

Our Ref: 217501\_LET\_007.docm

22 March 2023

Lithgow City Council  
 PO Box 19,  
 180 Mort Street  
 Lithgow NSW 2790

Attention: Nigel Campbell, Waste & Recycling Coordinator

## ENVIRONMENTAL MONITORING OF PORTLAND WASTE DISPOSAL DEPOT, UNDER ENVIRONMENT PROTECTION LICENCE 10936

Premise has completed annual groundwater monitoring at Portland Waste Disposal Depot, located off the Portland Cullen Bullen Road, approximately 2 km north of Portland, NSW.

### Groundwater Levels

Groundwater was gauged at six (6) groundwater monitoring wells across the site. Groundwater gauging data is included in **Table 1** (attached), and elevation trends are shown on **Figure 1**:

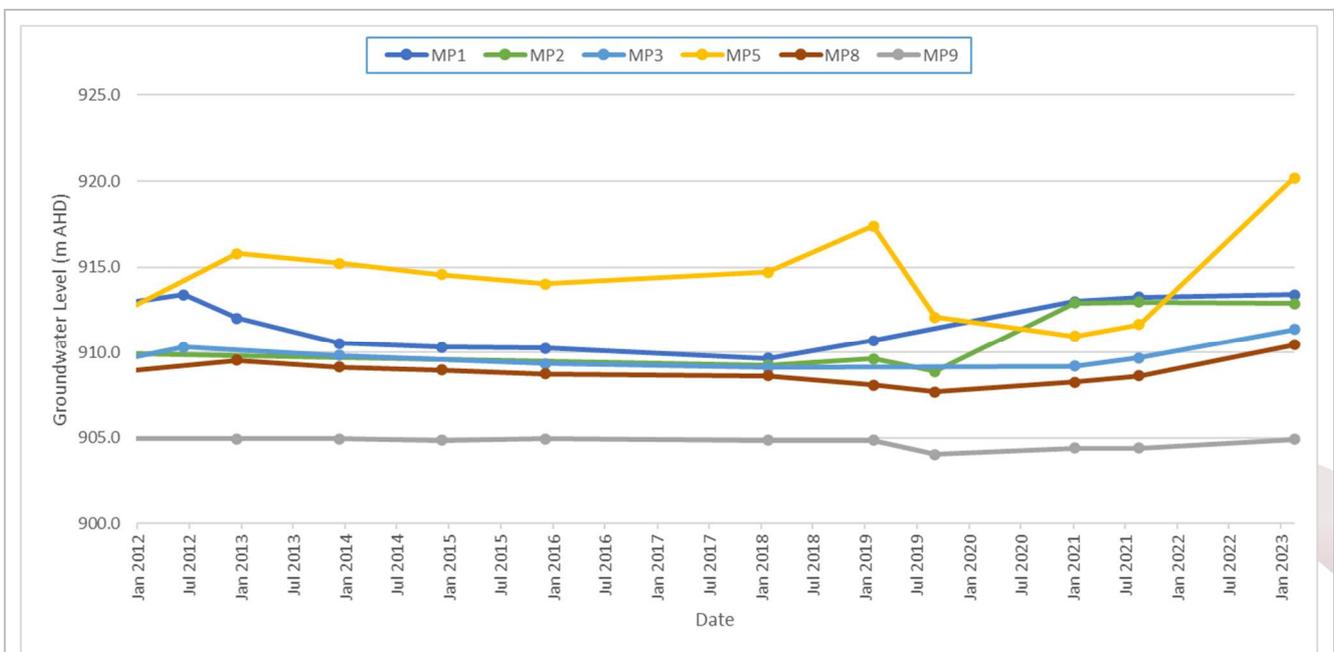


Figure 1 – Portland Waste Disposal Depot – Groundwater Elevations

Observations were as follows:

- Depths to groundwater ranged from artesian (overflowing) conditions observed at MP9, to 17.82 metres below ground level (mbgl) at MP5. Corrected groundwater elevations ranged from 904.90 metres Australian Height Datum (mAHD) at MP9, to 920.18 mAHD at MP5.
- Inference of groundwater elevations, calculated from available survey data from installed groundwater monitoring wells, indicates a flow direction to the north-west.

### **Groundwater Quality**

All groundwater samples were able to be collected from their sampling points. Samples were couriered to SGS Laboratories in Alexandria, NSW, who are NATA accredited to perform the scheduled analysis. Results of analysis are included in **Table 2** (attached), and laboratory certificates have also been appended to this letter.

Groundwater quality has been assessed by comparison to criteria (where available) adopted from Australian and New Zealand Environment and Conservation Council (ANZECC) Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000* – 'Primary Industries: Water quality for irrigation and general water use'.

- Laboratory measured pH ranged from 4.6 at MP2 to 6.8 at MP8. Groundwater was outside the guideline range considered suitable for pumping, irrigation and stock watering (6.0 to 8.5 pH units) at points MP2 and MP3.
- Electrical conductivity (EC) ranged from 350  $\mu\text{S}/\text{cm}$  at piezometer MP2 to 3400  $\mu\text{S}/\text{cm}$  at piezometer MP9. Corresponding total dissolved solid (TDS) concentrations (respectively 235 mg/L to 2278 mg/L) identifies the groundwater did not exceed the livestock watering 'loss of production' TDS tolerance limit for the most sensitive livestock category, poultry (3000 mg/L, ANZECC & ARMCANZ, 2000).
- Total alkalinity in groundwater ranged from below the laboratory limit of reporting (LOR) of 5 mg/L at MP2 and MP3, to 640 mg/L at MP9. Groundwater alkalinity at MP1, MP5, MP8 and MP9 exceeded the guideline hardness value for potential fouling of waters (350 mg/L).
- Groundwater chloride concentrations ranged from 33 mg/L at MP5 to 310 mg/L at MP9. The chloride concentration recorded at all sampling points was below the guideline value for protection of moderately sensitive crops (350 mg/L).
- Fluoride concentrations in groundwater ranged from below the laboratory LOR of 0.1 mg/L at MP8 to 0.19 mg/L at MP5. All concentrations were below the guideline value of 1 mg/L for long term irrigation use (up to 100 years).
- Sulfate concentrations in groundwater ranged from 81 mg/L at MP2 to 1200 mg/L at MP9.
- Calcium concentrations ranged from 12 mg/L at MP2 to 360 mg/L at MP9.
- Magnesium concentrations ranged from 3.4 mg/L at MP2 to 240 mg/L at MP9.
- Potassium concentrations ranged from 5.0 mg/L at MP3 to 130 mg/L at MP1.
- Concentrations of sodium ranged from 44 mg/L at MP2 to 220 mg/L at MP9. Sodium concentrations in groundwater samples did not exceed the guideline level for irrigation to moderately sensitive crops (<230 mg/L).
- Total organic carbon (TOC) in groundwater ranged from 1.5 mg/L at MP9 to 66 mg/L at MP1.

- Ammonia concentrations in groundwater ranged from 0.02 mgN/L at MP2 and MP5, to 2.1 mgN/L at MP1.
- Nitrate concentrations ranged from less than the laboratory LOR of 0.025 mgN/L at MP9, to 18.0 mgN/L at MP3.
- Iron concentrations ranged from less than the laboratory LOR of 0.005 mg/L at MP5, MP8 and MP9, to 0.35 mg/L at MP3. The iron concentration recorded in all collected groundwater samples exceeded the long-term (up to 100 years) irrigation guideline concentration of 0.2 mg/L.
- Manganese concentrations ranged from 0.17 mg/L at MP2 to 1.6 mg/L at MP8. Manganese concentrations at all locations exceeded the long-term (up to 100 years) irrigation guideline concentration of 0.2 mg/L, with the exception of MP2 which was less than the guideline.
- Total phenols were below the laboratory LOR of 0.05 mg/L at all groundwater monitoring points.
- Organochlorine pesticides were below respective laboratory LORs at all groundwater monitoring points.

### **Surface Water Discharge Monitoring**

The surface water monitoring point SW1 was inspected in February 2023. No discharge was occurring at the time of inspection, and no evidence of discharge(s) having occurred prior was apparent.

The next routine monitoring for groundwater is scheduled for August 2023. Surface water monitoring is required to take place any calendar month when a surface water discharge is recorded at an interval of not less than once every 6 months.

Please do not hesitate to contact us with any questions or comments you may have regarding this report.

Yours sincerely

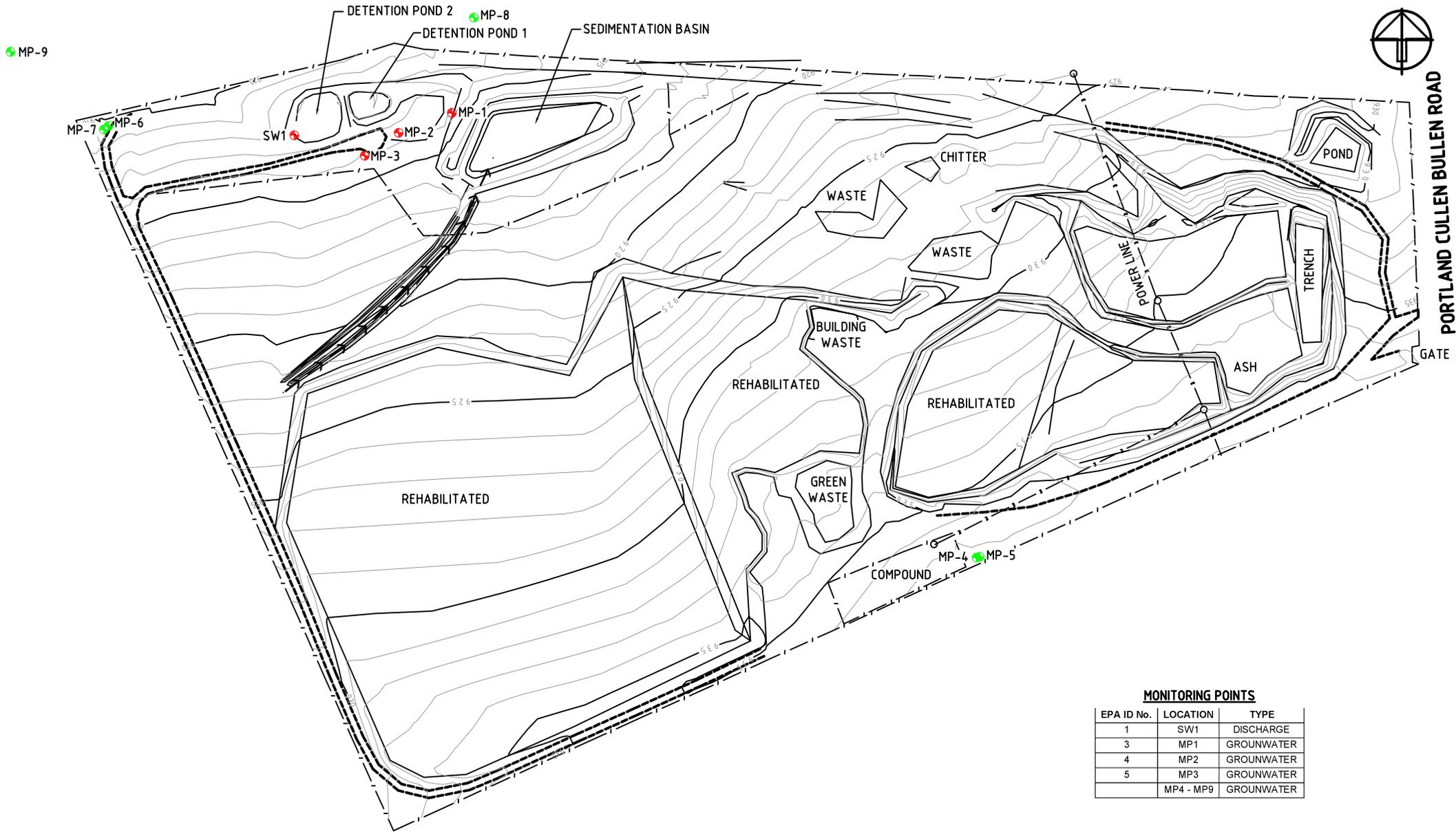


**BRENDAN STUART**  
Environmental Scientist

No. of Attachments – 4:                      Environmental Monitoring Point Locations  
Table 1 – Groundwater Level Measurements  
Table 2 – Results of Laboratory Analyses –February 2023  
SGS Laboratories Analytical Reports – February 2023



PORTLAND CULLEN BULLEN ROAD

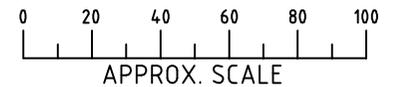


**MONITORING POINTS**

EPA ID No.	LOCATION	TYPE
1	SW1	DISCHARGE
3	MP1	GROUNWATER
4	MP2	GROUNWATER
5	MP3	GROUNWATER
	MP4 - MP9	GROUNWATER

**LEGEND:**

- + EPA MONITORING POINT
- + ADDITIONAL MONITORING POINT



**GEOLYSE**  
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 ORANGE, NSW 2800  
 Ph. (02) 6382 1055  
 Fax. (02) 6361 8178  
 orange@geolyse.com  
 www.geolyse.com

No	DATE	DEVELOPER CHECK	PI CHECK	DETAILS
A	15/09/08	-	-	ISSUED TO CLIENT
B	11/05/11	LRP	AGB	ISSUED TO CLIENT
C	01/11/12	MDH	KBF	ISSUED TO CLIENT

PROJECT  
 PORTLAND WASTE DISPOSAL DEPOT  
 FILE REFERENCE: 0:\Projects\202334\_01B\_EV01.dwg

APPROVAL AUTHORITY  
 ENVIRONMENTAL PROTECTION AUTHORITY  
 EPL: 10936

CLIENT  
  
 LITHGOW CITY COUNCIL  
 180 MORT STREET,  
 LITHGOW NSW 2790

DRAWING  
 ENVIRONMENTAL MONITORING POINTS  
 PROJECT NUMBER: 202334 DRAWING NUMBER: 01C\_EV01 REV: C  
 SOURCE: CRAVEN, ELLISTON & HAYES (LITHGOW) PTY.LTD.  
 CONSULTING LAND, ENGINEERING AND MINING SURVEYORS



**TABLE 1: PORTLAND WASTE DISPOSAL DEPOT - GROUNDWATER LEVEL RESULTS**

**Ground Water Levels:** 15-Feb-23

**Piezometer Details:**

	Ground Elev (mAHD)	Stickup (m)	Elevation Top PVC (mAHD)	Date	Measured (m)	GWL (mAHD)	Well Depth (m)	Well Base (mAHD)	Water Column (m)
MP1	913.700	0.40	914.100	15/02/2023	0.72	913.38	6.0	908.09	5.29
MP2	913.600	0.20	913.800	15/02/2023	0.92	912.88	5.0	908.80	4.08
MP3	914.200	0.60	914.800	15/02/2023	3.43	911.37	5.8	909.00	2.37
MP5	937.200	0.80	938.000	15/02/2023	17.82	920.18	61.3	876.70	43.48
MP8	911.800	0.50	912.300	15/02/2023	1.85	910.45	21.5	890.79	19.66
MP9	903.800	1.10	904.900	15/02/2023	0.00	904.90	16.7	888.20	16.70

**Definitions:**

- Stickup: Height of piezometer pipe above ground surface.
- Ground Elev: Actual elevation of ground at the piezometer relative to an arbitrary datum. All ground elevations are measured to the same datum, hence Piezo GWLs are relative to each other.
- GWL: Actual elevation of groundwater at the piezometer relative to an arbitrary datum.
- NMWL: No Measured Water Level
- Measured: Depth of groundwater measured from the top of the piezometer pipe.

Date	MP1		MP2		MP3		MP5		MP8		MP9	
	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)						
01-Jun-10	4.21	909.89	NMWL		NMWL		30.20	907.80	4.48	907.82	0.00	904.90
15-Dec-10	1.23	912.87	NMWL		NMWL		27.37	910.63	3.44	908.86	-0.05	904.95
29-Jun-11	1.30	912.80	NMWL		5.65	909.15	25.67	912.33	3.62	908.68	-0.05	904.95
27-Jul-11	1.57	912.53	NMWL		NMWL		NMWL		NMWL		NMWL	
06-Dec-11	1.14	912.96	3.85	909.95	NMWL		25.40	912.60	Bore Damaged		-0.05	904.95
13-Jun-12	0.70	913.40	NMWL		4.48	910.32	NMWL		NMWL		NMWL	
16-Dec-12	2.09	912.01	NMWL		NMWL		22.22	915.78	2.77	909.53	-0.05	904.95
11-Dec-13	3.57	910.53	NMWL		4.98	909.82	22.79	915.21	3.16	909.14	-0.05	904.95
04-Dec-14	3.80	910.30	NMWL		NMWL		23.43	914.57	3.33	908.97	0.05	904.85
03-Dec-15	3.84	910.26	NMWL		5.45	909.35	23.97	914.03	3.57	908.73	-0.05	904.95
24-Jan-18	4.46	909.64	4.56	909.24	5.68	909.12	23.30	914.70	3.68	908.62	0.05	904.85
30-Jan-19	3.40	910.70	4.18	909.62	NMWL		20.61	917.39	4.23	908.07	0.05	904.85
02-Sep-19	NMWL		4.92	908.88	NMWL		25.93	912.07	4.61	907.69	0.87	904.03
05-Jan-21	1.11	912.99	0.9	912.90	5.61	909.19	27.05	910.95	4.04	908.26	0.49	904.41
19-Aug-21	0.85	913.25	0.84	912.96	5.13	909.67	26.35	911.65	3.69	908.61	0.50	904.40
15-Feb-23	0.72	913.38	0.92	912.88	3.43	911.37	17.82	920.18	1.85	910.45	0.00	904.90

TABLE 2: PORTLAND WASTE DISPOSAL DEPOT - RESULTS OF LABORATORY ANALYSIS  
FEBRUARY 2023 GROUNDWATER



Group	Analyte	LOR	Units	Criteria	Sample ID	MP-1	MP-2	MP-3	MP-5	MP-8	MP-9
					Sample Date	15/02/2023 9:55 AM	15/02/2023 10:35 AM	15/02/2023 11:15 AM	15/02/2023 9:20 AM	15/02/2023 12:10 PM	15/02/2023 11:50 AM
					PS	PS	PS	PS	PS	PS	PS
Physical Parameters	pH (Lab)	0	No unit	6.0 - 8.5	6.7	4.6	4.7	6.7	6.8	6.7	6.7
	Electrical Conductivity (Lab)	2	µS/cm	4478	1500	350	930	1300	2300	3400	3400
Alkalinity	Total Alkalinity as CaCO3	5	mg/L	350	390	< 5	< 5	540	480	640	640
Anions	Chloride	1	mg/L	350	120	42	160	33	160	310	310
	Fluoride	0.1	mg/L	1	0.13	0.13	0.16	0.19	< 0.1	0.12	0.12
	Sulfate (SO4)	1	mg/L	-	280	81	120	190	700	1200	1200
Cations	Calcium (Ca)	0.2	mg/L	1000	150	12	27	150	290	360	360
	Magnesium (Mg)	0.1	mg/L	-	43	3.4	29	59	120	240	240
	Potassium (K)	0.1	mg/L	-	130	23	5	11	11	6.2	6.2
	Sodium (Na)	0.5	mg/L	230	67	44	130	87	110	220	220
Forms of Carbon	Total Organic Carbon	0.2	mg/L	-	66	20	30	14	4	1.5	1.5
Nutrients	Ammonia (NH3) as N	0.01	mg/L	-	2.1	0.02	0.05	0.02	0.03	0.05	0.05
	Nitrate (NO3) as N	0.005	mg/L	-	0.37	0.055	18	0.13	0.068	-	-
	Nitrate (NO3) as N	0.025	mg/L	-	-	-	-	-	-	< 0.025	< 0.025
Trace Metals	Iron (Fe)	0.005	mg/L	0.2	0.25	0.18	0.35	< 0.005	< 0.005	< 0.005	< 0.005
	Manganese (Mn)	0.001	mg/L	0.2	0.28	0.17	0.58	0.74	1.6	1	1
Phenolics	Total Phenols	0.05	mg/L	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
OC Pesticides	Aldrin	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Alpha BHC	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Alpha Chlordane	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Alpha Endosulfan	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Beta BHC	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Beta Endosulfan	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Delta BHC	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Dieldrin	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Endosulfan sulphate	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Endrin	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Endrin aldehyde	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Endrin ketone	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Heptachlor	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Heptachlor epoxide	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Hexachlorobenzene (HCB)	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Lindane (gamma BHC)	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Methoxychlor	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	p,p'-DDD	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	p,p'-DDE	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	p,p'-DDT	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	o,p'-DDD	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	o,p'-DDT	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	o,p'-DDE	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Gamma Chlordane	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	trans-Nonachlor	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Isodrin	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Mirex	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

mg/L milligrams per litre  
 µS/cm microsiemens per centimetre  
 LOR limit of reporting  
 PS primary sample  
 Criteria Criteria adopted from Australian and New Zealand Environment and Conservation Council (ANZECC) Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) Australian and New Zealand Guidelines for Fresh and Marine Water Quality - 'Primary Industries: Water quality for irrigation and general water use', 2000

within criteria  
 criteria exceeded

CLIENT DETAILS

Contact **Brendan Stuart**  
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**100 BRUNSWICK STREET**  
**FORTITUDE VALLEY QLD 4006**

Telephone **61 2 6939 5000**  
 Facsimile **(Not specified)**  
 Email **Brendan.stuart@premise.com.au**

Project **217501 - Portland GD**  
 Order Number **217501**  
 Samples **6**

LABORATORY DETAILS

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 Laboratory **SGS Alexandria Environmental**  
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**Alexandria NSW 2015**

Telephone **+61 2 8594 0400**  
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 Email **au.environmental.sydney@sgs.com**

SGS Reference **SE243318 R0**  
 Date Received **17 Feb 2023**  
 Date Reported **24 Feb 2023**

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

Ion Chromatography - The Limit of Reporting (LOR) has been raised due to high conductivity of the sample requiring dilution.

SIGNATORIES



Akheevar BENIAMEEN  
Chemist



Dong LIANG  
Metals/Inorganics Team Leader



Kamrul AHSAN  
Senior Chemist



Shane MCDERMOTT  
Inorganic/Metals Chemist

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Sample Number			SE243318.001	SE243318.002	SE243318.003	SE243318.004
Sample Matrix			Water	Water	Water	Water
Sample Date			15 Feb 2023	15 Feb 2023	15 Feb 2023	15 Feb 2023
Sample Name			MP-1	MP-2	MP-3	MP-5

**OC Pesticides in Water Method: AN420 Tested: 21/2/2023**

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Alpha BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobenzene (HCB)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Lindane (gamma BHC)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Gamma Chlordane	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Endrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDD	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDD	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Endrin aldehyde	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Endrin ketone	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
Mirex	µg/L	0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1

Surrogates

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	51	69	45	59

**Total Phenolics in Water Method: AN295 Tested: 20/2/2023**

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Total Phenols	mg/L	0.05	<0.05	<0.05	<0.05	<0.05

**Anions by Ion Chromatography in Water Method: AN245 Tested: 23/2/2023**

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Nitrate Nitrogen, NO3-N	mg/L	0.005	0.37	0.055	18	0.13
Chloride	mg/L	1	120	42	160	33
Sulfate, SO4	mg/L	1	280	81	120	190
Fluoride	mg/L	0.1	0.13	0.13	0.16	0.19

**Ammonia Nitrogen by Discrete Analyser Method: AN291 Tested: 17/2/2023**

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Ammonia Nitrogen, NH <sub>3</sub> as N	mg/L	0.01	2.1	0.02	0.05	0.02

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Sample Number			SE243318.001	SE243318.002	SE243318.003	SE243318.004
Sample Matrix			Water	Water	Water	Water
Sample Date			15 Feb 2023	15 Feb 2023	15 Feb 2023	15 Feb 2023
Sample Name			MP-1	MP-2	MP-3	MP-5

**pH in water Method: AN101 Tested: 17/2/2023**

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
pH**	No unit	-	6.7	4.6	4.7	6.7

**Conductivity and TDS by Calculation - Water Method: AN106 Tested: 17/2/2023**

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Conductivity @ 25 C	µS/cm	2	1500	350	930	1300

**Alkalinity Method: AN135 Tested: 21/2/2023**

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Total Alkalinity as CaCO3	mg/L	5	390	<5	<5	540

**Forms of Carbon Method: AN190 Tested: 21/2/2023**

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Total Organic Carbon as NPOC	mg/L	0.2	66	20	30	14

**Metals in Water (Dissolved) by ICPOES Method: AN320 Tested: 23/2/2023**

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Calcium, Ca	mg/L	0.2	150	12	27	150
Magnesium, Mg	mg/L	0.1	43	3.4	29	59
Potassium, K	mg/L	0.1	130	23	5.0	11
Sodium, Na	mg/L	0.5	67	44	130	87

**Trace Metals (Dissolved) in Water by ICPMS Method: AN318 Tested: 22/2/2023**

Parameter	Units	LOR	SE243318.001	SE243318.002	SE243318.003	SE243318.004
Iron	µg/L	5	250	180	350	<5
Manganese	µg/L	1	280	170	580	740

Parameter	Units	LOR	Sample Number	SE243318.005	SE243318.006
			Sample Matrix	Water	Water
			Sample Date	15 Feb 2023	15 Feb 2023
			Sample Name	MP-8	MP-9

**OC Pesticides in Water Method: AN420 Tested: 21/2/2023**

Parameter	Units	LOR	SE243318.005	SE243318.006
Alpha BHC	µg/L	0.1	<0.1	<0.1
Hexachlorobenzene (HCB)	µg/L	0.1	<0.1	<0.1
Beta BHC	µg/L	0.1	<0.1	<0.1
Lindane (gamma BHC)	µg/L	0.1	<0.1	<0.1
Delta BHC	µg/L	0.1	<0.1	<0.1
Heptachlor	µg/L	0.1	<0.1	<0.1
Aldrin	µg/L	0.1	<0.1	<0.1
Isodrin	µg/L	0.1	<0.1	<0.1
Heptachlor epoxide	µg/L	0.1	<0.1	<0.1
Gamma Chlordane	µg/L	0.1	<0.1	<0.1
Alpha Chlordane	µg/L	0.1	<0.1	<0.1
Alpha Endosulfan	µg/L	0.1	<0.1	<0.1
o,p'-DDE	µg/L	0.1	<0.1	<0.1
p,p'-DDE	µg/L	0.1	<0.1	<0.1
Dieldrin	µg/L	0.1	<0.1	<0.1
Endrin	µg/L	0.1	<0.1	<0.1
Beta Endosulfan	µg/L	0.1	<0.1	<0.1
o,p'-DDD	µg/L	0.1	<0.1	<0.1
p,p'-DDD	µg/L	0.1	<0.1	<0.1
Endrin aldehyde	µg/L	0.1	<0.1	<0.1
Endosulfan sulphate	µg/L	0.1	<0.1	<0.1
o,p'-DDT	µg/L	0.1	<0.1	<0.1
p,p'-DDT	µg/L	0.1	<0.1	<0.1
Endrin ketone	µg/L	0.1	<0.1	<0.1
Methoxychlor	µg/L	0.1	<0.1	<0.1
Mirex	µg/L	0.1	<0.1	<0.1
trans-Nonachlor	µg/L	0.1	<0.1	<0.1

Surrogates

Parameter	Units	LOR	SE243318.005	SE243318.006
Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	<b>88</b>	<b>74</b>

**Total Phenolics in Water Method: AN295 Tested: 20/2/2023**

Parameter	Units	LOR	SE243318.005	SE243318.006
Total Phenols	mg/L	0.05	<0.05	<0.05

**Anions by Ion Chromatography in Water Method: AN245 Tested: 23/2/2023**

Parameter	Units	LOR	SE243318.005	SE243318.006
Nitrate Nitrogen, NO <sub>3</sub> -N	mg/L	0.005	<b>0.068</b>	<0.025†
Chloride	mg/L	1	<b>160</b>	<b>310</b>
Sulfate, SO <sub>4</sub>	mg/L	1	<b>700</b>	<b>1200</b>
Fluoride	mg/L	0.1	<0.10	<b>0.12</b>

**Ammonia Nitrogen by Discrete Analyser Method: AN291 Tested: 17/2/2023**

Parameter	Units	LOR	SE243318.005	SE243318.006
Ammonia Nitrogen, NH <sub>3</sub> as N	mg/L	0.01	<b>0.03</b>	<b>0.05</b>

Parameter	Units	LOR	SE243318.005	SE243318.006
Sample Number			SE243318.005	SE243318.006
Sample Matrix			Water	Water
Sample Date			15 Feb 2023	15 Feb 2023
Sample Name			MP-8	MP-9

**pH in water** Method: AN101 Tested: 17/2/2023

Parameter	Units	LOR	SE243318.005	SE243318.006
pH**	No unit	-	6.8	6.7

**Conductivity and TDS by Calculation - Water** Method: AN106 Tested: 17/2/2023

Parameter	Units	LOR	SE243318.005	SE243318.006
Conductivity @ 25 C	µS/cm	2	2300	3400

**Alkalinity** Method: AN135 Tested: 21/2/2023

Parameter	Units	LOR	SE243318.005	SE243318.006
Total Alkalinity as CaCO3	mg/L	5	480	640

**Forms of Carbon** Method: AN190 Tested: 21/2/2023

Parameter	Units	LOR	SE243318.005	SE243318.006
Total Organic Carbon as NPOC	mg/L	0.2	4.0	1.5

**Metals in Water (Dissolved) by ICPOES** Method: AN320 Tested: 23/2/2023

Parameter	Units	LOR	SE243318.005	SE243318.006
Calcium, Ca	mg/L	0.2	290	360
Magnesium, Mg	mg/L	0.1	120	240
Potassium, K	mg/L	0.1	11	6.2
Sodium, Na	mg/L	0.5	110	220

**Trace Metals (Dissolved) in Water by ICPMS** Method: AN318 Tested: 22/2/2023

Parameter	Units	LOR	SE243318.005	SE243318.006
Iron	µg/L	5	<5	<5
Manganese	µg/L	1	1600	1000

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

**Alkalinity Method: ME-(AU)-[ENV]AN135**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB271950	mg/L	5	<5	0 - 3%	113%

**Ammonia Nitrogen by Discrete Analyser Method: ME-(AU)-[ENV]AN291**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Ammonia Nitrogen, NH <sub>3</sub> as N	LB271713	mg/L	0.01	<0.01	6 - 7%	99%	100%

**Anions by Ion Chromatography in Water Method: ME-(AU)-[ENV]AN245**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Nitrate Nitrogen, NO <sub>3</sub> -N	LB272157	mg/L	0.005	<0.005	0 - 1%	100%	103%
Chloride	LB272157	mg/L	1	<0.05	0%	99%	
Sulfate, SO <sub>4</sub>	LB272157	mg/L	1	<1.0	0 - 2%	102%	
Fluoride	LB272157	mg/L	0.1	<0.10	0 - 3%	103%	

**Conductivity and TDS by Calculation - Water Method: ME-(AU)-[ENV]AN106**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Conductivity @ 25 C	LB271745	µS/cm	2	<2	1%	NA

**Forms of Carbon Method: ME-(AU)-[ENV]AN190**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Organic Carbon as NPOC	LB271922	mg/L	0.2	<0.2	1 - 7%	95%	95%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

**Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Calcium, Ca	LB272139	mg/L	0.2	<0.2	0%		110 - 111%
Magnesium, Mg	LB272139	mg/L	0.1	<0.1	0 - 3%	103%	102%
Potassium, K	LB272139	mg/L	0.1	<0.1	0 - 2%	102%	114%
Sodium, Na	LB272139	mg/L	0.5	<0.5	0 - 3%	104%	155%

**OC Pesticides in Water Method: ME-(AU)-[ENV]AN420**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Alpha BHC	LB271906	µg/L	0.1	<0.1	NA
Hexachlorobenzene (HCB)	LB271906	µg/L	0.1	<0.1	NA
Beta BHC	LB271906	µg/L	0.1	<0.1	NA
Lindane (gamma BHC)	LB271906	µg/L	0.1	<0.1	NA
Delta BHC	LB271906	µg/L	0.1	<0.1	114%
Heptachlor	LB271906	µg/L	0.1	<0.1	115%
Aldrin	LB271906	µg/L	0.1	<0.1	111%
Isodrin	LB271906	µg/L	0.1	<0.1	NA
Heptachlor epoxide	LB271906	µg/L	0.1	<0.1	NA
Gamma Chlordane	LB271906	µg/L	0.1	<0.1	NA
Alpha Chlordane	LB271906	µg/L	0.1	<0.1	NA
Alpha Endosulfan	LB271906	µg/L	0.1	<0.1	NA
o,p'-DDE	LB271906	µg/L	0.1	<0.1	NA
p,p'-DDE	LB271906	µg/L	0.1	<0.1	NA
Dieldrin	LB271906	µg/L	0.1	<0.1	116%
Endrin	LB271906	µg/L	0.1	<0.1	114%
Beta Endosulfan	LB271906	µg/L	0.1	<0.1	NA
o,p'-DDD	LB271906	µg/L	0.1	<0.1	NA
p,p'-DDD	LB271906	µg/L	0.1	<0.1	NA
Endrin aldehyde	LB271906	µg/L	0.1	<0.1	NA
Endosulfan sulphate	LB271906	µg/L	0.1	<0.1	NA
o,p'-DDT	LB271906	µg/L	0.1	<0.1	NA
p,p'-DDT	LB271906	µg/L	0.1	<0.1	106%
Endrin ketone	LB271906	µg/L	0.1	<0.1	NA
Methoxychlor	LB271906	µg/L	0.1	<0.1	NA
Mirex	LB271906	µg/L	0.1	<0.1	NA
trans-Nonachlor	LB271906	µg/L	0.1	<0.1	NA

Surrogates

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Tetrachloro-m-xylene (TCMX) (Surrogate)	LB271906	%	-	81%	72%

MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

**pH in water** Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	DUP %RPD	LCS %Recovery
pH**	LB271745	No unit	-	0 - 1%	100%

**Total Phenolics in Water** Method: ME-(AU)-[ENV]AN295

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Phenols	LB271792	mg/L	0.05	<0.05	0%	95%	98%

**Trace Metals (Dissolved) in Water by ICPMS** Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Iron	LB272032	µg/L	5	<5	0%	118%
Manganese	LB272032	µg/L	1	<1		98%

METHOD

METHODOLOGY SUMMARY

AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2510 B.
AN106	Salinity may be calculated in terms of NaCl from the sample conductivity. This assumes all soluble salts present, measured by the conductivity, are present as NaCl.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN190	TOC and DOC in Water: A homogenised micro portion of sample is injected into a heated reaction chamber packed with an oxidative catalyst that converts organic carbon to carbon dioxide. The CO <sub>2</sub> is measured using a non-dispersive infrared detector. The process is fully automated in a commercially available analyser. If required a sugar value can be calculated from the TOC result. Reference APHA 5310 B.
AN190	Chemical oxygen demand can be calculated/estimated based on the O <sub>2</sub> /C relation as 2.67*NPOC (TOC). This is an estimate only and the factor will vary with sample matrix so results should be interpreted with caution.
AN245	Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO <sub>2</sub> , NO <sub>3</sub> and SO <sub>4</sub> are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
AN291	Ammonia in solution reacts with hypochlorite ions from Sodium Dichloroisocyanate, and salicylate in the presence of Sodium Nitroprusside to form indophenol blue and measured at 670 nm by Discrete Analyser.
AN295	The water sample or extract of sample is distilled in a phosphoric acid stream. Phenolic compounds in the distillate react with a reagent stream of potassium hexacyanoferrate(III) and 4-Amino-2,3-dimethyl-3-pyrazolin-5-one in an alkaline medium to form a coloured complex which is analysed spectrophotometrically onboard a continuous flow analyser.
AN318	Determination of elements at trace level in waters by ICP-MS technique,, referenced to USEPA 6020B and USEPA 200.8 (5.4).

METHOD

METHODOLOGY SUMMARY

AN320

Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .

AN320

Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.

AN420

SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process ( Based on USEPA 3500C and 8270D).

Calculation

Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported . APHA4500CO2 D.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
***	Indicates that both * and ** apply.	-	The sample was not analysed for this analyte
		NVL	Not Validated

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received. Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

Note that in terms of units of radioactivity:

- a. 1 Bq is equivalent to 27 pCi
- b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: [www.sgs.com.au/en-gb/environment-health-and-safety](http://www.sgs.com.au/en-gb/environment-health-and-safety).

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