CERTIFICATE OF ANALYSIS

Work Order	: **EW1510370**	Page	: 1 of 6
Client	: **WOLLONGONG CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
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Project	: Whytes Gully Groundwater Quarterly	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 3032573	Date Samples Received	: 25-May-2015 14:20
C-O-C number	: ----	Date Analysis Commenced	: 25-May-2015
Sampler	: Craig Wilson	Issue Date	: 03-Jun-2015 17:06
Site	: ----		
		No. of samples received	: 17
Quote number	: ----	No. of samples analysed	: 17

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

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.

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.

- ED093F: Results have been confirmed by reanalysis.
- Site GMW106 (Point 13) - Dry at time of sampling.
- Site GABH01 (Point 2) - Found destroyed at time of sampling.
- Ionic Balance out of acceptable limits due to analytes not quantified in this report.
- Field tests completed on day of sampling/receipt.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	GMW102 (Point 9)	GMW103 (Point 10)	GMW104 (Point 11)	GMW105 (Point 12)	GMW106 (Point 13)
				Client sampling date / time	25-May-2015 11:00	25-May-2015 11:15	25-May-2015 10:45	25-May-2015 11:30	25-May-2015 11:35
					EW1510370-001	EW1510370-002	EW1510370-003	EW1510370-004	EW1510370-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**7.1**	**7.0**	**7.1**	**5.7**	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**516**	**2530**	**529**	**282**	----
EA015: Total Dissolved Solids									
^ **Total Dissolved Solids @180°C**	----	10	mg/L		**300**	**988**	**260**	**221**	----
ED037P: Alkalinity by PC Titrator									
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		**210**	**432**	**159**	**32**	----
Total Alkalinity as CaCO3	----	1	mg/L		**210**	**432**	**159**	**32**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**13**	**129**	**30**	**15**	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**19**	**320**	**34**	**42**	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**62**	**181**	**26**	**7**	----
Magnesium	7439-95-4	1	mg/L		**14**	**64**	**19**	**4**	----
Sodium	7440-23-5	1	mg/L		**27**	**176**	**57**	**40**	----
Potassium	7440-09-7	1	mg/L		<1	<1	<1	<1	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.04**	**0.05**	**0.06**	**0.14**	----
EN055: Ionic Balance									
^ **Total Anions**	----	0.01	meq/L		**5.00**	**20.3**	**4.76**	**2.14**	----
^ **Total Cations**	----	0.01	meq/L		**5.42**	**22.0**	**5.34**	**2.42**	----
^ **Ionic Balance**	----	0.01	%		**4.02**	**3.82**	**5.72**	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	----	----	----	**DRY**
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**2**	**2**	**2**	**1**	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		**10.59**	**7.25**	**6.95**	**10.16**	----

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	GMW108S (Point 14)	GMW108D (Point 15)	GMW109S (Point 16)	GMW109D (Point 19)	GMW110 (Point 17)
				Client sampling date / time	25-May-2015 12:35	25-May-2015 12:45	25-May-2015 08:25	25-May-2015 08:35	25-May-2015 09:05
					EW1510370-006	EW1510370-007	EW1510370-008	EW1510370-009	EW1510370-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**6.8**	**7.4**	**6.3**	**7.4**	**6.8**
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**1590**	**3030**	**1380**	**1750**	**4100**
EA015: Total Dissolved Solids									
^ **Total Dissolved Solids @180°C**	----	10	mg/L		**692**	**1660**	**686**	**834**	**2160**
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		**440**	**453**	**239**	**218**	**566**
Total Alkalinity as CaCO3	----	1	mg/L		**440**	**453**	**239**	**218**	**566**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**42**	**205**	**100**	**26**	**319**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**109**	**615**	**228**	**388**	**816**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**37**	**153**	**77**	**104**	**220**
Magnesium	7439-95-4	1	mg/L		**22**	**100**	**42**	**52**	**170**
Sodium	7440-23-5	1	mg/L		**230**	**433**	**158**	**187**	**494**
Potassium	7440-09-7	1	mg/L		**3**	**3**	**2**	**1**	**2**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.04**	**0.01**	**0.54**	**0.13**	<0.01
EN055: Ionic Balance									
^ **Total Anions**	----	0.01	meq/L		**12.7**	**30.7**	**13.3**	**15.8**	**41.0**
^ **Total Cations**	----	0.01	meq/L		**13.7**	**34.8**	**14.2**	**17.6**	**46.5**
^ **Ionic Balance**	----	0.01	%		**3.73**	**6.27**	**3.39**	**5.34**	**6.33**
EN67 PK: Field Tests									
Field Observations	----	0.01	--		**----**	**----**	**----**	**----**	**----**
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**9**	**2**	**7**	<1	**5**
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		**2.52**	**2.02**	**3.04**	**2.74**	**3.93**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	GMW111 (Point 18)	GABH01 (Point 2)	GABH02 (Point 5)	GABH03 (Point 6)	GABH06S (Point 7)
				Client sampling date / time	25-May-2015 08:50	25-May-2015 11:40	25-May-2015 10:30	25-May-2015 09:50	25-May-2015 12:15
Compound	CAS Number	LOR	Unit		EW1510370-011	EW1510370-012	EW1510370-013	EW1510370-014	EW1510370-015
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.1	----	6.6	6.9	7.4
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		2530	----	5440	5450	3120
EA015: Total Dissolved Solids									
^ Total Dissolved Solids @180°C	----	10	mg/L		1300	----	2900	3130	1600
ED037P: Alkalinity by PC Titrator									
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		430	----	987	617	398
Total Alkalinity as CaCO3	----	1	mg/L		430	----	987	617	398
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		112	----	174	207	218
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		473	----	1070	1200	586
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		97	----	302	338	91
Magnesium	7439-95-4	1	mg/L		77	----	199	214	80
Sodium	7440-23-5	1	mg/L		347	----	602	496	452
Potassium	7440-09-7	1	mg/L		1	----	3	2	<1
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.02	----	0.03	0.03	0.02
EN055: Ionic Balance									
^ Total Anions	----	0.01	meq/L		24.3	----	53.5	50.5	29.0
^ Total Cations	----	0.01	meq/L		26.3	----	57.7	56.1	30.8
^ Ionic Balance	----	0.01	%		4.00	----	3.76	5.28	2.93
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DESTROYED	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		2	----	6	5	2
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		6.08	----	4.77	0.49	2.20

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	GABH06D (Point 8)	BH6 (Point 20)	----	----	----
			Client sampling date / time	25-May-2015 12:25	25-May-2015 09:20	----	----	----
Compound	CAS Number	LOR	Unit	EW1510370-016	EW1510370-017	--------	--------	--------
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.3	6.8	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	2830	4980	----	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	----	10	mg/L	1400	2540	----	----	----
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	327	707	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	327	707	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	178	298	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	559	986	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	104	120	----	----	----
Magnesium	7439-95-4	1	mg/L	62	125	----	----	----
Sodium	7440-23-5	1	mg/L	391	780	----	----	----
Potassium	7440-09-7	1	mg/L	<1	<1	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.04	0.10	----	----	----
EN055: Ionic Balance								
^ Total Anions	----	0.01	meq/L	26.0	48.1	----	----	----
^ Total Cations	----	0.01	meq/L	27.3	50.2	----	----	----
^ Ionic Balance	----	0.01	%	2.41	2.07	----	----	----
EN67 PK: Field Tests								
Field Observations	----	0.01	--	----	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	<1	5	----	----	----
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	1.70	1.36	----	----	----