

## CERTIFICATE OF ANALYSIS

**Work Order** : **EW2005149**  
**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** : 1021509  
**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 7  
**Laboratory** : Environmental Division NSW South Coast  
**Contact** : Glenn Davies  
**Address** : 1/19 Ralph Black Dr, North Wollongong 2500  
 4/13 Geary Pl, North Nowra 2541  
 Australia NSW Australia  
**Telephone** : 02 42253125  
**Date Samples Received** : 16-Nov-2020 14:35  
**Date Analysis Commenced** : 16-Nov-2020  
**Issue Date** : 24-Nov-2020 10:55



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, 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
Ashesh Patel	Senior Chemist	Sydney Inorganics, Smithfield, NSW
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, 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 sample 4 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.
- 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-Nov-2020 11:10	16-Nov-2020 11:30	16-Nov-2020 10:55	16-Nov-2020 11:40	16-Nov-2020 12:07	
Compound	CAS Number	LOR	Unit	EW2005149-001	EW2005149-002	EW2005149-003	EW2005149-004	EW2005149-005	
				Result	Result	Result	Result	Result	
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit	6.9	7.2	7.2	5.8	----	
<b>EA010FD: Field Conductivity</b>									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	360	1540	898	271	----	
<b>EA015: Total Dissolved Solids</b>									
Total Dissolved Solids @180°C	----	10	mg/L	260	904	526	290	----	
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	168	701	383	44	----	
Total Alkalinity as CaCO3	----	1	mg/L	168	701	383	44	----	
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	14	99	37	12	----	
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	29	104	66	48	----	
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	29	112	46	8	----	
Magnesium	7439-95-4	1	mg/L	10	50	27	4	----	
Sodium	7440-23-5	1	mg/L	30	159	118	36	----	
Potassium	7440-09-7	1	mg/L	<1	<1	<1	<1	----	
<b>EG020T: Total Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	----	----	4.28	----	----	
Barium	7440-39-3	0.001	mg/L	----	----	0.021	----	----	
Cadmium	7440-43-9	0.0001	mg/L	----	----	<0.0001	----	----	
Cobalt	7440-48-4	0.001	mg/L	----	----	0.003	----	----	
Chromium	7440-47-3	0.001	mg/L	----	----	0.003	----	----	
Copper	7440-50-8	0.001	mg/L	----	----	0.007	----	----	
Manganese	7439-96-5	0.001	mg/L	----	----	0.260	----	----	
Lead	7439-92-1	0.001	mg/L	----	----	0.003	----	----	
Zinc	7440-66-6	0.005	mg/L	----	----	0.016	----	----	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----	
<b>EN67 PK: Field Tests</b>									



**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-Nov-2020 11:10	16-Nov-2020 11:30	16-Nov-2020 10:55	16-Nov-2020 11:40	16-Nov-2020 12:07
Compound	CAS Number	LOR	Unit		EW2005149-001	EW2005149-002	EW2005149-003	EW2005149-004	EW2005149-005
				Result	Result	Result	Result	Result	Result
<b>EN67 PK: Field Tests - Continued</b>									
Field Observations	----	0.01	--	----	----	----	----	----	DRY
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L	3	2	4	3	----	
<b>FWI-EN/001: Groundwater Sampling - Depth</b>									
Depth	----	0.01	m	7.15	6.52	7.04	10.1	----	



## 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-Nov-2020 10:10	16-Nov-2020 10:17	16-Nov-2020 09:20	16-Nov-2020 09:30	16-Nov-2020 09:05	
Compound	CAS Number	LOR	Unit	EW2005149-006	EW2005149-007	EW2005149-008	EW2005149-009	EW2005149-010	
				Result	Result	Result	Result	Result	
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit	6.8	6.8	7.4	6.9	6.6	
<b>EA010FD: Field Conductivity</b>									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	698	3120	1840	1930	4270	
<b>EA015: Total Dissolved Solids</b>									
Total Dissolved Solids @180°C	----	10	mg/L	486	1840	1200	1240	2670	
<b>ED037P: Alkalinity by PC Titrator</b>									
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	226	491	389	253	680	
Total Alkalinity as CaCO3	----	1	mg/L	226	491	389	253	680	
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	24	194	237	25	328	
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	79	677	301	515	946	
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	40	133	117	106	214	
Magnesium	7439-95-4	1	mg/L	17	80	64	52	153	
Sodium	7440-23-5	1	mg/L	80	382	174	194	466	
Potassium	7440-09-7	1	mg/L	5	2	2	1	2	
<b>EG020T: Total Metals by ICP-MS</b>									
Aluminium	7429-90-5	0.01	mg/L	----	----	6.24	----	----	
Barium	7440-39-3	0.001	mg/L	----	----	0.177	----	----	
Cadmium	7440-43-9	0.0001	mg/L	----	----	0.0005	----	----	
Cobalt	7440-48-4	0.001	mg/L	----	----	0.047	----	----	
Chromium	7440-47-3	0.001	mg/L	----	----	0.008	----	----	
Copper	7440-50-8	0.001	mg/L	----	----	0.025	----	----	
Manganese	7439-96-5	0.001	mg/L	----	----	6.07	----	----	
Lead	7439-92-1	0.001	mg/L	----	----	0.007	----	----	
Zinc	7440-66-6	0.005	mg/L	----	----	0.056	----	----	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	0.08	0.02	0.31	0.10	<0.01	
<b>EP005: Total Organic Carbon (TOC)</b>									



### 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-Nov-2020 10:10	16-Nov-2020 10:17	16-Nov-2020 09:20	16-Nov-2020 09:30	16-Nov-2020 09:05
Compound	CAS Number	LOR	Unit		EW2005149-006	EW2005149-007	EW2005149-008	EW2005149-009	EW2005149-010
					Result	Result	Result	Result	Result
<b>EP005: Total Organic Carbon (TOC) - Continued</b>									
Total Organic Carbon	----	1	mg/L		7	2	11	<1	<1
<b>FWI-EN/001: Groundwater Sampling - Depth</b>									
Depth	----	0.01	m		2.62	2.17	3.10	2.91	3.95



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GMW111 (Point 18)	GABH02 (Point 5)	BH6 (Point 20)	----	----
Sampling date / time				16-Nov-2020 09:00	16-Nov-2020 10:35	16-Nov-2020 09:50	----	----	
Compound	CAS Number	LOR	Unit	EW2005149-011 Result	EW2005149-012 Result	EW2005149-013 Result	-----	-----	
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit	7.1	6.7	7.0	----	----	
<b>EA010FD: Field Conductivity</b>									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	3420	5480	1120	----	----	
<b>EA015: Total Dissolved Solids</b>									
Total Dissolved Solids @180°C	----	10	mg/L	2060	3350	732	----	----	
<b>ED037P: Alkalinity by PC Titrator</b>									
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	650	1250	465	----	----	
Total Alkalinity as CaCO3	----	1	mg/L	650	1250	465	----	----	
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	194	168	37	----	----	
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	753	1180	109	----	----	
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	135	312	66	----	----	
Magnesium	7439-95-4	1	mg/L	100	186	30	----	----	
Sodium	7440-23-5	1	mg/L	455	605	141	----	----	
Potassium	7440-09-7	1	mg/L	2	3	5	----	----	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	0.28	0.04	0.40	----	----	
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L	<1	10	23	----	----	
<b>FWI-EN/001: Groundwater Sampling - Depth</b>									
Depth	----	0.01	m	6.51	5.08	1.40	----	----	