

CERTIFICATE OF ANALYSIS

Work Order : **EW2103477**
Client : **WOLLONGONG CITY COUNCIL**
Contact : DELLA KUTZNER
Address : 41 BURELLI STREET
 WOLLONGONG NSW, AUSTRALIA 2500
Telephone : +61 02 4227 7111
Project : Whytes Gully Stage 3 Bores Quarterly
Order number : 1033040
C-O-C number : ----
Sampler : Robert DaLio
Site : ----
Quote number : WO/005/18 TENDER
No. of samples received : 13
No. of samples analysed : 13

Page : 1 of 8
Laboratory : Environmental Division NSW South Coast
Contact : Aneta Prosaroski
Address : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia

Telephone : 02 42253125
Date Samples Received : 16-Aug-2021 15:34
Date Analysis Commenced : 16-Aug-2021
Issue Date : 24-Aug-2021 12:13



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. 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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW



General Comments

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling and groundwater depth measurements completed by ALS Wollongong via inhouse sampling method EN/67.11 Groundwater Sampling Via Bailer Method.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- 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)				Sample ID	GMW102 (Point 9)	GMW103 (Point 10)	GMW104 (Point 11)	GMW105 (Point 12)	GMW106 (Point 13)
Sampling date / time				16-Aug-2021 13:55	16-Aug-2021 14:15	16-Aug-2021 13:30	16-Aug-2021 14:35	16-Aug-2021 14:40	
Compound	CAS Number	LOR	Unit	EW2103477-001	EW2103477-002	EW2103477-003	EW2103477-004	EW2103477-005	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	----	7.0	7.2	5.8	----	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	1680	973	245	----	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	----	1080	648	230	----	
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	----	571	400	47	----	
Total Alkalinity as CaCO3	----	1	mg/L	----	571	400	47	----	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	97	52	13	----	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	----	188	88	42	----	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	----	130	49	7	----	
Magnesium	7439-95-4	1	mg/L	----	52	29	3	----	
Sodium	7440-23-5	1	mg/L	----	172	132	37	----	
Potassium	7440-09-7	1	mg/L	----	<1	<1	<1	----	
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	----	----	7.32	----	----	
Barium	7440-39-3	0.001	mg/L	----	----	0.048	----	----	
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	----	----	0.012	----	----	
Manganese	7439-96-5	0.001	mg/L	----	----	0.454	----	----	
Lead	7439-92-1	0.001	mg/L	----	----	0.005	----	----	
Zinc	7440-66-6	0.005	mg/L	----	----	0.020	----	----	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	----	<0.01	0.01	0.02	----	
EN67 PK: Field Tests									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GMW102 (Point 9)	GMW103 (Point 10)	GMW104 (Point 11)	GMW105 (Point 12)	GMW106 (Point 13)
Sampling date / time					16-Aug-2021 13:55	16-Aug-2021 14:15	16-Aug-2021 13:30	16-Aug-2021 14:35	16-Aug-2021 14:40
Compound	CAS Number	LOR	Unit		EW2103477-001	EW2103477-002	EW2103477-003	EW2103477-004	EW2103477-005
					Result	Result	Result	Result	Result
EN67 PK: Field Tests - Continued									
Field Observations	----	0.01	--		DRY	----	----	----	DRY
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		----	3	3	4	----
QWI-EN 67.11 Sampling of Groundwaters									
Depth	----	0.01	m		----	7.68	7.07	11.3	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GMW108S (Point 14)	GMW108D (Point 15)	GMW109S (Point 16)	GMW109D (Point 19)	GMW110 (Point 17)
Sampling date / time				16-Aug-2021 10:40	16-Aug-2021 11:05	16-Aug-2021 09:30	16-Aug-2021 09:45	16-Aug-2021 09:00	
Compound	CAS Number	LOR	Unit	EW2103477-006	EW2103477-007	EW2103477-008	EW2103477-009	EW2103477-010	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	6.7	6.6	6.1	6.8	6.6	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	2400	3160	1290	1920	4100	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	1450	1900	962	1730	2620	
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	451	564	229	260	653	
Total Alkalinity as CaCO3	----	1	mg/L	451	564	229	260	653	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	154	205	158	25	341	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	518	714	235	512	901	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	115	135	70	105	202	
Magnesium	7439-95-4	1	mg/L	75	88	41	55	154	
Sodium	7440-23-5	1	mg/L	304	447	112	213	494	
Potassium	7440-09-7	1	mg/L	4	2	1	1	2	
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	----	----	1.24	----	----	
Barium	7440-39-3	0.001	mg/L	----	----	0.141	----	----	
Cadmium	7440-43-9	0.0001	mg/L	----	----	0.0004	----	----	
Cobalt	7440-48-4	0.001	mg/L	----	----	0.026	----	----	
Chromium	7440-47-3	0.001	mg/L	----	----	0.001	----	----	
Copper	7440-50-8	0.001	mg/L	----	----	0.014	----	----	
Manganese	7439-96-5	0.001	mg/L	----	----	2.95	----	----	
Lead	7439-92-1	0.001	mg/L	----	----	0.011	----	----	
Zinc	7440-66-6	0.005	mg/L	----	----	0.055	----	----	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.14	0.02	0.30	0.10	<0.01	
EP005: Total Organic Carbon (TOC)									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GMW108S (Point 14)	GMW108D (Point 15)	GMW109S (Point 16)	GMW109D (Point 19)	GMW110 (Point 17)
Sampling date / time					16-Aug-2021 10:40	16-Aug-2021 11:05	16-Aug-2021 09:30	16-Aug-2021 09:45	16-Aug-2021 09:00
Compound	CAS Number	LOR	Unit		EW2103477-006	EW2103477-007	EW2103477-008	EW2103477-009	EW2103477-010
					Result	Result	Result	Result	Result
EP005: Total Organic Carbon (TOC) - Continued									
Total Organic Carbon	----	1	mg/L		4	2	4	4	2
QWI-EN 67.11 Sampling of Groundwaters									
Depth	----	0.01	m		2.83	2.26	3.42	3.09	4.13



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GMW111 (Point 18)	GABH02 (Point 5)	BH6 (Point 20)	----	----
Sampling date / time				16-Aug-2021 08:30	16-Aug-2021 11:45	16-Aug-2021 10:15	----	----	
Compound	CAS Number	LOR	Unit	EW2103477-011	EW2103477-012	EW2103477-013	-----	-----	
				Result	Result	Result	----	----	
EA005FD: Field pH									
pH	----	0.1	pH Unit	7.2	6.7	7.0	----	----	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	3500	4150	1890	----	----	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	2150	2410	1260	----	----	
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	766	985	694	----	----	
Total Alkalinity as CaCO3	----	1	mg/L	766	985	694	----	----	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	171	126	68	----	----	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	810	842	272	----	----	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	132	227	73	----	----	
Magnesium	7439-95-4	1	mg/L	112	134	49	----	----	
Sodium	7440-23-5	1	mg/L	502	499	308	----	----	
Potassium	7440-09-7	1	mg/L	2	18	2	----	----	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.48	0.37	0.34	----	----	
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L	6	10	2	----	----	
QWI-EN 67.11 Sampling of Groundwaters									
Depth	----	0.01	m	6.32	4.91	1.63	----	----	

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Work Order : EW2103477
Client : WOLLONGONG CITY COUNCIL
Project : Whytes Gully Stage 3 Bores Quarterly



Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED041G: Sulfate (Turbidimetric) as SO₄²⁻ by DA

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

(WATER) EA015: Total Dissolved Solids dried at 180 ± 5 °C

(WATER) EG020T: Total Metals by ICP-MS