



Landfill Monitoring Report May 2022 Yulara Landfill Voyages Indigenous Tourism Pty Ltd



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1 INTRODUCTION

EcOz Environmental Consultants (EcOz) was engaged by Voyages Indigenous Tourism Pty Ltd (Voyages) to conduct groundwater and gas monitoring at the Yulara landfill (the Site) in accordance with the Site's Ongoing Monitoring Plan (OMP). This monitoring had previously been undertaken by Low Ecological Services Pty Ltd and GHD.

The Yulara landfill has been in operation since 2003, with its current Environment Protection Licence (EPL) #179 expiring on 30 June 2025. EcOz organised the field attendance with Voyages' Linda Harper. This report presents the findings of a biannual round of sampling conducted on 17 May 2022.

2 SITE DESCRIPTION

Yulara landfill occupies a roughly 30-acre lot located approximately 4 kilometres west north west of the Yulara resort township. The site consists of a landfill, recycling, white goods, oil and grease and green waste disposal areas. The surrounding area consists of open scrubland.

More detailed information on Geology, hydrogeology and waste characteristics are provided in the OMP and Landfill Environmental Management Plan.

3 FIELD SAMPLING AND MONITORING

Samples are collected from a total of eight wells throughout the landfill area. These eight wells consist of three sets of nested groundwater/gas monitoring wells and two leachate monitoring wells. The sites are shown in Figure 3-1.

The installation records for the monitoring wells are provided in Table 3-1.

Table 3-1. Monitoring well construction details¹

Site ID	Installation record			Monitoring purpose
	Bore No.	Depth (mbgl)	Screen (mbgl)	
MW1S	19405	4	1-4	Gas
MW1D	19406	12	9-12	Groundwater
MW2S	19403	10	1-10	Gas
MW2D	19404	15	12-15	Groundwater
MW3S	19400	11	2-11	Gas
MW3D	19399	30	15-27	Groundwater
LMW1	19401	6	1.5-6	Gas & leachate
LMW2	19402	8	1-8	Gas & leachate

¹ All information presented taken from GHD November 2021 report.

Sampling was conducted in accordance with the OMP. Where samples were not collected it was due to the lack of sample available (i.e. dry monitoring wells) or instructions from Voyages environmental staff.

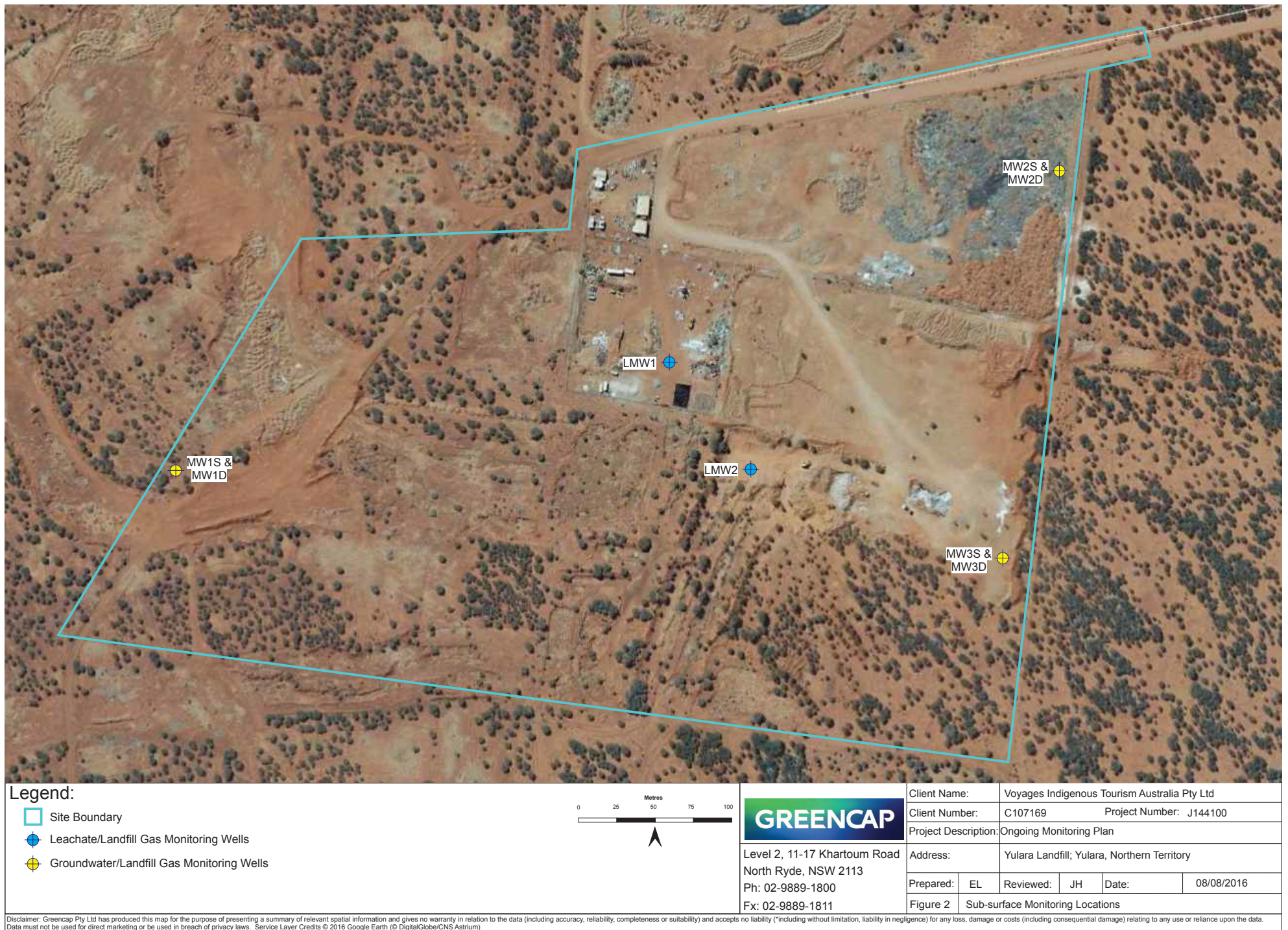


Figure 3-1. Map of landfill monitoring wells

3.1 Groundwater & leachate monitoring

EcOz sampling methods are provided in Table 3-2, based off the OMP and methodology used in previous monitoring rounds.

Table 3-2. Groundwater/leachate well monitoring method

Activity/Item	Details
Well sampling method	A dip meter was used to measure the standing water level (SWL)/presence of water in each monitoring well. An oil/water interface probe was used to assess whether light non-aqueous phase liquid (LNAPL) was present. For those wells which had water, HYDRASleeves were deployed between the SWL and bottom of the screen before being retrieved and water being transferred to sample bottles. Remaining sample was deposited in a sterile jug and field parameters taken with calibrated water quality meters. A chain of custody (CoC) was prepared for the sample and placed in the Esky with samples ready for shipping.
Sample preservation	Samples were placed in laboratory supplied bottles. Samples were stored on ice while on site and in transit to the nominated NATA accredited laboratory.
Decontamination procedure	The dip meter and water quality meters were washed and rinsed with demineralised water and decontaminated using DECON-90 detergent between locations. The HYDRASleeve was disposed of after sampling, with a new sleeve placed in the monitoring well.

3.2 Landfill gas monitoring

Landfill gas (LFG) sampling methods are provided in Table 3-3 based off the OMP and methodology used in previous monitoring rounds.

Table 3-3. Landfill gas monitoring method

Activity/Item	Details
Surface gases	Surface LFG readings were taken with a calibrated Laser Portable Gas Leak Detector, with the intake held approximately 50-100mm above the ground. The meter was sampling throughout the whole event.
Enclosed space sampling	On arriving at site, EcOz was informed that the enclosed space readings were no longer required due to lack of building use and access. No measurements taken.
Sub surface LFG	Sub surface LFG was recorded with a calibrated GA500 portable gas meter, attached to LFG well caps. The gas meter measured methane (CH₄), carbon dioxide (CO₂), oxygen (O₂), carbon monoxide (CO), hydrogen sulphide (H₂S) and Balance.

4 ASSESSMENT CRITERIA

4.1 Groundwater assessment criteria

The groundwater results were assessed against the following:

- NEPM (2013) Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater. Groundwater Investigation Levels (GIL) – to assess risks to aquatic ecosystems in slightly to

moderately disturbed systems (95% species protection level) as updated by Australia and New Zealand Guidelines (ANZG) 2018.

- ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments.

4.2 Landfill gas assessment criteria

LFG monitoring results are assessed against the NT EPAs *Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites* (2013).

5 FIELD OBSERVATIONS AND RESULTS

5.1 Groundwater

The May 2022 monitoring round sampled only one bore (MW3D), with all other bores dry.

5.1.1 Groundwater field readings

The standing water levels and field parameters of all monitoring events to date are presented in Table 5-1 and Table 5-2 below. The field readings are generally consistent with previous monitoring events, with neutral pH and a similar EC. ORP readings indicate a lack of leachate penetration into the groundwater, as discussed in the previous report. A copy of the field sheets are provided in Appendix A.

Table 5-1. Standing water levels to date*

Site ID	Depth to water (m btoc)								May 2022 Comments
	Nov-17	Aug-18	Jun-19	Nov-19	Oct-20	Jul-21	Nov-21	May-22	
MW1S	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	No odours
MW1D	Dry	14.42	12.42	12.43	12.43	Dry	Dry	Dry	No odours
MW2S	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	No odours
MW2D	14.54	Dry	Dry	Dry	Dry	Dry	Dry	14.54	No odours
MW3S	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	No odours
MW3D	19.54	19.97	20.40	20.72	20.89	20.80	20.87	20.85	No odours, no sheen or LNAPL, sediment in hydrosleeve, pale yellow in colour
LMW1	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	No odours
LMW2	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	No odours

*Bore depth and historic data provided to EcOz in previous GHD report.

Table 5-2. Field water quality parameters to date*

Parameter	Unit	MW3D								MW2D
		Nov-17	Aug-18	Jun-19	Nov-19	Oct-20	Jul-21	Nov-21	May-22	Nov 17
EC	µS/cm ^Λ	1540	2073	2109	1969	1671	1867	1915	1724	1800

Parameter	Unit	MW3D								MW2D
		Nov-17	Aug-18	Jun-19	Nov-19	Oct-20	Jul-21	Nov-21	May-22	Nov 17
Temperature	°C	27.1	23	25.6	26.1	26.5	24.1	26	23.6	27.05
Turbidity	NTU	N/A	2780.5	1655	233	2379.8	17.13	N/A ⁺	238	N/A
pH		7.57	7.25	7.26	5.99	7.02	6.04	7.34	6.81	7.04
DO	% sat	N/A	56.1	56.2	38.6	68.7	63.3	65.7	45.8	N/A
Salinity	Ppt	-	-	-	-	-	-	-	0.9	-
TDS	mg/L	-	-	-	-	-	-	-	1121	-
ORP	mV	N/A	233.6	149.5	15.7	182	-47.8	163.5	266	-26.7

*Historic data (prior to May 2022) provided to EcOz in GHD report.

[^] Please note that information provided to EcOz recorded EC in values that appear to be in mS/cm though reported as µS/cm.

5.1.2 Groundwater laboratory results

The laboratory results for analytes with guideline values are provided in Table 5-3. Exceedances are highlighted in red. Both Chromium and Boron recorded exceedances (0.002mg/L and 0.7mg/L) of the respective guideline values (0.001mg/L and 0.37mg/L) while all other analytes recorded values below the Limit of Reporting (LOR). It is noted that while the analytes that recorded exceedances seem to continue a trend, other analytes which had historically recorded exceedances reported values below the guidelines. This presents some challenges in the establishment of trends.

The full suite of laboratory analysis results are provided in Appendix B.

Table 5-3. Analytes with guideline values

Analyte	Guideline value	Unit	Aug 18	Jun 19	Nov 19	Oct 20	Jul21	Nov 21	May 22
Aluminium	0.055	mg/L	0.24	0.01	<0.01	<0.01	0.02	0.02	<0.01
Chromium	0.001	mg/L	0.001	0.002	0.001	0.002	0.002	0.002	0.002
Boron	0.37	mg/L	-	-	0.87	-	-	-	0.77
Copper	0.0014	mg/L	<0.001	<0.001	<0.001	<0.001	0.015	0.012	<0.001
Zinc	0.008	mg/L	<0.005	0.014	0.009	0.005	0.066	0.051	<0.005
Selenium	0.005	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01

5.2 Landfill gas

5.2.1 Surface gas survey

LFG levels were generally low, with most values recorded between 0 to 0.1 ppm. Two locations (49 and 48, located on what appears to be previous landfill sites) recorded much higher methane values, with maximum and minimum readings of 5.6 and 5.5 parts per million (ppm) and 0.1 and 0.2 ppm respectively. These readings stabilised to 0.6 and 0.7 ppm. The field readings are provided in a table in Appendix C. Site 56 was an active waste pit during the site visit and so no readings were taken due to safety concerns.

5.2.2 Enclosed space landfill gas survey

EcOz was informed via discussions with Linda and other Voyages employees that the onsite buildings were no longer in use and ongoing monitoring was not required. Given the consistently non or low levels of gas recorded in previous reports and the gradual reduction in sample sites that was already evident from previous reports, no readings were taken.

5.2.3 Sub surface LFG monitoring

LFG measurements are presented in Table 5-4 alongside historic data as provided in previous reports.

Methane and carbon dioxide were not detected in any of the bores. Very low concentrations of carbon monoxide and hydrogen sulphide were detected, in keeping with previous monitoring rounds.

Flow rate was low neutral at all sites except MW2S and MW3S, which flow rates of 0.4 L/hr and 0.2L/hr respectively. This is generally consistent with previous monitoring events.

Table 5-4. Sub surface gas readings to date

Site ID	Date	Time	Barometric pressure (mPa)	Flow rate (L/hr)					Methane (%)		Carbon dioxide (%)		Oxygen (%)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)	
				0	30	60	90	120	Peak	Stable	Peak	Stable	Peak	Stable	Peak	Stable	Peak	Stable
MW1S	28/08/2018	910	955	0	1.5	1.2	0.8	0	0	0	0.4	0.4	20	19.9	40	39	11	9
	19/06/2019	1020	967	4.8	5.1	4.9	4.9	4.8	0.4	0	2.3	0.1	17.1	20.9	1	0	1	0
	05/11/2019	920	967	0	0	0	0	0	0	0	0.2	0.2	20.8	20.9	1	0	0	0
	13/10/2020	1100	965	0	0	0	0	0	0	0	0.1	0.1	20.1	20.7	0	0	1	2
	09/07/2021	1710	959	0	0	0	0	0	0	0	0	0	21.3	21.3	1	1	1	1
	23/1/2021	1200	952	0	0	0	0	0	0	0	0	0	20.1	20.4	4	4	1	1
	17/05/2022	0830	963	0	0	0	0	0	0	0	0	0	21.3	21.1	1	1	1	1
MW2S	28/08/2018	925	955	2.2	1.3	0	0	0	4	0	0.9	0.9	19.6	19.9	1	0	1	0
	19/06/2019	840	964	0.1	0.5	0.3	0.1	0.3	0	0	0.9	0.9	20.1	20.1	0	0	1	0
	05/11/2019	930	970	0	0	0	0	0	0	0	0.7	0.7	20.1	20.3	3	1	2	1
	13/10/2020	900	966	0	0	0	0	0	0	0	0.7	0.7	20.3	20.3	0	0	0	1
	09/07/2021	1640	959	1.3	3	0.4	0	0	0	0	0.9	0.7	20.7	20.7	1	1	2	2
	23/1/2021	829	955	0	0.5	0.6	0.5	0.5	0	0	0	0	20	20.1	3	3	0	0
	17/05/2022	0930	965	0	0	0	0	0	0	0	0.1	0.1	20.2	20.1	2	1	0	0
MW3S	28/08/2018	1019	955	3.7	3	0.4	2.6	5.1	1.4	1.4	7.5	7.5	12.3	12.3	0	0	3	0
	19/06/2019	910	964	0.4	0.1	0.2	0.2	0.3	1.3	1.3	6.9	6.9	14.1	14.1	0	0	0	0
	05/11/2019	950	966	0.7	0.2	0.6	0.8	0	0.7	0.5	5.9	5.9	14.1	14.4	3	1	2	1
	13/10/2020	910	966	0	0	0	0	0	0	0	5.8	5	17.8	14.8	0	1	0	0
	09/07/2021	1620	959	0	0.6	0.3	0.7	0.4	0	0	3.7	3.7	17.3	17.4	0	0	2	2
	23/1/2021	850	955	0	0.3	0.2	0.4	0.3	0	0	0	0	20.7	21.4	3	3	1	1
	17/05/2022	0730	964	0	0	0	0	0	0	0	0	0	20.9	20.5	2	2	1	1
LMW1	28/08/2018	940	958	3.3	3.7	5.5	5.1	3.7	4.1	3.9	17.3	16.8	0.1	0.1	1	0	2	1
	19/06/2019	1010	968	5.5	5.4	5.1	5	5.4	6	1.8	17.8	17.8	0	0	1	0	1	0
	05/11/2019	1015	964	0.1	0	0.4	0	0	1.8	1.8	15.6	15.4	2.5	2.5	4	3	2	1
	13/10/2020	920	966	0	0	0	0	0	0	0	7.5	7.5	8	8	0	0	0	0

LMW2	09/07/2021	1510	964	0	0	0	0	0	0	0	3.4	3.4	17.4	17.5	0	0	2	1
	23/1/2021	1130	954	0	0	0	0	0	0	0	0	0	20.4	20.6	3	3	1	1
	17/05/2022	0800	963	0	0	0	0	0	0	0	0	0	21.2	21.1	0	0	0	0
	28/08/2018	947	956	3.2	2.4	3.2	3	3.9	39.8	39.8	34.2	34.2	0	0	3	0	2	0
	19/06/2019	940	967	6.4	6	6.5	7.4	7.2	28.2	28.2	30.3	30.3	0	0	3	3	1	0
	05/11/2019	1030	965	0.3	2.5	3.5	3.1	0	18.2	18.1	28.7	28.7	0	0	6	3	3	0
	13/10/2020	935	966	0.6	0	0	0	0	18.8	15.3	23.2	23.2	0	0.1	0	0	0	0
	09/07/2021	1500	964	0	0	0	0	0	0	0	0.1	0	0.2	0.3	0	0	2	2
	23/1/2021	905	954	0	0	0	0	0	0	0	0	0	20.7	20.7	3	3	1	1
	17/05/2022	0815	964	0	0	0	0	0	0	0	0	0	21.1	21.0	2	2	1	1

6 DISCUSSION

6.1 Groundwater

The groundwater results are consistent with previous monitoring rounds, with only one bore (MW3D) sampled due to lack of water in all other bores. The physical parameters are generally within the previously established range.

Laboratory results recorded guideline exceedances of boron and chromium which are similar to previous monitoring events. It should be noted that Boron is not listed in the required analytes table in the OMP and therefore not always analysed in each monitoring round.

Pesticides and hydrocarbons were not analysed for during this round as they are only sampled in the annual monitoring round.

6.2 Landfill gas

As mentioned in Section 5.2.2 no sampling was conducted in the buildings on site as they are no longer in use. Previous monitoring events had not found any indication of a significant build-up of LFGs in buildings.

Surface monitoring detected very minor levels of methane gas at approximately half of the sites, with the highest concentrations of 0.7 ppm and 0.6 ppm recorded at sites 48 and 49 respectively. Carbon dioxide was detected in low concentrations (0.1%) at all sites. Hydrogen sulphide was not detected at any sites, while carbon monoxide was detected at most sites with a maximum concentration of 1 ppm.

Landfill gases did not exceed the guideline value of 1% for methane and 2% for carbon dioxide at the monitoring wells.

The subsurface LFG results suggest a reducing trend as discussed in the previous report from GHD. These results are provided in Figure 6-1 to Figure 6-5 below.

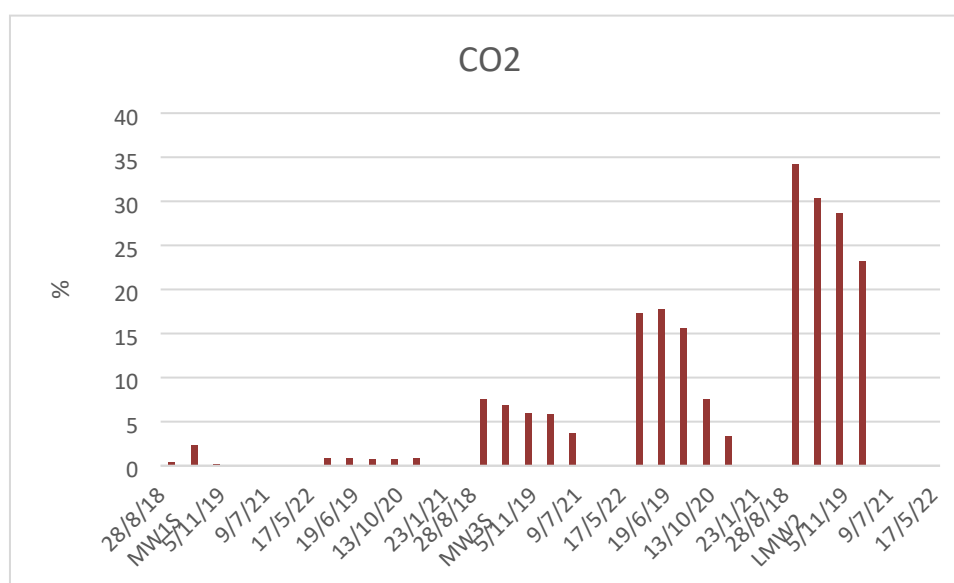


Figure 6-1. Subsurface carbon dioxide trend graph

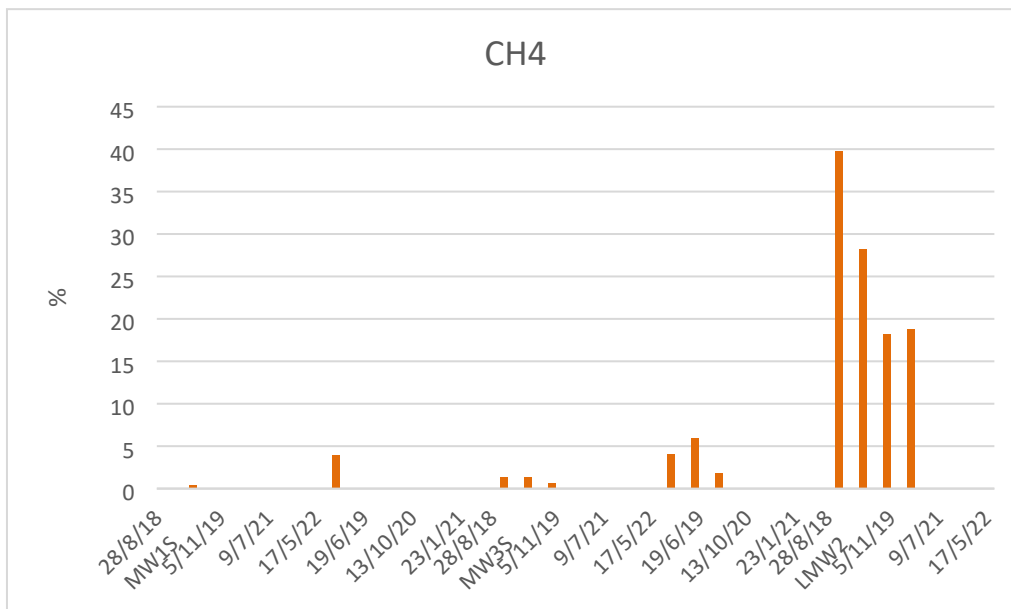


Figure 6-2. Subsurface methane trend graph

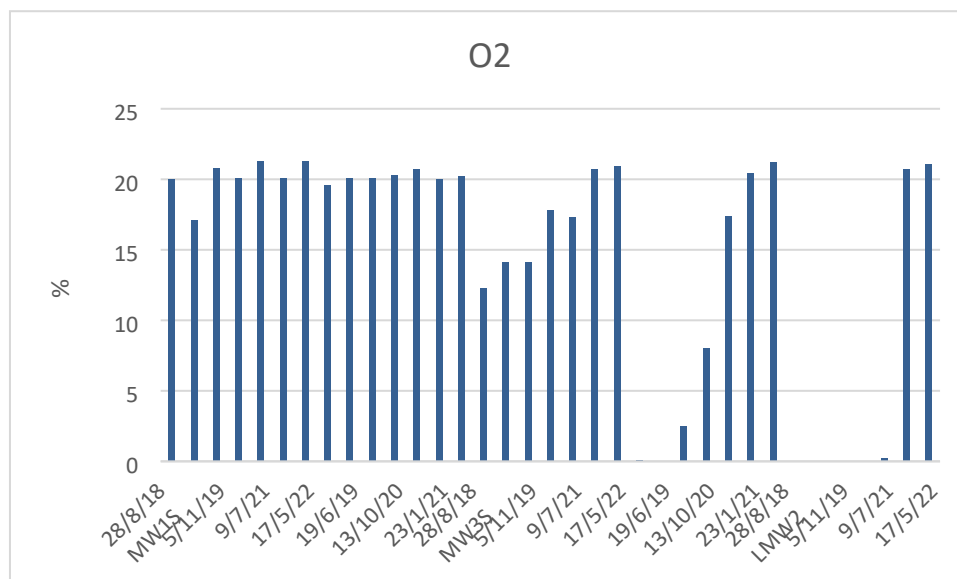


Figure 6-3. Subsurface oxygen trend graph

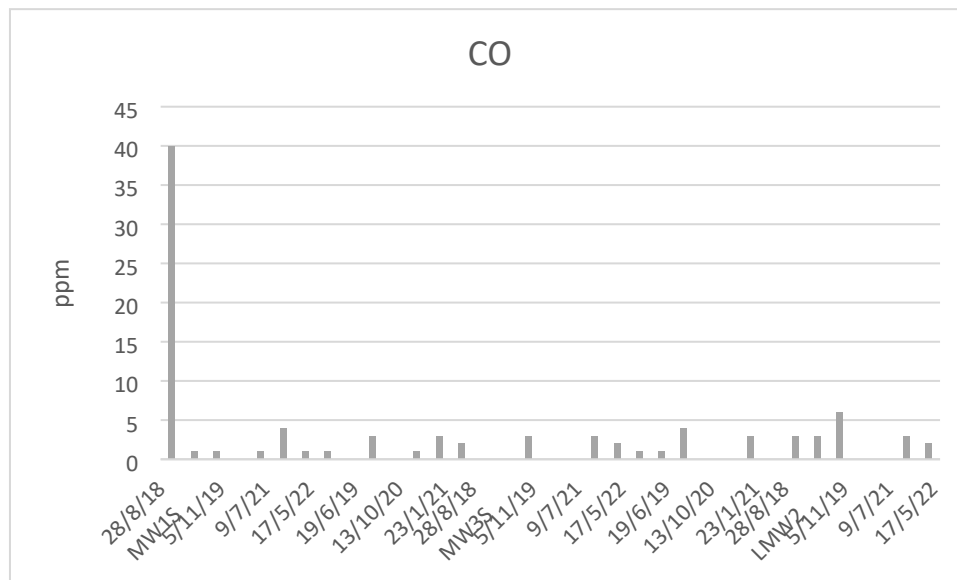


Figure 6-4. Subsurface carbon monoxide trend graph

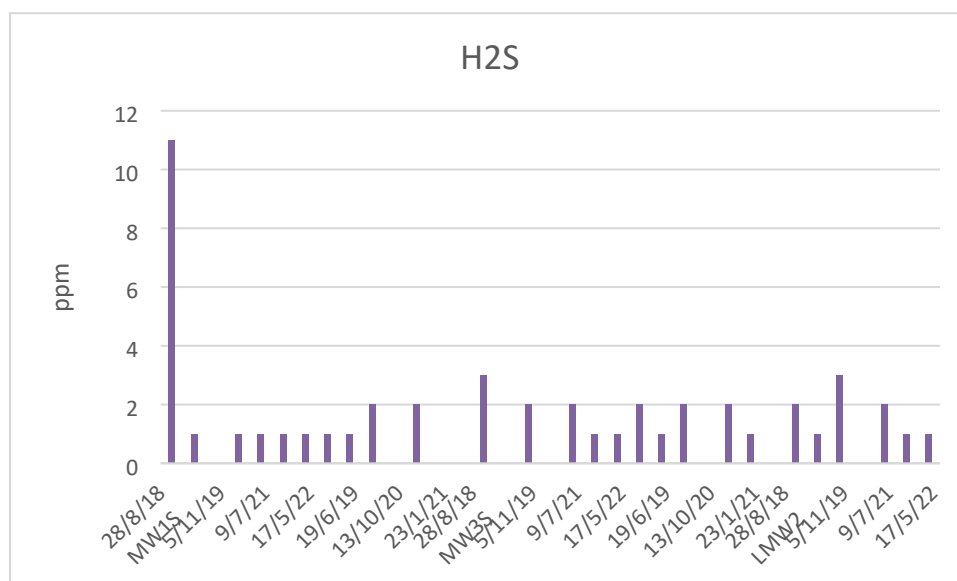


Figure 6-5. Subsurface hydrogen sulphide trend graph

7 RECOMMENDATIONS

The lack of groundwater samples since monitoring began indicates insufficient depth of monitoring bores (i.e. aquifer is located below bores maximum depth). Bores with a greater depth will need to be installed if more samples are to be collected.

Current activities do not appear to be having any significant effect on contamination levels when compared with historic data, therefore no new activities are recommended.

Consideration of the following is recommended going forward:

- Further landfill gas monitoring wells may be installed as the waste facility expands. This would include new boundary wells as the site expands and new monitoring wells in locations where LFGs are likely to be present (e.g. previous burial pits)

- Removal of enclosed area gas testing from monitoring plan if buildings/enclosed spaces are no longer in use.
- Conduct sampling (where possible and/or convenient) after significant rainfall event to ascertain water infiltration to groundwater.
- Attempt to conduct sampling during falling atmospheric pressure conditions (with the understanding that given the remote location and cost of travel this cannot always be achieved)

Biannual monitoring (pre and post wet season) should continue as outlined in the OMP.

8 REFERENCES

ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.

Northern Territory Environment Protection Authority (2013) Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites in the Northern Territory

GHD Pty Ltd (2021) Yulara Landfill services 2021, November 2021 Report

Greencap-NAA Pty Ltd (2016) Ongoing Monitoring Plan: Yulara Landfill, Lot 00248, Yulara NT

APPENDIX A FIELD SHEETS

Groundwater Sampling Field Data Sheet

Site/Project: YLF	
Sample Date:	17.5.22
Bore Name:	17020
Sampled By:	BP
Bore Head Condition:	Good
Total Depth (mbgl):	30
Screen Intervals (mbgl):	
Pump Depth:	

SWL Initial (m below top of casing):		20.55	
Casing Height (m above ground):			
SWL Initial (m below ground level):			
Casing:	Colour at Start:	Odour:	Equip?
PVC	✓ clear	Nil	Y N
Steel	Colour at End:	H ₂ S	psi
Other	pale yellow	Other:	L/s
Comments:			

Time started Pumping/Purging: 0730									
Time	0730								24hr
EC	1724								µs/cm
pH	6.81								
Temp	23.6								°C
Turbidity	238								NTU
Salinity	0.9								ppt
TDS	1121								g/L
ORP	266								mV
D.O.	45.8								%sat
SWL									mbtoc
Flow Rate									L/min

Time									24hr
EC									µs/cm
pH									
Temp									°C
Turbidity									NTU
Salinity									ppt
TDS									g/L
ORP									mV
D.O.									%sat
SWL									mtoc
Flow Rate									L/min

Time Lab Samples Collected:	Sample when 3 consecutive readings are within 10% of each other, or 0.2°C for temperature)
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Comments:
Hydroscience, sediment in hydroscience

APPENDIX B LABORATORY REPORTS

CERTIFICATE OF ANALYSIS

Work Order	: ES2217501	Page	: 1 of 5
Amendment	: 1		
Client	: ECOZ ENVIRONMENTAL SERVICES	Laboratory	: Environmental Division Sydney
Contact	: BILL DWYER	Contact	: Customer Services ES
Address	: PO BOX 381	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
	DARWIN NT, AUSTRALIA 0801		
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: EZ22032	Date Samples Received	: 20-May-2022 08:00
Order number	: ----	Date Analysis Commenced	: 21-May-2022
C-O-C number	: ----	Issue Date	: 28-Jun-2022 16:14
Sampler	: BD		
Site	: ----		
Quote number	: SY/455/20		
No. of samples received	: 1		
No. of samples analysed	: 1		



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- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW



General Comments

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

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

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

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

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

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

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

LOR = Limit of reporting

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

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- Amendment (28/06/2022): This report has been amended and re-released to allow the reporting of additional analytical data, specifically Al, Cr, Cu, Zn.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW3D	----	----	----	----
Sampling date / time				17-May-2022 00:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES2217501-001	-----	-----	-----	-----	
				Result	----	----	----	----	
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)		----	5	mg/L	683	----	----	----	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	187	----	----	----	----	
Total Alkalinity as CaCO3	----	1	mg/L	187	----	----	----	----	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric		14808-79-8	1	mg/L	225	----	----	----	
ED045G: Chloride by Discrete Analyser									
Chloride		16887-00-6	1	mg/L	298	----	----	----	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	83	----	----	----	----	
Magnesium	7439-95-4	1	mg/L	47	----	----	----	----	
Sodium	7440-23-5	1	mg/L	218	----	----	----	----	
Potassium	7440-09-7	1	mg/L	30	----	----	----	----	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----	
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----	
Barium	7440-39-3	0.001	mg/L	0.027	----	----	----	----	
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----	
Chromium	7440-47-3	0.001	mg/L	0.002	----	----	----	----	
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----	
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----	
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----	
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----	
Strontium	7440-24-6	0.001	mg/L	0.916	----	----	----	----	
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----	
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----	
Titanium	7440-32-6	0.01	mg/L	<0.01	----	----	----	----	
Uranium	7440-61-1	0.001	mg/L	0.001	----	----	----	----	
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----	
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----	
Boron	7440-42-8	0.05	mg/L	0.77	----	----	----	----	
EG020T: Total Metals by ICP-MS									

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW3D	----	----	----	----
Sampling date / time				17-May-2022 00:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES2217501-001	-----	-----	-----	-----	
				Result	----	----	----	----	
EG020T: Total Metals by ICP-MS - Continued									
Aluminium	7429-90-5	0.01	mg/L	6.37	----	----	----	----	
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----	
Barium	7440-39-3	0.001	mg/L	0.046	----	----	----	----	
Caesium	7440-46-2	0.001	mg/L	<0.001	----	----	----	----	
Chromium	7440-47-3	0.001	mg/L	0.003	----	----	----	----	
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----	
Copper	7440-50-8	0.001	mg/L	0.002	----	----	----	----	
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----	
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----	
Strontium	7440-24-6	0.001	mg/L	0.989	----	----	----	----	
Thorium	7440-29-1	0.001	mg/L	<0.001	----	----	----	----	
Tin	7440-31-5	0.001	mg/L	<0.001	----	----	----	----	
Titanium	7440-32-6	0.01	mg/L	0.01	----	----	----	----	
Uranium	7440-61-1	0.001	mg/L	0.002	----	----	----	----	
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----	
Zinc	7440-66-6	0.005	mg/L	0.015	----	----	----	----	
Boron	7440-42-8	0.05	mg/L	0.84	----	----	----	----	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.04	----	----	----	----	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	36.1	----	----	----	----	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	36.1	----	----	----	----	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.1	----	----	----	----	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L	38.2	----	----	----	----	
EK066G: Organic Phosphorus By Discrete Analyser									
Organic Phosphorus as P	----	0.01	mg/L	0.13	----	----	----	----	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.19	----	----	----	----	
EN055: Ionic Balance									



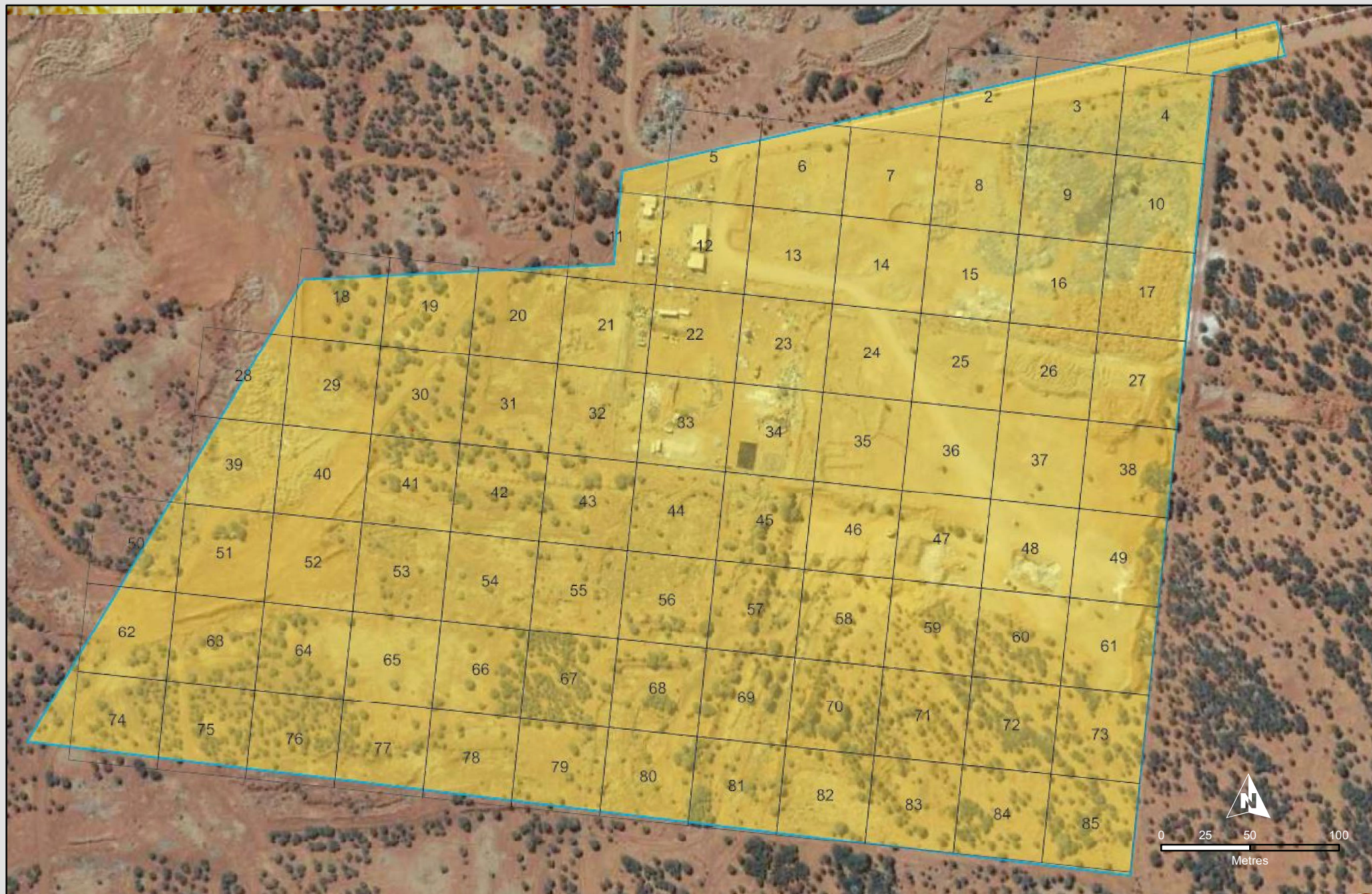
Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW3D	----	----	----	----
				Sampling date / time	17-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2217501-001	-----	-----	-----	-----
					Result	----	----	----	----
EN055: Ionic Balance - Continued									
∅ Total Anions	----	0.01	meq/L		16.8	----	----	----	----
∅ Total Cations	----	0.01	meq/L		18.2	----	----	----	----
∅ Ionic Balance	----	0.01	%		4.08	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		3	----	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		<10	----	----	----	----

APPENDIX C SURFACE GAS MONITORING RESULTS

Site ID	Date	Unit	CH4 %	CO2 %	O2 %	CO ppm	H2S ppm	Balance %	Rel CH4 ppm
1	17/05/2022		0	0.1	21.1	1	0	78.8	0
2	17/05/2022		0	0.1	21.1	1	0	78.8	0
3	17/05/2022		0	0.1	21	1	0	79	0
4	17/05/2022		0	0.1	21	1	0	79	0
5	17/05/2022		0	0.1	21	1	0	79	0.1
6	17/05/2022		0	0.1	21.1	1	0	78.8	0
7	17/05/2022		0	0.1	21.1	1	0	78.8	0
8	17/05/2022		0	0.1	21.1	1	0	78.8	0.1
9	17/05/2022		0	0.1	21.1	1	0	78.8	0.1
10	17/05/2022		0	0.1	21.1	1	0	78.8	0
11	17/05/2022		0	0.1	21.1	1	0	78.8	0.1
12	17/05/2022		0	0.1	21.1	1	0	78.8	0.1
13	17/05/2022		0	0.1	21.1	1	0	78.8	0
14	17/05/2022		0	0.1	21.1	1	0	78.8	0
15	17/05/2022		0	0.1	21	1	0	79	0
16	17/05/2022		0	0.1	21.1	1	0	78.8	0
17	17/05/2022		0	0.1	21.1	1	0	78.8	0
21	17/05/2022		0	0.1	21.1	1	0	78.8	0.1
22	17/05/2022		0	0.1	21.1	1	0	78.8	0
23	17/05/2022		0	0.1	20.8	1	0	79.1	0
24	17/05/2022		0	0.1	20.8	1	0	79.2	0.1
25	17/05/2022		0	0.1	20.6	1	0	79.4	0
26	17/05/2022		0	0.1	20.6	1	0	79.4	0
27	17/05/2022		0	0.1	20.5	0	0	79.4	0.1
32	17/05/2022		0	0.1	21.1	1	0	78.8	0
33	17/05/2022		0	0.1	21	1	0	79	0.1
34	17/05/2022		0	0.1	20.8	1	0	79.1	0
34	17/05/2022		0	0.1	21.1	1	0	78.8	0
35	17/05/2022		0	0.1	20.7	1	0	79.2	0.1
36	17/05/2022		0	0.1	20.5	1	0	79.4	0
37	17/05/2022		0	0.1	20.6	1	0	79.3	0.1
38	17/05/2022		0	0.1	20.6	0	0	79.3	0.1
43	17/05/2022		0	0.1	21.1	1	0	78.9	0.1
44	17/05/2022		0	0.1	21.1	1	0	78.9	0
45	17/05/2022		0	0.1	20.8	1	0	79.1	0.1
46	17/05/2022		0	0.1	20.7	1	0	79.2	0
47	17/05/2022		0	0.1	20.5	1	0	79.4	0
48	17/05/2022		0	0.1	20.6	0	0	79.3	0.7
49	17/05/2022		0	0.1	20.5	0	0	79.4	0.6
55	17/05/2022		0	0.1	21	1	0	78.9	0
57	17/05/2022		0	0.1	20.8	1	0	79.1	0
58	17/05/2022		0	0.1	20.7	1	0	79.3	0
59	17/05/2022		0	0.1	20.5	1	0	79.4	0.1
60	17/05/2022		0	0.1	20.6	0	0	79.3	0
61	17/05/2022		0	0.1	20.5	0	0	79.4	0.1
67	17/05/2022		0	0.1	21	1	0	78.9	0
68	17/05/2022		0	0.1	20.9	1	0	79	0
69	17/05/2022		0	0.1	20.8	1	0	79.1	0
70	17/05/2022		0	0.1	20.6	1	0	79.3	0
70	17/05/2022		0	0.1	21	1	0	79	0.1
71	17/05/2022		0	0.1	20.5	1	0	79.4	0
72	17/05/2022		0	0.1	20.6	0	0	79.3	0
73	17/05/2022		0	0.1	20.5	0	0	79.4	0

Site ID	Date	Unit	CH4 %	CO2 %	O2 %	CO ppm	H2S ppm	Balance %	Rel CH4 ppm
80	17/05/2022		0	0.1	20.9	1	0	79.1	0.1
81	17/05/2022		0	0.1	20.8	1	0	79.1	0
82	17/05/2022		0	0.1	20.6	1	0	79.3	0
83	17/05/2022		0	0.1	20.6	1	0	79.4	0
84	17/05/2022		0	0.1	20.5	0	0	79.4	0
85	17/05/2022		0	0.1	20.5	0	0	79.4	0.1





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