ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW1601262**	Page	: 1 of 10
Client	: **WINGECARRIBEE SHIRE COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR Scott McAllan	Contact	: Glenn Davies
Address	: PO BOX 141 MOSSVALE NSW AUSTRALIA	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia
Telephone	: ----	Telephone	: 02 42253125
Project	: Biannual Surface & Gound Water	Date Samples Received	: 01-Apr-2016 16:00
Order number	: ----	Date Analysis Commenced	: 01-Apr-2016
C-O-C number	: ----	Issue Date	: 08-Apr-2016 16:30
Sampler	: Glenn Davies		
Site	: ----		
Quote number	: ----		
No. of samples received	: 17		
No. of samples analysed	: 17		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED
ACCREDITATION

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

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
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Glenn Davies	Environmental Services Representative	Laboratory - Wollongong

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.

- EG035: Positive result has been confirmed by reanalysis.
- ED041G: LOR raised for Sulfate analysis on sample no:9, due to matrix interferences
- Sampling and sample data supplied by ALS Wollongong.
- Sampling completed as per FWI-EN001 Groundwater Sampling.
- Sampling completed as per FWI-EN002 Surface Water Sampling.
- Field tests completed on day of sampling/receipt.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Point 1	Point 2	Point 3	Point 4	Point 5
			Client sampling date / time	01-Apr-2016 10:50	01-Apr-2016 11:23	01-Apr-2016 11:13	01-Apr-2016 11:40	01-Apr-2016 12:05
Compound	CAS Number	LOR	Unit	EW1601262-001	EW1601262-002	EW1601262-003	EW1601262-004	EW1601262-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	5.4	6.3	----	----	4.4
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	488	2370	----	----	1170
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	305	----	----	----	----
Total Dissolved Solids @180°C	----	10	mg/L	----	1460	----	----	605
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	----	----	----	----	----
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	20	275	----	----	2
Total Alkalinity as CaCO3	----	1	mg/L	20	275	----	----	2
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	19	435	----	----	67
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	75	332	----	----	277
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	14	107	----	----	10
Magnesium	7439-95-4	1	mg/L	9	48	----	----	14
Sodium	7440-23-5	1	mg/L	49	265	----	----	161
Potassium	7440-09-7	1	mg/L	2	70	----	----	13
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.017	0.002	----	----	0.005
Cadmium	7440-43-9	0.0001	mg/L	0.0028	0.0007	----	----	<0.0001
Chromium	7440-47-3	0.001	mg/L	0.040	0.002	----	----	0.014
Nickel	7440-02-0	0.001	mg/L	0.065	0.005	----	----	0.024
Lead	7439-92-1	0.001	mg/L	0.060	0.036	----	----	0.094
Zinc	7440-66-6	0.005	mg/L	1.64	0.116	----	----	0.087
Iron	7439-89-6	0.05	mg/L	15.5	9.53	----	----	10.0
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	0.0005	<0.0001	----	----	0.0006
EK040P: Fluoride by PC Titrator								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Point 1	Point 2	Point 3	Point 4	Point 5
				Client sampling date / time	01-Apr-2016 10:50	01-Apr-2016 11:23	01-Apr-2016 11:13	01-Apr-2016 11:40	01-Apr-2016 12:05
Compound	CAS Number	LOR	Unit		EW1601262-001	EW1601262-002	EW1601262-003	EW1601262-004	EW1601262-005
					Result	Result	Result	Result	Result
EK040P: Fluoride by PC Titrator - Continued									
Fluoride	16984-48-8	0.1	mg/L		<0.1	<0.1	----	----	**0.2**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.45**	**0.30**	----	----	**6.28**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**17.5**	**0.51**	----	----	**11.7**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**9.5**	**1.1**	----	----	**9.0**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**4.16**	----	----	----	----
Total Anions	----	0.01	meq/L		----	**23.9**	----	----	**9.25**
Total Cations	----	0.01	meq/L		**3.77**	----	----	----	----
Total Cations	----	0.01	meq/L		----	**22.6**	----	----	**8.99**
Ionic Balance	----	0.01	%		**4.94**	----	----	----	----
Ionic Balance	----	0.01	%		----	**2.82**	----	----	**1.45**
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	----	**NOT FOUND**	**DRY**	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**12**	**14**	----	----	**9**
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	----	----	----	----
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		----	----	----	----	----
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L		<0.05	<0.05	----	----	<0.05
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		**3.59**	**2.65**	----	----	**7.20**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Point 6	Point 7	Point 8	Point 9	Point 10
			Client sampling date / time	01-Apr-2016 12:10	01-Apr-2016 12:40	01-Apr-2016 12:45	01-Apr-2016 10:15	01-Apr-2016 10:50
Compound	CAS Number	LOR	Unit	EW1601262-006	EW1601262-007	EW1601262-008	EW1601262-009	EW1601262-010
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	----	----	----	7.0	8.4
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	----	----	5070	1160
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	----	----	----	----
Total Dissolved Solids @180°C	----	10	mg/L	----	----	----	2500	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	----	----	----	----	8
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	----	----	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	----	----	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	----	----	2100	----
Total Alkalinity as CaCO3	----	1	mg/L	----	----	----	2100	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	----	----	<10	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	----	----	----	461	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	----	----	----	255	----
Magnesium	7439-95-4	1	mg/L	----	----	----	108	----
Sodium	7440-23-5	1	mg/L	----	----	----	280	----
Potassium	7440-09-7	1	mg/L	----	----	----	232	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	----	----	----	0.015	----
Cadmium	7440-43-9	0.0001	mg/L	----	----	----	0.0001	----
Chromium	7440-47-3	0.001	mg/L	----	----	----	0.009	----
Nickel	7440-02-0	0.001	mg/L	----	----	----	0.077	----
Lead	7439-92-1	0.001	mg/L	----	----	----	0.044	----
Zinc	7440-66-6	0.005	mg/L	----	----	----	0.229	----
Iron	7439-89-6	0.05	mg/L	----	----	----	32.4	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	----	----	<0.0001	----
EK040P: Fluoride by PC Titrator								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Point 6	Point 7	Point 8	Point 9	Point 10
				Client sampling date / time	01-Apr-2016 12:10	01-Apr-2016 12:40	01-Apr-2016 12:45	01-Apr-2016 10:15	01-Apr-2016 10:50
Compound	CAS Number	LOR	Unit		EW1601262-006	EW1601262-007	EW1601262-008	EW1601262-009	EW1601262-010
					Result	Result	Result	Result	Result
EK040P: Fluoride by PC Titrator - Continued									
Fluoride	16984-48-8	0.1	mg/L		----	----	----	0.3	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	----	----	174	0.05
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	----	----	0.04	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	----	----	181	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		----	----	----	----	----
Total Anions	----	0.01	meq/L		----	----	----	55.0	----
Total Cations	----	0.01	meq/L		----	----	----	52.2	----
Total Cations	----	0.01	meq/L		----	----	----	----	----
Ionic Balance	----	0.01	%		----	----	----	2.66	----
Ionic Balance	----	0.01	%		----	----	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		DRY	DRY	DRY	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		----	----	----	156	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	----	----	----	6.81
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		----	----	----	----	3
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L		----	----	----	<0.05	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		----	----	----	8.15	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Point 11	Point 12	Point 13	Point 14	Point 15
			Client sampling date / time	01-Apr-2016 12:15	01-Apr-2016 11:20	01-Apr-2016 11:47	01-Apr-2016 11:20	01-Apr-2016 10:55
Compound	CAS Number	LOR	Unit	EW1601262-011	EW1601262-012	EW1601262-013	EW1601262-014	EW1601262-015
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.1	7.4	----	7.6	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	147	2370	----	2050	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	----	----	----	----
Total Dissolved Solids @180°C	----	10	mg/L	----	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	17	<5	----	28	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	----	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	----	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	----	----	----	----	----
Magnesium	7439-95-4	1	mg/L	----	----	----	----	----
Sodium	7440-23-5	1	mg/L	----	----	----	----	----
Potassium	7440-09-7	1	mg/L	----	----	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	----	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	----	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	----	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	----	----	----	----	----
Lead	7439-92-1	0.001	mg/L	----	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	----	----	----	----	----
Iron	7439-89-6	0.05	mg/L	----	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	----	----	----	----
EK040P: Fluoride by PC Titrator								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Point 11	Point 12	Point 13	Point 14	Point 15
				Client sampling date / time	01-Apr-2016 12:15	01-Apr-2016 11:20	01-Apr-2016 11:47	01-Apr-2016 11:20	01-Apr-2016 10:55
Compound	CAS Number	LOR	Unit		EW1601262-011	EW1601262-012	EW1601262-013	EW1601262-014	EW1601262-015
					Result	Result	Result	Result	Result
EK040P: Fluoride by PC Titrator - Continued									
Fluoride	16984-48-8	0.1	mg/L		----	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	**0.04**	----	**0.80**	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	----	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		----	----	----	----	----
Total Anions	----	0.01	meq/L		----	----	----	----	----
Total Cations	----	0.01	meq/L		----	----	----	----	----
Total Cations	----	0.01	meq/L		----	----	----	----	----
Ionic Balance	----	0.01	%		----	----	----	----	----
Ionic Balance	----	0.01	%		----	----	----	----	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	----	**DRY**	----	**DRY**
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		----	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**6.24**	**1.81**	----	**2.06**	----
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		**4**	<2	----	<2	----
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L		----	----	----	----	----
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		----	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Point 16	Point 17	----	----	----
			Client sampling date / time	01-Apr-2016 13:20	01-Apr-2016 13:05	----	----	----
Compound	CAS Number	LOR	Unit	EW1601262-016	EW1601262-017	--------	--------	--------
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.8	8.1	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	436	410	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	----	----	----	----
Total Dissolved Solids @180°C	----	10	mg/L	----	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	----	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	----	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	----	----	----	----	----
Magnesium	7439-95-4	1	mg/L	----	----	----	----	----
Sodium	7440-23-5	1	mg/L	----	----	----	----	----
Potassium	7440-09-7	1	mg/L	----	----	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	----	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	----	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	----	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	----	----	----	----	----
Lead	7439-92-1	0.001	mg/L	----	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	----	----	----	----	----
Iron	7439-89-6	0.05	mg/L	----	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	----	----	----	----
EK040P: Fluoride by PC Titrator								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Point 16	Point 17	----	----	----
			Client sampling date / time	01-Apr-2016 13:20	01-Apr-2016 13:05	----	----	----
Compound	CAS Number	LOR	Unit	EW1601262-016	EW1601262-017	--------	--------	--------
				Result	Result	Result	Result	Result
EK040P: Fluoride by PC Titrator - Continued								
Fluoride	16984-48-8	0.1	mg/L	----	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.02**	**0.01**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	----	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	----	----	----	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	----	----	----	----	----
Total Anions	----	0.01	meq/L	----	----	----	----	----
Total Cations	----	0.01	meq/L	----	----	----	----	----
Total Cations	----	0.01	meq/L	----	----	----	----	----
Ionic Balance	----	0.01	%	----	----	----	----	----
Ionic Balance	----	0.01	%	----	----	----	----	----
EN67 PK: Field Tests								
Field Observations	----	0.01	--	----	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	----	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	**9.61**	**9.26**	----	----	----
EP030: Biochemical Oxygen Demand (BOD)								
Biochemical Oxygen Demand	----	2	mg/L	<2	<2	----	----	----
EP035G: Total Phenol by Discrete Analyser								
Phenols (Total)	----	0.05	mg/L	----	----	----	----	----
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	----	----	----	----	----