



62 075 657 359
Suite 3, 60-62 McNamara Street, Orange, NSW, 2800, Australia
(02) 6393 5000
orange@premise.com.au
Premise.com.au

Our Ref: 217504_LET_021

10 April 2024

Narromine Shire Council
PO Box 115,
Narromine NSW 2821

Attention: Carl Ebsworth – Team Leader Waste Services

Environmental Monitoring of Narromine Waste Depot – March 2024

Premise Australia Pty Ltd (Premise) has completed quarterly environmental monitoring at Narromine Waste Depot, located at 156 Gainsborough Road, Narromine. Monitoring was completed per the requirements of Environment Protection Licence (EPL) 6055.

Groundwater Levels

Groundwater was gauged at three (3) groundwater monitoring wells to the north-east of the site on 6 March 2024. Groundwater gauging data is included in **Table 1** (attached). Observations were as follows:

- Monitoring points Bore 1, Bore 2 and Bore 3 to the north-east of the site were monitored via access through the NSW Department of Primary Industries.
- Depths to groundwater ranged from 27.42 metres below ground level (mbgl) at Bore 1, to 30.29 mbgl at Bore 3. Groundwater levels have fallen at all monitoring points since December 2023, and risen at Bore 3.
- Monitoring point Bore 4, in the south-west corner of the site, was dry at 24 metres below ground level (mbgl). A groundwater sample could not be collected at Bore 4.
- Monitoring point Bore 5, to the south of the site, is equipped with a pump and tap, and depth to groundwater could not be gauged during the sampling event.
- Monitoring point Bore 6, to the west of the site, is located on private property and access was unable to be obtained during the sampling event.
- Inference of corrected groundwater elevations and flow direction was not possible from the available data. Surrounding topography of the region is relatively flat and groundwater connectivity with local drainage features is considered to be unlikely.
- The groundwater level measurements are illustrated in **Figure 1**.

Figure 1 – Narromine Waste Depot Groundwater Level Measurements



Groundwater Quality

Groundwater samples were able to be collected from wells Bore 1, Bore 2, Bore 3 and Bore 5. 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 6.8 at Bore 2 and Bore 3, to 7.3 at Bore 1. Groundwater was within the guideline range considered suitable for pumping, irrigation and stock watering (6.0 to 8.5 pH units).
- Total suspended solid (TSS) concentrations ranged from below the laboratory limit of reporting (LOR) of 5 mg/L at Bore 5, to 470 mg/L at Bore 1.
- Total alkalinity in groundwater ranged from 190 gCaCO₃/L at Bore 2 to 240 gCaCO₃/L at Bore 1. Groundwater alkalinity did not exceed the guideline hardness value for potential fouling of waters (350 mg/L).
- Groundwater chloride concentrations ranged from 77 mg/L at Bore 2 to 350 mg/L at Bore 5. All concentrations were below the guideline value for protection of moderately sensitive crops (350 mg/L), with the exception of Bore 5 which was equivalent to the guideline value.

- Fluoride concentrations in groundwater were recorded to range from below the laboratory LOR of 0.1 mg/L at Bore 1, to 0.18 mg/L at Bore 3. 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 25 mg/L at Bore 2 to 55 mg/L at Bore 5.
- Calcium concentrations ranged from 22 mg/L at Bore 3 to 72 mg/L at Bore 1.
- Magnesium concentrations ranged from 19 mg/L at Bore 2 to 41 mg/L at Bore 5.
- Potassium concentrations ranged from 2.4 mg/L at Bore 2 to 4.8mg/L at Bore 5.
- Concentrations of sodium ranged from 78 mg/L at Bore 2 to 220 mg/L at Bore 5. Sodium concentrations did not exceed the guideline level for irrigation to moderately sensitive crops (<230 mg/L).
- Total organic carbon (TOC) in groundwater ranged from 0.6 mg/L at Bore 5 to 2.6 mg/L at Bore 1.
- Ammonia concentrations in groundwater ranged from below the laboratory LOR of 0.01 mgN/L at Bore 5, to 0.08 mgN/L at Bore 1.
- Nitrate concentrations ranged from 0.082 mgN/L at Bore 3 to 5.3 mgN/L at Bore 5.
- Iron (Fe) concentrations were not recorded at concentrations above the laboratory LOR of 0.005 mg/L at all monitoring points. Iron concentrations in groundwater were below the long-term (up to 100 years) irrigation guideline concentration of 0.2 mg/L.
- Manganese (Mn) concentrations ranged from 0.004 mg/L at Bore 5 to 0.13 mg/L at Bore 3. Manganese concentrations did not exceed the long-term (up to 100 years) irrigation guideline concentration of 0.2 mg/L.
- Total phenols were not recorded at concentrations above the laboratory LOR of 0.01 mg/L at all monitoring bores.

Surface Water Sampling

A surface water sample was able to be collected from monitoring point SW7 on 6 March 2024. The sample was 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.

Surface water 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 was recorded to be 8.2 at SW7, within the guideline range for pumping, irrigation and stock watering of 6.0 to 8.5 pH units.
- Total suspended solids (TSS) concentrations were recorded to be 10 mg/L at SW7.

- Total alkalinity was recorded at 270 mgCaCO₃/L at SW7. The guideline hardness value for potential fouling of waters (350 mgCaCO₃/L – ANZECC & ARMCANZ, 2000) was not exceeded.
- The chloride concentration was recorded to be 120 mg/L at SW7. This concentration is below the guideline value for protection of moderately sensitive crops (350 mg/L).
- Fluoride was recorded at a concentration of 0.54 mg/L at SW7. Fluoride concentrations did not exceed the guideline value of 1 mg/L for long term irrigation use (up to 100 years).
- The sulphate concentration was recorded to be 87.0 mg/L at SW7.
- The calcium concentration was recorded to be 31.0 mg/L at SW7.
- The magnesium concentration was recorded to be 28.0 mg/L at SW7.
- The potassium concentration was recorded to be 39.0 mg/L at SW7.
- The sodium concentration was recorded to be 120 mg/L at SW7. Sodium concentrations were below the guideline level for irrigation to moderately sensitive crops (<230 mg/L).
- Total organic carbon (TOC) was recorded at a concentration of 29 mg/L at SW7.
- The ammonia concentration was recorded to be 0.14 mgN/L at SW7.
- The nitrate concentration was recorded at a concentration of 0.053 mgN/L at SW7.
- The nitrite concentration was not recorded at a concentration above the laboratory LOR of 0.005 mgN/L at SW7.
- The iron concentration was recorded to be 0.011 mg/L at SW7. Iron concentrations did not exceed the guideline value of 0.2 mg/L for long term irrigation use (up to 100 years).
- The manganese concentration was recorded to be 0.009 mg/L at SW7. Manganese concentrations did not exceed the guideline value of 0.2 mg/L for long term irrigation use (up to 100 years) at SW7.
- Phenolic compounds were not recorded at concentrations greater than the laboratory LOR of 0.01 mg/L in the sample collected from SW7

The next routine monitoring is scheduled for June 2024. Please do not hesitate to contact us with any questions or comments you may have regarding this report.

Yours sincerely



BRENDAN STUART

Senior Environmental Scientist

No. of Attachments – 4:

Environmental Monitoring Point Locations

Table 1 – Groundwater Level Results

Table 2 – Results of Laboratory Analyses

SGS Laboratories Analytical Reports – March 2024

Narramine Shire Council
124 Dandaleo Street
PO Box 115
NARRAMINE NSW 2821
Ph: (02) 6189 9999
Fax: (02) 6389 9999
Email: mail@narramine.nsw.gov.au

Water Sampling Locations

Created on Tuesday, 27 January 2009 by planning

DP 1011933

DP 755131

DP 1009073

DP 755131 218

Bore No 1 - DLWC Bore 36530-1 Depth 42.5

Bore No 2 - DLWC Bore 36530- 2 Depth 63.0

Bore No 3 - DLWC Bore 36530- 3 Depth 73.0

Bore No 4 - Tip piezometer

Bore No 5 - South bore

Sampling point No 6 - Kelly's well

Sampling point No 7 - Sampling dam

Sampling point No 8 - Sampling dam

© Narromine Shire Council

Map Scale: 1:12,750 Map Zoom: 2228 m

CAD_ID	Parcel_No	Lot_No	Sec_No	Plan_No	Pt_Lot	Area	Area_UOM
102644860	1881	195		D9755131	N	12.14	H

Property Name	Prefix	Street No	Suffix	Street Name	Locality	State	Postcode
Tip		0			NARROMINE	NSW	2821
		156		Gainsborough ROAD	NARROMINE	NSW	2821

Owner Title	Owner
THE GENERAL MANAGER	NARROMINE SHIRE COUNCIL

Assessment No	Valuation No	Land Value	Rates Cat	Rates Sub Cat	Rate Levied
1653-00000-8	2674206	120000	BUSINESS		2011.59

Post_Name_1	Post_Name_2	Post_Add_1	Post_Add_2	Post_PCode	Property_Desc
THE GENERAL MANAGER	NARROMINE SHIRE COUNCIL	PO BOX 115	NARROMINE NSW 2821	2821	LOT 195 DP 755131



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TABLE 1: NARROMINE WASTE DEPOT - GROUNDWATER LEVEL RESULTS
Ground Water Levels: 06-Mar-24

Piezometer Details:

	Stickup (m)	Date	Measured (m)	SWL (mBGL)	Well Depth (m)	Well Base (mBGL)	Water Column (m)
Bore 1	1.0	06/03/2024	28.42	27.42	60.0	59.00	31.58
Bore 2	1.0	06/03/2024	30.40	29.40	60.0	59.00	29.60
Bore 3	1.0	06/03/2024	31.29	30.29	70.0	69.00	38.71
Bore 5	TAP	06/03/2024	-	-	-	-	-

Definitions:

Stickup:	Height of piezometer pipe above ground surface.
SWL:	Actual depth to groundwater at the piezometer relative to ground level.
Measured:	Depth of groundwater measured from the top of the piezometer pipe.

Date	Bore 1		Bore 2		Bore 3		Bore 5	
	Measured	GWL (mBGL)	Measured	GWL (mBGL)	Measured	GWL (mBGL)	Measured	GWL (mBGL)
23-Jan-18	27.13	26.13	28.72	27.72	29.04	28.04	-	-
28-Mar-18	27.58	26.58	28.79	27.79	29.09	28.09	-	-
27-Jun-18	27.28	26.28	27.73	26.73	28.01	27.01	-	-
19-Sep-18	27.45	26.45	28.91	27.91	29.22	28.22	-	-
17-Dec-18	27.83	26.83	29.74	28.74	30.12	29.12	-	-
26-Mar-19	28.70	27.70	29.99	28.99	30.41	29.41	-	-
12-Jun-19	28.40	27.40	29.06	28.06	29.35	28.35	-	-
25-Oct-19	29.45	28.45	31.88	30.88	32.22	31.22	-	-
15-Jan-20	29.76	28.76	32.82	31.82	33.51	32.51	-	-
25-Mar-20	29.56	28.56	30.78	29.78	30.92	29.92	-	-
25-Jun-20	31.15	30.15	31.22	30.22	31.96	30.96	-	-
15-Sep-20	29.12	28.12	29.42	28.42	29.67	28.67	-	-
16-Dec-20	27.32	26.32	31.00	30.00	31.37	30.37	-	-
04-Mar-21	29.77	28.77	30.78	29.78	30.98	29.98	-	-
25-May-21	29.17	28.17	30.10	29.10	28.79	27.79	-	-
08-Sep-21	29.25	28.25	28.32	27.32	29.46	28.46	-	-
01-Dec-21	29.16	28.16	29.39	28.39	29.43	28.43	-	-
02-Mar-22	29.72	28.72	30.80	29.80	30.92	29.92	-	-
05-Jul-22	28.91	27.91	29.04	28.04	29.31	28.31	-	-
13-Feb-23	28.47	27.47	29.53	28.53	29.84	28.84	-	-
13-Apr-23	28.38	27.38	28.68	27.68	28.90	27.90	-	-
31-May-23	28.50	27.50	30.00	29.00	28.51	27.51	-	-
19-Jul-23	28.77	27.77	27.91	26.91	28.07	27.07	-	-
18-Sep-23	27.96	26.96	29.02	28.02	29.33	28.33	-	-
20-Dec-23	28.11	27.11	29.48	28.48	29.82	28.82	-	-
06-Mar-24	28.42	27.42	30.40	29.40	31.29	30.29	-	-

**TABLE 2: NARROMINE WASTE DEPOT - RESULTS OF LABORATORY ANALYSIS
MARCH 2024**



				Sample ID Sample Date	Bore 1	Bore 2	Bore 3	Bore 5	Sample 7
					06/03/2024	06/03/2024	06/03/2024	06/03/2024	06/03/2024
Group	Analyte	LOR	Units	Criteria	PS	PS	PS	PS	PS
Physical Parameters	pH (Lab)	0	No unit	6.0 - 8.5	7.3	6.8	6.8	7	8.2
	Biochemical Oxygen Demand (BOD5)	5	mg/L	-	< 5	< 5	< 5	< 5	< 5
	Total Suspended Solids	5	mg/L	-	470	120	190	< 5	10
Alkalinity	Total Alkalinity as CaCO3	5	mg/L	350	240	190	220	200	270
Anions	Chloride	0.05	mg/L	350	140	77	90	350	120
	Fluoride	0.1	mg/L	1	< 0.1	0.14	0.18	0.15	0.54
	Sulfate (SO4)	1	mg/L	-	35	25	30	55	87
Cations	Calcium (Ca)	0.1	mg/L	-	72	24	22	51	31
	Magnesium (Mg)	0.1	mg/L	-	25	19	20	41	28
	Potassium (K)	0.2	mg/L	-	2.7	2.4	3.1	4.8	39
	Sodium (Na)	0.1	mg/L	230	80	76	99	180	120
Forms of Carbon	Total Organic Carbon	0.2	mg/L	-	2.6	0.9	0.7	0.6	29
Nutrients	Ammonia (NH3) as N	0.01	mg/L	-	< 0.01	< 0.01	< 0.01	< 0.01	0.14
	Nitrate (NO3) as N	0.005	mg/L	-	3.1	0.33	0.027	4.1	0.053
	Nitrite (NO2) as N	0.005	mg/L	-	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
	Total Oxidised Nitrogen, NOx-N	0.005	mg/L	-	3.1	0.33	0.027	4.1	0.054
Trace Metals	Iron (Fe)	0.005	mg/L	0.2	< 0.005	< 0.005	< 0.005	< 0.005	0.011
	Manganese (Mn)	0.001	mg/L	0.2	0.021	0.05	0.13	0.004	0.009
Phenolics	Total Phenols	0.05	mg/L	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

mg/L milligrams per litre
µg/L micrograms per litre
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**
 Client **PREMISE**
 Address **LEVEL 1**
100 BRUNSWICK STREET
FORTITUDE VALLEY QLD 4006

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

Project **217504 - Narromine WD (Quarterly)**
 Order Number **217504**
 Samples **5**

LABORATORY DETAILS

Manager **Huong Crawford**
 Laboratory **SGS Alexandria Environmental**
 Address **Unit 16, 33 Maddox St**
Alexandria NSW 2015

Telephone **+61 2 8594 0400**
 Facsimile **+61 2 8594 0499**
 Email **au.environmental.sydney@sgs.com**

SGS Reference **SE261897 R0**
 Date Received **8/3/2024**
 Date Reported **15/3/2024**

COMMENTS

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

SIGNATORIES



Dong LIANG
 Metals/Inorganics Team Leader



Huong CRAWFORD
 Production Manager



Ying Ying ZHANG
 Laboratory Technician



ANALYTICAL RESULTS

SE261897 R0

Total Phenolics in Water [AN295] Tested: 11/3/2024

			Bore 1	Bore 2	Bore 3	Bore 5	Bore 7
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			6/3/2024	6/3/2024	6/3/2024	6/3/2024	6/3/2024
PARAMETER	UOM	LOR	SE261897.001	SE261897.002	SE261897.003	SE261897.004	SE261897.005
Total Phenols	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05



ANALYTICAL RESULTS

SE261897 R0

pH in water [AN101] Tested: 8/3/2024

			Bore 1	Bore 2	Bore 3	Bore 5	Bore 7
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			6/3/2024	6/3/2024	6/3/2024	6/3/2024	6/3/2024
PARAMETER	UOM	LOR	SE261897.001	SE261897.002	SE261897.003	SE261897.004	SE261897.005
pH**	No unit	-	7.3	6.8	6.8	7.0	8.2



ANALYTICAL RESULTS

SE261897 R0

Anions by Ion Chromatography in Water [AN245] Tested: 12/3/2024

			Bore 1	Bore 2	Bore 3	Bore 5	Bore 7
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			6/3/2024	6/3/2024	6/3/2024	6/3/2024	6/3/2024
PARAMETER	UOM	LOR	SE261897.001	SE261897.002	SE261897.003	SE261897.004	SE261897.005
Chloride	mg/L	0.05	140	77	90	350	120
Sulfate, SO4	mg/L	1	35	25	30	55	87
Nitrate Nitrogen, NO3-N	mg/L	0.005	3.1	0.33	0.027	4.1	0.053
Fluoride	mg/L	0.1	<0.10	0.14	0.18	0.15	0.54



ANALYTICAL RESULTS

SE261897 R0

Nitrite in Water [AN277] Tested: 8/3/2024

			Bore 1	Bore 2	Bore 3	Bore 5	Bore 7
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			6/3/2024	6/3/2024	6/3/2024	6/3/2024	6/3/2024
			SE261897.001	SE261897.002	SE261897.003	SE261897.004	SE261897.005
PARAMETER	UOM	LOR					
Nitrite Nitrogen, NO2 as N	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Oxidised Nitrogen, NOx-N	mg/L	0.005	3.1	0.33	0.027	4.1	0.054



ANALYTICAL RESULTS

SE261897 R0

Alkalinity [AN135] Tested: 12/3/2024

			Bore 1	Bore 2	Bore 3	Bore 5	Bore 7
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			6/3/2024	6/3/2024	6/3/2024	6/3/2024	6/3/2024
PARAMETER	UOM	LOR	SE261897.001	SE261897.002	SE261897.003	SE261897.004	SE261897.005
Total Alkalinity as CaCO3	mg/L	5	240	190	220	200	270



ANALYTICAL RESULTS

SE261897 R0

Ammonia Nitrogen by Discrete Analyser [AN291] Tested: 8/3/2024

			Bore 1	Bore 2	Bore 3	Bore 5	Bore 7
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			6/3/2024	6/3/2024	6/3/2024	6/3/2024	6/3/2024
PARAMETER	UOM	LOR	SE261897.001	SE261897.002	SE261897.003	SE261897.004	SE261897.005
Ammonia Nitrogen, NH ₃ as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	0.14



ANALYTICAL RESULTS

SE261897 R0

Total and Volatile Suspended Solids (TSS / VSS) [AN114] Tested: 12/3/2024

			Bore 1	Bore 2	Bore 3	Bore 5	Bore 7
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			6/3/2024	6/3/2024	6/3/2024	6/3/2024	6/3/2024
PARAMETER	UOM	LOR	SE261897.001	SE261897.002	SE261897.003	SE261897.004	SE261897.005
Total Suspended Solids Dried at 103-105°C	mg/L	5	470	120	190	<5	10



ANALYTICAL RESULTS

SE261897 R0

Forms of Carbon [AN190] Tested: 14/3/2024

			Bore 1	Bore 2	Bore 3	Bore 5	Bore 7
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			6/3/2024	6/3/2024	6/3/2024	6/3/2024	6/3/2024
PARAMETER	UOM	LOR	SE261897.001	SE261897.002	SE261897.003	SE261897.004	SE261897.005
Total Organic Carbon as NPOC	mg/L	0.2	2.6	0.9	0.7	0.6	29



ANALYTICAL RESULTS

SE261897 R0

BOD5 [AN183] Tested: 8/3/2024

			Bore 1	Bore 2	Bore 3	Bore 5	Bore 7
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			6/3/2024	6/3/2024	6/3/2024	6/3/2024	6/3/2024
PARAMETER	UOM	LOR	SE261897.001	SE261897.002	SE261897.003	SE261897.004	SE261897.005
Biochemical Oxygen Demand (BOD5)	mg/L	5	<5	<5	<5	<5	<5



ANALYTICAL RESULTS

SE261897 R0

Metals in Water (Dissolved) by ICPOES [AN320] Tested: 11/3/2024

			Bore 1	Bore 2	Bore 3	Bore 5	Bore 7
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			6/3/2024	6/3/2024	6/3/2024	6/3/2024	6/3/2024
PARAMETER	UOM	LOR	SE261897.001	SE261897.002	SE261897.003	SE261897.004	SE261897.005
Calcium, Ca	mg/L	0.1	72	24	22	51	31
Magnesium, Mg	mg/L	0.1	25	19	20	41	28
Potassium, K	mg/L	0.2	2.7	2.4	3.1	4.8	39
Sodium, Na	mg/L	0.1	80	76	99	180	120



ANALYTICAL RESULTS

SE261897 R0

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 13/3/2024

			Bore 1	Bore 2	Bore 3	Bore 5	Bore 7
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			6/3/2024	6/3/2024	6/3/2024	6/3/2024	6/3/2024
			SE261897.001	SE261897.002	SE261897.003	SE261897.004	SE261897.005
PARAMETER	UOM	LOR					
Manganese	mg/L	0.001	0.021	0.050	0.13	0.004	0.009
Iron	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	0.011

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+.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
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
AN183	BOD: Serial dilutions of the sample are firstly combined with various reagents to aid bacterial growth and the sample is incubated for 5 days at 20°C. The difference between the initial and final oxygen contents of the sample is the amount of oxygen consumed by the bacteria. This is related to the organic loading of the sample therefore cBOD is the measure of the digestibility or bioavailability of organic matter in the sample. Reference APHA 5210 B. Internal Reference AN183
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 ₂ 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 ₂ /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 ₂ , NO ₃ and SO ₄ 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
AN277	Nitrite ions, when reacted with a reagent containing sulphanilamide and N-(1-naphthyl)-ethylenediamine dihydrochloride produce a highly coloured azo dye that is measured photometrically at 540nm.
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 660 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).
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.
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 . APHA4500CO ₂ D.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
		IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
***	Indicates that both * and ** apply.	LNR	Sample listed, but not received.		

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 \pm 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:

- 1 Bq is equivalent to 27 pCi
- 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.

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