Douglas PARTNERS | GROUNDED EXPERTISE

Memorandum

To:	Kempsey Shire Council	Date:	8 Nov 2024
Attention:	Jason Magill	Project No.:	89781.25
Email:	jason.magill@kempsey.nsw.gov.au	Reference:	R.001.Q1 Memo
CC:	Sarah Krebs		
Subject:	Groundwater, Surface Water and Gas Monitoring 2024 - 2025 638 Crescent Head Road, Kempsey		

1. Introduction

This memo presents the October 2024 (Q1) results of groundwater, surface water and gas monitoring at the Kempsey Landfill site located at 638 Crescent Head Road, South Kempsey New South Wales (NSW). Monitoring was commissioned by Kempsey Shire Council (KSC).

The site is licensed by the Environmental Protection Authority under Environmental Protection Licence (EPL) 6269. The EPL notice specifies requirements for surface water, groundwater, and gas monitoring including test locations, analytes, and threshold concentration. Monitoring was conducted with reference to EPL 6269 requirements.

2. Scope of Works

The current round of monitoring was undertaken on 21 and 22 October 2024 (Q1) and comprised;

- Assessment of methane gas concentrations within existing buildings and capped landfill areas on 21 October 2024;
- Gas monitoring using landfill gas analyser at Wells BH1-02, BH1, BH2, BH3 and BH4 on 22 October 2024.;
- Collection of surface water samples at Locations S4, S5, S6, S7 and L8 on 21 October 2024, and
- Collection of groundwater samples at Wells BH01-2, BH1, BH3 and BH4 on 22 October 2024.

3. Field Work Results

3.1 Discussions with Site Personnel

- It is understood that there has been one discharge event since the previous July 2024 (Q4) monitoring round. It is understood that this event were directly reported to the EPA by KSC.
- It is understood that Cell 4 has yet to be open to receiving waste;
- There has been ongoing perimeter drain works, including the addition of some sediment catchment points; and

- Construction works on site are involved in transporting soil from the stockpile on cell 3 from the wall to the top of the stockpile.

3.2 Field Work Observations

The following observations were noted during fieldwork on 21 and 22 October 2024;

- It is noted that the site received minimal amount of rainfall in the week prior to monitoring (i.e. 11 mm of rainfall was recorded over the seven days prior to monitoring);
- Works to the stormwater perimeter drain are on-going; and
- Earthworks are underway on site in regard to a buttress wall on Cell 3 in preparation for future approval and construction of a new cell (ie Cell 5).

3.3 Groundwater

Refer to attached laboratory testing results (364662-[R00]) and summary tables as follows:

- Table F1: Field and Laboratory Results for Groundwater – October 2024 – Q1;
- Table A2: Groundwater and Surface water field parameters – Q1 October 2024.

With reference to Kempsey Landfill EPL there were some exceedances reported within the lab samples as indicated by the highlighted cells in the attached summary tables.

The reported exceedances from surface water quality were generally within the historical ranges for these analytes at these locations. As such the exceedance results are generally not considered to be significant. Further information and limitations will be provided in the annual report.

It is noted that groundwater sampling in BH1 was precluded due to an obstruction in the well.

3.4 Surface Water

Refer to attached laboratory testing results (364566-[R00]) and summary tables as follows:

- Table F2: Field and Laboratory Results for Surface water– October 2024 – Q1;
- Table A2: Groundwater and Surface water field parameters – Q1 October 2024.

With reference to Kempsey Landfill EPL there were some exceedances reported within the lab samples as indicated by the highlighted cells in the attached summary tables.

The reported exceedances from surface water quality were generally within the historical ranges for these analytes at these locations. As such the exceedance results are generally not considered to be significant. Further information and limitations will be provided in the annual report.

3.5 Gas

The methane walkover was conducted on 21 October 2024 with reference to EPA Environmental Guidelines for Solid Waste Landfills (2016).

No methane exceedances were recorded within the monitored on-site structures or within the groundwater monitoring bores (see results in Table A1 attached).

Past surface methane exceedance locations (E1 to E14) were accessed where possible. Results of current methane monitoring at these locations are outlined in Table 1 below:

Table 1: Summary of Surface Methane Monitoring – 21 October 2024 (Q1)

Location ID	Methane (ppm)	Description of Location
E1	-	Not accessible (under clay stockpile)
E2	1 – 2	Edge of stockpile batter, short grass
E3	3 – 4	Dead grass
E4	-	Not accessible (under clay stockpile)
E5	-	Not accessible (under clay stockpile)
E6	<1	Edge of capping area
E7	<1	Grassed area
E8	<1	Edge of capping area
E9	1 – 2	Grassed area
E10	<1	Grassed area
E11	0 – 2	Dead grass, edge of batter
E12	<1	Edge of capping area
E13	0 – 2	Edge of stockpile batter
E14	2 - 4	Grassed area

Coordinates of surface methane monitoring locations can be provided as required.

No new methane exceedances (i.e. at existing or new locations) were found in the current round of monitoring.

Refer to Figure 1 below for approximate locations of E1 to E14.

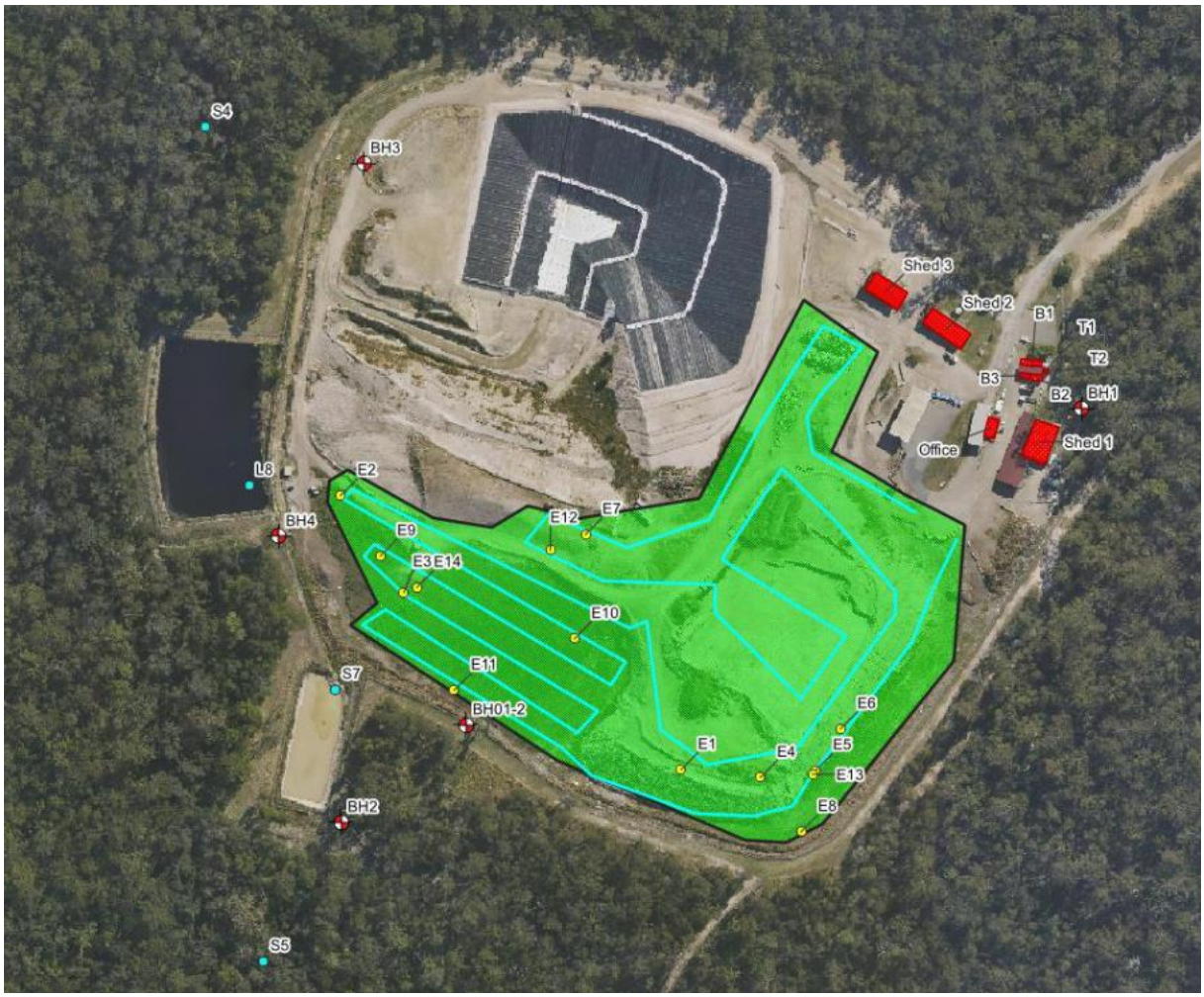

Figure 1: Approximate locations of historical methane exceedances (21 October 2024)

Historical surface methane monitoring has indicated some elevated results and localised exceedances. Further assessment was recommended to confirm subsurface conditions and capping within areas identified to contain methane exceedance in order to confirm possible capping rehabilitation requirements. Further details will be provided in the annual report.

4. Comments

Any discharges from the site should be conducted in accordance with the landfill EPL requirements.

It is recommended that grassed areas on site are maintained and slashed prior to the next monitoring event in January 2025 to facilitate surface gas monitoring.

Further details will be provided in the annual report.

5. Limitations

The above interim results have been provided for the exclusive use of Kempsey Shire Council. Further details will be provided in the annual report.

6. References

CRC CARE. (2017). Risk-based Management and Remediation Guidance for Benzo(a)pyrene. Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

NEPC. (2013). National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]. Australian Government Publishing Services Canberra: National Environment Protection Council.

NSW EPA. (1995). Contaminated Sites, Sampling Design Guidelines. NSW Environment Protection Authority.

NSW EPA. (2016). Environmental Guidelines, Solid Waste Landfills, Second Edition, 2016. NSW Environment Protection Authority.

NSW EPA. (2020). Assessment and Management of Hazardous Ground Gases. NSW Environment Protection Authority.

NSW EPA. (2020). Guidelines for Consultants Reporting on Contaminated Land. Contaminated Land Guidelines: NSW Environment Protection Authority.

Please contact the undersigned if you have any questions on this matter.

Douglas Partners Pty Ltd

Reviewed by

Sarah Krebs
Environmental Scientist

Chris Bozinovski
Principal

Attachments:
Table A1 – Gas monitoring results – Q1 October 2024
Table A2 – Groundwater and Surface water field parameters – Q1 October 2024.
Table F1 - Field and Laboratory Results for Groundwater – October 2024 – Q1
Table F2 - Field and Laboratory Results for Surface Water – October 2024 – Q1
Laboratory Test Results - (364566-[R00])
Laboratory Test Results - (364662-[R00])
Drawing – 89781.00.D.001.Rev0

Table A1: Gas monitoring Reults - Q1 October 2024

Well ID	Gauging Date	Max Methane (ppm)	Max Carbon Dioxide (%)	Oxygen(%)	Max Hydrogen Sulfide (ppm)	Max Carbon Monoxide (ppm)	Atmospheric Pressure (mb)	Flow (l/hr)
BH1	22/10/2024	0.0	1.1	20.3	0.0	1.0	1012	21.1
BH1-2	22/10/2024	0.0	0.1	20.3	1.0	1.0	1014	0.0
BH2	22/10/2024	0.1	0.0	20.7	0.0	1.0	1014	0.0
BH3	22/10/2024	0.0	0.1	20.7	0.0	1.0	1013	23.6
BH4	22/10/2024	0.0	0.3	19.5	1.0	1.0	1014	0.0

Notes to Table A1:

ppm	parts per million
mb	millibars
l/hr	litres per hour

Table A2: Groundwater and Surface water field parameters - Q1 October 2024

	Well ID	Gauging Date	TOC Elevation (mAHD)	Total Depth (mbTOC)	Depth to Water (mbTOC)	Corrected Water Elevation (mAHD)	PID	pH	EC (uS/cm)	mV	DO (ppm)	Temp (°C)	Turbidity (NTU)	Comments
Groundwater	**BH1**	22/10/2024	50.17	25.13	12.34	37.83	<1	-	-	-	-	-	-	Well not sampled due to obstruction
	BH1-2	22/10/2024	29.64	25.30	4.78	24.86	<1	6.0	1520	-5	0.47	18.97	22.6	Pale grey/clear
	BH2	22/10/2024	25.72	25.63	1.065	24.65	<1	6.6	1550	-25	0.83	9.4	18.57	Clear
	BH3	22/10/2024	29.78	25.88	4.695	25.08	<1	5.6	1840	108	0.05	20.68	49.8	pale brown
	BH4	22/10/2024	26.35	21.77	1.457	24.89	<1	6.5	1860	118	1.75	22.65	6	Clear, slight H_2S odour
Surface Water	**S4**	21/10/2024	-	-	-	-	<1	6.4	202	23	7.81	20.39	260	Pale brown/clear
	S5	21/10/2024	-	-	-	-	<1	6.3	363	144	3.26	18.35	35.3	pale brown
	S6	21/10/2024	-	-	-	-	<1	5.8	348	156	2.92	18.55	24.4	Pale brown
	S7	21/10/2024	-	-	-	-	<1	8.6	451	103	8.9	22.24	706	pale brown
	L8	21/10/2024	-	-	-	-	<1	7.7	2500	-156	1.16	22.97	367	Pale brown

Notes to Table A2:

AHD	Australian Height Datum
mbTOC	metres below top of PVC casing
PID	photo-ionisation detector
EC	electrical conductivity
ppm	parts per million
ORP	oxidation reduction potential
DO	Dissolved Oxygen
NTU	nephelometric turbidity unit
H_2S	Hydrogen Sulfide
uS/cm	microsiemens

Table F1: Field and Laboratory Results for Groundwater - October 2024 - Q1

				Field ID	BH1	BH2	BH3	BH4	BH01-2	D1/GW-22.10.24
				Date	22-Oct-24	22 Oct 2024	22 Oct 2024	22 Oct 2024	22 Oct 2024	22 Oct 2024
Analyte		Unit	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels	MP1	MP3	MP12	MP14	MP2	BH2 DUPLICATE
Field	Dissolved Oxygen (Filtered)	mg/L			*	1.75	0.83	0.05	0.47	N/A
	EC (Field)	µS/cm		1065	*	1860	1550	1840	1520	N/A
	pH (Field)	pH_Units		6.5 - 8.0	*	6.5	6.6	5.6	6	N/A
	Temp	°C			*	22.65	9.4	20.68	18.97	N/A
Ion Balance	Magnesium (filtered)	mg/L		10.05	*	17	39	32	19	17
Miscellaneous Inorganics	Ammonia as N (filtered)	mg/L	0.9	0.9	*	0.080	0.062	0.008	0.034	0.071
	Nitrate (as N) (filtered)	mg/L	0.1581	0.7	*	0.01	0.086	0.20	<0.005	0.02

Notes
Only EPL Trigger Levels exceedances highlighted
* Location not sampled due to obstruction

Table F2: Field and Laboratory Results for Surface water - October 2024 - Q1

				Field ID	S4	S5	S6	S7	L8	D1/SW-21.10.24
				Date	21 Oct 2024	21 Oct 2024	21 Oct 2024	21 Oct 2024	21 Oct 2024	21 Oct 2024
Analyte		Unit	ANZECC 2000 FW 95%	EPL Groundwater Trigger Levels	MP5	MP6	MP7	MP8	MP4	S7 DUPLICATE
Field	Dissolved Oxygen (Filtered)	mg/L		12.057	7.81	3.26	2.92	8.9	1.16	N/A
	EC (Field)	µS/cm		1065	202	363	348	451	2500	N/A
	pH (Field)	pH_Units		6.5 - 8.0	6.4	6.3	5.8	8.6	7.7	N/A
	Temp	°C			20.39	18.35	18.55	22.24	22.97	N/A
HM in water - dissolved	Iron (filtered)	mg/L		1.84	0.49	0.51	0.86	0.06	1.4	0.06
	Manganese (filtered)	mg/L	1.9	1.9	0.008	0.08	0.041	0.005	0.37	0.005
HM in water - total	Iron	mg/L		1.84	0.68	2.5	2.3	0.78	2.3	0.77
	Manganese	mg/L	1.9	1.9	0.019	0.092	0.05	0.026	0.37	0.025
Ion Balance	Chloride	mg/L		54.49	33	89	70	95	620	94
	Sulphate	mg/L		3.1	4	21	16	53	1	52
	Alkalinity (Hydroxide) as CaCO3	mg/L			<5	<5	<5	<5	<5	<5
	Alkalinity (Carbonate as CaCO3)	mg/L			<5	<5	<5	<5	<5	<5
	Alkalinity (total) as CaCO3	mg/L		12.28	11	36	34	61	410	58
	Alkalinity (Bicarbonate as CaCO3)	mg/L			11	36	34	61	410	58
	Calcium (filtered)	mg/L		2.05	0.6	13	9.1	28	39	32
	Ionic Balance	%			-15	-7.0	-9.0	-8.0	-8.0	-4.0
	Magnesium (filtered)	mg/L		10.05	1	5.7	5	6.6	23	7.3
	Potassium (filtered)	mg/L		2.282	2	6.0	5	8.2	77	8.4
	Sodium (filtered)	mg/L		34	17	43	36	48	370	49
Miscellaneous Inorganics	Fluoride	mg/L			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
	Ammonia as N (filtered)	mg/L	0.9	0.9	0.008	0.017	0.020	0.13	40	0.080
	Nitrate (as N) (filtered)	mg/L	0.1581	0.7	<0.005	0.006	<0.005	0.059	<0.005	0.067
	Total Organic Carbon	mg/L		33.1	16	13	17	13	150	12
	Total Suspended Solids (Lab)	mg/L		33.42	<10	18	<7	22	110	25
Total Phenolics in Water	Phenolics Total	mg/L		0.32	<0.05	<0.05	<0.05	<0.05	0.2	<0.05

Notes
Only EPL Trigger Level Exceedances highlighted
- Locations were dry

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CERTIFICATE OF ANALYSIS 364566

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.25, Kempsey**
Number of Samples	6 Water
Date samples received	23/10/2024
Date completed instructions received	23/07/2024

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.

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

Report Details

Date results requested by	30/10/2024
Date of Issue	30/10/2024

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Giovanni Agosti, Group Technical Manager
Nick Sarlamis, Assistant Operation Manager

Authorised By
Nancy Zhang, Laboratory Manager

Total Phenolics in Water						
Our Reference		364566-1	364566-2	364566-3	364566-4	364566-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		21/10/2024	21/10/2024	21/10/2024	21/10/2024	21/10/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024
Date analysed	-	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	0.2

Total Phenolics in Water		
Our Reference		364566-6
Your Reference	UNITS	D1/SW-21.10.24
Date Sampled		21/10/2024
Type of sample		Water
Date extracted	-	29/10/2024
Date analysed	-	29/10/2024
Total Phenolics (as Phenol)	mg/L	<0.05

Miscellaneous Inorganics						
Our Reference		364566-1	364566-2	364566-3	364566-4	364566-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		21/10/2024	21/10/2024	21/10/2024	21/10/2024	21/10/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/10/2024	23/10/2024	23/10/2024	23/10/2024	23/10/2024
Date analysed	-	23/10/2024	23/10/2024	23/10/2024	23/10/2024	23/10/2024
Ammonia as N in water	mg/L	0.008	0.017	0.020	0.13	40
Nitrate as N in water	mg/L	<0.005	0.006	<0.005	0.059	<0.005
Fluoride, F	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Total Suspended Solids	mg/L	<10	18	<7	22	110
Total Organic Carbon	mg/L	16	13	17	13	150

Miscellaneous Inorganics		
Our Reference		364566-6
Your Reference	UNITS	D1/SW-21.10.24
Date Sampled		21/10/2024
Type of sample		Water
Date prepared	-	23/10/2024
Date analysed	-	23/10/2024
Ammonia as N in water	mg/L	0.080
Nitrate as N in water	mg/L	0.067
Fluoride, F	mg/L	<0.1
Total Suspended Solids	mg/L	25
Total Organic Carbon	mg/L	12

Ion Balance						
Our Reference		364566-1	364566-2	364566-3	364566-4	364566-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		21/10/2024	21/10/2024	21/10/2024	21/10/2024	21/10/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/10/2024	23/10/2024	23/10/2024	23/10/2024	23/10/2024
Date analysed	-	23/10/2024	23/10/2024	23/10/2024	23/10/2024	23/10/2024
Calcium - Dissolved	mg/L	0.6	13	9.1	28	39
Potassium - Dissolved	mg/L	2	6.0	5	8.2	77
Sodium - Dissolved	mg/L	17	43	36	48	370
Magnesium - Dissolved	mg/L	1	5.7	5	6.6	23
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	11	36	34	61	410
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	11	36	34	61	410
Sulphate, SO4	mg/L	4	21	16	53	1
Chloride, Cl	mg/L	33	89	70	95	620
Ionic Balance	%	-15	-7.0	-9.0	-8.0	-8.0

Ion Balance		
Our Reference		364566-6
Your Reference	UNITS	D1/SW-21.10.24
Date Sampled		21/10/2024
Type of sample		Water
Date prepared	-	23/10/2024
Date analysed	-	23/10/2024
Calcium - Dissolved	mg/L	32
Potassium - Dissolved	mg/L	8.4
Sodium - Dissolved	mg/L	49
Magnesium - Dissolved	mg/L	7.3
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	58
Carbonate Alkalinity as $CaCO_3$	mg/L	<5
Total Alkalinity as $CaCO_3$	mg/L	58
Sulphate, SO4	mg/L	52
Chloride, Cl	mg/L	94
Ionic Balance	%	-4.0

HM in water - dissolved						
Our Reference		364566-1	364566-2	364566-3	364566-4	364566-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		21/10/2024	21/10/2024	21/10/2024	21/10/2024	21/10/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/10/2024	24/10/2024	24/10/2024	24/10/2024	24/10/2024
Date analysed	-	24/10/2024	24/10/2024	24/10/2024	24/10/2024	24/10/2024
Iron-Dissolved	µg/L	490	510	860	60	1,400
Manganese-Dissolved	µg/L	8	80	41	5	370

HM in water - dissolved		
Our Reference		364566-6
Your Reference	UNITS	D1/SW-21.10.24
Date Sampled		21/10/2024
Type of sample		Water
Date prepared	-	24/10/2024
Date analysed	-	24/10/2024
Iron-Dissolved	µg/L	60
Manganese-Dissolved	µg/L	5

HM in water - total						
Our Reference		364566-1	364566-2	364566-3	364566-4	364566-5
Your Reference	UNITS	S4	S5	S6	S7	L8
Date Sampled		21/10/2024	21/10/2024	21/10/2024	21/10/2024	21/10/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/10/2024	24/10/2024	24/10/2024	24/10/2024	24/10/2024
Date analysed	-	24/10/2024	24/10/2024	24/10/2024	24/10/2024	24/10/2024
Iron-Total	µg/L	680	2,500	2,300	780	2,300
Manganese-Total	µg/L	19	92	50	26	370

HM in water - total		
Our Reference		364566-6
Your Reference	UNITS	D1/SW-21.10.24
Date Sampled		21/10/2024
Type of sample		Water
Date prepared	-	24/10/2024
Date analysed	-	24/10/2024
Iron-Total	µg/L	770
Manganese-Total	µg/L	25

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	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. Salt forms (e.g. FeO, PbO, ZnO) are determined stoichiometrically from the base metal concentration.

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			29/10/2024	1	29/10/2024	29/10/2024		29/10/2024	[NT]
Date analysed	-			29/10/2024	1	29/10/2024	29/10/2024		29/10/2024	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	99	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	364566-2
Date prepared	-			24/10/2024	1	23/10/2024	23/10/2024		24/10/2024	24/10/2024
Date analysed	-			24/10/2024	1	23/10/2024	23/10/2024		24/10/2024	24/10/2024
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.008	[NT]		91	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	[NT]		106	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	<0.1	<0.1	0	97	87
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	<10	<10	0	98	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	16	16	0	101	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	5	23/10/2024	23/10/2024		[NT]	[NT]
Date analysed	-			[NT]	5	23/10/2024	23/10/2024		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	5	40	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	5	<0.005	[NT]		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	5	<0.1	[NT]		[NT]	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	[NT]	5	110	100	10	[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	5	150	[NT]		[NT]	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	364566-3
Date prepared	-			23/10/2024	2	23/10/2024	23/10/2024		23/10/2024	23/10/2024
Date analysed	-			23/10/2024	2	23/10/2024	23/10/2024		23/10/2024	23/10/2024
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	2	13	13	0	101	96
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	2	6.0	6.1	2	93	88
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	2	43	44	2	101	117
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	2	5.7	5.8	2	98	95
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	2	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	2	36	[NT]		[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	2	<5	[NT]		[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	2	36	[NT]		111	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	2	21	[NT]		108	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	2	89	[NT]		105	[NT]
Ionic Balance	%		Inorg-040	[NT]	2	-7.0	NT		[NT]	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	6	23/10/2024	23/10/2024		[NT]	[NT]
Date analysed	-			[NT]	6	23/10/2024	23/10/2024		[NT]	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	[NT]	6	32	[NT]		[NT]	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	[NT]	6	8.4	[NT]		[NT]	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	[NT]	6	49	[NT]		[NT]	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	[NT]	6	7.3	[NT]		[NT]	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	[NT]	6	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	[NT]	6	58	66	13	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	[NT]	6	<5	<5	0	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	[NT]	6	58	66	13	[NT]	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	[NT]	6	52	[NT]		[NT]	[NT]
Chloride, Cl	mg/L	1	Inorg-081	[NT]	6	94	[NT]		[NT]	[NT]
Ionic Balance	%		Inorg-040	[NT]	6	-4.0	[NT]		[NT]	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	364566-3
Date prepared	-			24/10/2024	2	24/10/2024	24/10/2024		24/10/2024	24/10/2024
Date analysed	-			24/10/2024	2	24/10/2024	24/10/2024		24/10/2024	24/10/2024
Iron-Dissolved	µg/L	10	Metals-022	<10	2	510	510	0	85	#
Manganese-Dissolved	µg/L	5	Metals-022	<5	2	80	81	1	87	89

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	364566-2
Date prepared	-			24/10/2024	1	24/10/2024	24/10/2024		24/10/2024	24/10/2024
Date analysed	-			24/10/2024	1	24/10/2024	24/10/2024		24/10/2024	24/10/2024
Iron-Total	µg/L	10	Metals-022	<10	1	680	680	0	82	#
Manganese-Total	µg/L	5	Metals-022	<5	1	19	19	0	81	77

Result Definitions

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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.
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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.

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

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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.

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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.

Report Comments

8 HM in water - dissolved - # Percent recovery is not applicable due to the high concentration of the element in the sample. However an acceptable recovery was obtained for the LCS.

ION_BALANCE
5110 24OCT2024 1:53 2:16(x20) XC

TSS:PQL has been raised due to the small volume of sample supplied.

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

CERTIFICATE OF ANALYSIS 364662

Client Details

Client	Douglas Partners Pty Ltd (Port Macquarie)
Attention	Joel Cowan
Address	PO Box 5463, Port Macquarie, NSW, 2444

Sample Details

Your Reference	**89781.25, Kempsey**
Number of Samples	5 Water
Date samples received	24/10/2024
Date completed instructions received	24/10/2024

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	31/10/2024
Date of Issue	31/10/2024

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

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

Results Approved By
Giovanni Agosti, Group Technical Manager
Nick Sarlamis, Assistant Operation Manager

Authorised By
Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics						
Our Reference		364662-1	364662-2	364662-3	364662-4	364662-5
Your Reference	UNITS	BH01-2	BH2	BH3	BH4	D1/GW-22.10.24
Date Sampled		22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/10/2024	24/10/2024	24/10/2024	24/10/2024	24/10/2024
Date analysed	-	24/10/2024	24/10/2024	24/10/2024	24/10/2024	24/10/2024
Ammonia as N in water	mg/L	0.034	0.080	0.062	0.008	0.071
Nitrate as N in water	mg/L	<0.005	0.01	0.086	0.20	0.02

Cations in water Dissolved						
Our Reference		364662-1	364662-2	364662-3	364662-4	364662-5
Your Reference	UNITS	BH01-2	BH2	BH3	BH4	D1/GW-22.10.24
Date Sampled		22/10/2024	22/10/2024	22/10/2024	22/10/2024	22/10/2024
Type of sample		Water	Water	Water	Water	Water
Date digested	-	25/10/2024	25/10/2024	25/10/2024	25/10/2024	25/10/2024
Date analysed	-	25/10/2024	25/10/2024	25/10/2024	25/10/2024	25/10/2024
Magnesium - Dissolved	mg/L	19	17	39	32	17

Method ID	Methodology Summary
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Metals-020	Determination of various metals by ICP-AES.

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	364662-2
Date prepared	-			24/10/2024	1	24/10/2024	24/10/2024		24/10/2024	24/10/2024
Date analysed	-			24/10/2024	1	24/10/2024	24/10/2024		24/10/2024	24/10/2024
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.034	0.033	3	101	85
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	0.008	46	114	118

QUALITY CONTROL: Cations in water Dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	364662-3
Date digested	-			25/10/2024	2	25/10/2024	25/10/2024		25/10/2024	25/10/2024
Date analysed	-			25/10/2024	2	25/10/2024	25/10/2024		25/10/2024	25/10/2024
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	2	17	18	6	98	103

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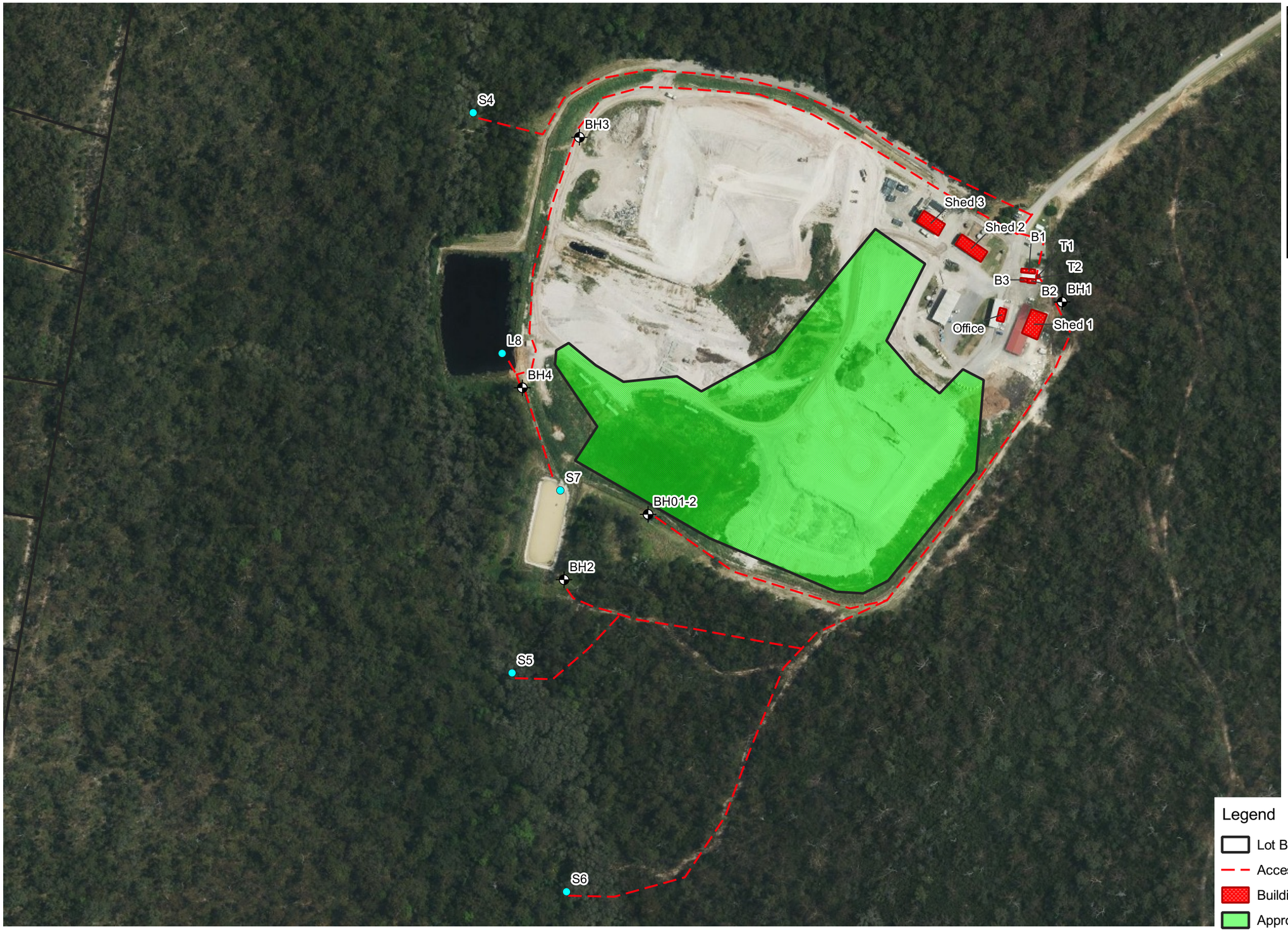

Site Location

Legend

- Lot Boundary
- Access Tracks
- Building Locations Monitored for Gas
- Approximate Area of Surface Gas Monitoring
- Approximate Surface Water Location
- Approximate Well Location

0 50 100 150 m

NOTE:
1. Drawing adapted from Metromap Image dated 22.11.2022.

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Kempsey Shire Council	
OFFICE:	Port Macquarie	DRAWN BY: PLH
SCALE:	1:3000@A3	DATE: 21.August.2023

TITLE: **Test Location Plan**
Proposed Kempsey Landfill Water and Gas Monitoring
638 Crescent Head Road, Kempsey, NSW

Project:	89781.00
DRAWING No:	1
REVISION:	0