



Environmental

## CERTIFICATE OF ANALYSIS

Work Order	: <b>EW1401444</b>	Page	: 1 of 7
Client	: <b>WOLLONGONG CITY COUNCIL</b>	Laboratory	: Environmental Division NSW South Coast
Contact	: MR WAYDE PETERSON	Contact	: Glenn Davies
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Project	: Whytes Gully Stage 3 Bores & Surface Water	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 3015425	Date Samples Received	: 12-MAY-2014
C-O-C number	: ----	Issue Date	: 19-MAY-2014
Sampler	: Glenn Davies	No. of samples received	: 23
Site	: ----	No. of samples analysed	: 23
Quote number	: WL/090/11 Stage 3		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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Environmental 

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## 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

- **EA015 : TDS result has been confirmed by re-analysis for sample ID Leachate and GMW102**
- **ED041G: Sulfate result for sample ID (Leachate) from ICPAES due to sample matrix. Ref. 4104368**
- **EP005: Nonpurgeable Organic Carbon has been analysed for sample ID GMW110 due to high Inorganic Carbon content.**
- **Sampling and sample data supplied by ALS Wollongong.**
- **Site - GABHO1 found destroyed at time of sampling.**



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Accredited for compliance with  
ISO/IEC 17025.

## Signatories

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

### Signatories

### Position

### Accreditation Category

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Sydney Inorganics

Ashesh Patel

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Glenn Davies

Environmental Services Representative

Laboratory - Wollongong

Hoa Nguyen

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Shobhna Chandra

Metals Coordinator

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## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

				GMW102	GMW103	GMW104	GMW105	GMW108S
				12-MAY-2014 12:40	12-MAY-2014 12:05	12-MAY-2014 12:50	12-MAY-2014 12:25	12-MAY-2014 13:50
				EW1401444-001	EW1401444-002	EW1401444-003	EW1401444-004	EW1401444-005
Compound	CAS Number	LOR	Unit					
<b>EA015: Total Dissolved Solids</b>								
Total Dissolved Solids @180°C	----	10	mg/L	----	1320	357	125	1150
Total Dissolved Solids @180°C	----	10	mg/L	411	----	----	----	----
<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	271	436	320	44	494
Total Alkalinity as CaCO3	----	1	mg/L	271	436	320	44	494
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	22	149	41	14	127
<b>ED045G: Chloride Discrete analyser</b>								
Chloride	16887-00-6	1	mg/L	24	486	58	38	424
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	56	204	44	4	84
Magnesium	7439-95-4	1	mg/L	17	73	24	2	64
Sodium	7440-23-5	1	mg/L	47	168	99	42	295
Potassium	7440-09-7	1	mg/L	<1	1	<1	<1	1
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.27	0.17	<0.01	0.06
<b>EN055: Ionic Balance</b>								
Total Anions	----	0.01	meq/L	6.55	25.5	8.88	2.24	24.5
Total Cations	----	0.01	meq/L	6.24	23.5	8.48	2.19	22.3
Ionic Balance	----	0.01	%	2.44	4.07	2.36	----	4.63
<b>EN67 PK: Field Tests</b>								
pH	----	0.1	pH Unit	7.3	6.9	7.2	5.7	6.8
Electrical Conductivity (Non Compensated)	----	1	µS/cm	594	2380	915	250	3460
Depth	----	0.01	m	10.57	7.65	7.14	10.55	2.66
<b>EP005: Total Organic Carbon (TOC)</b>								
Total Organic Carbon	----	1	mg/L	4	2	4	4	7



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				GMW108D	GMW109S	GMW109D	GMW110	GMW111
				12-MAY-2014 13:45	12-MAY-2014 10:39	12-MAY-2014 10:40	12-MAY-2014 11:23	12-MAY-2014 11:05
Compound	CAS Number	LOR	Unit	EW1401444-006	EW1401444-007	EW1401444-008	EW1401444-009	EW1401444-010
<b>EA015: Total Dissolved Solids</b>								
Total Dissolved Solids @180°C	----	10	mg/L	1560	1290	769	2130	1270
<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	509	980	249	623	483
Total Alkalinity as CaCO3	----	1	mg/L	509	980	249	623	483
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	216	190	28	319	123
<b>ED045G: Chloride Discrete analyser</b>								
Chloride	16887-00-6	1	mg/L	659	180	388	841	504
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	128	274	85	191	90
Magnesium	7439-95-4	1	mg/L	91	60	45	155	73
Sodium	7440-23-5	1	mg/L	392	161	174	435	326
Potassium	7440-09-7	1	mg/L	1	13	2	2	1
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	0.15	5.98	0.14	0.05	0.03
<b>EN055: Ionic Balance</b>								
Total Anions	----	0.01	meq/L	33.3	28.6	16.5	42.8	26.4
Total Cations	----	0.01	meq/L	31.0	26.0	15.6	41.3	24.7
Ionic Balance	----	0.01	%	3.60	4.88	2.92	1.85	3.39
<b>EN67 PK: Field Tests</b>								
pH	----	0.1	pH Unit	6.9	7.0	7.4	6.9	7.2
Electrical Conductivity (Non Compensated)	----	1	µS/cm	3300	2400	1680	4060	2570
Depth	----	0.01	m	2.15	3.32	2.86	4.06	6.10
<b>EP005: Total Organic Carbon (TOC)</b>								
Total Organic Carbon	----	1	mg/L	1	38	1	----	1
Nonpurgeable Organic Carbon	----	1	mg/L	----	----	----	2	----



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				GABH01	GABH02	GABH03	GABH06S	GABH06D
				12-MAY-2014 11:50	12-MAY-2014 12:55	12-MAY-2014 13:20	12-MAY-2014 11:34	12-MAY-2014 11:40
Compound	CAS Number	LOR	Unit	EW1401444-011	EW1401444-012	EW1401444-013	EW1401444-014	EW1401444-015
<b>EA015: Total Dissolved Solids</b>								
Total Dissolved Solids @180°C	----	10	mg/L	----	2800	2910	1420	1660
<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	----	1090	738	396	364
Total Alkalinity as CaCO3	----	1	mg/L	----	1090	738	396	364
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	187	224	204	209
<b>ED045G: Chloride Discrete analyser</b>								
Chloride	16887-00-6	1	mg/L	----	1150	1240	579	660
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	----	310	347	78	111
Magnesium	7439-95-4	1	mg/L	----	199	210	72	70
Sodium	7440-23-5	1	mg/L	----	566	464	392	402
Potassium	7440-09-7	1	mg/L	----	3	2	<1	1
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	----	0.02	0.07	0.06	0.01
<b>EN055: Ionic Balance</b>								
Total Anions	----	0.01	meq/L	----	58.1	54.4	28.5	30.2
Total Cations	----	0.01	meq/L	----	56.5	54.8	26.9	28.8
Ionic Balance	----	0.01	%	----	1.37	0.42	2.95	2.43
<b>EN67 PK: Field Tests</b>								
pH	----	0.1	pH Unit	----	6.6	6.6	7.2	7.2
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	5350	5470	2810	3110
Depth	----	0.01	m	----	4.79	0.38	2.24	1.64
Field Observations	----	0.01	--	DESTROYED	----	----	----	----
<b>EP005: Total Organic Carbon (TOC)</b>								
Total Organic Carbon	----	1	mg/L	----	5	4	2	1



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				BH6	Surface Water 1	Surface Water 2	Surface Water 3	Surface Water 4
				12-MAY-2014 14:10	12-MAY-2014 10:30	12-MAY-2014 09:50	12-MAY-2014 09:25	12-MAY-2014 10:10
Compound	CAS Number	LOR	Unit	EW1401444-016	EW1401444-017	EW1401444-018	EW1401444-019	EW1401444-020
<b>EA015: Total Dissolved Solids</b>								
Total Dissolved Solids @180°C	----	10	mg/L	2500	669	560	267	278
<b>EA025: Suspended Solids</b>								
Suspended Solids (SS)	----	5	mg/L	----	35	6	<5	<5
<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	816	279	295	139	151
Total Alkalinity as CaCO3	----	1	mg/L	816	279	295	139	151
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	302	49	26	27	23
<b>ED045G: Chloride Discrete analyser</b>								
Chloride	16887-00-6	1	mg/L	1020	240	150	45	47
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	120	59	44	30	30
Magnesium	7439-95-4	1	mg/L	130	34	26	16	16
Sodium	7440-23-5	1	mg/L	760	143	112	38	40
Potassium	7440-09-7	1	mg/L	1	9	16	3	4
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	0.12	0.34	0.29	0.05	0.02
<b>EN055: Ionic Balance</b>								
Total Anions	----	0.01	meq/L	51.4	13.4	10.7	4.61	4.82
Total Cations	----	0.01	meq/L	49.8	12.2	9.62	4.54	4.66
Ionic Balance	----	0.01	%	1.60	4.59	5.19	0.72	1.75
<b>EN67 PK: Field Tests</b>								
pH	----	0.1	pH Unit	6.8	7.7	7.8	7.6	7.5
Electrical Conductivity (Non Compensated)	----	1	µS/cm	4960	1280	1040	488	501
Depth	----	0.01	m	1.47	----	----	----	----
<b>EP005: Total Organic Carbon (TOC)</b>								
Total Organic Carbon	----	1	mg/L	2	6	12	2	3



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

				Surface Water 5	Surface Water 6	Leachate	----	----
				12-MAY-2014 10:05	12-MAY-2014 10:50	12-MAY-2014 14:00	----	----
				EW1401444-021	EW1401444-022	EW1401444-023	----	----
Compound	CAS Number	LOR	Unit					
<b>EA015: Total Dissolved Solids</b>								
Total Dissolved Solids @180°C	----	10	mg/L	270	327	8160	----	----
<b>EA025: Suspended Solids</b>								
Suspended Solids (SS)	----	5	mg/L	<5	<5	8	----	----
<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	388	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	151	178	7660	----	----
Total Alkalinity as CaCO3	----	1	mg/L	151	178	8050	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	21	38	79	----	----
<b>ED045G: Chloride Discrete analyser</b>								
Chloride	16887-00-6	1	mg/L	47	61	2920	----	----
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	29	44	28	----	----
Magnesium	7439-95-4	1	mg/L	16	20	60	----	----
Sodium	7440-23-5	1	mg/L	41	42	2150	----	----
Potassium	7440-09-7	1	mg/L	4	4	750	----	----
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.03	1750	----	----
<b>EN055: Ionic Balance</b>								
Total Anions	----	0.01	meq/L	4.78	6.07	245	----	----
Total Cations	----	0.01	meq/L	4.65	5.77	----	----	----
Total Cations	----	0.01	meq/L	----	----	244	----	----
Ionic Balance	----	0.01	%	1.39	2.51	----	----	----
Ionic Balance	----	0.01	%	----	----	0.20	----	----
<b>EN67 PK: Field Tests</b>								
pH	----	0.1	pH Unit	7.3	7.8	8.1	----	----
Electrical Conductivity (Non Compensated)	----	1	µS/cm	497	596	22200	----	----
<b>EP005: Total Organic Carbon (TOC)</b>								
Total Organic Carbon	----	1	mg/L	3	2	1290	----	----