMW28	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038137	Purple	No	
001	OHMW28	Amber Glass Bottle - Unpreserved	100 mL	00401121031384	Orange	No	
001	OHMW28	Clear Plastic Bottle - Natural	250 mL	00070621153139	Green	No	
001	OHMW28	HDPE (no PTFE)	20 mL	00350621010735	Grey	No	
001	OHMW28	HDPE (no PTFE)	20 mL	00350621010801	Grey	No	
002	SMW02	Amber Glass Bottle - Unpreserved	100 mL	00401121031389	Orange	No	
002	SMW02	Amber Glass Bottle - Unpreserved	100 mL	00401121031378	Orange	No	
002	SMW02	Amber Glass Bottle - Unpreserved	100 mL	00401121031395	Orange	No	
002	SMW02	Amber Glass Bottle - Unpreserved	100 mL	00401121031397	Orange	No	
002	SMW02	Amber Glass Bottle - Unpreserved	100 mL	00401121031401	Orange	No	
002	SMW02	Amber Glass Bottle - Unpreserved	100 mL	00401121031388	Orange	No	
002	SMW02	Amber Glass Bottle - Unpreserved	100 mL	00401121031391	Orange	No	
002	SMW02	Amber Glass Bottle - Unpreserved	100 mL	00401121031375	Orange	No	
002	SMW02	Amber Glass Bottle - Unpreserved	100 mL	00401121031381	Orange	No	
002	SMW02	Amber Glass Bottle - Unpreserved	100 mL	00401121031382	Orange	No	
002	SMW02	Clear Plastic Bottle - Nitric Acid; Filtered	60 mL	00121121036393	Red	Yes	
002	SMW02	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121036458	Red	No	
002	SMW02	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121056601	Purple	No	
002	SMW02	HDPE (no PTFE)	20 mL	00350621010899	Grey	No	
002	SMW02	HDPE (no PTFE)	20 mL	00350621010991	Grey	No	

CHAIN OF CUSTODY

COC#: 36757 ALS Laboratory: EW Wollongong

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 28/4/22 1839	DATE TIME:	DATE TIME:

CLIENT: SMEAUS - SMEC AUSTRALIA PTY LTD

PROJECT: Port Kembla GME

SITE: Port Kembla Manildra April 2022

ORDER NO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No (N/A)

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: 2.6 °C

Other comments:

PROJECT MANAGER: Joel Reynolds CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Joel Reynolds QUOTE NO: SY/080/21 / ES2021SMEAUS0001

EMAIL REPORTS TO:

EMAIL INVOICES TO:

002	SMW02	Clear Plastic Bottle - Natural	250 mL	00070621153162	Green	No	
002	SMW02	Amber VOC Vial - Sulfuric Acid	40 mL	00161121037916	Purple	No	
002	SMW02	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038184	Purple	No	
003	OHMW20	Clear Plastic Bottle - Nitric Acid; Filtered	60 mL	00121121035882	Red	Yes	
003	OHMW20	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121035790	Red	No	
003	OHMW20	Amber VOC Vial - Sulfuric Acid	40 mL	00161121037977	Purple	No	
003	OHMW20	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038003	Purple	No	
003	OHMW20	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121056571	Purple	No	
003	OHMW20	Clear Plastic Bottle - Natural	250 mL	00070621153166	Green	No	
003	OHMW20	Amber Glass Bottle - Unpreserved	100 mL	00401121031405	Orange	No	
003	OHMW20	HDPE (no PTFE)	20 mL	00350621010898	Grey	No	
003	OHMW20	HDPE (no PTFE)	20 mL	00350621010517	Grey	No	
004	SMW05	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121056822	Purple	No	
004	SMW05	Clear Plastic Bottle - Nitric Acid; Filtered	60 mL	00121121035773	Red	Yes	
004	SMW05	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121036410	Red	No	
004	SMW05	Clear Plastic Bottle - Natural	250 mL	00070621153044	Green	No	
004	SMW05	Amber Glass Bottle - Unpreserved	100 mL	00401121031413	Orange	No	
004	SMW05	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038183	Purple	No	
004	SMW05	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038165	Purple	No	
004	SMW05	HDPE (no PTFE)	20 mL	00350621010640	Grey	No	
004	SMW05	HDPE (no PTFE)	20 mL	00350621010879	Grey	No	
005	SMW03	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038206	Purple	No	
005	SMW03	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038173	Purple	No	
005	SMW03	Amber Glass Bottle - Unpreserved	100 mL	00401121031374	Orange	No	
005	SMW03	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121056574	Purple	No	
005	SMW03	Clear Plastic Bottle - Natural	250 mL	00070621153141	Green	No	
005	SMW03	Clear Plastic Bottle - Nitric Acid; Filtered	60 mL	00121121036466	Red	Yes	

CHAIN OF CUSTODY

COC#: 36757 ALS Laboratory: EW Wollongong

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 28/4/22 1850	DATE TIME:	DATE TIME:

CLIENT: SMEAUS - SMEC AUSTRALIA PTY LTD

PROJECT: Port Kembla GME

SITE: Port Kembla Manildra April 2022

ORDER NO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: 2.6 °C

Other comments:

PROJECT MANAGER: Joel Reynolds CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Joel Reynolds QUOTE NO: SY/080/21 / ES2021SMEAUS0001

EMAIL REPORTS TO:

EMAIL INVOICES TO:

005	SMW03	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121035965	Red	No	
005	SMW03	HDPE (no PTFE)	20 mL	00350621010948	Grey	No	
005	SMW03	HDPE (no PTFE)	20 mL	00350621010495	Grey	No	
006	SMW04	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121056757	Purple	No	
006	SMW04	Clear Plastic Bottle - Natural	250 mL	00070621153176	Green	No	
006	SMW04	Amber VOC Vial - Sulfuric Acid	40 mL	00161121037841	Purple	No	
006	SMW04	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038079	Purple	No	
006	SMW04	HDPE (no PTFE)	20 mL	00350621010942	Grey	No	
006	SMW04	HDPE (no PTFE)	20 mL	00350621011020	Grey	No	
006	SMW04	Clear Plastic Bottle - Nitric Acid; Filtered	60 mL	00121121035821	Red	Yes	
006	SMW04	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121035813	Red	No	
006	SMW04	Amber Glass Bottle - Unpreserved	100 mL	00401121031410	Orange	No	
007	SMW01	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038101	Purple	No	
007	SMW01	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038015	Purple	No	
007	SMW01	Clear Plastic Bottle - Nitric Acid; Filtered	60 mL	00121121035928	Red	Yes	
007	SMW01	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121035782	Red	No	
007	SMW01	Clear Plastic Bottle - Natural	250 mL	00070621153175	Green	No	
007	SMW01	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121056560	Purple	No	
007	SMW01	HDPE (no PTFE)	20 mL	00350621010647	Grey	No	
007	SMW01	HDPE (no PTFE)	20 mL	00350621011073	Grey	No	
007	SMW01	Amber Glass Bottle - Unpreserved	100 mL	00401121031403	Orange	No	
007	SMW01	Amber Glass Bottle - Unpreserved	100 mL	00401121031392	Orange	No	
007	SMW01	Amber Glass Bottle - Unpreserved	100 mL	00401121031383	Orange	No	
007	SMW01	Amber Glass Bottle - Unpreserved	100 mL	00401121031412	Orange	No	
007	SMW01	Amber Glass Bottle - Unpreserved	100 mL	00401121031408	Orange	No	
007	SMW01	Amber Glass Bottle - Unpreserved	100 mL	00401121031411	Orange	No	
008	SMW06	Clear Plastic Bottle - Nitric Acid; Filtered	60 mL	00121121035896	Red	Yes	

CHAIN OF CUSTODY

ALS COC#: 36757 ALS Laboratory: EW Wollongong

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 28/4/22 1850	DATE TIME:	DATE TIME:

CLIENT: SMEAUS - SMEC AUSTRALIA PTY LTD

PROJECT: Port Kembla GME

SITE: Port Kembla Manildra April 2022

ORDER NO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No (N/A)

Free ice / frozen ice bricks present upon receipt? (Yes) No N/A

Random Sample Temperature on Receipt: 2.6 °C

Other comments:

PROJECT MANAGER: Joel Reynolds CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Joel Reynolds QUOTE NO: SY/080/21 / ES2021SMEAUS0001

EMAIL REPORTS TO:

EMAIL INVOICES TO:

008	SMW06	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121057065	Purple	No	
008	SMW06	Amber Glass Bottle - Unpreserved	100 mL	00400621020955	Orange	No	
008	SMW06	Amber Glass Bottle - Unpreserved	100 mL	00400621020956	Orange	No	
008	SMW06	Amber Glass Bottle - Unpreserved	100 mL	00400621020953	Orange	No	
008	SMW06	Amber Glass Bottle - Unpreserved	100 mL	00400621020954	Orange	No	
008	SMW06	Amber Glass Bottle - Unpreserved	100 mL	00400621020957	Orange	No	
008	SMW06	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121035998	Red	No	
008	SMW06	HDPE (no PTFE)	20 mL	00350621010997	Grey	No	
008	SMW06	HDPE (no PTFE)	20 mL	00350621010916	Grey	No	
008	SMW06	HDPE (no PTFE)	20 mL	00350621010992	Grey	No	
008	SMW06	HDPE (no PTFE)	20 mL	00350621010844	Grey	No	
008	SMW06	Amber Glass Bottle - Unpreserved	100 mL	00401121031404	Orange	No	
008	SMW06	Clear Plastic Bottle - Natural	250 mL	00070621153048	Green	No	
008	SMW06	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038143	Purple	No	
008	SMW06	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038180	Purple	No	
008	SMW06	Amber Glass Bottle - Unpreserved	100 mL	00401121031406	Orange	No	
008	SMW06	Amber Glass Bottle - Unpreserved	100 mL	00401121031402	Orange	No	
008	SMW06	Amber Glass Bottle - Unpreserved	100 mL	00401121031393	Orange	No	
008	SMW06	Amber Glass Bottle - Unpreserved	100 mL	00401121031398	Orange	No	
008	SMW06	Amber Glass Bottle - Unpreserved	100 mL	00400621020946	Orange	No	
009	QA1	Clear Plastic Bottle - Natural	250 mL	00070621153147	Green	No	
009	QA1	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121056638	Purple	No	
009	QA1	Clear Plastic Bottle - Nitric Acid; Filtered	60 mL	00121121035802	Red	Yes	
009	QA1	HDPE (no PTFE)	20 mL	00350621010870	Grey	No	
009	QA1	HDPE (no PTFE)	20 mL	00350621010893	Grey	No	
009	QA1	Amber Glass Bottle - Unpreserved	100 mL	00401121031396	Orange	No	
009	QA1	Amber VOC Vial - Sulfuric Acid	40 mL	00161121037895	Purple	No	

CHAIN OF CUSTODY

ALS COC#: 36757 ALS Laboratory: EW Wollongong

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 28/4/22 1330	DATE TIME:	DATE TIME:

CLIENT: SMEAUS - SMEC AUSTRALIA PTY LTD

PROJECT: Port Kembla GME

SITE: Port Kembla Manildra April 2022

ORDER NO:

PROJECT MANAGER: Joel Reynolds CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Joel Reynolds QUOTE NO: SY/080/21 / ES2021SMEAUS0001

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No (N/A)

(Free ice) / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: 2.6 °C

Other comments:

009	QA1	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038158	Purple	No	
009	QA1	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121035801	Red	No	
009	QA1	HDPE (no PTFE)	20 mL	00350621010586	Grey	No	
009	QA1	HDPE (no PTFE)	20 mL	00350621010574	Grey	No	
010	QA1A	Clear Plastic Bottle - Nitric Acid; Filtered	60 mL	00121121035786	Red	Yes	
010	QA1A	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121035789	Red	No	
010	QA1A	Clear Plastic Bottle - Natural	250 mL	00070621153172	Green	No	
010	QA1A	Amber Glass Bottle - Unpreserved	100 mL	00401121031409	Orange	No	
010	QA1A	HDPE (no PTFE)	20 mL	00350621010672	Grey	No	
010	QA1A	HDPE (no PTFE)	20 mL	00350621010765	Grey	No	
010	QA1A	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121056607	Purple	No	
010	QA1A	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038202	Purple	No	
010	QA1A	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038176	Purple	No	
011	Trip blank	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038122	Purple	No	
012	Trip Spike	Amber VOC Vial - Sulfuric Acid	40 mL	00161121037571	Purple	No	
013	Rinsate 01	Amber Glass Bottle - Unpreserved	100 mL	00400621020968	Orange	No	
013	Rinsate 01	Amber Glass Bottle - Unpreserved	100 mL	00400621084683	Orange	No	
013	Rinsate 01	Amber Glass Bottle - Unpreserved	100 mL	00400621020939	Orange	No	
013	Rinsate 01	Amber Glass Bottle - Unpreserved	100 mL	00400621020960	Orange	No	
013	Rinsate 01	Amber Glass Bottle - Unpreserved	100 mL	00401121031386	Orange	No	
013	Rinsate 01	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038178	Purple	No	
013	Rinsate 01	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121035904	Red	No	
013	Rinsate 01	Clear Plastic Bottle - Nitric Acid; Unfiltered	60 mL	00121121035890	Red	No	
013	Rinsate 01	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121057092	Purple	No	
013	Rinsate 01	Amber VOC Vial - Sulfuric Acid	40 mL	00161121038226	Purple	No	
013	Rinsate 01	HDPE (no PTFE)	20 mL	00350621011031	Grey	No	
013	Rinsate 01	HDPE (no PTFE)	20 mL	00350621010912	Grey	No	

CHAIN OF CUSTODY

COC#: 36757 *ALS Laboratory:* EW Wollongong

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 28/4/22 1850	DATE TIME:	DATE TIME:

CLIENT: SMEAUS - SMEC AUSTRALIA PTY LTD

PROJECT: Port Kembla GME

SITE: Port Kembla Manildra April 2022

ORDER NO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

PROJECT MANAGER: Joel Reynolds
PRIMARY SAMPLER: Joel Reynolds

CONTACT PH:
QUOTE NO: SY/080/21

SAMPLER MOBILE:
/ ES2021SMEAUS0001

EMAIL REPORTS TO:

EMAIL INVOICES TO:

LABORATORY USE ONLY (Circle)

Custody Seal intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:	2.6	°C	
Other comments:			

Total Bottle Count: ALS: 134, Non ALS: 12

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E: samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT: SMEC	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE:		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes / No / (N/A)
PROJECT: 30013038	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes / No / N/A
ORDER NUMBER:		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 10.3 °C
PROJECT MANAGER: Joel Reynolds	CONTACT PH:	OF: 1 2 3 4 5 6 7	Other comment:
SAMPLER:	SAMPLER MOBILE:	RELINQUISHED BY:	RECEIVED BY: Dom
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	DATE/TIME:	DATE/TIME: 27/4/22 1600
Email Reports to (will default to PM if no other addresses are listed):		RELINQUISHED BY:	RECEIVED BY: Sophie
Email Invoice to (will default to PM if no other addresses are listed):		DATE/TIME:	DATE/TIME: 27/4/22 1853

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: COC#: 36757

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES									Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
				TOTAL										

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

Samples received without CoC

CLIENT / SENDER:	SMEC
PROJECT:	30013038
CONTACT NAME:	
CONTACT NUMBER:	
CARRIER:	
CONNOTE REFERENCE:	
SAMPLER:	
NUMBER OF SAMPLES:	
Client services notified by:	

COC SEQUENCE NUMBER (Circle)

COC:	1	2	3	4	5	6	7
OF:	1	2	3	4	5	6	7

SAMPLES RECEIVED BY: Sofia Lo

DATE/TIME: 27/4/22 1530

ANALYSIS RECEIVED BY:

DATE/TIME:

Comments: ATC
2 Esky's
NO COC
water sample in office

ALS WO Label

LAB ID	SAMPLE DETAILS: SAMPLE ID	DATE	MATRIX	NUMBER OF CONTAINERS	Additional Information
	SMW03		W		
	SMW04		↓		
	OH MW20		↓		

Appendix H

Dewatering Factsheet

Fact sheet

Water access licence exemption

for aquifer interference activities taking 3ML or less of groundwater per year

In December 2019 the NSW government introduced an exemption in the Water Management (General) Regulation 2018 that allows a small volume of groundwater to be taken through certain aquifer interference activities without the need for a water access licence.

Exemption from needing a water access licence

Under the exemption, a person can take up to 3 megalitres of groundwater through an aquifer interference activity per authorised project per water year without needing to obtain a water access licence, provided:

a) the water is not taken primarily for consumption or supply; and
b) the person claiming the exemption keeps a record of the water taken under the exemption and provides this to the Minister within 28 days of the end of the water year; and
c) the records are kept for 5 years.

Examples of aquifer interference activities to which the exemption may apply include:

- quarrying, excavating, dredging or exploring for stone, aggregate, sand or gravel;
- exploring for minerals, (including coal) or petroleum;
- excavation to construct or maintain a building, road or infrastructure;
- remediation of groundwater contamination;
- conducting pumping tests to investigate bore capacity or groundwater system characteristics;
- sampling for water quality from monitoring bores;
- ongoing dewatering of basements;
- creation of an artificial lake that intersects with groundwater and allows evaporation from it;
- investigation of groundwater resources or geotechnical investigation;
- operation of ground source heating or cooling systems.

The exemption provides a consistent, volume-based approach for the take of small volumes of groundwater and reduces red tape, delays and costs for businesses undertaking these aquifer interference activities.

Three megalitres per year is similar to the volume taken by landholders in accordance with domestic and stock rights held under section 52 of the *Water Management Act 2000*, for which a water access licence is not required to be held.

For mining and petroleum (including coal seam gas) activities, the exemption only applies to groundwater taken at the exploration stage. It does not apply to water taken during the production stage of mining and petroleum activities.

Fact sheet

Water access licence exemption

for aquifer interference activities taking 3ML or less of groundwater per year

Claiming the exemption

The exemption only applies where groundwater is taken incidentally so that the aquifer interference activity can occur. That is, the purpose of taking the water must not be for its consumption or supply. The groundwater taken may subsequently be used for other purposes, for example for dust suppression or mixing concrete.

No application is needed to rely on the exemption, however proponents must record the water taken under the exemption on the approved recording and reporting form at the end of each period of take no later than 24 hours after the water is taken, for each water year in which an exemption is claimed. The form must be provided to the Minister's representative within 28 days of the end of the water year in which the water was taken.

Proponents must record the following information:

- The total amount of groundwater taken per year per authorised project under the exemption.
- The date or dates on which the groundwater was taken.
- A description of the method used to measure the volume of groundwater taken.
- The groundwater source from which the water was taken.
- The authority under which the water is being taken, for example water supply work approval, licence under the *Water Act 1912*, development consent, complying development or an approval exemption under legislation.
- The details of the person taking water.
- A description of the activity taking water.
- The location of the activity taking water.

Proponents of activities should check whether an approval and an assessment of impacts are required to carry out the activity regardless of whether this water access licence exemption applies.

More information

See FAQs for this exemption.

If you have any questions, please contact one of our friendly Customer Service team on 1300 662 077 or email Customer.Helpdesk@waternsw.com.au

[1] ***Authorised project*** *is defined in clause 7(5) of Schedule 4 to the Water Management (General) Regulation 2018, being an activity –*

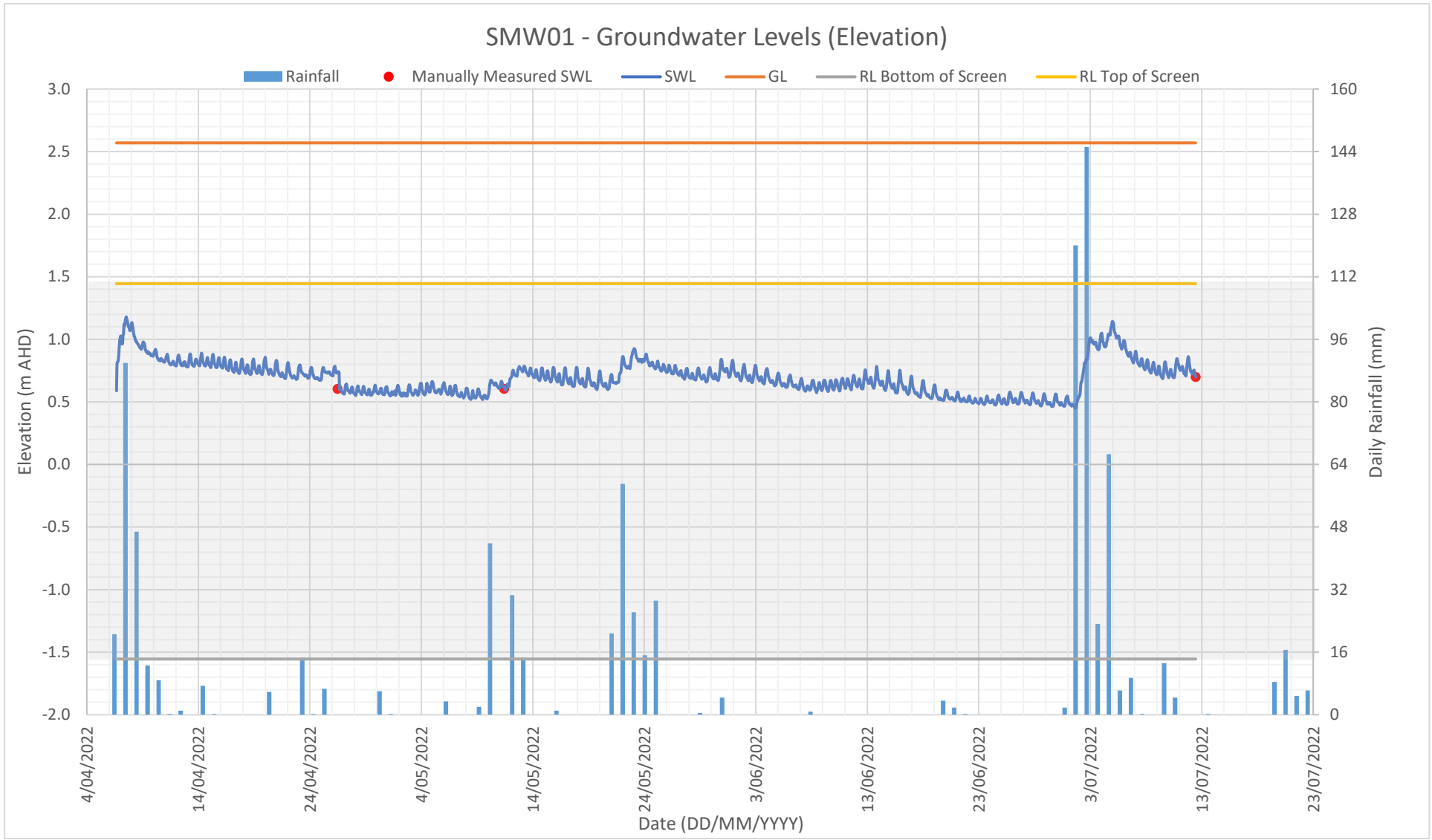
a) that is the subject of a consent, approval or other lawful authority conferred by or under an Act, or

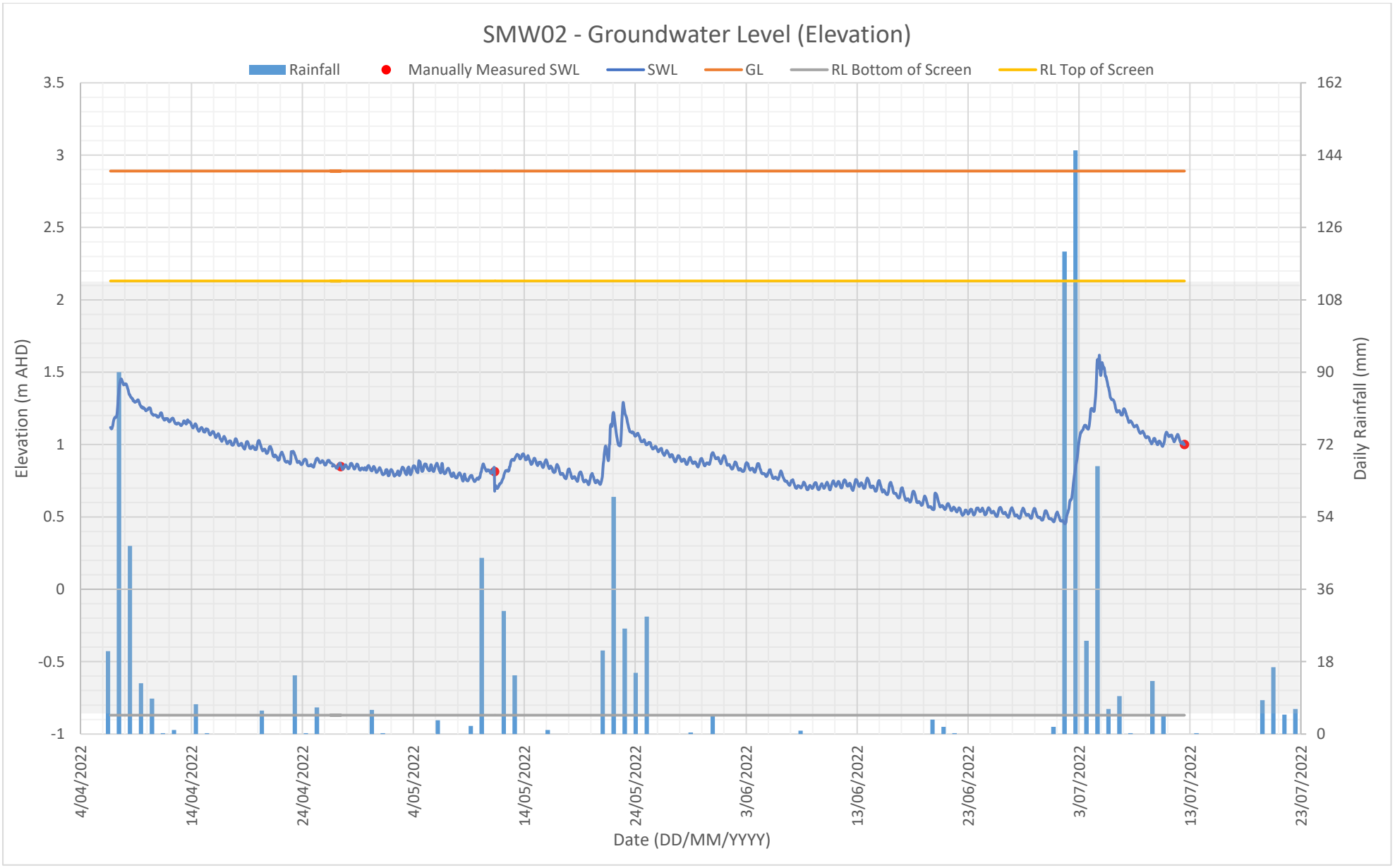
b) to which Division 5.1 of the Environmental Planning and Assessment Act 1979 applies, or

c) that is exempt development under that Act.

Appendix I

Hydrographs


SMW01 - Groundwater Levels (Elevation)
Rainfall
Manually Measured SWL
SWL
GL
RL Bottom of Screen
RL Top of Screen
Elevation (m AHD)
Daily Rainfall (mm)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
160
144
128
112
96
80
64
48
32
16
0
4/04/2022
14/04/2022
24/04/2022
4/05/2022
14/05/2022
24/05/2022
3/06/2022
13/06/2022
23/06/2022
3/07/2022
13/07/2022
23/07/2022
Date (DD/MM/YYYY)


SMW02 - Groundwater Level (Elevation)
Rainfall
Manually Measured SWL
SWL
GL
RL Bottom of Screen
RL Top of Screen
Elevation (m AHD)
Daily Rainfall (mm)
Date (DD/MM/YYYY)
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
162
144
126
108
90
72
54
36
18
0
4/04/2022
14/04/2022
24/04/2022
4/05/2022
14/05/2022
24/05/2022
3/06/2022
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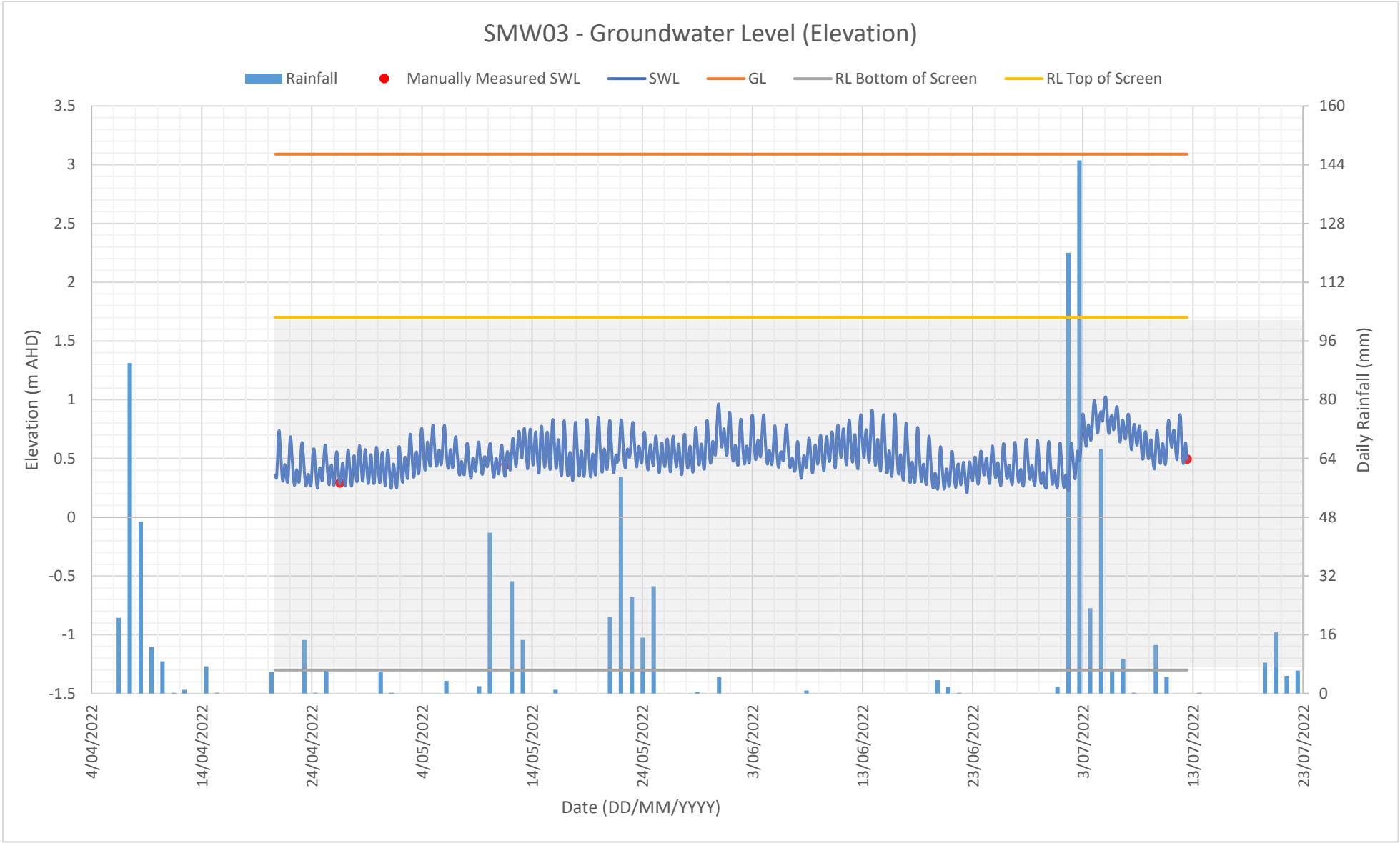
23/06/2022
3/07/2022
13/07/2022
23/07/2022


SMW03 - Groundwater Level (Elevation)
Rainfall
Manually Measured SWL
SWL
GL
RL Bottom of Screen
RL Top of Screen
Elevation (m AHD)
Daily Rainfall (mm)
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
160
144
128
112
96
80
64
48
32
16
0
4/04/2022
14/04/2022
24/04/2022
4/05/2022
14/05/2022
24/05/2022
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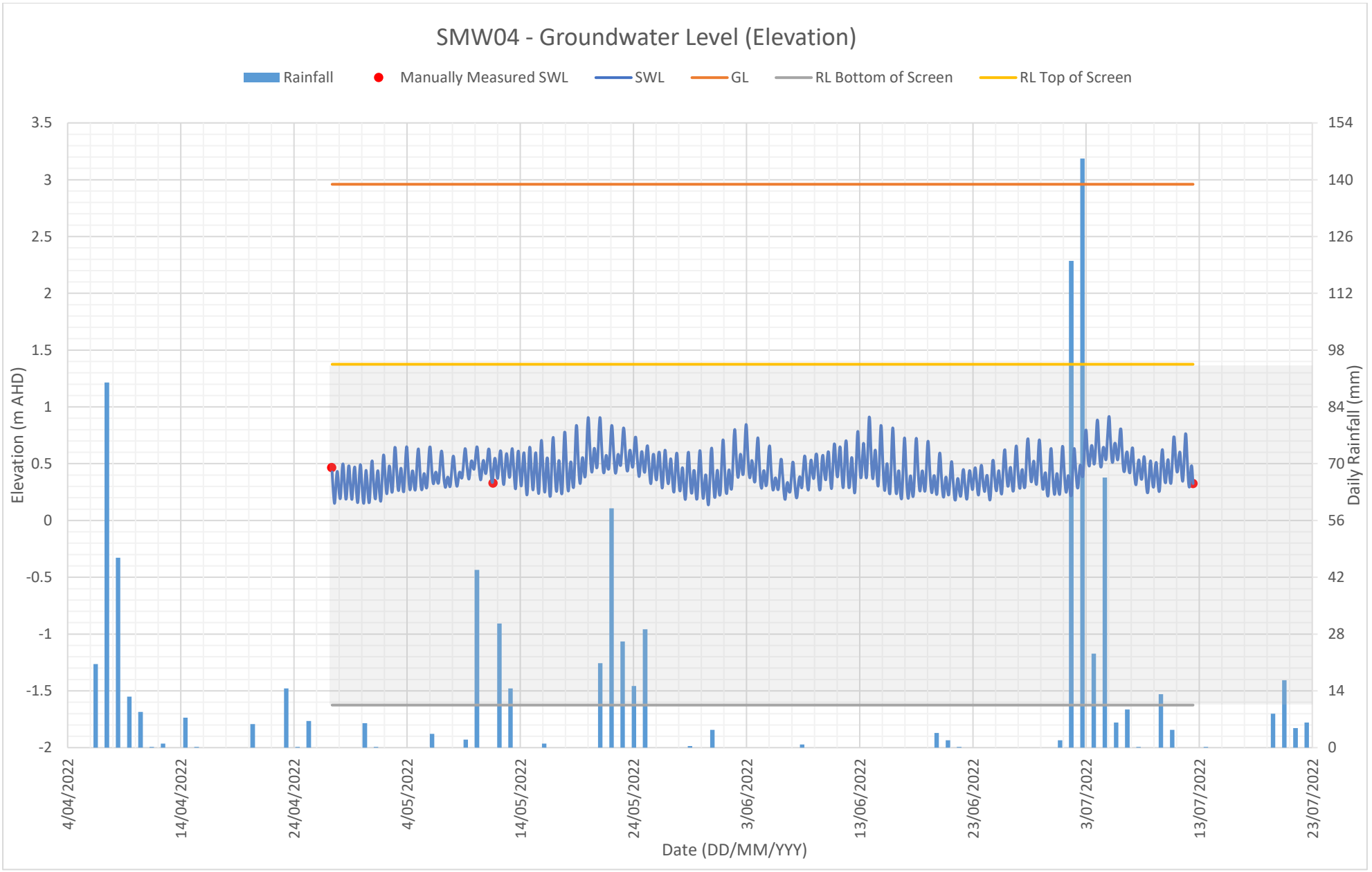
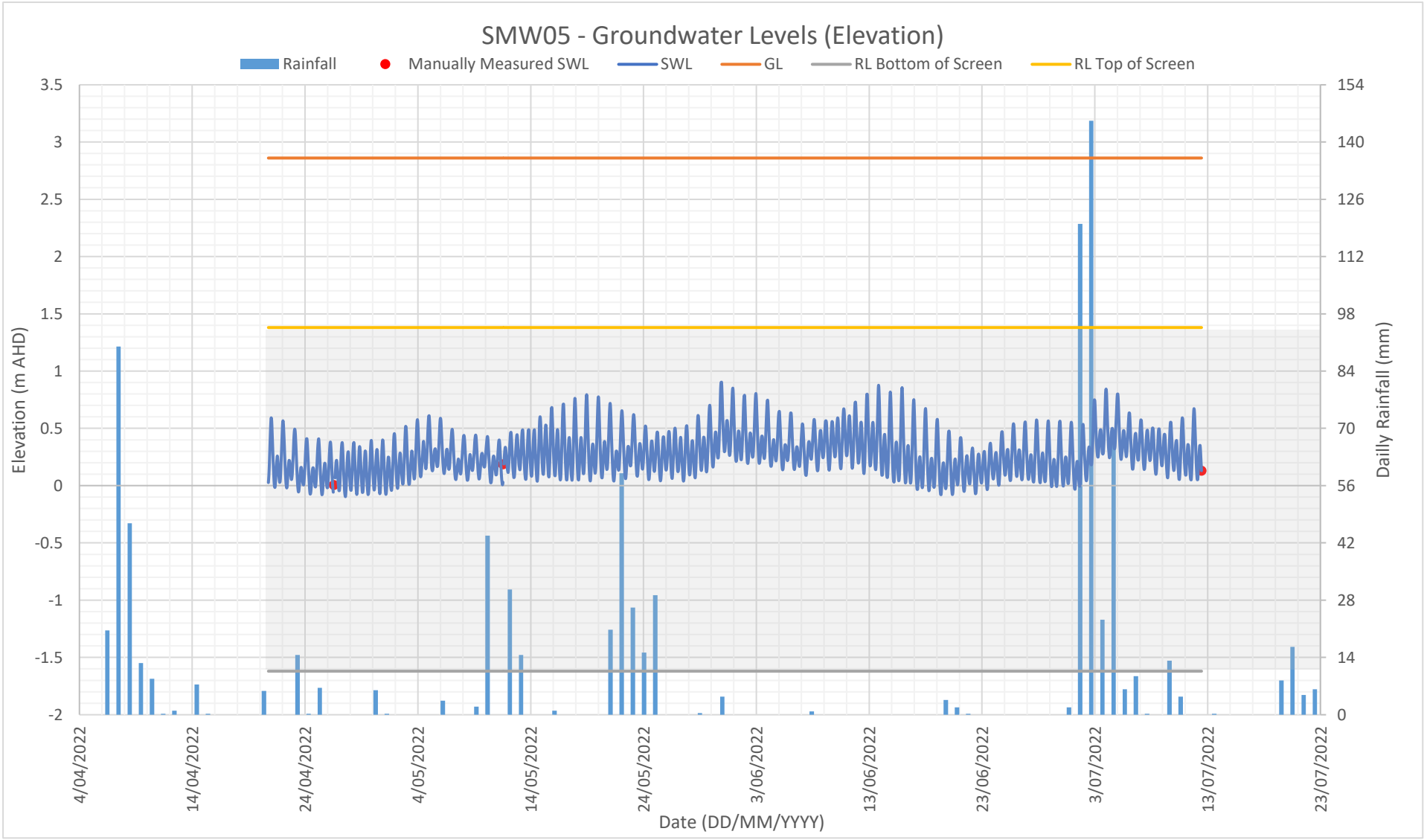
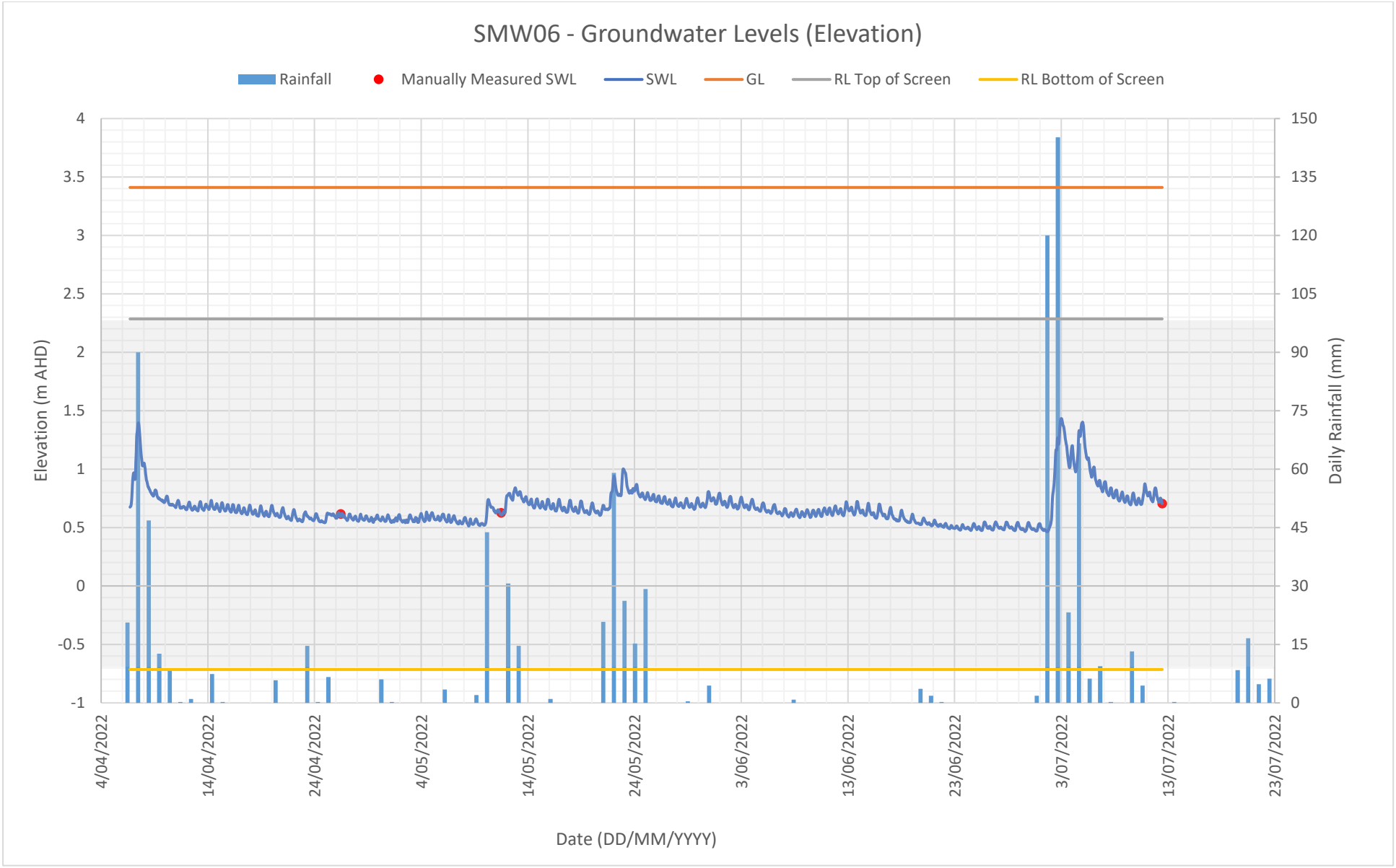
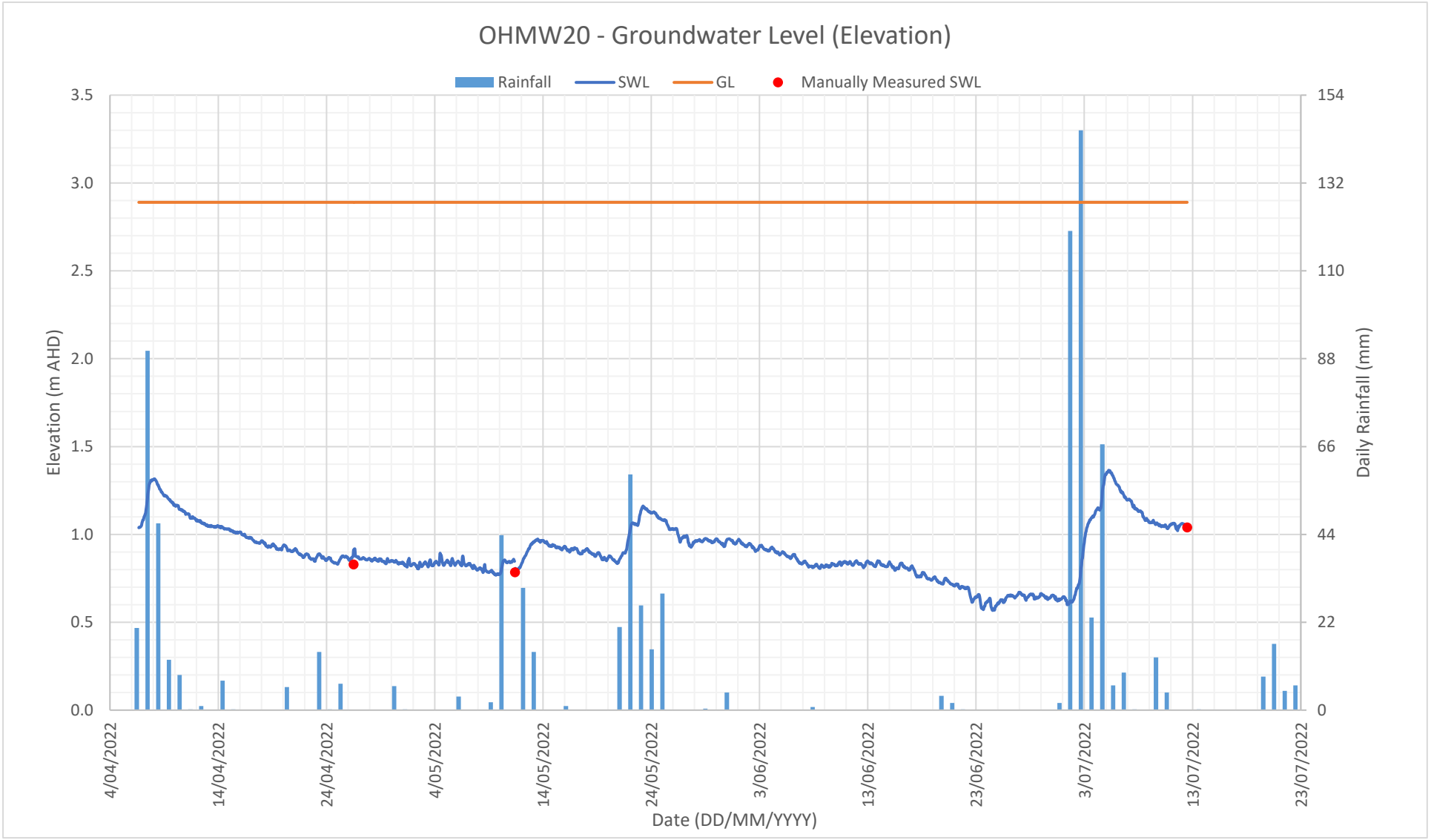
13/07/2022
23/07/2022
Date (DD/MM/YYYY)

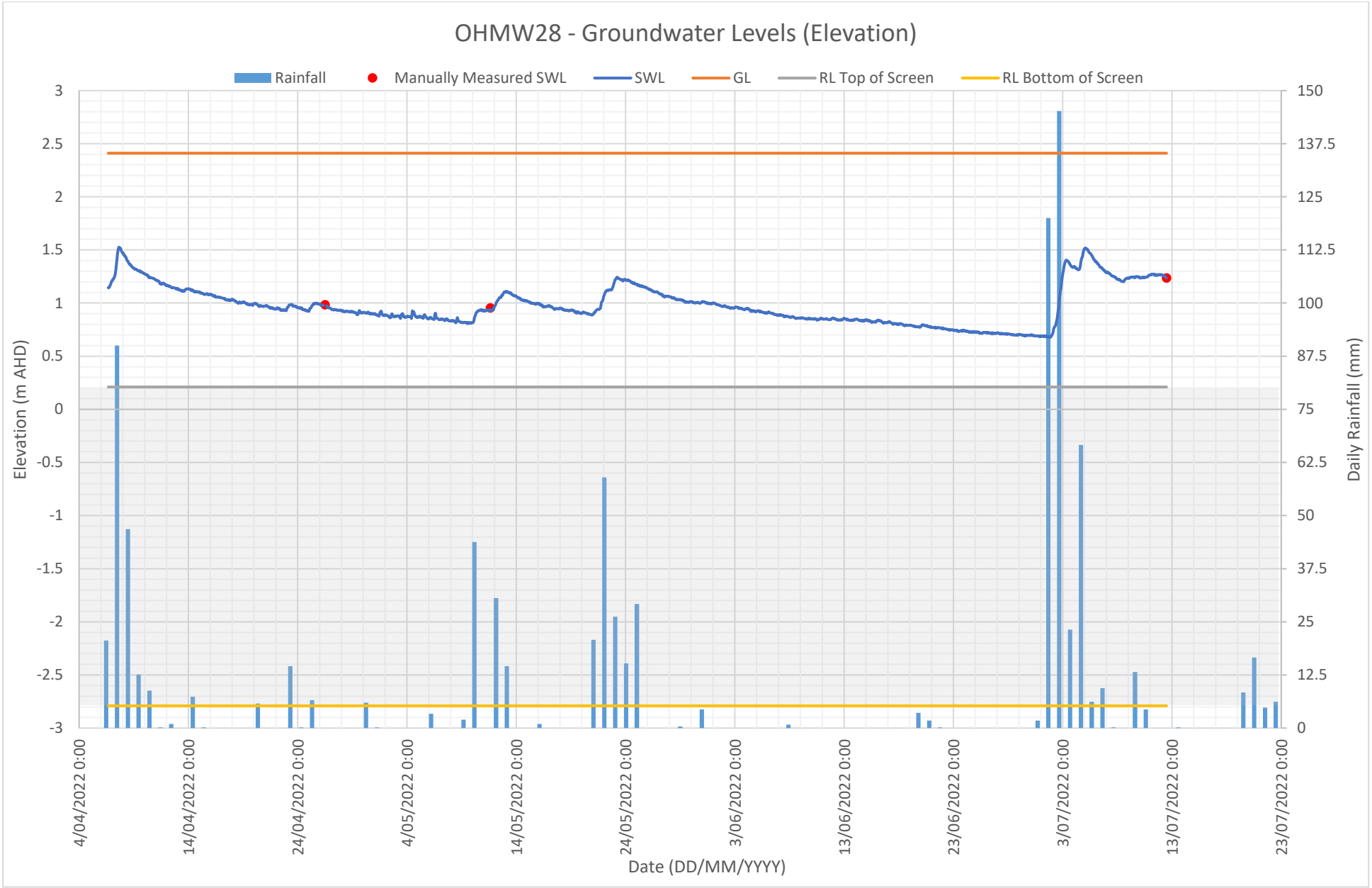

SMW04 - Groundwater Level (Elevation)
Rainfall
Manually Measured SWL
SWL
GL
RL Bottom of Screen
RL Top of Screen
Elevation (m AHD)
Daily Rainfall (mm)
Date (DD/MM/YYY)
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
154
140
126
112
98
84
70
56
42
28
14
0
4/04/2022
14/04/2022
24/04/2022
4/05/2022
14/05/2022
24/05/2022
3/06/2022
13/06/2022
23/06/2022
3/07/2022
13/07/2022
23/07/2022


SMW05 - Groundwater Levels (Elevation)
Rainfall
Manually Measured SWL
SWL
GL
RL Bottom of Screen
RL Top of Screen
Elevation (m AHD)
Dailly Rainfall (mm)
Date (DD/MM/YYYY)
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
154
140
126
112
98
84
70
56
42
28
14
0
4/04/2022
14/04/2022
24/04/2022
4/05/2022
14/05/2022
24/05/2022
3/06/2022
13/06/2022
23/06/2022
3/07/2022
13/07/2022
23/07/2022


SMW06 - Groundwater Levels (Elevation)
Rainfall
Manually Measured SWL
SWL
GL
RL Top of Screen
RL Bottom of Screen
Elevation (m AHD)
Daily Rainfall (mm)
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
150
135
120
105
90
75
60
45
30
15
0
4/04/2022
14/04/2022
24/04/2022
4/05/2022
14/05/2022
24/05/2022
3/06/2022
13/06/2022
23/06/2022
3/07/2022
13/07/2022
23/07/2022
Date (DD/MM/YYYY)



OHMW20 well construction details not available


OHMW28 - Groundwater Levels (Elevation)
Rainfall
Manually Measured SWL
SWL
GL
RL Top of Screen
RL Bottom of Screen
Elevation (m AHD)
Daily Rainfall (mm)
Date (DD/MM/YYYY)
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
150
137.5
125
112.5
100
87.5
75
62.5
50
37.5
25
12.5
0
4/04/2022 0:00
14/04/2022 0:00
24/04/2022 0:00
4/05/2022 0:00
14/05/2022 0:00
24/05/2022 0:00
3/06/2022 0:00
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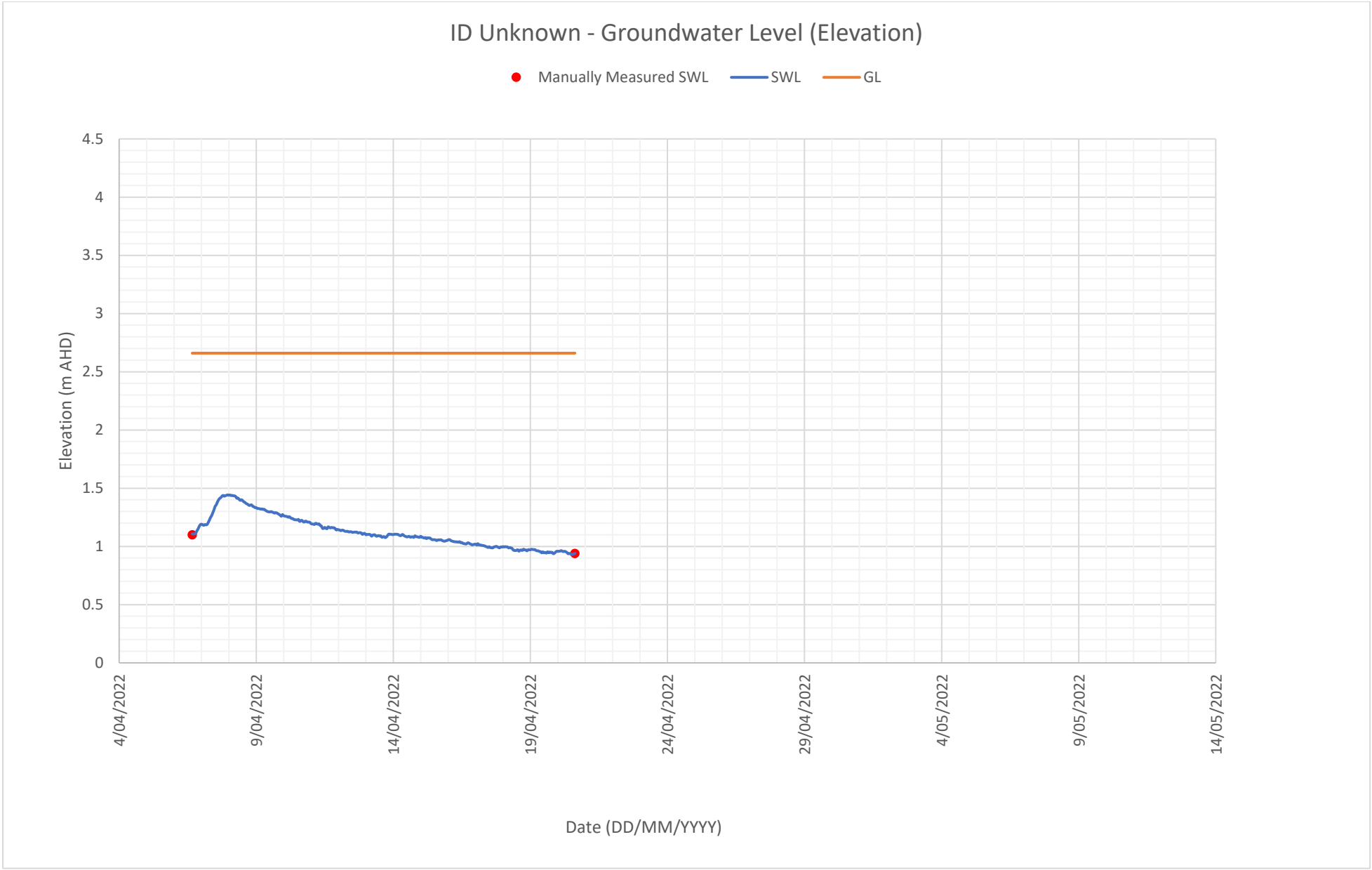

ID Unknown well construction details not available

SMEC Wollongong

Level 2, 6-8 Regent Street, Wollongong NSW
Phone: +61 2 4243 4400
Email: wollongong@smec.com