

VOPAK TERMINALS AUSTRALIA PTY
LTD (SITE B), GATE B47, 20 FRIENDSHIP
ROAD, PORT BOTANY, NSW

JUNE 2020

2020 GROUNDWATER MONITORING REPORT

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LICENCE

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2020 Groundwater Monitoring Report Environment Protection Licence

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EXECUTIVE SUMMARY

WSP Australia Pty Ltd (WSP) was engaged by Vopak Terminals Australia Pty Ltd Ltd (Vopak) to conduct groundwater sampling, analysis and reporting for existing groundwater monitoring wells located at Vopak Site B, Gate B47, 20 Friendship Road, Port Botany NSW ('the Site'; see Figure 1, **Appendix A**).

The objective of the groundwater monitoring event was to demonstrate compliance with the Environment Protection Licence (EPL) 6007, which Vopak holds for the Site. To comply with the EPL, groundwater sampling was required from seven (7) monitoring wells (MW1, MW2, MW3, MW4S, MW4D, MW5S and MW5D) with analysis conducted for EPL specified contaminants of concern including Benzene, Toluene, Ethylbenzene, Xylene (BTEX), Total Petroleum Hydrocarbons (TPH), Total r and Polycyclic Aromatic Hydrocarbons (PAH).

Groundwater sampling works were conducted on 28 May 2020 and comprised gauging, recording of field parameters and collection of samples for laboratory analysis from each specified well.

Based on the findings of the groundwater investigation, WSP concluded the following:

- Groundwater flow was not plotted this round, however, based on the location of Site WSP believes that groundwater flow is in a westerly direction, as per 2016 data;
- Phase separated hydrocarbons (PSH) were not observed in any of the monitoring wells assessed;
- Trace concentrations of C10 - C16 less Naphthalene (F2) in MW2 and MW4S were reported during the current monitoring round. Concentrations were below the EPA endorsed criteria for the protection of aquatic ecosystems; and
- TPH in wells MW2 and MW4S are not likely to pose an adverse environmental risk given they are only marginally above detection limits.

1 INTRODUCTION

1.1 BACKGROUND

WSP Australia Pty Ltd (WSP) was engaged by Vopak Terminals Australia Pty Ltd (Vopak) to conduct groundwater sampling, analysis and reporting for existing groundwater monitoring wells located at Vopak Site B, Gate B47, 20 Friendship Road, Port Botany NSW (the 'Site'). The location of the Site is shown in Figure 1, **Appendix A** and groundwater monitoring well locations are presented in Figure 2, **Appendix A**.

The Site is used by Vopak for bulk storage and distribution of petroleum products. In accordance with the requirements of Section 60 of the Protection of the Environment Operations Act 1997, Vopak holds an Environment Protection Licence (EPL) (Licence 6007) for petroleum product storage.

Groundwater monitoring has been routinely completed at the Site by WSP since 2003 to ensure compliance with the conditions of the EPL and to monitor the general contamination status of groundwater beneath the Site.

This report presents data from the current 2020 monitoring event for the EPL-listed wells and provides a comparison with historical results.

1.2 OBJECTIVES

The objective of the groundwater monitoring is to demonstrate compliance with Item M2 of the EPL Licence 6007 (Requirement to monitor the concentration of pollutants discharged). As defined by Item P1.3 of the EPL, the following seven (7) monitoring wells require monitoring every two years:

- MW1 (EPA Point 3)
- MW2 (EPA Point 4)
- MW3 (EPA Point 5)
- MW4S (EPA Point 6a)
- MW4D (EPA Point 6b)
- MW5S (EPA Point 7a)
- MW5D (EPA Point 7b)

The locations of the wells are provided in Figure 2, **Appendix A**.

In accordance with Item M2.3 of the EPL, each well must be 'grab' sampled and analysed for the following contaminants of concern: Benzene, Toluene, Ethylbenzene and Xylene (BTEX), Total Petroleum Hydrocarbons (TPH) and Polycyclic Aromatic Hydrocarbons (PAH).

2 SCOPE OF WORKS

To meet the project objectives, WSP completed the following scope of work:

- Review of previous reports prepared for the Site;
- Site-specific induction;
- Preparation of a Health, Environment and Safety Plan (HESP) for Site works;
- A Site walkover was conducted prior to groundwater sampling works to assess current conditions and features;
- All accessible existing monitoring wells were gauged, and the inferred groundwater flow direction was estimated;
- Groundwater samples from EPA monitoring wells were analysed by a National Association of Testing Authorities (NATA) accredited laboratory;
- Field and laboratory Quality Assurance/Quality Control (QA/QC) procedures were completed in compliance with the National Environmental Protection Council (NEPM) (2013 Revision) requirements; and
- Preparation of this report to present the findings of the investigation.

3 SAMPLING METHODOLOGY

3.1 WELL GAUGING, PURGING AND SAMPLING

Groundwater sampling works were conducted on 28 May 2020.

Prior to sampling, under the supervision of a Vopak representative, standing water levels were gauged in all monitoring wells using an interface probe, which can detect the thickness of any overlying non-aqueous phase liquids (NAPL) – otherwise known as phase-separated hydrocarbon (PSH), if present.

Monitoring wells were sampled using dedicated Hydrasleeve® grab samplers. Groundwater field parameters (pH, electrical conductivity (EC), temperature, oxygen-reduction potential (ORP) and dissolved oxygen [DO]) were conducted on each sample taken from the wells using a water quality meter. Observations of the groundwater conditions were also recorded, including colour, clarity, odour and presence of sheen. The field observations and measurements are provided in Table B2, **Appendix B** and field records are provided in Appendix C.

Groundwater samples were placed in new, clean, laboratory prepared bottles. Each sample bottle was labelled with the project number, sampling date and unique sample identifier.

3.2 SAMPLE STORAGE, HANDLING AND ANALYSIS

Groundwater samples were immediately placed in an ice-filled Esky to begin the cooling process before sample receipt by the laboratories. A Chain of Custody (COC) form was filled out with the sample ID and required analyses and dispatched to a NATA accredited laboratory with the samples.

Sample analysis was conducted by Envirolab Services (NATA No. 2901). Inter-laboratory duplicates were analysed by ALS Group Services Pty Ltd (NATA No. 825).

Samples were analysed for the contaminants of concern which included BTEX, TPH, Total Recoverable Hydrocarbons (TRH) and PAHs.

COC and laboratory sample receipt documentation are provided in Appendix D.

4 ASSESSMENT CRITERIA

The Groundwater Investigation Levels (GIL) for Marine Waters from the National Environment Protection Measure (2013) *Schedule, B1 Guidelines on Investigation Levels for Soil and Groundwater (National Environment Protection Council [NEPC], 2013)*, have been adopted as the appropriate assessment criteria.

Marine criteria have been adopted for the assessment of groundwater, given that local groundwater flow is generally in a westerly direction towards Botany Bay, located approximately 40 m west of the Site. Botany Bay is a marine ecosystem and considered to be ‘moderately disturbed’.

In the absence of GILs for TPH in the NEPM (2013), the Dutch (2013) *Soil Remediation Circular 2013* groundwater intervention value for mineral oil has been adopted in this report for screening purposes only.

The adopted criteria for contaminants of concern are presented in Table 4.1.

Table 4.1 Adopted Groundwater Assessment Criteria

PARAMETER	NEPM (2013) GIL MARINE WATERS (µg/L)	ANZECC 2000 MARINE TRIGGER VALUES (µg/L)	DUTCH (2013) (µg/L)
TPH (C ₆ -C ₉)	-	-	-
TPH (C ₁₀ -C ₃₆)	-	-	600
Benzene	500	500	30
Toluene	-	180 ^{1,2}	1000
Ethylbenzene	-	5 ²	150
Xylene (m&p)	200 ¹	75 ^{1,2}	70
Xylene (o)	350 ¹	350 ^{1,2}	
Naphthalene	50	70	70

Notes:

- 1 Freshwater criteria adopted in the absence of marine criteria, for screening purposes.
- 2 Low-reliability criteria.

5 RESULTS

5.1 GAUGING DATA

Water gauging data collected during the groundwater monitoring event is presented in **Appendix B**.

PSH was not observed in any of the EPL monitoring wells.

5.2 PHYSICOCHEMICAL RESULTS

Physicochemical results collected during groundwater monitoring event are presented in **Appendix B**. A summary of the results presented in **Appendix B** is provided below:

- pH ranged between 7.11 and 7.78 which indicates that groundwater at the Site is neutral;
 - EC generally ranged between 426 and 1,131 $\mu\text{S}/\text{cm}$, indicating that groundwater beneath the Site is fresh; however groundwater within MW4D (5,848 $\mu\text{S}/\text{cm}$) which is screened within a deeper aquifer, is moderately saline; all results are consistent with historical results for the Site;
 - DO range between 2.53 and 5.64 ppm indicating relatively well-oxygenated groundwater conditions across the Site;
 - Oxidation-Reduction Potential ranged between -74.0 and 208.5 mV which indicates that groundwater at the Site exhibits mildly reducing to oxidising conditions, consistent with more recent monitoring events;
 - The temperature was reported between 18.5 and 21.1 degrees Celsius; and
 - A slight sulphide odour was observed in the sample obtained from MW2; no odours were present in any other sample.
-

5.3 ANALYTICAL RESULTS

Analytical results are presented in **Appendix B** with laboratory certificates provided in Appendix D.

5.4 PETROLEUM HYDROCARBONS

Concentrations of TPH/TRH were generally reported below laboratory limit of reporting (LOR) with the exception C10 - C16 less Naphthalene (F2) with concentrations of 58 $\mu\text{g}/\text{L}$ at MW2, and 63 $\mu\text{g}/\text{L}$ at MW4S, which were only marginally above the detection limits, and consistent with historical concentrations. No exceedances of the criteria were observed during this monitoring round.

5.5 BTEXN

Concentrations of BTEXN were reported below the laboratory LOR all seven wells.

5.6 POLYCYCLIC AROMATIC HYDROCARBONS

Concentrations of PAHs were reported below the laboratory LOR all seven wells.

6 DISCUSSION

6.1 GROUNDWATER FLOW DIRECTION

The previously established flow direction (WSP, 2016), was generally to the west towards Botany Bay, groundwater flow was not plotted during this round of groundwater monitoring.

6.2 GROUNDWATER CONTAMINATION STATUS

Concentrations of BTEX and PAH were reported below laboratory LOR in all seven wells.

Trace levels of C10 - C16 less Naphthalene (F2) were detected in MW2 (58 µg/L) and MW4S (63 µg/L). These detections are below the EPL criteria for the Site. Nevertheless, the recorded concentration is not likely to pose an adverse environmental risk as the most toxic components of this hydrocarbon fraction in fuel are assessed by the BTEX analysis for which no detections were recorded.

6.3 QUALITY ASSURANCE AND QUALITY CONTROL

For any given project, all investigation data are potentially subject to sampling and data reduction errors. Data quality objectives are therefore established to control the sources of errors and quantify the errors whenever possible. Quality control (QC) procedures are designed to both increase sample data quality and help interpret discrepancies in results.

All work was conducted following industry-accepted standards, and quality assured procedures. Field quality control included rigorous sample collection and sample documentation. Calibration certificates are included in **Appendix E**.

A trip blank (sample TB) showed no cross-contamination in transit. Inter- and Intra-lab duplicate samples were collected from the wells on the Site, analysed and compared against each other. All analytes were less than LOR, which makes the calculation of the relative per cent differences (RPDs) impossible. Nevertheless, the result does show consistency in the laboratory method.

Laboratory QA and QC procedures included sample spikes for volatile analysis. The results of QC testing are presented in the laboratory reports (Appendix D), which also indicate how much of a particular analyte was recovered.

A review of field and laboratory QA indicated that:

- Sample integrity and container requirements were documented as acceptable;
- Holding time compliances were documented as acceptable;
- Matrix spike recovery (%R) values indicated that sample accuracy was acceptable; and,
- RPD values for all target analytes were within the accepted limits of 100% difference.

For this project, a review of laboratory QA/QC data indicates that the methods and results produced in this investigation are acceptable.

7 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this groundwater investigation, WSP concludes the following:

- Groundwater flow at the Site was in a westerly direction toward Botany Bay, consistent with the direction calculated in 2016.
- PSH was not observed in any of the monitoring wells;
- Concentrations of BTEX and PAHs were reported below LOR in all seven wells included in the EPL monitoring program;
- Trace levels of C10 - C16 less Naphthalene (F2) were detected in MW2 (58 µg/L), and MW4S (63 µg/L). These detections are below the EPL endorsed criteria for the Site and are not likely to pose an adverse environmental risk.
- It is recommended that during the next round of monitoring groundwater flow be established

8 LIMITATIONS

8.1 SCOPE OF SERVICES

This environmental site assessment report (the report) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or Site disturbance constraints.

8.2 RELIANCE ON DATA

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP

8.3 ENVIRONMENTAL CONCLUSIONS

In accordance with the scope of services, WSP has relied upon the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

On all sites, varying degrees of non-uniformity of the vertical and horizontal groundwater conditions are encountered. Hence no monitoring, common testing or sampling technique can eliminate the possibility that monitoring or testing results/samples are not representative of groundwater conditions encountered. The conclusions are based upon the data and the environmental field monitoring and/or testing and are therefore merely indicative of the environmental condition of the Site at the time of preparing the report, including the presence or otherwise of contaminants or emissions.

Also, it should be recognised that site conditions, including the extent and concentration of contaminants, can change with time.

Within the limitations imposed by the scope of services, the monitoring, testing, sampling and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

8.4 REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the client. WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

8.5 OTHER LIMITATIONS

WSP will not be liable to update or revise the report to take into account any events or new circumstances or facts occurring or becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to or ownership of the properties, buildings and structures referred to in the report nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.

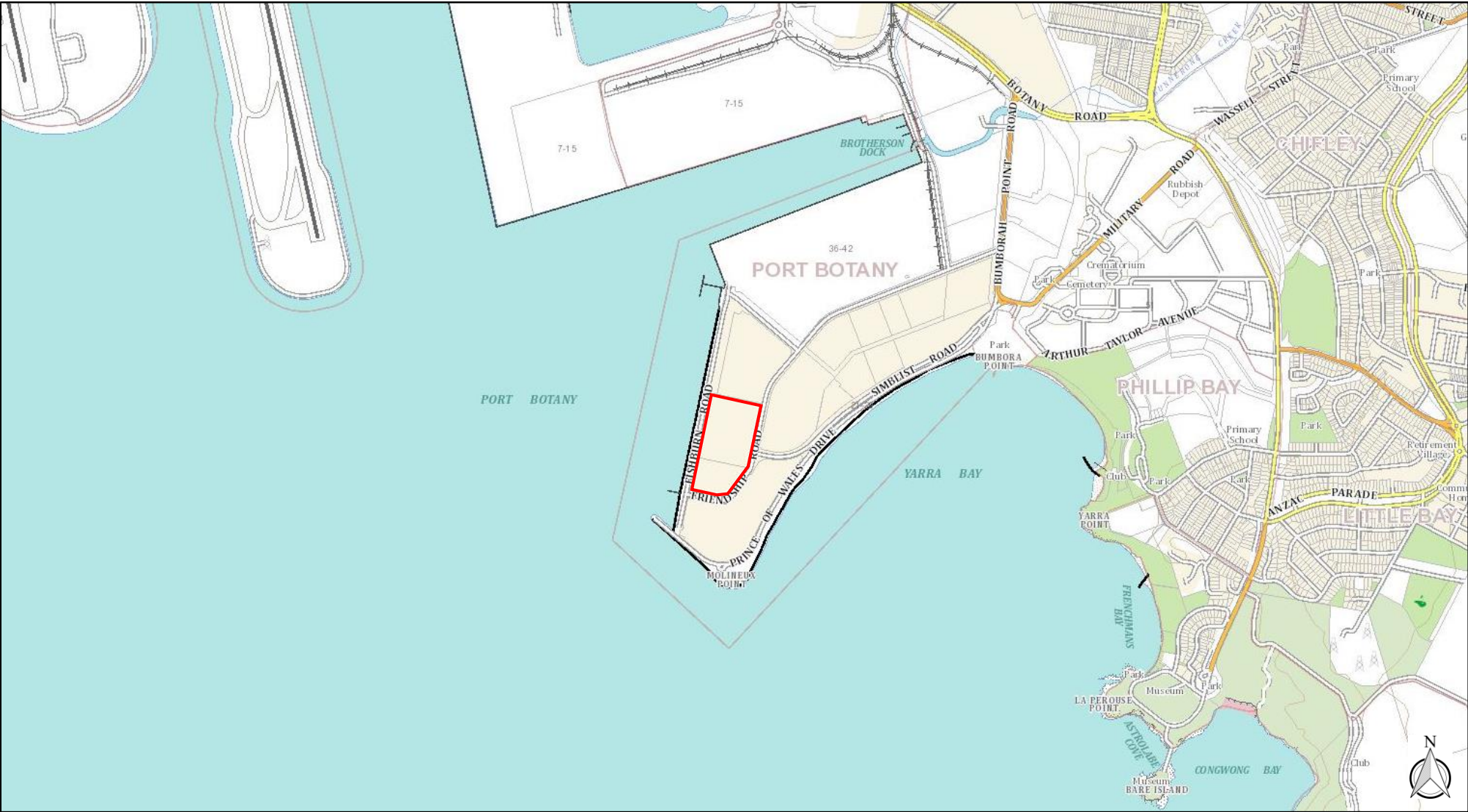
9 REFERENCES

- ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Paper No 4, Canberra.
- Dutch (2013) Soil Remediation Circular 2013
- NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999

APPENDIX A

FIGURES





Legend:
 Site location (approximate)

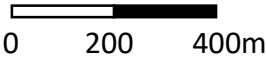


Figure 1 – Site Location
Vopak Site B, Gate B47, 20 Friendship Road, Port Botany, NSW



Legend:
 MW1 Monitoring Well - EPL

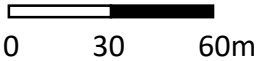


Figure 2 – Site Layout and Monitoring Well Locations
Vopak Site B, Gate B47, 20 Friendship Road, Port Botany, NSW

APPENDIX B

SUMMARY RESULTS





	TPH					BTEX				PAH						
	C6 - C9	C10 - C14	C15 - C28	C29 - C36	C10 - C36 (Sum)	Benzene	Toluene	Ethylbenzene	Xylene (Sum)	Benzo(a)pyrene TEQ	Benzo(b+j+k)fluoranthene	Benzo(a) pyrene	Naphthalene	Benzo(a)pyrene TEQ calc (Zero)	PAHs (Sum)	Total Positive PAHs
	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	10	50	100	50	50	1	1	1	2	5	2	0.5	1	0.5	0.5	1
ANZG (2018) Freshwater 95% toxicant DGVs						950 ^{#1}							16 ^{#2}			
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand						5,000	NL	NL	NL				NL			
NHMRC 2008 - Recreational Waters ADWG 2018						10	8,000	3,000	6,000			0.1				
Dutch Invervention 2000						30	1,000	150	70			0.05	70			
NEPM 2013 Table 1A(4) Res HSL A & B GW for Vapour Intrusion, Sand						800	NL	NL	NL				NL			
NEPM 2013 Table 1C GILs, Marine Waters						500 ^{#3}							50 ^{#3}			

Field ID	Lab Report Number	Date																
MW01	243780	5/28/2020	<10	<50	<100	<100	-	<1	<1	<1	-	<5	<2	<1	<1	-	-	NIL (+)VE
MW02	243780	5/28/2020	<10	58	<100	<100	-	<1	<1	<1	-	<5	<2	<1	<1	-	-	NIL (+)VE
MW03	243780	5/28/2020	<10	<50	<100	<100	-	<1	<1	<1	-	<5	<2	<1	<1	-	-	NIL (+)VE
QA01 (Duplicate of MW03)	243780	5/28/2020	<10	<50	<100	<100	-	<1	<1	<1	-	<5	<2	<1	<1	-	-	NIL (+)VE
QA01A (Triplicate of MW03)	ES2018786	6/1/2020	<20	<50	<100	<50	<50	<1	<2	<2	<2	-	-	<0.5	<1.0	<0.5	<0.5	NIL (+)VE
MW04D (Deep)	243780	5/28/2020	<10	<50	<100	<100	-	<1	<1	<1	-	<5	<2	<1	<1	-	-	NIL (+)VE
MW04 S (Shallow)	243780	5/28/2020	<10	63	<100	<100	-	<1	<1	<1	-	<5	<2	<1	<1	-	-	NIL (+)VE
MW05D	243780	5/28/2020	<10	<50	<100	<100	-	<1	<1	<1	-	<5	<2	<1	<1	-	-	NIL (+)VE
MW05S	243780	5/28/2020	<10	<50	<100	<100	-	<1	<1	<1	-	<5	<2	<1	<1	-	-	NIL (+)VE

Statistics																	
Number of Results	9	9	9	9	1	9	9	9	1	8	8	9	9	1	1	8	
Minimum Detect	ND	53	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Maximum Concentration	<20	53	<100	<100	<50	<1	<2	<2	<2	<5	<2	<1	<1	<0.5	<0.5	0	

Comments

#1 Moderate reliability

#2 Low reliability

#3 Figure may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance.

Environmental Standards

ANZG, 2018, ANZG (2018) Freshwater 95% toxicant DGVs



a

	TPH					BTEX				PAH						
	C6 - C9	C10 - C14	C15 - C28	C29 - C36	C10 - C36 (Sum)	Benzene	Toluene	Ethylbenzene	Xylene (Sum)	Benzo(a)pyrene TEQ	Benzo(b+j+k)fluoranthene	Benzo(a) pyrene	Naphthalene	Benzo(a)pyrene TEQ calc (Zero)	PAHs (Sum)	Total Positive PAHs
	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	10	50	100	50	50	1	1	1	2	5	2	0.5	1	0.5	0.5	1

Field ID	Lab Report Number	Date	Matrix Type															
MW03	243780	5/28/2020	water	<10	<50	<100	<100	-	<1	<1	<1	-	<5	<2	<1	<1	-	0 ^{#1}
QA01	243780	5/28/2020	water	<10	<50	<100	<100	-	<1	<1	<1	-	<5	<2	<1	<1	-	0 ^{#1}
RPD				0	0	0	0	-	0	0	0	-	0	0	0	0	-	-
MW03	243780	5/28/2020	water	<10	<50	<100	<100	-	<1	<1	<1	-	<5	<2	<1	<1	-	0 ^{#1}
QA01A	ES2018786	6/1/2020	water	<20	<50	<100	<50	<50	<1	<2	<2	<2	-	-	<0.5	<1.0	<0.5	<0.5
RPD				0	0	0	0	-	0	0	0	-	-	-	0	0	-	-

Comments

#1 NIL (+)VE

*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: (1 - 10 x EQL); 30 (10 - 20 x EQL); 30 (> 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



	TPH				BTEX			PAH				
	C6 - C9	C10 - C14	C15 - C28	C29 - C36	Benzene	Toluene	Ethylbenzene	Benzo(a)pyrene TEQ	Benzo(b+j+k)fluoranthene	Benzo(a) pyrene	Naphthalene	Total Positive PAHs
	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	10	50	100	100	1	1	1	5	2	1	1	1

Lab Report Number	Date	Matrix Type												
243780	5/28/2020	water	<10	<50	<100	<100	<1	<1	<1	<5	<2	<1	<1	NIL (+)VE

Table B4: Groundwater Gauging Summary Table

Well	Monitoring Purpose	Well Depth (m)	Apparent Thickness of Product (m)	Depth to groundwater (m below TOC) (A)	mAHD - well TOC (m) (B)	mAHD - groundwater (m) (B – A)
MW1	EPL	7.31	ND	3.85	-	-
MW2	EPL	7.29	ND	3.88	10.07	6.19
MW3	EPL	5.85	ND	3.625	10.09	6.465
MW4S	EPL	7.36	ND	3.975	10.11	6.135
MW4D	EPL	21.99	ND	3.995	-	-
MW5S	EPL	5.75	ND	3.765	10.12	6.355
MW5D	EPL	26.75	ND	4.015	-	-

Table B5: Groundwater Parameters Summary Table

Monitoring Well ID	pH	Temperature (°C)	Conductivity (µs/cm)	Dissolved Oxygen (ppm)	Oxidation Reduction Potential (SHE) (mv) ¹	Comments
MW1	7.41	20.1	1131	5.64	202.4	No odour, PSH or sheen
MW2	7.47	20.2	743	3.42	-74	Slight H ₂ S odour, No PSH or sheen
MW3	7.11	21.1	834	2.53	0.8	No odour, PSH or sheen
MW4S	7.78	18.5	849	5.55	200.6	No odour, PSH or sheen
MW4D	7.28	19.3	5848	4.64	208.5	No odour, PSH or sheen
MW5S	7.2	19.6	426	4.6	90.8	No odour, PSH or sheen
MW5D	7.65	19.4	806	2.96	-19.4	No odour, PSH or sheen

¹ Oxidation Reduction Potential (ORP) field results converted to Standard Hydrogen Electrode (SHE) readings by adding 199mV to each field value

Table B6: Groundwater Historical Data Summary Table

			TRH					BTEXN					PAH																	
			C6 - C9	C10-C14	C15-C28	C29-C36	+C10-C36 (Sum of total)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Total Xylenes	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b+J+K)fluoranthene	Benzo(g,h,i)perylene	PAH		Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Total Positive PAHs	
																					Chrysene	Dibenz(a,h)anthracene								
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	µg/L	
EQL	10	50	100	100	100	1	1	1	1	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	
NEPM 2013 Table 1C GILs, Marine Waters	-	-	-	-	-	500	-	-	350 ¹	200 ¹	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	-	-	-	-	
Dutch Invervention 2000 (Screening Purposed Only)	-	-	-	-	600	30	1,000	150	-	-	70	-	-	5	0.5	0.05	-	0.05	0.2	-	1	-	0.05	70	5	-	-	-	-	
ANZECC 2000 Marine Trigger Values	-	-	-	-	-	500	180 ^{1,2}	5 ²	350 ^{1,2}	75 ^{1,2}	-	-	-	-	-	-	-	-	-	-	-	-	-	70	-	-	-	-	-	
Field ID	Date Sampled	Lab Report																												
EPL																														
MW1	6/10/2014	111458	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW1	7/11/2016	149937	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW1	5/14/2018	191804	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW1	5/28/2020	243780	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW2	6/10/2014	111458	87	69	<100	<100	69	4	<1	27	<1	5	5	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW2	9/28/2015	135192	16	86	<100	<100	86	4	<1	4	<1	<2	<2	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-
MW2	6/8/2016	148211	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW2	5/14/2018	191804	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW2	5/28/2020	243780	<10	53	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW3	6/10/2014	111458	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW3	7/11/2016	149937	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW3	5/14/2018	191804	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW3	5/28/2020	243780	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW4-D	6/10/2014	111458	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW4-D	9/28/2015	135192	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW4-D	6/8/2016	148211	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW4-D	5/14/2018	191804	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW4-D	5/28/2020	243780	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW4-S	6/10/2014	111458	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW4-S	9/28/2015	135192	76	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW4-S	6/8/2016	148211	12	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW4-S	5/14/2018	191804	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW4-S	5/28/2020	243780	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW5-D	6/10/2014	111458	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW5-D	7/11/2016	149937	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW5-D	5/14/2018	191804	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW5-D	5/28/2020	243780	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW5-S	6/10/2014	111458	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW5-S	7/11/2016	149937	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
MW5-S	5/14/2018	191804	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW5-S	5/28/2020	243780	<10	<50	<100	<100	<100	<1	<1	<1	<1	<2	<2	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Note:

¹ 1 Freshwater criteria adopted in the absence of marine criteria, for screening purposes.

² Low reliability criteria.

BOLD = Current Rounds Data

APPENDIX C

FIELDSHEETS



Contaminated Land Management Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS120073	Well ID:	MW01					
Client:	VOPAK	Sampling date:	26/5/20					
Site location:	VOPAK Terminal B	Sampler:	James Robinson					
Casing Diameter (mm):	50mm	Depth to groundwater from TOC Before Sampling (m):	3.885					
Depth to LNAPL (mm):		Depth to groundwater from TOC After Sampling (m):	3.850					
LNAPL thickness (mm):		Initial Pump Speed (Purging):	N/A					
Method/pump type:	Hydrasleeve	Initial Pump Speed (Sampling):	N/A					
Start time (2400 hr):		Pump depth (from base of well):						
Well depth from TOC (m):		Actual purge volume (L):						
Well condition:		Did well purge 'dry'? Y / N	If yes, volume (L)?					
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)							
Purging and Water Quality Parameters:								
Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
			7.41	20.1	1131	202.4	5.64	Clear, Orange Colour Some algae No Odour No Sheen
Stabilisation Range:	- 0.1 m	+/- 0.05	+/- 3%	+/- 10mV	+/- 10%	+/- 0.2°C		
Water quality meter ID:	Airmet Hire			Calibration date:				
Did field parameters stabilise?	Yes / No / NA			Was the well dry purged Yes (No)				
Sampling details:				Analysis required:				
Method/pump type:	Hydrasleeve			TRH/BTEXN		Phenols		
Tubing material:				TRH silica gel		Metals (see COC for list)		
Sampling equipment:				BTEXN		MNA		
Hydrocarbon sheen observed?:	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No			VOC		Nutrients		
Primarily Sample ID:	MW01			PAH		Other		
Were samples filtered?	<input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No			QC samples collected? Yes / No				
Preservations:				If yes – QC Sample IDs:				
Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):								
Gas Detector above well 20.8% ^{O₂} 0% ^{CO} 0% ^{CH₄} 0% ^{UEL}								
Field scientist: James Robinson				Project manager: Aaron Young				

Contaminated Land Management Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS120073	Well ID:	MW02					
Client:	VOPAK	Sampling date:	26/5/20					
Site location:	VOPAK Terminal B	Sampler:	James Robinson					
Casing Diameter (mm): 50mm	Depth to groundwater from TOC Before Sampling (m): 3.880							
Depth to LNAPL (mm):	Depth to groundwater from TOC After Sampling (m):							
LNAPL thickness (mm):	Initial Pump Speed (Purging): N/A							
Method/pump type: Hydrasleeve	Initial Pump Speed (Sampling): N/A							
Start time (2400 hr):	Pump depth (from base of well):							
Well depth from TOC (m):	Actual purge volume (L):							
Well condition:	Did well purge 'dry'? Y / N If yes, volume (L)?							
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)							
Purging and Water Quality Parameters:								
Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
			7.47	20.2	734	- 74.0	3.12	black, turbid
								slight H ₂ S odour
								no sheen
Stabilisation Range:	- 0.1 m	+/- 0.05	+/- 3%	+/- 10mV	+/- 10%	+/- 0.2°C		
Water quality meter ID:				Calibration date:				
Did field parameters stabilise? Yes / No / NA				Was the well dry purged Yes / No				
Sampling details:				Analysis required:				
Method/pump type:	TRH/BTEXN			Phenols				
Tubing material:	TRH silica gel			Metals (see COC for list)				
Sampling equipment:	BTEXN			MNA				
Hydrocarbon sheen observed?: Yes / No	VOC			Nutrients				
Primarily Sample ID:	PAH			Other				
Were samples filtered? Yes / No	QC samples collected? Yes / No							
Preservations:	If yes – QC Sample IDs:							
Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):								
Field scientist: James Robinson				Project manager: Aaron Young				

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Contaminated Land Management
Standard Form 3.2.2:
Groundwater Sampling Record

Job number:	PS120073	Well ID:	MW03					
Client:	VOPAK	Sampling date:	26/5/20					
Site location:	VOPAK Terminal B	Sampler:	James Robinson					
Casing Diameter (mm): 50mm		Depth to groundwater from TOC Before Sampling (m): 3.625						
Depth to LNAPL (mm):		Depth to groundwater from TOC After Sampling (m):						
LNAPL thickness (mm):		Initial Pump Speed (Purging): N/A						
Method/pump type: Hydrasleeve		Initial Pump Speed (Sampling): N/A						
Start time (2400 hr):		Pump depth (from base of well):						
Well depth from TOC (m):		Actual purge volume (L):						
Well condition:		Did well purge 'dry'? Y / N If yes, volume (L)?						
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)						
Purging and Water Quality Parameters:								
Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
			7.1	21.1	834	0.8	2.53	light brown, not turbid, no odour
Stabilisation Range:	- 0.1 m	+/- 0.05	+/- 3%	+/- 10mV	+/- 10%	+/- 0.2°C		
Water quality meter ID:				Calibration date:				
Did field parameters stabilise? Yes / No / NA				Was the well dry purged Yes / No				
Sampling details:				Analysis required:				
Method/pump type:				TRH/BTEXN			Phenols	
Tubing material:				TRH silica gel			Metals (see COC for list)	
Sampling equipment:				BTEXN			MNA	
Hydrocarbon sheen observed?: Yes / <u>No</u>				VOC			Nutrients	
Primarily Sample ID:				PAH			Other:	
Were samples filtered? <u>Yes</u> / No				QC samples collected? <u>Yes</u> / No QA01 / QA01A				
Preservations:				If yes – QC Sample IDs:				
Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):								
Field scientist: James Robinson				Project manager: Aaron Young				

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Contaminated Land Management Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS120073	Well ID:	MW04S (Shallow)					
Client:	VOPAK	Sampling date:	26/5/20					
Site location:	VOPAK Terminal B	Sampler:	James Robinson					
Casing Diameter (mm): 50mm		Depth to groundwater from TOC Before Sampling (m): 3.975						
Depth to LNAPL (mm):		Depth to groundwater from TOC After Sampling (m):						
LNAPL thickness (mm):		Initial Pump Speed (Purging): N/A						
Method/pump type: Hydrasleeve		Initial Pump Speed (Sampling): N/A						
Start time (2400 hr):		Pump depth (from base of well):						
Well depth from TOC (m):		Actual purge volume (L):						
Well condition:		Did well purge 'dry'? Y / N If yes, volume (L)?						
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)						
Purging and Water Quality Parameters:								
Time (min)	Purged Vol (L)	DTW (mBTC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
			7.8	18.5	849	200.6	5.55	drawn large
								slightly turbid
								no odour no sheen
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	
Water quality meter ID:				Calibration date:				
Did field parameters stabilise? Yes / No / NA				Was the well dry purged Yes / No				
Sampling details:				Analysis required:				
Method/pump type:				TRH/BTEXN			Phenols	
Tubing material:				TRH silica gel			Metals (see COC for list)	
Sampling equipment:				BTEXN			MNA	
Hydrocarbon sheen observed?: Yes / No				VOC			Nutrients	
Primarily Sample ID:				PAH			Other	
Were samples filtered? Yes / No				QC samples collected? Yes / No				
Preservations:				If yes – QC Sample IDs:				
Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):								
Field scientist: James Robinson				Project manager: Aaron Young				

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Contaminated Land Management Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS120073	Well ID:	MW04D (Deep)					
Client:	VOPAK	Sampling date:	26/5/20					
Site location:	VOPAK Terminal B	Sampler:	James Robinson					
Casing Diameter (mm): 50mm		Depth to groundwater from TOC Before Sampling (m): 3.995						
Depth to LNAPL (mm):		Depth to groundwater from TOC After Sampling (m):						
LNAPL thickness (mm):		Initial Pump Speed (Purging): N/A						
Method/pump type: Hydrasleeve		Initial Pump Speed (Sampling): N/A						
Start time (2400 hr):		Pump depth (from base of well):						
Well depth from TOC (m):		Actual purge volume (L):						
Well condition:		Did well purge 'dry'? Y / N If yes, volume (L)?						
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)						
Purging and Water Quality Parameters:								
Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
			7.28	19.3	5848	208.5	4.64	Clear, not turbid
								Slight orange colour
								No odour no sheen
Stabilisation Range:	- 0.1 m	+/- 0.05	+/- 3%	+/- 10mV	+/- 10%	+/- 0.2°C		
Water quality meter ID:				Calibration date:				
Did field parameters stabilise? Yes / No / NA				Was the well dry purged Yes / No				
Sampling details:				Analysis required:				
Method/pump type: Hydrasleeve				TRH/BTEXN			Phenols	
Tubing material:				TRH silica gel			Metals (see COC for list)	
Sampling equipment:				BTEXN			MNA	
Hydrocarbon sheen observed?: Yes / No				VOC			Nutrients	
Primarily Sample ID:				PAH			Other	
Were samples filtered? Yes / No				QC samples collected? Yes / No				
Preservations:				If yes – QC Sample IDs:				
Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):								
Field scientist: James Robinson				Project manager: Aaron Young				

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Contaminated Land Management Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS120073	Well ID:	MW05S (Shallow)					
Client:	VOPAK	Sampling date:	26/5/20					
Site location:	VOPAK Terminal B	Sampler:	James Robinson					
Casing Diameter (mm):	50mm	Depth to groundwater from TOC Before Sampling (m):	3.765					
Depth to LNAPL (mm):		Depth to groundwater from TOC After Sampling (m):						
LNAPL thickness (mm):		Initial Pump Speed (Purging):	N/A					
Method/pump type:	Hydrasleeve	Initial Pump Speed (Sampling):	N/A					
Start time (2400 hr):		Pump depth (from base of well):						
Well depth from TOC (m):		Actual purge volume (L):						
Well condition:		Did well purge 'dry'? Y / N If yes, volume (L)?						
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)							
Purging and Water Quality Parameters:								
Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (µS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
			7.20	19.6	426	90-8	4-60	Brown/orange Nil turbidity No odour/no sheen
Stabilisation Range:	- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C		
Water quality meter ID:				Calibration date:				
Did field parameters stabilise? Yes / No / NA				Was the well dry purged Yes / No				
Sampling details:				Analysis required:				
Method/pump type:				TRH/BTEXN		Phenols		
Tubing material:				TRH silica gel		Metals (see COC for list)		
Sampling equipment:				BTENX		MNA		
Hydrocarbon sheen observed?: Yes (No)				VOC		Nutrients		
Primarily Sample ID:				PAH		Other		
Were samples filtered? Yes (Yes) / No				QC samples collected? Yes / No				
Preservations:				If yes – QC Sample IDs:				
Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):								
Field scientist: James Robinson				Project manager: Aaron Young				

Contaminated Land Management Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS120073	Well ID:	MW05D (Deep)					
Client:	VOPAK	Sampling date:	28/5/20					
Site location:	VOPAK Terminal B	Sampler:	James Robinson					
Casing Diameter (mm): 50mm		Depth to groundwater from TOC Before Sampling (m): 4.015						
Depth to LNAPL (mm):		Depth to groundwater from TOC After Sampling (m):						
LNAPL thickness (mm):		Initial Pump Speed (Purging): N/A						
Method/pump type: Hydrasleeve		Initial Pump Speed (Sampling): N/A						
Start time (2400 hr):		Pump depth (from base of well):						
Well depth from TOC (m):		Actual purge volume (L):						
Well condition:		Did well purge 'dry'? Y / N If yes, volume (L)?						
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)						
Purging and Water Quality Parameters:								
Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
			7.65	19.4	800	-19.4	2.96	brown/orange slightly turbid no odour
Stabilisation Range:	- 0.1 m	+/- 0.05	+/- 3%	+/- 10mV	+/- 10%	+/- 0.2°C		
Water quality meter ID:		Calibration date:						
Did field parameters stabilise? Yes / No / NA		Was the well dry purged Yes / No						
Sampling details:		Analysis required:						
Method/pump type: Hydrasleeve		TRH/BTEXN			Phenols			
Tubing material:		TRH silica gel			Metals (see COC for list)			
Sampling equipment:		BTEXN			MNA			
Hydrocarbon sheen observed?: Yes / <u>No</u>		VOC			Nutrients			
Primarily Sample ID:		PAH			Other			
Were samples filtered? <u>Yes</u> / No		QC samples collected? Yes / No						
Preservations:		If yes – QC Sample IDs:						
Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):								
Field scientist: James Robinson				Project manager: Aaron Young				

21.0% 0% 0% 0%

Contaminated Land Management Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS120073	Well ID:	MW					
Client:	VOPAK	Sampling date:						
Site location:	VOPAK Terminal B	Sampler:	James Robinson					
Casing Diameter (mm): 50mm		Depth to groundwater from TOC Before Sampling (m):						
Depth to LNAPL (mm):		Depth to groundwater from TOC After Sampling (m):						
LNAPL thickness (mm):		Initial Pump Speed (Purging): N/A						
Method/pump type: Hydrasleeve		Initial Pump Speed (Sampling): N/A						
Start time (2400 hr):		Pump depth (from base of well):						
Well depth from TOC (m):		Actual purge volume (L):						
Well condition:		Did well purge 'dry'? Y / N If yes, volume (L)?						
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)						
Purging and Water Quality Parameters:								
Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
Stabilisation Range:	- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C		
Water quality meter ID:				Calibration date:				
Did field parameters stabilise? Yes / No / NA				Was the well dry purged Yes / No				
Sampling details:				Analysis required:				
Method/pump type:				TRH/BTEXN		Phenols		
Tubing material:				TRH silica gel		Metals (see COC for list)		
Sampling equipment:				BTEXN		MNA		
Hydrocarbon sheen observed?: Yes / No				VOC		Nutrients		
Primarily Sample ID:				PAH		Other		
Were samples filtered? Yes / No				QC samples collected? Yes / No				
Preservations:				If yes – QC Sample IDs:				
Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):								
Field scientist: James Robinson				Project manager: Aaron Young				

APPENDIX D

LABORATORY CERTIFICATES



CERTIFICATE OF ANALYSIS 243780

Client Details

Client	WSP Australia Pty Limited
Attention	James Robinson
Address	GPO Box 5394, Sydney, NSW, 2001

Sample Details

Your Reference	<u>PS120073</u>
Number of Samples	9 WATER
Date samples received	28/05/2020
Date completed instructions received	28/05/2020

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.

Report Details

Date results requested by	04/06/2020
Date of Issue	04/06/2020
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, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water

Our Reference		243780-1	243780-2	243780-3	243780-4	243780-5
Your Reference	UNITS	MW01	MW02	MW03	MW04 S (Shallow)	MW04D (Deep)
Date Sampled		28/05/2020	28/05/2020	28/05/2020	28/05/2020	28/05/2020
Type of sample		WATER	WATER	WATER	WATER	WATER
Date extracted	-	29/05/2020	29/05/2020	29/05/2020	29/05/2020	29/05/2020
Date analysed	-	30/05/2020	30/05/2020	30/05/2020	30/05/2020	30/05/2020
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	%	112	113	113	114	115
Surrogate toluene-d8	%	97	98	97	98	96
Surrogate 4-BFB	%	101	100	98	99	100

vTRH(C6-C10)/BTEXN in Water

Our Reference		243780-6	243780-7	243780-8	243780-9
Your Reference	UNITS	MW05S	MW05D	QA01	FIELD BLANK/RINSATE
Date Sampled		28/05/2020	28/05/2020	28/05/2020	28/05/2020
Type of sample		WATER	WATER	WATER	WATER
Date extracted	-	29/05/2020	29/05/2020	29/05/2020	29/05/2020
Date analysed	-	30/05/2020	30/05/2020	30/05/2020	30/05/2020
TRH C ₆ - C ₉	µg/L	<10	<10	<10	<10
TRH C ₆ - C ₁₀	µg/L	<10	<10	<10	<10
TRH C ₆ - C ₁₀ less BTEX (F1)	µg/L	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	115	115	114	111
Surrogate toluene-d8	%	97	97	97	97
Surrogate 4-BFB	%	100	99	100	102

svTRH (C10-C40) in Water

Our Reference		243780-1	243780-2	243780-3	243780-4	243780-5
Your Reference	UNITS	MW01	MW02	MW03	MW04 S (Shallow)	MW04D (Deep)
Date Sampled		28/05/2020	28/05/2020	28/05/2020	28/05/2020	28/05/2020
Type of sample		WATER	WATER	WATER	WATER	WATER
Date extracted	-	01/06/2020	01/06/2020	01/06/2020	01/06/2020	01/06/2020
Date analysed	-	02/06/2020	01/06/2020	01/06/2020	02/06/2020	01/06/2020
TRH C ₁₀ - C ₁₄	µg/L	<50	53	<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	58	<50	63	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	58	<50	63	<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	%	76	77	70	97	82

svTRH (C10-C40) in Water

Our Reference		243780-6	243780-7	243780-8	243780-9
Your Reference	UNITS	MW05S	MW05D	QA01	FIELD BLANK/RINSE
Date Sampled		28/05/2020	28/05/2020	28/05/2020	28/05/2020
Type of sample		WATER	WATER	WATER	WATER
Date extracted	-	01/06/2020	01/06/2020	01/06/2020	01/06/2020
Date analysed	-	01/06/2020	04/06/2020	02/06/2020	02/06/2020
TRH C ₁₀ - C ₁₄	µg/L	<50	<50	<50	<50
TRH C ₁₅ - C ₂₈	µg/L	<100	<100	<100	<100
TRH C ₂₉ - C ₃₆	µg/L	<100	<100	<100	<100
TRH >C ₁₀ - C ₁₆	µg/L	<50	<50	<50	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	<50	<50	<50
TRH >C ₁₆ - C ₃₄	µg/L	<100	<100	<100	<100
TRH >C ₃₄ - C ₄₀	µg/L	<100	<100	<100	<100
Surrogate o-Terphenyl	%	70	80	80	75

PAHs in Water						
Our Reference	UNITS	243780-1	243780-2	243780-3	243780-4	243780-5
Your Reference		MW01	MW02	MW03	MW04 S (Shallow)	MW04D (Deep)
Date Sampled		28/05/2020	28/05/2020	28/05/2020	28/05/2020	28/05/2020
Type of sample		WATER	WATER	WATER	WATER	WATER
Date extracted	-	01/06/2020	01/06/2020	01/06/2020	01/06/2020	01/06/2020
Date analysed	-	01/06/2020	01/06/2020	01/06/2020	01/06/2020	01/06/2020
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	%	74	76	72	75	84

PAHs in Water					
Our Reference		243780-6	243780-7	243780-8	243780-9
Your Reference	UNITS	MW05S	MW05D	QA01	FIELD BLANK/RINSAT E
Date Sampled		28/05/2020	28/05/2020	28/05/2020	28/05/2020
Type of sample		WATER	WATER	WATER	WATER
Date extracted	-	01/06/2020	01/06/2020	01/06/2020	01/06/2020
Date analysed	-	01/06/2020	01/06/2020	01/06/2020	01/06/2020
Naphthalene	µg/L	<1	<1	<1	<1
Acenaphthylene	µg/L	<1	<1	<1	<1
Acenaphthene	µg/L	<1	<1	<1	<1
Fluorene	µg/L	<1	<1	<1	<1
Phenanthrene	µg/L	<1	<1	<1	<1
Anthracene	µg/L	<1	<1	<1	<1
Fluoranthene	µg/L	<1	<1	<1	<1
Pyrene	µg/L	<1	<1	<1	<1
Benzo(a)anthracene	µg/L	<1	<1	<1	<1
Chrysene	µg/L	<1	<1	<1	<1
Benzo(b,j+k)fluoranthene	µg/L	<2	<2	<2	<2
Benzo(a)pyrene	µg/L	<1	<1	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1	<1	<1	<1
Dibenzo(a,h)anthracene	µg/L	<1	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	<1	<1	<1	<1
Benzo(a)pyrene TEQ	µg/L	<5	<5	<5	<5
Total +ve PAH's	µg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	72	70	72	70

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)-BTX 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-W5	[NT]
Date extracted	-			29/05/2020	1	29/05/2020	01/06/2020		29/05/2020	[NT]
Date analysed	-			30/05/2020	1	30/05/2020	02/06/2020		30/05/2020	[NT]
TRH C ₆ - C ₉	µg/L	10	Org-023	<10	1	<10	<10	0	123	[NT]
TRH C ₆ - C ₁₀	µg/L	10	Org-023	<10	1	<10	<10	0	123	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	124	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	124	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	121	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	123	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	123	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	106	1	112	112	0	99	[NT]
Surrogate toluene-d8	%		Org-023	96	1	97	98	1	99	[NT]
Surrogate 4-BFB	%		Org-023	98	1	101	103	2	107	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			01/06/2020	4	01/06/2020	01/06/2020		01/06/2020	[NT]
Date analysed	-			01/06/2020	4	02/06/2020	01/06/2020		01/06/2020	[NT]
TRH C ₁₀ - C ₁₄	µg/L	50	Org-020	<50	4	<50	71	35	97	[NT]
TRH C ₁₅ - C ₂₈	µg/L	100	Org-020	<100	4	<100	<100	0	87	[NT]
TRH C ₂₉ - C ₃₆	µg/L	100	Org-020	<100	4	<100	<100	0	108	[NT]
TRH >C ₁₀ - C ₁₆	µg/L	50	Org-020	<50	4	63	89	34	97	[NT]
TRH >C ₁₆ - C ₃₄	µg/L	100	Org-020	<100	4	<100	<100	0	87	[NT]
TRH >C ₃₄ - C ₄₀	µg/L	100	Org-020	<100	4	<100	<100	0	108	[NT]
Surrogate o-Terphenyl	%		Org-020	104	4	97	91	6	96	[NT]

QUALITY CONTROL: PAHs in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			01/06/2020	4	01/06/2020	01/06/2020		01/06/2020	[NT]
Date analysed	-			01/06/2020	4	01/06/2020	01/06/2020		01/06/2020	[NT]
Naphthalene	µg/L	1	Org-022/025	<1	4	<1	<1	0	84	[NT]
Acenaphthylene	µg/L	1	Org-022/025	<1	4	<1	<1	0	[NT]	[NT]
Acenaphthene	µg/L	1	Org-022/025	<1	4	<1	<1	0	[NT]	[NT]
Fluorene	µg/L	1	Org-022/025	<1	4	<1	<1	0	86	[NT]
Phenanthrene	µg/L	1	Org-022/025	<1	4	<1	<1	0	76	[NT]
Anthracene	µg/L	1	Org-022/025	<1	4	<1	<1	0	[NT]	[NT]
Fluoranthene	µg/L	1	Org-022/025	<1	4	<1	<1	0	72	[NT]
Pyrene	µg/L	1	Org-022/025	<1	4	<1	<1	0	78	[NT]
Benzo(a)anthracene	µg/L	1	Org-022/025	<1	4	<1	<1	0	[NT]	[NT]
Chrysene	µg/L	1	Org-022/025	<1	4	<1	<1	0	70	[NT]
Benzo(b,j+k)fluoranthene	µg/L	2	Org-022/025	<2	4	<2	<2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	1	Org-022/025	<1	4	<1	<1	0	84	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-022/025	<1	4	<1	<1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	1	Org-022/025	<1	4	<1	<1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	1	Org-022/025	<1	4	<1	<1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	79	4	75	81	8	103	[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.



CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

Client: WSP Sydney	Client Project Name/Number/Site etc (ie report title):
Contact Person: James Robinson	PS120073
Project Mgr: AARON YOUNG	PO No.:
Sampler: James Robinson	Envirolab Quote No.:
Address: L27 Ernst & Young Centre 680 George Street	Date results required: Or choose: <u>standard</u> / same day / 1 day / 2 day / 3 day
Sydney NSW 2000	Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Phone: 0431524568 Mob:	Additional report format: esdat
Email:	Lab Comments:
james.robinson.2@wsp.com ; wsp.labsync@esdat.com.au	

ENVIROLAB GROUP

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

Sample information					Tests Required										Comments	
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Envirolab Services 12 Ashley St Chatswood NSW 2067 Ph: (02) 9910 6200										ON HOLD	Provide as much information about the sample as you can
1	MW01		28/5/20	WATERS	Job No: 243780 Date Received: 28/5/20 Time Received: 1510 Received by: JD Temp: Cool/Ambient Cooling: Ice/Coolpack Security: Intact/Broken/None											
2	MW02															
3	MW03															
4	MW04 S(hallow)															
5	MW04 D(Deep)															
6	MW05 S															
7	MW05 D															
8	QA01															
-	QA01A															SEND TO AUS PLEASE
9	FIELD BLANK / RINSE															

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): WSP Aust	Received by (Company): EGS S/D	Lab Use Only	
Print Name: James Robinson	Print Name: Jason Day	Job number: 243780	Cooling: Ice / Ice pack / None
Date & Time: 28/5/20 1500	Date & Time: 28/5/20 1510	Temperature: 11.7	Security seal: Intact / Broken / None
Signature: James Robinson	Signature: [Signature]	TAT Req - SAME day / 1 / 2 / 3 / 4 / <u>STD</u>	

SAMPLE RECEIPT ADVICE

Client Details

Client	WSP Australia Pty Limited
Attention	James Robinson

Sample Login Details

Your reference	PS120073
Envirolab Reference	243780
Date Sample Received	28/05/2020
Date Instructions Received	28/05/2020
Date Results Expected to be Reported	04/06/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	9 WATER
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	117
Cooling Method	Ice
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:

**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 ID	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water
MW01	✓	✓	✓
MW02	✓	✓	✓
MW03	✓	✓	✓
MW04 S (Shallow)	✓	✓	✓
MW04D (Deep)	✓	✓	✓
MW05S	✓	✓	✓
MW05D	✓	✓	✓
QA01	✓	✓	✓
FIELD BLANK/RINSATE	✓	✓	✓

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.

CERTIFICATE OF ANALYSIS

Work Order : **ES2018786**
Client : **WSP Australia Pty Ltd**
Contact : **MR AARON YOUNG**
Address : **ABN: 80 078 004 798 GPO BOX 5394**
SYDNEY NSW, AUSTRALIA 2001
Telephone : **+61 02 92725100**
Project : **PS120073**
Order number : **----**
C-O-C number : **----**
Sampler : **JAMES ROBINSON**
Site : **----**
Quote number : **EN/008/18 B**
No. of samples received : **1**
No. of samples analysed : **1**

Page : 1 of 5
Laboratory : Environmental Division Sydney
Contact : Grace White
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61 2 8784 8555
Date Samples Received : 29-May-2020 17:45
Date Analysis Commenced : 02-Jun-2020
Issue Date : 05-Jun-2020 14:28



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. 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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- 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.

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	QA01A	----	----	----	----
Client sampling date / time				01-Jun-2020 00:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES2018786-001	-----	-----	-----	-----	
				Result	----	----	----	----	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----	
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----	
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----	
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----	
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----	
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----	
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----	
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----	
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----	
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	----	----	----	
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----	
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----	
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----	
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----	
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	----	----	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----	
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----	
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----	
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----	
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----	
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----	
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----	
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----	
EP080: BTEXN									



Analytical Results

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

Client sample ID

				QA01A	----	----	----	----
Client sampling date / time				01-Jun-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2018786-001	-----	-----	-----	-----
				Result	----	----	----	----
EP080: BTEXN - Continued								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	18.2	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	45.0	----	----	----	----
2,4,6-Tribromophenol	118-79-6	1.0	%	50.2	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	60.1	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	65.1	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	73.8	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	79.0	----	----	----	----
Toluene-D8	2037-26-5	2	%	104	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	109	----	----	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
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

QUALITY CONTROL REPORT

Work Order	: ES2018786	Page	: 1 of 4
Client	: WSP Australia Pty Ltd	Laboratory	: Environmental Division Sydney
Contact	: MR AARON YOUNG	Contact	: Grace White
Address	: ABN: 80 078 004 798 GPO BOX 5394 SYDNEY NSW, AUSTRALIA 2001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 92725100	Telephone	: +61 2 8784 8555
Project	: PS120073	Date Samples Received	: 29-May-2020
Order number	: ----	Date Analysis Commenced	: 02-Jun-2020
C-O-C number	: ----	Issue Date	: 05-Jun-2020
Sampler	: JAMES ROBINSON		
Site	: ----		
Quote number	: EN/008/18 B		
No. of samples received	: 1		
No. of samples analysed	: 1		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3052938)									
ES2018611-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
ES2018650-003	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3052938)									
ES2018611-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
ES2018650-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 3052938)									
ES2018611-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
ES2018650-003	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.00	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (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 Spike (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**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3052823)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	67.6	50.0	94.0
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	67.6	63.6	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	71.0	62.2	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	70.9	63.9	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	75.1	62.6	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	79.8	64.3	116
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	81.3	63.6	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	80.0	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	74.4	64.1	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	70.1	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	1	µg/L	<1.0	5 µg/L	83.0	61.7	119
	205-82-3							
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	73.1	63.0	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	72.0	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	69.6	59.9	118
EP075(SIM): Dibenzo(a,h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	69.2	61.2	117
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	74.6	59.1	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3052822)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	80.1	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	93.5	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	94.6	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3052938)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	79.6	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3052822)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	84.8	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	84.3	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	99.8	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3052938)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	82.1	75.0	127
EP080: BTEXN (QCLot: 3052938)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	78.3	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	87.5	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	92.7	70.0	120



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EP080: BTEXN (QCLot: 3052938) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	90.5	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	90.2	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	89.3	70.0	120

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**

				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery(%) MS	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number			Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3052938)							
ES2018611-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	96.6	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3052938)							
ES2018611-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	96.8	70.0	130
EP080: BTEXN (QCLot: 3052938)							
ES2018611-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	85.5	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	94.3	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	99.2	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	98.4	70.0	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	101	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	81.2	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2018786	Page	: 1 of 4
Client	: WSP Australia Pty Ltd	Laboratory	: Environmental Division Sydney
Contact	: MR AARON YOUNG	Telephone	: +61 2 8784 8555
Project	: PS120073	Date Samples Received	: 29-May-2020
Site	: ----	Issue Date	: 05-Jun-2020
Sampler	: JAMES ROBINSON	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	1	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	5	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	5	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	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) QA01A	01-Jun-2020	02-Jun-2020	08-Jun-2020	✓	03-Jun-2020	12-Jul-2020	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) QA01A	01-Jun-2020	02-Jun-2020	08-Jun-2020	✓	03-Jun-2020	12-Jul-2020	✓
Clear glass VOC vial - HCl (EP080) QA01A	01-Jun-2020	04-Jun-2020	15-Jun-2020	✓	04-Jun-2020	15-Jun-2020	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) QA01A	01-Jun-2020	02-Jun-2020	08-Jun-2020	✓	03-Jun-2020	12-Jul-2020	✓
Clear glass VOC vial - HCl (EP080) QA01A	01-Jun-2020	04-Jun-2020	15-Jun-2020	✓	04-Jun-2020	15-Jun-2020	✓
EP080: BTEXN							
Clear glass VOC vial - HCl (EP080) QA01A	01-Jun-2020	04-Jun-2020	15-Jun-2020	✓	04-Jun-2020	15-Jun-2020	✓



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)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	1	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	5	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	16	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	1	100.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	5	20.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	6.25	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	1	100.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	5	20.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	6.25	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	1	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	5	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	6.25	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
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A 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 (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270E 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 (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260D 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 (2013) Schedule B(3)
Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 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 (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
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 sparging.



CHAIN OF CUSTODY FORM - Client

ENVIROLAB GROUP

National phone number 1300 424 344

Sydney Lab - Envirolab Services

12 Ashley St, Chatswood, NSW 2067

02 9910 6200 | sydney@envirolab.com.au

Perth Lab - MPL Laboratories

16-18 Hayden Crt, Myaree, WA 6154

08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services

25 Research Drive, Croydon South, VIC 3136

03 9763 2500 | melbourne@envirolab.com.au

Adelaide Office - Envirolab Services

7a The Parade, Norwood, SA 5067

08 7087 6800 | adelaide@envirolab.com.au

[Copyright and Confidential]

Client: WSP Sydney

Contact Person: James Robinson

Project Mgr: AARON YOUNG

Sampler: James Robinson

Address: L27 Ernst & Young Centre

680 George Street

Sydney NSW 2000

Phone: 0431524568

Mob:

Email: james.robinson.2@wsp.com ; wsp.labsync@esdat.com.au

Client Project Name/Number/Date etc (ie report title):

PS120073

PO No.:

Envirolab Quote No.:

Date results required:

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

Lab Comments:

Sample Information

Tests Required

Envirolab Services

12 Ashley St

Chatswood NSW 2067

Ph: (02) 9910 6200

Job No: 243780

Date Received: 28/5/20

Time Received: 15:10

Received by: JD

Temp: 600/Ambient

Cooling: Ice/Capack

Security: Intact/Broken/None

Envirolab Sample ID

Client Sample ID or information

Depth

Date sampled

Type of sample

WATERS

mw01

mw02

mw03

mw04 (Shallow)

mw04 D (Deep)

mw05S

mw05D

QA01

QA01A

FIELD BLANK (RMS)

Comments

Provide as much information about the sample as you can

Environmental Division

Sydney

Work Order Reference

ES2018786



Telephone: + 61-2-8714 1555

SEND TO AUS PENSE

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):

WSP Aust: ELS

Received by (Company): ES

Print Name: James Robinson

Date & Time: 28/5/20 15:00

Signature: James Robinson

Lab Use Only

Job number: 243780

Cooling: Ice / Ice pack / None

Temperature: 11.7

Security seal: Intact / Broken / None

TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

REC-508 29/5/20 1745 105

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : ES2018786

<p>Client : WSP Australia Pty Ltd</p> <p>Contact : MR AARON YOUNG</p> <p>Address : ABN: 80 078 004 798 GPO BOX 5394 SYDNEY NSW, AUSTRALIA 2001</p> <p>E-mail : aaron.young@wsp.com</p> <p>Telephone : +61 02 92725100</p> <p>Facsimile : +61 02 92725101</p> <p>Project : PS120073</p> <p>Order number : ----</p> <p>C-O-C number : ----</p> <p>Site : ----</p> <p>Sampler : JAMES ROBINSON</p>	<p>Laboratory : Environmental Division Sydney</p> <p>Contact : Grace White</p> <p>Address : 277-289 Woodpark Road Smithfield NSW Australia 2164</p> <p>E-mail : Grace.White@ALSGlobal.com</p> <p>Telephone : +61 2 8784 8555</p> <p>Facsimile : +61-2-8784 8500</p> <p>Page : 1 of 2</p> <p>Quote number : ES2019PARBRINSW0005 (EN/008/18 B)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 29-May-2020 17:45	Issue Date : 01-Jun-2020
Client Requested Due : 05-Jun-2020	Scheduled Reporting Date : 05-Jun-2020
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 1	Temperature : 10°C - Ice Bricks present
Receipt Detail :	No. of samples received / analysed : 1 / 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
- **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 absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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.



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

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	Client sampling date / time	Client sample ID	WATER - W-07 TRH/BTEXN/PAH
ES2018786-001	01-Jun-2020 00:00	QA01A	✓

Proactive Holding Time Report

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

Requested Deliverables

AARON YOUNG

- *AU Certificate of Analysis - NATA (COA)	Email	aaron.young@wsp.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	aaron.young@wsp.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	aaron.young@wsp.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	aaron.young@wsp.com
- Chain of Custody (CoC) (COC)	Email	aaron.young@wsp.com
- EDI Format - ENMRG (ENMRG)	Email	aaron.young@wsp.com
- EDI Format - ESDAT (ESDAT)	Email	aaron.young@wsp.com

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AU.AccountsPayable@wsp.com
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JAMES ROBINSON

- *AU Certificate of Analysis - NATA (COA)	Email	james.robinson.2@wsp.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	james.robinson.2@wsp.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	james.robinson.2@wsp.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	james.robinson.2@wsp.com
- Chain of Custody (CoC) (COC)	Email	james.robinson.2@wsp.com
- EDI Format - ENMRG (ENMRG)	Email	james.robinson.2@wsp.com
- EDI Format - ESDAT (ESDAT)	Email	james.robinson.2@wsp.com

wsp labsync

- EDI Format - ESDAT (ESDAT)	Email	wsp.labsync@esdat.com.au
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APPENDIX E

CALIBRATION CERTIFICATES



Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **18J104319**



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		pH 10.00		332474	pH 9.83
2. pH 7.00		pH 7.00		330737	pH 7.13
3. pH 4.00		pH 4.00		330734	pH 4.12
4. mV		229.6mV		346052/337074	226.7mV
5. EC		2.76mS		333787	2.76mS
6. D.O		0.00ppm		1904288592	0.01pm
7. Temp		22.6°C		MultiTherm	21.5°C

Calibrated by:

Darcy Keogh

Calibration date:

27/05/2020

Next calibration due:

26/06/2020