ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW1803261**	Page	: 1 of 7
Client	: **WOLLONGONG CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: DELLA KUTZNER	Contact	: Glenn Davies
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Telephone	: +61 02 4227 7111	Telephone	: 02 42253125
Project	: Whytes Gully Stage 3 Bores Quarterly	Date Samples Received	: 14-Aug-2018 15:20
Order number	: 3071587	Date Analysis Commenced	: 14-Aug-2018
C-O-C number	: ----	Issue Date	: 23-Aug-2018 14:51
Sampler	: Robert DaLio		
Site	: Whytes Gully LANDFILL		
Quote number	: SY/454/14 Tender		
No. of samples received	: 13		
No. of samples analysed	: 13		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Field tests completed on day of sampling/receipt.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GMW102 (Point 9)	GMW103 (Point 10)	GMW104 (Point 11)	GMW105 (Point 12)	GMW106 (Point 13)
			Client sampling date / time	14-Aug-2018 12:25	14-Aug-2018 12:30	14-Aug-2018 12:05	14-Aug-2018 12:40	14-Aug-2018 12:45
Compound	CAS Number	LOR	Unit	EW1803261-001	EW1803261-002	EW1803261-003	EW1803261-004	EW1803261-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	----	7.1	7.4	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	2160	1360	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	1280	774	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	430	481	----	----
Total Alkalinity as CaCO3	----	1	mg/L	----	430	481	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	139	65	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	----	482	120	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	----	194	63	----	----
Magnesium	7439-95-4	1	mg/L	----	63	38	----	----
Sodium	7440-23-5	1	mg/L	----	162	162	----	----
Potassium	7440-09-7	1	mg/L	----	<1	<1	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	----	----	7.56	----	----
Barium	7440-39-3	0.001	mg/L	----	----	0.041	----	----
Cadmium	7440-43-9	0.0001	mg/L	----	----	<0.0001	----	----
Cobalt	7440-48-4	0.001	mg/L	----	----	0.005	----	----
Chromium	7440-47-3	0.001	mg/L	----	----	0.004	----	----
Copper	7440-50-8	0.001	mg/L	----	----	0.010	----	----
Manganese	7439-96-5	0.001	mg/L	----	----	0.392	----	----
Lead	7439-92-1	0.001	mg/L	----	----	0.004	----	----
Zinc	7440-66-6	0.005	mg/L	----	----	0.023	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	----	0.06	0.03	----	----
EN67 PK: Field Tests								
Field Observations	----	0.01	--	DRY	----	----	DRY	DRY

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	GMW102 (Point 9)	GMW103 (Point 10)	GMW104 (Point 11)	GMW105 (Point 12)	GMW106 (Point 13)
				Client sampling date / time	14-Aug-2018 12:25	14-Aug-2018 12:30	14-Aug-2018 12:05	14-Aug-2018 12:40	14-Aug-2018 12:45
Compound	CAS Number	LOR	Unit		EW1803261-001	EW1803261-002	EW1803261-003	EW1803261-004	EW1803261-005
					Result	Result	Result	Result	Result
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**----**	**2**	**2**	**----**	**----**
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		**----**	**3.85**	**3.32**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GMW108S (Point 14)	GMW108D (Point 15)	GMW109S (Point 16)	GMW109D (Point 19)	GMW110 (Point 17)
			Client sampling date / time	14-Aug-2018 14:10	14-Aug-2018 14:25	14-Aug-2018 13:40	14-Aug-2018 13:50	14-Aug-2018 13:25
Compound	CAS Number	LOR	Unit	EW1803261-006	EW1803261-007	EW1803261-008	EW1803261-009	EW1803261-010
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.0	7.0	6.2	6.9	6.8
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	2770	3160	1630	1820	4370
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	1380	1670	886	1040	2460
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	447	470	211	234	610
Total Alkalinity as CaCO3	----	1	mg/L	447	470	211	234	610
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	165	189	95	25	324
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	577	673	368	359	1910
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	112	128	77	92	204
Magnesium	7439-95-4	1	mg/L	75	82	49	48	153
Sodium	7440-23-5	1	mg/L	313	405	157	186	454
Potassium	7440-09-7	1	mg/L	2	2	2	1	1
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	----	----	3.70	----	----
Barium	7440-39-3	0.001	mg/L	----	----	0.268	----	----
Cadmium	7440-43-9	0.0001	mg/L	----	----	0.0002	----	----
Cobalt	7440-48-4	0.001	mg/L	----	----	0.044	----	----
Chromium	7440-47-3	0.001	mg/L	----	----	0.004	----	----
Copper	7440-50-8	0.001	mg/L	----	----	0.018	----	----
Manganese	7439-96-5	0.001	mg/L	----	----	4.62	----	----
Lead	7439-92-1	0.001	mg/L	----	----	0.017	----	----
Zinc	7440-66-6	0.005	mg/L	----	----	0.109	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.16	0.02	0.55	0.09	0.02
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	4	3	5	<1	2

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)	Client sample ID	GMW108S (Point 14)	GMW108D (Point 15)	GMW109S (Point 16)	GMW109D (Point 19)	GMW110 (Point 17)
	Client sampling date / time	14-Aug-2018 14:10	14-Aug-2018 14:25	14-Aug-2018 13:40	14-Aug-2018 13:50	14-Aug-2018 13:25
Compound	CAS Number / LOR / Unit	EW1803261-006	EW1803261-007	EW1803261-008	EW1803261-009	EW1803261-010
		Result	Result	Result	Result	Result
FWI-EN/001: Groundwater Sampling - Depth						
Depth	---- / 0.01 / m	**3.22**	**2.74**	**3.58**	**3.38**	**4.47**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GMW111 (Point 18)	GABH02 (Point 5)	BH6 (Point 20)	----	----
			Client sampling date / time	14-Aug-2018 13:10	14-Aug-2018 11:45	14-Aug-2018 11:30	----	----
Compound	CAS Number	LOR	Unit	EW1803261-011	EW1803261-012	EW1803261-013	--------	--------
				Result	Result	Result	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.0	6.8	6.9	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	3490	5420	5060	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	1930	2830	2520	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	523	1100	728	----	----
Total Alkalinity as CaCO3	----	1	mg/L	523	1100	728	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	217	166	270	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	800	1180	1120	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	126	295	118	----	----
Magnesium	7439-95-4	1	mg/L	99	181	119	----	----
Sodium	7440-23-5	1	mg/L	420	583	747	----	----
Potassium	7440-09-7	1	mg/L	1	2	<1	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.20	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	1	6	6	----	----
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	5.88	5.58	2.03	----	----