

## CERTIFICATE OF ANALYSIS

**Work Order** : **ES1619698**  
**Client** : **ORIGIN ENERGY RESOURCES LTD**  
**Contact** : [REDACTED]  
**Address** : GPO BOX 2320  
ADELAIDE SOUTH AUSTRALIA, AUSTRALIA 5001  
**Telephone** : [REDACTED]  
**Project** : BEETALOO GROUNDWATER MONITORING  
**Order number** : 16231417  
**C-O-C number** : ALS001\_915  
**Sampler** : ----  
**Site** : BEETALOO  
**Quote number** : ----  
**No. of samples received** : 3  
**No. of samples analysed** : 3

**Page** : 1 of 4  
**Laboratory** : Environmental Division Sydney  
**Contact** : EB ProjectManager  
**Address** : 277-289 Woodpark Road Smithfield NSW Australia 2164  
**Telephone** : [REDACTED]  
**Date Samples Received** : 07-Sep-2016 09:35  
**Date Analysis Commenced** : 07-Sep-2016  
**Issue Date** : 19-Sep-2016 16:36



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. 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.

Signatories	Position	Accreditation Category
<span style="background-color: black; color: black;">[REDACTED]</span>	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
	Metals Teamleader	Sydney Inorganics, Smithfield, NSW Radionuclides, Fyshwick, ACT



## 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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- Gross Alpha and Beta Activity analyses are performed by ALS Fyshwick (NATA Accreditation number 992).
- MBAS is calculated as LAS, molecular weight 342.
- EA015: TDS may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper (confirmed by re-analysis).
- EN055: Ionic Balance out of acceptable limits due to analytes not quantified in this report.
- EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.
- EA250 LSC : LOR for Gross Alpha and Beta raised due to high solid content



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	BET-PW001_FF_6	BET-PW001_FF_7	BET-PW001_FF_8		
Client sampling date / time					[01-Sep-2016]	[02-Sep-2016]	[05-Sep-2016]	----	----
Compound	CAS Number	LOR	Unit		ES1619698-001	ES1619698-002	ES1619698-003	-----	-----
				Result	Result	Result		---	---
<b>EA005P: pH by PC Titrator</b>									
pH Value	----	0.01	pH Unit		8.06	7.77	8.23	----	----
<b>EA010P: Conductivity by PC Titrator</b>									
Electrical Conductivity @ 25°C	----	1	µS/cm		2650	2600	2620	----	----
<b>EA015: Total Dissolved Solids dried at 180 ± 5 °C</b>									
Total Dissolved Solids @180°C	----	10	mg/L		2800	3240	3010	----	----
<b>EA016: Calculated TDS (from Electrical Conductivity)</b>									
Total Dissolved Solids (Calc.)	----	1	mg/L		1720	1690	1700	----	----
<b>EA065: Total Hardness as CaCO3</b>									
Total Hardness as CaCO3	----	1	mg/L		423	434	445	----	----
<b>EA250: Gross Alpha and Beta Activity</b>									
Gross alpha	----	0.05	Bq/L		<0.05	<0.05	<0.05	----	----
Gross beta activity - 40K	----	0.1	Bq/L		<0.10	<0.10	<0.10	----	----
<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		359	360	391	----	----
Total Alkalinity as CaCO3	----	1	mg/L		359	360	391	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		334	309	302	----	----
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L		500	497	510	----	----
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L		82	88	94	----	----
Magnesium	7439-95-4	1	mg/L		53	52	51	----	----
Sodium	7440-23-5	1	mg/L		117	116	122	----	----
Potassium	7440-09-7	1	mg/L		11	11	11	----	----
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Boron	7440-42-8	0.05	mg/L		0.63	0.26	0.26	----	----
Barium	7440-39-3	0.001	mg/L		0.062	0.061	0.068	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	0.0002	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	----	----



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Client sampling date / time					[01-Sep-2016]	[02-Sep-2016]	[05-Sep-2016]	----	----
Compound	CAS Number	LOR	Unit		ES1619698-001	ES1619698-002	ES1619698-003	-----	-----
				Result	Result	Result		---	---
<b>EG020F: Dissolved Metals by ICP-MS - Continued</b>									
Chromium	7440-47-3	0.001	mg/L		<0.001	0.003	0.001	----	----
Copper	7440-50-8	0.001	mg/L		0.028	0.012	0.033	----	----
Manganese	7439-96-5	0.001	mg/L		<0.001	0.005	0.003	----	----
Nickel	7440-02-0	0.001	mg/L		0.001	0.003	0.003	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L		0.128	0.140	0.210	----	----
<b>EG035F: Dissolved Mercury by FIMS</b>									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L		0.5	0.5	0.5	----	----
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L		2.39	0.67	0.87	----	----
<b>EK061G: Total Kjeldahl Nitrogen By Discrete Analyser</b>									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		174	160	151	----	----
<b>EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser</b>									
^ Total Nitrogen as N	----	0.1	mg/L		176	161	152	----	----
<b>EK067G: Total Phosphorus as P by Discrete Analyser</b>									
Total Phosphorus as P	----	0.01	mg/L		1.51	1.60	1.50	----	----
<b>EN055: Ionic Balance</b>									
Total Anions	----	0.01	meq/L		28.2	27.6	28.5	----	----
Total Cations	----	0.01	meq/L		13.8	14.0	14.5	----	----
Ionic Balance	----	0.01	%		34.2	32.8	32.6	----	----
<b>EP041A: Nonionic Surfactants</b>									
Nonionic Surfactants as CTAS	----	5	mg/L		18	26	27	----	----
<b>EP050: Anionic Surfactants as MBAS</b>									
Anionic Surfactants as MBAS	----	0.1	mg/L		<0.1	<0.1	<0.1	----	----