Water Quality Monitoring – Round 3

Site B4A, 37 Friendship Road, Port Botany
Vopak Terminals Australia Pty Ltd
P034521.004 / C0256
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CERTIFIED ENVIRONMENTAL PRACTITIONER
Financial Year 2021/2022
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Definitions and Abbreviations

AHD	Australian Height Datum
ANZECC	Australia and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
BOD	Biological Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
COC	Chain-of-Custody
CoPC	Contaminant(s) of Potential Concern
DO	Dissolved Oxygen
DQI	Data Quality Indicators
DQO	Data Quality Objectives
EC	Electrical Conductivity
EPA	Environment Protection Authority
GPS	Global Positioning System
ID	Identification
LOR	Limit of Reporting
NAPL	Light Non-Aqueous Phase Liquid
mBGL	Metres Below Ground Level
MGA	Map Grid of Australia
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEPM	National Environmental Protection Measure
NEMP	National Environmental Management Plan
NAPL	Non-Aqueous Phase Liquid
ORP	Oxidation Reduction Potential
PAH	Polycyclic Aromatic Hydrocarbons
PRM	Progressive Risk Management
QAQC	Quality Assurance and Quality Control
SWL	Standing Water Level
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
WHS	Work Health and Safety
WMP	Water Management Plan
WQM	Water Quality Monitoring

1. Introduction and Background

Progressive Risk Management (PRM) was engaged by Vopak Terminals Australia Pty Ltd (Vopak) to undertake water quality monitoring of existing groundwater wells as part of the Water Quality Monitoring (WQM) program for Site B4A, located at Lot 20 of DP1210638, 37 Friendship Road, Port Botany (hereafter referred to as 'the site').

See **Figure 1** for site locality and **Figure 2** for site location.

This factual report summaries the key findings from Round 3 (March 2022) of the groundwater sampling event.

The site is currently a liquid fuels storage depot with three above ground storage tanks with a total nominal capacity of 200 megalitres and stores petroleum products.

PRM completed a Baseline Contamination Assessment of the site in March 2020 that was limited to soil investigations and sampling of one existing groundwater well (ref: P034521.001, Baseline Contamination Assessment, 39 Friendship Road Port Botany, March 2020 - PRM, 2020). A subsequent Water Management Plan (WMP) was prepared for the site for Vopak in June 2021 (ref: 20758-RP-001, Water Management Plan, Vopak Site B4A, 23 June 2021). In relation to groundwater, the WMP identifies the need for installation of five new wells and WQM to be conducted preoperational (monthly) and over the course of the operational period (quarterly for first 2 years). The WMP references the advice provided by EMM Consulting on the installation and sampling requirements for groundwater wells.

To satisfy this requirement, PRM installed five groundwater wells and completed pre operational monitoring in October 2021 (ref:P034521.002 Water Quality Monitoring – Pre-operational, Site B4A, 37 Friendship Road, Port Botany – PRM October 2021). No contaminants of potential concern (CoPC) were detected in groundwater above the LOR or above the adopted Site Assessment Criteria (SAC). The data collected during the assessment was considered representative of baseline conditions. A subsequent Round 2 monitoring event was completed by PRM in December 2021 with all analytical results below the adopted SAC and/or laboratory LOR.

This WQM report has been prepared to meet the requirements of quarterly WQM outlined in the WMP. The summary report has been prepared in accordance PRM Proposal Q1502 (dated 15 September 2021). This report should be read in conjunction with the WMP (Vopak, 2021).

1.1. Objective

The objective of the WQM is to determine if the groundwater underlying the site has potentially been impacted from onsite activities. All monitoring is to be undertaken as per the requirements in the sites WMP (Vopak, 2021).

1.2. Scope of Work

The following scope of works was undertaken:

- Project management and provision of work health and safety documentation.
- Groundwater sampling in accordance with the requirements specified in the WMP.
- Preparation of a brief factual report providing the details of the results against screening criteria provided in the WMP.

All works have been completed in general accordance with relevant Standards, Codes of Practice, Regulations and guidance.

1.3. Regulatory Guidance

This WQM is to comply with the requirements of the WMP. The WMP is for the operation of the B4A site and addresses consent conditions for the overall B4 site that are relevant to surface and groundwater management during operation of the facility. The WMP forms part of the Operations Environmental Management Plan (OEMP). The B4 site holds an

Environment Protection License (EPL #6007). The WMP has been submitted to NSW EPA for the modification of the existing EPL to include the B4A site.

The standards and methodologies that have been used to develop this monitoring report are those made or approved by the NSW Environment Protection Authority (EPA) and generally comply with the provisions of the NSW Contaminated Land Management Act (1997). The documents where these standards and methodologies are described comprise:

- *Guidelines for the Assessment and Management of Groundwater Contamination (NSW DECC, 2007).*
- *Australian and New Zealand Environmental and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Guidelines for Fresh and Marine Water Quality 2000 (ANZECC, 2000).*
- *National Health and Medical Research Council Guidelines for Managing Risks in Recreational Water Australia 2008 (NHMRC, 2008).*
- *National Environment Protection Council (1999, Revised 2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC, 2013).*
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Governments 2018 (ANZG, 2018)*
- *Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales (NSW DEC, 2004).*
- *AS/NZS 5667.11:1998 Water quality – Sampling, Part 11: Guidance on sampling of groundwaters*

1.4. Monitoring Schedule

The WMP proposed monitoring schedule includes three phases as detailed below:

Pre-operational: Monthly monitoring prior to operation of the facility. Results to be used to identify existing groundwater hydrocarbon contamination.

Operational Period (first two years): Quarterly monitoring for the first two years of operation.

Operational Period (after two years): Bi-annual monitoring after the initial two year period.

This report is the Round 3 quarterly event for 2021/2022 monitoring period. The proposed monitoring schedule to achieve the objectives of the WMP is included in **Table 1** below:

Table 1: Monitoring Schedule

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Operational Quarterly Monitoring 2021/2022	✓			✓			✓			**X**		
Operational Quarterly Monitoring 2022/2023	**X**			**X**			**X**			**X**		
Operational Bi-annual Monitoring From 2023				**X**						**X**		

Note:

- ✓ denotes monitoring rounds completed
- **X** denotes monitoring rounds to be completed

1.5. Completed Monitoring Rounds

The completed monitoring rounds are as follows:

- Round 1, reference: P034521.002 Version A, October 2021 (PRM, October 2021).
- Round 2, reference: P034521.003 Version A, December 2021 (PRM, December 2021).
- Round 3, reference: P034521.004 Version A, March 2022 (PRM, March 2022).

2. Site Information and Environmental Setting

2.1. Site Details

A summary of site details is provided in **Table 2**.

Table 2: Site Details

Detail	Information
Site Address:	37 Friendship Road, Port Botany, NSW 2036
Lot Parcel:	Lot 20, DP1272410
Site Area	Approximately 2.5 hectares
Local Council:	Randwick City Council
Current Zoning:	SP1 – Special Activities under State Environmental Planning Policy (Three Ports) 2013
Current site use	Commercial/industrial land use large-scale storage of petroleum-based products.
Surrounding land use	The site is within Port Botany, an industrial and commercial port precinct. **North**: Commercial/industrial properties and port operations. **South:** Commercial/industrial properties and Botany Bay. **East:** A shipping container yard borders the site, with Yarra Bay and Yarra Bay Park further east. **West:** Vopak Site B and Botany Bay.

2.2. Current Site Description and Inspection

The site is an unmanned product storage facility. The centre of the site consists of three above ground holding tanks for petroleum-based products (automotive diesel oil), which is bunded by a 2-3m wall. A road, understood to be utilised for fire access, runs along the perimeter of the site.

2.3. Environmental Setting

The site environmental setting is summarised in **Table 3**.

Table 3: Environmental Setting

Soils Landscape:	Based on review of on-line mapping (eSPADE, NSW OEH 2020) soils at the site are mapped as disturbed terrain. Disturbed terrain commonly includes turfed fill areas capped with up to 40 cm of sandy loam or up to 60cm of compacted clay over fill or waste materials including rock, demolition rubble and waste materials. The WMP describes the site as located on reclaimed shoreline, consisting of anthropogenic fill and dredged sediments overlying Quaternary unconsolidated sediments. PRM 2020 encountered fill and reclaimed sands consistent with the above description. Boreholes completed during well installation (PRM, 2021) encountered roadbase materials imported to the site for construction, with sandy fill material and underlying sands consistent with the above description.
Acid Sulfate Soils:	Randwick Local Environment Plan (LEP) 2012 Acid Sulfate Risk Map indicates that site is not within an Acid Sulfate Risk area. A review of the Atlas of Australian Acid Sulfate Soils indicated there is low probability of acid sulfate soils occurring on site (6-70%).
Geology:	A review of the Sydney 1:100,000 Geological Map (Geological Series Sheet 9130 (Edition 1), 1983, Department of Mineral Resources) indicated the site underlain by man-made fill, comprising dredged estuarine sand and mud, demolition rubble, industrial and household waste. Below the fill there are Botany Sand beds overlying Triassic Hawkesbury Sandstone. The WMP indicates Quaternary unconsolidated sediments underlie the site primary consisting of aeolian and beach sand with occasional peat, mud, gravel and shelly layers.

Table 3: Environmental Setting	
	The main bedrock unit that underlies the Quaternary infill is the Triassic Hawksbury Sandstone.
Hydrogeology:	A search of the Water NSW groundwater map identified six registered groundwater bores within 500 m of the site. No registered wells were identified within the site. The WMP describes the hydrogeology at the site as follows: *The hydrogeology of the site is defined by two groundwater systems in a stacked configuration. These are:* *1. The Botany Sands aquifer: consisting of unconfined to semi - confined groundwater systems within the Quaternary unconsolidated sediments.* *2. The Hawksbury Sandstone: comprising of deeper confined groundwater systems within the fractured/porous Triassic sandstone.* *The average thickness of the Botany Sands aquifer is 15 m with a maximum thickness of up to 35 m. A nearby exploration borehole (GW109706), located approximately 100 m south of site, intercepted weathered sandstone at approximately 33 m depth. The aquifer is primarily recharged by direct rainfall infiltration in open areas such as golf courses and parklands (ie Centennial Park, Moore Park and Randwick Racecourse).* *The aquifer is highly permeable and productive with yields ranging from 1 to 41 litres per second. Salinity ranges from fresh to brackish and can be highly saline in areas with tidal influence and estuarine muds.* *As a result of over a century of industrial and urban land use, the aquifer is highly degraded in parts due to diffuse and point sources of pollution. In areas of the Botany Sands aquifer, access to groundwater is restricted, and further embargoed from future usage, due to high concentrations of dissolved metals, nutrients, bacteria and hydrocarbons.* *The regional groundwater flow in the Botany Sands aquifer is from the north east to south west, discharging at Botany Bay foreshores and low lying depressions (ie ponds, culverts) that intercept the groundwater table. Local groundwater flows are variable, typically controlled by topography.* PRM 2020 and WMP indicate standing groundwater was encountered from 2 and 4 mBGL at former wells on site, with groundwater flow direction likely in a southerly direction towards Botany Bay. This is consistent with what was encountered during the Round 3 monitoring event.
Topography / Drainage:	The current site surface is flat and has been levelled for the construction of the storage tanks and road. Stormwater within the bunded area and the site itself is understood to be managed in accordance with the WMP.
Sensitive Receptors:	Aquatic ecosystems of nearby Yarra Bay and Frenchmans Bay.

3. Methodology

3.1. *Investigation Rationale*

The purpose of this sampling event is to determine if the groundwater underlying the site has potentially been impacted from onsite activities. All sampling was completed from the five existing groundwater wells installed by PRM in October 2021 in accordance with the WMP.

3.2. *Preliminaries*

3.2.1. *Health and Safety*

All site work was carried out in accordance with the Project Safety Environmental Plan (PSEP) and site-specific Safe Work Method Statement (SWMS), which were developed prior to the commencement of any onsite fieldworks. Daily Site Hazard Assessment Checklist (SHAC) forms were completed on site, subsequent to a site walkover and assessment of the work area to identify site specific hazards prior to commencing works.

3.2.2. *Groundwater Well Sampling*

At each well, depth to water and total depth measurements was recorded using a multiphase interface probe that detects water levels and the presence of light non-aqueous phase liquids (LNAPL). If suspected LNAPL was detected, a single use bailer was to be used to collect the LNAPL for visual confirmation.

Groundwater samples were collected using low-flow peristaltic pump. The standing water level (SWL) was monitored during low flow pumping to ensure significant drawdown did not occur.

Physical and chemical water quality indicators were also recorded at the time of sampling using a calibrated Water Quality Meter. This field instrument measures dissolved oxygen (DO), electrical conductivity (EC), pH, redox potential, and temperature of the water being sampled. The water quality parameters were considered stable when successive measurements (generally 3-5 minutes apart) were found to meet the stabilisation criteria outlined in the table below.

Table 4: Groundwater Stabilisation Parameters

Parameter	Stabilisation Criterion
pH	± 0.05 pH units
EC	± 3 % of reading
DO	± 10 % of reading or ± 0.2 mg/L, whichever is greater
ORP	± 10 mV

Wells were immediately sampled following stabilisation.

The water quality meter was calibrated prior to sampling by the hire company. Samples were collected in appropriately preserved bottles provided by the laboratory and immediately stored on ice in an esky. Containers were labelled with the sample ID, project number and date.

3.3. *Decontamination*

The reusable equipment (interface probe) was decontaminated after use by scrubbing with brushes and Decon 90 solution followed by rinsing with potable water.

Some materials and equipment used for sampling were single-use (e.g. nitrile gloves) and/or dedicated to individual wells (e.g. tubing and bailers). These items were not decontaminated and were placed within the site vehicle for appropriate disposal.

4. Site Assessment Criteria

4.1. Contaminants of potential of concern (CoPC)

Consistent with site operations, which include the storage of hydrocarbon fuels, the monitoring program has been designed to target the following potential contaminants of concern (CoPC) at all groundwater monitoring wells (MB01-MB05):

- Total Petroleum Hydrocarbons (TPH),
- Benzene, Toluene, Ethylbenzene, Xylene (BTEX),
- Polycyclic Aromatic Hydrocarbons (PAH).

It is noted that the site is surrounded by industrial activities and is underlain by the botany sands aquifer which has been impacted by a number of industrial activities as discussed in the WQM – Pre-operational report (PRM, 2021). The site has been subject to prior intrusive groundwater and soil investigations (PRM, 2020 and 2021). A broad range of contaminants of concern in addition to those stated above were investigated by PRM, 2020 and Jacobs 2015 (see PRM, 2020 for summary). It was therefore not considered necessary to assess groundwater at the site for CoPC that are unlikely to be introduced from the operation of the current fuel storage activity.

4.2. Adopted Site Assessment Criteria

As outlined in the WMP, the groundwater site assessment (SAC) has been derived from ANZG (2018). The SAC adopted have been selected based on the current and future commercial/industrial land use with groundwater underlying the site and receiving ecosystems considered to be disturbed marine systems.

Where marine water values were not provided, freshwater criteria were adopted. No criteria is provided in ANZG 2018 for PAH and TPH and so the laboratory limit of reporting (LOR) has been adopted.

The various groundwater SAC adopted for the site are summarised in **Table 5.**

Table 5: Groundwater Assessment Criteria Summary

Contaminant	Information
Benzene	700
Ethylbenzene	80
Toluene	180
Xylenes	350
PAHs	<LOR
TPH	<LOR

4.3. Baseline Conditions

In addition to the SAC, subsequent sampling events are to be compared to pre-operational baseline data as presented in PRM, October 2021. **Table 6** below summarises baseline conditions.

Table 6: Baseline Conditions

Contaminant	Information
BTEX	<LOR
PAHs	<LOR
TPH	<LOR

5. Data Quality Objectives

A Data Quality Objectives (DQOs) process is used to define the type, quantity and quality of data needed to support decisions relating to the environmental condition of a site.

Table 7 summarises the DQO process for the sampling works prescribed within the WMP (Vopak, 2021).

Table 7: DQO Process

Step 1: **State the problem**	WQM is required to determine if the groundwater underlying the site has potentially been impacted from onsite activities
Step 2: **Identify the decisions / goal of the study**	Is groundwater at the site contaminated with hydrocarbons or PAHs from fuel storage operations?
Step 3: **Identify information input**	The primary information inputs required are: • WMP (Vopak, 2021). • Field observations. • Review of previous reports. • Laboratory sample results. • Field and laboratory QAQC findings.
Step 4: **Define the study boundary**	The extent of the study boundary is as follows: • Lateral: Boundary of Site B4A, as outlined within the WMP, is shown in Figure 2. • Vertical: The depth of potential water pathways or receptors i.e. the groundwater underneath the site, limit of investigation. • Temporal: The date of inspection and sampling and any previous data.
Step 5: **Develop an analytical approach / decision rule**	Groundwater is considered contaminated if any analyte concentrations exceed criteria (or is detected above LOR) (or if deemed appropriate, the 95% UCL of the mean concentrations) and there is no evidence they are associated with background concentrations for the area, which was established during the baseline monitoring (PRM, 2021).
Step 6: **Specify the acceptable criteria**	Specific limits for this project are in accordance with the appropriate guidance within the WMP, or the appropriate national or state regulator, appropriate indicators of data quality, and standard procedures for field sampling and handling. This includes, but is not limited to, the following: • Analytes of concern have been including in testing. • Appropriate field methodologies have been undertaken. • Relevant criteria's have been adopted. • Acceptance limits for laboratory and field QC have been adhered to.
Step 7: **Optimise design for obtaining data**	This sampling program presented is aimed at obtaining the necessary data to allow the identified decisions in Step 2 to be made.

6. Summary of Field Observations

The following observations were made by PRM during groundwater sampling on 14 March 2022.

6.1. *Groundwater*

- Groundwater was present in all five wells with a standing water level between 2.687 and 3.843 metres below top of casing (mbtoc).
- During sampling, all wells were gauged for the presence of LNAPL and SWL. No LNAPL or odours were encountered.

Groundwater field sheets are provided in **Appendix A** and equipment calibration certificates included in **Appendix B.**

6.1.1. Groundwater Field Screening

Groundwater physiochemical parameters were measured prior to sampling with the field measurements summarised in **Table 7**. A copy of field sheets is included in **Appendix A**.

Table 7: Groundwater Field Screening Results

Well ID	SWL (mbtoc)	Well RL (mAHD)	SWL RL (mAHD)	pH	EC (uS/cm)	Redox (mV)	DO (mg/L)	Temp (°C)	Comments
MB01	2.687	3.638	0.951	7.03	704	-104.2	1.00	22.6	Clear, no odour or sheen.
MB02	2.792	3.642	0.850	7.24	675	-119.8	2.799	23.2	Clear, no odour or sheen.
MB03	3.776	4.497	0.721	7.50	756	-119.2	0.32	21.2	Clear, no odour or sheen.
MB04	3.843	4.659	0.816	6.42	1108	-95.8	0.93	23.1	Clear, no odour or sheen.
MB05	3.503	4.216	0.713	6.83	1798	-136.4	0.39	22.2	Clear, no odour or sheen.

Based on the field parameters, the following interpretations have been made:

- pH is neutral to slightly acidic.
- Electrical conductivity is indicative of fresh water. This is comparable to the Pre-Operational groundwater field screening from October and December 2021.
- No visual or olfactory indications of contamination were present during sampling.

7. Analytical Results

The following sections summarise the analytical groundwater results of the Round 3 monitoring. Refer to **Figure 2** for site layout and investigation locations discussed herein.

7.1. Groundwater Analytical Results

A total of five primary groundwater samples and one QA/QC duplicate were submitted for analysis for the following CoPC:

- Total recoverable hydrocarbons (TRH)
- BTEX
- PAH

TRH analysis was undertaken instead of TPH. It is standard industry practice to analyse for TRH in the first instance and if detectable TRH concentrations are present, additional analysis to calculate the TPH results would be completed.

Results are provided in the attached **Analytical Table A1** and are summarised in **Table 8**. NATA accredited laboratory certificates are shown in **Appendix C.**

Table 8: Summary of Groundwater Analytical Results

Analyte	Results
TRH	All samples below LOR, below the adopted SAC and consistent with baseline conditions.
BTEX	All samples below LOR, below the adopted SAC and consistent with baseline conditions.
PAH	All samples below LOR, below the adopted SAC and consistent with baseline conditions.

7.2. Quality Assurance / Quality Control

The results of the laboratory analysis for field QC samples are evaluated in the attached **Analytical Table A2**, and summarised as follows:

- One groundwater duplicate was obtained from primary sample MB01 as part of the baseline monitoring in accordance with the WMP. The duplicate was collected and analysed at a rate of 20% which achieves/exceeds the minimum 5%, compared to primary data.
- As all results obtained for the primary groundwater sample and duplicate sample were below the limit of reporting, there were no calculated RPD values. This therefore meets the RPD acceptance criteria of all RPDs <50% for organic contaminants.
- The sampling was undertaken during one sampling event on the 14 March 2022. One trip blank (TB) and trip spike (TS) was utilised for the event. Concentrations of selected volatile CoPC for the TB were all below detection limits indicating that the potential for significant cross contamination had not occurred during the course of the round trip from the site to the laboratory. The TS analytical results indicated that the percentage loss for BTEX during the sampling and transport to the laboratory was minimal indicating that appropriate preservation techniques were employed.
- One rinsate sample (R1) returned an analytical result above LOR (160mg/L) of TRH C10-C16. The laboratory report notes that the single peak was found to not be consistent with hydrocarbons and is consistent with storage of deionised water within a plastic container, as supplied by the lab. All samples returned analytical results below the LOR for hydrocarbons. As such, there is no indication of cross contamination from sampling equipment.
- All DQOs, as stated above, were achieved during field works.

Detailed laboratory QA/QC results are presented on the laboratory testing certificates in **Appendix C** and summarised in the attached **Analytical Tables.**

Based on the information referenced above, it was concluded that data generated during the investigation is of an acceptable quality to achieve the objective of the quarterly monitoring event.

8. Discussions

The results indicate that all CoPC were not detected above the laboratory LOR and not above the adopted SAC. All sample results from Round 3 were comparable to the baseline results from Round 1 (October 2021) and Round 2 (December 2021).

Based on the analytical results and field observations, there is no indication of contamination associated with the CoPC analysed for at the five sampling locations.

Groundwater flow direction was calculated during the first round of monitoring (PRM, 2021), and was found to flow in a south easterly direction. Groundwater flow direction encountered during round 3 was consistent with the baseline observations (see groundwater contours in **Figure 3**).

9. Conclusions

PRM were engaged by Vopak to complete Round 3 of the quarterly WQM in line with WMP.

Five monitoring wells were sampled in accordance with the WMP. No CoPC were detected in groundwater above the LOR or above the adopted SAC. All sample results were consistent with baseline data obtained prior to operation of the facility (PRM, 2021). No field observations of contamination were noted during PRMs site works.

Based on the findings of this WQM event, no indication of groundwater contamination was identified at the sample locations.

10. Limitations

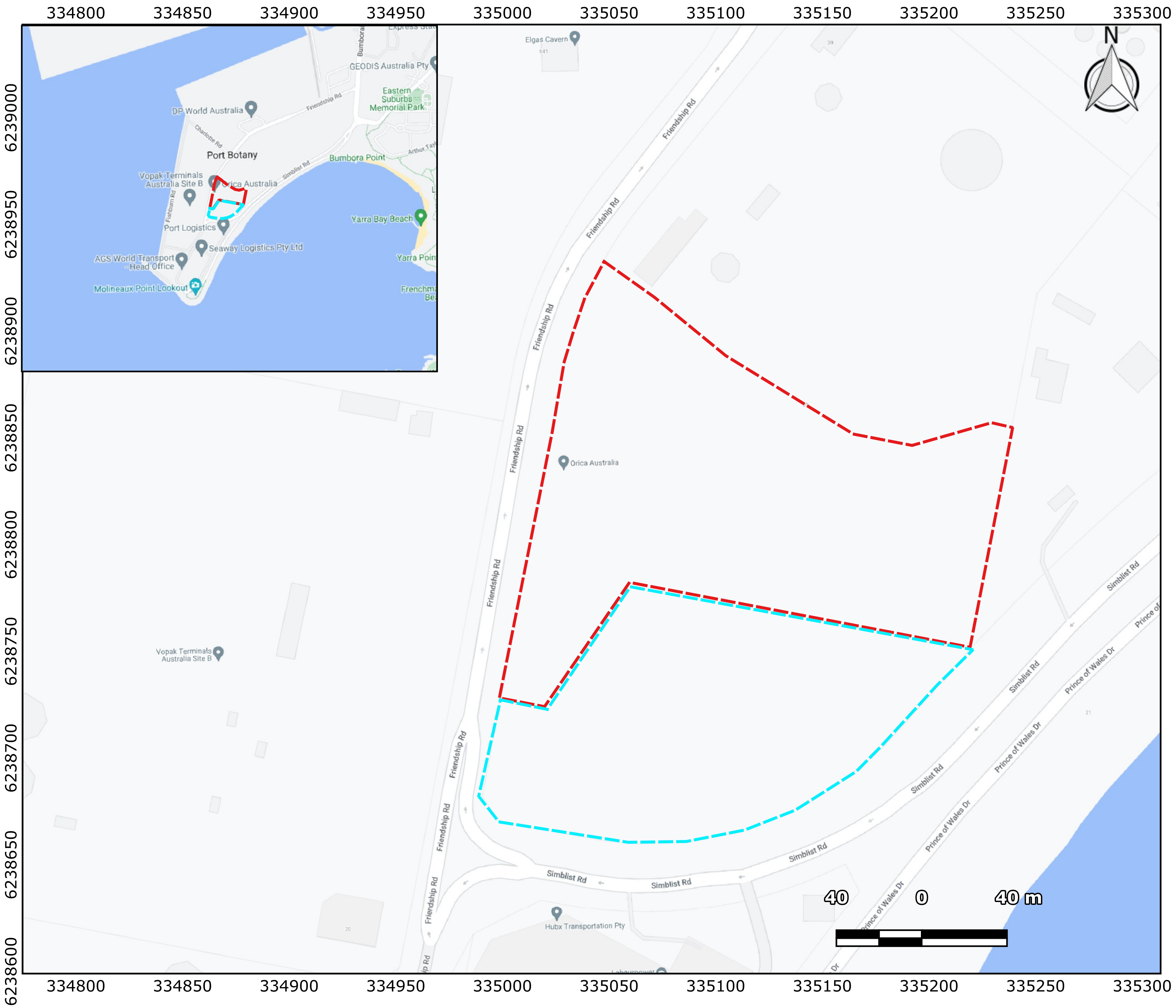
This report is confidential and has been prepared by Progressive Risk Management (PRM) for Vopak Terminals Australia Pty Ltd (the client). This report may only be used and relied upon by the client and must not be copied to, used by or relied upon by any person other than the client. This report is limited to the observations made by PRM during the Water Quality Monitoring, and was limited to the assessment of contaminants of concern in groundwater only, as detailed in the *Scope of Works*.

All results, conclusions and recommendations presented should be reviewed by a competent person before being used for any other purpose. PRM accepts no liability for use of, interpretation of or reliance upon this report by any person or body other than the client. Third parties must make their own independent inquiries.

This report should not be altered amended or abbreviated, issued in part or issued incomplete without prior checking and approval by PRM. PRM accepts no liability that may arise from the alteration, amendment, abbreviation or part-issue or incomplete issue of this report. To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by PRM and this report are expressly excluded (save as agreed otherwise with the client).

PRM shall bear no liability in relation to any change to site conditions after the date of this report. This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope and limitations defined herein (*Scope of Works*). Should information become available regarding conditions at the site including previously unknown sources of contamination, PRM reserves the right to review the report in the context of the additional information.

Figures



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39 Friendship Road,
Port Botany NSW

Figure 1
Regional Site Location Diagram

PROGRESSIVE RISK MANAGEMENT

Scale: 1:2500

Coor. Sys: GDA 1994 MGA Zone56

Legend

🟥 Approximate Site Boundary

🟦 Leased Area - Future B4B Expansion

Image Source: Google Maps (2021)

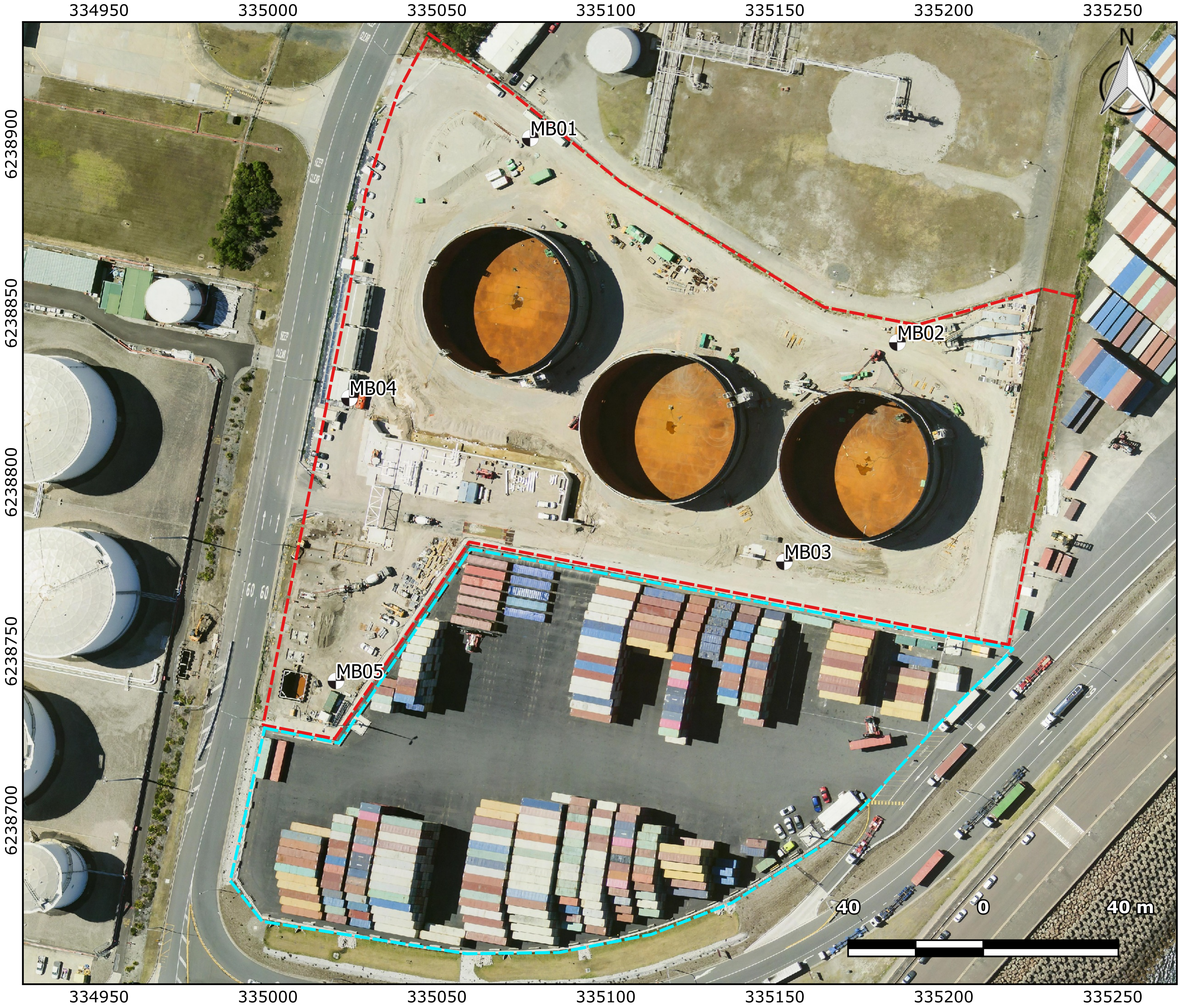

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Figure 2
Site Layout & Sample Locations

PRM
PROGRESSIVE RISK MANAGEMENT

Scale: 1:1,600

Coor. Sys: GDA 1994 MGA Zone56

Legend

- 🟥 Approximate Site Boundary
- 🟦 Leased Area - Future B4B Expansion
- ◐ Monitoring Well Locations

Image Source: MetroMap (2021)

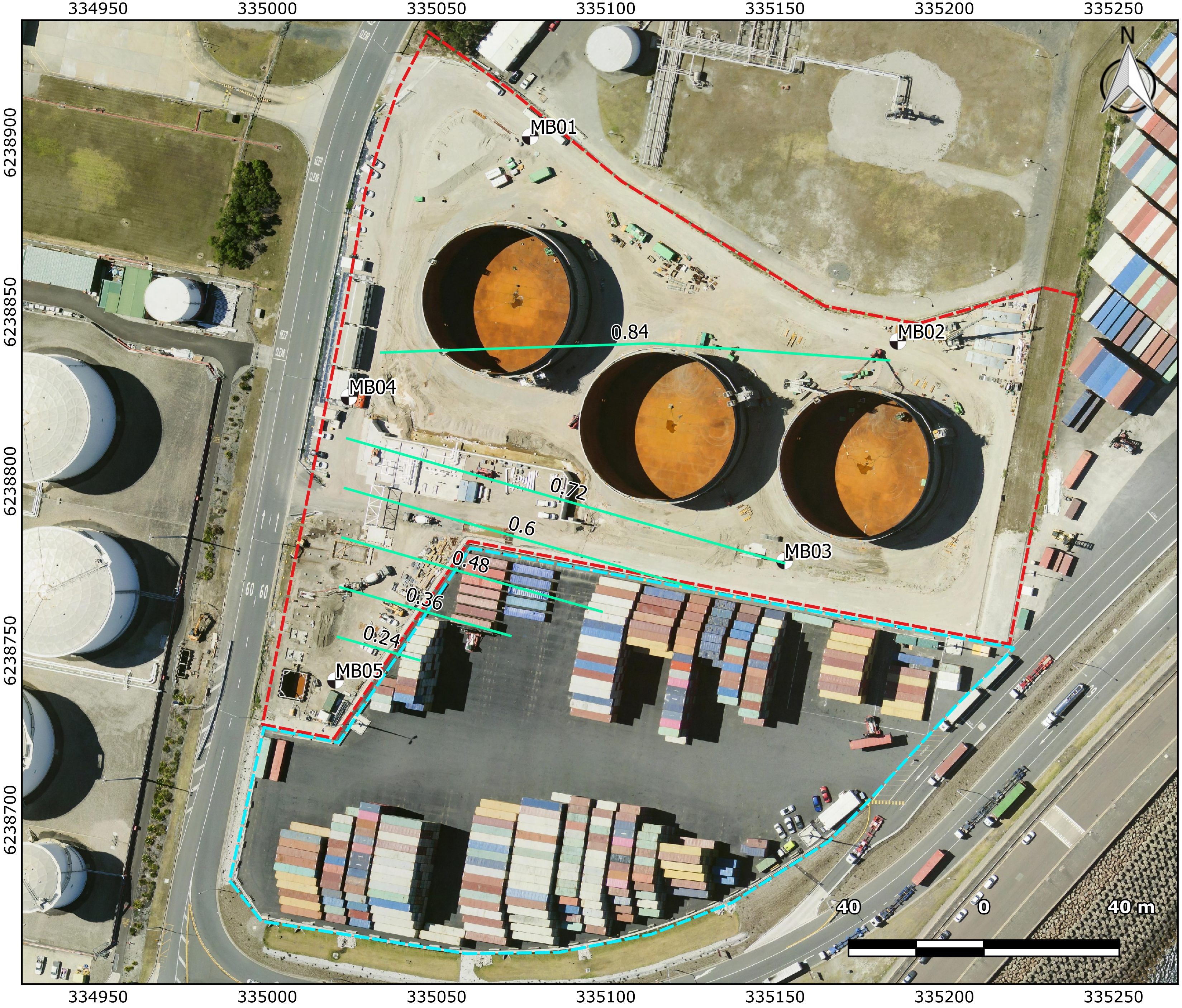

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Figure 3
Groundwater Contours

PROGRESSIVE RISK MANAGEMENT

Scale: 1:1,600

Coor. Sys: GDA 1994 MGA Zone56

Legend

🟥	Approximate Site Boundary
🟦	Leased Area - Future B4B Expansion
◐	Monitoring Well Locations
—	Inferred Groundwater Contours (mAHD)

Image Source: MetroMap (2021)

Analytical Tables

				TRH						BTEX						PAHs																	
				C6-C10	**C6-C10 (F1 minus BTEX)**	**C10-C16 (F2)**	**C10-C16 (F2 minus Naphthalene)**	**C16-C34 (F3)**	**C34-C40) F4**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylene (m & p)**	**Xylene (o)**	**Total xylenes**	**Naphthalene**	**Acenaphthylene**	**Acenaphthene**	**Fluorene**	**Phenanthrene**	**Anthracene**	**Fluoranthene**	**Pyrene**	**Benzo(a)anthracene**	**Chrysene**	**Benzo(b,j+k)fluoranthene**	**Benzo(a)pyrene**	**Indeno(1,2,3-c,d)pyrene**	**Dibenzo(a,h)anthracene**	**Benzo(g,h,i)perylene**	**Benzo(a)pyrene TEQ**	**Total +vePAH's**
				µg/L	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**
LOR				10	10	50	50	100	100	1	1	1	2	1	1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.5	0.1
Adopted Site Assessment Criteria				<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	700	180	80			350	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR
Baseline Data (PRM October 2021)				<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<5	<LOR
Sample	**Monitoring Round**	**Date**	**Report**																													
MB01	**3**	14/03/2022	290899	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<5	<LOR
MB02	**3**	14/03/2022	290899	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<5	<LOR
MB03	**3**	14/03/2022	290899	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<5	<LOR
MB04	**3**	14/03/2022	290899	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<5	<LOR
MB05	**3**	14/03/2022	290899	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<5	<LOR
DUP01	**3**	14/03/2022	290899	<10	<10	<50	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<5	<LOR

Table A2 - RPD Summary Table

				TRH				BTEX				PAHs		
				F1 - TRH C6-C10 less BTEX	**F2 - TRH C10-C16 less naphthalene**	**TRH C16-C34**	**TRH C34-C40**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**Benoz(a)pyrene**	**Benzo(a)pyrene TEQ**	**Total +ve**
				mg/kg	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
			LOR	10	50	100	100	1	1	1	3	1	5	-
Sample	**Matrix**	**Date**	**Report**											
MB01	Water	14/03/2022	290899	<10	<50	<100	<100	<1	<1	<1	<3	<1	<5	<LOR
DUP01	Water	14/03/2022	290899	<10	<50	<100	<100	<1	<1	<1	<3	<1	<5	<LOR
			RPD Calculation	-	-	-	-	-	-	-	-	-	-	-

Appendix A: Groundwater Field Notes

WELL DEVELOPMENT, GAUGING AND SAMPLING DATA SHEET

WELL No : MB 01

PROGRESSIVE RISK MANAGEMENT

Project No : PO34521 **Project Name :** Vopak GME

Gauging

Date : 14/03/22
Performed By : SYB
Gauging Method : IP.
Well Diameter : 50mm
Time : 08:22
Bore Depth : 6 724
LNAPL Present : Y / [✓ N]
SWL : 2.687
Depth to LNAPL :
(If yes, thickness) : —
Comments : Water in gattic
DNAPL Present : Y / [✓ N]
(If yes, thickness) : —
Maintainance required : N/A
Visual confirmation with bailer : ~~Y / N~~
Photo Number : —

Purging / Development

Date :
Performed By :
Well Diameter :
~~Purge Method :~~
Time Started :
~~SWL (start) :~~
Volume Removed :
Bore Depth (start) :
Time Stopped :
SWL (end) :
~~Discharge Rate :~~
Bore Depth (end) :
Comments :
~~NAPL Present : Y / N~~
(If yes, thickness) :

Sampling

Date : 14/03/22
Performed By : SYB
Well Diameter : 50mm
Sampling Method : peri pump
Time Started : 0832
Sampling Depth : 5. mm
Time Stopped : 08:59
SWL (start) : 2.687
Tubing Type : LDPE
SWL (end) : 2.673
Comments :

Duplicate Sample Collected? [✓ Y] N
Duplicate Sample ID : DUP01

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (ppm)	Dissolved Oxygen (mg/L)	SWL (m)	Comments (colour, turbidity, odours, sheen etc)
08:35	0.1	717	7.05	22.5	-79.9	1.47		2.672	Clear, no odour
08:38	0.3	717	6.95	22.6	-90.1	1.26		2.669	
08:41	0.8	718	7.04	22.5	-96.2	1.13		2.672	
08:44	1	715	7.06	22.6	-99.6	1.10		2.669	
08:47	1.5	708	7.04	22.6	-102.3	1.00		2.674	
08:50	2	704	7.03	22.6	-104.2	1.00		2.678	
Stabilisation Criteria		+/- 3%	+/- 0.05		+/- 10mV	+/- 10%			

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*
________ m (-) ________ (=) ________

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME
________ (X) ________ (=) ________ L

WELL DEVELOPMENT, GAUGING AND SAMPLING DATA SHEET

WELL No : MB02

PRM
PROGRESSIVE RISK MANAGEMENT

Project No : PO34521 **Project Name :** Vopak GME

Gauging

Date : 14/3/22		Performed By : SYB	
Gauging Method : IP			Well Diameter : 50mm
Time : 09:18		Bore Depth : 6.997	LNAPL Present : Y / [✓ N]
SWL : 2.792		Depth to LNAPL :	(If yes, thickness) : —
Comments : Water in Gattic.			DNAPL Present : Y / [✓ N]
			(If yes, thickness) : —
Maintainance required :			Visual confirmation with bailer : Y / [✓ N]
Photo Number :			

Purging / Development

~~Date :~~		Performed By :	Well Diameter :
Purge Method :			
Time Started :	SWL (start) :	Volume Removed :	Bore Depth (start) :
Time Stopped :	SWL (end) :	Discharge Rate :	Bore Depth (end) :
Comments :			NAPL Present : Y / N
			(If yes, thickness) :

Sampling

Date : 14/3/22		Performed By : SYB	Well Diameter : 50mm
Sampling Method : peri pump.			
Time Started : 09:27		Sampling Depth : 5.5	
Time Stopped : 09:46		SWL (start) : 2.792.	
Tubing Type : LDPE		SWL (end) : 2.797	
Comments :			
Duplicate Sample Collected? Y / [✓ N]		Duplicate Sample ID : —	

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (ppm)	Dissolved Oxygen (mg/L)	SWL (m)	Comments (colour, turbidity, odours, sheen etc)
09:29	0.1	680	7.22	23.6	-777	0.85		2.793	Clear, no
09:32	0.4	684	7.25	23.3	-105.0	0.34		2.892	odour
09:35	0.9	679	7.23	23.2	-112.5	0.26		2.792	
09:38	1.3	675	7.28	23.3	-117.2	0.24		2.799	
09:41	1.8	675	7.24	23.2	-119.8	0.24		2.799	
Stabilisation Criteria		+/- 3%	+/- 0.05		+/- 10mV	+/- 10%			

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*
__________ m (-) __________ (=) __________

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME
__________ (X) __________ (=) __________ L

WELL DEVELOPMENT, GAUGING AND SAMPLING DATA SHEET

WELL No : MB 03

PRM
PROGRESSIVE RISK MANAGEMENT

Project No : PO34521
Project Name : Vopak GME

Gauging

Date : 14/3/22
Performed By : SYB
Gauging Method : IP
Well Diameter : 50mm
Time : 10:05
Bore Depth : 7.102
LNAPL Present : Y / [✓ N]
SWL : 3.776
Depth to LNAPL :
(If yes, thickness) : —
Comments : —
DNAPL Present : Y / [✓ N]
(If yes, thickness) : —
Maintainance required : —
Visual confirmation with bailer : Y / [✓ N]
Photo Number : —

Purging / Development

Date :
Performed By :
Well Diameter :
Purge Method :
Time Started :
SWL (start) :
Volume Removed :
Bore Depth (start) :
Time Stopped :
SWL (end) :
Discharge Rate :
Bore Depth (end) :
Comments :
NAPL Present : Y / N
(If yes, thickness) :

Sampling

Date : 14/3/22
Performed By : SYB
Well Diameter : 50mm
Sampling Method : peri pump
Time Started : 10:11
Sampling Depth : 5
Time Stopped : 10:29
SWL (start) : 3.776
Tubing Type : LDPE
SWL (end) : 3.781
Comments :

Duplicate Sample Collected? Y / [✓ N]
Duplicate Sample ID : —

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (ppm)	Dissolved Oxygen (mg/L)	SWL (m)	Comments (colour, turbidity, odours, sheen etc)
10:13	0.1	786	7.58	21.6	-80.2	0.87		3.770	Clear, no
10:16	0.3	777	7.52	21.2	-102.4	0.84		3.773	odour
10:19	0.9	771	7.52	21.2	-110.4	0.38		3.773	
10:22	1.1	757	7.52	21.2	-116.9	0.33		3.775	
10:25	1.4	756	7.50	21.2	-119.2	0.32		3.776	
Stabilisation Criteria		+/- 3%	+/- 0.05		+/- 10mV	+/- 10%			

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*
________ m (-) ________ (=) ________

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME
________ (X) ________ (=) ________ L

WELL DEVELOPMENT, GAUGING AND SAMPLING DATA SHEET

WELL No : MB 04

PROGRESSIVE RISK MANAGEMENT

Project No : P034521
Project Name : Vopak

Gauging

Date : 14/3/22
Performed By : SYB
Gauging Method : IP
Well Diameter : 50mm
Time : 11:33
Bore Depth : 7.520
LNAPL Present : Y / [✓ N]
SWL : 3.843
Depth to LNAPL :
(If yes, thickness) : —
Comments : —
DNAPL Present : Y / [✓ N]
(If yes, thickness) : —
Maintainance required : —
Visual confirmation with bailer : Y / [✓ N]
Photo Number : —

Purging / Development

~~Date :~~
~~Performed By :~~
~~Well Diameter :~~
~~Purge Method :~~
~~Time Started :~~
~~SWL (start) :~~
~~Volume Removed :~~
~~Bore Depth (start) :~~
~~Time Stopped :~~
~~SWL (end) :~~
~~Discharge Rate :~~
~~Bore Depth (end) :~~
~~Comments :~~
~~NAPL Present : Y / N~~
~~(If yes, thickness) :~~

Sampling

Date : 14/3/22
Performed By : SYB
Well Diameter : 50mm
Sampling Method : peri pump
Time Started : 11:39.
Sampling Depth : 5 mbTOC
Time Stopped :
SWL (start) : 3.843.
Tubing Type : LDPE
SWL (end) :
Comments : —

Duplicate Sample Collected? Y/[✓ N]
Duplicate Sample ID : —

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (ppm)	Dissolved Oxygen (mg/L)	SWL (m)	Comments (colour, turbidity, odours, sheen etc)
11:41	0.1	1,100	6.74	23.5	-74.2	1.31		3.844	Clear, no
11:44	0.4	1081	6.66	23.2	-90.2	0.89		3.847	odour
11:47	1	1071	6.62	23.0	-95.9	0.89		3.847	
11:50	1.3	1095	6.45	23.1	-95.7	0.96		3.846	
11:53	1.9	1166	6.41	23.1	-96.9	0.92		3.846	
11:56	2.2	1108	6.42	23.1	-95.8	0.93		3.847	
Stabilisation Criteria		+/- 3%	+/- 0.05		+/- 10mV	+/- 10%			

Well Volume Calculations								
Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*
__________ m (-) __________ (=) __________

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME
__________ (X) __________ (=) __________ L

PRM
PROGRESSIVE RISK MANAGEMENT

WELL DEVELOPMENT, GAUGING AND SAMPLING DATA SHEET

WELL No : MB 05

Project No : PO34521
Project Name : Vopak

Gauging

Date : 14/3/22
Performed By : SYB
Gauging Method : IP
Well Diameter : 50mm
Time : 10:46
Bore Depth : 6.163
LNAPL Present : Y / [✓ N]
SWL : 3.503
Depth to LNAPL :
(If yes, thickness) : –
Comments : —
DNAPL Present : Y / [✓ N]
(If yes, thickness) : —
Maintainance required : —
Visual confirmation with bailer : Y / [✓ N]
Photo Number : —

Purging / Development

Date :
Performed By :
Well Diameter :
Purge Method :
Time Started :
SWL (start) :
Volume Removed :
Bore Depth (start) :
Time Stopped :
SWL (end) :
Discharge Rate :
Bore Depth (end) :
Comments :
NAPL Present : Y / N
(If yes, thickness) :

Sampling

Date : 14/3/22
Performed By : SYB
Well Diameter : 50mm
Sampling Method : peri pump.
Time Started : 10:53
Sampling Depth : 5
Time Stopped : 11:15
SWL (start) : 3.503
Tubing Type : LDPE
SWL (end) : 3.509
Comments :

Duplicate Sample Collected? Y [✓ N]
Duplicate Sample ID : —

Field Analyses

Time	Volume Removed (L)	EC (uS/cm)	pH	Temp (C)	Redox (mV)	Dissolved Oxygen (ppm)	Dissolved Oxygen (mg/L)	SWL (m)	Comments (colour, turbidity, odours, sheen etc)
10:55	0.1	1813	6.65	22.2	-98.3	1.02		3.509	Clear, no
10:58	0.3	1813	6.68	22.0	-122.3	0.32		3.509	odour
11:01	0.8	1812	6.71	22.1	-131.3	0.33		3.508	
11:04	1.1	1810	6.80	22.2	-129.5	0.34		3.509	
11:07	1.5	1798	6.82	22.0	-138.2	0.38		3.511	
11:10	2.0	1798	6.83	22.2	-136.4	0.39		3.509	
Stabilisation Criteria		+/- 3%	+/- 0.05		+/- 10mV	+/- 10%			

Well Volume Calculations

Casing Diameter	25mm	50mm	100mm	125mm	150mm	200mm	250mm	300mm
Conversion Factor	0.98	1.96	7.85	31.4	49.1	70.7	125.7	196.3

TOTAL WELL DEPTH (-) WATER LEVEL (=) *WATER COLUMN*
________ m (-)________ (=)________

WATER COLUMN (X) CONVERSION FACTOR (=) LITRES PER WELL VOLUME
________(X)________ (=)________ L

Appendix B: Equipment Calibration Certificates

Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **21B104020**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. PH 10.00		PH1 10.00		380833	pH 9.70
2. pH 7.00		pH 7.00		377339	pH 6.99
3. pH 4.00		pH 4.00		380327	pH 4.08
4. mV		231.8 mV		365451/374424	237.1mV
5. EC		2.76mS		377099	2.75mS
6. D.O		0.00 ppm		371864	0.00ppm
7. Temp		20.8°C		MultiTherm	21.2°C

Calibrated by: **Sarah Lian**

Calibration date: **10/03/2022**

Next calibration due: **9/09/2022**

Appendix C: NATA Laboratory Results, COCs and Sample Receipts

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

CERTIFICATE OF ANALYSIS 290899

Client Details

Client	Progressive Risk Management Pty Ltd
Attention	Sarah Bolton
Address	14/76 Reserve Road, ARTARMON, NSW, 2064

Sample Details

Your Reference	**P034521**
Number of Samples	9 Water
Date samples received	14/03/2022
Date completed instructions received	14/03/2022

Analysis Details

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

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

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

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

Report Details

Date results requested by	21/03/2022
Date of Issue	18/03/2022

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

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

Results Approved By
Dragana Tomas, Senior Chemist
Josh Williams, LC Supervisor
Kyle Gavrily, Chemist

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water

Our Reference		290899-1	290899-2	290899-3	290899-4	290899-5
Your Reference	UNITS	MB01	MB02	MB03	MB04	MB05
Date Sampled		14/03/2022	14/03/2022	14/03/2022	14/03/2022	14/03/2022
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	15/03/2022	15/03/2022	15/03/2022	15/03/2022	15/03/2022
Date analysed	-	15/03/2022	15/03/2022	15/03/2022	15/03/2022	15/03/2022
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	99	100	98	98	97
Surrogate toluene-d8	%	97	98	97	97	98
Surrogate 4-BFB	%	103	104	102	103	103

vTRH(C6-C10)/BTEXN in Water

Our Reference		290899-6	290899-7	290899-8	290899-9
Your Reference	UNITS	DUP01	R1	TB	TS
Date Sampled		14/03/2022	14/03/2022	14/03/2022	14/03/2022
Type of sample		Water	Water	Water	Water
Date extracted	-	15/03/2022	15/03/2022	15/03/2022	15/03/2022
Date analysed	-	15/03/2022	15/03/2022	15/03/2022	15/03/2022
TRH C_6 - C_9	µg/L	<10	<10	<10	[NA]
TRH C_6 - C_{10}	µg/L	<10	<10	<10	[NA]
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	[NA]
Benzene	µg/L	<1	<1	<1	86%
Toluene	µg/L	<1	<1	<1	81%
Ethylbenzene	µg/L	<1	<1	<1	95%
m+p-xylene	µg/L	<2	<2	<2	89%
o-xylene	µg/L	<1	<1	<1	90%
Naphthalene	µg/L	<1	<1	<1	[NA]
Surrogate Dibromofluoromethane	%	98	99	98	100
Surrogate toluene-d8	%	98	98	97	101
Surrogate 4-BFB	%	103	104	103	99

svTRH (C10-C40) in Water

Our Reference		290899-1	290899-2	290899-3	290899-4	290899-5
Your Reference	UNITS	MB01	MB02	MB03	MB04	MB05
Date Sampled		14/03/2022	14/03/2022	14/03/2022	14/03/2022	14/03/2022
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	17/03/2022	17/03/2022	17/03/2022	17/03/2022	17/03/2022
Date analysed	-	18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	94	98	90	93	91

svTRH (C10-C40) in Water

Our Reference		290899-6	290899-7
Your Reference	UNITS	DUP01	R1
Date Sampled		14/03/2022	14/03/2022
Type of sample		Water	Water
Date extracted	-	17/03/2022	17/03/2022
Date analysed	-	18/03/2022	18/03/2022
TRH C_{10} - C_{14}	µg/L	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	160
TRH C_{29} - C_{36}	µg/L	<100	<100
TRH >C_{10} - C_{16}	µg/L	<50	160
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	160
TRH >C_{16} - C_{34}	µg/L	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100
Surrogate o-Terphenyl	%	103	92

PAHs in Water						
Our Reference	UNITS	290899-1	290899-2	290899-3	290899-4	290899-5
Your Reference		MB01	MB02	MB03	MB04	MB05
Date Sampled		14/03/2022	14/03/2022	14/03/2022	14/03/2022	14/03/2022
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	17/03/2022	17/03/2022	17/03/2022	17/03/2022	17/03/2022
Date analysed	-	17/03/2022	17/03/2022	17/03/2022	17/03/2022	17/03/2022
Naphthalene	µg/L	<1	<1	<1	<1	<1
Acenaphthylene	µg/L	<1	<1	<1	<1	<1
Acenaphthene	µg/L	<1	<1	<1	<1	<1
Fluorene	µg/L	<1	<1	<1	<1	<1
Phenanthrene	µg/L	<1	<1	<1	<1	<1
Anthracene	µg/L	<1	<1	<1	<1	<1
Fluoranthene	µg/L	<1	<1	<1	<1	<1
Pyrene	µg/L	<1	<1	<1	<1	<1
Benzo(a)anthracene	µg/L	<1	<1	<1	<1	<1
Chrysene	µg/L	<1	<1	<1	<1	<1
Benzo(b,j+k)fluoranthene	µg/L	<2	<2	<2	<2	<2
Benzo(a)pyrene	µg/L	<1	<1	<1	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1	<1	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1	<1	<1	<1
Benzo(a)pyrene TEQ	µg/L	<5	<5	<5	<5	<5
Total +ve PAH's	µg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	127	124	116	114	113

PAHs in Water			
Our Reference		290899-6	290899-7
Your Reference	UNITS	DUP01	R1
Date Sampled		14/03/2022	14/03/2022
Type of sample		Water	Water
Date extracted	-	17/03/2022	17/03/2022
Date analysed	-	17/03/2022	17/03/2022
Naphthalene	µg/L	<1	<1
Acenaphthylene	µg/L	<1	<1
Acenaphthene	µg/L	<1	<1
Fluorene	µg/L	<1	<1
Phenanthrene	µg/L	<1	<1
Anthracene	µg/L	<1	<1
Fluoranthene	µg/L	<1	<1
Pyrene	µg/L	<1	<1
Benzo(a)anthracene	µg/L	<1	<1
Chrysene	µg/L	<1	<1
Benzo(b,j+k)fluoranthene	µg/L	<2	<2
Benzo(a)pyrene	µg/L	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1
Benzo(a)pyrene TEQ	µg/L	<5	<5
Total +ve PAH's	µg/L	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	120	113

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			15/03/2022	1	15/03/2022	16/03/2022		15/03/2022	[NT]
Date analysed	-			15/03/2022	1	15/03/2022	16/03/2022		15/03/2022	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	88	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	88	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	86	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	84	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	90	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	91	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	88	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	99	1	99	95	4	102	[NT]
Surrogate toluene-d8	%		Org-023	98	1	97	97	0	101	[NT]
Surrogate 4-BFB	%		Org-023	103	1	103	105	2	100	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	290899-3
Date extracted	-			17/03/2022	2	17/03/2022	17/03/2022		17/03/2022	17/03/2022
Date analysed	-			18/03/2022	2	18/03/2022	18/03/2022		18/03/2022	18/03/2022
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	2	<50	<50	0	93	77
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	2	<100	<100	0	90	81
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	2	<100	<100	0	109	92
TRH $>C_{10}$ - C_{16}	µg/L	50	Org-020	<50	2	<50	<50	0	93	77
TRH $>C_{16}$ - C_{34}	µg/L	100	Org-020	<100	2	<100	<100	0	90	81
TRH $>C_{34}$ - C_{40}	µg/L	100	Org-020	<100	2	<100	<100	0	109	92
Surrogate o-Terphenyl	%		Org-020	124	2	98	95	3	99	86

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			17/03/2022	2	17/03/2022	17/03/2022		17/03/2022	[NT]
Date analysed	-			17/03/2022	2	17/03/2022	17/03/2022		17/03/2022	[NT]
Naphthalene	µg/L	1	Org-022/025	<1	2	<1	<1	0	91	[NT]
Acenaphthylene	µg/L	1	Org-022/025	<1	2	<1	<1	0	[NT]	[NT]
Acenaphthene	µg/L	1	Org-022/025	<1	2	<1	<1	0	78	[NT]
Fluorene	µg/L	1	Org-022/025	<1	2	<1	<1	0	89	[NT]
Phenanthrene	µg/L	1	Org-022/025	<1	2	<1	<1	0	106	[NT]
Anthracene	µg/L	1	Org-022/025	<1	2	<1	<1	0	[NT]	[NT]
Fluoranthene	µg/L	1	Org-022/025	<1	2	<1	<1	0	83	[NT]
Pyrene	µg/L	1	Org-022/025	<1	2	<1	<1	0	91	[NT]
Benzo(a)anthracene	µg/L	1	Org-022/025	<1	2	<1	<1	0	[NT]	[NT]
Chrysene	µg/L	1	Org-022/025	<1	2	<1	<1	0	71	[NT]
Benzo(b,j+k)fluoranthene	µg/L	2	Org-022/025	<2	2	<2	<2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	1	Org-022/025	<1	2	<1	<1	0	78	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-022/025	<1	2	<1	<1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	1	Org-022/025	<1	2	<1	<1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	1	Org-022/025	<1	2	<1	<1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	122	2	124	125	1	93	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

TRH Water(C10-C40) NEPM - The positive result in the rinsate sample is due to a single peak with no hydrocarbon profile that is consistent with the use of plastic containers.

CHAIN OF CUSTODY FORM - Client

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Client: Progessive Risk Management
Contact Person: Stuart Dundas
Project Mgr: Stuart Dundas
Sampler: Sarah Bolton
Address: 14/76 Reserve Road, Artarmon
Phone: Mob: 0479 195 358
Email: sarah.bolton@progressiverm.com
stuart.dundas@progressiverm.com
results@progressiverm.com

Client Project Name/Number/Site etc (ie report title): P034521
PO No.:
Envirolab Quote No. :
Date results required: STD
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Additional report format: esdat / equis /
Lab Comments:

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	TPH	BTEX	PAH													Provide as much information about the sample as you can
1	MB01	-	14/03/2022	Water	x	x	x													
2	MB02	-	14/03/2022	Water	x	x	x													
3	MB03	-	14/03/2022	Water	x	x	x													
4	MB04	-	14/03/2022	Water	x	x	x													
5	MB05	-	14/03/2022	Water	x	x	x													
6	DUP01	-	14/03/2022	Water	x	x	x													
7	R1	-	14/03/2022	Water	x	x	x													
8	TB	-	14/03/2022	Water	x	x														
9	TS	-	14/03/2022	Water	x	x														

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 290899
Date Received: 14.3.22
Time Received: 1600
Received By: NS
Temp: Cool/[✓ Ambient]
Cooling: Ice/[✓ Icepack]
Security: Intact/Broken/[✓ None]

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

Relinquished by (Company): PRM	Received by (Company):	***Lab Use Only***	
Print Name: Sarah Bolton	Print Name:	Job number:	Cooling: Ice / Ice pack / None
Date & Time: 14/03/2022	Date & Time:	Temperature:	Security seal: Intact / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Progressive Risk Management Pty Ltd
Attention	Sarah Bolton

Sample Login Details

Your reference	P034521
Envirolab Reference	290899
Date Sample Received	14/03/2022
Date Instructions Received	14/03/2022
Date Results Expected to be Reported	21/03/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	9 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	22
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Sample ID	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHsin Water
MB01	✓	✓	✓
MB02	✓	✓	✓
MB03	✓	✓	✓
MB04	✓	✓	✓
MB05	✓	✓	✓
DUP01	✓	✓	✓
R1	✓	✓	✓
TB	✓		
TS	✓		

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.