Yulara Landfill

Environmental Compliance Monitoring - March 2024

Prepared for

Voyages Indigenous Tourism Australia Pty Ltd

16 May 2024

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1 INTRODUCTION 4
1.1 General 4
1.2 Objectives 4
1.3 Site Definition 4
1.4 Geological and Topographical Information 4
1.5 Hydrogeology 5
1.6 Previous Environmental Investigations 5
1.7 Scope of Works 6
2 INVESTIGATION METHODOLOGY 7
2.1 Landfill Gas 7
2.1.1 Gas well status 7
2.1.2 Landfill gas monitoring 7
2.1.3 Landfill gas accumulation monitoring 7
2.1.4 Landfill gas surface survey 7
2.2 Landfill Leachate 7
2.2.1 Leachate well status 7
2.2.2 Leachate sampling 8
2.3 Groundwater 8
2.3.1 Groundwater well status 8
2.3.2 Sampling preparation 8
2.3.3 Groundwater sampling 8
2.4 Quality Control Sampling 8
2.5 Tracking of Samples 9
2.6 Analytical Testing 9
3 QUALITY ASSESSMENT 10
4 ACCEPTANCE CRITERIA 11
5 INVESTIGATION RESULTS 12
5.1 Landfill Gas Monitoring 12
5.2 Landfill Gas Trends 12
5.3 Landfill Gas Surface Survey 12
5.4 Leachate Analytical Results 12
5.5 Groundwater Gauging 13
5.6 Groundwater Field Observations 13
5.7 Groundwater Analytical Findings 13
5.8 Groundwater Trend Analysis 13
6 SUMMARY AND RECOMMENDATIONS 15
6.1 Summary 15
6.2 Recommendations 15
7 LIMITATIONS OF USE 16

APPENDIX A
FIGURES

APPENDIX B
WELL GAUGING RECORDS

APPENDIX C
WELL PURGING RECORDS

APPENDIX D
CURRENT AND HISTORICAL RESULT SUMMARY TABLES

APPENDIX E
QA/QC ASSESSMENT

APPENDIX F
CALIBRATION CERTIFICATE

APPENDIX G
MANN KENDALL TREND ASSESSMENT

APPENDIX H
LABORATORY REPORTS

1 INTRODUCTION

1.1 General

This report has been prepared by Tierra Environment Pty Ltd (Tierra) for Voyages Indigenous Tourism Australia (Voyages). It documents an environmental compliance monitoring event undertaken in March 2024 as part of the compliance reporting for the Yulara Landfill, Northern Territory. A plan showing the location of the site is provided as Figure 1 in Appendix A.

1.2 Objectives

As per the landfills licence (EPL179-02) the landfill "must implement, maintain and follow the Monitoring Plan". An "Ongoing Monitoring Plan" (OMP) was prepared by Greencap in 2016 for the landfill. The OMP requires that a groundwater, surface water, leachate and landfill gas monitoring programme must be carried out every 6 months with the intention to achieve the following objectives:

- Determine baseline environmental conditions at and around the landfill site
- Determine processes occurring within the landfill through monitoring of leachate production, leachate composition and landfill gas composition
- Determine risks or effects on the environment due to the landfill through monitoring of groundwater, surface water and landfill gas
- Check compliance with regulatory requirements
- Identify the need for, and extent of, remedial/mitigation measures to reduce effects on the environment

1.3 Site Definition

The site is defined as follows:

Description	Yulara Landfill
Address	Lot 248 Yulara NT
Title	Volume CUFT 866 Folio 877
Plan	LTO94/017B
Council	Unincorporated area within McDonnell Shire Council
Zoning	No Zone
Size	201,400m^2
Owner	Voyages Indigenous Tourism Australia

1.4 Geological and Topographical Information

The OMP discusses the geology of Yulara as one area however since the preparation of this document NT Power and Water Corporation commissioned CloudGMS to prepare a model of the Dune Plains Aquifer. From this it appears that the landfill lies just to the west of the boundary between the "Dune Plains Aquifer" and outcrops and sediments associated with the "Sedimentaries" where as the township of Yulara lies within the Dune Plains Aquifer as the OMP details. The landfill being just outside of the Dune Plains Aquifer appears to be confirmed with the material logs from groundwater well installation by Low Ecological in 2017. On this basis the geology at the site is described as follows:

The Yulara landfill site lies on a portion of the Amadeus Basin to the south west of the outcrops of The Sedimentaries and approximately 1km west of the western extent of the Dune Plains Aquifer near Yulara.

Underlying soils are:

- Quaternary age Red Soils – Red sand, mud and gravel; sheet wash deposits found in inter-dune depressions and on gentle slopes flanking hills.

Overlying

- Proterozoic age Winnall Beds – Brown to pale quarts sandstone, often micaceous, dominantly tabular but massive in upper part; minor red-purple fine sandstone to siltstone.

The Quaternary age Red Soils have formed from erosion of the outcropping Sedimentaries which themselves are Neoproterzoic age conglomerates. The south eastern most outcrop lie approximately 1.5km west north west of the landfill.

The Dune Pains Aquifer in the vicinity of the landfill is approximately co-located with the Olga Thrust. To the east of this boundary/fault soils are Quaternary age Aeolian Sands – (aeolian sand plains and sand dune deposits). These Quaternary age sediments within the Dune Plains Aquifer are significantly deeper (up to 100m thick) than the Quaternary age sediments below the landfill (less than 20m thick) and they constitute the aquifer itself.

The topography in the vicinity of the landfill is relatively complicated due to outcropping of the Sedimentaries, the Quaternary sediments formed on its flanks and the change in geology across the western boundary of the Dune Plains Aquifer and the Olga Thrust. The topography is described as follows:

To the north west of the landfill are north west to south east trending ridges of the Sedimentaries. To the north east and south west of these outcrops the ground falls away gently. The landfill is to the north east of one of these outcrops and as such there is a gentle fall to the north east. The landfill is also to the south east of the ends of a collection of the outcrops and as a result there is an even shallower component of cross fall to the south east. All of the land immediately surrounding the landfill sits higher than the land to the east which is essentially flat plains.

1.5 Hydrogeology

The hydrogeology of the site based on information contained in the OMP and the geology and topography discussed in Section 1.4 is as follows:

From the OMP for Yulara

> *"Yulara is highly seasonal with the lowest average rainfall occurring in August (4.3mm) and increasing and extending through the northern Australian monsoon period through to December. Both the Cainozoic sediments and Proterozoic bedrock provide useable groundwater. This multi-layered aquifer is called the Dune Plains Aquifer and correlates with the palaeovalley underneath Yulara.*
>
> *The Dune Plains Aquifer is actively recharged during the high rainfall events during the monsoonal periods. Based upon available information the net groundwater flow is towards Lake Amadeus (i.e. to the north-east). However the shallower local groundwater is generally more complex and flows in a generally easterly direction. Information suggests that the site lies in an area which acts as a recharge zone for the Dune Plains Aquifer."*

The above appears correct with the exception of the landfill site being just to the west of the Dune Plains Aquifer. It is expected that the upper Quaternary aquifer is linked to (feeds into) the Dune Plains Aquifer through permeable and porous layers within the Quaternary age Red Soils. Based on the local topography (an indicator of groundwater flow in recent sedimentary aquifers) and the surface topography appears to be sloping down to the north east suggesting local flow may be more north east than east.

1.6 Previous Environmental Investigations

While the OMP states monitoring at the site should be undertaken every six months previous monitoring at the site was undertaken in November 2017 (Low Ecological Services), August 2018 (GHD), June 2019 (GHD), November 2019 (GHD), October 2020 (GHD), July 2021 (GHD), November 2021 (GHD), May 2022 (EcOz) and May 2023 (EcOz). A review of the latest monitoring report identified the following:

- No groundwater was present in the three wells (MW1D, MW2D & MW3D).
- Leachate was not present in the two wells (LMW1 & LMW2).

- Landfill gas monitoring was undertaken in five wells (MW1S, MW2S, MW3S, LMW1 & LMW2). Methane was detected in LMW1 & LMW2 which are located within the landfill at limits below the LEL (5% by volume). Carbon dioxide readings were below 1.5% by volume in the perimeter well (MW1S)
- Enclosed space landfill gas survey was not undertaken due to no onsite buildings being in use.
- The surface gas survey recorded landfill gas levels between 0ppm to 0.3ppm.
- There were no groundwater results as groundwater was not detected in the three wells however historical results provided show that previous exceedances were observed in MW3D for aluminium, chromium, boron, copper, zinc and selenium.

1.7 Scope of Works

The following activities were undertaken as part of the environmental monitoring by Tierra:

- Field monitoring of 5 landfill gas monitoring points for methane (CH_4), carbon dioxide (CO_2), oxygen (O_2), and volatile organic compounds (VOCs)
- Groundwater level gauging of 3 groundwater wells
- Purging and sampling of 1 groundwater well
- Field analysis of 1 groundwater sample for temperature (°C), dissolved oxygen (% and mg/L), specific conductivity SPC (µS/cm), conductivity (µS/cm), total dissolved solids (ppm), pH and redox potential (mV)
- Laboratory analysis of 1 groundwater sample,1 intra-laboratory and 1 inter-laboratory groundwater sample for TSS, alkalinity, total nitrogen, ammonia, nitrate, nitrite, total phosphorous, orthophosphate, dissolved organic carbon, COD, Fe, Al, Cu, Zn, Cr, Mn, Ni, Pb, Ca, chloride, Ca, sulphate, Na, P, Mg, As, Hg, Se, TRH, BTEX, PAH, OCP, OPP, PCB
- Gauging of 2 leachate wells
- Measurement of methane (CH_4), carbon dioxide (CO_2), oxygen (O_2), and volatile organic compounds (VOCs) using a PID across the surface of the landfill in a grid based pattern
- Data review and assessment
- Preparation of performance report

2 INVESTIGATION METHODOLOGY

2.1 Landfill Gas

2.1.1 Gas well status

The following table details the current status of the gas wells at the landfill.

Gas Well	Depth	Screen	Status in March 2024	Comments
MW1S	4m	1-4m	In service	-
MW2S	10m	1-10m	In service	-
MW3S	11m	2-11m	In service	-
LMW1	6m	1.5-6m	In service	-
LMW2	8m	1-8m	In service	-

A site plan detailing locations of in service gas wells is presented as Figure 2 in Appendix A.

The positions and purposes of the wells based on their location are as follows:

- MW1S is situated on the western boundary and is considered to show background concentrations.
- MW2S and MW3S are situated on the eastern boundary up gradient of the landfill but also within a filled area of the landfill.
- LMW1 and LMW2 are located in the centre of the site within the filled area of the landfill.

2.1.2 Landfill gas monitoring

Available gas wells were monitored for concentrations of methane, carbon dioxide, oxygen and volatile organic compounds (CH_4, CO_2, O_2 and VOCs respectively) on 8 March 2024. Monitoring data prior to March 20234 while not presented in this report, has been utilised to produce plots of gas levels and local moisture budgets over time.

A GA5000 landfill gas analyser with sampling pump was used to test for CH_4, CO_2 and O_2 concentrations. VOC concentrations were measured using an Ion Phocheck Tiger Photo Ionisation Detector (PID).

2.1.3 Landfill gas accumulation monitoring

Landfill gas accumulation monitoring was not undertaken as the structures onsite do not penetrate the ground below creating a preferential pathway and the buildings are no longer used and are fenced off.

2.1.4 Landfill gas surface survey

An experienced environmental scientist conducted a landfill gas surface survey on 8 March 2024. The site is broken up into approximately 85 grids roughly 50m x 50m. The grids covering the filled and active areas of the landfill and the immediate surrounding unfilled land were surveyed by standing in the centre of each grid and recording the methane concentration at just above surface level using a GA5000 landfill gas analyser. The GA5000 measures methane to 0.1% (1,000ppm). It should be noted that previous investigations undertook this survey using an instrument capable of measuring methane to 0.1ppm concentrations however this could possibly lead to false positive interpretations as rotting natural organic matter in soil can produce low concentrations of methane therefore Tierra opted to use the GA5000.

2.2 Landfill Leachate

2.2.1 Leachate well status

Leachate Well	Depth	Screen	Status in March 2024	Comments
LMW1	6m	1.5-6m	In service	Dry
LMW2	8m	1-8m	In service	Dry

A plan detailing the location of the leachate wells is presented as Figure 2 in Appendix A.

2.2.2 Leachate sampling

Leachate samples were not able to be collected as no leachate was present in the wells.

2.3 Groundwater

2.3.1 Groundwater well status

The following table details the current status of the groundwater wells at the landfill.

Groundwater Well	Depth	Screen	Status at March 2024	Comments
MW1D	12m	9-12m	In service	Dry – appears to be installed above the expected permanent groundwater level
MW2D	15m	12-15m	In service	Dry – appears to be installed above the expected permanent groundwater level
MW3D	30m	15-27m	In service	-

A site plan detailing locations of these groundwater wells is presented as Figure 2 in Appendix A.

The positions and purposes of the wells based on their location and the direction of groundwater flow are as follows:

- MW1D is situated on the western boundary and is considered to show background concentrations.
- MW2D and MW3D are situated on the eastern boundary up gradient of the landfill but also within a filled area of the landfill and could display leachate contamination prior to moving offsite.

2.3.2 Sampling preparation

Sample bottles were labelled prior to going on site. Sample bottles for individual wells were removed from the site vehicle immediately after purging and prior to sampling. Sample bottles were labelled with the groundwater well designation as only one sample was to be taken from each well.

2.3.3 Groundwater sampling

All groundwater wells were dipped on 8 March 2024 prior to sampling. Two wells were found to be dry and groundwater was only detected in one well (MW3D). MW3D was also purged and sampled on 8 March 2024.

For the purging and sampling of the well a Waterra Power Pack was used to pump the dedicated tubing and foot valve in the well. The well was purged prior to sampling until dissolved oxygen, redox potential, conductivity, pH and temperature readings, measured in the field using a YSI Quatro Pro Plus multi parameter water meter, had stabilised. Groundwater well summary records for purging are provided in Appendix C.

After the completion of purging activities a sample was taken from the well. Appropriate sampling bottles were used and samples were stored in an esky with ice prior to transportation to the laboratory to ensure that optimal storage conditions were achieved as relevant to the type of analyses to be undertaken.

2.4 Quality Control Sampling

Quality control sampling was undertaken at the rates indicated in the following table.

Quality Sampling	Number samples collected	Number samples analysed
Intra Laboratory Duplicate (groundwater)	1 sample	1 sample
Inter Laboratory Duplicate (groundwater)	1 sample	1 sample
Rinsate Sample	1 sample	1 sample
Field Blank Sample	1 sample	1 sample

The procedure for collecting quality samples was the same as for normal samples.

2.5 Tracking of Samples

Tracking of samples was undertaken using Chain of Custody (COC) documentation. COCs were sent to the laboratories with instructions for the analyses required. The laboratories checked the condition and number of samples and signed and returned copies of the COC to confirm the receipt of samples. Copies of COCs are provided in Appendix H.

2.6 Analytical Testing

Analysis of groundwater samples, intra-laboratory duplicates, rinsate and field blank samples were conducted by Eurofins. Inter-laboratory duplicates were analysed by Envirolab Services. Both laboratories hold National Association of Testing Authorities (NATA) registration for the parameters listed in the following table:

Parameter	Analytical Method	Limits of Reporting	Total Number of Samples Tested
BTEX	Eurofins: LTM-ORG-2010 BTEX and Volatile TRH	0.001, 0.002, 0.003	1 + (1+0+0+0) quality
	Envirolab: Org-023	0.01, 0.001, 0.002	(1) quality
OCP	Eurofins: LTM-ORG-2220 (USEPA 8270)	0.0002, 0.002, 0.005	1 + (0+0+0+0) quality
OPP	Eurofins: LTM-ORG-2200 (USEPA 8270)	0.02, 0.002	1 + (0+0+0+0) quality
Phenols	Eurofins: LTM-ORG-2130	various	1 + (0+0+0+0) quality
Turbidity	Eurofins: APHA 2130B (LTM-INO-4140)	1 (NTU)	1 + (0+0+0+0) quality
Alkalinity	Eurofins: LTM-INO-4250 by Electrometric Titration	10, 20	1 + (0+0+0+0) quality
Chloride	Eurofins: LTM-INO-4270 by Ion Chromatography	1	1 + (0+0+0+0) quality
Alkali Metals	Eurofins: LTM-MET-3010 by ICP-AES	0.5	1 + (0+0+0+0) quality
Sulphate	Eurofins: LTM-INO-4270 by Ion Chromatography	5	1 + (0+0+0+0) quality
Organic N	Eurofins: APHA 4500	0.2	1 + (0+0+0+0) quality
Ammonia	Eurofins: LTM-INO-4450 by Discrete Analyser	0.01	1 + (0+0+0+0) quality
Nitrate & Nitrite	Eurofins: LTM-INO-4450 by Discrete Analyser	0.05	1 + (0+0+0+0) quality
Total Kjeldahl Nitrogen	Eurofins: APHA 4500	0.2	1 + (0+0+0+0) quality
Phosphorous Reactive	Eurofins: APHA 4500-P by FIA	0.01	1 + (0+0+0+0) quality
Phosphate total	Eurofins: LTM-MET-3040 by ICP-MS	0.01	1 + (0+0+0+0) quality
COD	Eurofins: LTM-INO-4220	25	1 + (0+0+0+0) quality
DOC	Eurofins: APHA 5310B	5	1 + (0+0+0+0) quality
TSS	Eurofins: LTM-INO-4070 by Gravimetry	5	1 + (0+0+0+0) quality
TDS	Eurofins: LTM-INO-4170	10	1 + (0+0+0+0) quality
Metals	Eurofins: LTM-MET-3040 by ICP-MS	various	1 + (1+1+1+0) quality
	Envirolab: Metals-022 ICP-MS	Various	(1) quality
TRH	Eurofins: LTM-ORG-2010 TRH C6-C40	0.02, 0.05, 0.1	1 + (1+0+0+0) quality
	Envirolab: Org-023	0.05, 0.1	(1) quality
PCB	Eurofins: LTM-ORG-2220	0.005	1 + (0+0+0+0) quality
PAH	Eurofins: LTM-ORG-2130	0.001	1 + (0+0+0+0) quality

Notes to table:

– Units are in mg/L unless otherwise stated

– Quality in the brackets refers to Eurofins intra-laboratory sample, rinsate, field blank and trip spike samples respectively and Envirolab inter-laboratory samples

3 QUALITY ASSESSMENT

Tierra Environment conducts investigations in accordance with the principles of quality assurance and quality control (QA/QC). The Tierra QA/QC principles include:

- use of established procedures and suitably qualified field personnel for environmental sampling
- documentation of chain-of-custody and sample handling and storage
- use of NATA registered laboratories (where possible)
- use of intra and inter laboratory field duplicates samples and rinsate, field blank, trip blank or trip spike samples

Quality of investigation outputs is maintained by ensuring:

- all staff are appropriately trained
- safety standards are defined and implemented
- good housekeeping practices are adopted during all phases of the investigation
- complete records of fieldwork, samples and data are maintained

Specific quality control procedures conducted for this investigation include:

- the use of appropriate sample collection and handling procedures
- the use of appropriately skilled and experienced personnel
- the application of decontamination procedures where appropriate to minimise cross contamination
- the extraction and analysis within appropriate handling times
- the use of an independent, NATA accredited laboratory for analysis (where possible)
- the collection and analysis of quality samples, e.g. blind duplicates, split duplicates, and internal laboratory duplicates, rinsate, field blank and matrix spike/matrix spike duplicates

Based on the QA/QC information listed in this report in Appendix E, the results are considered to be of an appropriate standard and it is concluded that:

- field investigation and sample preservation methods are appropriate for the investigations reported
- the analytical methods used for site assessment are of appropriate precision and accuracy, and that the sensitivity and selectivity of the analytical methods are appropriate for the assessment of risks
- the precision and accuracy criteria set out in the QA/QC plan, for a given method and matrix, meet the performance expected of the reference method
- the quality of data supplied by the analytical laboratory meets the objectives of the testing laboratory's quality plan for blanks, spikes, control samples, laboratory duplicates and holding times

4 ACCEPTANCE CRITERIA

The OMP stipulates that acceptance criteria should be selected based on:

- the most suitable available (national or territory) or site specific risk based criteria derived at the time of monitoring
- the NT EPA (2013) Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites in the Northern Territory

As per the OMP, groundwater and leachate results (where available) were assessed against the following criteria:

- ANZG (2018)[1] toxicant default guideline values for 95% level of species protection in freshwater

Selected assessment criteria are listed in the summary table of analytical results provided in Appendix D.

The acceptance criteria for landfill gas were as follows:

- methane should be less than 1% by volume in perimeter wells
- CO_2 should be less than 1.5% by volume in perimeter wells

[1] Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2018 online revision

5 INVESTIGATION RESULTS

5.1 Landfill Gas Monitoring

In March 2024, methane, carbon dioxide and oxygen concentrations were measured in 5 landfill gas monitoring points.

Monitoring results for the 4 wells (MW2S, MW3S, LMW1 & LMW2) situated within the filled landfill area were as follows:

	March 2024	
	Min	**Max**
Methane	0.0%	24.9%
Carbon dioxide	1.3%	29.9%
Oxygen	0.0%	18.5%
VOC (PID)	0.0ppm	1.3ppm

The low oxygen and high carbon dioxide levels observed in LMW2 are consistent with an anoxic methane-producing environment, such as landfills. Methane concentrations measured in wells were either above the upper explosive limit (UEL) of 15% or below the lower explosive limit (LEL) of 5%.

Monitoring results for the 1 perimeter well (MW1S) were as follows:

	March 2024
	Max
Methane	0.0%
Carbon dioxide	0.4%
Oxygen	19%
VOC (PID)	0.4ppm

Methane and carbon dioxide levels measured were below the 1% and 1.5% criterion respectively.

Landfill gas monitoring results are presented in Appendix D.

5.2 Landfill Gas Trends

Methane and CO2 concentrations from all monitoring rounds since 2018 were graphed and the following noted:

- Methane has never been detected in MW1S and MW2S
- Methane concentrations in MW3S and LMW1 are below 5% and since 2020 have been 0% with the exception of LMW1 which recorded 0.2% this year.
- Methane concentrations in LMW2 are generally above 15% and have ranged between 15.3% to 39.8% with the exception of three monitoring rounds (July 2021, November 2021 and May 2022) where methane was recorded as 0%. A review of historical reports (where available) provided no explanation for the change. Given CO2 concentrations also followed a similar trend in this well and oxygen was generally at atmospheric levels it is assumed that there may have been a leak in the well affecting the readings.

5.3 Landfill Gas Surface Survey

Surface level methane concentrations were assessed in 40 of the grid based locations covering the active/filled areas and adjacent natural land. Measured methane concentrations were all 0%.

5.4 Leachate Analytical Results

Leachate samples were not collected as the wells were dry.

5.5 Groundwater Gauging

Only one well MW3D had water during the March 2024 monitoring event. The depth to water was 21m from ground surface. The change in water level in MW3D from last monitoring event to this monitoring event was unable to be calculated as the well was dry in 2023.

Reduced water levels were not able to be determined as the wells have not been surveyed and as such the direction of groundwater flow was unable to be determined.

Past monitoring reports stated that local groundwater flow is to the east and regional groundwater flow is thought to be to north north-east towards Lake Amadeus. Tierra staff undertook a review of the local topography (an indicator of groundwater flow in sedimentary aquifers) and the surface topography appears to be sloping down to the north east suggesting local flow may be more north east than east. Installation of new wells in the same aquifer as MW3D and survey of the wells would be needed to confirm this.

5.6 Groundwater Field Observations

Records of groundwater gauging and purging are presented in Appendix B and Appendix C respectively. In summary the following purging results were obtained:

	pH	Temp (C)	Specific Conductivity (µS/cm)	Dissolved Oxygen (%)[2]	Redox Potential (mV)	Odour	Dis-colouration	LNAPL
MW1D	-	-	-	-	-	-	-	-
MW2D	-	-	-	-	-	-	-	-
MW3D	7.0	27.0	1894	-	-45	No	No	No

5.7 Groundwater Analytical Findings

Results for the analytes described in this section are presented in Appendix D. Original laboratory certificates are presented in Appendix H.

Groundwater results generally complied with assessment criteria with the exception of some OCPs, OPPs, PAHs, PCBs and phenol analytes whose results were below the laboratory's limits of reporting however the limits of reporting exceeded the acceptance criteria.

5.8 Groundwater Trend Analysis

Historically the following exceedances have been observed in MW3D.

Analyte	Criteria	Nov 17	Aug 18	June 19	Nov 19	Oct 20	Jul 21	Nov 21	May 22	May 23	Mar 24
Aluminium	0.055mg/L	-	**0.24**	0.01	<0.01	<0.01	0.02	0.02	<0.01	-	<0.05
Copper	0.0014mg/L	-	<0.001	<0.001	<0.001	<0.001	**0.015**	**0.012**	<0.001	-	<0.001
Selenium	0.011mg/L	-	<0.01	<0.01	<0.01	<0.01	<0.01	**0.02**	<0.01	-	0.004
Zinc	0.008mg/L	-	<0.005	**0.014**	**0.009**	0.005	**0.066**	**0.051**	<0.005	-	<0.005

A Mann Kendall trend assessment was undertaken to assess if there is a trend in the well for an analyte over time and if that is increasing, decreasing or stable. A Mann Kendall assessment was undertaken for analytes that have had exceedances and analytes which are considered key landfill leachate indicators. A copy of the Mann Kendall assessments is provided in Appendix G. From the Mann Kendall's the following is noted:

- No discernible trend was reported for copper and zinc in MW3D.

[2] Results for dissolved oxygen have not been included as there was an error with the probe making any obtained results unreliable.

- A possible decreasing trend was observed for aluminium.
- Selenium concentrations appear to be stable.
- Ammonia had no discernible trend and pH levels appear to be stable.

A Mann Kendall assessment was also undertaken for manganese and nickel as they have been analysed for over multiple rounds and have had some results above the limits of detection. Results from the Mann Kendall show that there is no trend for both manganese and nickel.

6 SUMMARY AND RECOMMENDATIONS

6.1 Summary

On the basis of information contained in this report (i.e. observations made during site presence, field and analytical testing), the following conditions are summarised:

- Methane was not detected in the perimeter well (MW1S) and carbon dioxide concentrations were below the acceptance criteria.
- Methane levels in the landfill ranged from 0% to 24.9%. Measured concentrations were either above or below the explosive limits.
- Methane levels measured across the surface of the site were all below detection.
- Only one well MW3D had water in February 2024.
- Regional groundwater flow is likely to the north north-east while based on previous reports local flow is to the east.
- LNAPL, odours and sheens were not observed in purged waters.
- Results from MW3D complied with acceptance criteria.
- A Mann Kendall trend assessment was undertaken using historical results for analytes that have previously had exceedances and analytes that are key indicators. Results from the Mann Kendall assessment found either no discernible trend or a stable trend with the exception of aluminium which reported a possible decreasing trend.

6.2 Recommendations

Based on the findings we suggest the following:

- New groundwater wells be installed to a greater depth to intersect the groundwater.
- All wells be surveyed to establish the direction of local groundwater flow.
- Continued monitoring as per the existing schedule.
- Continued trend analysis (Mann Kendall trend assessment) with particular focus on key indicators of landfill impact.
- Revision of monitoring plan to be better suited to the current site conditions (i.e. amendments to confined space monitoring and groundwater analytes).

7 LIMITATIONS OF USE

Site contamination is generally a product of man-made processes and therefore exhibits characteristics and properties that vary from place to place and can change with time. Contamination assessments involve gathering and assimilating limited facts about these characteristics and properties in order to better understand or predict the status of contamination on a particular site under certain conditions.

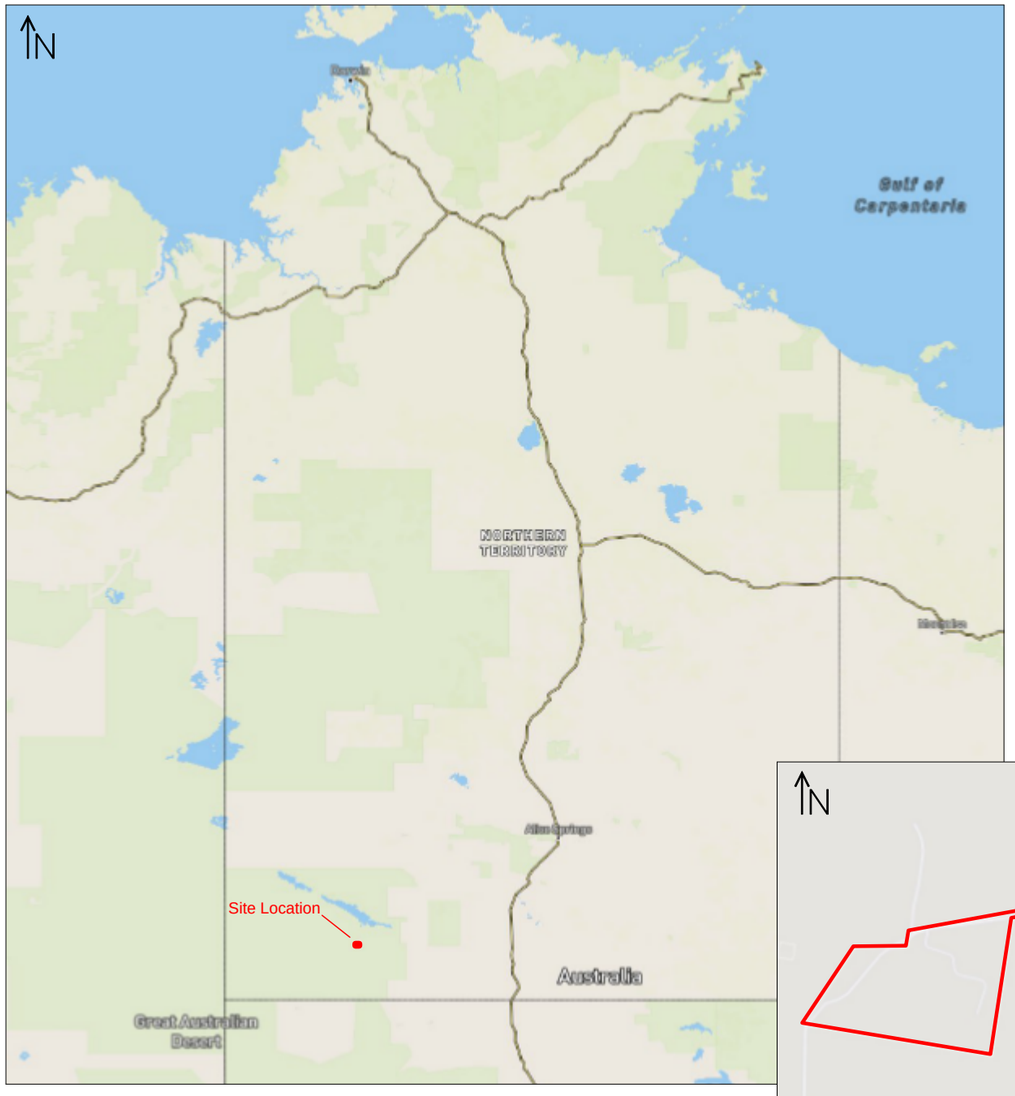
The facts reported and utilised in this document were obtained by inspection, excavation, sampling, testing, and other means of investigation or from the client. They are directly relevant only to the ground at the place where and time when an investigation was carried out.

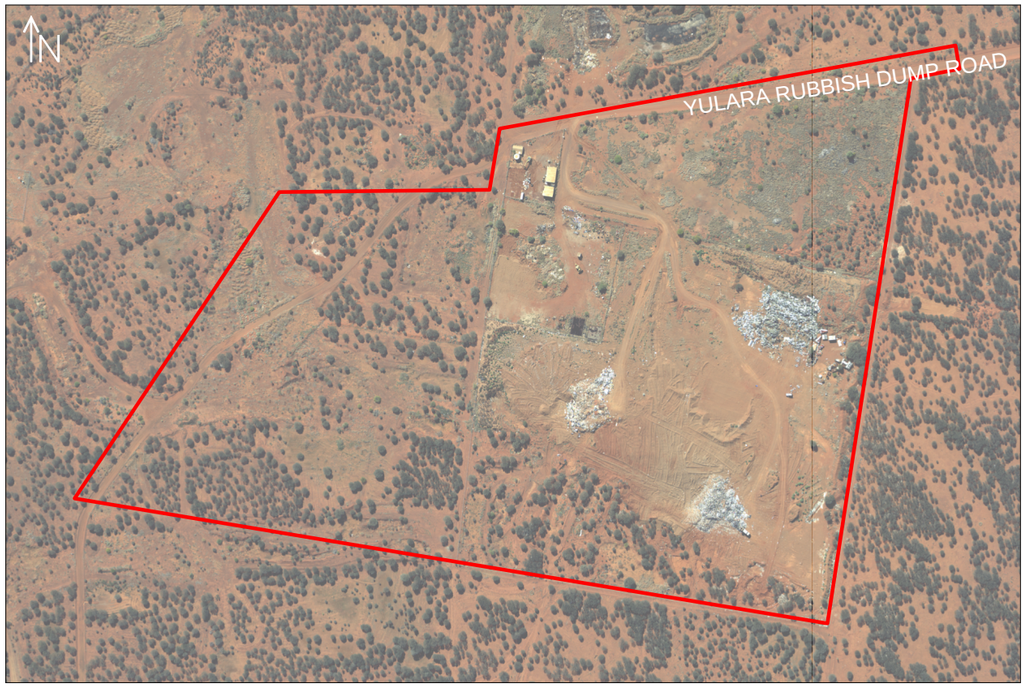
Any interpretation or recommendation given in this report is based on judgment and experience and not on greater knowledge of the facts than the sources of information indicate. The interpretations and recommendations are opinions provided for the sole use by Voyages Indigenous Tourism Australia and in accordance with a specific brief.

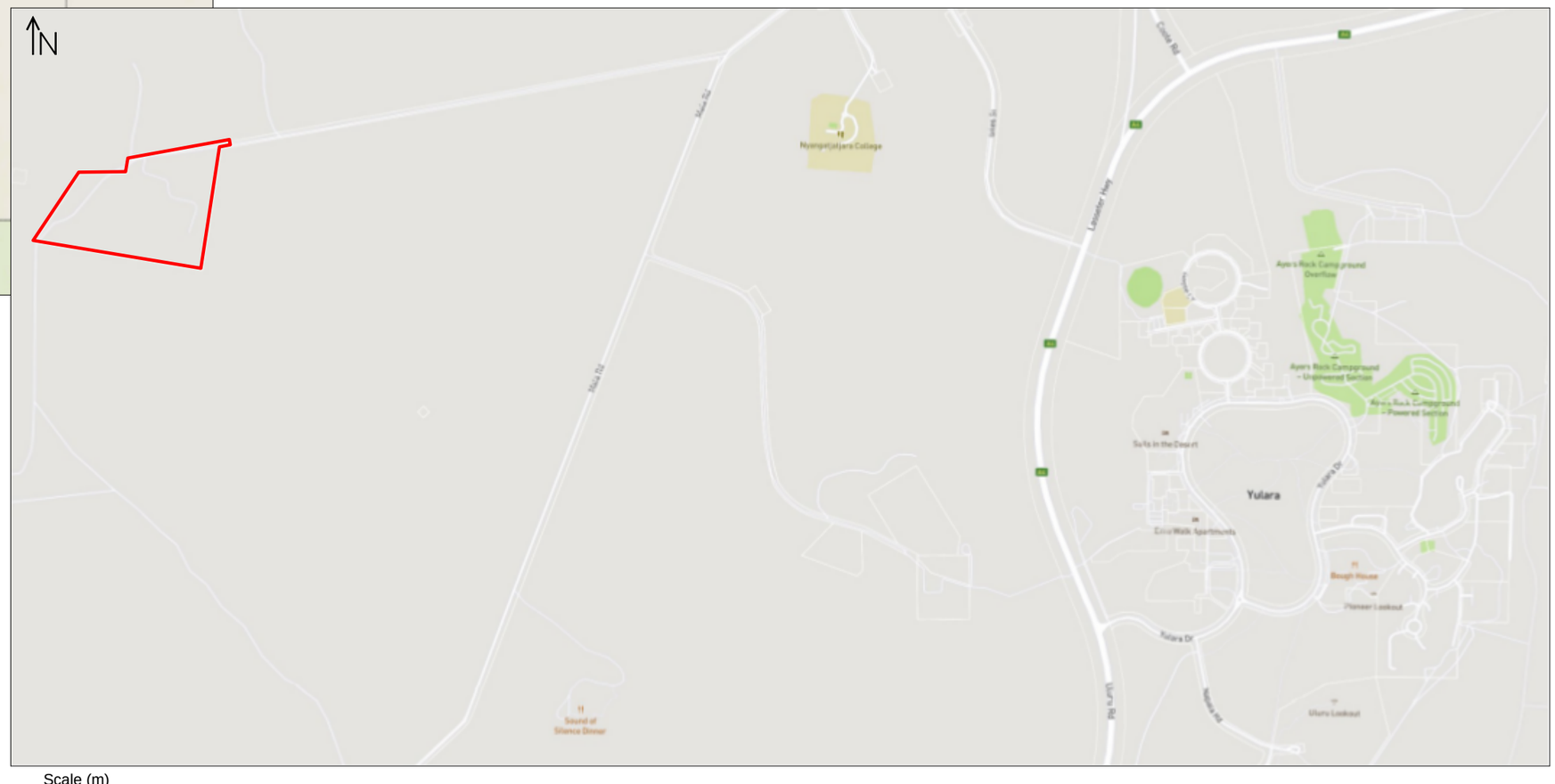
Tierra Environment does not represent that the information or interpretation contained in this document addresses completely existing features such as surface and subsurface contamination, groundwater and geotechnical conditions or ground or contamination behaviour on a subject site or of particular materials.

The responsibility of Tierra Environment Pty Ltd is solely to Voyages Indigenous Tourism Australia. It is not intended that this document be relied upon by any third party other than a site contamination auditor appointed by Voyages Indigenous Tourism Australia to undertake a site contamination audit. Tierra Environment does not undertake any duty or accept any responsibility to any other parties who may rely upon this document.

APPENDIX A
FIGURES







Approximate site boundary

Notes:

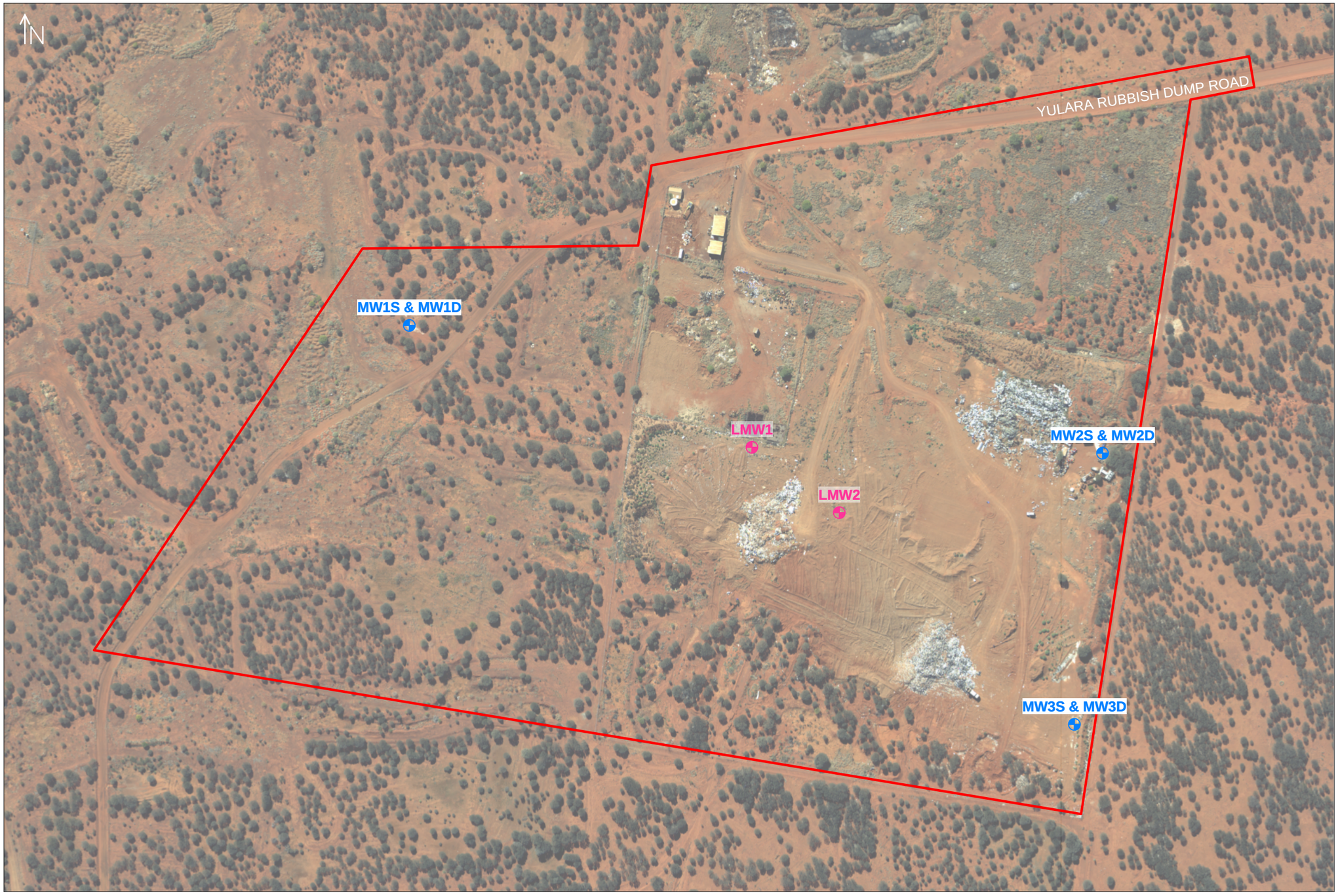
1. Base aerial photo by NT Department of Infrastructure, Planning and Logistics, taken 2017, used under licence.

2. Site boundary approximate, based on coordinates from strike.net.gov.au.

C:\Users\laurenh\Tierra Environment\Shared - Projects\24\ASY 24 050\01\Surfer\Fig 1 - Yulara - Site Location.srf

Figure 1 - Site Location
Environmental Compliance Monitoring – March 2024
Yulara Landfill

Rev A, 16 May 2024



Scale (m)
0 20 40

Legend

MW1S/MW1D — Landfill Gas/Groundwater monitoring well

LMW1 — Leachate/Landfill Gas monitoring well

Landfill boundary

Notes:

1. Base aerial photo by NT Department of Infrastructure, Planning and Logistics, taken 2017, used under licence.
2. Well locations based on field records and aerial imagery.
3. Site boundary approximate, based on coordinates from strike.net.gov.au.

Figure 2 - Groundwater, Leachate and Landfill Gas Wells
Environmental Compliance Monitoring – March 2024
Yulara Landfill

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Rev A, 16 May 2024

APPENDIX B
WELL GAUGING RECORDS

Yulara Landfill
Environmental Compliance
Monitoring - March 2024

Groundwater Gauging Summary

Well No	Date	Well depth (m)	Depth to Water (m)	Well Elevation (mAHD)	Reduced Water Level (mAHD)	Metres of water in well (m)	Volume of water removed (L)
MW1D	9/03/2024	12.4	-	-	-	-	-
MW2D	9/03/2024	15.9	-	-	-	-	-
MW3D	9/03/2024	30.5	21.003	-	-	9.45	40

Purging of water from well continued until temperature, DO, conductivity, pH and redox parameters are stabilised

APPENDIX C
WELL PURGING RECORDS

Groundwater Purging Record Sheet

Client:	Voyages Indigenous Tourism Australia Pty Ltd	**Job no:**	ASY 24 050.01	**Well No.**	**MW3D-AXY**
Project:	Yulara Landfill Monitoring	**Date:**	9/03/2024		
Location:	South east corner	**Logged:**	DPB		

Depth to Groundwater: 21.003m
Weather: Cloudy, 28℃
Purging Method:
Purging Equipment: Wattera Pump, Footvalue & Tubing
Sampling Method: Wattera Pump, Footvalue & Tubing
Start Time: 8:31am
Finish Time: 9am

Comments:

Time	Depth (m)	Purged (L)	Temp (˚C)	DO (%)	DO (mg/L)	SPC (ms/cm)	Cond (ms/cm)	TDS (ppm)	pH	Redox (mV)	Appearance (colour, turbidity, odour, sheen)
8:33	-	0	27.0	-	-	1897	1968	-	7.01	-61.2	cream tan, cloudy, no odour, no sheen
8:38	-	10	27.0	-	-	1888	1965	-	6.98	-48.3	colourless, very slightly cloudy, no odour, no sheen
8:43	-	20	27.0	-	-	1894	1968	-	6.99	-48.8	colourless, very slightly cloudy, no odour, no sheen
8:48	-	30	27.0	-	-	1894	1964	-	6.98	-49.1	colourless, very slightly cloudy, no odour, no sheen
8:53	-	40	27.0	-	-	1894	1966	-	6.98	-44.7	colourless, very slightly cloudy, no odour, no sheen

Purging should continue until measurements for pH are within 0.05 pH unit; conductivity within 3%; DO within 10%; Redox within 10mV and Temperature within 0.5 ˚C over three successive measurements

APPENDIX D
CURRENT AND HISTORICAL RESULT SUMMARY TABLES

Yulara Landfill
Environmental Compliance Monitoring - March 2024

2024 Groundwater
Sample Results

TIERRA ENVIRONMENT

		Field					Inorganics																		Metals																
		Electrical conductivity	pH (Field)	Redox	Temp	Turbidity	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (total) as CaCO3	Ammonia as N	Chloride	COD	Dissolved Organic Carbon	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrate & Nitrite (as N)	Nitrogen (Organic)	Nitrogen (Total)	Phosphate (as P)	Reactive Phosphorus as P	Sodium	Sulphate	TDS	TSS	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Calcium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Magnesium (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Potassium (Filtered)	Selenium (Filtered)	Zinc (Filtered)
		µS/cm	pH Units	mV	°C	NTU	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL						1	20		20	10	1	25		0.2	0.02	0.02	0.05	0.2	200	0.01		0.5	5	10	5	0.05	0.001	0.0002		0.001	0.001	0.05	0.001		0.005	0.0001	0.001		0.001	0.005
ANZG (2018) Freshwater 95%										**900**																**0.055**		**0.0002**			**0.0014**		**0.0034**		**1.9**	**0.0006**	**0.011**		**0.011**	**0.008**
Location	**Sample Date**																																							
MW3D	9/03/2024	1894	6.98	-44.7	27	110	220	<10	220	<10	280	28	<5	12	42	0.03	42	12	54,000	0.04	0.02	230	240	1,100	270	<0.05	<0.001	<0.0002	77	0.002	<0.001	<0.05	<0.001	48	<0.005	<0.0001	0.001	33	0.004	<0.005
Statistical Summary																																								
Number of Results		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Maximum Concentration		1894	6.98	0	27	110	220	<10	220	<10	280	28	<5	12	42	0.03	42	12	54000	0.04	0.02	230	240	1100	270	<0.05	<0.001	<0.0002	77	0.002	<0.001	<0.05	<0.001	48	<0.005	<0.0001	0.001	33	0.004	<0.005

		Organochlorine Pesticides																									
		4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	chlordane	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	Toxaphene	Vic EPA IWRG 621 OCP (Total)*	Vic EPA IWRG 621 Other OCP (Total)*
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L
EQL		0.2	0.2	0.2	0.2	0.2	2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.005	0.002	0.002
ANZG (2018) Freshwater 95%							**0.08**			**0.01**						**0.02**			**0.2**	**0.09**				**0.0002**		
Location	**Sample Date**																										
MW3D	9/03/2024	<0.2	<0.2	<0.2	<0.2	<0.2	**<2**	<0.2	<0.2	**<0.2**	<0.2	<0.2	<0.2	<0.2	<0.2	**<0.2**	<0.2	<0.2	**<0.2**	**<0.2**	<0.2	<0.2	<0.2	**<0.005**	<0.002	<0.002
Statistical Summary																											
Number of Results		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Maximum Concentration		<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.005	<0.002	<0.002

		Organophosphorous Pesticides																													Pesticides			
		Azinophos methyl	Bolstar (Sulprofos)	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Demeton-O	Demeton-S	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethion	Ethoprop	Fenitrothion	Fensulfothion	Fenthion	Malathion	Merphos	Methyl parathion	Mevinphos (Phosdrin)	Monocrotophos	Naled (Dibrom)	Omethoate	Phorate	Pyrazophos	Ronnel	Terbufos	Trichloronate	Tetrachlorvinphos	Tokuthion	EPN	Parathion	Pirimiphos-methyl
		µg/L	µg/L	µg/L	µg/L	mg/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	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L	µg/L	mg/L
EQL		2	2	20	2	0.002	20	2	2	2	2	2	2	2	2	2	2	2	2	0.002	2	2	2	2	20	2	2	2	2	2	0.002	0.002	2	2	0.02
ANZG (2018) Freshwater 95%		**0.02**			**0.01**					**0.01**		**0.15**				**0.2**			**0.05**																	
Location	**Sample Date**																																			
MW3D	9/03/2024	**<2**	<2	<20	**<2**	<0.002	<20	<2	<2	**<2**	<2	**<2**	<2	<2	<2	**<2**	<2	<2	**<2**	<0.002	<2	<2	<2	<2	<20	<2	<2	<2	<2	<2	<0.002	<0.002	<2	**<2**	<0.02
Statistical Summary																																				
Number of Results		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Maximum Concentration		<2	<2	<20	<2	<0.002	<20	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0.002	<2	<2	<2	<2	<20	<2	<2	<2	<2	<2	<0.002	<0.002	<2	<2	<0.02

		PAH																	Phenols (non-Halogenated)										Phenols	Phenols (Halogenated)									
		Benzo[b+j]fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene	2,4-dimethylphenol	2,4-dinitrophenol	2-methylphenol	2-nitrophenol	3-&4-methylphenol	4,6-Dinitro-2-methylphenol	4,6-Dinitro-o-cyclohexyl phenol	4-nitrophenol	Dinoseb	Phenol	Phenols (Total Non Halogenated)	Cresol Total	2,4,5-trichlorophenol	2,4,6-trichlorophenol	2,4-dichlorophenol	2,6-dichlorophenol	2-chlorophenol	4-chloro-3-methylphenol	Pentachlorophenol	tetrachlorophenols	Phenols (Total Halogenated)
		mg/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	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
EQL		0.001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	0.03	3	10	6	30	100	30	100	3	0.1	0.01	10	10	3	3	3	10	10	30	0.01
ANZG (2018) Freshwater 95%					**0.4**		**0.2**					**1.4**			**16**		**2**			**0.013**									**320**				**20**	**160**		**490**		**10**		
Location	**Sample Date**																																						
MW3D	9/03/2024	<0.001	<1	<1	**<1**	<1	**<1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<3	**<0.03**	<3	<10	<6	<30	<100	<30	<100	<3	<0.1	<0.01	<10	<10	<3	<3	<3	<10	<10	<30	<0.01
Statistical Summary																																							
Number of Results		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Maximum Concentration		<0.001	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<3	<0.03	<3	<10	<6	<30	<100	<30	<100	<3	<0.1	<0.01	<10	<10	<3	<3	<3	<10	<10	<30	<0.01

		Polychlorinated Biphenyls								TRH												BTEX					
		Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	PCBs (Sum of total)	C6-C10	C6-C10 less BTEX (F1)	C10-C16	C10-C16 less NAPHTHALENE (F2	C16-C34	C34-C40	C10 - C40 (Sum of total)	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene Total
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		5	5	5	5	5	5	5	5	0.02	0.02	0.05	0.05	0.1	0.1	100	20	50	100	100	100	1	1	1	2	1	3
ANZG (2018) Freshwater 95%					**0.6**		**0.03**															**950**	**80**	**180**	**275**	**350**	
Location	**Sample Date**																										
MW3D	9/03/2024	<5	<5	<5	**<5**	<5	**<5**	<5	<5	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<100	<20	<50	<100	<100	<100	<1	<1	2	<2	<1	<3
Statistical Summary																											
Number of Results		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Maximum Concentration		<5	<5	<5	<5	<5	<5	<5	<5	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<100	<20	<50	<100	<100	<100	<1	<1	2	<2	<1	<3

Yulara Landfill
Environmental Compliance Monitoring - March 2024

2017 - 2024
Groundwater Sample Results

TIERRA ENVIRONMENT

		Field						Inorganics																															
		Dissolved Oxygen	Electrical conductivity	pH (Field)	Redox	Temp	Turbidity	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N	Anions Total	Bromine (Filtered)	Cations Total	Chloride	COD	Dissolved Organic Carbon	Iodine (Filtered)	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrate & Nitrite (as N)	Nitrogen (Total Oxidised)	Nitrogen (Organic)	Nitrogen (Total)	Phosphate (as P)	Reactive Phosphorus as P	Salinity	Sodium	Sodium (Filtered)	Sulphate	Sulphate (Filtered)	TDS	TSS
		%	µS/cm	pH Units	mV	°C	NTU	mg/L	mg/L	µg/L	mg/L	µg/L	meq/L	µg/L	meq/L	mg/L	mg/L	mg/L	µg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	ppt	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL							1	20			20	10				1	25				0.2	0.02	0.02	0.05		0.2	200	0.01			0.5		5		10	5
ANZG (2018) Freshwater 95%												**900**																										
Location	**Sample Date**																																						
MW2D	1/11/2017	-	1,800	7.04	-26.7	27.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	1/11/2017	-	1,540	7.57	-	27.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	28/08/2018	56.1	2,073	7.25	233.6	23	2,781	184	19	<1,000	202	40	15.9	-	17.7	263	104	<1	-	5.3	<0.1	41.4	<0.01	-	41.4	-	41,400	-	0.02	-	-	215	-	215	-	1,220
MW3D	1/06/2019	56.2	2,109	7.26	149.5	25.6	1,655	185	<1	<1,000	185	<10	-	-	-	300	1,550	2	-	-	1	43	<0.01	-	43	-	44,000	-	0.02	-	-	209	-	217	-	695
MW3D	4/11/2019	38.6	1,969	5.99	15.7	26.1	233	197	<1	<1,000	197	-	18.4	1,800	18.5	334	<10	2	400	0.45	-	45	<0.01	-	45	-	-	-	0.02	-	-	222	-	241	-	-
MW3D	13/10/2020	68.7	1,671	7.02	182	26.5	2,380	183	<1	<1,000	183	-	16.7	-	18.8	292	<10	<1	-	5.98	-	41	<0.01	-	41	-	-	-	0.02	-	-	228	-	230	-	-
MW3D	8/07/2021	63.3	1,867	6.04	-47.8	24.1	17.13	186	<1	<1,000	186	30	16.1	-	18.9	271	<10	<1	-	7.88	2.4	43.3	<0.01	-	43.3	-	45,700	-	0.02	-	-	229	-	228	-	147
MW3D	23/11/2021	65.7	1,915	7.34	163.5	26	-	202	<1	<1,000	202	110	21.8	-	18.7	289	<10	4	-	7.66	1.8	49	<0.01	-	49	-	50,800	-	0.02	-	-	225	-	463	-	781
MW3D	1/05/2022	45.8	1,724	6.81	266	23.6	238	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9	-	-	-	1,121	-
MW3D	9/03/2024	-	1894	6.98	-44.7	27	110	220	<10	-	220	<10	-	-	-	280	28	<5	-	-	12	42	0.03	42	-	12	54,000	0.04	0.02	-	230	-	240	-	1,100	270
Statistical Summary																																							
Number of Results		7	10	10	9	10	7	7	7	6	7	5	5	1	5	7	7	7	1	5	5	7	7	1	6	1	5	1	7	1	1	6	1	6	2	5
Maximum Concentration		68.7	2109	7.57	266	27.1	2781	220	19	<1000	220	110	21.8	1800	18.9	334	1550	<5	400	7.88	12	49	0.03	42	49	12	54000	0.04	0.02	0.9	230	229	240	463	1121	1220

		Metals																																					
		Aluminium (Filtered)	Antimony (Filtered)	Arsenic (Filtered)	Barium (Filtered)	Beryllium (Filtered)	Boron (Filtered)	Boron (calculated as H3BO3) (filtered)	Cadmium (Filtered)	Calcium (Filtered)	Chromium (III+VI) (Filtered)	Cobalt (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Lithium (Filtered)	Magnesium (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Molybdenum (Filtered)	Nickel (Filtered)	Phosphorus	Potassium (Filtered)	Selenium (Filtered)	Thallium (Filtered)	Tin (Filtered)	Vanadium (Filtered)	Zinc (Filtered)
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL		0.05		0.001					0.0002		0.001		0.001	0.05	0.001			0.005	0.0001		0.001			0.001				0.005
ANZG (2018) Freshwater 95%		**0.055**					**0.94**		**0.0002**				**0.0014**		**0.0034**			**1.9**	**0.0006**		**0.011**			**0.011**				**0.008**
Location	**Sample Date**																											
MW2D	1/11/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	1/11/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	28/08/2018	**0.24**	-	0.001	-	-	-	-	<0.0001	78	0.001	-	<0.001	<0.05	<0.001	-	45	<0.001	<0.0001	-	<0.001	0.17	30	<0.01	-	-	-	<0.005
MW3D	1/06/2019	0.01	-	<0.001	-	-	-	-	<0.0001	76	0.002	-	<0.001	<0.05	<0.001	-	49	<0.001	<0.0001	-	<0.001	0.15	29	<0.01	-	-	-	**0.014**
MW3D	4/11/2019	<0.01	<0.001	<0.001	0.03	<0.001	0.87	4.97	<0.0001	82	0.001	<0.001	<0.001	<0.05	<0.001	0.02	48	0.003	<0.0001	<0.001	0.005	0.02	33	<0.01	<0.001	<0.001	<0.01	**0.009**
MW3D	13/10/2020	<0.01	-	<0.001	-	-	-	-	<0.0001	82	0.002	-	<0.001	<0.05	<0.001	-	48	<0.001	<0.0001	-	<0.001	0.03	33	<0.01	-	-	-	0.005
MW3D	8/07/2021	0.02	-	<0.001	-	-	-	-	<0.0001	84	0.002	-	**0.015**	<0.05	<0.001	-	47	0.004	<0.0001	-	0.005	0.05	33	<0.01	-	-	-	**0.066**
MW3D	23/11/2021	0.02	-	0.002	-	-	-	-	<0.0001	84	0.002	-	**0.012**	<0.05	<0.001	-	48	0.003	<0.0001	-	0.004	0.06	31	**0.02**	-	-	-	**0.051**
MW3D	1/05/2022	<0.01	-	-	-	-	0.77	-	-	-	0.002	-	<0.001	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	<0.005
MW3D	9/03/2024	<0.05	-	<0.001	-	-	-	-	<0.0002	77	0.002	-	<0.001	<0.05	<0.001	-	48	<0.005	<0.0001	-	0.001	-	33	0.004	-	-	-	<0.005
Statistical Summary																												
Number of Results		8	1	7	1	1	2	1	7	7	8	1	8	7	7	1	7	7	7	1	7	6	7	8	1	1	1	8
Maximum Concentration		0.24	<0.001	0.002	0.03	<0.001	0.87	4.97	<0.0002	84	0.002	<0.001	0.015	<0.05	<0.001	0.02	49	<0.005	<0.0001	<0.001	0.005	0.17	33	0.02	<0.001	<0.001	<0.01	0.066

		Organochlorine Pesticides																										
		4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	Toxaphene	Vic EPA IWRG 621 OCP (Total)*	Vic EPA IWRG 621 Other OCP (Total)*
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L
EQL		0.2	0.2	0.2	0.2	0.2	2			0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.005	0.002	0.002
ANZG (2018) Freshwater 95%							**0.08**					**0.01**						**0.02**			**0.2**	**0.09**				**0.0002**		
Location	**Sample Date**																											
MW2D	1/11/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	1/11/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	28/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	1/06/2019	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.5**	<0.5	<0.5	<0.5	<0.5	**<2**	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.5**	<0.5	<0.5	**<0.5**	**<0.5**	<0.5	<0.5	<2	-	-	-
MW3D	4/11/2019	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.5**	<0.5	<0.5	<0.5	<0.5	**<2**	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.5**	<0.5	<0.5	**<0.5**	**<0.5**	<0.5	<0.5	<2	-	-	-
MW3D	13/10/2020	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.5**	<0.5	<0.5	<0.5	<0.5	**<2**	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.5**	<0.5	<0.5	**<0.5**	**<0.5**	<0.5	<0.5	<2	-	-	-
MW3D	8/07/2021	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.5**	<0.5	<0.5	<0.5	<0.5	**<2**	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.5**	<0.5	<0.5	**<0.5**	**<0.5**	<0.5	<0.5	<2	-	-	-
MW3D	23/11/2021	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.5**	<0.5	<0.5	<0.5	<0.5	**<2**	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.5**	<0.5	<0.5	**<0.5**	**<0.5**	<0.5	<0.5	<2	-	-	-
MW3D	1/05/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	9/03/2024	<0.2	<0.2	<0.2	<0.2	<0.2	**<2**	-	-	<0.2	<0.2	**<0.2**	<0.2	<0.2	<0.2	<0.2	<0.2	**<0.2**	<0.2	<0.2	**<0.2**	**<0.2**	<0.2	<0.2	<0.2	**<0.005**	<0.002	<0.002
Statistical Summary																												
Number of Results		6	6	6	6	6	6	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	1	1	1
Maximum Concentration		<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.005	<0.002	<0.002

		Organophosphorous Pesticides																													Pesticides						
		Azinophos methyl	Bolstar (Sulprofos)	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Demeton-O	Demeton-S	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethion	Ethoprop	Fenitrothion	Fensulfothion	Fenthion	Malathion	Merphos	Methyl parathion	Mevinphos (Phosdrin)	Monocrotophos	Naled (Dibrom)	Omethoate	Phorate	Prothiofos	Pyrazophos	Ronnel	Terbufos	Trichloronate	Tetrachlorvinphos	Tokuthion	EPN	Demeton-S-methyl	Fenamiphos	Parathion	Pirimiphos-methyl	Pirimphos-ethyl
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/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	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L
EQL		2	2			20	2	0.002	20	2	2	2	2	2	2	2	2	2	2	2	2	0.002	2	2	2	2	20	2		2	2	2	2	0.002	0.002	2			2	0.02	
ANZG (2018) Freshwater 95%		**0.02**					**0.01**					**0.01**		**0.15**				**0.2**			**0.05**																		**0**		
Location	**Sample Date**																																								
MW2D	1/11/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	1/11/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	28/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	1/06/2019	**<0.5**	-	<0.5	<0.5	<0.5	**<0.5**	<0.0005	-	-	-	**<0.5**	<0.5	**<0.5**	-	<0.5	-	-	-	<0.5	**<0.5**	-	<2	-	<2	-	-	-	<0.5	-	-	-	-	-	-	<0.5	<0.5	**<2**	-	<0.5
MW3D	4/11/2019	**<0.5**	-	<0.5	<0.5	<0.5	**<0.5**	<0.0005	-	-	-	**<0.5**	<0.5	**<0.5**	-	<0.5	-	-	-	<0.5	**<0.5**	-	<2	-	<2	-	-	-	<0.5	-	-	-	-	-	-	<0.5	<0.5	**<2**	-	<0.5
MW3D	13/10/2020	**<0.5**	-	<0.5	<0.5	<0.5	**<0.5**	<0.0005	-	-	-	**<0.5**	<0.5	**<0.5**	-	<0.5	-	-	-	<0.5	**<0.5**	-	<2	-	<2	-	-	-	<0.5	-	-	-	-	-	-	<0.5	<0.5	**<2**	-	<0.5
MW3D	8/07/2021	**<0.5**	-	<0.5	<0.5	<0.5	**<0.5**	<0.0005	-	-	-	**<0.5**	<0.5	**<0.5**	-	<0.5	-	-	-	<0.5	**<0.5**	-	<2	-	<2	-	-	-	<0.5	-	-	-	-	-	-	<0.5	<0.5	**<2**	-	<0.5
MW3D	23/11/2021	**<0.5**	-	<0.5	<0.5	<0.5	**<0.5**	<0.0005	-	-	-	**<0.5**	<0.5	**<0.5**	-	<0.5	-	-	-	<0.5	**<0.5**	-	<2	-	<2	-	-	-	<0.5	-	-	-	-	-	-	<0.5	<0.5	**<2**	-	<0.5
MW3D	1/05/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	9/03/2024	**<2**	<2	-	-	<20	**<2**	<0.002	<20	<2	<2	**<2**	<2	**<2**	<2	<2	<2	**<2**	<2	<2	**<2**	<0.002	<2	<2	<2	<2	<20	<2	-	<2	<2	<2	<2	<0.002	<0.002	<2	-	-	**<2**	<0.02	-
Statistical Summary																																									
Number of Results		6	1	5	5	6	6	6	1	1	1	6	6	6	1	6	1	1	1	6	6	1	6	1	6	1	1	1	5	1	1	1	1	1	1	1	5	5	6	1	5
Maximum Concentration		<2	<2	<0.5	<0.5	<20	<2	<0.002	<20	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0.002	<2	<2	<2	<2	<20	<2	<0.5	<2	<2	<2	<2	<0.002	<0.002	<2	<0.5	<0.5	<2	<0.02	<0.5

Yulara Landfill
Environmental Compliance Monitoring - March 2024

2017 - 2024
Groundwater Sample Results

TIERRA ENVIRONMENT

		PAH																		Phenols (non-Halogenated)											Phenol	Phenols (Halogenated)								
		Benzo(a)pyrene TEQ (medium bound)	Benzo[b+j]fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene	2,4-dimethylphenol	2,4-dinitrophenol	2-methylphenol	2-nitrophenol	3-&4-methylphenol	4,6-Dinitro-2-methylphenol	4,6-Dinitro-o-cyclohexyl phenol	4-nitrophenol	Dinoseb	Phenol	Phenols (Total Non Halogenated)	Cresol Total	2,4,5-trichlorophenol	2,4,6-trichlorophenol	2,4-dichlorophenol	2,6-dichlorophenol	2-chlorophenol	4-chloro-3-methylphenol	Pentachlorophenol	tetrachlorophenols	Phenols (Total Halogenated)
		mg/L	mg/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	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
EQL			0.001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	0.03	3	10	6	30	100	30	100	3	0.1	0.01	10	10	3	3	3	10	10	30	0.01
ANZG (2018) Freshwater 95%						**0.4**		**0.2**					**1.4**			**16**		**2**			**0.013**								**320**				**20**	**160**		**490**		**10**			
Location	**Sample Date**																																							
MW2D	1/11/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	1/11/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	28/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	1/06/2019	<0.0005	<0.001	<1	<1	**<1**	<1	**<0.5**	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	4/11/2019	<0.0005	<0.001	<1	<1	**<1**	<1	**<0.5**	<1	<1	<1	<1	<1	<1	<1	<1	-	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	13/10/2020	<0.0005	<0.001	<1	<1	**<1**	<1	**<0.5**	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	8/07/2021	<0.0005	<0.001	<1	<1	**<1**	<1	**<0.5**	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	23/11/2021	<0.0005	<0.001	<1	<1	**<1**	<1	**<0.5**	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	1/05/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	9/03/2024	-	<0.001	<1	<1	**<1**	<1	**<1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<3	**<0.03**	<3	<10	<6	<30	<100	<30	<100	<3	<0.1	<0.01	<10	<10	<3	<3	<3	<10	<10	<30	<0.01
Statistical Summary																																								
Number of Results		5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	4	6	6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Maximum Concentration		<0.0005	<0.001	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<3	<0.03	<3	<10	<6	<30	<100	<30	<100	<3	<0.1	<0.01	<10	<10	<3	<3	<3	<10	<10	<30	<0.01

		Polychlorinated Biphenyls								TRH													BTEX						
		Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	PCBs (Sum of total)	C6-C10	C6-C10 less BTEX (F1)	C10-C16	C10-C16 less NAPHTHALENE (F2	C16-C34	C34-C40	C10 - C40 (Sum of total)	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Total BTEX	Xylene (m & p)	Xylene (o)	Xylene Total
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L
EQL		5	5	5	5	5	5	5	5	0.02	0.02	0.05	0.05	0.1	0.1	100	20	50	100	100	100	1	1	1		2	1	3
ANZG (2018) Freshwater 95%					**0.6**		**0.03**															**950**	**80**	**180**		**275**	**350**	
Location	**Sample Date**																											
MW2D	1/11/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	1/11/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	28/08/2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	1/06/2019	-	-	-	-	-	-	-	<1	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<100	<20	<50	<100	<50	<50	<1	<2	<2	<0.001	<2	<2	<2
MW3D	4/11/2019	-	-	-	-	-	-	-	<1	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<100	<20	<50	<100	<50	<50	<1	<2	<2	<0.001	<2	<2	<2
MW3D	13/10/2020	-	-	-	-	-	-	-	<1	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<100	<20	<50	<100	<50	<50	<1	<2	<2	<0.001	<2	<2	<2
MW3D	8/07/2021	-	-	-	-	-	-	-	<1	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<100	<20	<50	<100	<50	<50	<1	<2	<2	<0.001	<2	<2	<2
MW3D	23/11/2021	-	-	-	-	-	-	-	<1	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<100	<20	<50	<100	<50	<50	<1	<2	<2	<0.001	<2	<2	<2
MW3D	1/05/2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3D	9/03/2024	<5	<5	<5	**<5**	<5	**<5**	<5	<5	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<100	<20	<50	<100	<100	<100	<1	<1	2	-	<2	<1	<3
Statistical Summary																												
Number of Results		1	1	1	1	1	1	1	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	6	6	6
Maximum Concentration		<5	<5	<5	<5	<5	<5	<5	<5	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<100	<20	<50	<100	<100	<100	<1	<2	2	<0.001	<2	<2	<3

APPENDIX E
QA/QC ASSESSMENT

E.1 Field QA/QC Procedures

Field methodology

The field methodology described in Section 2 is considered appropriate and applicable to site conditions encountered during field works and groundwater characteristics reported by the laboratories.

Sample preservation

The primary laboratory supplied clean bottles for groundwater samples and rinsate and field blank samples. The bottles were labelled prior to field work based on a predetermined sampling program. On site the bottles were filled with water and stored in an esky with ice. At the end of the day samples were stored in a refrigerator if not sent to the laboratories. During transportation to the laboratories the samples were packed in eskies with ice and packaging to avoid damage.

Field Equipment Calibration

Kennards Hire provided a Smart Troll multifunction water quality meter for use on 9 March 2024. Kennards calibrated the equipment prior to delivery. A copy of the calibration certificate is provided in Appendix F.

E.2 Data Quality Indicators

E.2.1 Completeness

Completeness is expressed as a percentage of usable data from a data collection activity. The following factors were considered and assessed:

Field and laboratory considerations	Achieved
All critical locations sampled	No, only MW3D had water present
All samples collected (e.g. all available wells)	No, only MW3D had water present
Standard operating practices (SOPs) listed in Section 2 appropriate and complied with	Yes
Experienced field personnel utilised	Yes
Field documentation appropriate and complete	Yes
All critical samples analysed	Yes
All critical analytes analysed	Yes
Appropriate methods and practical quantitation limits (PQL)	Yes, refer also to Section 2
Sample documentation complete	Yes
Sample holding times complied with	Yes

Completeness is influenced by field performance issues (e.g. access, site restrictions, damage to sampling infrastructure) and laboratory performance issues (e.g. matrix interference, holding times). A percentage completeness of 95% is considered acceptable. The above assessment indicates that the achieved percentage completeness is less than 95%. Recommendations as presented in Section 6.2 should be implemented to achieve a completeness above 95%.

E.2.2 Comparability

Comparability is expressed qualitatively to indicate that data may be considered to be equivalent for each sampling and analytical event.

Field and laboratory considerations	Results
Same SOPs used on each occasion	Standard operating practices as listed in Section 2
Same sampling procedures	Yes, refer Section 2
Experienced sampler	Environmental scientist with 27 years experience
Climatic conditions (temperature, rainfall, wind)	No climatic influences
Same types of samples collected	Yes, specific laboratory prepared water bottles
Same analytical methods used (including clean-up)	Yes
Sample PQLs	Standard, see below
Same laboratories	Yes
Same units	Yes

Laboratory PQLs were above selected criteria for chlordane, DDT, endrin, lindane, heptachlor, toxaphene, azinphos-methyl, chlorpyrifos, diazinon, dimethoate, fenitrothion, malathion, parathion, anthracene, benzo(a)pyrene, 2,4-dinitrophenol, arochlor 1242 and arochlor 1254.

E.2.3 Representativeness

Representativeness is expressed qualitatively to indicate that data is representative of each medium present on the site.

Field and laboratory considerations	Achieved
Appropriate media sampled according to field observations	Yes, groundwater only
All media identified during field work sampled	Yes, groundwater only
All samples analysed according to field observations	Yes
Samples were reasonably homogeneous	Yes

The above assessment indicates that data is representative of each medium encountered on the site.

E.2.4 Precision

Precision is a quantitative measure of the variability of data.

Field and laboratory considerations	Achieved
Standard operating procedure appropriate and complied with	Yes
Analysis of intra and inter laboratory duplicates	Yes
Analysis of laboratory duplicates	Yes, refer to Section 2.4

Duplicate samples were collected to provide an indication of the reliability of the sampling and analysis process. Duplicate groundwater samples were analysed for the majority of parameters. Duplicate sample results are presented in the quality assessment data provided at the end of Appendix E.

Relative Percentage Differences (RPDs) for intra-laboratory (or field) and inter-laboratory duplicate samples were calculated and are presented at the end of Appendix E.

All calculated RPDs where within the acceptable limits of 0% to 50% for concentrations 10 to 30 times the limits of reporting and 0% to 30% for concentrations 30 times greater than the limits of reporting.

The above assessment indicates that observed data variability (or reproducibility) is acceptable.

E.2.5 Accuracy

Accuracy is a quantitative measure of the closeness of reported data to the true value. Bias could be introduced by chemicals during collection/handling or transport, from contaminated equipment, from contaminated reagent, during laboratory analysis, during laboratory preparation or by the analytical method.

Field and laboratory considerations	Achieved
Standard operating procedure appropriate and complied with	Yes
Analysis of rinsates, field blanks and trip blanks	Yes, rinsate and field blank only
Analysis of laboratory method blanks, control samples, spike samples and duplicates	Yes, refer below
Analysis of laboratory prepared volatile trip spikes	No

Rinsate, field blank and trip blank samples were collected as follows:

Date	Rinsate collected from	Field blank collected	Trip blank used
09/03/24	Pump casing	Yes	No

The rinsate and field blank sample results was below the limits of detection for all analytes thereby indicating that pump used for sample collection did not impact upon the results. A trip blank sample was not used as volatiles were not identified as chemicals of concern. Rinsate and field blank results are provided at the end of Appendix E.

During the analysis of samples, Eurofins conducted internal QA/QC procedures including the analysis of laboratory method blanks, control samples, spike samples and duplicates. Results of these QA/QC procedures complied with the laboratory's acceptance criteria as presented in its reports. Laboratory reports for method blanks, control samples, spike samples and duplicates are provided in Appendix H.

E.3 Field QA/QC

The following information on field QA/QC is provided.

Issue	Achieved
Replicate samples are split in the field and submitted to two separate laboratories in accordance with the requirements of NEPM Schedule B3	Yes, refer to Section 2.4
The sampling program includes assessment of all relevant environmental media, i.e. groundwater	Yes
Sample collection, handling and transportation procedures are documented and appropriate	Yes, refer to Section 2
Sampling is representative of site conditions, based on the selection of appropriate numbers of sampling points	Yes, refer to Section 2
Experienced field team members	Yes, refer to Section E.2.2
Sampling methods	Yes, refer to Sections 2
Evidence of appropriate decontamination procedures carried out between sampling events	Yes, refer to Section 2
Completed purging records for each well, showing time, location, initials of sampler, duplicate locations, duplicate type, site observations and weather conditions	Yes, refer to Appendix C
Completed chain-of-custody documentation	Yes, refer to Appendix H

Issue	Achieved
A statement of duplicate frequency for intra-laboratory and inter-laboratory duplicate samples, appropriate splitting techniques and duplicate sample results	Yes, refer to Section E.2.4
Field blank results, background sample results, rinsate sample results, laboratory-prepared trip spike results for volatile analytes and trip blank results	Results presented in Appendix E. Background, trip blank and trip spike samples were not collected.

E.4 Laboratory QA/QC

The following information on laboratory QA/QC is provided.

Issue	Achieved
Appropriate methodologies for each potential contaminant in the matrix in laboratories accredited for those analyses by NATA	Yes, refer to Section 2.6
Appropriate practical quantitation limits (PQLs) for the chemicals of concern for use in the assessment of risk	Yes, refer to Section E.2.2
COCs, comparison of holding times, analytical methods, laboratory accreditation, laboratory performance	Yes, refer to Section 2.1
Results of blind duplicate samples (intra laboratory duplicates)	Yes, refer Section E.2.4

E.5 QA/QC Discussion

Quality assurance and quality control was conducted based upon Tierra Environment's environmental investigation principles to ensure that data of known quality is reported. The required scope of sample numbers, analytical testing and quality testing was achieved. Specific aspects of the investigation used to achieve appropriate QA/QC results are summarised below:

Field Procedures	The investigations, including the collection of duplicates, are of a standard that provides confidence in the quality of the samples collected. Field procedures were undertaken in accordance with NEPM requirements and EPA guidelines.
Analytical Procedures	The laboratories used for analytical work are NATA registered for the analyses undertaken. The laboratories' internal QA/QC results indicate that analytical information provided by the laboratories is reliable.
Sample Tracking	Chain of Custody documentation was used for the transport of all samples to the laboratories.
Sample Preservation and Storage	Samples were placed in containers supplied by the laboratories and placed in chilled eskies for transport to the laboratories.
Sample Holding Times	The required holding times were adhered to.
Data Transcription	Summary tables were generated from laboratory supplied CSV files using ESDAT software.
Laboratory Limits of Reporting	Results below the laboratory's limits of reporting were also generally below acceptance criteria. The exceptions listed in Section E.2.2 are recognised.
Field Equipment Calibration	The field equipment used was appropriately calibrated.

Intra Laboratory Duplicate Sample	The primary laboratory's processes by which its results are obtained are generally considered to be acceptable in terms of the precision/repeatability of those results.
Inter Laboratory Duplicate Sample	The primary laboratory's processes by which its results are obtained are considered to be acceptable in terms of their accuracy of those results (i.e. in terms of how close the results are to their 'true' value).
Rinsate and Field Blank Samples	Results indicate that the equipment used for the collection of samples has not impacted the results.
Laboratory Internal Quality Control	Results obtained from laboratory internal quality control samples were within the acceptable limits of repeatability, chemical extraction and detection. Details of laboratory quality control measures are provided on laboratory certificates.

Based on the QA/QC information listed in this report, the results are considered to be of an appropriate standard and it is concluded that:

- field investigation and sample preservation methods are appropriate for the investigations reported
- the analytical methods used for site assessment are of appropriate precision and accuracy, and that the sensitivity and selectivity of the analytical methods are appropriate for the assessment of risks
- the precision and accuracy criteria set out in the QA/QC plan, for a given method and matrix, meet the performance expected of the reference method
- the quality of data supplied by the analytical laboratory meets the objectives of the testing laboratory's quality plan for blanks, spikes, control samples, laboratory duplicates and holding times

Yulara Landfill
Environmental Compliance Monitoring - March 2024

Intra-laboratory and Inter-laboratory Duplicate Sample Results

SDG	T1979	T1979		T1979	Interlab_D	
Sample ID	MW3D-A	MW3D-X	**RPD**	MW3D-A	MW3D-Y	**RPD**
Sample Date	9/03/2024	9/03/2024		9/03/2024	9/03/2024	

ChemName	Units	EQL						
BTEX								
Benzene	µg/l	1	<1.0	<1.0	0	<1.0	<1.0	0
Ethylbenzene	µg/l	1	<1.0	<1.0	0	<1.0	<1.0	0
Toluene	µg/l	1	2.0	2.0	0	2.0	2.0	0
Xylene (m & p)	µg/l	2	<2.0	<2.0	0	<2.0	<2.0	0
Xylene (o)	µg/l	1	<1.0	<1.0	0	<1.0	<1.0	0
Xylene Total	µg/l	3 (Primary): 1 (Interlab)	<3.0	<3.0	0	<3.0	<1.0	0
Metals								
Aluminium (Filtered)	mg/l	0.05 (Primary): 0.01 (Interlab)	<0.05	<0.05	0	<0.05	<0.01	0
Arsenic (Filtered)	mg/l	0.001	<0.001	<0.001	0	<0.001	<0.001	0
Cadmium (Filtered)	mg/l	0.0002 (Primary): 0.0001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0001	0
Chromium (III+VI) (Filtered)	mg/l	0.001	0.002	0.002	0	0.002	0.002	0
Copper (Filtered)	mg/l	0.001	<0.001	0.002	67	<0.001	0.002	67
Iron (Filtered)	mg/l	0.05 (Primary): 0.01 (Interlab)	<0.05	<0.05	0	<0.05	<0.01	0
Lead (Filtered)	mg/l	0.001	<0.001	<0.001	0	<0.001	<0.001	0
Manganese (Filtered)	mg/l	0.005	<0.005	<0.005	0	<0.005	<0.005	0
Mercury (Filtered)	mg/l	0.0001 (Primary): 0.00005 (Interlab)	<0.0001	<0.0001	0	<0.0001	<0.0001	0
Nickel (Filtered)	mg/l	0.001	0.001	0.003	100	0.001	0.001	0
Selenium (Filtered)	mg/l	0.001	0.004	0.004	0	0.004	0.003	29
Zinc (Filtered)	mg/l	0.005 (Primary): 0.001 (Interlab)	<0.005	0.006	18	<0.005	0.003	0
PAH								
Naphthalene	µg/l	10 (Primary): 1 (Interlab)	<10.0	<10.0	0	<10.0	<1.0	0
Naphthalene	µg/l	1	<1.0			<1.0	<1.0	0
TPH								
C10-C16	mg/l	0.05	<0.05	<0.05	0	<0.05	<0.05	0
C10-C16 less NAPHTHALENE (F2)	mg/l	0.05	<0.05	<0.05	0	<0.05	<0.05	0
C16-C34	mg/l	0.1	<0.1	<0.1	0	<0.1	<0.1	0
C34-C40	mg/l	0.1	<0.1	<0.1	0	<0.1	<0.1	0
C6 - C9	µg/l	20 (Primary): 10 (Interlab)	<20.0	<20.0	0	<20.0	<10.0	0
C10 - C14	µg/l	50	<50.0	<50.0	0	<50.0	<50.0	0
C15 - C28	µg/l	100	<100.0	<100.0	0	<100.0	<100.0	0
C29-C36	µg/l	100	<100.0	<100.0	0	<100.0	<100.0	0
+C10 - C36 (Sum of total)	µg/l	100 (Primary): 50 (Interlab)	<100.0	<100.0	0	<100.0	<50.0	0
C10 - C40 (Sum of total)	µg/l	100 (Primary): 50 (Interlab)	<100.0	<100.0	0	<100.0	<50.0	0
C6-C10 less BTEX (F1)	mg/l	0.02 (Primary): 0.01 (Interlab)	<0.02	<0.02	0	<0.02	<0.01	0
C6-C10	mg/l	0.02 (Primary): 0.01 (Interlab)	<0.02	<0.02	0	<0.02	<0.01	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 50 (10-30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

SDG	T1979	T1979
Field_ID	20240303FB1	20240303R1
Sampled_Date	9/03/2024	9/03/2024
Sample_Type	Field_B	Rinsate

ChemName	Units	EQL		
Metals				
Aluminium (Filtered)	mg/l	0.05	<0.05	<0.05
Arsenic (Filtered)	mg/l	0.001	<0.001	<0.001
Cadmium (Filtered)	mg/l	0.0002	<0.0002	<0.0002
Calcium	mg/l	0.5		
Chromium (III+VI) (Filtered)	mg/l	0.001	<0.001	<0.001
Copper (Filtered)	mg/l	0.001	<0.001	<0.001
Iron (Filtered)	mg/l	0.05	<0.05	<0.05
Lead (Filtered)	mg/l	0.001	<0.001	<0.001
Magnesium	mg/l	0.5		
Manganese (Filtered)	mg/l	0.005	<0.005	<0.005
Mercury (Filtered)	mg/l	0.0001	<0.0001	<0.0001
Nickel (Filtered)	mg/l	0.001	<0.001	<0.001
Potassium	mg/l	0.5		
Selenium (Filtered)	mg/l	0.001	<0.001	<0.001
Zinc (Filtered)	mg/l	0.005	<0.005	<0.005

APPENDIX F
CALIBRATION CERTIFICATE

EQUIPMENT CERTIFICATION REPORT

KENNARDS HIRE

PGN9003823 GAS ANALYSER – LANDFILL **GA5000 / GEM5000**

Plant Number: 234905 Serial Number: 9502366

SENSOR	CONCENTRATION	INSTRUMENT READING	TRACEABILITY	PASS
O2/Zero	Fresh air	20.9%	N/A	☑
CH4	60%	60 %	Lot # 302-4025 60910-7	☑
CO2	40%	40 %	Lot # "	☑
O2	15%	15 %	Lot # 277553	☑
CO	60ppm	60 ppm	Lot # 277553	☑
H2S	20ppm	20 ppm	Lot # 277553	☑

Data Cleared ☑

Battery Status 100 charged. (%)	Temperature 25.5 °C
Electrical Test & Tag (AS/NZS 3760)	Inlet Filter Cleaned/Replaced

Note: Calibration traceability information is available upon request.

Checked By: ECS Date: 29/2/24 Signed:

Accessories List:

User's Manual & USB	1x Gas Inlet Hoses	1X Gas Inlet Hose With Filter
1x Gas Inlet Hose & Clip Fitting	2x Spare Inlet Filters	1x Flow Through Desiccant
1x Wall Charger	Carry Pouch With Neck Strap	1x USB Comms Cable
Carry Transit Case	Calibration Certificate	

EQUIPMENT CERTIFICATION REPORT

KENNARDS HIRE

PGN9003871 WATER QUALITY METER – MULTIFUNCTION (YSI PRO PLUS)

Plant Number: 1077348 **Serial Number:** 20L10/814

SENSOR	CONCENTRATION	SPAN 1	SPAN 2	TRACEABILITY	PASS
pH	pH 7.00 / pH 4.00	7.00 pH	4.00 pH	pH4-380327 pH7-330737	☑
Conductivity	12.88 mS/cm	12.88 mS/cm		399853	☑
Dissolved Oxygen	Sodium Sulphite / Air	0% In Sodium Sulphite	100% in Air	123302	☑
ORP	240mV @ 20°C	240mV		337308	☑

Battery Status 100 % spare included	Temperature 25.0 °C
Electrodes Cleaned and Checked	

Note: Calibration solution traceability information is available upon request.

Checked By: ECA **Date:** 20/2/24 **Signed:**

Accessories List:

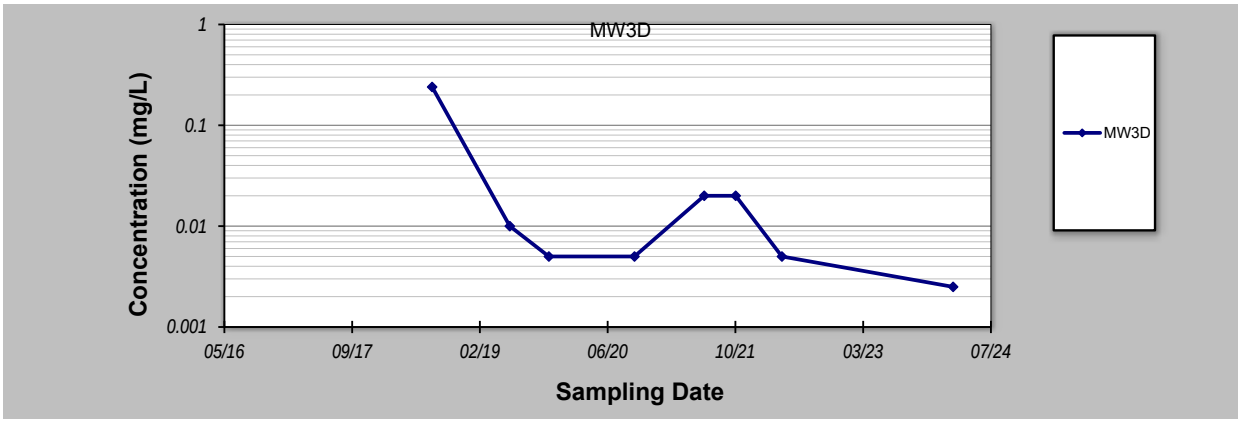
User's Manual	pH Sensor	Conductivity/Temp Sensor
Dissolved Oxygen Sensor	Redox (ORP) Sensor	Flow Cell
User Guide	Stainless Steel Restrictor	Spare Batteries
Calibration Cup		

APPENDIX G
MANN KENDALL TREND ASSESSMENT

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	12-Apr-24	Job ID:	ASY 24 050.01
Facility Name:	Yulara Landfill	Constituent:	Aluminium
Conducted By:	LH	Concentration Units:	mg/L
Sampling Point ID:	MW3D		

Sampling Event	Sampling Date	ALUMINIUM CONCENTRATION (mg/L)
1	1/11/2017	
2	1/08/2018	0.24
3	1/06/2019	0.01
4	1/11/2019	*0.005*
5	1/10/2020	*0.005*
6	1/07/2021	0.02
7	1/11/2021	0.02
8	1/05/2022	*0.005*
9	1/05/2023	
10	1/03/2024	*0.0025*
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		2.13
Mann-Kendall Statistic (S):		-12
Confidence Factor:		91.1%
Concentration Trend:		Prob. Decreasing



Notes:

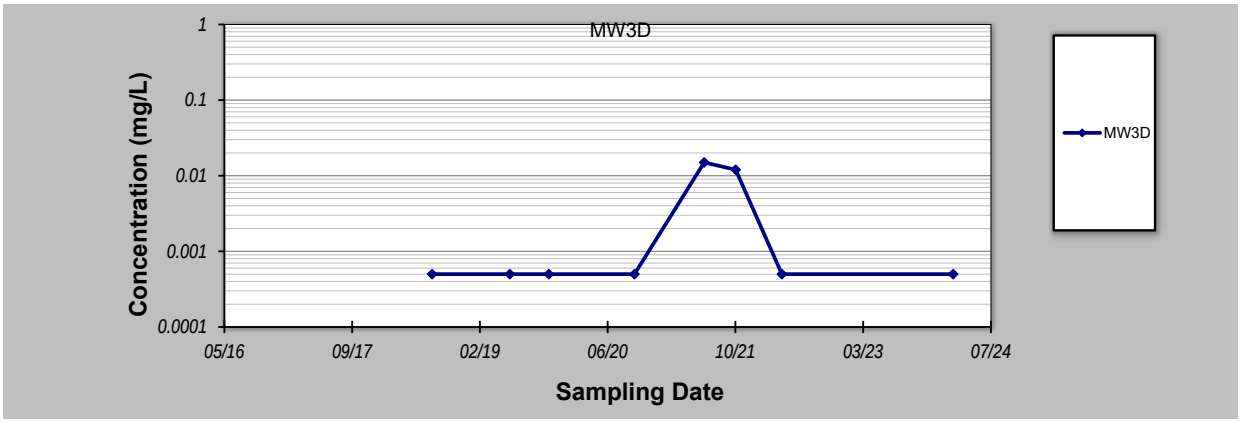
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably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

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	12-Apr-24	Job ID:	ASY 24 050.01
Facility Name:	Yulara Landfill	Constituent:	Copper
Conducted By:	LH	Concentration Units:	mg/L

Sampling Point ID: **MW3D**

Sampling Event	Sampling Date	COPPER CONCENTRATION (mg/L)
1	1/11/2017	
2	1/08/2018	*0.0005*
3	1/06/2019	*0.0005*
4	1/11/2019	*0.0005*
5	1/10/2020	*0.0005*
6	1/07/2021	0.015
7	1/11/2021	0.012
8	1/05/2022	*0.0005*
9	1/05/2023	
10	1/03/2024	*0.0005*
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		1.62
Mann-Kendall Statistic (S):		3
Confidence Factor:		59.4%
Concentration Trend:		No Trend



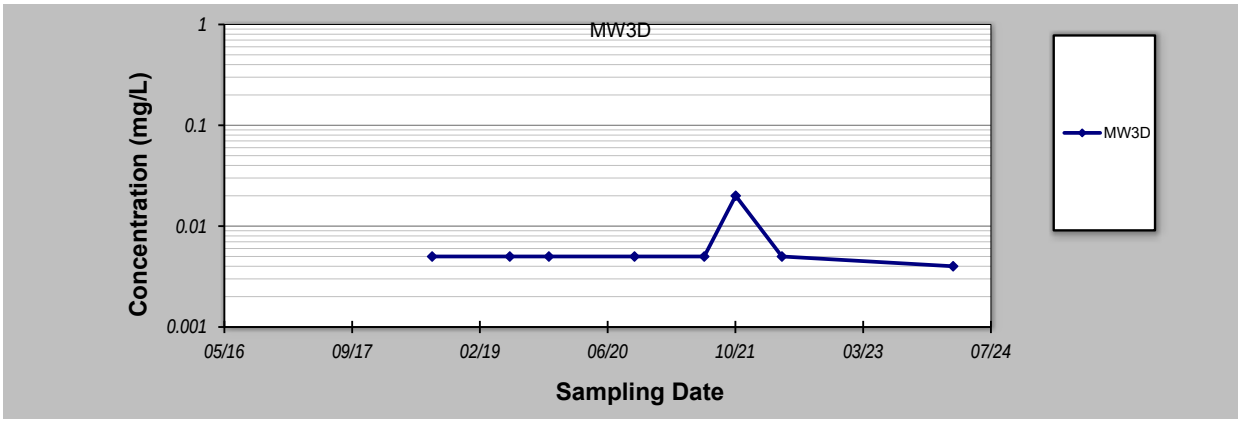
Notes:

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

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	12-Apr-24	Job ID:	ASY 24 050.01
Facility Name:	Yulara Landfill	Constituent:	Selenium
Conducted By:	LH	Concentration Units:	mg/L
Sampling Point ID:	MW3D		

Sampling Event	Sampling Date	SELENIUM CONCENTRATION (mg/L)
1	1/11/2017	
2	1/08/2018	0.005
3	1/06/2019	0.005
4	1/11/2019	0.005
5	1/10/2020	0.005
6	1/07/2021	0.005
7	1/11/2021	0.02
8	1/05/2022	0.005
9	1/05/2023	
10	1/03/2024	0.004
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		0.79
Mann-Kendall Statistic (S):		-3
Confidence Factor:		59.4%
Concentration Trend:		Stable



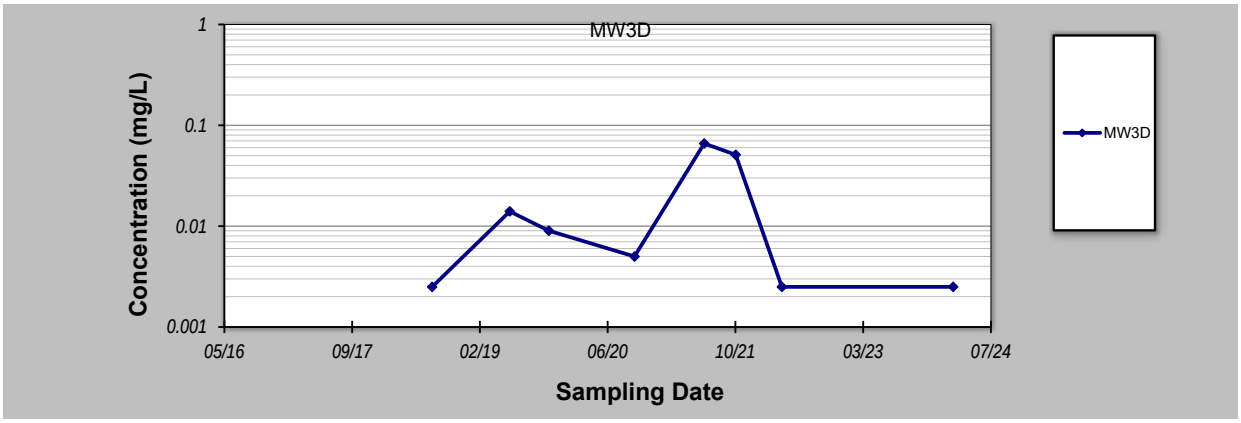
Notes:

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

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	12-Apr-24	Job ID:	ASY 24 050.01
Facility Name:	Yulara Landfill	Constituent:	Zinc
Conducted By:	LH	Concentration Units:	mg/L
Sampling Point ID:	MW3D		

Sampling Event	Sampling Date	ZINC CONCENTRATION (mg/L)
1	1/11/2017	
2	1/08/2018	*0.0025*
3	1/06/2019	0.014
4	1/11/2019	0.009
5	1/10/2020	0.005
6	1/07/2021	0.066
7	1/11/2021	0.051
8	1/05/2022	*0.0025*
9	1/05/2023	
10	1/03/2024	*0.0025*
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		1.31
Mann-Kendall Statistic (S):		-3
Confidence Factor:		59.4%
Concentration Trend:		No Trend



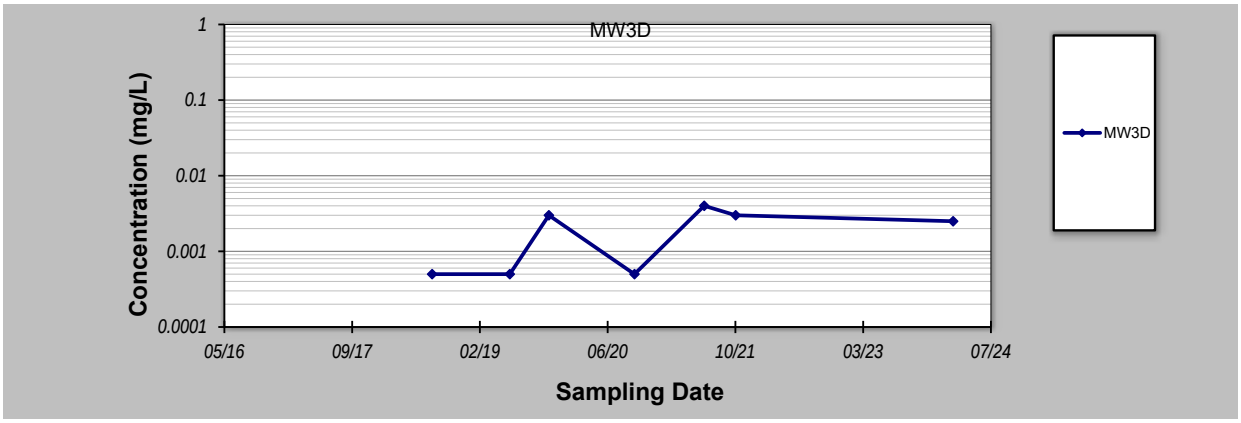
Notes:

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

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	12-Apr-24	Job ID:	ASY 24 050.01
Facility Name:	Yulara Landfill	Constituent:	Manganese
Conducted By:	LH	Concentration Units:	mg/L
Sampling Point ID:	MW3D		

Sampling Event	Sampling Date	MANGANESE CONCENTRATION (mg/L)
1	1/11/2017	
2	1/08/2018	*0.0005*
3	1/06/2019	*0.0005*
4	1/11/2019	0.003
5	1/10/2020	*0.0005*
6	1/07/2021	0.004
7	1/11/2021	0.003
8	1/05/2022	
9	1/05/2023	
10	1/03/2024	*0.0025*
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		0.74
Mann-Kendall Statistic (S):		7
Confidence Factor:		80.9%
Concentration Trend:		No Trend



Notes:

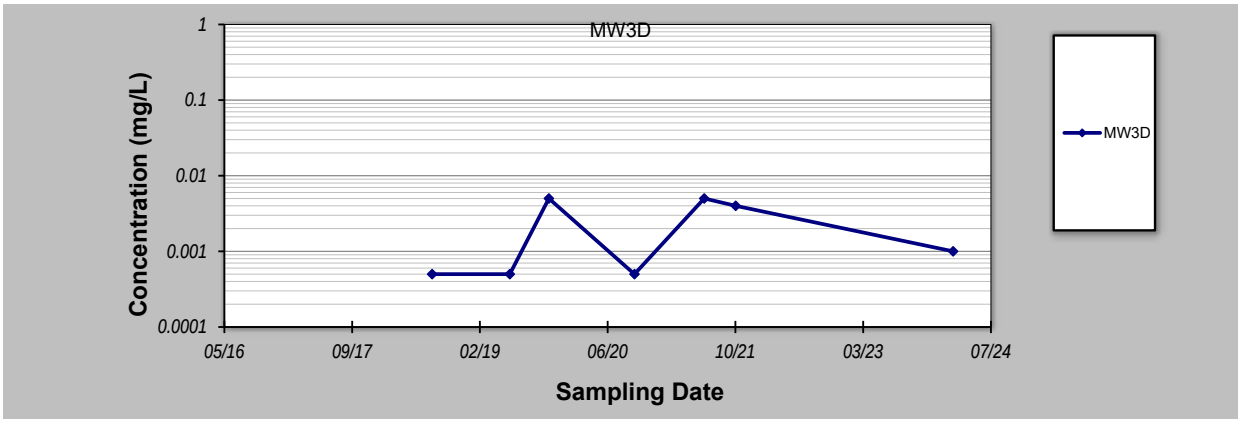
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably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

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:		Job ID:	ASY 24 050.01
Facility Name:	Yulara Landfill	Constituent:	Nickel
Conducted By:	LH	Concentration Units:	mg/L

Sampling Point ID: MW3D

Sampling Event	Sampling Date	NICKEL CONCENTRATION (mg/L)
1	1/11/2017	
2	1/08/2018	*0.0005*
3	1/06/2019	*0.0005*
4	1/11/2019	0.005
5	1/10/2020	*0.0005*
6	1/07/2021	0.005
7	1/11/2021	0.004
8	1/05/2022	
9	1/05/2023	
10	1/03/2024	0.001
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		0.93
Mann-Kendall Statistic (S):		5
Confidence Factor:		71.9%
Concentration Trend:		No Trend



Notes:

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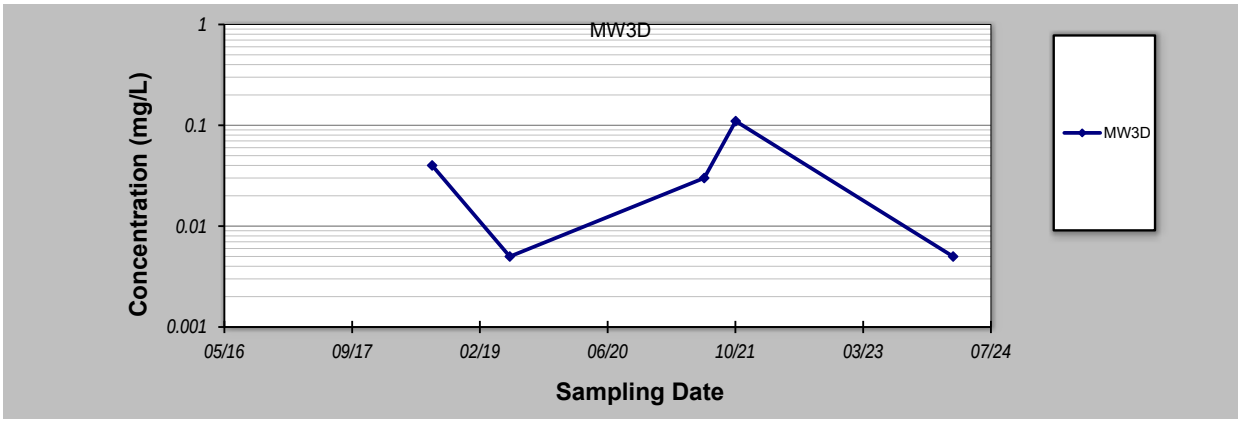
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	12-Apr-24	Job ID:	ASY 24 050.01
Facility Name:	Yulara Landfill	Constituent:	Ammonia
Conducted By:	LH	Concentration Units:	mg/L
Sampling Point ID:	MW3D		

Sampling Event	Sampling Date	AMMONIA CONCENTRATION (mg/L)
1	1/11/2017	
2	1/08/2018	0.04
3	1/06/2019	*0.005*
4	1/11/2019	
5	1/10/2020	
6	1/07/2021	0.03
7	1/11/2021	0.11
8	1/05/2022	
9	1/05/2023	
10	1/03/2024	*0.005*
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		1.13
Mann-Kendall Statistic (S):		-1
Confidence Factor:		50.0%
Concentration Trend:		No Trend



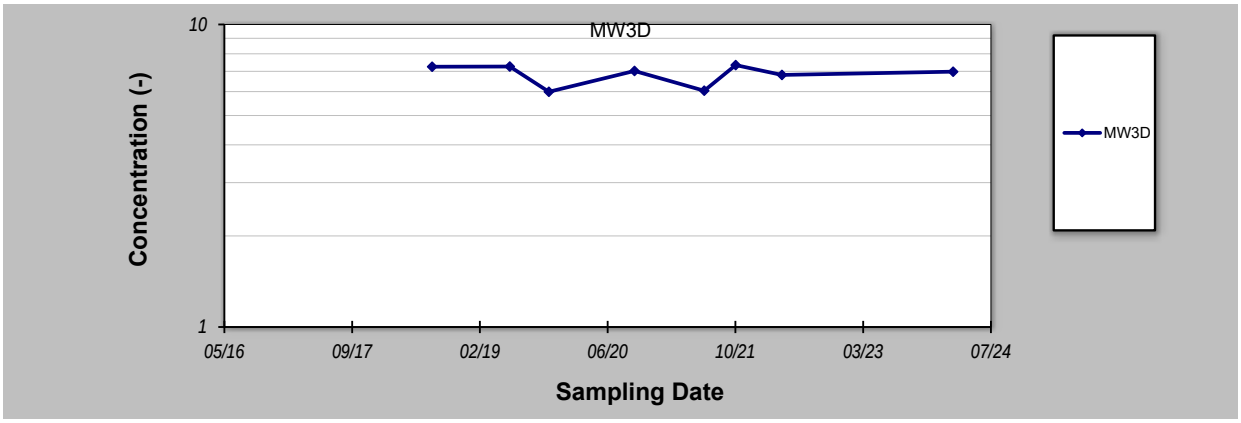
Notes:

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

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	12-Apr-24	Job ID:	ASY 24 050.01
Facility Name:	Yulara Landfill	Constituent:	pH
Conducted By:	LH	Concentration Units:	-
Sampling Point ID:	MW3D		

Sampling Event	Sampling Date	PH CONCENTRATION (-)
1	1/11/2017	
2	1/08/2018	7.25
3	1/06/2019	7.26
4	1/11/2019	5.99
5	1/10/2020	7.02
6	1/07/2021	6.04
7	1/11/2021	7.34
8	1/05/2022	6.81
9	1/05/2023	
10	1/03/2024	6.98
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		0.08
Mann-Kendall Statistic (S):		-2
Confidence Factor:		54.8%
Concentration Trend:		Stable



Notes:

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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

APPENDIX H
LABORATORY REPORTS

CHAIN OF CUSTODY RECORD

eurofins | mgt

CLIENT DETAILS

Page 1 of 1

Company Name : Tierra Environment	Contact Name : Daryl Burrows	Purchase Order : NA	COC Number : T1979
Office Address :	Project Manager : Daryl Burrows	Project Number : ASY 24 050.01	QUOTE ID : 231130TIES
	Email for results : general@tierra.com.au	Project Name : Yulara Landfill	Esdat

Special Directions & Comments :

Metals same as listed in B10C screen plus extras (Iron, Aluminium, Manganese, Selenium)

Some analyses nay not be able to be performed as there was insufficient water to fill the 500mL plastics. Please perform as many as possible.

Laboratory Address

Eurofins - Melbourne
6 Monterey Road, Dandenong South, VIC 3175
Phone: 03 8584 5000
Fax: 03 8564 5090
Email: EnviroSampleVic@eurofins.com

	Sample ID	Date	Matrix	Turbidity	TDS	TSS	DOC	COD	B10C Screen + Iron, Aluminium, Manganese, Selenium	B11A Screen	B19E Nutrients 6	Metals*	TRH	BTEXN	Containers 500P	250A	50P	250A	VIAL	125mL A	Jar	Sample Comments
1	MW3D-A	09-Mar-24	Water	X	X	X	X	X	X	X	X				1	1	4		2	1		
2	MW3D-X	09-Mar-24	Water									X	X	X		1	4		2	1		
3	20240303R1	09-Mar-24	Water									X					1		2	1		
4	20240303FB1	09-Mar-24	Water									X					1		2	1		
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						
13																						
14																						
15																						
16																						
17																						

Relinquished By: Daryl Burrows	Laboratory Staff Adelaide	Laboratory Staff Melbourne	Turn around Time	Method Of Shipment
Date & Time : 12/03/24 9:30am	Received By: Pazeena	Received By:	24 Hrs 48 Hrs	[x] Courier
Signature:	Date & Time : 12/03 10:40 am	Date & Time :	[5 Days] 10 Days	[ ] Hand Delivered
	Signature:	Signature:		[ ] Postal
	Report Number :	Report Number :		

5.2°C
-0.1°C
5.1°C on ice

#1077050
Pazeena

Tierra Environmental Pty Ltd
PO Box 360
Mitcham
SA 5062

Attention: **Daryl Burrows**

Report **1077050-W**
Project name YULARA LANDFILL
Project ID ASY 24 050.01
Received Date Mar 12, 2024

Client Sample ID			**MW3D-A**	**MW3D-X**	**20240303R1**	**20240303FB1**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**M24-Ma0025416**	**M24-Ma0025417**	**M24-Ma0025418**	**M24-Ma0025419**
Date Sampled			**Mar 09, 2024**	**Mar 09, 2024**	**Mar 09, 2024**	**Mar 09, 2024**
Test/Reference	LOR	Unit				
BTEX						
Benzene	0.001	mg/L	< 0.001	< 0.001	-	-
Toluene	0.001	mg/L	0.002	0.002	-	-
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	-	-
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	-	-
o-Xylene	0.001	mg/L	< 0.001	< 0.001	-	-
Xylenes - Total*	0.003	mg/L	< 0.003	< 0.003	-	-
4-Bromofluorobenzene (surr.)	1	%	91	90	-	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.01	mg/L	< 0.01	< 0.01	-	-
Total Recoverable Hydrocarbons						
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	-	-
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	-	-
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	-	-
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	-	-
TRH C10-C36 (Total)	0.1	mg/L	< 0.1	< 0.1	-	-
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	-	-
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02	< 0.02	-	-
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	-	-
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05	< 0.05	-	-
TRH >C16-C34	0.1	mg/L	< 0.1	< 0.1	-	-
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	-	-
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1	< 0.1	-	-
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	0.001	mg/L	< 0.001	-	-	-
Acenaphthylene	0.001	mg/L	< 0.001	-	-	-
Anthracene	0.001	mg/L	< 0.001	-	-	-
Benz(a)anthracene	0.001	mg/L	< 0.001	-	-	-
Benzo(a)pyrene	0.001	mg/L	< 0.001	-	-	-
Benzo(b&j)fluoranthene[N07]	0.001	mg/L	< 0.001	-	-	-
Benzo(g.h.i)perylene	0.001	mg/L	< 0.001	-	-	-
Benzo(k)fluoranthene	0.001	mg/L	< 0.001	-	-	-
Chrysene	0.001	mg/L	< 0.001	-	-	-
Dibenz(a.h)anthracene	0.001	mg/L	< 0.001	-	-	-
Fluoranthene	0.001	mg/L	< 0.001	-	-	-
Fluorene	0.001	mg/L	< 0.001	-	-	-

Client Sample ID			MW3D-A	MW3D-X	20240303R1	20240303FB1
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			M24-Ma0025416	M24-Ma0025417	M24-Ma0025418	M24-Ma0025419
Date Sampled			Mar 09, 2024	Mar 09, 2024	Mar 09, 2024	Mar 09, 2024
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Indeno(1.2.3-cd)pyrene	0.001	mg/L	< 0.001	-	-	-
Naphthalene	0.001	mg/L	< 0.001	-	-	-
Phenanthrene	0.001	mg/L	< 0.001	-	-	-
Pyrene	0.001	mg/L	< 0.001	-	-	-
Total PAH*	0.001	mg/L	< 0.001	-	-	-
2-Fluorobiphenyl (surr.)	1	%	53	-	-	-
p-Terphenyl-d14 (surr.)	1	%	67	-	-	-
Organochlorine Pesticides						
Chlordanes - Total	0.002	mg/L	< 0.002	-	-	-
4.4'-DDD	0.0002	mg/L	< 0.0002	-	-	-
4.4'-DDE	0.0002	mg/L	< 0.0002	-	-	-
4.4'-DDT	0.0002	mg/L	< 0.0002	-	-	-
a-HCH	0.0002	mg/L	< 0.0002	-	-	-
Aldrin	0.0002	mg/L	< 0.0002	-	-	-
b-HCH	0.0002	mg/L	< 0.0002	-	-	-
d-HCH	0.0002	mg/L	< 0.0002	-	-	-
Dieldrin	0.0002	mg/L	< 0.0002	-	-	-
Endosulfan I	0.0002	mg/L	< 0.0002	-	-	-
Endosulfan II	0.0002	mg/L	< 0.0002	-	-	-
Endosulfan sulphate	0.0002	mg/L	< 0.0002	-	-	-
Endrin	0.0002	mg/L	< 0.0002	-	-	-
Endrin aldehyde	0.0002	mg/L	< 0.0002	-	-	-
Endrin ketone	0.0002	mg/L	< 0.0002	-	-	-
g-HCH (Lindane)	0.0002	mg/L	< 0.0002	-	-	-
Heptachlor	0.0002	mg/L	< 0.0002	-	-	-
Heptachlor epoxide	0.0002	mg/L	< 0.0002	-	-	-
Hexachlorobenzene	0.0002	mg/L	< 0.0002	-	-	-
Methoxychlor	0.0002	mg/L	< 0.0002	-	-	-
Toxaphene	0.005	mg/L	< 0.005	-	-	-
Aldrin and Dieldrin (Total)*	0.0002	mg/L	< 0.0002	-	-	-
DDT + DDE + DDD (Total)*	0.0002	mg/L	< 0.0002	-	-	-
Vic EPA IWRG 621 OCP (Total)*	0.002	mg/L	< 0.002	-	-	-
Vic EPA IWRG 621 Other OCP (Total)*	0.002	mg/L	< 0.002	-	-	-
Dibutylchlorendate (surr.)	1	%	73	-	-	-
Tetrachloro-m-xylene (surr.)	1	%	53	-	-	-
Organophosphorus Pesticides						
Azinphos-methyl	0.002	mg/L	< 0.002	-	-	-
Bolstar	0.002	mg/L	< 0.002	-	-	-
Chlorfenvinphos	0.02	mg/L	< 0.02	-	-	-
Chlorpyrifos	0.002	mg/L	< 0.002	-	-	-
Chlorpyrifos-methyl	0.002	mg/L	< 0.002	-	-	-
Coumaphos	0.02	mg/L	< 0.02	-	-	-
Demeton-S	0.002	mg/L	< 0.002	-	-	-
Demeton-O	0.002	mg/L	< 0.002	-	-	-
Diazinon	0.002	mg/L	< 0.002	-	-	-
Dichlorvos	0.002	mg/L	< 0.002	-	-	-
Dimethoate	0.002	mg/L	< 0.002	-	-	-
Disulfoton	0.002	mg/L	< 0.002	-	-	-
EPN	0.002	mg/L	< 0.002	-	-	-

Client Sample ID			MW3D-A	MW3D-X	20240303R1	20240303FB1
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			M24-Ma0025416	M24-Ma0025417	M24-Ma0025418	M24-Ma0025419
Date Sampled			Mar 09, 2024	Mar 09, 2024	Mar 09, 2024	Mar 09, 2024
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Ethion	0.002	mg/L	< 0.002	-	-	-
Ethoprop	0.002	mg/L	< 0.002	-	-	-
Ethyl parathion	0.002	mg/L	< 0.002	-	-	-
Fenitrothion	0.002	mg/L	< 0.002	-	-	-
Fensulfothion	0.002	mg/L	< 0.002	-	-	-
Fenthion	0.002	mg/L	< 0.002	-	-	-
Malathion	0.002	mg/L	< 0.002	-	-	-
Merphos	0.002	mg/L	< 0.002	-	-	-
Methyl parathion	0.002	mg/L	< 0.002	-	-	-
Mevinphos	0.002	mg/L	< 0.002	-	-	-
Monocrotophos	0.002	mg/L	< 0.002	-	-	-
Naled	0.002	mg/L	< 0.002	-	-	-
Omethoate	0.02	mg/L	< 0.02	-	-	-
Phorate	0.002	mg/L	< 0.002	-	-	-
Pirimiphos-methyl	0.02	mg/L	< 0.02	-	-	-
Pyrazophos	0.002	mg/L	< 0.002	-	-	-
Ronnel	0.002	mg/L	< 0.002	-	-	-
Terbufos	0.002	mg/L	< 0.002	-	-	-
Tetrachlorvinphos	0.002	mg/L	< 0.002	-	-	-
Tokuthion	0.002	mg/L	< 0.002	-	-	-
Trichloronate	0.002	mg/L	< 0.002	-	-	-
Triphenylphosphate (surr.)	1	%	59	-	-	-
Polychlorinated Biphenyls						
Aroclor-1016	0.005	mg/L	< 0.005	-	-	-
Aroclor-1221	0.005	mg/L	< 0.005	-	-	-
Aroclor-1232	0.005	mg/L	< 0.005	-	-	-
Aroclor-1242	0.005	mg/L	< 0.005	-	-	-
Aroclor-1248	0.005	mg/L	< 0.005	-	-	-
Aroclor-1254	0.005	mg/L	< 0.005	-	-	-
Aroclor-1260	0.005	mg/L	< 0.005	-	-	-
Total PCB*	0.005	mg/L	< 0.005	-	-	-
Dibutylchlorendate (surr.)	1	%	73	-	-	-
Tetrachloro-m-xylene (surr.)	1	%	53	-	-	-
Phenols (Halogenated)						
2-Chlorophenol	0.003	mg/L	< 0.003	-	-	-
2.4-Dichlorophenol	0.003	mg/L	< 0.003	-	-	-
2.4.5-Trichlorophenol	0.01	mg/L	< 0.01	-	-	-
2.4.6-Trichlorophenol	0.01	mg/L	< 0.01	-	-	-
2.6-Dichlorophenol	0.003	mg/L	< 0.003	-	-	-
4-Chloro-3-methylphenol	0.01	mg/L	< 0.01	-	-	-
Pentachlorophenol	0.01	mg/L	< 0.01	-	-	-
Tetrachlorophenols - Total	0.03	mg/L	< 0.03	-	-	-
Total Halogenated Phenol*	0.01	mg/L	< 0.01	-	-	-
Phenols (non-Halogenated)						
2-Cyclohexyl-4.6-dinitrophenol	0.1	mg/L	< 0.1	-	-	-
2-Methyl-4.6-dinitrophenol	0.03	mg/L	< 0.03	-	-	-
2-Nitrophenol	0.01	mg/L	< 0.01	-	-	-
2.4-Dimethylphenol	0.003	mg/L	< 0.003	-	-	-
2.4-Dinitrophenol	0.03	mg/L	< 0.03	-	-	-

Client Sample ID			MW3D-A	MW3D-X	20240303R1	20240303FB1
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			M24-Ma0025416	M24-Ma0025417	M24-Ma0025418	M24-Ma0025419
Date Sampled			Mar 09, 2024	Mar 09, 2024	Mar 09, 2024	Mar 09, 2024
Test/Reference	LOR	Unit				
Phenols (non-Halogenated)						
2-Methylphenol (o-Cresol)	0.003	mg/L	< 0.003	-	-	-
3&4-Methylphenol (m&p-Cresol)	0.006	mg/L	< 0.006	-	-	-
Total cresols*	0.01	mg/L	< 0.01	-	-	-
4-Nitrophenol	0.03	mg/L	< 0.03	-	-	-
Dinoseb	0.1	mg/L	< 0.1	-	-	-
Phenol	0.003	mg/L	< 0.003	-	-	-
Phenol-d6 (surr.)	1	%	22	-	-	-
Total Non-Halogenated Phenol*	0.1	mg/L	< 0.1	-	-	-
Ammonia (as N)	0.01	mg/L	< 0.01	-	-	-
Chemical Oxygen Demand (COD)	25	mg/L	28	-	-	-
Chloride	1	mg/L	280	-	-	-
Dissolved Organic Carbon	5	mg/L	< 5	-	-	-
Nitrate & Nitrite (as N)	0.05	mg/L	42	-	-	-
Nitrate (as N)	0.02	mg/L	42	-	-	-
Nitrite (as N)	0.02	mg/L	0.03	-	-	-
Organic Nitrogen (as N)*	0.2	mg/L	12	-	-	-
Phosphorus reactive (as P)	0.01	mg/L	0.02	-	-	-
Sulphate (as SO4)	5	mg/L	240	-	-	-
Total Dissolved Solids Dried at 180 °C ± 2 °C	10	mg/L	1100	-	-	-
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	12	-	-	-
Total Nitrogen (as N)*	0.2	mg/L	54	-	-	-
Total Suspended Solids Dried at 103 °C to 105 °C	5	mg/L	270	-	-	-
Turbidity	1	NTU	110	-	-	-
Phosphate total (as P)	0.01	mg/L	0.04	-	-	-
Alkalinity (speciated)						
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	220	-	-	-
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10	-	-	-
Total Alkalinity (as CaCO3)	20	mg/L	220	-	-	-
Alkali Metals						
Calcium	0.5	mg/L	77	-	-	-
Magnesium	0.5	mg/L	48	-	-	-
Potassium	0.5	mg/L	33	-	-	-
Sodium	0.5	mg/L	230	-	-	-
Heavy Metals						
Aluminium (filtered)	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	0.002	0.002	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001	0.002	< 0.001	< 0.001
Iron (filtered)	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Manganese (filtered)	0.005	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.001	0.003	< 0.001	< 0.001
Selenium (filtered)	0.001	mg/L	0.004	0.004	< 0.001	< 0.001
Zinc (filtered)	0.005	mg/L	< 0.005	0.006	< 0.005	< 0.005

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Suite B10C: M8filt/BTEX/TRH/PAH/Phenol/OCP/OPP/PCB			
BTEX	Melbourne	Mar 15, 2024	14 Days
- Method: LTM-ORG-2010 BTEX and Volatile TRH			
Total Recoverable Hydrocarbons	Melbourne	Mar 15, 2024	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Mar 15, 2024	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Mar 15, 2024	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Mar 15, 2024	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Melbourne	Mar 15, 2024	7 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Organochlorine Pesticides	Melbourne	Mar 15, 2024	7 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water (USEPA 8270)			
Organophosphorus Pesticides	Melbourne	Mar 15, 2024	7 Days
- Method: LTM-ORG-2200 Organophosphorus Pesticides by GC-MS (USEPA 8270)			
Polychlorinated Biphenyls	Melbourne	Mar 15, 2024	7 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water (USEPA 8082)			
Phenols (Halogenated)	Melbourne	Mar 15, 2024	7 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Phenols (non-Halogenated)	Melbourne	Mar 15, 2024	7 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Metals M8 filtered	Melbourne	Mar 15, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Eurofins Suite B19E: Total N, TKN, NOx, NO2, NO3, NH3, Total P, Reactive P			
Ammonia (as N)	Melbourne	Mar 15, 2024	28 Days
- Method: LTM-INO-4450 Determination of Nitrogen Species by Discrete Analyser			
Nitrate & Nitrite (as N)	Melbourne	Mar 15, 2024	28 Days
- Method: LTM-INO-4450 Determination of Nitrogen Species by Discrete Analyser			
Nitrate (as N)	Melbourne	Mar 15, 2024	28 Days
- Method: LTM-INO-4450 Determination of Nitrogen Species by Discrete Analyser			
Nitrite (as N)	Melbourne	Mar 15, 2024	2 Days
- Method: LTM-INO-4450 Determination of Nitrogen Species by Discrete Analyser			
Organic Nitrogen (as N)*	Melbourne	Mar 12, 2024	7 Days
- Method: APHA 4500 Organic Nitrogen (N)			
Phosphorus reactive (as P)	Melbourne	Mar 15, 2024	2 Days
- Method: APHA 4500-P			
Total Kjeldahl Nitrogen (as N)	Melbourne	Mar 15, 2024	28 Days
- Method: APHA 4500-Norg B,D Total Kjeldahl Nitrogen by FIA			
Chemical Oxygen Demand (COD)	Melbourne	Mar 15, 2024	28 Days
- Method: LTM-INO-4220 Determination of COD in Water			
Dissolved Organic Carbon	Melbourne	Mar 15, 2024	28 Days
- Method: APHA 5310B Dissolved Organic Carbon			
Total Suspended Solids Dried at 103 °C to 105 °C	Melbourne	Mar 15, 2024	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Turbidity	Melbourne	Mar 15, 2024	28 Days
- Method: Turbidity by classical using APHA 2130B (LTM-INO-4140)			
Phosphate total (as P)	Melbourne	Mar 19, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Heavy Metals (filtered)	Melbourne	Mar 15, 2024	180 Days

Description	Testing Site	Extracted	Holding Time
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Eurofins Suite B11A			
Chloride	Melbourne	Mar 15, 2024	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
Sulphate (as SO4)	Melbourne	Mar 15, 2024	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
Alkalinity (speciated)	Melbourne	Mar 15, 2024	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Alkali Metals	Melbourne	Mar 15, 2024	180 Days
- Method: LTM-MET-3010 Alkali Metals Sulfur Silicon Phosphorus by ICP-AES			
Total Dissolved Solids Dried at 180 °C ± 2 °C	Melbourne	Mar 15, 2024	28 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			

eurofins

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Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794	Site# 25079 & 25289

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Project ID: ASY 24 050.01

Order No.:
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Received: Mar 12, 2024 10:40 AM
Due: Mar 19, 2024
Priority: 5 Day
Contact Name: Daryl Burrows

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						Aluminium (filtered)	Chemical Oxygen Demand (COD)	Dissolved Organic Carbon	HOLD	Iron (filtered)	Manganese (filtered)	Selenium (filtered)	Total Suspended Solids Dried at 103 °C to 105 °C	Turbidity	Metals M8 filtered	Eurofins Suite B11A	BTEX and Naphthalene	Total Recoverable Hydrocarbons	Eurofins Suite B19E: Total N, TKN, NOx, NO2, NO3, NH3, Total P, Reactive P	Total Dissolved Solids Dried at 180 °C ± 2 °C	Suite B10C: M8filt/BTEX/TRH/PAH/Phenol/OCP/OPP/PC
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
External Laboratory																					
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**																
1	MW3D-A	Mar 09, 2024		Water	M24-Ma0025416	X	X	X		X	X	X	X	X		X			X	X	X
2	MW3D-X	Mar 09, 2024		Water	M24-Ma0025417	X				X	X	X			X		X	X			
3	20240303R1	Mar 09, 2024		Water	M24-Ma0025418	X				X	X	X									
4	20240303FB1	Mar 09, 2024		Water	M24-Ma0025419	X				X	X	X									
5	WSP 9468 (TRIP SPIKE)	Mar 09, 2024		Water	M24-Ma0025420				X												
Test Counts						4	1	1	1	4	4	4	1	1	1	1	1	1	1	1	1

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ppm:** parts per million
µg/L: micrograms per litre	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit	**Colour:** Pt-Co Units	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

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

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

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

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

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 70 – 130%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total*	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
Method Blank							
Total Recoverable Hydrocarbons							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/L	< 0.001			0.001	Pass	
Acenaphthylene	mg/L	< 0.001			0.001	Pass	
Anthracene	mg/L	< 0.001			0.001	Pass	
Benz(a)anthracene	mg/L	< 0.001			0.001	Pass	
Benzo(a)pyrene	mg/L	< 0.001			0.001	Pass	
Benzo(b&j)fluoranthene	mg/L	< 0.001			0.001	Pass	
Benzo(g.h.i)perylene	mg/L	< 0.001			0.001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.001			0.001	Pass	
Chrysene	mg/L	< 0.001			0.001	Pass	
Dibenz(a.h)anthracene	mg/L	< 0.001			0.001	Pass	
Fluoranthene	mg/L	< 0.001			0.001	Pass	
Fluorene	mg/L	< 0.001			0.001	Pass	
Indeno(1.2.3-cd)pyrene	mg/L	< 0.001			0.001	Pass	
Naphthalene	mg/L	< 0.001			0.001	Pass	
Phenanthrene	mg/L	< 0.001			0.001	Pass	
Pyrene	mg/L	< 0.001			0.001	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/L	< 0.002			0.002	Pass	
4.4'-DDD	mg/L	< 0.0002			0.0002	Pass	
4.4'-DDE	mg/L	< 0.0002			0.0002	Pass	
4.4'-DDT	mg/L	< 0.0002			0.0002	Pass	
a-HCH	mg/L	< 0.0002			0.0002	Pass	
Aldrin	mg/L	< 0.0002			0.0002	Pass	
b-HCH	mg/L	< 0.0002			0.0002	Pass	
d-HCH	mg/L	< 0.0002			0.0002	Pass	
Dieldrin	mg/L	< 0.0002			0.0002	Pass	
Endosulfan I	mg/L	< 0.0002			0.0002	Pass	
Endosulfan II	mg/L	< 0.0002			0.0002	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endosulfan sulphate	mg/L	< 0.0002			0.0002	Pass	
Endrin	mg/L	< 0.0002			0.0002	Pass	
Endrin aldehyde	mg/L	< 0.0002			0.0002	Pass	
Endrin ketone	mg/L	< 0.0002			0.0002	Pass	
g-HCH (Lindane)	mg/L	< 0.0002			0.0002	Pass	
Heptachlor	mg/L	< 0.0002			0.0002	Pass	
Heptachlor epoxide	mg/L	< 0.0002			0.0002	Pass	
Hexachlorobenzene	mg/L	< 0.0002			0.0002	Pass	
Methoxychlor	mg/L	< 0.0002			0.0002	Pass	
Toxaphene	mg/L	< 0.005			0.005	Pass	
Method Blank							
Organophosphorus Pesticides							
Azinphos-methyl	mg/L	< 0.002			0.002	Pass	
Bolstar	mg/L	< 0.002			0.002	Pass	
Chlorfenvinphos	mg/L	< 0.02			0.02	Pass	
Chlorpyrifos	mg/L	< 0.002			0.002	Pass	
Chlorpyrifos-methyl	mg/L	< 0.002			0.002	Pass	
Coumaphos	mg/L	< 0.02			0.02	Pass	
Demeton-S	mg/L	< 0.002			0.002	Pass	
Demeton-O	mg/L	< 0.002			0.002	Pass	
Diazinon	mg/L	< 0.002			0.002	Pass	
Dichlorvos	mg/L	< 0.002			0.002	Pass	
Dimethoate	mg/L	< 0.002			0.002	Pass	
Disulfoton	mg/L	< 0.002			0.002	Pass	
EPN	mg/L	< 0.002			0.002	Pass	
Ethion	mg/L	< 0.002			0.002	Pass	
Ethoprop	mg/L	< 0.002			0.002	Pass	
Ethyl parathion	mg/L	< 0.002			0.002	Pass	
Fenitrothion	mg/L	< 0.002			0.002	Pass	
Fensulfothion	mg/L	< 0.002			0.002	Pass	
Fenthion	mg/L	< 0.002			0.002	Pass	
Malathion	mg/L	< 0.002			0.002	Pass	
Merphos	mg/L	< 0.002			0.002	Pass	
Methyl parathion	mg/L	< 0.002			0.002	Pass	
Mevinphos	mg/L	< 0.002			0.002	Pass	
Monocrotophos	mg/L	< 0.002			0.002	Pass	
Naled	mg/L	< 0.002			0.002	Pass	
Omethoate	mg/L	< 0.02			0.02	Pass	
Phorate	mg/L	< 0.002			0.002	Pass	
Pirimiphos-methyl	mg/L	< 0.02			0.02	Pass	
Pyrazophos	mg/L	< 0.002			0.002	Pass	
Ronnel	mg/L	< 0.002			0.002	Pass	
Terbufos	mg/L	< 0.002			0.002	Pass	
Tetrachlorvinphos	mg/L	< 0.002			0.002	Pass	
Tokuthion	mg/L	< 0.002			0.002	Pass	
Trichloronate	mg/L	< 0.002			0.002	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/L	< 0.005			0.005	Pass	
Aroclor-1221	mg/L	< 0.005			0.005	Pass	
Aroclor-1232	mg/L	< 0.005			0.005	Pass	
Aroclor-1242	mg/L	< 0.005			0.005	Pass	
Aroclor-1248	mg/L	< 0.005			0.005	Pass	
Aroclor-1254	mg/L	< 0.005			0.005	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Aroclor-1260	mg/L	< 0.005			0.005	Pass	
Total PCB*	mg/L	< 0.005			0.005	Pass	
Method Blank							
Phenols (Halogenated)							
2-Chlorophenol	mg/L	< 0.003			0.003	Pass	
2.4-Dichlorophenol	mg/L	< 0.003			0.003	Pass	
2.4.5-Trichlorophenol	mg/L	< 0.01			0.01	Pass	
2.4.6-Trichlorophenol	mg/L	< 0.01			0.01	Pass	
2.6-Dichlorophenol	mg/L	< 0.003			0.003	Pass	
4-Chloro-3-methylphenol	mg/L	< 0.01			0.01	Pass	
Pentachlorophenol	mg/L	< 0.01			0.01	Pass	
Tetrachlorophenols - Total	mg/L	< 0.03			0.03	Pass	
Method Blank							
Phenols (non-Halogenated)							
2-Cyclohexyl-4.6-dinitrophenol	mg/L	< 0.1			0.1	Pass	
2-Methyl-4.6-dinitrophenol	mg/L	< 0.03			0.03	Pass	
2-Nitrophenol	mg/L	< 0.01			0.01	Pass	
2.4-Dimethylphenol	mg/L	< 0.003			0.003	Pass	
2.4-Dinitrophenol	mg/L	< 0.03			0.03	Pass	
2-Methylphenol (o-Cresol)	mg/L	< 0.003			0.003	Pass	
3&4-Methylphenol (m&p-Cresol)	mg/L	< 0.006			0.006	Pass	
4-Nitrophenol	mg/L	< 0.03			0.03	Pass	
Dinoseb	mg/L	< 0.1			0.1	Pass	
Phenol	mg/L	< 0.003			0.003	Pass	
Method Blank							
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Chemical Oxygen Demand (COD)	mg/L	< 25			25	Pass	
Chloride	mg/L	< 1			1	Pass	
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Nitrite (as N)	mg/L	< 0.02			0.02	Pass	
Phosphorus reactive (as P)	mg/L	< 0.01			0.01	Pass	
Sulphate (as SO4)	mg/L	< 5			5	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Total Suspended Solids Dried at 103 °C to 105 °C	mg/L	< 5			5	Pass	
Turbidity	NTU	< 1			1	Pass	
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Heavy Metals							
Aluminium (filtered)	mg/L	< 0.05			0.05	Pass	
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Iron (filtered)	mg/L	< 0.05			0.05	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Manganese (filtered)	mg/L	< 0.005			0.005	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Selenium (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	84			70-130	Pass	
Toluene	%	86			70-130	Pass	
Ethylbenzene	%	88			70-130	Pass	
m&p-Xylenes	%	85			70-130	Pass	
Xylenes - Total*	%	85			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	83			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons							
TRH C6-C9	%	89			70-130	Pass	
TRH C10-C14	%	94			70-130	Pass	
TRH C6-C10	%	88			70-130	Pass	
TRH >C10-C16	%	93			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	76			70-130	Pass	
Acenaphthylene	%	75			70-130	Pass	
Anthracene	%	86			70-130	Pass	
Benz(a)anthracene	%	80			70-130	Pass	
Benzo(a)pyrene	%	83			70-130	Pass	
Benzo(b&j)fluoranthene	%	74			70-130	Pass	
Benzo(g.h.i)perylene	%	80			70-130	Pass	
Benzo(k)fluoranthene	%	87			70-130	Pass	
Chrysene	%	87			70-130	Pass	
Dibenz(a.h)anthracene	%	85			70-130	Pass	
Fluoranthene	%	82			70-130	Pass	
Fluorene	%	80			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	89			70-130	Pass	
Naphthalene	%	82			70-130	Pass	
Phenanthrene	%	79			70-130	Pass	
Pyrene	%	81			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	86			70-130	Pass	
4.4'-DDD	%	88			70-130	Pass	
4.4'-DDE	%	79			70-130	Pass	
4.4'-DDT	%	110			70-130	Pass	
a-HCH	%	79			70-130	Pass	
Aldrin	%	73			70-130	Pass	
b-HCH	%	85			70-130	Pass	
d-HCH	%	94			70-130	Pass	
Dieldrin	%	86			70-130	Pass	
Endosulfan I	%	76			70-130	Pass	
Endosulfan II	%	95			70-130	Pass	
Endosulfan sulphate	%	95			70-130	Pass	
Endrin	%	107			70-130	Pass	
Endrin aldehyde	%	76			70-130	Pass	
Endrin ketone	%	86			70-130	Pass	
g-HCH (Lindane)	%	100			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Heptachlor	%	86			70-130	Pass	
Heptachlor epoxide	%	74			70-130	Pass	
Hexachlorobenzene	%	71			70-130	Pass	
Methoxychlor	%	114			70-130	Pass	
LCS - % Recovery							
Organophosphorus Pesticides							
Diazinon	%	94			70-130	Pass	
Dimethoate	%	72			70-130	Pass	
Ethion	%	88			70-130	Pass	
Fenitrothion	%	103			70-130	Pass	
Mevinphos	%	96			70-130	Pass	
LCS - % Recovery							
Polychlorinated Biphenyls							
Aroclor-1260	%	88			70-130	Pass	
LCS - % Recovery							
Phenols (Halogenated)							
2-Chlorophenol	%	62			25-140	Pass	
2.4-Dichlorophenol	%	60			25-140	Pass	
2.4.5-Trichlorophenol	%	73			25-140	Pass	
2.4.6-Trichlorophenol	%	69			25-140	Pass	
2.6-Dichlorophenol	%	61			25-140	Pass	
4-Chloro-3-methylphenol	%	77			25-140	Pass	
Pentachlorophenol	%	44			25-140	Pass	
Tetrachlorophenols - Total	%	61			25-140	Pass	
LCS - % Recovery							
Phenols (non-Halogenated)							
2-Cyclohexyl-4.6-dinitrophenol	%	101			25-140	Pass	
2-Methyl-4.6-dinitrophenol	%	70			25-140	Pass	
2-Nitrophenol	%	51			25-140	Pass	
2.4-Dimethylphenol	%	76			25-140	Pass	
2.4-Dinitrophenol	%	81			25-140	Pass	
2-Methylphenol (o-Cresol)	%	66			25-140	Pass	
3&4-Methylphenol (m&p-Cresol)	%	68			25-140	Pass	
4-Nitrophenol	%	42			25-140	Pass	
Dinoseb	%	74			25-140	Pass	
Phenol	%	53			25-140	Pass	
LCS - % Recovery							
Ammonia (as N)	%	111			70-130	Pass	
Chemical Oxygen Demand (COD)	%	83			70-130	Pass	
Chloride	%	108			70-130	Pass	
Nitrate & Nitrite (as N)	%	119			70-130	Pass	
Nitrite (as N)	%	114			70-130	Pass	
Phosphorus reactive (as P)	%	109			70-130	Pass	
Sulphate (as SO4)	%	110			70-130	Pass	
Total Dissolved Solids Dried at 180 °C ± 2 °C	%	83			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	127			70-130	Pass	
Total Suspended Solids Dried at 103 °C to 105 °C	%	86			70-130	Pass	
Turbidity	%	105			70-130	Pass	
Phosphate total (as P)	%	105			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO3)	%	106			70-130	Pass	
Total Alkalinity (as CaCO3)	%	95			70-130	Pass	
LCS - % Recovery							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Alkali Metals							
Calcium	%	89			80-120	Pass	
Magnesium	%	92			80-120	Pass	
Potassium	%	93			80-120	Pass	
Sodium	%	91			80-120	Pass	
LCS - % Recovery							
Heavy Metals							
Aluminium (filtered)	%	97			80-120	Pass	
Arsenic (filtered)	%	93			80-120	Pass	
Cadmium (filtered)	%	94			80-120	Pass	
Chromium (filtered)	%	96			80-120	Pass	
Copper (filtered)	%	95			80-120	Pass	
Iron (filtered)	%	99			80-120	Pass	
Lead (filtered)	%	93			80-120	Pass	
Manganese (filtered)	%	94			80-120	Pass	
Mercury (filtered)	%	89			80-120	Pass	
Nickel (filtered)	%	94			80-120	Pass	
Selenium (filtered)	%	96			80-120	Pass	
Zinc (filtered)	%	94			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
BTEX				Result 1					
Benzene	M24-Ma0027401	NCP	%	73			70-130	Pass	
Toluene	M24-Ma0027401	NCP	%	73			70-130	Pass	
Ethylbenzene	M24-Ma0027401	NCP	%	73			70-130	Pass	
m&p-Xylenes	M24-Ma0027401	NCP	%	71			70-130	Pass	
o-Xylene	M24-Ma0027401	NCP	%	73			70-130	Pass	
Xylenes - Total*	M24-Ma0027401	NCP	%	72			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	M24-Ma0027401	NCP	%	73			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons				Result 1					
TRH C6-C9	M24-Ma0027401	NCP	%	83			70-130	Pass	
TRH C10-C14	M24-Ma0036671	NCP	%	92			70-130	Pass	
TRH C6-C10	M24-Ma0027401	NCP	%	83			70-130	Pass	
TRH >C10-C16	M24-Ma0036671	NCP	%	91			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	M24-Ma0027769	NCP	%	97			70-130	Pass	
Acenaphthylene	M24-Ma0027769	NCP	%	93			70-130	Pass	
Anthracene	M24-Ma0027769	NCP	%	71			70-130	Pass	
Benz(a)anthracene	M24-Ma0027769	NCP	%	98			70-130	Pass	
Benzo(a)pyrene	M24-Ma0027769	NCP	%	96			70-130	Pass	
Benzo(b&j)fluoranthene	M24-Ma0027769	NCP	%	103			70-130	Pass	
Benzo(g.h.i)perylene	M24-Ma0027769	NCP	%	110			70-130	Pass	
Benzo(k)fluoranthene	M24-Ma0027769	NCP	%	102			70-130	Pass	
Chrysene	M24-Ma0027769	NCP	%	112			70-130	Pass	
Dibenz(a.h)anthracene	M24-Ma0027769	NCP	%	85			70-130	Pass	
Fluoranthene	M24-Ma0027769	NCP	%	112			70-130	Pass	
Fluorene	M24-Ma0027769	NCP	%	103			70-130	Pass	
Indeno(1.2.3-cd)pyrene	M24-Ma0027769	NCP	%	91			70-130	Pass	
Naphthalene	M24-Ma0027769	NCP	%	85			70-130	Pass	
Phenanthrene	M24-Ma0027769	NCP	%	100			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Pyrene	M24-Ma0027769	NCP	%	109			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
Chlordanes - Total	M24-Ma0027769	NCP	%	108			70-130	Pass	
4.4'-DDD	M24-Ma0027769	NCP	%	120			70-130	Pass	
4.4'-DDE	M24-Ma0027769	NCP	%	116			70-130	Pass	
4.4'-DDT	M24-Ma0027769	NCP	%	104			70-130	Pass	
a-HCH	M24-Ma0027769	NCP	%	105			70-130	Pass	
Aldrin	M24-Ma0027769	NCP	%	99			70-130	Pass	
b-HCH	M24-Ma0027769	NCP	%	107			70-130	Pass	
d-HCH	M24-Ma0027769	NCP	%	112			70-130	Pass	
Dieldrin	M24-Ma0027769	NCP	%	112			70-130	Pass	
Endosulfan I	M24-Ma0027769	NCP	%	103			70-130	Pass	
Endosulfan II	M24-Ma0027769	NCP	%	110			70-130	Pass	
Endosulfan sulphate	M24-Ma0027769	NCP	%	122			70-130	Pass	
Endrin	M24-Ma0027769	NCP	%	111			70-130	Pass	
Endrin aldehyde	M24-Ma0027769	NCP	%	76			70-130	Pass	
Endrin ketone	M24-Ma0027769	NCP	%	116			70-130	Pass	
g-HCH (Lindane)	M24-Ma0027769	NCP	%	122			70-130	Pass	
Heptachlor	M24-Ma0027769	NCP	%	125			70-130	Pass	
Heptachlor epoxide	M24-Ma0027769	NCP	%	90			70-130	Pass	
Hexachlorobenzene	M24-Ma0027769	NCP	%	102			70-130	Pass	
Methoxychlor	M24-Ma0027769	NCP	%	130			70-130	Pass	
Spike - % Recovery									
Organophosphorus Pesticides				Result 1					
Diazinon	M24-Ma0027769	NCP	%	106			70-130	Pass	
Dimethoate	M24-Ma0027769	NCP	%	92			70-130	Pass	
Ethion	M24-Ma0027769	NCP	%	98			70-130	Pass	
Fenitrothion	M24-Ma0027769	NCP	%	101			70-130	Pass	
Mevinphos	M24-Ma0027769	NCP	%	122			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1016	M24-Ma0027769	NCP	%	110			70-130	Pass	
Aroclor-1260	M24-Ma0027769	NCP	%	100			70-130	Pass	
Spike - % Recovery									
Phenols (Halogenated)				Result 1					
2-Chlorophenol	M24-Ma0027769	NCP	%	105			30-130	Pass	
2.4-Dichlorophenol	M24-Ma0027769	NCP	%	90			30-130	Pass	
2.4.5-Trichlorophenol	M24-Ma0027769	NCP	%	105			30-130	Pass	
2.4.6-Trichlorophenol	M24-Ma0027769	NCP	%	99			30-130	Pass	
2.6-Dichlorophenol	M24-Ma0027769	NCP	%	96			30-130	Pass	
4-Chloro-3-methylphenol	M24-Ma0027769	NCP	%	108			30-130	Pass	
Pentachlorophenol	M24-Ma0027769	NCP	%	65			30-130	Pass	
Tetrachlorophenols - Total	M24-Ma0027769	NCP	%	82			30-130	Pass	
Spike - % Recovery									
Phenols (non-Halogenated)				Result 1					
2-Cyclohexyl-4.6-dinitrophenol	M24-Ma0027769	NCP	%	115			30-130	Pass	
2-Methyl-4.6-dinitrophenol	M24-Ma0027769	NCP	%	90			30-130	Pass	
2-Nitrophenol	M24-Ma0027769	NCP	%	89			30-130	Pass	
2.4-Dimethylphenol	M24-Ma0027769	NCP	%	50			30-130	Pass	
2.4-Dinitrophenol	M24-Ma0027769	NCP	%	113			30-130	Pass	
2-Methylphenol (o-Cresol)	M24-Ma0027769	NCP	%	94			30-130	Pass	
3&4-Methylphenol (m&p-Cresol)	M24-Ma0027769	NCP	%	105			30-130	Pass	
4-Nitrophenol	M24-Ma0027769	NCP	%	34			30-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Dinoseb	M24-Ma0027769	NCP	%	83			30-130	Pass	
Phenol	M24-Ma0027769	NCP	%	77			30-130	Pass	
Spike - % Recovery									
				Result 1					
Chemical Oxygen Demand (COD)	M24-Ma0035641	NCP	%	134			70-130	Fail	Q08
Nitrate & Nitrite (as N)	M24-Ma0035640	NCP	%	101			70-130	Pass	
Nitrite (as N)	M24-Ma0035640	NCP	%	97			70-130	Pass	
Sulphate (as SO4)	M24-Ma0034445	NCP	%	104			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	M24-Ma0033402	NCP	%	127			70-130	Pass	
Phosphate total (as P)	B24-Ma0035551	NCP	%	98			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M24-Ma0033476	NCP	%	97			75-125	Pass	
Magnesium	M24-Ma0033476	NCP	%	104			75-125	Pass	
Potassium	M24-Ma0033476	NCP	%	98			75-125	Pass	
Sodium	M24-Ma0032824	NCP	%	98			75-125	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Aluminium (filtered)	B24-Ma0017500	NCP	%	97			75-125	Pass	
Arsenic (filtered)	B24-Ma0017500	NCP	%	98			75-125	Pass	
Cadmium (filtered)	B24-Ma0017500	NCP	%	98			75-125	Pass	
Chromium (filtered)	B24-Ma0017500	NCP	%	94			75-125	Pass	
Copper (filtered)	B24-Ma0017500	NCP	%	96			75-125	Pass	
Iron (filtered)	B24-Ma0017500	NCP	%	101			75-125	Pass	
Lead (filtered)	B24-Ma0017500	NCP	%	89			75-125	Pass	
Manganese (filtered)	B24-Ma0017500	NCP	%	93			75-125	Pass	
Mercury (filtered)	B24-Ma0017500	NCP	%	94			75-125	Pass	
Nickel (filtered)	B24-Ma0017500	NCP	%	95			75-125	Pass	
Selenium (filtered)	B24-Ma0017500	NCP	%	96			75-125	Pass	
Zinc (filtered)	B24-Ma0017500	NCP	%	101			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	M24-Ma0032295	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	M24-Ma0032295	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	M24-Ma0032295	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	M24-Ma0032295	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	M24-Ma0032295	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total*	M24-Ma0032295	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	M24-Ma0032295	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	M24-Ma0032295	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	M24-Ma0036615	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	M24-Ma0036615	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	M24-Ma0036615	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C6-C10	M24-Ma0032295	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH >C10-C16	M24-Ma0036615	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C16-C34	M24-Ma0036615	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	M24-Ma0036615	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	

Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Acenaphthylene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Anthracene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benz(a)anthracene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(a)pyrene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(b&j)fluoranthene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(g.h.i)perylene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(k)fluoranthene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chrysene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dibenz(a.h)anthracene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluoranthene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluorene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Naphthalene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Phenanthrene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Pyrene	M24-Ma0036615	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
4.4'-DDD	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
4.4'-DDE	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
4.4'-DDT	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
a-HCH	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Aldrin	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
b-HCH	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
d-HCH	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Dieldrin	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Endosulfan I	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Endosulfan II	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Endosulfan sulphate	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Endrin	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Endrin aldehyde	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Endrin ketone	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
g-HCH (Lindane)	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Heptachlor	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Heptachlor epoxide	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Hexachlorobenzene	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Methoxychlor	M24-Ma0036615	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Toxaphene	M24-Ma0036615	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Organophosphorus Pesticides				Result 1	Result 2	RPD			
Azinphos-methyl	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Bolstar	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Chlorfenvinphos	M24-Ma0036615	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Chlorpyrifos	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Chlorpyrifos-methyl	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Coumaphos	M24-Ma0036615	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Demeton-S	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Demeton-O	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Diazinon	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Dichlorvos	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Dimethoate	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Disulfoton	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
EPN	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	

Duplicate									
Organophosphorus Pesticides				Result 1	Result 2	RPD			
Ethion	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Ethoprop	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Ethyl parathion	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Fenitrothion	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Fensulfothion	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Fenthion	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Malathion	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Merphos	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Methyl parathion	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Mevinphos	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Monocrotophos	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Naled	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Omethoate	M24-Ma0036615	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Phorate	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Pirimiphos-methyl	M24-Ma0036615	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Pyrazophos	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Ronnel	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Terbufos	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Tetrachlorvinphos	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Tokuthion	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Trichloronate	M24-Ma0036615	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
Duplicate									
Polychlorinated Biphenyls				Result 1	Result 2	RPD			
Aroclor-1016	M24-Ma0036615	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Aroclor-1221	M24-Ma0036615	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Aroclor-1232	M24-Ma0036615	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Aroclor-1242	M24-Ma0036615	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Aroclor-1248	M24-Ma0036615	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Aroclor-1254	M24-Ma0036615	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Aroclor-1260	M24-Ma0036615	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Total PCB*	M24-Ma0036615	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Phenols (Halogenated)				Result 1	Result 2	RPD			
2-Chlorophenol	M24-Ma0036615	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
2.4-Dichlorophenol	M24-Ma0036615	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
2.4.5-Trichlorophenol	M24-Ma0036615	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
2.4.6-Trichlorophenol	M24-Ma0036615	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
2.6-Dichlorophenol	M24-Ma0036615	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
4-Chloro-3-methylphenol	M24-Ma0036615	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
Pentachlorophenol	M24-Ma0036615	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
Tetrachlorophenols - Total	M24-Ma0036615	NCP	mg/L	< 0.03	< 0.03	<1	30%	Pass	
Duplicate									
Phenols (non-Halogenated)				Result 1	Result 2	RPD			
2-Cyclohexyl-4.6-dinitrophenol	M24-Ma0036615	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
2-Methyl-4.6-dinitrophenol	M24-Ma0036615	NCP	mg/L	< 0.03	< 0.03	<1	30%	Pass	
2-Nitrophenol	M24-Ma0036615	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
2.4-Dimethylphenol	M24-Ma0036615	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
2.4-Dinitrophenol	M24-Ma0036615	NCP	mg/L	< 0.03	< 0.03	<1	30%	Pass	
2-Methylphenol (o-Cresol)	M24-Ma0036615	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
3&4-Methylphenol (m&p-Cresol)	M24-Ma0036615	NCP	mg/L	< 0.006	< 0.006	<1	30%	Pass	
4-Nitrophenol	M24-Ma0036615	NCP	mg/L	< 0.03	< 0.03	<1	30%	Pass	
Dinoseb	M24-Ma0036615	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Phenol	M24-Ma0036615	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	M24-Ma0035643	NCP	mg/L	0.43	0.47	8.2	30%	Pass	
Chemical Oxygen Demand (COD)	L24-Ma0029557	NCP	mg/L	2200	2100	2.3	30%	Pass	
Chloride	M24-Ma0037562	NCP	mg/L	5300	5400	1.5	30%	Pass	
Nitrate & Nitrite (as N)	M24-Ma0035643	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Nitrite (as N)	M24-Ma0035643	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Sulphate (as SO4)	M24-Ma0037562	NCP	mg/L	470	470	<1	30%	Pass	
Total Kjeldahl Nitrogen (as N)	M24-Ma0036612	NCP	mg/L	1.0	1.0	6.3	30%	Pass	
Turbidity	M24-Ma0012504	NCP	NTU	5.0	5.0	1.2	30%	Pass	
Phosphate total (as P)	W24-Ma0028917	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	M24-Ma0033355	NCP	mg/L	120	100	17	30%	Pass	
Carbonate Alkalinity (as CaCO3)	M24-Ma0033355	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Total Alkalinity (as CaCO3)	M24-Ma0033355	NCP	mg/L	120	100	17	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M24-Ma0033476	NCP	mg/L	140	140	1.9	30%	Pass	
Magnesium	M24-Ma0033476	NCP	mg/L	400	390	1.3	30%	Pass	
Potassium	M24-Ma0033476	NCP	mg/L	58	58	<1	30%	Pass	
Sodium	M24-Ma0033476	NCP	mg/L	3100	3100	1.8	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium (filtered)	B24-Ma0017500	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Arsenic (filtered)	B24-Ma0017500	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	B24-Ma0017500	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium (filtered)	B24-Ma0017500	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	B24-Ma0017500	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Iron (filtered)	B24-Ma0017500	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Lead (filtered)	B24-Ma0017500	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Manganese (filtered)	B24-Ma0017500	NCP	mg/L	0.049	0.048	<1	30%	Pass	
Mercury (filtered)	B24-Ma0017500	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	B24-Ma0017500	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Selenium (filtered)	B24-Ma0017500	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc (filtered)	B24-Ma0017500	NCP	mg/L	< 0.005	< 0.005	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.

Authorised by:

Amy Meunier	Analytical Services Manager
Caitlin Breeze	Senior Analyst-Inorganic
Edward Lee	Senior Analyst-Organic
Emily Rosenberg	Senior Analyst-Metal
Joseph Edouard	Senior Analyst-Organic
Joseph Edouard	Senior Analyst-Volatile
Mary Makarios	Senior Analyst-Inorganic

Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

COC

7 44

CHAIN OF CUSTODY RECORD

CLIENT DETAILS : Page 1 of 1

ENVIROLAB SERVICES — A division of Envirolab Group — ENVIROLAB GROUP

Company Name : Tierra Environment	Contact Name : Daryl Burrows	Purchase Order : NA	COC Number : T1980
Office Address :	Project Manager : Daryl Burrows	Project Number : ASY 24 050.01	QUOTE ID : 18SA026v2
	Email for results : general@tierra.com.au	Project Name : Yulara Landfill	Eadat

Special Directions & Comments :

Metals - (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, Fe, Al, Mn, Se)

Analytes

Laboratory Address

Envirolab - Melbourne
25 Research Drive, Croydon South, VIC 3136
Phone: 03 9763 2500
Fax: 03 9763 2633
Email: adelaide@envirolab.com.au

	Sample ID	Date	Matrix	Metals	TRH	Containers 500P	500A	100P	250A	VIAL	125mL A	Jar	Sample Comments
1	MW2-Y	09-Mar-24	Water	X	X		1	4		2	1		
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													

ENVIROLAB GROUP

Job No: 42590

Date Received 18/3/24
Time Received 3:15
Received By: CS
Temp: Cool/Ambient 10.6
Cooling: Ice/Icepack
Security: Intact/Broken/None

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

Relinquished By: Daryl Burrows	Laboratory Staff Adelaide	Laboratory Staff Melbourne	Turn around Time	Method Of Shipment
Date & Time : 12/3/24 9:30am	Received By: Pa Rual	Received By:	24 Hrs 48 Hrs	Courier
Signature:	Date & Time : 12/03 10:40 am	Date & Time :	5 Days 10 Days	X Hand Delivered
	Signature:	Signature:		Postal
	Report Number :	Report Number :		

For samples which require transportation between internal laboratories : Departing : Date & Time : Signature : Temperature : Upon Receipt : Date & Time : Signature : Temperature :

Relinquished by Nicole R (EA) 18/3/24 8am

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

CERTIFICATE OF ANALYSIS 42596

Client Details

Client	Tierra Environment
Attention	Daryl Burrows
Address	31 Hauteville Tce, EASTWOOD, SA, 5062

Sample Details

Your Reference	**ASY 24 050.01 - Yulara Landfill**
Number of Samples	1 Water
Date samples received	18/03/2024
Date completed instructions received	18/03/2024

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	25/03/2024
Date of Issue	25/03/2024

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

Results Approved By
Tara White, Metals Supervisor
Tianna Milburn, Senior Chemist

Authorised By
Pamela Adams, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water		
Our Reference		42596-1
Your Reference	UNITS	MW2-Y
Date Sampled		09/03/2024
Type of sample		Water
Date extracted	-	20/03/2024
Date analysed	-	20/03/2024
TRH C_6 - C_9	µg/L	<10
TRH C_6 - C_{10}	µg/L	<10
TRH C_6 -C_{10} less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	2
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Total +ve Xylenes	µg/L	<1
Total BTEX in water	µg/L	2
Surrogate Dibromofluoromethane	%	101
Surrogate toluene-d8	%	100
Surrogate 4-BFB	%	104

TRH Water(C10-C40) NEPM		
Our Reference	UNITS	42596-1
Your Reference		MW2-Y
Date Sampled		09/03/2024
Type of sample		Water
Date extracted	-	19/03/2024
Date analysed	-	20/03/2024
TRH C_{10} - C_{14}	µg/L	<50
TRH C_{15} - C_{28}	µg/L	<100
TRH C_{29} - C_{36}	µg/L	<100
Total +ve TRH (C10-C36)	µg/L	<50
TRH >C_{10} - C_{16}	µg/L	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50
TRH >C_{16} - C_{34}	µg/L	<100
TRH >C_{34} - C_{40}	µg/L	<100
Total +ve TRH (>C10-C40)	µg/L	<50
Surrogate o-Terphenyl	%	65

HM in water - dissolved		
Our Reference		42596-1
Your Reference	UNITS	MW2-Y
Date Sampled		09/03/2024
Type of sample		Water
Date prepared	-	25/03/2024
Date analysed	-	25/03/2024
Arsenic-Dissolved	µg/L	<1
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	2
Copper-Dissolved	µg/L	2
Lead-Dissolved	µg/L	<1
Nickel-Dissolved	µg/L	1
Zinc-Dissolved	µg/L	3
Mercury-Dissolved	µg/L	<0.05
Iron-Dissolved	µg/L	<10
Aluminium-Dissolved	µg/L	<10
Manganese-Dissolved	µg/L	<5
Selenium-Dissolved	µg/L	3

Method ID	Methodology Summary
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-022 ICP-MS	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements.
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. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			20/03/2024	[NT]	[NT]	[NT]	[NT]	20/03/2024	[NT]
Date analysed	-			20/03/2024	[NT]	[NT]	[NT]	[NT]	20/03/2024	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	116	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	116	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	120	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	117	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	111	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	115	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	113	[NT]
Surrogate Dibromofluoromethane	%		Org-023	97	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate toluene-d8	%		Org-023	100	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate 4-BFB	%		Org-023	99	[NT]	[NT]	[NT]	[NT]	94	[NT]

QUALITY CONTROL: TRH Water(C10-C40) NEPM						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			19/03/2024	[NT]	[NT]	[NT]	[NT]	19/03/2024	[NT]
Date analysed	-			19/03/2024	[NT]	[NT]	[NT]	[NT]	19/03/2024	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	66	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	90	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	93	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	66	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	90	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	93	[NT]
Surrogate o-Terphenyl	%		Org-020	86	[NT]	[NT]	[NT]	[NT]	77	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			25/03/2024	[NT]	[NT]	[NT]	[NT]	25/03/2024	[NT]
Date analysed	-			25/03/2024	[NT]	[NT]	[NT]	[NT]	25/03/2024	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	[NT]	[NT]	[NT]	[NT]	109	[NT]
Iron-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	[NT]	[NT]	[NT]	[NT]	103	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022 ICP-MS	<10	[NT]	[NT]	[NT]	[NT]	104	[NT]
Manganese-Dissolved	µg/L	5	Metals-022 ICP-MS	<5	[NT]	[NT]	[NT]	[NT]	103	[NT]
Selenium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

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

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