ROSEBY COPPER PROJECT

2013/14 WATER AND SEDIMENT QUALITY MONITORING SUMMARY

PREPARED FOR:

ALTONA MINING LIMITED

MAY 2014

PREPARED BY:

Martinick Bosch Sell Pty Ltd
4 Cook Street
West Perth WA 6005
Ph: (08) 9226 3166
Fax: (08) 9226 3177
Email: info@mbsenvironmental.com.au
Web: www.mbsenvironmental.com.au

MARTINICK BOSCH SELL PTY LTD
ABN 60 102 614 479
MBS ENVIRONMENTAL
environmental and geoscience consultants

ROSEBY COPPER PROJECT
2013/14 WATER AND SEDIMENT QUALITY MONITORING SUMMARY

Distribution List:

Company	Contact name	Copies	Date
Department of Environment and Heritage Protection	Lauren Payne (A/Senior Environmental Officer)	[01]	30 May 2014
Altona Mining Limited	Iain Scott (Chief Operating Officer)	[02]	30 May 2014
Altona Mining Limited	Jani Impola (Exploration Manager)	[03]	30 May 2014
Altona Mining Limited	George Ross (Senior Project Geologist)	[04]	30 May 2014

Document Control for Job Number: AMLCOM

Document Status	Prepared By	Authorised By	Date
Draft Report	Hilary Chin	David Allen	28 May 2014
Final Report	Hilary Chin	David Allen	30 May 2014

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

Appendix 1: Surface Water Quality Results Tables

Appendix 2: Stream Sediment Results Tables

Appendix 3: Groundwater Quality Results Tables

Appendix 4: Laboratory Reports

Appendix 5: Interim (Low Reliability) Surface Water Trigger Values for Scanlan

Appendix 6: Interim (Low Reliability) Sediment Values for Little Eva

Appendix 7: Interim (Low Reliability) Sediment Values for Blackard

Appendix 8: Interim (Low Reliability) Sediment Values for Scanlan

1. INTRODUCTION

1.1 BACKGROUND

Altona Mining Limited (Altona) proposes to mine copper from its Roseby Copper Project located 90 km northeast of Mt Isa in northwest Queensland. Operating conditions are stipulated by Environmental Authority (EA) EPML00899613 (mining activities) (DEHP 2013) and an Environmental Management Plan (AARC 2012).

1.2 MONITORING REQUIREMENTS

Monitoring requirements in relation to surface water and stream sediments is specified by Schedule G of the EA and Section 2 of the Monitoring Manual for Environmental Authority EPML00899613 (Surface Water, Sediments and Groundwater) (MBS 2012) (referred to subsequently as the "Monitoring Manual").

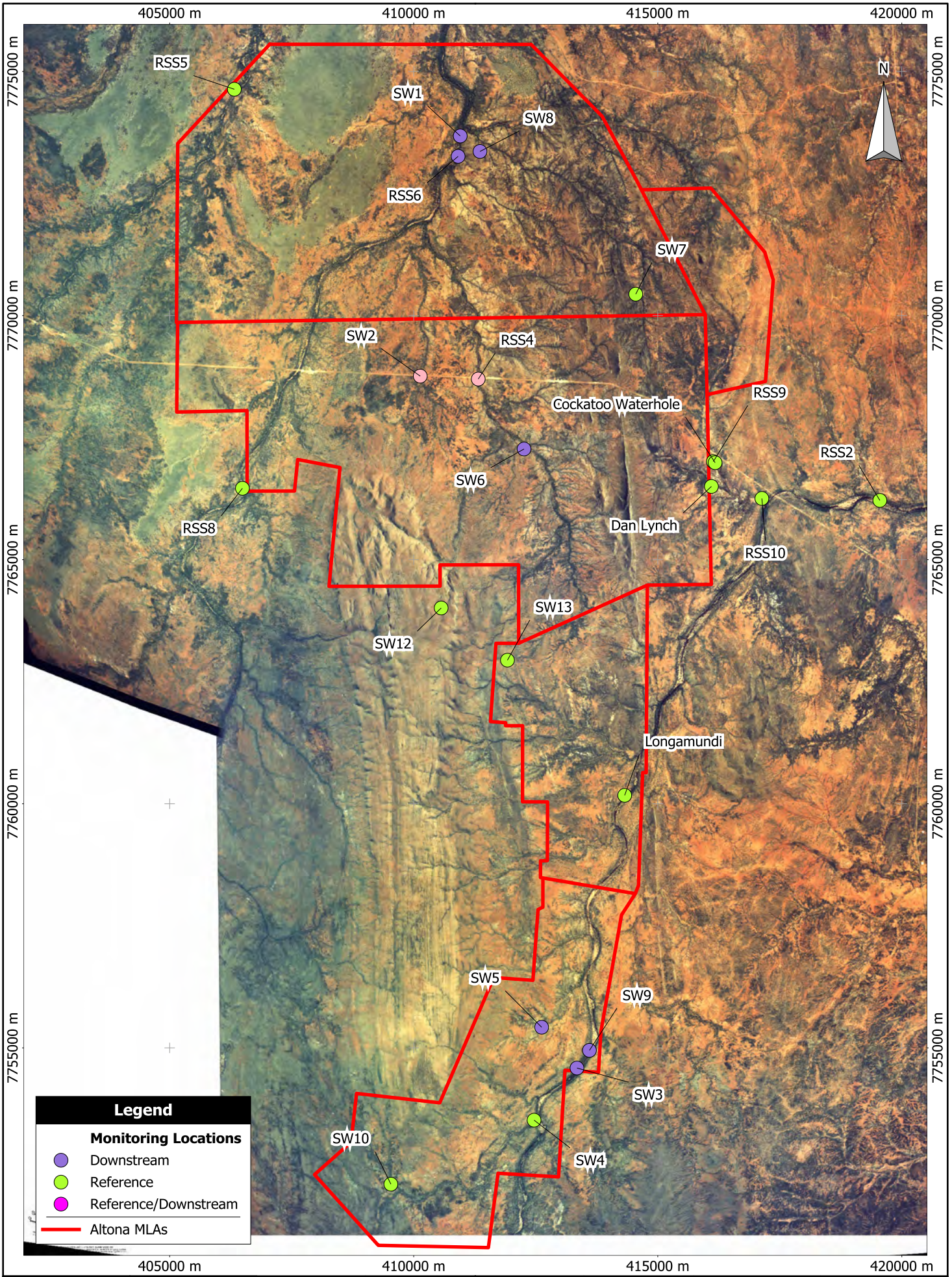
The Monitoring Manual specifies the following:

- Sampling locations (mandatory and voluntary reference and downstream surface water and stream sediment sampling locations are shown in Figure 1 and Figure 2).
- Sampling frequencies.
- Water and sediment quality parameters.
- Methods for determining trigger levels and contaminant limits.
- Reporting requirements.

1.3 OBJECTIVES

This report has the following objectives:

- Compile results of surface water, sediment and groundwater monitoring undertaken in 2013/14.
- Compare results from 2013/14 to previous monitoring results.
- Provide recommendations for future monitoring.



Scale: 1:100000
Original Size: A4
Air Photo Date: 1998
Grid: MGA94(54)
0 4 km

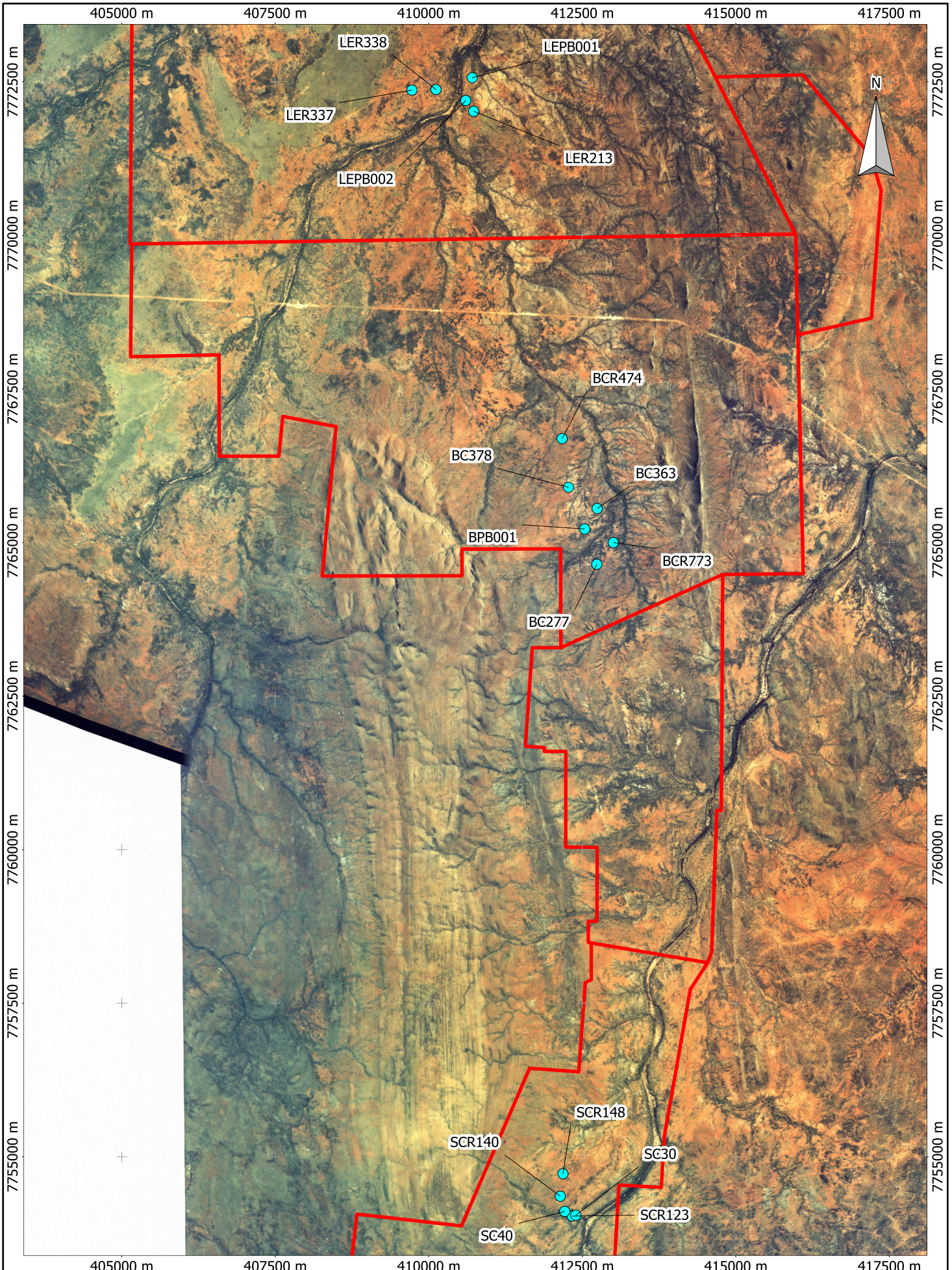
Altona Mining Limited
Roseby Copper Project

Figure 1

Surface Water and Sediment Monitoring Locations

Martinick Bosch Sell Pty Ltd
4 Cook St
West Perth WA 6005
Ph: (08) 9226 3166
Fax: (08) 9226 3177
info@mbsenvironmental.com.au
www.mbsenvironmental.com.au

MBS ENVIRONMENTAL



Scale: 1:80000
Original Size: A4
Air Photo Date: 1998
Grid: MGA94(54)
0 2 km

Altona Mining Limited
Roseby Copper Project

Figure 2

Groundwater Sampling Locations

Martinick Bosch Sell Pty Ltd
4 Cook St
West Perth WA 6005
Ph: (08) 9226 3166
Fax: (08) 9226 3177
info@mbsenvironmental.com.au
www.mbsenvironmental.com.au

MBS ENVIRONMENTAL

2. 2013/14 MONITORING PROGRAM

2.1 SURFACE WATER AND SEDIMENTS

2.1.1 Overview

Surface water monitoring was undertaken during the wet season in February, March and April 2014. Sediment monitoring was undertaken in October 2013 and February 2014 to capture both the dry and wet seasons. Sampling was undertaken by Altona personnel and contractors under the direction of George Ross, Senior Project Geologist, using procedures outlined in the Monitoring Manual.

As the result of heavy flows following rainfall in the Cloncurry district during the wet season, it was not possible to safely collect surface water samples from some sampling locations, these locations are outlined in Section 2.1.4.

As no mining activities other than exploration are being undertaken at Roseby, all data reflects pre-mining conditions and any abnormal water or sediment quality is unlikely to be a result of Altona's activities.

2.1.2 EA Requirements

Monitoring requirements in relation to surface water and stream sediments are specified by Schedule G of the EA and key requirements are summarised below:

- Sampling locations (mandatory and voluntary reference and downstream surface water and stream sediment sampling locations are shown in Figure 1 and Figure 2).
- Surface water samples are to be collected monthly (subject to stream flow and access) or immediately following controlled release events. As no construction or mining activities had been undertaken during the reporting period, there were no controlled release events.
- Mandatory water quality parameters are pH, Electrical Conductivity (EC), sulfate, fluoride, total nitrogen, total phosphorus, faecal coliforms, free chlorine, turbidity, total suspended solids (TSS) and field filtered metals and metalloids (aluminium, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, mercury, nickel, selenium, silver, uranium and zinc).
- Sediment samples are to be collected twice a year concurrent with water monitoring (at the end of the wet season and at the end of the dry season).
- Mandatory sediment quality parameters are arsenic, cadmium, chromium, cobalt, copper, fluoride, lead, manganese, mercury, nickel, selenium, silver, sulfur, uranium and zinc.
- By 1 June each year, Altona is required to provide an update to the administering authority on monitoring data and associated trigger values and contaminant levels incorporating monitoring data obtained during the previous twelve months. This report is intended to meet this requirement.

2.1.3 Rainfall and Stream Flow Conditions

Despite heavier than usual rainfall in February 2014 overall rainfall in the 2013/14 wet season in the Cloncurry district was below long term averages, as indicated by monthly rainfall data for three Bureau of Meteorology weather stations presented in Table 1 (BOM 2014).

Stream flows in the Dugald River were very low. According to data for Dugald River (Railway Crossing) streamflow monitoring station 915206A managed by the Queensland Department of Environment and Heritage Protection (DEHP), flow was only recorded during February and the very beginning of March 2014.

Table 1: 2013/14 Wet Season Rainfall Data for Cloncurry

Month	Rainfall (BOM Site: 029141) (mm)	Long Term Averages for Cloncurry Weather Stations		
		029141	029009	029008
November 2013	50.8	33.6	24.2	31.2
December 2013	55.4	80.7	57.8	69.0
January 2014	39.6	174.7	107.8	122.6
February 2014	163.0	105.6	124.3	114.3
March 2014	35.0	75.8	78.6	66.7
April 2013	33.0	19.5	20.3	18.3

2.1.4 Sampling Events

A summary of surface water sampling events undertaken in February, March and April 2014 is presented in Table 2. Samples were not taken in November 2013, December 2013 and January 2014 due to lack of stream flows. Unless otherwise specified, locations noted as "Not sampled" were due to impassability of the water bodies at the time of sampling. A summary of sediment sampling events undertaken in October 2013 and February 2014 is presented in Table 3.

Table 2: Surface Water Sampling Events, 2013/14 Wet Season

Location	Description	February 2014	March 2014	April 2014
Little Eva Reference Sites				
RSS8	Cabbage Tree Creek	Not sampled	Not sampled	Not sampled
RSS5	Pinnacle Creek	Not sampled	Not sampled	Not sampled
SW7	Little Eva Southeast	Not sampled	Not sampled	Not sampled
RSS4	Lake Julius pipeline / TSF	Sampled	Not sampled	Not sampled
SW2	Relates to TSF	Not sampled	Not sampled	Not sampled
Little Eva Mine Downstream				
SW1	Relates to Pit and WRD	Not sampled	Sampled	Not sampled
SW8	Relates to WRD	Not sampled	Not sampled	Not sampled
RSS6	Relates to Pit and WRD	Sampled	Not sampled	Not sampled
Blackard Reference Sites				
SW13	Upstream of WRD	Sampled	Not sampled	Not sampled
SW12	Upstream of TSF	Not sampled	Not sampled	Not sampled
Blackard Mine Downstream				
SW2	Relates to TSF	Not sampled	Sampled	Not sampled
SW6	Relates to Pit and WRD	Sampled	Not sampled	Not sampled
Scanlan Reference Sites				
SW4	Scanlan South	Sampled	Not sampled	Not sampled
SW10	Scanlan Southwest	Sampled	Not sampled	Not sampled
RSS2	Dugald River	Sampled	Not sampled	Sampled (as “Railway”)
RSS9	Cockatoo Creek	Sampled	Not sampled	Not sampled
RSS10	Dugald River	Sampled	Sampled	Not sampled
Cockatoo W/H	Dugald River	Sampled	Not sampled	Not sampled
Dan Lynch	Dugald River	Sampled	Sampled	Sampled
Longamundi	Dugald River	Sampled	Sampled	Sampled
Scanlan Mine Downstream				
SW3	Relates to SW4 and SW10	Sampled	Sampled	Not sampled
SW5	Relates to SW4 and SW10	Sampled	Not sampled	Not sampled
SW9	Relates to SW4 and SW10	Sampled	Not sampled	Not sampled

Table 3: Sediment Sampling Events

Location	Description	October 2013	February 2014
Little Eva Reference Sites			
RSS8	Cabbage Tree Creek	Sampled	Inaccessible
RSS5	Pinnacle Creek	Sampled	Inaccessible
SW7	Little Eva Southeast	Sampled	Inaccessible
RSS4	Lake Julius pipeline / TSF	Sampled	Inaccessible
SW2	Relates to TSF	Sampled	Inaccessible
Little Eva Mine Downstream			
SW1	Relates to Pit and WRD	Sampled	Inaccessible
SW8	Relates to WRD	Sampled	Inaccessible
RSS6	Relates to Pit and WRD	Sampled	Sampled
Blackard Reference Sites			
SW13	Upstream of WRD	Sampled	Sampled
SW12	Upstream of TSF	Inaccessible	Inaccessible
Blackard Mine Downstream			
SW2	Relates to TSF	Inaccessible	Inaccessible
SW6	Relates to Pit and WRD	Sampled	Sampled
Scanlan Reference Sites			
SW4	Scanlan South	Sampled	Sampled
SW10	Scanlan south-west	Sampled	Sampled
RSS2	Dugald River	Sampled	Sampled
RSS9	Cockatoo Creek	Sampled	Sampled
RSS10	Dugald River	Sampled	Sampled
Cockatoo W/H	Dugald River	Inaccessible	Sampled
Dan Lynch	Dugald River	Sampled	Sampled
Longamundi	Dugald River	Sampled	Sampled
Scanlan Mine Downstream			
SW3	Relates to SW4 and SW10	Sampled	Sampled
SW5	Relates to SW4 and SW10	Sampled	Sampled
SW9	Relates to SW4 and SW10	Sampled	Sampled

2.2 GROUNDWATER

No groundwater bores were sampled between July to October 2013, due to the Roseby Copper Project being put temporarily on hold resulting in closure of the Cloncurry exploration office in August 2013 and retrenchment of exploration personnel who were responsible for collection of samples as per EA requirements. On 16 October 2013, the EA was amended to replace the reference groundwater bore sampling locations with currently existing bores from previous groundwater monitoring carried out by Kevin Morgan and Associates and exploration boreholes. These new bore locations were sampled on 16 October 2013 (by Altona geology staff) and 17 February 2014 (by a trained contractor). Bores not accessible in February 2014 were sampled on 19 March 2014. A summary of the bores sampled and the condition of the bores is provided in Table 4.

Table 4: Reference Bore Sampling and Condition Summary

Bore ID	October 2013	February/March 2014	Condition
Little Eva			
LEPB001	Sampled	Sampled	No comments.
LEPB002	Sampled	Sampled	No comments.
LER213	Sampled	Sampled	No comments.
LER337	Sampled	Inaccessible	No comments.
LER338	Dry	Inaccessible	Dry to 15 m when monitored in October 2013.
Blackard			
BC277	Sampled	Sampled	No comments.
BC363	Sampled	Sampled	No comments.
BC378	Sampled	Inaccessible	No comments.
BCR474	Sampled	Sampled	No comments.
BCR773	Sampled	Sampled	No comments.
BPB001	Sampled	Sampled	No comments.
Scanlan			
SC40	Sampled	Sampled	Tree roots present.
SCR123	Dry	Sampled	Appears to have caved in above the water table (<8 m). Alternate bore SC30 (MGA 412394.4 E, 7754048.02 N) located approximately 50 m east of SCR123 sampled in replacement of this bore.
SCR140	Sampled	Sampled	No comments.
SCR148	Sampled	Sampled	Blocked by clay approximately 1 m below the water table when sampled in October 2013.

3. RESULTS AND DISCUSSION

Laboratory data was collated and assessed as follows:

- Pooled surface water quality data for all sampling events in the 2013/14 wet season have been tabulated and presented in tables included in Appendix 1.
- Pooled sediment quality data for both sampling events have been tabulated and presented in tables included in Appendix 2.
- Pooled groundwater quality data for both sampling events for 2013/14 have been tabulated and presented in tables included in Appendix 3.
- Laboratory reports for all samples collected 2013/14 are presented in Appendix 4.
- Updated interim (low reliability) site specific trigger values for mandatory surface water and sediment quality parameters have been calculated using Australian and New Zealand Environment and Conservation Council (ANZECC) 2000 (typically 80th percentile values) methodology and presented in the following Appendices:
  - Appendix 5; surface water trigger values for Scanlan.
  - Appendix 6; sediment trigger values for Little Eva.
  - Appendix 7; sediment trigger values for Blackard.
  - Appendix 8; sediment trigger values for Scanlan.

3.1 SURFACE WATER

3.1.1 Little Eva Surface Water

3.1.1.1 Reference Sites

Only one sample was collected from Little Eva reference sites during the 2013/14 wet season, that being for site RSS4 on 12 February 2014. The current dataset is limited to this sample and three samples from a single sampling event in the 2011/12 wet season. Significantly more monitoring data will be required to calculate statistically reliable site specific trigger values for Little Eva surface water.

3.1.1.2 Downstream Sites

Only two samples were collected from Little Eva downstream sites during the 2013/14 wet season. These were:

- A single sample from site RSS6, which was also sampled on single occasions during the 2011/12 and 2012/13 wet seasons.
- A single sample from site SW1, which has not been sampled previously.

A total of four samples have been collected from downstream sites at Little Eva since the 2011/12 wet season. There is insufficient data to compare water quality at Little Eva downstream sites with reference sites.

3.1.2 Blackard Surface Water

3.1.2.1 Reference Sites

Only one sample was collected from Blackard reference sites during the 2013/14 wet season, that being for site SW13 on 12 February 2014. The current dataset is limited to two samples, the other being a single sample from

site RSS3 in the 2011/12 wet season. Significantly more monitoring data will be required to calculate statistically reliable site specific trigger values for Blackard surface water.

3.1.2.2 Downstream Sites

Only two samples were collected from Blackard downstream sites during the 2013/14 wet season. These were:

- A single sample from site SW2, which has not been sampled previously.
- A single sample from site SW6, which was also sampled on single occasions during the 2011/12 and 2012/13 wet seasons.

A total of four samples have been collected from downstream sites at Blackard since the 2011/12 wet season. There is insufficient data to compare water quality at Blackard downstream sites with reference sites.

3.1.3 Scanlan Surface Water

3.1.3.1 Reference Sites

There is now a reasonable amount of data for Scanlan surface water reference sites, comprising a total of 25 sampling events (three from 2011/12, 11 from 2012/13 and 11 from 2013/14 wet seasons). There is sufficient data to justify re-calculating site specific trigger values for Scanlan for comparison with default ANZECC 2000 trigger values, although additional data will be required from the 2014/15 wet season before these site specific values will be sufficiently robust for comparison with water quality data from downstream sites.

Based on the current dataset, it is likely that the default ANZECC 2000 freshwater trigger values will apply except for the following:

- **pH**. Scanlan water is distinctly alkaline. Current site specific trigger values based on 20th and 80th percentile values are 7.2 to 8.0 (compared to ANZECC 2000 values of 6.0 to 7.5).
- **Aluminium**. The current site specific trigger value based on the 80th percentile value for reference sites data is 0.14 mg/L, which is approximately three times higher than the ANZECC 2000 value of 0.055 mg/L.
- **Copper**. The current specific trigger value based on the 80th percentile value for reference sites data is 0.004 mg/L, which is approximately three times higher than the ANZECC 2000 value of 0.0014 mg/L.
- **Total nitrogen**. The current specific trigger value based on the 80th percentile value for reference sites data is 1.7 mg/L, which is significantly higher than the ANZECC 2000 value of 0.15 mg/L. This reflects the eutrophic condition of surface water in the region due to impact from pastoral (cattle grazing) activities.
- **Total phosphorus**. The current specific trigger value based on the 80th percentile value for reference sites data is 13 mg/L, which is significantly higher than the ANZECC 2000 value of 0.01 mg/L. This reflects the eutrophic condition of surface water in the region due to impact from pastoral (cattle grazing) activities.

An anomalous value of 0.00036 mg/L was recorded for mercury for a sample from Longamundi collected on 23 April 2014. Another anomalous value of 0.00015 mg/L was recorded for the same site for the sample collected on 26 March 2013. These two anomalous values are unlikely to affect the site specific trigger value for mercury at Scanlan.

3.1.3.2 Downstream Sites

Due to dry conditions experienced across the site, only four samples were collected from downstream sites at Scanlan; two from site SW3 and single samples from sites SW5 and SW9.

The only exceedance of the calculated site specific trigger values for Scanlan was a concentration of 0.61 mg/L for aluminium from site SW5 sampled on 12 February 2014. This sample also contained an unusually high iron concentration of 0.43 mg/L. The combination of elevated aluminium and iron at circum-neutral pH (6.8 pH units)

may indicate the presence of colloidal clay material which has dispersed as a result of the exceptionally low TDS level (22 mg/L) at that time.

3.2 SEDIMENTS

3.2.1 Little Eva Sediments

3.2.1.1 Particle Size Distribution and Textural Classification

Sediment samples collected from Little Eva monitoring sites in October 2013 and February 2014 (Appendix 2) were characterised by very coarse texture, with all samples containing <10% by weight in the <63 µm fraction.

3.2.1.2 Metals and Metalloids

Preliminary (low reliability) sediment trigger values for metals and metalloids listed in Schedule G – Table 9 of the EA have been calculated from 18 observations for each element except uranium. Results for uranium in all samples collected on 14 October 2013 were rejected as outliers; the reported concentrations were approximately ten times higher than previous and subsequent results for each site and are considered to be a systematic laboratory error, likely involving the dilution factor applied to uranium analysis. The calculated values are compared with default trigger values (based on ANZECC 2000), where appropriate, in Table A6-1 (Appendix 6).

With the exception of copper, all preliminary (low reliability) sediment trigger values were well below the default trigger values (based on ANZECC 2000). Should this trend continue the default ANZECC 2000 values will be used.

The calculated preliminary (low reliability) sediment trigger value for copper was 94 mg/kg (Table A6-1, Appendix 6), which is significantly higher than the default (ANZECC 2000) value of 65 mg/kg. This indicates natural enrichment by copper in the reference catchment.

None of the four observations for sediment copper concentrations from downstream locations exceeded the preliminary (low reliability) sediment trigger value for copper of 94 mg/kg. The highest value was 93 mg/kg for site SW8 (Table A2-2, Appendix 2).

3.2.1.3 Fluoride

A preliminary (low reliability) sediment trigger value for fluoride has been calculated from 11 observations. Note that water-soluble fluoride concentrations were used. Strong acid digest ("total") concentrations were used for metals and metalloids. The calculated value was 1.0 mg/kg (Table A6-1, Appendix 6), which is unlikely to be of environmental concern.

3.2.2 Blackard Sediments

3.2.2.1 Particle Size Distribution and Textural Classification

The only reference site samples collected in 2013/14 were from site SW13. The sample collected on 14 October 2013 had a very coarse texture, with only 1% of the sample less than 63 µm (Appendix 2). The corresponding sample collected on 12 February 2014 was much finer, with 29% of the sample less than 63 µm (Appendix 2).

Downstream samples were collected from site SW6 due to accessibility issues to site SW2 on both sampling occasions. Both samples from SW6 had very coarse textures, with the less than 63 µm fraction being <1 and 1% of total sample weight for samples collected on 14 October 2013 and 12 February 2014, respectively.

3.2.2.2 Metals and Metalloids

Descriptive statistics for elemental concentrations in sediments from Blackard reference sites are presented in Appendix 7 (Table A7-1). Preliminary (low reliability) sediment trigger values were not calculated as the maximum number of observations (three) is not statistically valid for calculation of meaningful 80th percentile values. It was noted (Appendix 7) that only one result exceeded the corresponding default ANZECC 2000 values listed in Schedule G – Table 9 of the EA. This was from site SW13 collected on 14 October 2013, where the reported arsenic concentration of 23 mg/kg exceeded the default ANZECC 2000/EA value of 20 mg/kg.

Preliminary results for downstream monitoring site SW6 suggest that it may be naturally enriched in copper. Both samples collected in 2013/14 contained 140 mg/kg of copper (Table A2-4 of Appendix 2), which was significantly higher than the maximum reference site value of 74 mg/kg (Table A7-1 of Appendix 7).

3.2.2.3 Fluoride

Water soluble fluoride concentrations of 1.1 and 1.5 mg/kg for reference site SW13 respectively (Table A2-3, Appendix 2), are comparable to those for Little Eva reference sites (Section 3.2.1.3) and of no environmental significance.

3.2.3 Scanlan Sediments

3.2.3.1 Particle Size Distribution and Textural Classification

As observed for Little Eva and Blackard, Scanlan sediments are generally characterised by coarse to very coarse texture. The only sites providing sediments with significant (greater than 10%) of fine (less than 63 µm) material were reference site Dan Lynch (33% on 12 February 2014, but only 8% on 14 October 2013, Appendix 2) and downstream site SW3 (17%).

3.2.3.2 Metals and Metalloids

Preliminary (low reliability) sediment trigger values for metals and metalloids listed in Schedule G – Table 9 of the EA have been calculated from 29 observations for each element except uranium (as discussed in Section 3.2.1.2). The calculated values are compared with default trigger values (based on ANZECC 2000), where appropriate, in Table A8-1 (Appendix 8).

All preliminary (low reliability) sediment trigger values were well below the default trigger values (based on ANZECC 2000). Should this trend continue, default values will be used. It was noted that the current preliminary (low reliability) sediment trigger value for copper was 51 mg/kg (Table A8-1, Appendix 8), which is only slightly below the default ANZECC 2000 value of 65 mg/kg. As was observed in 2012/13, site SW10, (Table A2-5, Appendix 2) exceeded the default ANZECC 2000 value with concentrations of 130 and 97 mg/kg.

Both samples from reference site SW10 also recorded arsenic concentrations (34 and 24 mg/kg) above the default ANZECC 2000 value of 20 mg/kg.

Based on 2012/13 data, downstream site SW5, natural enrichment by copper was suggested, with sediment concentrations of 85 and 74 mg/kg. Significantly lower values (49 and 48 mg/kg) were recorded in 2013/14 samples, both of which are below the current preliminary (low reliability) sediment trigger value for copper of 51 mg/kg (Table A8-1, Appendix 8) and the default ANZECC 2000 value of 65 mg/kg.

3.2.3.3 Fluoride

A preliminary (low reliability) sediment trigger value for fluoride has been calculated from 23 observations. The calculated value of 1.5 mg/kg (Table A8-1, Appendix 8) is slightly higher than that calculated for Little Eva (1.0 mg/kg, Section 3.2.1.3).

3.3 GROUNDWATER

3.3.1 Groundwater Levels

A summary of groundwater levels is provided in Table 5. As the groundwater bore locations were amended in September 2013 and the inaccessibility of groundwater bores at Little Eva and Scanlan in February/March 2014 there is limited data from which to identify trends in water levels. From the data available it can be seen that groundwater levels have risen at Blackard bores between the two sampling rounds.

Table 5: Summary of Groundwater Levels

Bore ID	October 2013 (mBGL)	February/March 2014 (mBGL)
Little Eva		
LEPB001	9.40	-
LEPB002	8.30	-
LER213	13.20	-
LER337	-	-
LER338	10.07	-
Blackard		
BC277	11.10	13.00
BC363	10.92	11.00
BC378	11.31	dry
BCR474	10.60	11.00
BCR773	9.89	12.00
BPB001	11.63	12.00
Scanlan		
SC40	8.30	-
SCR123	8.00	-
SCR140	11.73	-
SCR148	10.96	-

3.3.2 Little Eva Groundwater Quality

A total of seven samples from four Little Eva groundwater reference site bores were collected in 2013/14. Results are presented in Table A3-1 of Appendix 3.

Schedule G – Table 11 of the EA lists initial, interim and final groundwater trigger values that will apply to compliance bores after mining commences. These values are generally based on the higher of site specific data for reference site bores or ANZECC 2000 guideline values for surface waters. There is insufficient data (seven samples) to calculate site specific trigger values based on 80th percentile values according to ANZECC 2000 guidelines.

The following observations relate to comparison of results for seven reference site samples across four locations presented in Table A3-1 of Appendix 3 with ANZECC guideline values listed in Schedule G – Table 11 of the EA:

- pH values ranged from 7.6 to 8.7, all of which are outside the guideline range of 6.0 to 7.5. It is not unusual for groundwaters to have higher pH values than surface waters.
- Laboratory EC values were not reported, but are expected to be significantly higher than the guideline value of 435 µS/cm based on TDS values ranging from 780 to 1,500 mg/L. It is not unusual for groundwaters to have higher EC and TDS values than surface waters.
- Total nitrogen concentrations ranged from 1.5 to 110 mg/L, which are several orders of magnitude higher than the guideline value of 0.15 mg/L (150 µg/L). This clearly demonstrates the eutrophic condition of Little Eva groundwater resulting from pastoral activities.
- Total phosphorus concentrations ranged from 0.05 to 6.5 mg/L, which are several orders of magnitude higher than the guideline value of 0.01 mg/L (10 µg/L). This also demonstrates the eutrophic condition of Little Eva groundwater resulting from pastoral activities.
- Copper concentrations ranged from <0.001 to 0.020 mg/L, six of which exceeded the guideline value of 0.0014 mg /L (1.4 µg/L). This suggests natural enrichment of copper in Little Eva groundwater.
- Molybdenum concentrations ranged from <0.005 to 0.040 mg/L, with all six values above the laboratory reporting limit exceeding the default value listed in Schedule G – Table 11 of the EA of 0.000034 mg/L (0.034 µg/L). The EA value appears to be an error by the Department of Environment and Heritage Protection (DEHP) because the ANZECC 2000 freshwater (low reliability) trigger value for molybdenum is 0.034 mg/L (34 µg/L).
- Zinc concentrations ranged from 0.014 to 0.045 mg/L, all of which exceeded the guideline value of 0.008 mg /L (8 µg/L). This suggests natural enrichment of zinc in Little Eva groundwater.
- Uranium concentrations ranged from <0.5 to 40 µg/L. Schedule G – Table 11 of the EA does not include a default ANZECC guideline value. The ANZECC 2000 livestock drinking water trigger value is 200 µg/L, while the short term irrigation trigger value is 100 µg/L and long term irrigation value is 10 µg/L. Overall the levels of uranium seen also suggest natural enrichment of uranium in Little Eva groundwater.

3.3.3 Blackard Groundwater Quality

A total of 11 samples from six Blackard groundwater reference site bores were collected in 2013/14. Results are presented in Table A3-2 of Appendix 3. There is insufficient data to calculate site specific trigger values based on 80th percentile values according to ANZECC 2000 guidelines.

The following observations relate to comparison of results for seven reference sites samples presented in Table A3-2 of Appendix 3 with ANZECC guideline values listed in Schedule G – Table 11 of the EA:

- pH values ranged from 7.0 to 9.2, ten of which are outside the guideline range of 6.0 to 7.5. Bore BPB001 recorded the highest pH values of 9.0 and 9.2.
- Laboratory EC values were not reported, but are expected to be significantly higher than the guideline value of 435 µS/cm based on TDS values ranging from 490 to 1,700 mg/L.
- Total nitrogen concentrations ranged from 0.15 to 3.4 mg/L, which are generally higher than the guideline value of 0.15 mg/L (150 µg/L), but much lower than Little Eva groundwater samples.
- Total phosphorus concentrations ranged from <0.02 to 0.33 mg/L, which are also generally higher than the guideline value of 0.01 mg/L (10 µg/L). As observed for total nitrogen, total phosphorus concentrations in Blackard groundwater samples are significantly lower than Little Eva groundwater samples.
- Copper concentrations ranged from 0.003 to 0.10 mg/L, all of which exceeded the guideline value of 0.0014 mg /L (1.4 µg/L). This suggests natural enrichment of copper in Blackard groundwater.

- Molybdenum concentrations ranged from <0.005 to 0.019 mg/L, with all six values above the laboratory reporting limit exceeding the apparently erroneous default value listed in Schedule G – Table 11 of the EA of 0.000034 mg/L (0.034 µg/L).
- Zinc concentrations ranged from 0.012 to 0.093 mg/L, all of which exceeded the guideline value of 0.008 mg /L (8 µg/L). This suggests natural enrichment of zinc in Blackard groundwater.

Uranium concentrations were highly variable, ranging from <0.5 µg/L in bore BPB001 to 120 µg/L in bore BCR773. Schedule G – Table 11 of the EA does not include a default ANZECC guideline value. The ANZECC 2000 livestock drinking water trigger value is 200 µg/L, while the short term irrigation trigger value is 100 µg/L and long term irrigation value is 10 µg/L. Overall the levels of uranium seen suggest natural enrichment of uranium in Blackard groundwater.

3.3.4 Scanlan Groundwater Quality

A total of seven samples from four Scanlan groundwater reference site bores were collected in 2013/14. Results are presented in Table A3-3 of Appendix 3. There is insufficient data to calculate site specific trigger values based on 80th percentile values according to ANZECC 2000 guidelines.

The following observations relate to comparison of results for seven reference sites samples presented in Table A3-3 of Appendix 3 with ANZECC guideline values listed in Schedule G – Table 11 of the EA:

- pH values were relatively consistent when compared to Little Eva and Blackard bores. Values ranged from 7.4 to 7.8, five of which are outside the guideline range of 6.0 to 7.5.
- Laboratory EC values were not reported, but are expected to be significantly higher than the guideline value of 435 µS/cm based on TDS values ranging from 720 to 2,800 mg/L.
- Total nitrogen concentrations ranged from 0.08 to 2.4 mg/L, which are generally higher than the guideline value of 0.15 mg/L (150 µg/L), but much lower than Little Eva and similar to Blackard groundwater samples.
- Total phosphorus concentrations ranged from <0.02 to 0.63 mg/L, which are also generally higher than the guideline value of 0.01 mg/L (10 µg/L). As observed for total nitrogen, total phosphorus concentrations in Scanlan groundwater samples are significantly lower than Little Eva and similar to Blackard groundwater samples.
- Copper concentrations ranged from 0.006 to 0.35 mg/L, all of which exceeded the guideline value of 0.0014 mg/L (1.4 µg/L). The highest values were 0.35 mg/L in bore SCR123 (SC30) and 0.15 and 0.24 mg/L in bore SCR148. This suggests natural enrichment of copper in Scanlan groundwater at concentrations significantly higher than Little Eva and Blackard.
- Molybdenum concentrations ranged from <0.005 to 0.014 mg/L, with two values at or above the laboratory reporting limit exceeding the apparently erroneous default value listed in Schedule G – Table 11 of the EA of 0.000034 mg/L (0.034 µg/L).
- Zinc concentrations ranged from 0.011 to 0.079 mg/L, all of which exceeded the guideline value of 0.008 mg/L (8 µg/L). This suggests natural enrichment of zinc in Scanlan groundwater.
- Uranium concentrations ranged from 3.4 µg/L to 58 µg/L which appears to be similar in concentrations to that seen in Little Eva groundwater and lower than concentrations observed in Blackard groundwater.

4. CONCLUSIONS AND RECOMMENDATIONS

Surface water and sediment quality data provided by three sampling events during the 2013/14 wet season provide a significant contribution to a database of reference site and downstream pre-mining baseline data that will be used to derive site specific trigger values for compliance with EA conditions.

However, another unusually dry "wet season" resulted in limited water sampling opportunities, especially at the geographically elevated Little Eva and Blackard locations.

Where sufficient data is available, calculated low reliability surface water trigger values for most water quality parameters have been below default trigger values listed in the EA, which are based on ANZECC 2000 water quality guidelines. Likely exceptions are pH (characterised by elevated alkalinity), soluble copper and soluble aluminium. Depending on the amount of rainfall received in 2014/15 and subsequent wet seasons, data from at least two more wet seasons will be required to provide statistically valid site-specific trigger values.

Interim site specific (low reliability) sediment quality trigger values have been calculated from data from single wet season sampling events in 2011/12 and 2012/13 and two sampling events in 2013/14. Available data suggest that all elements, with the exception of copper, are likely to have site specific sediment quality trigger values below default values listed in the EA. In such cases, the corresponding default values will be used. It is expected that statistically valid site specific trigger values for copper will be attained after one more sampling event.

On 16 October 2013, the EA was amended to replace the reference groundwater bore sampling locations with currently existing bores from previous groundwater monitoring carried out by Kevin Morgan and Associates and exploration boreholes. These new bore locations were sampled on 16 October 2013 and 17 February 2014. Bores not accessible in February 2014 were sampled on 19 March 2014. It is expected that site specific reference trigger values will provide the majority of groundwater trigger values in Schedule G – Table 11 of the EA because the listed default base values based on ANZECC 2000 default surface freshwater trigger values are not relevant to local groundwater. Preliminary results indicate that groundwater within the Roseby Copper Project area is distinctly alkaline, nutrient-enriched (elevated nitrogen and phosphorus) and contains naturally elevated concentrations of copper, zinc and uranium.

The default value listed in Schedule G – Table 11 of the EA of 0.000034 mg/L (0.034 µg/L) for molybdenum in groundwater appears to be an error in units translation by DEHP as it is 1,000 times higher than the ANZECC 2000 freshwater (low reliability) trigger value for molybdenum of 0.034 mg/L (34 µg/L). The site specific trigger values for molybdenum at Little Eva, Blackard and Scanlan are expected to be well below 0.034 mg/L based on results for 25 samples collected in 2013/14.

5. REFERENCES

AARC. 2012. Roseby Copper Project Environmental Management Plan. Prepared for Altona Mining Limited. May 2011. Revision 3. AustralAsian Resource Consultants. Taringa, Queensland.

ANZECC 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. National Water Quality Management Strategy Report No. 4. Australian and New Zealand Environment and Conservation Council/Agriculture and Resource Management Council of Australia and New Zealand, Australia.

DEHP 2013. Environmental Authority MIN102973311 (mining activities). Department of Environment and Heritage Protection. Queensland Government. Cairns Office. Cairns, Queensland. 28 March 2013.

MBS. 2012. Roseby Copper Project Monitoring Manual for Environmental Authority MIN102973311 (Surface Water, Sediments and Groundwater). September 2012. Prepared for Altona Mining Limited. MBS Environmental. West Perth, WA.

APPENDICES

APPENDIX 1: SURFACE WATER QUALITY RESULTS TABLES

Table A1-1: **Little Eva Reference Sites**

Parameter	Units	*LOR*	RSS8		RSS5		SW7		RSS4		SW2	
Date	-	-	12/02/2014	20/03/2014	12/02/2014	20/03/2014	12/02/2014	20/03/2014	12/02/2014	20/03/2014	12/02/2014	20/03/2014
Physicochemical Parameters												
pH	pH units	*0.1*	-	-	-	-	-	-	7.6	-	-	-
TDS	mg/L	*10*	-	-	-	-	-	-	96	-	-	-
TSS	mg/L	*5*	-	-	-	-	-	-	480	-	-	-
Bicarbonate	mg CaCO3/L	*5*	-	-	-	-	-	-	74	-	-	-
Carbonate	mg CaCO3/L	*5*	-	-	-	-	-	-	<5	-	-	-
Total Alkalinity	mg CaCO3/L	*5*	-	-	-	-	-	-	74	-	-	-
Major Ions												
Calcium	mg/L	*0.05*	-	-	-	-	-	-	19	-	-	-
Magnesium	mg/L	*0.05*	-	-	-	-	-	-	2.6	-	-	-
Sodium	mg/L	*0.05*	-	-	-	-	-	-	5.7	-	-	-
Potassium	mg/L	*0.05*	-	-	-	-	-	-	5.1	-	-	-
Chloride	mg/L	*2*	-	-	-	-	-	-	5	-	-	-
Free Chlorine	mg/L	*0.5*										
Sulfate	mg/L	*0.5*	-	-	-	-	-	-	2.2	-	-	-
Fluoride	mg/L	*0.05*	-	-	-	-	-	-	0.08	-	-	-
Filtered Metals and Metalloids												
Aluminium	mg/L	*0.005*	-	-	-	-	-	-	0.008	-	-	-
Arsenic	mg/L	*0.003*	-	-	-	-	-	-	<0.003	-	-	-
Cadmium	mg/L	*0.0001*	-	-	-	-	-	-	0.0002	-	-	-
Chromium	mg/L	*0.001*	-	-	-	-	-	-	<0.001	-	-	-
Cobalt	mg/L	*0.001*	-	-	-	-	-	-	<0.001	-	-	-
Copper	mg/L	*0.001*	-	-	-	-	-	-	0.005	-	-	-
Iron	mg/L	*0.005*	-	-	-	-	-	-	<0.005	-	-	-
Lead	mg/L	*0.001*	-	-	-	-	-	-	<0.001	-	-	-
Manganese	mg/L	*0.005*	-	-	-	-	-	-	<0.005	-	-	-
Molybdenum	mg/L	*0.005*	-	-	-	-	-	-	<0.005	-	-	-
Mercury	mg/L	*0.0001*	-	-	-	-	-	-	<0.00005	-	-	-
Nickel	mg/L	*0.001*	-	-	-	-	-	-	<0.001	-	-	-
Selenium	mg/L	*0.003*	-	-	-	-	-	-	<0.003	-	-	-
Silver	µg/L	*0.05*	-	-	-	-	-	-	<0.05	-	-	-
Uranium	µg/L	*0.01*	-	-	-	-	-	-	<0.5	-	-	-
Zinc	mg/L	*0.005*	-	-	-	-	-	-	<0.005	-	-	-
Nutrients												
Total Nitrogen	mg/L	*0.05*	-	-	-	-	-	-	1.7	-	-	-
Total Phosphorus	mg/L	*0.02*	-	-	-	-	-	-	0.12	-	-	-
Nitrate/Nitrite Nitrogen (NOx as N)	mg/L	*0.005*	-	-	-	-	-	-	0.97	-	-	-
Total Kjeldahl Nitrogen	mg/L	*0.05*	-	-	-	-	-	-	0.71	-	-	-
Biological												
Faecal coliforms	cfu/100 mL	-	-	-	-	-	-	-	980	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	120	-	-	-

Table A1-2: **Little Eva Downstream Sites**

Parameter	Units	*LOR*	SW1		SW8		RSS6	
Date	-	-	12/02/2014	20/03/2014	12/02/2014	20/03/2014	12/02/2014	20/03/2014
Physicochemical Parameters								
pH	pH units	*0.1*	-	7.8	-	-	7.6	-
TDS	mg/L	*10*	-	230	-	-	130	-
TSS	mg/L	*5*	-	36	-	-	99	-
Bicarbonate	mg CaCO3/L	*5*	-	210	-	-	100	-
Carbonate	mg CaCO3/L	*5*	-	<5	-	-	<5	-
Total Alkalinity	mg CaCO3/L	*5*	-	210	-	-	100	-
Major Ions								
Calcium	mg/L	*0.05*	-	52	-	-	25	-
Magnesium	mg/L	*0.05*	-	9.7	-	-	4.4	-
Sodium	mg/L	*0.05*	-	16	-	-	11	-
Potassium	mg/L	*0.05*	-	9	-	-	4.8	-
Chloride	mg/L	*2*	-	10	-	-	6	-
Free Chlorine	mg/L	*0.5*		<0.5				
Sulfate	mg/L	*0.5*	-	0.8	-	-	3.1	-
Fluoride	mg/L	*0.05*	-	0.23	-	-	0.17	-
Filtered Metals and Metalloids								
Aluminium	mg/L	*0.005*	-	<0.005	-	-	0.006	-
Arsenic	mg/L	*0.003*	-	0.003	-	-	<0.003	-
Cadmium	mg/L	*0.0001*	-	<0.0001	-	-	<0.0001	-
Chromium	mg/L	*0.001*	-	<0.001	-	-	<0.001	-
Cobalt	mg/L	*0.001*	-	<0.001	-	-	<0.001	-
Copper	mg/L	*0.001*	-	0.002	-	-	0.003	-
Iron	mg/L	*0.005*	-	<0.005	-	-	0.009	-
Lead	mg/L	*0.001*	-	<0.001	-	-	<0.001	-
Manganese	mg/L	*0.005*	-	0.007	-	-	<0.005	-
Molybdenum	mg/L	*0.005*	-	<0.005	-	-	<0.005	-
Mercury	mg/L	*0.0001*	-	<0.00005	-	-	<0.00005	-
Nickel	mg/L	*0.001*	-	0.001	-	-	<0.001	-
Selenium	mg/L	*0.003*	-	<0.003	-	-	<0.003	-
Silver	µg/L	*0.05*	-	<0.05	-	-	<0.05	-
Uranium	µg/L	*0.01*	-	1.7	-	-	<0.5	-
Zinc	mg/L	*0.005*	-	<0.005	-	-	<0.005	-
Nutrients								
Total Nitrogen	mg/L	*0.05*	-	1.4	-	-	2	-
Total Phosphorus	mg/L	*0.02*	-	0.11	-	-	0.13	-
Nitrate/Nitrite Nitrogen (NOx as N)	mg/L	*0.005*	-	0.022	-	-	1.3	-
Total Kjeldahl Nitrogen	mg/L	*0.05*	-	1.4	-	-	0.75	-
Biological								
Faecal coliforms	cfu/100 mL	-	-	-	-	-	980	-
Turbidity	NTU	-	-	16	-	-	68	-

Table A1-3: Blackard Reference Sites

Parameter	Units	*LOR*	SW13		SW12	
Date	-	-	12/02/2014	20/03/2014	12/02/2014	20/03/2014
Physicochemical Parameters						
pH	pH units	*0.1*	6.8	-	-	-
TDS	mg/L	*10*	84	-	-	-
TSS	mg/L	*5*	52	-	-	-
Bicarbonate	mg CaCO3/L	*5*	27	-	-	-
Carbonate	mg CaCO3/L	*5*	<5	-	-	-
Total Alkalinity	mg CaCO3/L	*5*	27	-	-	-
Major Ions						
Calcium	mg/L	*0.05*	8.1	-	-	-
Magnesium	mg/L	*0.05*	4.6	-	-	-
Sodium	mg/L	*0.05*	7.3	-	-	-
Potassium	mg/L	*0.05*	7.8	-	-	-
Chloride	mg/L	*2*	7	-	-	-
Free Chlorine	mg/L	*0.5*				
Sulfate	mg/L	*0.5*	3.5	-	-	-
Fluoride	mg/L	*0.05*	0.09	-	-	-
Filtered Metals and Metalloids						
Aluminium	mg/L	*0.005*	0.01	-	-	-
Arsenic	mg/L	*0.003*	<0.003	-	-	-
Cadmium	mg/L	*0.0001*	0.0002	-	-	-
Chromium	mg/L	*0.001*	<0.001	-	-	-
Cobalt	mg/L	*0.001*	<0.001	-	-	-
Copper	mg/L	*0.001*	0.003	-	-	-
Iron	mg/L	*0.005*	0.014	-	-	-
Lead	mg/L	*0.001*	<0.001	-	-	-
Manganese	mg/L	*0.005*	0.067	-	-	-
Molybdenum	mg/L	*0.005*	<0.005	-	-	-
Mercury	mg/L	*0.0001*	<0.00005	-	-	-
Nickel	mg/L	*0.001*	<0.001	-	-	-
Selenium	mg/L	*0.003*	<0.003	-	-	-
Silver	µg/L	*0.05*	<0.05	-	-	-
Uranium	µg/L	*0.01*	<0.5	-	-	-
Zinc	mg/L	*0.005*	0.017	-	-	-
Nutrients						
Total Nitrogen	mg/L	*0.05*	8.5	-	-	-
Total Phosphorus	mg/L	*0.02*	0.03	-	-	-
Nitrate/Nitrite Nitrogen (NOx as	mg/L	*0.005*	7.9	-	-	-
Total Kjeldahl Nitrogen	mg/L	*0.05*	0.7	-	-	-
Biological						
Faecal coliforms	cfu/100 mL	-	1400	-	-	-
Turbidity	NTU	-	61	-	-	-

Table A1-4: Blackard Downstream Sites

Parameter	Units	*LOR*	SW2		SW6	
Date	-	-	12/02/2014	20/03/2014	12/02/2014	20/03/2014
Physicochemical Parameters						
pH	pH units	*0.1*	-	7.6	6.9	-
TDS	mg/L	*10*	-	140	40	-
TSS	mg/L	*5*	-	140	36	-
Bicarbonate	mg CaCO3/L	*5*	-	130	31	-
Carbonate	mg CaCO3/L	*5*	-	<5	<5	-
Total Alkalinity	mg CaCO3/L	*5*	-	130	31	-
Major Ions						
Calcium	mg/L	*0.05*	-	26	8.2	-
Magnesium	mg/L	*0.05*	-	5.5	1.3	-
Sodium	mg/L	*0.05*	-	15	2.4	-
Potassium	mg/L	*0.05*	-	8.1	3.5	-
Chloride	mg/L	*2*	-	7	2	-
Free Chlorine	mg/L	*0.5*		<0.5		
Sulfate	mg/L	*0.5*	-	2.7	1.7	-
Fluoride	mg/L	*0.05*	-	0.3	0.09	-
Filtered Metals and Metalloids						
Aluminium	mg/L	*0.005*	-	0.008	0.007	-
Arsenic	mg/L	*0.003*	-	<0.003	<0.003	-
Cadmium	mg/L	*0.0001*	-	<0.0001	<0.0001	-
Chromium	mg/L	*0.001*	-	<0.001	<0.001	-
Cobalt	mg/L	*0.001*	-	<0.001	<0.001	-
Copper	mg/L	*0.001*	-	0.004	0.005	-
Iron	mg/L	*0.005*	-	<0.005	0.008	-
Lead	mg/L	*0.001*	-	<0.001	<0.001	-
Manganese	mg/L	*0.005*	-	0.01	0.013	-
Molybdenum	mg/L	*0.005*	-	<0.005	<0.005	-
Mercury	mg/L	*0.0001*	-	<0.00005	<0.00005	-
Nickel	mg/L	*0.001*	-	<0.001	<0.001	-
Selenium	mg/L	*0.003*	-	<0.003	<0.003	-
Silver	µg/L	*0.05*	-	<0.05	<0.05	-
Uranium	µg/L	*0.01*	-	0.9	<0.5	-
Zinc	mg/L	*0.005*	-	<0.005	<0.005	-
Nutrients						
Total Nitrogen	mg/L	*0.05*	-	2.1	1.1	-
Total Phosphorus	mg/L	*0.02*	-	0.12	0.1	-
Nitrate/Nitrite Nitrogen (NOx as	mg/L	*0.005*	-	<0.005	0.39	-
Total Kjeldahl Nitrogen	mg/L	*0.05*	-	2.1	0.7	-
Biological						
Faecal coliforms	cfu/100 mL	-	-	-	1300	-
Turbidity	NTU	-	-	64	46	-

Table A1-5: **Scanlan Reference Sites**

Parameter	Units	*LOR*	SW4		SW10		RSS2			RSS9		RSS10		Cockatoo W/H
Date	-	-	12/02/2014	20/03/2014	12/02/2014	20/03/2014	12/02/2014	20/03/2014	23/04/2014	12/02/2014	20/03/2014	12/02/2014	20/03/2014	12/02/2014
Physicochemical Parameters														
pH	pH units	*0.1*	7.4	-	6.2	-	7.2	-	7.9	7.4	-	7.1	7.7	7.1
TDS	mg/L	*10*	72	-	56	-	60	-	160	150	-	59	110	43
TSS	mg/L	*5*	39	-	16	-	93	-	8	16	-	73	20	28
Bicarbonate	mg CaCO3/L	*5*	56	-	7	-	50	-	160	83	-	48	96	35
Carbonate	mg CaCO3/L	*5*	<5	-	<5	-	<5	-	<5	<5	-	<5	<5	<5
Total Alkalinity	mg CaCO3/L	*5*	56	-	7	-	50	-	160	83	-	48	96	35
Major Ions														
Calcium	mg/L	*0.05*	11	-	6.7	-	11	-	30	19	-	9.6	20	7.2
Magnesium	mg/L	*0.05*	2.5	-	1.1	-	2.0	-	5.3	3.7	-	1.9	4	1.5
Sodium	mg/L	*0.05*	8.8	-	0.6	-	7.9	-	17	23	-	7.8	17	5.7
Potassium	mg/L	*0.05*	3.6	-	3.5	-	3.2	-	6.1	4.9	-	3.1	4.4	3.3
Chloride	mg/L	*2*	4	-	8	-	4	-	7	12	-	4	5	3
Free Chlorine	mg/L	*0.5*							<0.5				<0.5	
Sulfate	mg/L	*0.5*	1.8	-	1.4	-	2.3	-	1.7	15	-	2.2	2.3	1.3
Fluoride	mg/L	*0.05*	0.2	-	0.05	-	0.06	-	0.30	0.1	-	0.16	0.26	<0.05
Filtered Metals and Metalloids														
Aluminium	mg/L	*0.005*	0.006	-	0.014	-	0.14	-	0.006	0.01	-	0.13	0.008	0.2
Arsenic	mg/L	*0.003*	<0.003	-	<0.003	-	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	<0.003
Cadmium	mg/L	*0.0001*	<0.0001	-	<0.0001	-	<0.0001	-	<0.0001	0.0001	-	<0.0001	0.0003	<0.0001
Chromium	mg/L	*0.001*	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001
Cobalt	mg/L	*0.001*	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001
Copper	mg/L	*0.001*	0.002	-	0.003	-	0.003	-	0.002	0.004	-	0.003	0.003	0.003
Iron	mg/L	*0.005*	0.021	-	0.019	-	0.16	-	0.015	0.017	-	0.14	0.011	0.19
Lead	mg/L	*0.001*	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	<0.001	<0.001
Manganese	mg/L	*0.005*	<0.005	-	<0.005	-	<0.005	-	0.046	0.007	-	<0.005	0.006	<0.005
Molybdenum	mg/L	*0.005*	<0.005	-	<0.005	-	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	<0.005
Mercury	mg/L	*0.0001*	<0.00005	-	<0.00005	-	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	<0.00005
Nickel	mg/L	*0.001*	<0.001	-	<0.001	-	<0.001	-	<0.001	<0.001	-	<0.001	0.001	<0.001
Selenium	mg/L	*0.003*	<0.003	-	<0.003	-	<0.003	-	<0.003	<0.003	-	<0.003	<0.003	<0.003
Silver	µg/L	*0.05*	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	<0.05
Uranium	µg/L	*0.01*	<0.5	-	<0.5	-	<0.5	-		0.7	-	<0.5	0.7	<0.5
Zinc	mg/L	*0.005*	<0.005	-	<0.005	-	<0.005	-	0.005	0.006	-	<0.005	0.008	<0.005
Nutrients														
Total Nitrogen	mg/L	*0.05*	0.83	-	0.86	-	0.9	-	0.84	3.5	-	0.69	0.54	0.59
Total Phosphorus	mg/L	*0.02*	0.12	-	0.07	-	0.1	-	0.06	0.05	-	0.11	0.04	0.06
litrate/Nitrite Nitrogen (NOx as N	mg/L	*0.005*	0.27	-	0.45	-	0.21	-	0.006	2.8	-	0.25	0.013	0.17
Total Kjeldahl Nitrogen	mg/L	*0.05*	0.57	-	0.4	-	0.7	-	0.83	0.64	-	0.44	0.53	0.41
Biological														
Faecal coliforms	cfu/100 mL	-	820	-	920	-	870	-		580	-	870	-	1300
Turbidity	NTU	-	99	-	39	-	150	-	28	42	-	150	26	63

Table A1-5: **Scanlan Reference Sites**

Parameter	Units	*LOR*		Dan Lynch			Longamundi		
Date	-	-	20/03/2014	12/02/2014	20/03/2014	23/04/2014	12/02/2014	20/03/2014	23/04/2014
Physicochemical Parameters									
pH	pH units	*0.1*	-	7.2	7.7	7.9	7.2	7.7	7.7
TDS	mg/L	*10*	-	66	110	160	66	110	160
TSS	mg/L	*5*	-	1100	17	26	25	44	96
Bicarbonate	mg CaCO3/L	*5*	-	56	96	160	53	100	140
Carbonate	mg CaCO3/L	*5*	-	<5	<5	<5	<5	<5	<5
Total Alkalinity	mg CaCO3/L	*5*	-	56	96	160	53	100	140
Major Ions									
Calcium	mg/L	*0.05*	-	9.9	20	30	11	23	32
Magnesium	mg/L	*0.05*	-	1.9	4	5.3	2.3	4.4	5.5
Sodium	mg/L	*0.05*	-	8	13	17	8.4	11	14
Potassium	mg/L	*0.05*	-	3	4.4	6.1	3.5	4.7	5.9
Chloride	mg/L	*2*	-	4	5	7	4	5	3
Free Chlorine	mg/L	*0.5*			<0.5	<0.5		<0.5	<0.5
Sulfate	mg/L	*0.5*	-	2.2	2.1	1.7	2.4	1.6	0.8
Fluoride	mg/L	*0.05*	-	0.17	0.29	0.30	0.18	0.27	0.30
Filtered Metals and Metalloids									
Aluminium	mg/L	*0.005*	-	0.089	<0.005	0.006	<0.005	0.007	0.006
Arsenic	mg/L	*0.003*	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cadmium	mg/L	*0.0001*	-	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001
Chromium	mg/L	*0.001*	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	*0.001*	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	*0.001*	-	0.003	0.003	0.003	0.002	0.003	0.002
Iron	mg/L	*0.005*	-	0.099	0.007	0.017	0.026	0.026	0.057
Lead	mg/L	*0.001*	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	*0.005*	-	<0.005	0.01	0.047	<0.005	0.12	0.026
Molybdenum	mg/L	*0.005*	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	mg/L	*0.0001*	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00036
Nickel	mg/L	*0.001*	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	*0.003*	-	<0.003	0.005	<0.003	<0.003	<0.003	<0.003
Silver	µg/L	*0.05*	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Uranium	µg/L	*0.01*	-	<0.5	<0.5		<0.5	<0.5	
Zinc	mg/L	*0.005*	-	<0.005	0.012	0.005	<0.005	0.012	<0.005
Nutrients									
Total Nitrogen	mg/L	*0.05*	-	1.6	0.62	0.83	0.86	0.8	2.1
Total Phosphorus	mg/L	*0.02*	-	0.31	0.05	0.05	0.11	0.08	0.18
litrate/Nitrite Nitrogen (NOx as N	mg/L	*0.005*	-	0.29	0.005	<0.005	0.32	<0.005	0.005
Total Kjeldahl Nitrogen	mg/L	*0.05*	-	1.3	0.61	0.83	0.55	0.79	2.1
Biological									
Faecal coliforms	cfu/100 mL	-	-	1000	-		1700	-	
Turbidity	NTU	-	-	510	25	29	72	66	62

Table A1-6: **Scanlan Downstream Sites**

Parameter	Units	*LOR*	SW3		SW5		SW9	
Date	-	-	12/02/2014	20/03/2014	12/02/2014	20/03/2014	12/02/2014	20/03/2014
Physicochemical Parameters								
pH	pH units	*0.1*	7.4	7.6	6.8	-	7.4	-
TDS	mg/L	*10*	72	140	22	-	72	-
TSS	mg/L	*5*	34	66	42	-	34	-
Bicarbonate	mg CaCO3/L	*5*	58	130	18	-	59	-
Carbonate	mg CaCO3/L	*5*	<5	<5	<5	-	<5	-
Total Alkalinity	mg CaCO3/L	*5*	58	130	18	-	59	-
Major Ions								
Calcium	mg/L	*0.05*	11	26	4.9	-	12	-
Magnesium	mg/L	*0.05*	2.5	5.6	0.69	-	2.8	-
Sodium	mg/L	*0.05*	9.1	15	0.8	-	9.2	-
Potassium	mg/L	*0.05*	3.6	8.1	3	-	3.8	-
Chloride	mg/L	*2*	4	6	2	-	4	-
Free Chlorine	mg/L	*0.5*		1.2				
Sulfate	mg/L	*0.5*	2.1	2.6	<0.5	-	2.2	-
Fluoride	mg/L	*0.05*	0.23	0.32	0.06	-	0.18	-
Filtered Metals and Metalloids								
Aluminium	mg/L	*0.005*	0.008	0.009	0.61	-	0.012	-
Arsenic	mg/L	*0.003*	<0.003	<0.003	<0.003	-	<0.003	-
Cadmium	mg/L	*0.0001*	<0.0001	<0.0001	<0.0001	-	<0.0001	-
Chromium	mg/L	*0.001*	<0.001	<0.001	<0.001	-	<0.001	-
Cobalt	mg/L	*0.001*	<0.001	<0.001	<0.001	-	<0.001	-
Copper	mg/L	*0.001*	0.003	0.004	0.004	-	0.002	-
Iron	mg/L	*0.005*	0.028	<0.005	0.43	-	0.019	-
Lead	mg/L	*0.001*	<0.001	<0.001	<0.001	-	<0.001	-
Manganese	mg/L	*0.005*	0.011	0.008	0.025	-	<0.005	-
Molybdenum	mg/L	*0.005*	<0.005	<0.005	<0.005	-	<0.005	-
Mercury	mg/L	*0.0001*	<0.00005	<0.00005	<0.00005	-	<0.00005	-
Nickel	mg/L	*0.001*	<0.001	<0.001	0.001	-	<0.001	-
Selenium	mg/L	*0.003*	<0.003	<0.003	<0.003	-	<0.003	-
Silver	µg/L	*0.05*	<0.05	<0.05	<0.05	-	<0.05	-
Uranium	µg/L	*0.01*	<0.5	0.9	<0.5	-	<0.5	-
Zinc	mg/L	*0.005*	<0.005	<0.005	<0.005	-	<0.005	-
Nutrients								
Total Nitrogen	mg/L	*0.05*	0.82	2	0.54	-	0.81	-
Total Phosphorus	mg/L	*0.02*	0.09	0.13	0.09	-	0.11	-
Nitrate/Nitrite Nitrogen (NOx as	mg/L	*0.005*	0.29	0.005	0.015	-	0.25	-
Total Kjeldahl Nitrogen	mg/L	*0.05*	0.53	2	0.53	-	0.56	-
Biological								
Faecal coliforms	cfu/100 mL	-	1400	-	1200	-	730	-
Turbidity	NTU	-	83	63	87	-	82	-

Physicochemical Parameters	
pH	pH**
TDS	Total Dissolved Solids (by calculation)
TSS	Total Suspended Solids Dried at 103-105°(
Bicarbonate	Bicarbonate Alkalinity as CaCO3
Carbonate	Carbonate Alkalinity as CaCO3
Total Alkalinity	Total Alkalinity as CaCO3
Major Ions	
Calcium	Calcium, Ca
Magnesium	Magnesium, Mg
Sodium	Sodium, Na
Potassium	Potassium, K
Chloride	Chloride
Free Chlorine	
Sulphate	Sulphur as Sulphate, SO4
Fluoride	Fluoride by ISE
Filtered Metals and Metalloids	
Aluminium	Aluminium, Al
Arsenic	Arsenic, As
Cadmium	Cadmium, Cd
Chromium	Chromium, Cr
Cobalt	Cobalt, Co
Copper	Copper, Cu
Iron	Iron, Fe
Lead	Lead, Pb
Manganese	Manganese, Mn
Molybdenum	Molybdenum, Mo
Mercury	Mercury
Nickel	Nickel, Ni
Selenium	Selenium, Se
Silver	Silver, Ag
Uranium	Uranium, U
Zinc	Zinc, Zn
Nutrients	
Total Nitrogen	Total Nitrogen (calc)
Total Phosphorus	Total Phosphorus (Kjeldahl Digestion)
Nitrate/Nitrite Nitrogen (NOx as N)	Nitrate/Nitrite Nitrogen, NOx as N
Total Kjeldahl Nitrogen	Total Kjeldahl Nitrogen
Biological	
Faecal coliforms	Faecal Coliforms
Turbidity	Turbidity

APPENDIX 2: STREAM SEDIMENT RESULTS TABLES

Table A2-1: **Little Eva Reference Sites**

Parameter	Units	LOR	RSS8		RSS5		SW7		RSS4		SW2	
Date			14/10/2013	12/02/2014	14/10/2013	12/02/2014	14/10/2013	12/02/2014	14/10/2013	12/02/2014	14/10/2013	12/02/2014
Particle Size Distribution												
Passing 2.00mm	%w/w	1	99	inaccessible	62	inaccessible	64	inaccessible	43	64	88	inaccessible
Retained 2.00mm	%w/w	1	<1	inaccessible	38	inaccessible	37	inaccessible	57	36	12	inaccessible
Passing 600µm	%w/w	1	99	inaccessible	21	inaccessible	36	inaccessible	10	48	56	inaccessible
Retained 600µm	%w/w	1	<1	inaccessible	41	inaccessible	27	inaccessible	33	16	32	inaccessible
Passing 300µm	%w/w	1	66	inaccessible	9	inaccessible	22	inaccessible	2	30	19	inaccessible
Retained 300µm	%w/w	1	33	inaccessible	13	inaccessible	14	inaccessible	8	18	37	inaccessible
Passing 212µm	%w/w	1	40	inaccessible	7	inaccessible	15	inaccessible	1	16	8	inaccessible
Retained 212µm	%w/w	1	26	inaccessible	2	inaccessible	7	inaccessible	1	14	11	inaccessible
Passing 63µm	%w/w	1	5	inaccessible	3	inaccessible	5	inaccessible	<1	3	2	inaccessible
Retained 63µm	%w/w	1	35	inaccessible	4	inaccessible	10	inaccessible	<1	13	6	inaccessible
Total Recoverable Metals												
Arsenic	mg/kg	0.5	2	inaccessible	2	inaccessible	3	inaccessible	2	1.8	2	inaccessible
Cadmium	mg/kg	0.1	<0.3	inaccessible	<0.3	inaccessible	<0.3	inaccessible	<0.3	<0.1	<0.3	inaccessible
Chromium	mg/kg	0.5	11	inaccessible	12	inaccessible	24	inaccessible	14	12	30	inaccessible
Cobalt	mg/kg	0.5	5.3	inaccessible	8.7	inaccessible	26	inaccessible	9.7	8	9	inaccessible
Copper	mg/kg	0.5	10	inaccessible	19	inaccessible	130	inaccessible	92	71	44	inaccessible
Lead	mg/kg	0.5	3	inaccessible	2	inaccessible	6	inaccessible	3	2.9	4	inaccessible
Manganese	mg/kg	2	250	inaccessible	430	inaccessible	500	inaccessible	800	640	580	inaccessible
Mercury	mg/kg	0.01	<0.01	inaccessible	<0.01	inaccessible	<0.01	inaccessible	<0.01	<0.01	<0.01	inaccessible
Nickel	mg/kg	0.5	6.7	inaccessible	6.8	inaccessible	19	inaccessible	12	10	8.6	inaccessible
Selenium	mg/kg	1	<3	inaccessible	<3	inaccessible	<3	inaccessible	<3	<1	<3	inaccessible
Silver	mg/kg	0.2	<1	inaccessible	<1	inaccessible	<1	inaccessible	<1	<0.2	<1	inaccessible
Sulfur	mg/kg	50	27	inaccessible	<10	inaccessible	<10	inaccessible	<10	<50	<10	inaccessible
Uranium[1]	mg/kg	0.1	(2.7)	inaccessible	(4.8)	inaccessible	(15)	inaccessible	(5.0)	1	(6.1)	inaccessible
Zinc	mg/kg	0.5	8	inaccessible	4	inaccessible	12	inaccessible	5	5.1	2	inaccessible
Bioavailable Metals												
Arsenic	mg/kg	0.5	<0.5	inaccessible	<0.5	inaccessible	0.7	inaccessible	0.8	0.7	<0.5	inaccessible
Cadmium	mg/kg	0.1	<0.1	inaccessible	<0.1	inaccessible	<0.1	inaccessible	<0.1	<0.1	<0.1	inaccessible
Chromium	mg/kg	0.5	<0.5	inaccessible	<0.5	inaccessible	0.5	inaccessible	<0.5	0.5	<0.5	inaccessible
Cobalt	mg/kg	0.5	2.1	inaccessible	3.2	inaccessible	4.8	inaccessible	3.0	3.7	3.0	inaccessible
Copper	mg/kg	0.5	2.5	inaccessible	2.2	inaccessible	14	inaccessible	15	16	8.2	inaccessible
Lead	mg/kg	0.5	1.6	inaccessible	0.8	inaccessible	2.0	inaccessible	1	1.7	1.1	inaccessible
Manganese	mg/kg	2	160	inaccessible	280	inaccessible	320	inaccessible	440	510	260	inaccessible
Mercury	mg/kg	0.01	<0.01	inaccessible	<0.01	inaccessible	<0.01	inaccessible	<0.01	<0.01	<0.01	inaccessible
Nickel	mg/kg	0.5	0.9	inaccessible	0.9	inaccessible	0.9	inaccessible	1.3	1.7	0.7	inaccessible
Selenium	mg/kg	1	<1	inaccessible	<1	inaccessible	<1	inaccessible	<1	<1	<1	inaccessible
Silver	mg/kg	0.2	<0.2	inaccessible	<0.2	inaccessible	<0.2	inaccessible	<0.2	<0.2	<0.2	inaccessible
Sulfur	mg/kg	50	<50	inaccessible	<50	inaccessible	<50	inaccessible	<50	<50	<50	inaccessible
Uranium	mg/kg	0.5	0.8	inaccessible	0.8	inaccessible	0.9	inaccessible	0.8	<0.5	0.6	inaccessible
Zinc	mg/kg	0.5	1.7	inaccessible	0.7	inaccessible	1.3	inaccessible	0.6	1	0.7	inaccessible
Other												
Fluoride	mg/kg	0.5	1	inaccessible	0.9	inaccessible	0.6	inaccessible	0.8	1.1	0.6	inaccessible

Note [1] Uranium values in parentheses are considered outliers due to suspected laboratory error

Table A2-2: **Little Eva Downstream Sites**

Parameter	Units	LOR	SW1		SW8		RSS6	
Date			14/10/2013	12/02/2014	14/10/2013	12/02/2014	14/10/2013	12/02/2014
Particle Size Distribution								
Passing 2.00mm	%w/w	1	98	inaccessible	82	inaccessible	94	78
Retained 2.00mm	%w/w	1	2	inaccessible	18	inaccessible	7	22
Passing 600µm	%w/w	1	72	inaccessible	35	inaccessible	14	9
Retained 600µm	%w/w	1	26	inaccessible	47	inaccessible	80	68
Passing 300µm	%w/w	1	28	inaccessible	15	inaccessible	3	5
Retained 300µm	%w/w	1	44	inaccessible	20	inaccessible	11	5
Passing 212µm	%w/w	1	12	inaccessible	9	inaccessible	1	3
Retained 212µm	%w/w	1	16	inaccessible	6	inaccessible	1	2
Passing 63µm	%w/w	1	4	inaccessible	2	inaccessible	<1	1
Retained 63µm	%w/w	1	8	inaccessible	7	inaccessible	<1	2
Total Recoverable Metals								
Arsenic	mg/kg	0.5	1	inaccessible	2	inaccessible	3	1.7
Cadmium	mg/kg	0.1	<0.3	inaccessible	<0.3	inaccessible	<0.3	<0.1
Chromium	mg/kg	0.5	7.8	inaccessible	17	inaccessible	7.2	6.7
Cobalt	mg/kg	0.5	4.6	inaccessible	16	inaccessible	4.7	3.8
Copper	mg/kg	0.5	11	inaccessible	93	inaccessible	9.7	8.5
Lead	mg/kg	0.5	2	inaccessible	3	inaccessible	3	2.4
Manganese	mg/kg	2	240	inaccessible	650	inaccessible	350	290
Mercury	mg/kg	0.01	<0.01	inaccessible	<0.01	inaccessible	<0.01	<0.01
Nickel	mg/kg	0.5	4.7	inaccessible	16	inaccessible	4.6	4
Selenium	mg/kg	1	<3	inaccessible	<3	inaccessible	<3	<1
Silver	mg/kg	0.2	<1	inaccessible	<1	inaccessible	<1	<0.2
Sulfur	mg/kg	50	<10	inaccessible	<10	inaccessible	<10	<50
Uranium[1]	mg/kg	0.1	(3.0)	inaccessible	(7.7)	inaccessible	(1.1)	0.7
Zinc	mg/kg	0.5	5	inaccessible	10	inaccessible	6	5
Bioavailable Metals								
Arsenic	mg/kg	0.5	<0.5	inaccessible	0.9	inaccessible	<0.5	<0.5
Cadmium	mg/kg	0.1	<0.1	inaccessible	<0.1	inaccessible	<0.1	<0.1
Chromium	mg/kg	0.5	<0.5	inaccessible	<0.5	inaccessible	<0.5	0.5
Cobalt	mg/kg	0.5	1.4	inaccessible	3.4	inaccessible	1.4	1.8
Copper	mg/kg	0.5	2.3	inaccessible	17	inaccessible	1.7	1.5
Lead	mg/kg	0.5	1	inaccessible	1	inaccessible	0.9	1.1
Manganese	mg/kg	2	130	inaccessible	400	inaccessible	160	220
Mercury	mg/kg	0.01	<0.01	inaccessible	<0.01	inaccessible	<0.01	<0.01
Nickel	mg/kg	0.5	0.5	inaccessible	0.7	inaccessible	<0.5	0.9
Selenium	mg/kg	1	<1	inaccessible	<1	inaccessible	<1	<1
Silver	mg/kg	0.2	<0.2	inaccessible	<0.2	inaccessible	<0.2	<0.2
Sulfur	mg/kg	50	<50	inaccessible	<50	inaccessible	<50	<50
Uranium	mg/kg	0.5	<0.5	inaccessible	<0.5	inaccessible	1	<0.5
Zinc	mg/kg	0.5	1	inaccessible	0.9	inaccessible	0.9	1
Other								
Fluoride	mg/kg	0.5	<0.5	inaccessible	1.1	inaccessible	<0.5	0.7

Note [1] Uranium values in parentheses are considered outliers due to suspected laboratory error

Table A2-3: **Blackard Reference Sites**

Parameter	Units	LOR	SW13		SW12	
Date			14/10/2013	12/02/2014	14/10/2013	12/02/2014
Particle Size Distribution						
Passing 2.00mm	%w/w	1	24	77	inaccessible	inaccessible
Retained 2.00mm	%w/w	1	76	23	inaccessible	inaccessible
Passing 600µm	%w/w	1	2	59	inaccessible	inaccessible
Retained 600µm	%w/w	1	22	19	inaccessible	inaccessible
Passing 300µm	%w/w	1	1	49	inaccessible	inaccessible
Retained 300µm	%w/w	1	<1	10	inaccessible	inaccessible
Passing 212µm	%w/w	1	<1	41	inaccessible	inaccessible
Retained 212µm	%w/w	1	<1	8	inaccessible	inaccessible
Passing 63µm	%w/w	1	<1	12	inaccessible	inaccessible
Retained 63µm	%w/w	1	<1	29	inaccessible	inaccessible
Total Recoverable Metals						
Arsenic	mg/kg	0.5	23	5.6	inaccessible	inaccessible
Cadmium	mg/kg	0.1	<0.3	<0.1	inaccessible	inaccessible
Chromium	mg/kg	0.5	13	11	inaccessible	inaccessible
Cobalt	mg/kg	0.5	10	8.1	inaccessible	inaccessible
Copper	mg/kg	0.5	74	38	inaccessible	inaccessible
Lead	mg/kg	0.5	8	6.1	inaccessible	inaccessible
Manganese	mg/kg	2	600	590	inaccessible	inaccessible
Mercury	mg/kg	0.01	<0.01	<0.01	inaccessible	inaccessible
Nickel	mg/kg	0.5	11	8.7	inaccessible	inaccessible
Selenium	mg/kg	1	<3	<1	inaccessible	inaccessible
Silver	mg/kg	0.2	<1	<0.2	inaccessible	inaccessible
Sulfur	mg/kg	50	<10	<50	inaccessible	inaccessible
Uranium[1]	mg/kg	0.1	(7.0)	0.5	inaccessible	inaccessible
Zinc	mg/kg	0.5	25	9.8	inaccessible	inaccessible
Bioavailable Metals						
Arsenic	mg/kg	0.5	<0.5	0.5	inaccessible	inaccessible
Cadmium	mg/kg	0.1	<0.1	<0.1	inaccessible	inaccessible
Chromium	mg/kg	0.5	<0.5	<0.5	inaccessible	inaccessible
Cobalt	mg/kg	0.5	<0.5	3.7	inaccessible	inaccessible
Copper	mg/kg	0.5	1	7.6	inaccessible	inaccessible
Lead	mg/kg	0.5	<0.5	2.9	inaccessible	inaccessible
Manganese	mg/kg	2	220	310	inaccessible	inaccessible
Mercury	mg/kg	0.01	<0.01	<0.01	inaccessible	inaccessible
Nickel	mg/kg	0.5	<0.5	1.2	inaccessible	inaccessible
Selenium	mg/kg	1	<1	<1	inaccessible	inaccessible
Silver	mg/kg	0.2	<0.2	<0.2	inaccessible	inaccessible
Sulfur	mg/kg	50	<50	<50	inaccessible	inaccessible
Uranium	mg/kg	0.5	0.5	<0.5	inaccessible	inaccessible
Zinc	mg/kg	0.5	<0.5	2.5	inaccessible	inaccessible
Other						
Fluoride	mg/kg	0.5	1.1	1.5	inaccessible	inaccessible

Note [1] Uranium values in parentheses are considered outliers due to suspected laboratory error

Table A2-4: **Blackard Downstream Sites**

Parameter	Units	LOR	SW2		SW6	
Date			14/10/2013	12/02/2014	14/10/2013	12/02/2014
Particle Size Distribution						
Passing 2.00mm	%w/w	1	inaccessible	inaccessible	66	45
Retained 2.00mm	%w/w	1	inaccessible	inaccessible	34	55
Passing 600µm	%w/w	1	inaccessible	inaccessible	19	12
Retained 600µm	%w/w	1	inaccessible	inaccessible	47	33
Passing 300µm	%w/w	1	inaccessible	inaccessible	2	3
Retained 300µm	%w/w	1	inaccessible	inaccessible	17	9
Passing 212µm	%w/w	1	inaccessible	inaccessible	2	2
Retained 212µm	%w/w	1	inaccessible	inaccessible	<1	1
Passing 63µm	%w/w	1	inaccessible	inaccessible	<1	1
Retained 63µm	%w/w	1	inaccessible	inaccessible	<1	1
Total Recoverable Metals						
Arsenic	mg/kg	0.5	inaccessible	inaccessible	3	2.1
Cadmium	mg/kg	0.1	inaccessible	inaccessible	<0.3	<0.1
Chromium	mg/kg	0.5	inaccessible	inaccessible	15	14
Cobalt	mg/kg	0.5	inaccessible	inaccessible	18	10
Copper	mg/kg	0.5	inaccessible	inaccessible	140	140
Lead	mg/kg	0.5	inaccessible	inaccessible	4	4.1
Manganese	mg/kg	2	inaccessible	inaccessible	850	810
Mercury	mg/kg	0.01	inaccessible	inaccessible	<0.01	<0.01
Nickel	mg/kg	0.5	inaccessible	inaccessible	14	12
Selenium	mg/kg	1	inaccessible	inaccessible	<3	<1
Silver	mg/kg	0.2	inaccessible	inaccessible	<1	<0.2
Sulfur	mg/kg	50	inaccessible	inaccessible	<10	<50
Uranium[1]	mg/kg	0.1	inaccessible	inaccessible	(5.8)	1
Zinc	mg/kg	0.5	inaccessible	inaccessible	6	4.8
Bioavailable Metals						
Arsenic	mg/kg	0.5	inaccessible	inaccessible	0.8	0.8
Cadmium	mg/kg	0.1	inaccessible	inaccessible	<0.1	<0.1
Chromium	mg/kg	0.5	inaccessible	inaccessible	<0.5	1
Cobalt	mg/kg	0.5	inaccessible	inaccessible	4.6	5.5
Copper	mg/kg	0.5	inaccessible	inaccessible	22	32
Lead	mg/kg	0.5	inaccessible	inaccessible	1.3	2
Manganese	mg/kg	2	inaccessible	inaccessible	400	630
Mercury	mg/kg	0.01	inaccessible	inaccessible	<0.01	<0.01
Nickel	mg/kg	0.5	inaccessible	inaccessible	1.3	2.3
Selenium	mg/kg	1	inaccessible	inaccessible	<1	<1
Silver	mg/kg	0.2	inaccessible	inaccessible	<0.2	<0.2
Sulfur	mg/kg	50	inaccessible	inaccessible	<50	<50
Uranium	mg/kg	0.5	inaccessible	inaccessible	<0.5	<0.5
Zinc	mg/kg	0.5	inaccessible	inaccessible	0.6	1
Other						
Fluoride	mg/kg	0.5	inaccessible	inaccessible	0.9	1.3

Note [1] Uranium values in parentheses are considered outliers due to suspected laboratory error

Table A2-5: **Scanlan Reference Sites**

Parameter	Units	LOR	SW4		SW10		RSS2		RSS9		RSS10		Cockatoo W/H		Dan Lynch		Longamundi	
Date			14/10/2013	12/02/2014	14/10/2013	12/02/2014	14/10/2013	12/02/2014	14/10/2013	12/02/2014	14/10/2013	12/02/2014	14/10/2013	12/02/2014	14/10/2013	12/02/2014	14/10/2013	12/02/2014
Particle Size Distribution																		
Passing 2.00mm	%w/w	1	74	100	77	82	86	67	88	77	85	99	inaccessible	90	98	99	91	99
Retained 2.00mm	%w/w	1	26	<1	23	18	15	33	12	23	15	1	inaccessible	10	2	2	9	1
Passing 600µm	%w/w	1	17	80	29	24	82	34	47	36	45	97	inaccessible	24	86	96	61	59
Retained 600µm	%w/w	1	57	20	48	58	4	33	41	41	39	2	inaccessible	66	12	2	30	40
Passing 300µm	%w/w	1	<1	16	7	8	67	14	15	8	15	73	inaccessible	3	45	86	25	10
Retained 300µm	%w/w	1	26	65	22	16	15	19	32	28	30	24	inaccessible	21	41	10	36	49
Passing 212µm	%w/w	1	<1	4	4	5	42	11	6	3	7	50	inaccessible	1	24	74	13	4
Retained 212µm	%w/w	1	1	12	3	3	25	4	10	5	8	23	inaccessible	2	21	12	12	6
Passing 63µm	%w/w	1	<1	<1	2	3	8	4	<1	<1	<1	9	inaccessible	<1	8	33	2	2
Retained 63µm	%w/w	1	<1	3	2	3	34	6	5	2	6	41	inaccessible	1	16	41	11	2
Total Recoverable Metals																		
Arsenic	mg/kg	0.5	5	4.5	34	24	1	1.8	<1	0.6	2	1	inaccessible	0.8	1	1.8	2	1.6
Cadmium	mg/kg	0.1	<0.3	<0.1	0.7	0.5	<0.3	<0.1	<0.3	<0.1	<0.3	<0.1	inaccessible	<0.1	<0.3	<0.1	<0.3	<0.1
Chromium	mg/kg	0.5	12	13	38	28	11	7.3	13	11	9.6	12	inaccessible	9.6	11	16	9.2	7.3
Cobalt	mg/kg	0.5	11	8.4	33	27	6.2	5.1	11	8.9	7.1	6.6	inaccessible	10	5.8	8.5	5.8	4.6
Copper	mg/kg	0.5	28	20	130	97	18	16	32	25	30	22	inaccessible	27	16	31	25	15
Lead	mg/kg	0.5	9	9.7	51	38	2	2.2	2	3.2	2	2.1	inaccessible	1.6	3	45	3	2.7
Manganese	mg/kg	2	1100	720	4800	4800	210	240	180	170	170	150	inaccessible	180	130	280	290	180
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	inaccessible	<0.01	<0.01	0.01	<0.01	<0.01
Nickel	mg/kg	0.5	11	9.2	36	30	7.3	5.3	9.1	8.1	6.3	7.8	inaccessible	7.5	6.4	11	6.3	5.1
Selenium	mg/kg	1	<3	<1	<3	<1	<3	<1	<3	<1	<3	<1	inaccessible	<1	<3	<1	<3	<1
Silver	mg/kg	0.2	<1	<0.2	<1	0.4	<1	<0.2	<1	<0.2	<1	<0.2	inaccessible	<0.2	<1	<0.2	<1	<0.2
Sulfur	mg/kg	50	<10	<50	26	<50	140	<50	<10	<50	<10	<50	inaccessible	<50	71	150	14	<50
Uranium[1]	mg/kg	0.1	(6.4)	0.7	(25)	2.4	(4.3)	0.9	(6.2)	0.7	(3.0)	0.8	inaccessible	0.6	(3.1)	1.1	(2.0)	0.7
Zinc	mg/kg	0.5	15	15	150	120	8	6.6	4	5.2	5	7	inaccessible	4.1	8	21	7	7
Bioavailable Metals																		
Arsenic	mg/kg	0.5	0.7	0.5	1.8	1.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	inaccessible	<0.5	0.5	1.4	0.7	0.5
Cadmium	mg/kg	0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	inaccessible	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	0.5	<0.5	0.5	0.6	0.5	<0.5	0.5	0.5	0.5	0.5	0.5	inaccessible	0.5	0.8	0.5	0.6	0.5
Cobalt	mg/kg	0.5	3.2	4.1	5.6	7	<0.5	1.7	2.6	2.5	1.6	2.2	inaccessible	3.2	1.8	4.1	2	1.8
Copper	mg/kg	0.5	4.2	4.2	13	13	1.1	3.2	3.4	2.8	15	4.7	inaccessible	3.4	4	12	5.1	4
Lead	mg/kg	0.5	2.7	5.1	6.9	8.7	<0.5	1.1	<0.5	2.3	0.6	1.2	inaccessible	0.5	1.3	40	1.4	1.5
Manganese	mg/kg	2	450	520	710	840	150	160	120	110	120	110	inaccessible	130	79	210	200	110
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	inaccessible	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel	mg/kg	0.5	1.3	2.1	2.2	3.3	<0.5	0.9	0.6	0.7	<0.5	0.9	inaccessible	0.9	0.7	1.5	0.8	0.9
Selenium	mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	inaccessible	<1	<1	<1	<1	<1
Silver	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	inaccessible	<0.2	<0.2	<0.2	<0.2	<0.2
Sulfur	mg/kg	50	<50	<50	<50	<50	100	<50	<50	<50	<50	<50	inaccessible	<50	79	<50	<50	<50
Uranium	mg/kg	0.5	<0.5	<0.5	<0.5	0.6	0.7	<0.5	1.1	<0.5	0.6	<0.5	inaccessible	<0.5	1.1	<0.5	1.2	<0.5
Zinc	mg/kg	0.5	1.3	2	13	16	<0.5	1.5	0.7	1	0.9	1.5	inaccessible	0.5	2.2	9	1.1	1.5
Other																		
Fluoride	mg/kg	0.5	1.5	1.1	0.8	1	2.7	1	0.7	0.7	1.5	1	inaccessible	0.8	2.3	2.3	1.9	1.2

Note [1] Uranium values in parentheses are considered outliers due to suspected laboratory error

Table A2-6: **Scanlan Downstream Sites**

Parameter	Units	LOR	SW3		SW5		SW9	
Date			14/10/2013	12/02/2014	14/10/2013	12/02/2014	14/10/2013	12/02/2014
Particle Size Distribution								
Passing 2.00mm	%w/w	1	73	100	68	93	81	60
Retained 2.00mm	%w/w	1	27	<1	32	7	20	40
Passing 600µm	%w/w	1	35	99	33	67	41	8
Retained 600µm	%w/w	1	38	<1	35	26	40	53
Passing 300µm	%w/w	1	20	93	7	38	11	1
Retained 300µm	%w/w	1	16	6	27	29	30	7
Passing 212µm	%w/w	1	11	85	2	20	6	<1
Retained 212µm	%w/w	1	9	8	5	18	5	<1
Passing 63µm	%w/w	1	1	17	<1	7	1	<1
Retained 63µm	%w/w	1	10	68	2	13	5	<1
Total Recoverable Metals								
Arsenic	mg/kg	0.5	2	1.7	2	1.5	2	2.1
Cadmium	mg/kg	0.1	<0.3	<0.1	<0.3	<0.1	<0.3	<0.1
Chromium	mg/kg	0.5	10	14	18	14	8.3	8
Cobalt	mg/kg	0.5	7.6	6.5	8.1	6	8.2	5
Copper	mg/kg	0.5	30	24	49	48	18	17
Lead	mg/kg	0.5	4	3.7	3	2.9	4	4.2
Manganese	mg/kg	2	560	300	700	450	710	590
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel	mg/kg	0.5	8.4	8.8	11	8.9	6.9	7.2
Selenium	mg/kg	1	<3	<1	<3	<1	<3	<1
Silver	mg/kg	0.2	<1	<0.2	<1	<0.2	<1	<0.2
Sulfur	mg/kg	50	<10	<50	<10	<50	<10	<50
Uranium[1]	mg/kg	0.1	(3.7)	0.8	(3.6)	0.6	(4.0)	0.8
Zinc	mg/kg	0.5	11	11	4	3.9	8	7.8
Bioavailable Metals								
Arsenic	mg/kg	0.5	0.7	<0.5	0.6	0.6	0.8	0.8
Cadmium	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	0.5	<0.5	1	<0.5	0.5	<0.5	0.5
Cobalt	mg/kg	0.5	2.4	2.9	2.1	2.8	3.1	2.8
Copper	mg/kg	0.5	4.2	6.2	9.9	15	3.0	2.2
Lead	mg/kg	0.5	1.7	1.9	0.7	1.4	1.5	2
Manganese	mg/kg	2	310	210	270	290	430	360
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel	mg/kg	0.5	1.0	1.4	0.9	1.5	1.0	1.2
Selenium	mg/kg	1	<1	<1	<1	<1	<1	<1
Silver	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Sulfur	mg/kg	50	<50	<50	<50	<50	<50	<50
Uranium	mg/kg	0.5	0.7	<0.5	0.8	<0.5	<0.5	<0.5
Zinc	mg/kg	0.5	1.4	2.0	<0.5	0.5	1.1	1.0
Other								
Fluoride	mg/kg	0.5	1.4	1.7	0.6	0.8	1.6	1

Note [1] Uranium values in parentheses are considered outliers due to suspected laboratory error

APPENDIX 3: GROUNDWATER QUALITY RESULTS TABLES

Table A3-1: **Little Eva Reference Bores**

Parameter	Units	LOR	LEPB001		LEPB002		LER213		LER337		LER338	
Date	-	-	14/10/2013	17/02/2014	14/10/2013	17/02/2014	14/10/2013	17/02/2014	14/10/2013	17/02/2014	14/10/2013	17/02/2014
Physicochemical Parameters												
pH	pH units	0.1	7.6	7.6	8.7	7.8	7.8	8.5	7.9	inaccessible	dry	inaccessible
TDS	mg/L	10	1100	1100	960	1500	1100	960	780	inaccessible	dry	inaccessible
TSS	mg/L	5	<5	69	<5	160	92	16	330	inaccessible	dry	inaccessible
Bicarbonate	mg CaCO3/L	5	650	670	450	450	630	490	120	inaccessible	dry	inaccessible
Carbonate	mg CaCO3/L	5	<5	<5	46	<5	<5	26	<5	inaccessible	dry	inaccessible
Total Alkalinity	mg CaCO3/L	5	650	670	500	450	630	520	120	inaccessible	dry	inaccessible
Major Ions												
Calcium	mg/L	0.05	44	50	32	54	41	31	6.5	inaccessible	dry	inaccessible
Magnesium	mg/L	0.05	42	45	38	26	19	42	3.1	inaccessible	dry	inaccessible
Sodium	mg/L	0.05	270	300	220	270	290	240	220	inaccessible	dry	inaccessible
Potassium	mg/L	0.05	6.6	8.2	9.5	21	9.9	11	3.9	inaccessible	dry	inaccessible
Chloride	mg/L	2	200	210	160	240	220	170	190	inaccessible	dry	inaccessible
Sulphate	mg/L	0.5	70	62	77	40	8.9	68	31	inaccessible	dry	inaccessible
Fluoride	mg/L	0.05	2.6	2.4	2.6	0.85	0.95	2.5	7.4	inaccessible	dry	inaccessible
Free Chlorine	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	inaccessible	dry	inaccessible
Filtered Metals and Metalloids												
Aluminium	mg/L	0.005	0.011	0.005	0.007	0.012	0.009	<0.005	0.22	inaccessible	dry	inaccessible
Arsenic	mg/L	0.003	<0.003	<0.003	<0.003	0.003	0.003	<0.003	<0.003	inaccessible	dry	inaccessible
Cadmium	mg/L	0.0001	0.0002	<0.0001	0.0001	0.0002	0.0001	0.0001	<0.0001	inaccessible	dry	inaccessible
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	inaccessible	dry	inaccessible
Cobalt	mg/L	0.001	<0.001	<0.001	0.002	0.003	0.002	<0.001	<0.001	inaccessible	dry	inaccessible
Copper	mg/L	0.001	0.004	0.006	0.017	0.012	0.002	0.02	<0.001	inaccessible	dry	inaccessible
Iron	mg/L	0.005	<0.005	<0.005	<0.005	0.026	0.033	<0.005	0.05	inaccessible	dry	inaccessible
Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	inaccessible	dry	inaccessible
Manganese	mg/L	0.005	<0.005	<0.005	<0.005	0.3	0.17	<0.005	0.02	inaccessible	dry	inaccessible
Molybdenum	mg/L	0.005	0.02	0.023	0.036	0.01	<0.005	0.04	<0.005	inaccessible	dry	inaccessible
Mercury	mg/L	0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	inaccessible	dry	inaccessible
Nickel	mg/L	0.001	<0.001	<0.001	<0.001	0.007	<0.001	0.001	<0.001	inaccessible	dry	inaccessible
Selenium	mg/L	0.003	0.004	0.005	<0.003	<0.003	<0.003	0.004	<0.003	inaccessible	dry	inaccessible
Silver	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	inaccessible	dry	inaccessible
Uranium	µg/L	0.01	39	40	25	4.1	1.4	25	<0.5	inaccessible	dry	inaccessible
Zinc	mg/L	0.005	0.019	0.021	0.017	0.045	0.014	0.024	0.016	inaccessible	dry	inaccessible
Nutrients												
Total Nitrogen	mg/L	0.05	1.6	1.5	3	110	36	2.9	2.4	inaccessible	dry	inaccessible
Total Phosphorus	mg/L	0.02	0.35	0.05	0.47	6.5	2.2	0.39	0.19	inaccessible	dry	inaccessible
Nitrate/Nitrite Nitrogen (NOx as N)	mg/L	0.005	1.5	1.1	2.8	10	0.41	2.1	0.039	inaccessible	dry	inaccessible
Total Kjeldahl Nitrogen	mg/L	0.05	0.15	0.37	0.21	98	35	0.87	2.4	inaccessible	dry	inaccessible
Biological												
Faecal coliforms	cfu/100 mL	-	<1	1	3	>2400	1	<1	<1	inaccessible	dry	inaccessible
Turbidity	NTU	-	0.8	26	3	55	39	8.9	330	inaccessible	dry	inaccessible

Table A3-2: **Blackard Reference Bores**

Parameter	Units	LOR	BC277		BC363		BC378		BCR474		BCR773		BPB001	
Date	-	-	14/10/2013	19/03/2014	14/10/2013	19/03/2014	14/10/2013	19/03/2014	14/10/2013	19/03/2014	14/10/2013	19/03/2014	14/10/2013	19/03/2014
Physicochemical Parameters														
pH	pH units	0.1	7.7	8.2	7.7	8.2	8	-	7.8	7	8.1	8.3	9	9.2
TDS	mg/L	10	1400	1300	1100	1300	660	-	1600	1400	1700	1300	490	490
TSS	mg/L	5	500	110	52	84	53	-	840	1300	46	100	18	180
Bicarbonate	mg CaCO3/L	5	1000	1200	610	1200	570	-	730	750	1300	1200	370	460
Carbonate	mg CaCO3/L	5	<5	<5	<5	<5	<5	-	<5	<5	<5	<5	64	<5
Total Alkalinity	mg CaCO3/L	5	1000	1200	610	1200	570	-	730	750	1300	1200	440	460
Major Ions														
Calcium	mg/L	0.05	23	1.7	67	1.3	46	-	50	53	2.8	1.3	5.8	2.9
Magnesium	mg/L	0.05	51	4.7	57	4.5	38	-	62	67	23	4.5	25	26
Sodium	mg/L	0.05	390	550	190	550	120	-	380	410	580	550	120	130
Potassium	mg/L	0.05	4.6	3.7	8.1	3.5	6.2	-	11	12	6.7	3.5	7.1	8.3
Chloride	mg/L	2	170	79	180	78	44	-	290	300	190	78	25	23
Sulphate	mg/L	0.5	41	43	120	44	15	-	210	230	120	44	1.1	2
Fluoride	mg/L	0.05	5	5.2	0.95	5.4	1.8	-	2.4	2.4	5	5.3	0.8	0.77
Free Chlorine	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Filtered Metals and Metalloids														
Aluminium	mg/L	0.005	0.007	0.005	0.008	<0.005	0.008	-	0.01	0.008	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.003	0.01	0.023	<0.003	0.022	<0.003	-	<0.003	0.004	0.01	0.021	<0.003	<0.003
Cadmium	mg/L	0.0001	0.0003	0.0004	0.0001	0.0002	0.0001	-	0.0002	<0.0001	0.0003	0.0003	<0.0001	<0.0001
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.003	0.006	0.014	0.006	0.01	-	0.089	0.1	0.013	0.008	0.005	0.008
Iron	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	0.011	<0.005
Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Manganese	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	0.069	0.086	<0.005	<0.005	0.008	<0.005
Molybdenum	mg/L	0.005	0.006	0.019	<0.005	0.018	<0.005	-	<0.005	0.005	0.012	0.019	<0.005	0.007
Mercury	mg/L	0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Nickel	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.003	0.008	0.006	<0.003	0.004	<0.003	-	<0.003	<0.003	0.008	0.006	<0.003	<0.003
Silver	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Uranium	µg/L	0.01	31	45	27	45	4.1	-	2.7	3.4	120	45	<0.5	<0.5
Zinc	mg/L	0.005	0.014	0.027	0.016	0.016	0.093	-	0.033	0.026	0.026	0.023	0.012	0.017
Nutrients														
Total Nitrogen	mg/L	0.05	3.4	0.21	0.3	0.15	0.26	-	0.53	0.18	1.6	0.22	0.62	1.2
Total Phosphorus	mg/L	0.02	0.29	0.14	<0.02	0.12	<0.02	-	0.33	0.09	0.21	0.15	0.02	0.11
Nitrate/Nitrite Nitrogen (NOx as N)	mg/L	0.005	2.9	<0.005	0.13	<0.005	<0.005	-	<0.005	<0.005	0.7	<0.005	0.22	0.94
Total Kjeldahl Nitrogen	mg/L	0.05	0.5	0.21	0.17	0.15	0.26	-	0.53	0.17	0.92	0.22	0.4	0.26
Biological														
Faecal coliforms	cfu/100 mL	-	3	-	1	-	99	-	>2400	-	3	-	<1	-
Turbidity	NTU	-	300	37	10	26	18	-	500	520	10	36	26	56

Table A3-3: **Scanlan Reference Bores**

Parameter	Units	LOR	SC40		SCR123	(SC30)	SCR140		SCR148	
Date	-	-	14/10/2013	17/02/2014	14/10/2013	17/02/2014	14/10/2013	17/02/2014	14/10/2013	17/02/2014
Physicochemical Parameters										
pH	pH units	0.1	7.8	7.4	dry	7.6	7.7	7.6	7.7	7.6
TDS	mg/L	10	900	900	dry	2800	720	720	1200	1200
TSS	mg/L	5	660	890	dry	130	230	15	1900	4800
Bicarbonate	mg CaCO3/L	5	440	450	dry	610	500	510	550	560
Carbonate	mg CaCO3/L	5	<5	<5	dry	<5	<5	<5	<5	<5
Total Alkalinity	mg CaCO3/L	5	440	450	dry	610	500	510	550	560
Major Ions										
Calcium	mg/L	0.05	61	65	dry	100	51	59	38	44
Magnesium	mg/L	0.05	68	74	dry	96	34	39	26	31
Sodium	mg/L	0.05	110	120	dry	650	160	150	310	350
Potassium	mg/L	0.05	6.9	7.6	dry	10	7	8.5	8.9	10
Chloride	mg/L	2	150	150	dry	630	73	74	230	240
Sulphate	mg/L	0.5	140	120	dry	700	58	53	130	130
Fluoride	mg/L	0.05	1.1	1.1	dry	1.1	0.88	0.82	1.7	1.6
Free Chlorine	mg/L	0.5	<0.5	1.4	dry	<0.5	<0.5	<0.5	<0.5	<0.5
Filtered Metals and Metalloids										
Aluminium	mg/L	0.005	0.007	<0.005	dry	0.006	0.005	<0.005	0.007	0.005
Arsenic	mg/L	0.003	<0.003	<0.003	dry	0.004	<0.003	<0.003	<0.003	<0.003
Cadmium	mg/L	0.0001	0.0002	<0.0001	dry	0.0004	<0.0001	<0.0001	0.0001	0.0003
Chromium	mg/L	0.001	<0.001	<0.001	dry	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	0.001	<0.001	<0.001	dry	<0.001	0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.006	0.007	dry	0.35	0.007	0.017	0.15	0.24
Iron	mg/L	0.005	<0.005	<0.005	dry	<0.005	<0.005	<0.005	<0.005	<0.005
Lead	mg/L	0.001	<0.001	<0.001	dry	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.005	0.053	0.056	dry	0.051	0.005	0.011	<0.005	0.009
Molybdenum	mg/L	0.005	<0.005	<0.005	dry	<0.005	<0.005	<0.005	0.005	0.014
Mercury	mg/L	0.0001	<0.00005	<0.00005	dry	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Nickel	mg/L	0.001	<0.001	<0.001	dry	0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.003	<0.003	<0.003	dry	0.015	<0.003	<0.003	<0.003	<0.003
Silver	µg/L	0.05	<0.05	<0.05	dry	<0.05	<0.05	<0.05	<0.05	<0.05
Uranium	µg/L	0.01	6	5.4	dry	58	3.5	3.4	4.9	5.3
Zinc	mg/L	0.005	0.011	0.025	dry	0.079	0.019	0.041	0.012	0.063
Nutrients										
Total Nitrogen	mg/L	0.05	2.4	0.95	dry	1.1	0.08	0.14	0.75	0.48
Total Phosphorus	mg/L	0.02	0.4	0.23	dry	0.1	0.02	<0.02	0.61	1.1
Nitrate/Nitrite Nitrogen (NOx as N)	mg/L	0.005	0.024	0.012	dry	0.069	0.011	<0.005	0.15	0.077
Total Kjeldahl Nitrogen	mg/L	0.05	2.4	0.94	dry	1	0.07	0.14	0.61	0.4
Biological										
Faecal coliforms	cfu/100 mL	-	2	43	dry	46	<1	48	<1	4
Turbidity	NTU	-	260	210	dry	59	170	7.2	1300	2200

Physicochemical Parameters	
pH	pH**
TDS	Total Dissolved Solids (by calculation)
TSS	Total Suspended Solids Dried at 103-105°(
Bicarbonate	Bicarbonate Alkalinity as CaCO3
Carbonate	Carbonate Alkalinity as CaCO3
Total Alkalinity	Total Alkalinity as CaCO3
Major Ions	
Calcium	Calcium, Ca
Magnesium	Magnesium, Mg
Sodium	Sodium, Na
Potassium	Potassium, K
Chloride	Chloride
Sulphate	Sulphur as Sulphate, SO4
Fluoride	Fluoride by ISE
Free Chlorine	Free Chlorine by DPD Colourimetric**
Filtered Metals and Metalloids	
Aluminium	Aluminium, Al
Arsenic	Arsenic, As
Cadmium	Cadmium, Cd
Chromium	Chromium, Cr
Cobalt	Cobalt, Co
Copper	Copper, Cu
Iron	Iron, Fe
Lead	Lead, Pb
Manganese	Manganese, Mn
Molybdenum	Molybdenum, Mo
Mercury	Mercury
Nickel	Nickel, Ni
Selenium	Selenium, Se
Silver	Silver, Ag
Uranium	Uranium, U
Zinc	Zinc, Zn
Nutrients	
Total Nitrogen	Total Nitrogen (calc)
Total Phosphorus	Total Phosphorus (Kjeldahl Digestion)
Nitrate/Nitrite Nitrogen (NOx as N)	Nitrate/Nitrite Nitrogen, NOx as N
Total Kjeldahl Nitrogen	Total Kjeldahl Nitrogen
Biological	
Faecal coliforms	Faecal Coliforms
Turbidity	Turbidity

APPENDIX 4: LABORATORY REPORTS

ANALYTICAL REPORT

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Talia Warda	Manager	Jon Dicker
Client	ALTONA MINING LTD	Laboratory	SGS Cairns Environmental
Address	PO BOX 1466 WEST PERTH WA 6872	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 8 94852929	Telephone	+61 07 4035 5111
Facsimile	61 8 94868700	Facsimile	+61 07 4035 5122
Email	TWarda@mbsenvironmental.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**Altona Mining - Water samples**	SGS Reference	**CE106458 R0**
Order Number	(Not specified)	Report Number	0000012121
Samples	14	Date Reported	30 Oct 2013
		Date Received	18 Oct 2013

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

Bacteriological samples received and tested >24 hours old. Results may not be indicative of conditions at the time of sampling.
Uranium subcontracted to SGS Brisbane, 59 Bancroft Rd, Pinkenba QLD 4008, NATA Accreditation Number: 2562: Site number 1706 -Micro, 20707-Chemical, BE006879.
LOR for metals has been increased due to sample matrix interferences.

SIGNATORIES

Alyson Bergamo
Senior Laboratory Technician

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Nathan Quinn
Micro Supervisor / Quality Co-ordinator

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE106458.001 Water 14 Oct 2013 LEPB001	CE106458.002 Water 14 Oct 2013 LEPB002	CE106458.003 Water 14 Oct 2013 LER213	CE106458.004 Water 14 Oct 2013 LER337
pH in water Method: AN101							
pH**	pH Units	0.1		**7.6**	**8.7**	**7.8**	**7.9**
Conductivity and TDS by Calculation - Water Method: AN106							
Conductivity @ 25 C	µS/cm	2		**1900**	**1600**	**1900**	**1300**
Total Dissolved Solids (by calculation)	mg/L	10		**1100**	**960**	**1100**	**780**
Turbidity Method: AN119							
Turbidity	NTU	0.1		**0.8**	**3.0**	**39**	**330**
Alkalinity Method: AN135							
Total Alkalinity as CaCO3	mg/L	5		**650**	**500**	**630**	**120**
Bicarbonate Alkalinity as CaCO3	mg/L	5		**650**	**450**	**630**	**120**
Carbonate Alkalinity as CaCO3	mg/L	5		<5	**46**	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5		<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144							
Free Chlorine by DPD Colourimetric***	mg/L	0.5		<0.5	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274							
Chloride	mg/L	1		**200**	**160**	**220**	**190**
Fluoride by Ion Selective Electrode in Water Method: AN141							
Fluoride by ISE	mg/L	0.05		**2.6**	**2.6**	**0.95**	**7.4**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114							
Total Suspended Solids Dried at 103-105°C	mg/L	5		<5	<5	**92**	**330**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248							
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005		**1.5**	**2.8**	**0.41**	**0.039**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE106458.001 Water 14 Oct 2013 LEPB001	CE106458.002 Water 14 Oct 2013 LEPB002	CE106458.003 Water 14 Oct 2013 LER213	CE106458.004 Water 14 Oct 2013 LER337
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281							
Total Kjeldahl Nitrogen	mg/L	0.05		**0.15**	**0.21**	**35**	**2.4**
Total Nitrogen (calc)	mg/L	0.05		**1.6**	**3.0**	**36**	**2.4**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293							
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02		**0.35**	**0.47**	**2.2**	**0.19**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321							
Aluminium, Al	mg/L	0.005		**0.011**	**0.007**	**0.009**	**0.22**
Calcium, Ca	mg/L	0.05		**44**	**32**	**41**	**6.5**
Iron, Fe	mg/L	0.005		<0.005	<0.005	**0.033**	**0.050**
Magnesium, Mg	mg/L	0.05		**42**	**38**	**19**	**3.1**
Manganese, Mn	mg/L	0.005		<0.005	<0.005	**0.17**	**0.020**
Molybdenum, Mo	mg/L	0.005		**0.020**	**0.036**	<0.005	<0.005
Potassium, K	mg/L	0.05		**6.6**	**9.5**	**9.9**	**3.9**
Sodium, Na	mg/L	0.5		**270**	**220**	**290**	**220**
Sulphur as Sulphate, SO4	mg/L	0.5		**70**	**77**	**8.9**	**31**
Zinc, Zn	mg/L	0.005		**0.019**	**0.017**	**0.014**	**0.016**
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322							
Arsenic, As	mg/L	0.003		<0.003	<0.003	**0.003**	<0.003
Cadmium, Cd	mg/L	0.0001		**0.0002**	**0.0001**	**0.0001**	<0.0001
Chromium, Cr	mg/L	0.001		<0.001	<0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001		<0.001	**0.002**	**0.002**	<0.001
Copper, Cu	mg/L	0.001		**0.004**	**0.017**	**0.002**	<0.001
Lead, Pb	mg/L	0.001		<0.001	<0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001		<0.001	<0.001	<0.001	<0.001
Selenium, Se	mg/L	0.003		**0.004**	<0.003	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304							
Silver, Ag	µg/L	0.05		<0.05	<0.05	<0.05	<0.05
Trace Metals (Dissolved) in Water by ICPMS Method: AN318							
Uranium, U^	µg/L	0.5		**39**	**25**	**1.4**	<0.5

Parameter	Units	LOR	Sample Number: CE106458.001 Sample Matrix: Water Sample Date: 14 Oct 2013 Sample Name: LEPB001	CE106458.002 Water 14 Oct 2013 LEPB002	CE106458.003 Water 14 Oct 2013 LER213	CE106458.004 Water 14 Oct 2013 LER337
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents	meq/L	-	**17.7**	**14.4**	**16.4**	**10.0**
Anion-Cation Balance	%	-100	**-6.6**	**-6.6**	**-7.2**	**9.0**
Sum of Anion Milliequivalents	meq/L	-	**20.2**	**16.5**	**19.0**	**8.37**
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
E. coli, Total and Faecal (Thermotolerant) coliforms in Water Method: AN735						
Date & Time Processed*	No unit	-	18/10/2013 14:00	18/10/2013 14:00	18/10/2013 14:00	18/10/2013 14:00
Faecal Coliforms	MPN/100mL	1	<1	**3**	**1**	<1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE106458.005 Water 15 Oct 2013 SC30	CE106458.006 Water 15 Oct 2013 SC40	CE106458.007 Water 15 Oct 2013 SCR140	CE106458.008 Water 15 Oct 2013 SCR148
pH in water Method: AN101							
pH**	pH Units	0.1		**7.9**	**7.8**	**7.7**	**7.7**
Conductivity and TDS by Calculation - Water Method: AN106							
Conductivity @ 25 C	µS/cm	2		**5500**	**1500**	**1200**	**2000**
Total Dissolved Solids (by calculation)	mg/L	10		**3300**	**900**	**720**	**1200**
Turbidity Method: AN119							
Turbidity	NTU	0.1		**12**	**260**	**170**	**1300**
Alkalinity Method: AN135							
Total Alkalinity as CaCO3	mg/L	5		**620**	**440**	**500**	**550**
Bicarbonate Alkalinity as CaCO3	mg/L	5		**620**	**440**	**500**	**550**
Carbonate Alkalinity as CaCO3	mg/L	5		<5	<5	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5		<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144							
Free Chlorine by DPD Colourimetric***	mg/L	0.5		<0.5	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274							
Chloride	mg/L	1		**790**	**150**	**73**	**230**
Fluoride by Ion Selective Electrode in Water Method: AN141							
Fluoride by ISE	mg/L	0.05		**1.4**	**1.1**	**0.88**	**1.7**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114							
Total Suspended Solids Dried at 103-105°C	mg/L	5		**22**	**660**	**230**	**1900**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248							
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005		**0.30**	**0.024**	**0.011**	**0.15**

Parameter	Units	LOR	Sample Number: CE106458.005 Sample Matrix: Water Sample Date: 15 Oct 2013 Sample Name: SC30	CE106458.006 Water 15 Oct 2013 SC40	CE106458.007 Water 15 Oct 2013 SCR140	CE106458.008 Water 15 Oct 2013 SCR148
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281						
Total Kjeldahl Nitrogen	mg/L	0.05	**0.18**	**2.4**	**0.07**	**0.61**
Total Nitrogen (calc)	mg/L	0.05	**0.48**	**2.4**	**0.08**	**0.75**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.06**	**0.40**	**0.02**	**0.61**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Aluminium, Al	mg/L	0.005	**0.009**	**0.007**	**0.005**	**0.007**
Calcium, Ca	mg/L	0.05	**84**	**61**	**51**	**38**
Iron, Fe	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Magnesium, Mg	mg/L	0.05	**88**	**68**	**34**	**26**
Manganese, Mn	mg/L	0.005	**0.008**	**0.053**	**0.005**	<0.005
Molybdenum, Mo	mg/L	0.005	<0.005	<0.005	<0.005	**0.005**
Potassium, K	mg/L	0.05	**9.2**	**6.9**	**7.0**	**8.9**
Sodium, Na	mg/L	0.5	**910**	**110**	**160**	**310**
Sulphur as Sulphate, SO4	mg/L	0.5	**1100**	**140**	**58**	**130**
Zinc, Zn	mg/L	0.005	**0.055**	**0.011**	**0.019**	**0.012**
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322						
Arsenic, As	mg/L	0.003	<0.006↑	<0.003	<0.003	<0.003
Cadmium, Cd	mg/L	0.0001	**0.0003**	**0.0002**	<0.0001	**0.0001**
Chromium, Cr	mg/L	0.001	<0.002↑	<0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.002↑	<0.001	**0.001**	<0.001
Copper, Cu	mg/L	0.001	**0.35**	**0.006**	**0.007**	**0.15**
Lead, Pb	mg/L	0.001	<0.002↑	<0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.002↑	<0.001	<0.001	<0.001
Selenium, Se	mg/L	0.003	**0.038**	<0.003	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304						
Silver, Ag	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Uranium, U^	µg/L	0.5	**58**	**6.0**	**3.5**	**4.9**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE106458.005 Water 15 Oct 2013 SC30	CE106458.006 Water 15 Oct 2013 SC40	CE106458.007 Water 15 Oct 2013 SCR140	CE106458.008 Water 15 Oct 2013 SCR148
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents	meq/L	-	**51.3**	**13.7**	**12.3**	**17.6**
Anion-Cation Balance	%	-100	**-5.3**	**-7.4**	**-3.8**	**-6.9**
Sum of Anion Milliequivalents	meq/L	-	**57.1**	**15.8**	**13.3**	**20.3**
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
E. coli, Total and Faecal (Thermotolerant) coliforms in Water Method: AN735						
Date & Time Processed*	No unit	-	18/10/2013 14:00	18/10/2013 14:00	18/10/2013 14:00	18/10/2013 14:00
Faecal Coliforms	MPN/100mL	1	**8**	**2**	<1	<1

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE106458.009 Water 15 Oct 2013 BCR474	CE106458.010 Water 15 Oct 2013 BC378	CE106458.011 Water 15 Oct 2013 BPB001	CE106458.012 Water 15 Oct 2013 BC363
pH in water Method: AN101						
pH**	pH Units	0.1	**7.8**	**8.0**	**9.0**	**7.7**
Conductivity and TDS by Calculation - Water Method: AN106						
Conductivity @ 25 C	µS/cm	2	**2600**	**1100**	**820**	**1800**
Total Dissolved Solids (by calculation)	mg/L	10	**1600**	**660**	**490**	**1100**
Turbidity Method: AN119						
Turbidity	NTU	0.1	**500**	**18**	**26**	**10**
Alkalinity Method: AN135						
Total Alkalinity as CaCO3	mg/L	5	**730**	**570**	**440**	**610**
Bicarbonate Alkalinity as CaCO3	mg/L	5	**730**	**570**	**370**	**610**
Carbonate Alkalinity as CaCO3	mg/L	5	<5	<5	**64**	<5
Hydroxide Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144						
Free Chlorine by DPD Colourimetric***	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274						
Chloride	mg/L	1	**290**	**44**	**25**	**180**
Fluoride by Ion Selective Electrode in Water Method: AN141						
Fluoride by ISE	mg/L	0.05	**2.4**	**1.8**	**0.80**	**0.95**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	**840**	**53**	**18**	**52**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	<0.005	<0.005	**0.22**	**0.13**

Parameter	Units	LOR	Sample Number: CE106458.009 Sample Matrix: Water Sample Date: 15 Oct 2013 Sample Name: BCR474	CE106458.010 Water 15 Oct 2013 BC378	CE106458.011 Water 15 Oct 2013 BPB001	CE106458.012 Water 15 Oct 2013 BC363
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281						
Total Kjeldahl Nitrogen	mg/L	0.05	**0.53**	**0.26**	**0.40**	**0.17**
Total Nitrogen (calc)	mg/L	0.05	**0.53**	**0.26**	**0.62**	**0.30**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.33**	<0.02	**0.02**	<0.02
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Aluminium, Al	mg/L	0.005	**0.010**	**0.008**	<0.005	**0.008**
Calcium, Ca	mg/L	0.05	**50**	**46**	**5.8**	**67**
Iron, Fe	mg/L	0.005	<0.005	<0.005	**0.011**	<0.005
Magnesium, Mg	mg/L	0.05	**62**	**38**	**25**	**57**
Manganese, Mn	mg/L	0.005	**0.069**	<0.005	**0.008**	<0.005
Molybdenum, Mo	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Potassium, K	mg/L	0.05	**11**	**6.2**	**7.1**	**8.1**
Sodium, Na	mg/L	0.5	**380**	**120**	**120**	**190**
Sulphur as Sulphate, SO4	mg/L	0.5	**210**	**15**	**1.1**	**120**
Zinc, Zn	mg/L	0.005	**0.033**	**0.093**	**0.012**	**0.016**
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322						
Arsenic, As	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Cadmium, Cd	mg/L	0.0001	**0.0002**	**0.0001**	<0.0001	**0.0001**
Chromium, Cr	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001	**0.089**	**0.010**	**0.005**	**0.014**
Lead, Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Selenium, Se	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304						
Silver, Ag	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Uranium, U^	µg/L	0.5	**2.7**	**4.1**	<0.5	**27**

Parameter	Units	LOR	Sample Number / Sample Matrix / Sample Date / Sample Name: CE106458.009 Water 15 Oct 2013 BCR474	CE106458.010 Water 15 Oct 2013 BC378	CE106458.011 Water 15 Oct 2013 BPB001	CE106458.012 Water 15 Oct 2013 BC363
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents	meq/L	-	**24.4**	**10.9**	**7.72**	**16.6**
Anion-Cation Balance	%	-100	**-5.3**	**-8.7**	**-10**	**-8.0**
Sum of Anion Milliequivalents	meq/L	-	**27.2**	**13.0**	**9.48**	**19.5**
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
E. coli, Total and Faecal (Thermotolerant) coliforms in Water Method: AN735						
Date & Time Processed*	No unit	-	18/10/2013 14:00	18/10/2013 14:00	18/10/2013 14:00	18/10/2013 14:00
Faecal Coliforms	MPN/100mL	1	**>2400**	**99**	<1	**1**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE106458.013 Water 15 Oct 2013 BCR773	CE106458.014 Water 15 Oct 2013 BC277
pH in water Method: AN101					
pH**	pH Units	0.1		**8.1**	**7.7**
Conductivity and TDS by Calculation - Water Method: AN106					
Conductivity @ 25 C	µS/cm	2		**2900**	**2300**
Total Dissolved Solids (by calculation)	mg/L	10		**1700**	**1400**
Turbidity Method: AN119					
Turbidity	NTU	0.1		**10**	**300**
Alkalinity Method: AN135					
Total Alkalinity as CaCO3	mg/L	5		**1300**	**1000**
Bicarbonate Alkalinity as CaCO3	mg/L	5		**1300**	**1000**
Carbonate Alkalinity as CaCO3	mg/L	5		<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5		<5	<5
Chlorine Free and Total DPD Method: AN144					
Free Chlorine by DPD Colourimetric***	mg/L	0.5		<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274					
Chloride	mg/L	1		**190**	**170**
Fluoride by Ion Selective Electrode in Water Method: AN141					
Fluoride by ISE	mg/L	0.05		**5.0**	**5.0**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114					
Total Suspended Solids Dried at 103-105°C	mg/L	5		**46**	**500**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE106458.013 Water 15 Oct 2013 BCR773	CE106458.014 Water 15 Oct 2013 BC277
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248				
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**0.70**	**2.9**
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281				
Total Kjeldahl Nitrogen	mg/L	0.05	**0.92**	**0.50**
Total Nitrogen (calc)	mg/L	0.05	**1.6**	**3.4**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293				
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.21**	**0.29**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321				
Aluminium, Al	mg/L	0.005	<0.005	**0.007**
Calcium, Ca	mg/L	0.05	**2.8**	**23**
Iron, Fe	mg/L	0.005	<0.005	<0.005
Magnesium, Mg	mg/L	0.05	**23**	**51**
Manganese, Mn	mg/L	0.005	<0.005	<0.005
Molybdenum, Mo	mg/L	0.005	**0.012**	**0.006**
Potassium, K	mg/L	0.05	**6.7**	**4.6**
Sodium, Na	mg/L	0.5	**580**	**390**
Sulphur as Sulphate, SO4	mg/L	0.5	**120**	**41**
Zinc, Zn	mg/L	0.005	**0.026**	**0.014**
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322				
Arsenic, As	mg/L	0.003	**0.010**	**0.010**
Cadmium, Cd	mg/L	0.0001	**0.0003**	**0.0003**
Chromium, Cr	mg/L	0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001	**0.013**	**0.003**
Lead, Pb	mg/L	0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001	<0.001
Selenium, Se	mg/L	0.003	**0.008**	**0.008**

Parameter	Units	LOR	Sample Number: CE106458.013 Sample Matrix: Water Sample Date: 15 Oct 2013 Sample Name: BCR773	Sample Number: CE106458.014 Sample Matrix: Water Sample Date: 15 Oct 2013 Sample Name: BC277
Metals (dissolved) in Water by GF AAS Method: AN304				
Silver, Ag	µg/L	0.05	<0.05	<0.05
Trace Metals (Dissolved) in Water by ICPMS Method: AN318				
Uranium, U^	µg/L	0.5	**120**	**31**
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121				
Sum of Cation Milliequivalents	meq/L	-	**27.5**	**22.6**
Anion-Cation Balance	%	-100	**-9.2**	**-8.1**
Sum of Anion Milliequivalents	meq/L	-	**33.1**	**26.5**
Mercury (dissolved) in Water Method: AN311/AN312				
Mercury	mg/L	0.00005	<0.00005	<0.00005
E. coli, Total and Faecal (Thermotolerant) coliforms in Water Method: AN735				
Date & Time Processed*	No unit	-	18/10/2013 14:00	18/10/2013 14:00
Faecal Coliforms	MPN/100mL	1	**3**	**3**

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB010388	mg/L	5	<5	0%	105%
Bicarbonate Alkalinity as CaCO3	LB010388	mg/L	5	<5		
Carbonate Alkalinity as CaCO3	LB010388	mg/L	5	<5		
Hydroxide Alkalinity as CaCO3	LB010388	mg/L	5	<5		

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride	LB010400	mg/L	1	<1	0 - 2%	103 - 106%

Conductivity and TDS by Calculation - Water Method: ME-(AU)-[ENV]AN106

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Conductivity @ 25 C	LB010389	µS/cm	2	<2	0%
Total Dissolved Solids (by calculation)	LB010389	mg/L	10	<10	0%

Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Fluoride by ISE	LB010413	mg/L	0.05	<0.05	0 - 2%	98 - 100%

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB010654	mg/L	0.00005	<0.00005	0 - 6%	100%	112%

Metals (dissolved) in Water by GF AAS Method: ME-(AU)-[ENV]AN304

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Silver, Ag	LB010639	µg/L	0.05	<0.05	0%	98 - 101%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium, Al	LB010616	mg/L	0.005	<0.005	0%	96%	105%
Calcium, Ca	LB010616	mg/L	0.05	<0.05	0 - 1%	96%	100%
Iron, Fe	LB010616	mg/L	0.005	<0.005	0%	102%	110%
Magnesium, Mg	LB010616	mg/L	0.05	<0.05	0 - 1%	92%	96%
Manganese, Mn	LB010616	mg/L	0.005	<0.005	0%	104%	112%
Molybdenum, Mo	LB010616	mg/L	0.005	<0.005	0%	101%	110%
Potassium, K	LB010616	mg/L	0.05	<0.05	0%	101%	
Sodium, Na	LB010616	mg/L	0.5	<0.5	1%	98%	98%
Sulphur as Sulphate, SO4	LB010616	mg/L	0.5	<0.5	0 - 1%	NA	NA
Zinc, Zn	LB010616	mg/L	0.005	<0.005	0 - 3%	97%	103%

Metals in Water (Dissolved) by ICPOES-USN Method: ME-(AU)-[ENV]AN320/AN322

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Arsenic, As	LB010633	mg/L	0.003	<0.003	0 - 5%	104%
Cadmium, Cd	LB010633	mg/L	0.0001	<0.0001	0 - 18%	103%
Chromium, Cr	LB010633	mg/L	0.001	<0.001	0%	100%
Cobalt, Co	LB010633	mg/L	0.001	<0.001	0%	101%
Copper, Cu	LB010633	mg/L	0.001	<0.001	0 - 7%	106%
Lead, Pb	LB010633	mg/L	0.001	<0.001	0%	100%
Nickel, Ni	LB010633	mg/L	0.001	<0.001	0%	104%
Selenium, Se	LB010633	mg/L	0.003	<0.003	0 - 15%	110%

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: ME-(AU)-[ENV]AN248

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB010436	mg/L	0.005	<0.005	0 - 1%	103 - 107%

pH in water Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH**	LB010390	pH Units	0.1	5.4 - 5.7	0 - 1%	100%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281

Parameter	QC Reference	Units	LOR	DUP %RPD
Total Kjeldahl Nitrogen	LB010394	mg/L	0.05	1 - 7%

Total and Volatile Suspended Solids (TSS / VSS) Method: ME-(AU)-[ENV]AN114

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 103-105°C	LB010402	mg/L	5	<5	4 - 11%	93 - 96%

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293

Parameter	QC Reference	Units	LOR	DUP %RPD
Total Phosphorus (Kjeldahl Digestion)	LB010395	mg/L	0.02	0 - 1%

Trace Metals (Dissolved) in Water by ICPMS Method: ME-(AU)-[ENV]AN318

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Uranium, U^	LB010604	µg/L	0.5	<0.5	0%

Turbidity Method: ME-(AU)-[ENV]AN119

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Turbidity	LB010393	NTU	0.1	0.3	1 - 2%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2520 B.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN119	Turbidity by Nepholometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN121	This method is used to calculation the balance of major Anions and Cations in water samples and converts major ion concentration to milliequivalents and then summed. Anions sum and Cation sum is calculated as a difference and expressed as a percentage.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN135	Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported. APHA4500CO2 D.
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination, in the presence of a pH/complexation buffer, is used to determine the fluoride concentration. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN144	Commercially available DPD powders, which react with chlorine in solution to form a reddish pink dye. The chlorine concentration is estimated by measuring the intensity of colour produced on a colorimeter or by UV Vis spectrophotometer. The DPD powders contain diethyl-p-phenylenediamine, together with EDTA (to complex interfering metal ions) and a suitable buffer. Free and Total chlorine may be determined and combined chlorine calculated by their difference.
AN248	Nitrate / Nitrite by Auto Analyser: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Reference APHA 4500-NO3- F.
AN274	Chloride by Aquakem DA: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulphuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.
AN304	Filtered acidified sample analysed by GFAAS, referenced to APHA3113B.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN320/AN322	ICP-OES (Ultrasonic Nebuliser): After preservation with 10% nitric acid, a wide range of metals and some non-metals in solution can be measured by ICP- Ultrasonic nebulisation. Solutions are aspirated using an ultrasonic nebuliser into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN322	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B
AN735	The Colilert matrix contains two nutrient indicators, ONPG (ortho-nitro-phenyl B-d- galactopyranoside) and MUG (4-methyl-umbelliferyl B-d-glucruonide). As coliforms grow, they use B-galactosidase to metabolise ONPG which causes yellow colouration of the matrix via the nitro-phenyl. E.coli possesses an additional enzyme, B-glucuronidase, which it uses to metabolise MUG and display florescence (caused by the 4 methyl-umbelliferyl). Incubation at 37 C.
AN735	Non target organisms are suppressed by a combination of high salts, detergents etc. present within the matrix. Faecal coliforms are thermotolerant, thus they can be enumerated by testing at 44.5°C.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

ANALYTICAL REPORT

WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Talia Warda	Manager	Jon Dicker
Client	ALTONA MINING LTD	Laboratory	SGS Cairns Environmental
Address	PO BOX 1466 WEST PERTH WA 6872	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 8 94852929	Telephone	+61 07 4035 5111
Facsimile	61 8 94868700	Facsimile	+61 07 4035 5122
Email	TWarda@mbsenvironmental.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**Altona Mining - Soil**	SGS Reference	**CE106472 R1**
Order Number	(Not specified)	Report Number	0000012313
Samples	21	Date Reported	06 Nov 2013
		Date Received	18 Oct 2013

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

Uranium subcontracted to SGS Townsville, 50-52 Leyland St Garbutt QLD 4814, Not Accredited, TV081288.
Uranium(Bioavailable) was analysed by ICP-OES, Not accredited.
This report cancels and supersedes the report No.CE106472.R0. dated 05/11/2013 issued by SGS Environmental Services due to amended bioavailable metals reporting units.

SIGNATORIES

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Nathan Quinn
Micro Supervisor / Quality Co-ordinator

Parameter	Units	LOR	Sample Number: CE106472.001 Sample Matrix: Soil Sample Date: 14 Oct 2013 Sample Name: RSS2	CE106472.002 Soil 14 Oct 2013 RSS10	CE106472.003 Soil 14 Oct 2013 RSS9	CE106472.004 Soil 14 Oct 2013 SW7
Particle sizing of soils by sieving Method: AN005						
Passing 2.00mm	%w/w	1	**86**	**85**	**88**	**64**
Retained 2.00mm	%w/w	1	**15**	**15**	**12**	**37**
Passing 600µm	%w/w	1	**82**	**45**	**47**	**36**
Retained 600µm	%w/w	1	**4**	**39**	**41**	**27**
Passing 300µm	%w/w	1	**67**	**15**	**15**	**22**
Retained 300µm	%w/w	1	**15**	**30**	**32**	**14**
Passing 212µm	%w/w	1	**42**	**7**	**6**	**15**
Retained 212µm	%w/w	1	**25**	**8**	**10**	**7**
Passing 63µm	%w/w	1	**8**	<1	<1	**5**
Retained 63µm	%w/w	1	**34**	**6**	**5**	**10**
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141						
Water Soluble Fluoride*	mg/kg	0.5	**2.7**	**1.5**	**0.7**	**0.6**
Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest Method: AN040/AN320						
Arsenic, As	mg/kg	1	**1**	**2**	<1	**3**
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	**11**	**9.6**	**13**	**24**
Cobalt, Co	mg/kg	0.5	**6.2**	**7.1**	**11**	**26**
Copper, Cu	mg/kg	0.5	**18**	**30**	**32**	**130**
Lead, Pb	mg/kg	1	**2**	**2**	**2**	**6**
Manganese, Mn	mg/kg	1	**210**	**170**	**180**	**500**
Nickel, Ni	mg/kg	0.5	**7.3**	**6.3**	**9.1**	**19**
Selenium, Se	mg/kg	3	<3	<3	<3	<3
Silver, Ag	mg/kg	1	<1	<1	<1	<1
Sulphur, S	mg/kg	10	**140**	<10	<10	<10
Zinc, Zn	mg/kg	2	**8**	**5**	**4**	**12**
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318						
Uranium, U^	mg/kg	0.1	**4.3**	**3.0**	**6.2**	**15**
Mercury in Soil Method: AN312						
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01
Bioavailable Metals in Soil by ICPOES Method: AN037/AN320/AN321						
Arsenic, As*	mg/kg	0.5	<0.5	<0.5	<0.5	**0.7**
Cadmium, Cd*	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr*	mg/kg	0.5	<0.5	**0.5**	**0.5**	**0.5**
Cobalt, Co*	mg/kg	0.5	<0.5	**1.6**	**2.6**	**4.8**
Copper, Cu*	mg/kg	0.5	**1.1**	**15**	**3.4**	**14**
Lead, Pb*	mg/kg	0.5	<0.5	**0.6**	<0.5	**2.0**
Manganese, Mn*	mg/kg	2	**150**	**120**	**120**	**320**
Nickel, Ni*	mg/kg	0.5	<0.5	<0.5	**0.6**	**0.9**
Selenium, Se*	mg/kg	1	<1	<1	<1	<1
Silver, Ag*	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S*	mg/kg	50	**100**	<50	<50	<50
Zinc, Zn*	mg/kg	0.5	<0.5	**0.9**	**0.7**	**1.3**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE106472.001 Soil 14 Oct 2013 RSS2	CE106472.002 Soil 14 Oct 2013 RSS10	CE106472.003 Soil 14 Oct 2013 RSS9	CE106472.004 Soil 14 Oct 2013 SW7
Bioavailable metals in sediment by ICP MS Method: AN037/AN318						
Uranium, U*	mg/kg	0.5	**0.7**	**0.6**	**1.1**	**0.9**
Bio Available Mercury in Soils and Sediments Method: AN312						
Mercury*	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number: CE106472.005 Sample Matrix: Soil Sample Date: 14 Oct 2013 Sample Name: SW1	CE106472.006 Soil 14 Oct 2013 RSS6	CE106472.007 Soil 14 Oct 2013 SW8	CE106472.008 Soil 14 Oct 2013 RSS5
Particle sizing of soils by sieving Method: AN005						
Passing 2.00mm	%w/w	1	**98**	**94**	**82**	**62**
Retained 2.00mm	%w/w	1	**2**	**7**	**18**	**38**
Passing 600µm	%w/w	1	**72**	**14**	**35**	**21**
Retained 600µm	%w/w	1	**26**	**80**	**47**	**41**
Passing 300µm	%w/w	1	**28**	**3**	**15**	**9**
Retained 300µm	%w/w	1	**44**	**11**	**20**	**13**
Passing 212µm	%w/w	1	**12**	**1**	**9**	**7**
Retained 212µm	%w/w	1	**16**	**1**	**6**	**2**
Passing 63µm	%w/w	1	**4**	<1	**2**	**3**
Retained 63µm	%w/w	1	**8**	<1	**7**	**4**
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141						
Water Soluble Fluoride*	mg/kg	0.5	<0.5	<0.5	**1.1**	**0.9**
Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest Method: AN040/AN320						
Arsenic, As	mg/kg	1	**1**	**3**	**2**	**2**
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	**7.8**	**7.2**	**17**	**12**
Cobalt, Co	mg/kg	0.5	**4.6**	**4.7**	**16**	**8.7**
Copper, Cu	mg/kg	0.5	**11**	**9.7**	**93**	**19**
Lead, Pb	mg/kg	1	**2**	**3**	**3**	**2**
Manganese, Mn	mg/kg	1	**240**	**350**	**650**	**430**
Nickel, Ni	mg/kg	0.5	**4.7**	**4.6**	**16**	**6.8**
Selenium, Se	mg/kg	3	<3	<3	<3	<3
Silver, Ag	mg/kg	1	<1	<1	<1	<1
Sulphur, S	mg/kg	10	<10	<10	<10	<10
Zinc, Zn	mg/kg	2	**5**	**6**	**10**	**4**
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318						
Uranium, U^	mg/kg	0.1	**3.0**	**1.1**	**7.7**	**4.8**
Mercury in Soil Method: AN312						
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01
Bioavailable Metals in Soil by ICPOES Method: AN037/AN320/AN321						
Arsenic, As*	mg/kg	0.5	<0.5	<0.5	**0.9**	<0.5
Cadmium, Cd*	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr*	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Cobalt, Co*	mg/kg	0.5	**1.4**	**1.4**	**3.4**	**3.2**
Copper, Cu*	mg/kg	0.5	**2.3**	**1.7**	**17**	**2.2**
Lead, Pb*	mg/kg	0.5	**1.0**	**0.9**	**1.0**	**0.8**
Manganese, Mn*	mg/kg	2	**130**	**160**	**400**	**280**
Nickel, Ni*	mg/kg	0.5	**0.5**	<0.5	**0.7**	**0.9**
Selenium, Se*	mg/kg	1	<1	<1	<1	<1
Silver, Ag*	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S*	mg/kg	50	<50	<50	<50	<50
Zinc, Zn*	mg/kg	0.5	**1.0**	**0.9**	**0.9**	**0.7**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE106472.005 Soil 14 Oct 2013 SW1	CE106472.006 Soil 14 Oct 2013 RSS6	CE106472.007 Soil 14 Oct 2013 SW8	CE106472.008 Soil 14 Oct 2013 RSS5
Bioavailable metals in sediment by ICP MS Method: AN037/AN318							
Uranium, U*	mg/kg	0.5		<0.5	**1.0**	<0.5	**0.8**
Bio Available Mercury in Soils and Sediments Method: AN312							
Mercury*	mg/kg	0.01		<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number: CE106472.009 Sample Matrix: Soil Sample Date: 14 Oct 2013 Sample Name: RSS8	CE106472.010 Soil 14 Oct 2013 SW2	CE106472.011 Soil 14 Oct 2013 RSS4	CE106472.012 Soil 14 Oct 2013 SW6
Particle sizing of soils by sieving Method: AN005						
Passing 2.00mm	%w/w	1	**99**	**88**	**43**	**66**
Retained 2.00mm	%w/w	1	<1	**12**	**57**	**34**
Passing 600µm	%w/w	1	**99**	**56**	**10**	**19**
Retained 600µm	%w/w	1	<1	**32**	**33**	**47**
Passing 300µm	%w/w	1	**66**	**19**	**2**	**2**
Retained 300µm	%w/w	1	**33**	**37**	**8**	**17**
Passing 212µm	%w/w	1	**40**	**8**	**1**	**2**
Retained 212µm	%w/w	1	**26**	**11**	**1**	<1
Passing 63µm	%w/w	1	**5**	**2**	<1	<1
Retained 63µm	%w/w	1	**35**	**6**	<1	<1
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141						
Water Soluble Fluoride*	mg/kg	0.5	**1.0**	**0.6**	**0.8**	**0.9**
Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest Method: AN040/AN320						
Arsenic, As	mg/kg	1	**2**	**2**	**2**	**3**
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	**11**	**30**	**14**	**15**
Cobalt, Co	mg/kg	0.5	**5.3**	**9.0**	**9.7**	**18**
Copper, Cu	mg/kg	0.5	**10**	**44**	**92**	**140**
Lead, Pb	mg/kg	1	**3**	**4**	**3**	**4**
Manganese, Mn	mg/kg	1	**250**	**580**	**800**	**850**
Nickel, Ni	mg/kg	0.5	**6.7**	**8.6**	**12**	**14**
Selenium, Se	mg/kg	3	<3	<3	<3	<3
Silver, Ag	mg/kg	1	<1	<1	<1	<1
Sulphur, S	mg/kg	10	**27**	<10	<10	<10
Zinc, Zn	mg/kg	2	**8**	**2**	**5**	**6**
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318						
Uranium, U^	mg/kg	0.1	**2.7**	**6.1**	**5.0**	**5.8**
Mercury in Soil Method: AN312						
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01
Bioavailable Metals in Soil by ICPOES Method: AN037/AN320/AN321						
Arsenic, As*	mg/kg	0.5	<0.5	<0.5	**0.8**	**0.8**
Cadmium, Cd*	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr*	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Cobalt, Co*	mg/kg	0.5	**2.1**	**3.0**	**3.0**	**4.6**
Copper, Cu*	mg/kg	0.5	**2.5**	**8.2**	**15**	**22**
Lead, Pb*	mg/kg	0.5	**1.6**	**1.1**	**1.0**	**1.3**
Manganese, Mn*	mg/kg	2	**160**	**260**	**440**	**400**
Nickel, Ni*	mg/kg	0.5	**0.9**	**0.7**	**1.3**	**1.3**
Selenium, Se*	mg/kg	1	<1	<1	<1	<1
Silver, Ag*	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S*	mg/kg	50	<50	<50	<50	<50
Zinc, Zn*	mg/kg	0.5	**1.7**	**0.7**	**0.6**	**0.6**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE106472.009 Soil 14 Oct 2013 RSS8	CE106472.010 Soil 14 Oct 2013 SW2	CE106472.011 Soil 14 Oct 2013 RSS4	CE106472.012 Soil 14 Oct 2013 SW6
Bioavailable metals in sediment by ICP MS Method: AN037/AN318						
Uranium, U*	mg/kg	0.5	**0.8**	**0.6**	**0.8**	<0.5
Bio Available Mercury in Soils and Sediments Method: AN312						
Mercury*	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number: CE106472.013 Sample Matrix: Soil Sample Date: 14 Oct 2013 Sample Name: DAN LYNCH	CE106472.014 Soil 14 Oct 2013 DUP1	CE106472.015 Soil 15 Oct 2013 SW10	CE106472.016 Soil 15 Oct 2013 SW4
Particle sizing of soils by sieving Method: AN005						
Passing 2.00mm	%w/w	1	**98**	**79**	**77**	**74**
Retained 2.00mm	%w/w	1	**2**	**22**	**23**	**26**
Passing 600µm	%w/w	1	**86**	**34**	**29**	**17**
Retained 600µm	%w/w	1	**12**	**44**	**48**	**57**
Passing 300µm	%w/w	1	**45**	**19**	**7**	<1
Retained 300µm	%w/w	1	**41**	**16**	**22**	**26**
Passing 212µm	%w/w	1	**24**	**15**	**4**	<1
Retained 212µm	%w/w	1	**21**	**4**	**3**	**1**
Passing 63µm	%w/w	1	**8**	**5**	**2**	<1
Retained 63µm	%w/w	1	**16**	**10**	**2**	<1
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141						
Water Soluble Fluoride*	mg/kg	0.5	**2.3**	**1.1**	**0.8**	**1.5**
Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest Method: AN040/AN320						
Arsenic, As	mg/kg	1	**1**	**2**	**34**	**5**
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	**0.7**	<0.3
Chromium, Cr	mg/kg	0.5	**11**	**14**	**38**	**12**
Cobalt, Co	mg/kg	0.5	**5.8**	**13**	**33**	**11**
Copper, Cu	mg/kg	0.5	**16**	**16**	**130**	**28**
Lead, Pb	mg/kg	1	**3**	**3**	**51**	**9**
Manganese, Mn	mg/kg	1	**130**	**280**	**4800**	**1100**
Nickel, Ni	mg/kg	0.5	**6.4**	**7.3**	**36**	**11**
Selenium, Se	mg/kg	3	<3	<3	<3	<3
Silver, Ag	mg/kg	1	<1	<1	<1	<1
Sulphur, S	mg/kg	10	**71**	<10	**26**	<10
Zinc, Zn	mg/kg	2	**8**	**6**	**150**	**15**
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318						
Uranium, U^	mg/kg	0.1	**3.1**	**4.5**	**25**	**6.4**
Mercury in Soil Method: AN312						
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01
Bioavailable Metals in Soil by ICPOES Method: AN037/AN320/AN321						
Arsenic, As*	mg/kg	0.5	**0.5**	<0.5	**1.8**	**0.7**
Cadmium, Cd*	mg/kg	0.1	<0.1	<0.1	**0.1**	<0.1
Chromium, Cr*	mg/kg	0.5	**0.8**	**0.5**	**0.6**	<0.5
Cobalt, Co*	mg/kg	0.5	**1.8**	**3.3**	**5.6**	**3.2**
Copper, Cu*	mg/kg	0.5	**4.0**	**2.6**	**13**	**4.2**
Lead, Pb*	mg/kg	0.5	**1.3**	**1.0**	**6.9**	**2.7**
Manganese, Mn*	mg/kg	2	**79**	**190**	**710**	**450**
Nickel, Ni*	mg/kg	0.5	**0.7**	**0.9**	**2.2**	**1.3**
Selenium, Se*	mg/kg	1	<1	<1	<1	<1
Silver, Ag*	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S*	mg/kg	50	**79**	<50	<50	<50
Zinc, Zn*	mg/kg	0.5	**2.2**	**0.8**	**13**	**1.3**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE106472.013 Soil 14 Oct 2013 DAN LYNCH	CE106472.014 Soil 14 Oct 2013 DUP1	CE106472.015 Soil 15 Oct 2013 SW10	CE106472.016 Soil 15 Oct 2013 SW4
Bioavailable metals in sediment by ICP MS Method: AN037/AN318						
Uranium, U*	mg/kg	0.5	**1.1**	<0.5	<0.5	<0.5
Bio Available Mercury in Soils and Sediments Method: AN312						
Mercury*	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number: CE106472.017 Sample Matrix: Soil Sample Date: 15 Oct 2013 Sample Name: SW5	CE106472.018 Soil 15 Oct 2013 SW3	CE106472.019 Soil 15 Oct 2013 SW9	CE106472.020 Soil 15 Oct 2013 LONGAMUNDI
Particle sizing of soils by sieving Method: AN005						
Passing 2.00mm	%w/w	1	**68**	**73**	**81**	**91**
Retained 2.00mm	%w/w	1	**32**	**27**	**20**	**9**
Passing 600µm	%w/w	1	**33**	**35**	**41**	**61**
Retained 600µm	%w/w	1	**35**	**38**	**40**	**30**
Passing 300µm	%w/w	1	**7**	**20**	**11**	**25**
Retained 300µm	%w/w	1	**27**	**16**	**30**	**36**
Passing 212µm	%w/w	1	**2**	**11**	**6**	**13**
Retained 212µm	%w/w	1	**5**	**9**	**5**	**12**
Passing 63µm	%w/w	1	<1	**1**	**1**	**2**
Retained 63µm	%w/w	1	**2**	**10**	**5**	**11**
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141						
Water Soluble Fluoride*	mg/kg	0.5	**0.6**	**1.4**	**1.6**	**1.9**
Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest Method: AN040/AN320						
Arsenic, As	mg/kg	1	**2**	**2**	**2**	**2**
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.5	**18**	**10**	**8.3**	**9.2**
Cobalt, Co	mg/kg	0.5	**8.1**	**7.6**	**8.2**	**5.8**
Copper, Cu	mg/kg	0.5	**49**	**30**	**18**	**25**
Lead, Pb	mg/kg	1	**3**	**4**	**4**	**3**
Manganese, Mn	mg/kg	1	**700**	**560**	**710**	**290**
Nickel, Ni	mg/kg	0.5	**11**	**8.4**	**6.9**	**6.3**
Selenium, Se	mg/kg	3	<3	<3	<3	<3
Silver, Ag	mg/kg	1	<1	<1	<1	<1
Sulphur, S	mg/kg	10	<10	<10	<10	**14**
Zinc, Zn	mg/kg	2	**4**	**11**	**8**	**7**
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318						
Uranium, U^	mg/kg	0.1	**3.6**	**3.7**	**4.0**	**2.0**
Mercury in Soil Method: AN312						
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01
Bioavailable Metals in Soil by ICPOES Method: AN037/AN320/AN321						
Arsenic, As*	mg/kg	0.5	**0.6**	**0.7**	**0.8**	**0.7**
Cadmium, Cd*	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr*	mg/kg	0.5	<0.5	<0.5	<0.5	**0.6**
Cobalt, Co*	mg/kg	0.5	**2.1**	**2.4**	**3.1**	**2.0**
Copper, Cu*	mg/kg	0.5	**9.9**	**4.2**	**3.0**	**5.1**
Lead, Pb*	mg/kg	0.5	**0.7**	**1.7**	**1.5**	**1.4**
Manganese, Mn*	mg/kg	2	**270**	**310**	**430**	**200**
Nickel, Ni*	mg/kg	0.5	**0.9**	**1.0**	**1.0**	**0.8**
Selenium, Se*	mg/kg	1	<1	<1	<1	<1
Silver, Ag*	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S*	mg/kg	50	<50	<50	<50	<50
Zinc, Zn*	mg/kg	0.5	<0.5	**1.4**	**1.1**	**1.1**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE106472.017 Soil 15 Oct 2013 SW5	CE106472.018 Soil 15 Oct 2013 SW3	CE106472.019 Soil 15 Oct 2013 SW9	CE106472.020 Soil 15 Oct 2013 LONGAMUNDI
Bioavailable metals in sediment by ICP MS Method: AN037/AN318						
Uranium, U*	mg/kg	0.5	**0.8**	**0.7**	<0.5	**1.2**
Bio Available Mercury in Soils and Sediments Method: AN312						
Mercury*	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number CE106472.021 Sample Matrix Soil Sample Date 15 Oct 2013 Sample Name SW13
Particle sizing of soils by sieving Method: AN005			
Passing 2.00mm	%w/w	1	**24**
Retained 2.00mm	%w/w	1	**76**
Passing 600µm	%w/w	1	**2**
Retained 600µm	%w/w	1	**22**
Passing 300µm	%w/w	1	**1**
Retained 300µm	%w/w	1	<1
Passing 212µm	%w/w	1	<1
Retained 212µm	%w/w	1	<1
Passing 63µm	%w/w	1	<1
Retained 63µm	%w/w	1	<1
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141			
Water Soluble Fluoride*	mg/kg	0.5	**1.1**
Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest Method: AN040/AN320			
Arsenic, As	mg/kg	1	**23**
Cadmium, Cd	mg/kg	0.3	<0.3
Chromium, Cr	mg/kg	0.5	**13**
Cobalt, Co	mg/kg	0.5	**10**
Copper, Cu	mg/kg	0.5	**74**
Lead, Pb	mg/kg	1	**8**
Manganese, Mn	mg/kg	1	**600**
Nickel, Ni	mg/kg	0.5	**11**
Selenium, Se	mg/kg	3	<3
Silver, Ag	mg/kg	1	<1
Sulphur, S	mg/kg	10	<10
Zinc, Zn	mg/kg	2	**25**

Parameter	Units	LOR	Sample Number CE106472.021 Sample Matrix Soil Sample Date 15 Oct 2013 Sample Name SW13
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318			
Uranium, U^	mg/kg	0.1	**7.0**
Mercury in Soil Method: AN312			
Mercury	mg/kg	0.01	<0.01
Bioavailable Metals in Soil by ICPOES Method: AN037/AN320/AN321			
Arsenic, As*	mg/kg	0.5	<0.5
Cadmium, Cd*	mg/kg	0.1	<0.1
Chromium, Cr*	mg/kg	0.5	<0.5
Cobalt, Co*	mg/kg	0.5	<0.5
Copper, Cu*	mg/kg	0.5	**1.0**
Lead, Pb*	mg/kg	0.5	<0.5
Manganese, Mn*	mg/kg	2	**220**
Nickel, Ni*	mg/kg	0.5	<0.5
Selenium, Se*	mg/kg	1	<1
Silver, Ag*	mg/kg	0.2	<0.2
Sulphur, S*	mg/kg	50	<50
Zinc, Zn*	mg/kg	0.5	<0.5
Bioavailable metals in sediment by ICP MS Method: AN037/AN318			
Uranium, U*	mg/kg	0.5	**0.5**
Bio Available Mercury in Soils and Sediments Method: AN312			
Mercury*	mg/kg	0.01	<0.01

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Bio Available Mercury in Soils and Sediments **Method: ME-(AU)-[ENV]AN312**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Mercury*	LB010857	mg/kg	0.01	<0.01	0%	NA

Bioavailable Metals in Soil by ICPOES **Method: ME-(AU)-[ENV]AN037/AN320/AN321**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Arsenic, As*	LB010856	mg/kg	0.5	<0.5	0 - 66%	88 - 89%
Cadmium, Cd*	LB010856	mg/kg	0.1	<0.1	0%	103 - 104%
Chromium, Cr*	LB010856	mg/kg	0.5	<0.5	0 - 3%	90 - 92%
Cobalt, Co*	LB010856	mg/kg	0.5	<0.5	2%	96 - 97%
Copper, Cu*	LB010856	mg/kg	0.5	<0.5	2 - 3%	96 - 97%
Lead, Pb*	LB010856	mg/kg	0.5	<0.5	2 - 10%	90 - 91%
Manganese, Mn*	LB010856	mg/kg	2	<2	0%	111%
Nickel, Ni*	LB010856	mg/kg	0.5	<0.5	1 - 6%	91 - 100%
Selenium, Se*	LB010856	mg/kg	1	<1	0%	97 - 104%
Silver, Ag*	LB010856	mg/kg	0.2	<0.2	0%	89 - 93%
Sulphur, S*	LB010856	mg/kg	50	<50	0%	100%
Zinc, Zn*	LB010856	mg/kg	0.5	<0.5	1 - 89%	94 - 97%

Mercury in Soil **Method: ME-(AU)-[ENV]AN312**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB010558	mg/kg	0.01	<0.01	0%	112 - 113%	106%

Total Recoverable Metals in Soil by ICPMS **Method: ME-(AU)-[ENV]AN041/AN318**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Uranium, U^	LB010611	mg/kg	0.1	<0.1	5 - 13%	NA

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest **Method: ME-(AU)-[ENV]AN040/AN320**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Arsenic, As	LB010536	mg/kg	1	<1	6 - 10%	103%	95%
Cadmium, Cd	LB010536	mg/kg	0.3	<0.3	0%	109 - 110%	101%
Chromium, Cr	LB010536	mg/kg	0.5	<0.5	1 - 4%	102 - 103%	93%
Cobalt, Co	LB010536	mg/kg	0.5	<0.5	0 - 2%	101 - 102%	92%
Copper, Cu	LB010536	mg/kg	0.5	<0.5	1 - 5%	101 - 103%	95%
Lead, Pb	LB010536	mg/kg	1	<1	0 - 6%	99 - 100%	89%
Manganese, Mn	LB010536	mg/kg	1	<1	0 - 4%	106%	90%
Nickel, Ni	LB010536	mg/kg	0.5	<0.5	0 - 2%	101 - 102%	91%
Selenium, Se	LB010536	mg/kg	3	<3	0%	101%	92%
Silver, Ag	LB010536	mg/kg	1	<1	0%	94%	
Sulphur, S	LB010536	mg/kg	10	<10			
Zinc, Zn	LB010536	mg/kg	2	<2	5 - 10%	102%	91%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN005	The particle size distribution of a soil is determined by wet sieving, using a maximum of 900 mL of deionised water to sieve all fractions down to 75 µm. Referenced to AS1289.3.6.1 and AS1141.11.
AN040/AN320	A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
AN041/AN318	Determination of elements at trace level in soil digest by ICP-MS technique, in accordance with USEPA 6020A.
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination, in the presence of a pH/complexation buffer, is used to determine the fluoride concentration on the soil water extract. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN213	As received sediment sample is analysed by a purge and trap method. The sample is mixed or extracted with 1M hydrochloric acid in a rapid distillation unit to produce hydrogen sulphide (H2S) which is collected and titrated with iodine (I2(aq)) to measure AVS. The original extract solution may then be analysed for metals by ICP OES or ICP MS to determine the bioavailable metals (simultaneously extractable metals - SEM).
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN320AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

ANALYTICAL REPORT

WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS

Contact	Talia Warda
Client	ALTONA MINING LTD
Address	PO BOX 1466 WEST PERTH WA 6872
Telephone	61 8 94852929
Facsimile	61 8 94868700
Email	TWarda@mbsenvironmental.com.au
Project	**Altona Mining - Water samples**
Order Number	(Not specified)
Samples	8

LABORATORY DETAILS

Manager	Jon Dicker
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
SGS Reference	**CE108443 R0**
Report Number	0000015331
Date Reported	04 Mar 2014
Date Received	19 Feb 2014

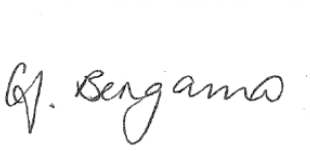
COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

Bacteriological samples received and tested >24 hours old. Results may not be indicative of conditions at the time of sampling.

Uranium subcontracted to SGS Brisbane, 59 Bancroft Rd, Pinkenba QLD 4008, NATA Accreditation Number: 2562, Site Number 1706 (Micro) / 20707 (Chemical), BE008331.

SIGNATORIES



Alyson Bergamo
Senior Laboratory Technician

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Maristela Ganzan
Metals Team Leader

Nathan Quinn
Micro Supervisor / Quality Co-ordinator

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE108443.001 Water 17 Feb 2014 LRPB001	CE108443.002 Water 17 Feb 2014 LER 213	CE108443.003 Water 17 Feb 2014 LRPB002	CE108443.004 Water 17 Feb 2014 SCR 140
pH in water Method: AN101						
pH**	pH Units	0.1	**7.6**	**8.5**	**7.8**	**7.6**
Conductivity and TDS by Calculation - Water Method: AN106						
Conductivity @ 25 C	µS/cm	2	**1900**	**1600**	**2500**	**1200**
Total Dissolved Solids (by calculation)	mg/L	10	**1100**	**960**	**1500**	**720**
Turbidity Method: AN119						
Turbidity	NTU	0.1	**26**	**8.9**	**55**	**7.2**
Alkalinity Method: AN135						
Total Alkalinity as CaCO3	mg/L	5	**670**	**520**	**450**	**510**
Bicarbonate Alkalinity as CaCO3	mg/L	5	**670**	**490**	**450**	**510**
Carbonate Alkalinity as CaCO3	mg/L	5	<5	**26**	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144						
Free Chlorine by DPD Colourimetric***	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274						
Chloride	mg/L	1	**210**	**170**	**240**	**74**
Fluoride by Ion Selective Electrode in Water Method: AN141						
Fluoride by ISE	mg/L	0.05	**2.4**	**2.5**	**0.85**	**0.82**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	**69**	**16**	**160**	**15**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**1.1**	**2.1**	**10**	<0.005

Parameter	Units	LOR	Sample Number: CE108443.001 Sample Matrix: Water Sample Date: 17 Feb 2014 Sample Name: LRPB001	Sample Number: CE108443.002 Sample Matrix: Water Sample Date: 17 Feb 2014 Sample Name: LER 213	Sample Number: CE108443.003 Sample Matrix: Water Sample Date: 17 Feb 2014 Sample Name: LRPB002	Sample Number: CE108443.004 Sample Matrix: Water Sample Date: 17 Feb 2014 Sample Name: SCR 140
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281						
Total Kjeldahl Nitrogen	mg/L	0.05	**0.37**	**0.87**	**98**	**0.14**
Total Nitrogen (calc)	mg/L	0.05	**1.5**	**2.9**	**110**	**0.14**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.05**	**0.39**	**6.5**	<0.02
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Aluminium, Al	mg/L	0.005	**0.005**	<0.005	**0.012**	<0.005
Calcium, Ca	mg/L	0.05	**50**	**31**	**54**	**59**
Iron, Fe	mg/L	0.005	<0.005	<0.005	**0.026**	<0.005
Magnesium, Mg	mg/L	0.05	**45**	**42**	**26**	**39**
Manganese, Mn	mg/L	0.005	<0.005	<0.005	**0.30**	**0.011**
Molybdenum, Mo	mg/L	0.005	**0.023**	**0.040**	**0.010**	<0.005
Potassium, K	mg/L	0.05	**8.2**	**11**	**21**	**8.5**
Sodium, Na	mg/L	0.5	**300**	**240**	**270**	**150**
Sulphur as Sulphate, SO4	mg/L	0.5	**62**	**68**	**40**	**53**
Zinc, Zn	mg/L	0.005	**0.021**	**0.024**	**0.045**	**0.041**
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322						
Arsenic, As	mg/L	0.003	<0.003	<0.003	**0.003**	<0.003
Cadmium, Cd	mg/L	0.0001	<0.0001	**0.0001**	**0.0002**	<0.0001
Chromium, Cr	mg/L	0.001	<0.001	**0.002**	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001	**0.003**	<0.001
Copper, Cu	mg/L	0.001	**0.006**	**0.020**	**0.012**	**0.017**
Lead, Pb	mg/L	0.001	<0.001	**0.001**	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001	**0.001**	**0.007**	<0.001
Selenium, Se	mg/L	0.003	**0.005**	**0.004**	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304						
Silver, Ag	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Uranium, U^	µg/L	0.5	**40**	**25**	**4.1**	**3.4**
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents	meq/L	-	**19.4**	**15.8**	**17.1**	**12.7**
Anion-Cation Balance	%	-100	**-3.1**	**-3.0**	**-0.7**	**-3.0**
Sum of Anion Milliequivalents	meq/L	-	**20.6**	**16.8**	**17.4**	**13.5**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE108443.001 Water 17 Feb 2014 LRPB001	CE108443.002 Water 17 Feb 2014 LER 213	CE108443.003 Water 17 Feb 2014 LRPB002	CE108443.004 Water 17 Feb 2014 SCR 140
E. coli, Total and Faecal (Thermotolerant) coliforms in Water	**Method: AN735**						
Date & Time Processed*	No unit	-		19/2/2014 10:30	19/2/2014 10:30	19/2/2014 10:30	19/2/2014 10:30
Faecal Coliforms	MPN/100mL	1		**1**	<1	**>2400**	**48**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE108443.005 Water 17 Feb 2014 SC 40	CE108443.006 Water 17 Feb 2014 SC 30	CE108443.007 Water 17 Feb 2014 SCR 148	CE108443.008 Water 17 Feb 2014 BLANK 1
pH in water Method: AN101							
pH**	pH Units	0.1		**7.4**	**7.6**	**7.6**	**6.1**
Conductivity and TDS by Calculation - Water Method: AN106							
Conductivity @ 25 C	µS/cm	2		**1500**	**4600**	**2000**	**6**
Total Dissolved Solids (by calculation)	mg/L	10		**900**	**2800**	**1200**	<10
Turbidity Method: AN119							
Turbidity	NTU	0.1		**210**	**59**	**2200**	**0.5**
Alkalinity Method: AN135							
Total Alkalinity as CaCO3	mg/L	5		**450**	**610**	**560**	<5
Bicarbonate Alkalinity as CaCO3	mg/L	5		**450**	**610**	**560**	<5
Carbonate Alkalinity as CaCO3	mg/L	5		<5	<5	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5		<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144							
Free Chlorine by DPD Colourimetric***	mg/L	0.5		**1.4**	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274							
Chloride	mg/L	1		**150**	**630**	**240**	<1
Fluoride by Ion Selective Electrode in Water Method: AN141							
Fluoride by ISE	mg/L	0.05		**1.1**	**1.1**	**1.6**	<0.05
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114							
Total Suspended Solids Dried at 103-105°C	mg/L	5		**890**	**130**	**4800**	<5
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248							
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005		**0.012**	**0.069**	**0.077**	**0.005**

Parameter	Units	LOR	Sample Number: CE108443.005 Sample Matrix: Water Sample Date: 17 Feb 2014 Sample Name: SC 40	CE108443.006 Water 17 Feb 2014 SC 30	CE108443.007 Water 17 Feb 2014 SCR 148	CE108443.008 Water 17 Feb 2014 BLANK 1
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281						
Total Kjeldahl Nitrogen	mg/L	0.05	**0.94**	**1.0**	**0.40**	**0.15**
Total Nitrogen (calc)	mg/L	0.05	**0.95**	**1.1**	**0.48**	**0.15**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.23**	**0.10**	**1.1**	<0.02
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Aluminium, Al	mg/L	0.005	<0.005	**0.006**	**0.005**	<0.005
Calcium, Ca	mg/L	0.05	**65**	**100**	**44**	**0.19**
Iron, Fe	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Magnesium, Mg	mg/L	0.05	**74**	**96**	**31**	**0.07**
Manganese, Mn	mg/L	0.005	**0.056**	**0.051**	**0.009**	<0.005
Molybdenum, Mo	mg/L	0.005	<0.005	<0.005	**0.014**	<0.005
Potassium, K	mg/L	0.05	**7.6**	**10**	**10**	**0.13**
Sodium, Na	mg/L	0.5	**120**	**650**	**350**	**1.2**
Sulphur as Sulphate, SO4	mg/L	0.5	**120**	**700**	**130**	<0.5
Zinc, Zn	mg/L	0.005	**0.025**	**0.079**	**0.063**	<0.005
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322						
Arsenic, As	mg/L	0.003	<0.003	**0.004**	<0.003	<0.003
Cadmium, Cd	mg/L	0.0001	<0.0001	**0.0004**	**0.0003**	<0.0001
Chromium, Cr	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001	**0.007**	**0.35**	**0.24**	<0.001
Lead, Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001	**0.001**	<0.001	<0.001
Selenium, Se	mg/L	0.003	<0.003	**0.015**	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304						
Silver, Ag	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Uranium, U^	µg/L	0.5	**5.4**	**58**	**5.3**	<0.5
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents	meq/L	-	**14.9**	**41.6**	**20.4**	-
Anion-Cation Balance	%	-100	**-2.2**	**-3.8**	**-0.9**	-
Sum of Anion Milliequivalents	meq/L	-	**15.5**	**44.8**	**20.8**	-

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE108443.005 Water 17 Feb 2014 SC 40	CE108443.006 Water 17 Feb 2014 SC 30	CE108443.007 Water 17 Feb 2014 SCR 148	CE108443.008 Water 17 Feb 2014 BLANK 1
E. coli, Total and Faecal (Thermotolerant) coliforms in Water	**Method: AN735**						
Date & Time Processed*	No unit	-		19/2/2014 10:30	19/2/2014 10:30	19/2/2014 10:30	19/2/2014 10:30
Faecal Coliforms	MPN/100mL	1		**43**	**46**	**4**	<1

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB014105	mg/L	5	<5	0 - 2%	112%
Bicarbonate Alkalinity as CaCO3	LB014105	mg/L	5	<5		
Carbonate Alkalinity as CaCO3	LB014105	mg/L	5	<5		
Hydroxide Alkalinity as CaCO3	LB014105	mg/L	5	<5		

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride	LB014114	mg/L	1	<1	0 - 1%	103 - 105%

Chlorine Free and Total DPD Method: ME-(AU)-[ENV]AN144

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Free Chlorine by DPD Colourimetric***	LB014072	mg/L	0.5	<0.5	0%

Conductivity and TDS by Calculation - Water Method: ME-(AU)-[ENV]AN106

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Conductivity @ 25 C	LB014107	µS/cm	2	<2	0%
Total Dissolved Solids (by calculation)	LB014107	mg/L	10		0%

Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Fluoride by ISE	LB014112	mg/L	0.05	<0.05	0 - 7%	99%

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB014292	mg/L	0.00005	<0.00005	0 - 50%	92 - 108%	92 - 111%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Metals (dissolved) in Water by GF AAS Method: ME-(AU)-[ENV]AN304

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Silver, Ag	LB014453	µg/L	0.05	<0.05	0%	102%

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium, Al	LB014387	mg/L	0.005	<0.005	0 - 1%	103 - 104%	
Calcium, Ca	LB014387	mg/L	0.05	<0.05	0 - 1%	104 - 105%	
Iron, Fe	LB014387	mg/L	0.005	<0.005	0%	107 - 110%	
Magnesium, Mg	LB014387	mg/L	0.05	<0.05	0%	102%	
Manganese, Mn	LB014387	mg/L	0.005	<0.005	0 - 1%	110%	117%
Molybdenum, Mo	LB014387	mg/L	0.005	<0.005	0%	107 - 108%	
Potassium, K	LB014387	mg/L	0.05	<0.05	1 - 3%	107%	
Sodium, Na	LB014387	mg/L	0.5	<0.5	0 - 3%	98 - 99%	
Sulphur as Sulphate, SO4	LB014387	mg/L	0.5	<0.5	0%	NA	
Zinc, Zn	LB014387	mg/L	0.005	<0.005	0 - 8%	103 - 106%	

Metals in Water (Dissolved) by ICPOES-USN Method: ME-(AU)-[ENV]AN320/AN322

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Arsenic, As	LB014420	mg/L	0.003	<0.003	0 - 15%	95%	
Cadmium, Cd	LB014420	mg/L	0.0001	<0.0001	0 - 7%	105%	
Chromium, Cr	LB014420	mg/L	0.001	<0.001	0%	103%	
Cobalt, Co	LB014420	mg/L	0.001	<0.001	0%	103%	
Copper, Cu	LB014420	mg/L	0.001	<0.001	0 - 2%	100%	
Lead, Pb	LB014420	mg/L	0.001	<0.001	0%	101%	103%
Nickel, Ni	LB014420	mg/L	0.001	<0.001	0%	106%	
Selenium, Se	LB014420	mg/L	0.003	<0.003	0 - 21%	96%	

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: ME-(AU)-[ENV]AN248

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB014167	mg/L	0.005	<0.005	0 - 17%	94 - 99%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

pH in water **Method: ME-(AU)-[ENV]AN101**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH**	LB014106	pH Units	0.1	5.7	0 - 1%	99%

TKN Kjeldahl Digestion by Discrete Analyser **Method: ME-(AU)-[ENV]AN281**

Parameter	QC Reference	Units	LOR	DUP %RPD
Total Kjeldahl Nitrogen	LB014115	mg/L	0.05	1 - 2%

Total and Volatile Suspended Solids (TSS / VSS) **Method: ME-(AU)-[ENV]AN114**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 103-105°C	LB014211	mg/L	5	<5	0%	96%

Total Phosphorus by Kjeldahl Digestion DA in Water **Method: ME-(AU)-[ENV]AN279/AN293**

Parameter	QC Reference	Units	LOR	DUP %RPD
Total Phosphorus (Kjeldahl Digestion)	LB014116	mg/L	0.02	0 - 4%

Turbidity **Method: ME-(AU)-[ENV]AN119**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Turbidity	LB014108	NTU	0.1	0.2	0 - 6%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2520 B.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN119	Turbidity by Nepholometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN121	This method is used to calculation the balance of major Anions and Cations in water samples and converts major ion concentration to milliequivalents and then summed. Anions sum and Cation sum is calculated as a difference and expressed as a percentage.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN135	Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported. APHA4500CO2 D.
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination, in the presence of a pH/complexation buffer, is used to determine the fluoride concentration. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN144	Commercially available DPD powders, which react with chlorine in solution to form a reddish pink dye. The chlorine concentration is estimated by measuring the intensity of colour produced on a colorimeter or by UV Vis spectrophotometer. The DPD powders contain diethyl-p-phenylenediamine, together with EDTA (to complex interfering metal ions) and a suitable buffer. Free and Total chlorine may be determined and combined chlorine calculated by their difference.
AN248	Nitrate / Nitrite by Auto Analyser: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Reference APHA 4500-NO3- F.
AN274	Chloride by Aquakem DA: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulphuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.
AN304	Filtered acidified sample analysed by GFAAS, referenced to APHA3113B.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN320/AN322	ICP-OES (Ultrasonic Nebuliser): After preservation with 10% nitric acid, a wide range of metals and some non-metals in solution can be measured by ICP- Ultrasonic nebulisation. Solutions are aspirated using an ultrasonic nebuliser into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN322	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B
AN735	The Colilert matrix contains two nutrient indicators, ONPG (ortho-nitro-phenyl B-d- galactopyranoside) and MUG (4-methyl-umbelliferyl B-d-glucruonide). As coliforms grow, they use B-galactosidase to metabolise ONPG which causes yellow colouration of the matrix via the nitro-phenyl. E.coli possesses an additional enzyme, B-glucuronidase, which it uses to metabolise MUG and display florescence (caused by the 4 methyl-umbelliferyl). Incubation at 37 C.
AN735	Non target organisms are suppressed by a combination of high salts, detergents etc. present within the matrix. Faecal coliforms are thermotolerant, thus they can be enumerated by testing at 44.5°C.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

ANALYTICAL REPORT

WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Talia Warda	Manager	Jon Dicker
Client	ALTONA MINING LTD	Laboratory	SGS Cairns Environmental
Address	PO BOX 1466 WEST PERTH WA 6872	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 8 94852929	Telephone	+61 07 4035 5111
Facsimile	61 8 94868700	Facsimile	+61 07 4035 5122
Email	TWarda@mbsenvironmental.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**Altona Mining - Water samples**	SGS Reference	**CE108391 R0**
Order Number	(Not specified)	Report Number	0000015277
Samples	18	Date Reported	03 Mar 2014
		Date Received	17 Feb 2014

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

Uranium subcontracted to SGS Brisbane, 59 Bancroft Rd, Pinkenba QLD 4008, NATA Accreditation Number: 2562, Site Number 1706 (Micro) / 20707 (Chemical), BE008331.

SIGNATORIES

Alyson Bergamo
Senior Laboratory Technician

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Maristela Ganzan
Metals Team Leader

Nathan Quinn
Micro Supervisor / Quality Co-ordinator

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE108391.001 Water 12 Feb 2014 SW3	CE108391.002 Water 12 Feb 2014 SW4	CE108391.003 Water 12 Feb 2014 SW5	CE108391.004 Water 12 Feb 2014 SW9
pH in water Method: AN101							
pH**	pH Units	0.1		**7.4**	**7.4**	**6.8**	**7.4**
Conductivity and TDS by Calculation - Water Method: AN106							
Conductivity @ 25 C	µS/cm	2		**120**	**120**	**37**	**120**
Total Dissolved Solids (by calculation)	mg/L	10		**72**	**72**	**22**	**72**
Turbidity Method: AN119							
Turbidity	NTU	0.1		**83**	**99**	**87**	**82**
Alkalinity Method: AN135							
Total Alkalinity as CaCO3	mg/L	5		**58**	**56**	**18**	**59**
Bicarbonate Alkalinity as CaCO3	mg/L	5		**58**	**56**	**18**	**59**
Carbonate Alkalinity as CaCO3	mg/L	5		<5	<5	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5		<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144							
Free Chlorine by DPD Colourimetric***	mg/L	0.5		<0.5	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274							
Chloride	mg/L	1		**4**	**4**	**2**	**4**
Fluoride by Ion Selective Electrode in Water Method: AN141							
Fluoride by ISE	mg/L	0.05		**0.23**	**0.20**	**0.06**	**0.18**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114							
Total Suspended Solids Dried at 103-105°C	mg/L	5		**34**	**39**	**42**	**34**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248							
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005		**0.29**	**0.27**	**0.015**	**0.25**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE108391.001 Water 12 Feb 2014 SW3	CE108391.002 Water 12 Feb 2014 SW4	CE108391.003 Water 12 Feb 2014 SW5	CE108391.004 Water 12 Feb 2014 SW9
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281						
Total Kjeldahl Nitrogen	mg/L	0.05	**0.53**	**0.57**	**0.53**	**0.56**
Total Nitrogen (calc)	mg/L	0.05	**0.82**	**0.83**	**0.54**	**0.81**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.09**	**0.12**	**0.09**	**0.11**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Aluminium, Al	mg/L	0.005	**0.008**	**0.006**	**0.61**	**0.012**
Calcium, Ca	mg/L	0.05	**11**	**11**	**4.9**	**12**
Iron, Fe	mg/L	0.005	**0.028**	**0.021**	**0.43**	**0.019**
Magnesium, Mg	mg/L	0.05	**2.5**	**2.5**	**0.69**	**2.8**
Manganese, Mn	mg/L	0.005	**0.011**	<0.005	**0.025**	<0.005
Molybdenum, Mo	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Potassium, K	mg/L	0.05	**3.6**	**3.6**	**3.0**	**3.8**
Sodium, Na	mg/L	0.5	**9.1**	**8.8**	**0.8**	**9.2**
Sulphur as Sulphate, SO4	mg/L	0.5	**2.1**	**1.8**	<0.5	**2.2**
Zinc, Zn	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322						
Arsenic, As	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Cadmium, Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium, Cr	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001	**0.003**	**0.002**	**0.004**	**0.002**
Lead, Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001	<0.001	**0.001**	<0.001
Selenium, Se	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304						
Silver, Ag	µg/L	0.05	<0.05	<0.05	<0.05	<0.05

Parameter	Units	LOR	Sample Number: CE108391.001 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: SW3	Sample Number: CE108391.002 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: SW4	Sample Number: CE108391.003 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: SW5	Sample Number: CE108391.004 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: SW9
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Uranium, U^	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents	meq/L	-	**1.27**	**1.23**	**0.428**	**1.34**
Anion-Cation Balance	%	-100	**-2.7**	**-2.2**	**-0.2**	**-0.3**
Sum of Anion Milliequivalents	meq/L	-	**1.34**	**1.28**	**0.430**	**1.35**
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
E. coli, Total and Faecal (Thermotolerant) coliforms in Water Method: AN735						
Date & Time Processed*	No unit	-	15/2/2014 0:00	15/2/2014 0:00	15/2/2014 0:00	15/2/2014 0:00
Faecal Coliforms	MPN/100mL	1	**1400**	**820**	**1200**	**730**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE108391.005 Water 12 Feb 2014 SW10	CE108391.006 Water 12 Feb 2014 LONGA	CE108391.007 Water 12 Feb 2014 SW6	CE108391.008 Water 12 Feb 2014 SW13
pH in water Method: AN101						
pH**	pH Units	0.1	**6.2**	**7.2**	**6.9**	**6.8**
Conductivity and TDS by Calculation - Water Method: AN106						
Conductivity @ 25 C	µS/cm	2	**93**	**110**	**67**	**140**
Total Dissolved Solids (by calculation)	mg/L	10	**56**	**66**	**40**	**84**
Turbidity Method: AN119						
Turbidity	NTU	0.1	**39**	**72**	**46**	**61**
Alkalinity Method: AN135						
Total Alkalinity as CaCO3	mg/L	5	**7**	**53**	**31**	**27**
Bicarbonate Alkalinity as CaCO3	mg/L	5	**7**	**53**	**31**	**27**
Carbonate Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144						
Free Chlorine by DPD Colourimetric***	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274						
Chloride	mg/L	1	**8**	**4**	**2**	**7**
Fluoride by Ion Selective Electrode in Water Method: AN141						
Fluoride by ISE	mg/L	0.05	**0.05**	**0.18**	**0.09**	**0.09**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	**16**	**25**	**36**	**52**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**0.45**	**0.32**	**0.39**	**7.9**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE108391.005 Water 12 Feb 2014 SW10	CE108391.006 Water 12 Feb 2014 LONGA	CE108391.007 Water 12 Feb 2014 SW6	CE108391.008 Water 12 Feb 2014 SW13
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281							
Total Kjeldahl Nitrogen	mg/L	0.05		**0.40**	**0.55**	**0.70**	**0.70**
Total Nitrogen (calc)	mg/L	0.05		**0.86**	**0.86**	**1.1**	**8.5**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293							
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02		**0.07**	**0.11**	**0.10**	**0.03**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321							
Aluminium, Al	mg/L	0.005		**0.014**	<0.005	**0.007**	**0.010**
Calcium, Ca	mg/L	0.05		**6.7**	**11**	**8.2**	**8.1**
Iron, Fe	mg/L	0.005		**0.019**	**0.026**	**0.008**	**0.014**
Magnesium, Mg	mg/L	0.05		**1.1**	**2.3**	**1.3**	**4.6**
Manganese, Mn	mg/L	0.005		<0.005	<0.005	**0.013**	**0.067**
Molybdenum, Mo	mg/L	0.005		<0.005	<0.005	<0.005	<0.005
Potassium, K	mg/L	0.05		**3.5**	**3.5**	**3.5**	**7.8**
Sodium, Na	mg/L	0.5		**0.6**	**8.4**	**2.4**	**7.3**
Sulphur as Sulphate, SO4	mg/L	0.5		**1.4**	**2.4**	**1.7**	**3.5**
Zinc, Zn	mg/L	0.005		<0.005	<0.005	<0.005	**0.017**
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322							
Arsenic, As	mg/L	0.003		<0.003	<0.003	<0.003	<0.003
Cadmium, Cd	mg/L	0.0001		<0.0001	<0.0001	<0.0001	**0.0002**
Chromium, Cr	mg/L	0.001		<0.001	<0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001		<0.001	<0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001		**0.003**	**0.002**	**0.005**	**0.003**
Lead, Pb	mg/L	0.001		<0.001	<0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001		<0.001	<0.001	<0.001	<0.001
Selenium, Se	mg/L	0.003		<0.003	<0.003	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304							
Silver, Ag	µg/L	0.05		<0.05	<0.05	<0.05	<0.05

Parameter	Units	LOR	Sample Number: CE108391.005 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: SW10	CE108391.006 Water 12 Feb 2014 LONGA	CE108391.007 Water 12 Feb 2014 SW6	CE108391.008 Water 12 Feb 2014 SW13
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Uranium, U^	µg/L	0.5	<0.5	<0.5	<0.5	<0.5
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents	meq/L	-	**0.540**	**1.18**	**0.711**	**1.30**
Anion-Cation Balance	%	-100	**13**	**-2.5**	**-2.8**	**-2.6**
Sum of Anion Milliequivalents	meq/L	-	**0.412**	**1.24**	**0.753**	**1.37**
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
E. coli, Total and Faecal (Thermotolerant) coliforms in Water Method: AN735						
Date & Time Processed*	No unit	-	15/2/2014 0:00	15/2/2014 0:00	15/2/2014 0:00	15/2/2014 0:00
Faecal Coliforms	MPN/100mL	1	**920**	**1700**	**1300**	**1400**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE108391.009 Water 12 Feb 2014 RSS2	CE108391.010 Water 12 Feb 2014 RSS6	CE108391.011 Water 12 Feb 2014 RSS9	CE108391.012 Water 12 Feb 2014 RSS10
pH in water Method: AN101							
pH**	pH Units	0.1		**7.2**	**7.6**	**7.4**	**7.1**
Conductivity and TDS by Calculation - Water Method: AN106							
Conductivity @ 25 C	µS/cm	2		**100**	**210**	**250**	**98**
Total Dissolved Solids (by calculation)	mg/L	10		**60**	**130**	**150**	**59**
Turbidity Method: AN119							
Turbidity	NTU	0.1		**150**	**68**	**42**	**150**
Alkalinity Method: AN135							
Total Alkalinity as CaCO3	mg/L	5		**50**	**100**	**83**	**48**
Bicarbonate Alkalinity as CaCO3	mg/L	5		**50**	**100**	**83**	**48**
Carbonate Alkalinity as CaCO3	mg/L	5		<5	<5	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5		<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144							
Free Chlorine by DPD Colourimetric***	mg/L	0.5		<0.5	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274							
Chloride	mg/L	1		**4**	**6**	**12**	**4**
Fluoride by Ion Selective Electrode in Water Method: AN141							
Fluoride by ISE	mg/L	0.05		**0.06**	**0.17**	**0.10**	**0.16**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114							
Total Suspended Solids Dried at 103-105°C	mg/L	5		**93**	**99**	**16**	**73**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248							
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005		**0.21**	**1.3**	**2.8**	**0.25**

Parameter	Units	LOR	Sample Number: CE108391.009 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: RSS2	CE108391.010 Water 12 Feb 2014 RSS6	CE108391.011 Water 12 Feb 2014 RSS9	CE108391.012 Water 12 Feb 2014 RSS10
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281						
Total Kjeldahl Nitrogen	mg/L	0.05	**0.70**	**0.75**	**0.64**	**0.44**
Total Nitrogen (calc)	mg/L	0.05	**0.90**	**2.0**	**3.5**	**0.69**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.10**	**0.13**	**0.05**	**0.11**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Aluminium, Al	mg/L	0.005	**0.14**	**0.006**	**0.010**	**0.13**
Calcium, Ca	mg/L	0.05	**11**	**25**	**19**	**9.6**
Iron, Fe	mg/L	0.005	**0.16**	**0.009**	**0.017**	**0.14**
Magnesium, Mg	mg/L	0.05	**2.0**	**4.4**	**3.7**	**1.9**
Manganese, Mn	mg/L	0.005	<0.005	<0.005	**0.007**	<0.005
Molybdenum, Mo	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Potassium, K	mg/L	0.05	**3.2**	**4.8**	**4.9**	**3.1**
Sodium, Na	mg/L	0.5	**7.9**	**11**	**23**	**7.8**
Sulphur as Sulphate, SO4	mg/L	0.5	**2.3**	**3.1**	**15**	**2.2**
Zinc, Zn	mg/L	0.005	<0.005	<0.005	**0.006**	<0.005
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322						
Arsenic, As	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Cadmium, Cd	mg/L	0.0001	<0.0001	<0.0001	**0.0001**	<0.0001
Chromium, Cr	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001	**0.003**	**0.003**	**0.004**	**0.003**
Lead, Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Selenium, Se	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304						
Silver, Ag	µg/L	0.05	<0.05	<0.05	<0.05	<0.05

Parameter	Units	LOR	Sample Number: CE108391.009 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: RSS2	Sample Number: CE108391.010 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: RSS6	Sample Number: CE108391.011 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: RSS9	Sample Number: CE108391.012 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: RSS10
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Uranium, U^	µg/L	0.5	<0.5	<0.5	**0.7**	<0.5
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents	meq/L	-	**1.14**	**2.18**	**2.39**	**1.06**
Anion-Cation Balance	%	-100	**-1.5**	**-3.0**	**-2.3**	**-3.1**
Sum of Anion Milliequivalents	meq/L	-	**1.17**	**2.32**	**2.50**	**1.13**
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
E. coli, Total and Faecal (Thermotolerant) coliforms in Water Method: AN735						
Date & Time Processed*	No unit	-	15/2/2014 0:00	15/2/2014 0:00	15/2/2014 0:00	15/2/2014 0:00
Faecal Coliforms	MPN/100mL	1	**870**	**980**	**580**	**870**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE108391.013 Water 12 Feb 2014 DAN LYNCH	CE108391.014 Water 12 Feb 2014 COCKATOO	CE108391.015 Water 12 Feb 2014 BLANK 1	CE108391.016 Water 12 Feb 2014 DUP1
pH in water Method: AN101						
pH**	pH Units	0.1	**7.2**	**7.1**	**6.1**	**7.4**
Conductivity and TDS by Calculation - Water Method: AN106						
Conductivity @ 25 C	µS/cm	2	**110**	**72**	**5**	**240**
Total Dissolved Solids (by calculation)	mg/L	10	**66**	**43**	<10	**140**
Turbidity Method: AN119						
Turbidity	NTU	0.1	**510**	**63**	**0.5**	**41**
Alkalinity Method: AN135						
Total Alkalinity as CaCO3	mg/L	5	**56**	**35**	<5	**83**
Bicarbonate Alkalinity as CaCO3	mg/L	5	**56**	**35**	<5	**83**
Carbonate Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144						
Free Chlorine by DPD Colourimetric***	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274						
Chloride	mg/L	1	**4**	**3**	<1	**12**
Fluoride by Ion Selective Electrode in Water Method: AN141						
Fluoride by ISE	mg/L	0.05	**0.17**	<0.05	<0.05	**0.09**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	**1100**	**28**	<5	**17**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**0.29**	**0.17**	**0.010**	**2.7**

Parameter	Units	LOR	Sample Number: CE108391.013 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: DAN LYNCH	CE108391.014 Water 12 Feb 2014 COCKATOO	CE108391.015 Water 12 Feb 2014 BLANK 1	CE108391.016 Water 12 Feb 2014 DUP1
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281						
Total Kjeldahl Nitrogen	mg/L	0.05	**1.3**	**0.41**	**0.13**	**0.58**
Total Nitrogen (calc)	mg/L	0.05	**1.6**	**0.59**	**0.14**	**3.2**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.31**	**0.06**	<0.02	**0.04**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Aluminium, Al	mg/L	0.005	**0.089**	**0.20**	<0.005	**0.015**
Calcium, Ca	mg/L	0.05	**9.9**	**7.2**	**0.14**	**19**
Iron, Fe	mg/L	0.005	**0.099**	**0.19**	<0.005	**0.028**
Magnesium, Mg	mg/L	0.05	**1.9**	**1.5**	<0.05	**3.7**
Manganese, Mn	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum, Mo	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Potassium, K	mg/L	0.05	**3.0**	**3.3**	**0.12**	**4.8**
Sodium, Na	mg/L	0.5	**8.0**	**5.7**	**1.1**	**23**
Sulphur as Sulphate, SO4	mg/L	0.5	**2.2**	**1.3**	<0.5	**15**
Zinc, Zn	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322						
Arsenic, As	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Cadmium, Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium, Cr	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001	**0.003**	**0.003**	<0.001	**0.004**
Lead, Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Selenium, Se	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304						
Silver, Ag	µg/L	0.05	<0.05	<0.05	<0.05	<0.05

Parameter	Units	LOR	Sample Number: CE108391.013 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: DAN LYNCH	Sample Number: CE108391.014 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: COCKATOO	Sample Number: CE108391.015 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: BLANK 1	Sample Number: CE108391.016 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: DUP1
Trace Metals (Dissolved) in Water by ICPMS Method: AN318						
Uranium, U^	µg/L	0.5	<0.5	<0.5	<0.5	**0.7**
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents	meq/L	-	**1.08**	**0.821**	-	**2.39**
Anion-Cation Balance	%	-100	**-9.2**	**-1.1**	-	**-2.0**
Sum of Anion Milliequivalents	meq/L	-	**1.30**	**0.838**	-	**2.49**
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
E. coli, Total and Faecal (Thermotolerant) coliforms in Water Method: AN735						
Date & Time Processed*	No unit	-	15/2/2014 0:00	15/2/2014 0:00	15/2/2014 0:00	15/2/2014 0:00
Faecal Coliforms	MPN/100mL	1	**1000**	**1300**	<1	**1200**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE108391.017 Water 12 Feb 2014 DUP2	CE108391.018 Water 12 Feb 2014 RSS4
pH in water Method: AN101				
pH**	pH Units	0.1	**7.2**	**7.6**
Conductivity and TDS by Calculation - Water Method: AN106				
Conductivity @ 25 C	µS/cm	2	**110**	**160**
Total Dissolved Solids (by calculation)	mg/L	10	**66**	**96**
Turbidity Method: AN119				
Turbidity	NTU	0.1	**73**	**120**
Alkalinity Method: AN135				
Total Alkalinity as CaCO3	mg/L	5	**53**	**74**
Bicarbonate Alkalinity as CaCO3	mg/L	5	**53**	**74**
Carbonate Alkalinity as CaCO3	mg/L	5	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5	<5	<5
Chlorine Free and Total DPD Method: AN144				
Free Chlorine by DPD Colourimetric***	mg/L	0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274				
Chloride	mg/L	1	**4**	**5**
Fluoride by Ion Selective Electrode in Water Method: AN141				
Fluoride by ISE	mg/L	0.05	**0.18**	**0.08**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114				
Total Suspended Solids Dried at 103-105°C	mg/L	5	**35**	**480**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE108391.017 Water 12 Feb 2014 DUP2	CE108391.018 Water 12 Feb 2014 RSS4
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248				
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**0.33**	**0.97**
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281				
Total Kjeldahl Nitrogen	mg/L	0.05	**0.60**	**0.71**
Total Nitrogen (calc)	mg/L	0.05	**0.93**	**1.7**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293				
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.13**	**0.12**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321				
Aluminium, Al	mg/L	0.005	**0.007**	**0.008**
Calcium, Ca	mg/L	0.05	**11**	**19**
Iron, Fe	mg/L	0.005	**0.025**	<0.005
Magnesium, Mg	mg/L	0.05	**2.3**	**2.6**
Manganese, Mn	mg/L	0.005	<0.005	<0.005
Molybdenum, Mo	mg/L	0.005	<0.005	<0.005
Potassium, K	mg/L	0.05	**3.5**	**5.1**
Sodium, Na	mg/L	0.5	**8.4**	**5.7**
Sulphur as Sulphate, SO4	mg/L	0.5	**2.5**	**2.2**
Zinc, Zn	mg/L	0.005	<0.005	<0.005
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322				
Arsenic, As	mg/L	0.003	<0.003	<0.003
Cadmium, Cd	mg/L	0.0001	<0.0001	**0.0002**
Chromium, Cr	mg/L	0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001	**0.002**	**0.005**
Lead, Pb	mg/L	0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001	<0.001
Selenium, Se	mg/L	0.003	<0.003	<0.003

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE108391.017 Water 12 Feb 2014 DUP2	CE108391.018 Water 12 Feb 2014 RSS4
Metals (dissolved) in Water by GF AAS Method: AN304				
Silver, Ag	µg/L	0.05	<0.05	<0.05
Trace Metals (Dissolved) in Water by ICPMS Method: AN318				
Uranium, U^	µg/L	0.5	<0.5	<0.5
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121				
Sum of Cation Milliequivalents	meq/L	-	**1.18**	**1.56**
Anion-Cation Balance	%	-100	**-2.8**	**-5.1**
Sum of Anion Milliequivalents	meq/L	-	**1.25**	**1.73**
Mercury (dissolved) in Water Method: AN311/AN312				
Mercury	mg/L	0.00005	<0.00005	<0.00005
E. coli, Total and Faecal (Thermotolerant) coliforms in Water Method: AN735				
Date & Time Processed*	No unit	-	15/2/2014 0:00	15/2/2014 0:00
Faecal Coliforms	MPN/100mL	1	**1000**	**980**

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB014003	mg/L	5	<5	0 - 2%	108%
Bicarbonate Alkalinity as CaCO3	LB014003	mg/L	5	<5		
Carbonate Alkalinity as CaCO3	LB014003	mg/L	5	<5		
Hydroxide Alkalinity as CaCO3	LB014003	mg/L	5	<5		

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride	LB014033	mg/L	1	<1	0 - 1%	99 - 100%

Chlorine Free and Total DPD Method: ME-(AU)-[ENV]AN144

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Free Chlorine by DPD Colourimetric***	LB014017	mg/L	0.5	<0.5	0%

Conductivity and TDS by Calculation - Water Method: ME-(AU)-[ENV]AN106

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Conductivity @ 25 C	LB014008	µS/cm	2	<2	0 - 1%
Total Dissolved Solids (by calculation)	LB014008	mg/L	10	<10	0 - 1%

Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MSD %RPD
Fluoride by ISE	LB014039	mg/L	0.05	<0.05	0 - 7%	100 - 102%	NA

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB014119	mg/L	0.00005	<0.00005	0 - 49%	101 - 109%	104 - 112%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Metals (dissolved) in Water by GF AAS Method: ME-(AU)-[ENV]AN304

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Silver, Ag	LB014436	µg/L	0.05	<0.05	0%	97%

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium, Al	LB014152	mg/L	0.005	<0.005	0%	99%	84%
Calcium, Ca	LB014152	mg/L	0.05	<0.05	0%	102%	104%
Iron, Fe	LB014152	mg/L	0.005	<0.005	0%	105%	109%
Magnesium, Mg	LB014152	mg/L	0.05	<0.05	1%	100%	102%
Manganese, Mn	LB014152	mg/L	0.005	<0.005	0%	107%	110%
Molybdenum, Mo	LB014152	mg/L	0.005	<0.005	0%	104%	108%
Potassium, K	LB014152	mg/L	0.05	<0.05	0 - 1%	107%	113%
Sodium, Na	LB014152	mg/L	0.5	<0.5	1%	100%	99%
Sulphur as Sulphate, SO4	LB014152	mg/L	0.5	<0.5	0 - 2%	NA	NA
Zinc, Zn	LB014152	mg/L	0.005	<0.005	0%	104%	105%

Metals in Water (Dissolved) by ICPOES-USN Method: ME-(AU)-[ENV]AN320/AN322

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Arsenic, As	LB014181	mg/L	0.003	<0.003	0%	104%	101%
Cadmium, Cd	LB014181	mg/L	0.0001	<0.0001	0%	105%	104%
Chromium, Cr	LB014181	mg/L	0.001	<0.001	0%	102%	96%
Cobalt, Co	LB014181	mg/L	0.001	<0.001	0%	103%	95%
Copper, Cu	LB014181	mg/L	0.001	<0.001	2 - 3%	104%	104%
Lead, Pb	LB014181	mg/L	0.001	<0.001	0%	98%	93%
Nickel, Ni	LB014181	mg/L	0.001	<0.001	0%	103%	95%
Selenium, Se	LB014181	mg/L	0.003	<0.003	0%	105%	

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: ME-(AU)-[ENV]AN248

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB014092	mg/L	0.005	<0.005	0 - 2%	88 - 101%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

pH in water **Method: ME-(AU)-[ENV]AN101**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH**	LB014007	pH Units	0.1	5.9	0 - 2%	99%

TKN Kjeldahl Digestion by Discrete Analyser **Method: ME-(AU)-[ENV]AN281**

Parameter	QC Reference	Units	LOR	DUP %RPD
Total Kjeldahl Nitrogen	LB014012	mg/L	0.05	1 - 8%

Total and Volatile Suspended Solids (TSS / VSS) **Method: ME-(AU)-[ENV]AN114**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 103-105°C	LB014121	mg/L	5	<5	1 - 8%	97%

Total Phosphorus by Kjeldahl Digestion DA in Water **Method: ME-(AU)-[ENV]AN279/AN293**

Parameter	QC Reference	Units	LOR	DUP %RPD
Total Phosphorus (Kjeldahl Digestion)	LB014013	mg/L	0.02	0 - 6%

Turbidity **Method: ME-(AU)-[ENV]AN119**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Turbidity	LB014009	NTU	0.1	0.2	1 - 12%

METHOD	METHODOLOGY SUMMARY
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2520 B.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN119	Turbidity by Nepholometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN121	This method is used to calculation the balance of major Anions and Cations in water samples and converts major ion concentration to milliequivalents and then summed. Anions sum and Cation sum is calculated as a difference and expressed as a percentage.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN135	Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported. APHA4500CO2 D.
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination, in the presence of a pH/complexation buffer, is used to determine the fluoride concentration. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN144	Commercially available DPD powders, which react with chlorine in solution to form a reddish pink dye. The chlorine concentration is estimated by measuring the intensity of colour produced on a colorimeter or by UV Vis spectrophotometer. The DPD powders contain diethyl-p-phenylenediamine, together with EDTA (to complex interfering metal ions) and a suitable buffer. Free and Total chlorine may be determined and combined chlorine calculated by their difference.
AN248	Nitrate / Nitrite by Auto Analyser: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Reference APHA 4500-NO3- F.
AN274	Chloride by Aquakem DA: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulphuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.
AN304	Filtered acidified sample analysed by GFAAS, referenced to APHA3113B.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN320/AN322	ICP-OES (Ultrasonic Nebuliser): After preservation with 10% nitric acid, a wide range of metals and some non-metals in solution can be measured by ICP- Ultrasonic nebulisation. Solutions are aspirated using an ultrasonic nebuliser into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN322	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B
AN735	The Colilert matrix contains two nutrient indicators, ONPG (ortho-nitro-phenyl B-d- galactopyranoside) and MUG (4-methyl-umbelliferyl B-d-glucruonide). As coliforms grow, they use B-galactosidase to metabolise ONPG which causes yellow colouration of the matrix via the nitro-phenyl. E.coli possesses an additional enzyme, B-glucuronidase, which it uses to metabolise MUG and display florescence (caused by the 4 methyl-umbelliferyl). Incubation at 37 C.
AN735	Non target organisms are suppressed by a combination of high salts, detergents etc. present within the matrix. Faecal coliforms are thermotolerant, thus they can be enumerated by testing at 44.5°C.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

ANALYTICAL REPORT

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Talia Warda	Manager	Jon Dicker
Client	ALTONA MINING LTD	Laboratory	SGS Cairns Environmental
Address	PO BOX 1466 WEST PERTH WA 6872	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 8 94852929	Telephone	+61 07 4035 5111
Facsimile	61 8 94868700	Facsimile	+61 07 4035 5122
Email	TWarda@mbsenvironmental.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**Altona Mining - Soil Samples**	SGS Reference	**CE108406 R0**
Order Number	(Not specified)	Report Number	0000015449
Samples	17	Date Reported	07 Mar 2014
		Date Received	17 Feb 2014

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

Uranium subcontracted to SGS Townsville, 50-52 Leyland St Garbutt QLD 4814, Not Accredited, TV084622 (WAE) & TV084661 (NORMAL)

SIGNATORIES

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Maristela Ganzan
Metals Team Leader

Nathan Quinn
Micro Supervisor / Quality Co-ordinator

Parameter	Units	LOR	Sample Number: CE108406.001 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: SW3	CE108406.002 Water 12 Feb 2014 SW4	CE108406.003 Water 12 Feb 2014 SW5	CE108406.004 Water 12 Feb 2014 SW9
Particle sizing of soils by sieving Method: AN005						
Passing 2.00mm	%w/w	1	100	100	93	60
Retained 2.00mm	%w/w	1	<1	<1	7	40
Passing 600µm	%w/w	1	99	80	67	8
Retained 600µm	%w/w	1	<1	20	26	53
Passing 300µm	%w/w	1	93	16	38	1
Retained 300µm	%w/w	1	6	65	29	7
Passing 212µm	%w/w	1	85	4	20	<1
Retained 212µm	%w/w	1	8	12	18	<1
Passing 63µm	%w/w	1	17	<1	7	<1
Retained 63µm	%w/w	1	68	3	13	<1
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141						
Water Soluble Fluoride*	mg/kg	0.5	1.7	1.1	0.8	1.0
Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest Method: AN040/AN320						
Arsenic, As	mg/kg	0.5	1.7	4.5	1.5	2.1
Cadmium, Cd	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	mg/kg	0.5	14	13	14	8.0
Cobalt, Co	mg/kg	0.5	6.5	8.4	6.0	5.0
Copper, Cu	mg/kg	0.5	24	20	48	17
Lead, Pb	mg/kg	0.5	3.7	9.7	2.9	4.2
Manganese, Mn	mg/kg	2	300	720	450	590
Nickel, Ni	mg/kg	0.5	8.8	9.2	8.9	7.2
Selenium, Se	mg/kg	1	<1	<1	<1	<1
Silver, Ag	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S	mg/kg	50	<50	<50	<50	<50
Zinc, Zn	mg/kg	0.5	11	15	3.9	7.8
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318						
Uranium, U^	mg/kg	0.1	0.8	0.7	0.6	0.8
Mercury in Soil Method: AN312						
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01
Bioavailable Metals in Soil by ICPOES Method: AN037/AN320/AN321						
Arsenic, As*	mg/kg	0.5	<0.5	0.5	0.6	0.8
Cadmium, Cd*	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr*	mg/kg	0.5	1.0	0.5	0.5	0.5
Cobalt, Co*	mg/kg	0.5	2.9	4.1	2.8	2.8
Copper, Cu*	mg/kg	0.5	6.2	4.2	15	2.2
Lead, Pb*	mg/kg	0.5	1.9	5.1	1.4	2.0
Manganese, Mn*	mg/kg	2	210	520	290	360
Nickel, Ni*	mg/kg	0.5	1.4	2.1	1.5	1.2
Selenium, Se*	mg/kg	1	<1	<1	<1	<1
Silver, Ag*	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S*	mg/kg	50	<50	<50	<50	<50
Zinc, Zn*	mg/kg	0.5	2.0	2.0	0.5	1.0

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE108406.001 Water 12 Feb 2014 SW3	CE108406.002 Water 12 Feb 2014 SW4	CE108406.003 Water 12 Feb 2014 SW5	CE108406.004 Water 12 Feb 2014 SW9
Bioavailable metals in sediment by ICP MS Method: AN037/AN318							
Uranium, U*	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Bio Available Mercury in Soils and Sediments Method: AN312							
Mercury*	mg/kg	0.01		<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number: CE108406.005 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: SW10	CE108406.006 Water 12 Feb 2014 LONGA	CE108406.007 Water 12 Feb 2014 SW6	CE108406.008 Water 12 Feb 2014 SW13
Particle sizing of soils by sieving Method: AN005						
Passing 2.00mm	%w/w	1	**82**	**99**	**45**	**77**
Retained 2.00mm	%w/w	1	**18**	**1**	**55**	**23**
Passing 600µm	%w/w	1	**24**	**59**	**12**	**59**
Retained 600µm	%w/w	1	**58**	**40**	**33**	**19**
Passing 300µm	%w/w	1	**8**	**10**	**3**	**49**
Retained 300µm	%w/w	1	**16**	**49**	**9**	**10**
Passing 212µm	%w/w	1	**5**	**4**	**2**	**41**
Retained 212µm	%w/w	1	**3**	**6**	**1**	**8**
Passing 63µm	%w/w	1	**3**	**2**	**1**	**12**
Retained 63µm	%w/w	1	**3**	**2**	**1**	**29**
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141						
Water Soluble Fluoride*	mg/kg	0.5	**1.0**	**1.2**	**1.3**	**1.5**
Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest Method: AN040/AN320						
Arsenic, As	mg/kg	0.5	**24**	**1.6**	**2.1**	**5.6**
Cadmium, Cd	mg/kg	0.1	**0.5**	<0.1	<0.1	<0.1
Chromium, Cr	mg/kg	0.5	**28**	**7.3**	**14**	**11**
Cobalt, Co	mg/kg	0.5	**27**	**4.6**	**10**	**8.1**
Copper, Cu	mg/kg	0.5	**97**	**15**	**140**	**38**
Lead, Pb	mg/kg	0.5	**38**	**2.7**	**4.1**	**6.1**
Manganese, Mn	mg/kg	2	**4800**	**180**	**810**	**590**
Nickel, Ni	mg/kg	0.5	**30**	**5.1**	**12**	**8.7**
Selenium, Se	mg/kg	1	<1	<1	<1	<1
Silver, Ag	mg/kg	0.2	**0.4**	<0.2	<0.2	<0.2
Sulphur, S	mg/kg	50	<50	<50	<50	<50
Zinc, Zn	mg/kg	0.5	**120**	**7.0**	**4.8**	**9.8**
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318						
Uranium, U^	mg/kg	0.1	**2.4**	**0.7**	**1.0**	**0.5**
Mercury in Soil Method: AN312						
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01
Bioavailable Metals in Soil by ICPOES Method: AN037/AN320/AN321						
Arsenic, As*	mg/kg	0.5	**1.4**	**0.5**	**0.8**	**0.5**
Cadmium, Cd*	mg/kg	0.1	**0.1**	<0.1	<0.1	<0.1
Chromium, Cr*	mg/kg	0.5	**0.5**	**0.5**	**1.0**	<0.5
Cobalt, Co*	mg/kg	0.5	**7.0**	**1.8**	**5.5**	**3.7**
Copper, Cu*	mg/kg	0.5	**13**	**4.0**	**32**	**7.6**
Lead, Pb*	mg/kg	0.5	**8.7**	**1.5**	**2.0**	**2.9**
Manganese, Mn*	mg/kg	2	**840**	**110**	**630**	**310**
Nickel, Ni*	mg/kg	0.5	**3.3**	**0.9**	**2.3**	**1.2**
Selenium, Se*	mg/kg	1	<1	<1	<1	<1
Silver, Ag*	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S*	mg/kg	50	<50	<50	<50	<50
Zinc, Zn*	mg/kg	0.5	**16**	**1.5**	**1.0**	**2.5**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE108406.005 Water 12 Feb 2014 SW10	CE108406.006 Water 12 Feb 2014 LONGA	CE108406.007 Water 12 Feb 2014 SW6	CE108406.008 Water 12 Feb 2014 SW13
Bioavailable metals in sediment by ICP MS Method: AN037/AN318						
Uranium, U*	mg/kg	0.5	**0.6**	<0.5	<0.5	<0.5
Bio Available Mercury in Soils and Sediments Method: AN312						
Mercury*	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number: CE108406.009 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: RSS2	CE108406.010 Water 12 Feb 2014 RSS6	CE108406.011 Water 12 Feb 2014 RSS9	CE108406.012 Water 12 Feb 2014 RSS10
Particle sizing of soils by sieving Method: AN005						
Passing 2.00mm	%w/w	1	**67**	**78**	**77**	**99**
Retained 2.00mm	%w/w	1	**33**	**22**	**23**	**1**
Passing 600µm	%w/w	1	**34**	**9**	**36**	**97**
Retained 600µm	%w/w	1	**33**	**68**	**41**	**2**
Passing 300µm	%w/w	1	**14**	**5**	**8**	**73**
Retained 300µm	%w/w	1	**19**	**5**	**28**	**24**
Passing 212µm	%w/w	1	**11**	**3**	**3**	**50**
Retained 212µm	%w/w	1	**4**	**2**	**5**	**23**
Passing 63µm	%w/w	1	**4**	**1**	<1	**9**
Retained 63µm	%w/w	1	**6**	**2**	**2**	**41**
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141						
Water Soluble Fluoride*	mg/kg	0.5	**1.0**	**0.7**	**0.7**	**1.0**
Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest Method: AN040/AN320						
Arsenic, As	mg/kg	0.5	**1.8**	**1.7**	**0.6**	**1.0**
Cadmium, Cd	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	mg/kg	0.5	**7.3**	**6.7**	**11**	**12**
Cobalt, Co	mg/kg	0.5	**5.1**	**3.8**	**8.9**	**6.6**
Copper, Cu	mg/kg	0.5	**16**	**8.5**	**25**	**22**
Lead, Pb	mg/kg	0.5	**2.2**	**2.4**	**3.2**	**2.1**
Manganese, Mn	mg/kg	2	**240**	**290**	**170**	**150**
Nickel, Ni	mg/kg	0.5	**5.3**	**4.0**	**8.1**	**7.8**
Selenium, Se	mg/kg	1	<1	<1	<1	<1
Silver, Ag	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S	mg/kg	50	<50	<50	<50	<50
Zinc, Zn	mg/kg	0.5	**6.6**	**5.0**	**5.2**	**7.0**
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318						
Uranium, U^	mg/kg	0.1	**0.9**	**0.7**	**0.7**	**0.8**
Mercury in Soil Method: AN312						
Mercury	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01
Bioavailable Metals in Soil by ICPOES Method: AN037/AN320/AN321						
Arsenic, As*	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5
Cadmium, Cd*	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr*	mg/kg	0.5	**0.5**	**0.5**	**0.5**	**0.5**
Cobalt, Co*	mg/kg	0.5	**1.7**	**1.8**	**2.5**	**2.2**
Copper, Cu*	mg/kg	0.5	**3.2**	**1.5**	**2.8**	**4.7**
Lead, Pb*	mg/kg	0.5	**1.1**	**1.1**	**2.3**	**1.2**
Manganese, Mn*	mg/kg	2	**160**	**220**	**110**	**110**
Nickel, Ni*	mg/kg	0.5	**0.9**	**0.9**	**0.7**	**0.9**
Selenium, Se*	mg/kg	1	<1	<1	<1	<1
Silver, Ag*	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S*	mg/kg	50	<50	<50	<50	<50
Zinc, Zn*	mg/kg	0.5	**1.5**	**1.0**	**1.0**	**1.5**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE108406.009 Water 12 Feb 2014 RSS2	CE108406.010 Water 12 Feb 2014 RSS6	CE108406.011 Water 12 Feb 2014 RSS9	CE108406.012 Water 12 Feb 2014 RSS10
Bioavailable metals in sediment by ICP MS Method: AN037/AN318							
Uranium, U*	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Bio Available Mercury in Soils and Sediments Method: AN312							
Mercury*	mg/kg	0.01		<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE108406.013 Water 12 Feb 2014 DAN LYNCH	CE108406.014 Water 12 Feb 2014 COCKATOO	CE108406.015 Water 12 Feb 2014 DUP 1	CE108406.016 Water 12 Feb 2014 DUP 2
Particle sizing of soils by sieving Method: AN005						
Passing 2.00mm	%w/w	1	**99**	**90**	**70**	**96**
Retained 2.00mm	%w/w	1	**2**	**10**	**30**	**4**
Passing 600µm	%w/w	1	**96**	**24**	**32**	**45**
Retained 600µm	%w/w	1	**2**	**66**	**38**	**51**
Passing 300µm	%w/w	1	**86**	**3**	**6**	**10**
Retained 300µm	%w/w	1	**10**	**21**	**26**	**35**
Passing 212µm	%w/w	1	**74**	**1**	**2**	**4**
Retained 212µm	%w/w	1	**12**	**2**	**4**	**6**
Passing 63µm	%w/w	1	**33**	<1	<1	**1**
Retained 63µm	%w/w	1	**41**	**1**	**2**	**3**
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141						
Water Soluble Fluoride*	mg/kg	0.5	**2.3**	**0.8**	**0.8**	**1.1**
Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest Method: AN040/AN320						
Arsenic, As	mg/kg	0.5	**1.8**	**0.8**	<0.5	**2.3**
Cadmium, Cd	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr	mg/kg	0.5	**16**	**9.6**	**9.9**	**6.9**
Cobalt, Co	mg/kg	0.5	**8.5**	**10**	**9.1**	**4.3**
Copper, Cu	mg/kg	0.5	**31**	**27**	**25**	**15**
Lead, Pb	mg/kg	0.5	**45**	**1.6**	**2.1**	**2.4**
Manganese, Mn	mg/kg	2	**280**	**180**	**170**	**190**
Nickel, Ni	mg/kg	0.5	**11**	**7.5**	**7.6**	**5.1**
Selenium, Se	mg/kg	1	<1	<1	<1	<1
Silver, Ag	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S	mg/kg	50	**150**	<50	**50**	<50
Zinc, Zn	mg/kg	0.5	**21**	**4.1**	**6.0**	**7.1**
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318						
Uranium, U^	mg/kg	0.1	**1.1**	**0.6**	**0.7**	**0.7**
Mercury in Soil Method: AN312						
Mercury	mg/kg	0.01	**0.01**	<0.01	<0.01	<0.01
Bioavailable Metals in Soil by ICPOES Method: AN037/AN320/AN321						
Arsenic, As*	mg/kg	0.5	**1.4**	<0.5	<0.5	<0.5
Cadmium, Cd*	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Chromium, Cr*	mg/kg	0.5	**0.5**	**0.5**	<0.5	**0.5**
Cobalt, Co*	mg/kg	0.5	**4.1**	**3.2**	**2.9**	**1.6**
Copper, Cu*	mg/kg	0.5	**12**	**3.4**	**2.7**	**3.0**
Lead, Pb*	mg/kg	0.5	**40**	**0.5**	**1.3**	**1.1**
Manganese, Mn*	mg/kg	2	**210**	**130**	**130**	**120**
Nickel, Ni*	mg/kg	0.5	**1.5**	**0.9**	**0.9**	**0.9**
Selenium, Se*	mg/kg	1	<1	<1	<1	<1
Silver, Ag*	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2
Sulphur, S*	mg/kg	50	<50	<50	<50	<50
Zinc, Zn*	mg/kg	0.5	**9.0**	**0.5**	**1.0**	**1.0**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE108406.013 Water 12 Feb 2014 DAN LYNCH	CE108406.014 Water 12 Feb 2014 COCKATOO	CE108406.015 Water 12 Feb 2014 DUP 1	CE108406.016 Water 12 Feb 2014 DUP 2
Bioavailable metals in sediment by ICP MS Method: AN037/AN318							
Uranium, U*	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5
Bio Available Mercury in Soils and Sediments Method: AN312							
Mercury*	mg/kg	0.01		<0.01	<0.01	<0.01	<0.01

Parameter	Units	LOR	Sample Number CE108406.017 Sample Matrix Water Sample Date 12 Feb 2014 Sample Name RSS4
Particle sizing of soils by sieving Method: AN005			
Passing 2.00mm	%w/w	1	**64**
Retained 2.00mm	%w/w	1	**36**
Passing 600µm	%w/w	1	**48**
Retained 600µm	%w/w	1	**16**
Passing 300µm	%w/w	1	**30**
Retained 300µm	%w/w	1	**18**
Passing 212µm	%w/w	1	**16**
Retained 212µm	%w/w	1	**14**
Passing 63µm	%w/w	1	**3**
Retained 63µm	%w/w	1	**13**
Fluoride in Soil (Water Soluble 1:5 Extraction) by ISE Method: AN141			
Water Soluble Fluoride*	mg/kg	0.5	**1.1**
Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest Method: AN040/AN320			
Arsenic, As	mg/kg	0.5	**1.8**
Cadmium, Cd	mg/kg	0.1	<0.1
Chromium, Cr	mg/kg	0.5	**12**
Cobalt, Co	mg/kg	0.5	**8.0**
Copper, Cu	mg/kg	0.5	**71**
Lead, Pb	mg/kg	0.5	**2.9**
Manganese, Mn	mg/kg	2	**640**
Nickel, Ni	mg/kg	0.5	**10**
Selenium, Se	mg/kg	1	<1
Silver, Ag	mg/kg	0.2	<0.2
Sulphur, S	mg/kg	50	<50
Zinc, Zn	mg/kg	0.5	**5.1**

Parameter	Units	LOR	Sample Number: CE108406.017 Sample Matrix: Water Sample Date: 12 Feb 2014 Sample Name: RSS4
Total Recoverable Metals in Soil by ICPMS Method: AN041/AN318			
Uranium, U^	mg/kg	0.1	**1.0**
Mercury in Soil Method: AN312			
Mercury	mg/kg	0.01	<0.01
Bioavailable Metals in Soil by ICPOES Method: AN037/AN320/AN321			
Arsenic, As*	mg/kg	0.5	**0.7**
Cadmium, Cd*	mg/kg	0.1	<0.1
Chromium, Cr*	mg/kg	0.5	**0.5**
Cobalt, Co*	mg/kg	0.5	**3.7**
Copper, Cu*	mg/kg	0.5	**16**
Lead, Pb*	mg/kg	0.5	**1.7**
Manganese, Mn*	mg/kg	2	**510**
Nickel, Ni*	mg/kg	0.5	**1.7**
Selenium, Se*	mg/kg	1	<1
Silver, Ag*	mg/kg	0.2	<0.2
Sulphur, S*	mg/kg	50	<50
Zinc, Zn*	mg/kg	0.5	**1.0**
Bioavailable metals in sediment by ICP MS Method: AN037/AN318			
Uranium, U*	mg/kg	0.5	<0.5
Bio Available Mercury in Soils and Sediments Method: AN312			
Mercury*	mg/kg	0.01	<0.01

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Bio Available Mercury in Soils and Sediments **Method: ME-(AU)-[ENV]AN312**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Mercury*	LB014496	mg/kg	0.01	<0.01	0%	NA

Bioavailable Metals in Soil by ICPOES **Method: ME-(AU)-[ENV]AN037/AN320/AN321**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Arsenic, As*	LB014495	mg/kg	0.5	<0.5	0%	96%
Cadmium, Cd*	LB014495	mg/kg	0.1	<0.1	0%	107%
Chromium, Cr*	LB014495	mg/kg	0.5	<0.5	0%	91%
Cobalt, Co*	LB014495	mg/kg	0.5	<0.5	0 - 1%	89%
Copper, Cu*	LB014495	mg/kg	0.5	<0.5	0 - 1%	104%
Lead, Pb*	LB014495	mg/kg	0.5	<0.5	0%	94%
Manganese, Mn*	LB014495	mg/kg	2	<2	0 - 1%	95%
Nickel, Ni*	LB014495	mg/kg	0.5	<0.5	0%	90%
Selenium, Se*	LB014495	mg/kg	1	<1	0%	99%
Silver, Ag*	LB014495	mg/kg	0.2	<0.2	0%	98%
Sulphur, S*	LB014495	mg/kg	50	<50	0 - 6%	106%
Zinc, Zn*	LB014495	mg/kg	0.5	<0.5	0%	92%

Mercury in Soil **Method: ME-(AU)-[ENV]AN312**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Mercury	LB014412	mg/kg	0.01	<0.01	0%	97 - 99%	98%

Total Recoverable Metals in Soil by ICPOES from EPA 200.8 Digest **Method: ME-(AU)-[ENV]AN040/AN320**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Arsenic, As	LB014410	mg/kg	0.5	<0.5	0 - 12%	103%
Cadmium, Cd	LB014410	mg/kg	0.1	<0.1	0%	108%
Chromium, Cr	LB014410	mg/kg	0.5	<0.5	0 - 3%	100%
Cobalt, Co	LB014410	mg/kg	0.5	<0.5	0 - 4%	100%
Copper, Cu	LB014410	mg/kg	0.5	<0.5	2 - 5%	100%
Lead, Pb	LB014410	mg/kg	0.5	<0.5	5 - 9%	103%
Manganese, Mn	LB014410	mg/kg	2	<2	1 - 6%	101%
Nickel, Ni	LB014410	mg/kg	0.5	<0.5	1 - 8%	101%
Selenium, Se	LB014410	mg/kg	1	<1	0%	99%
Silver, Ag	LB014410	mg/kg	0.2	<0.2	0%	95%
Sulphur, S	LB014410	mg/kg	50	<50		
Zinc, Zn	LB014410	mg/kg	0.5	1.4	3%	103%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN005	The particle size distribution of a soil is determined by wet sieving, using a maximum of 900 mL of deionised water to sieve all fractions down to 75 µm. Referenced to AS1289.3.6.1 and AS1141.11.
AN040/AN320	A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
AN041/AN318	Determination of elements at trace level in soil digest by ICP-MS technique, in accordance with USEPA 6020A.
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination, in the presence of a pH/complexation buffer, is used to determine the fluoride concentration on the soil water extract. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN213	As received sediment sample is analysed by a purge and trap method. The sample is mixed or extracted with 1M hydrochloric acid in a rapid distillation unit to produce hydrogen sulphide (H2S) which is collected and titrated with iodine (I2(aq)) to measure AVS. The original extract solution may then be analysed for metals by ICP OES or ICP MS to determine the bioavailable metals (simultaneously extractable metals - SEM).
AN312	Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN320AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

ANALYTICAL REPORT

WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS

Contact	Talia Warda
Client	ALTONA MINING LTD
Address	PO BOX 1466 WEST PERTH WA 6872
Telephone	61 8 94852929
Facsimile	61 8 94868700
Email	TWarda@mbsenvironmental.com.au
Project	**Altona Mining - Water samples - 20/03/14**
Order Number	(Not specified)
Samples	8

LABORATORY DETAILS

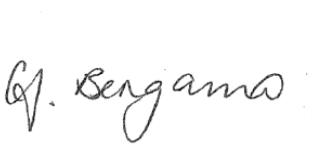
Manager	Jon Dicker
Laboratory	SGS Cairns Environmental
Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	+61 07 4035 5111
Facsimile	+61 07 4035 5122
Email	AU.Environmental.Cairns@sgs.com
SGS Reference	**CE109097 R0**
Report Number	0000016525
Date Reported	17 Apr 2014
Date Received	28 Mar 2014

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

Uranium subcontracted to SGS Sydney, Unit 16 33 Maddox St Alexandria NSW 2015, NATA Accreditation Number: 2562, Site Number: 4354, SE126533.

SIGNATORIES



Alyson Bergamo
Senior Laboratory Technician

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Maristela Ganzan
Metals Team Leader

Nathan Quinn
Micro Supervisor / Quality Co-ordinator

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE109097.001 Water 20 Mar 2014 RSS10	CE109097.002 Water 20 Mar 2014 DAN LYNCH	CE109097.003 Water 20 Mar 2014 SW1	CE109097.004 Water 20 Mar 2014 SW2
pH in water Method: AN101						
pH**	pH Units	0.1	**7.7**	**7.7**	**7.8**	**7.6**
Conductivity and TDS by Calculation - Water Method: AN106						
Conductivity @ 25 C	µS/cm	2	**180**	**180**	**390**	**240**
Total Dissolved Solids (by calculation)	mg/L	10	**110**	**110**	**230**	**140**
Turbidity Method: AN119						
Turbidity	NTU	0.1	**26**	**25**	**16**	**64**
Alkalinity Method: AN135						
Total Alkalinity as CaCO3	mg/L	5	**96**	**96**	**210**	**130**
Bicarbonate Alkalinity as CaCO3	mg/L	5	**96**	**96**	**210**	**130**
Carbonate Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144						
Free Chlorine by DPD Colourimetric***	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274						
Chloride	mg/L	1	**5**	**5**	**10**	**7**
Fluoride by Ion Selective Electrode in Water Method: AN141						
Fluoride by ISE	mg/L	0.05	**0.26**	**0.29**	**0.23**	**0.30**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	**20**	**17**	**36**	**140**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**0.013**	**0.005**	**0.022**	<0.005

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE109097.001 Water 20 Mar 2014 RSS10	CE109097.002 Water 20 Mar 2014 DAN LYNCH	CE109097.003 Water 20 Mar 2014 SW1	CE109097.004 Water 20 Mar 2014 SW2
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281						
Total Kjeldahl Nitrogen	mg/L	0.05	**0.53**	**0.61**	**1.4**	**2.1**
Total Nitrogen (calc)	mg/L	0.05	**0.54**	**0.62**	**1.4**	**2.1**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.04**	**0.05**	**0.11**	**0.12**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Aluminium, Al	mg/L	0.005	**0.008**	<0.005	<0.005	**0.008**
Calcium, Ca	mg/L	0.05	**20**	**20**	**52**	**26**
Iron, Fe	mg/L	0.005	**0.011**	**0.007**	<0.005	<0.005
Magnesium, Mg	mg/L	0.05	**4.0**	**4.0**	**9.7**	**5.5**
Manganese, Mn	mg/L	0.005	**0.006**	**0.010**	**0.007**	**0.010**
Molybdenum, Mo	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Potassium, K	mg/L	0.05	**4.4**	**4.4**	**9.0**	**8.1**
Sodium, Na	mg/L	0.5	**17**	**13**	**16**	**15**
Sulphur as Sulphate, SO4	mg/L	0.5	**2.3**	**2.1**	**0.8**	**2.7**
Zinc, Zn	mg/L	0.005	**0.008**	**0.012**	<0.005	<0.005
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322						
Arsenic, As	mg/L	0.003	<0.003	<0.003	**0.003**	<0.003
Cadmium, Cd	mg/L	0.0001	**0.0003**	<0.0001	<0.0001	<0.0001
Chromium, Cr	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001	**0.003**	**0.003**	**0.002**	**0.004**
Lead, Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	**0.001**	<0.001	**0.001**	<0.001
Selenium, Se	mg/L	0.003	<0.003	**0.005**	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304						
Silver, Ag	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Rare Earth Metals in Solutions and Brines by ICPMS Method: IMS84V						
Uranium, U*^	µg/L	0.5	**0.7**	<0.5	**1.7**	**0.9**
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents	meq/L	-	**2.16**	**2.01**	**4.33**	**2.60**
Anion-Cation Balance	%	-100	**1.2**	**-2.6**	**-1.6**	**-3.2**
Sum of Anion Milliequivalents	meq/L	-	**2.11**	**2.11**	**4.47**	**2.77**

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE109097.005 Water 20 Mar 2014 SW3	CE109097.006 Water 20 Mar 2014 LONGAMUNDI	CE109097.007 Water 20 Mar 2014 STANDARD	CE109097.008 Water 20 Mar 2014 DUP1
pH in water Method: AN101						
pH**	pH Units	0.1	**7.6**	**7.7**	**6.2**	**7.7**
Conductivity and TDS by Calculation - Water Method: AN106						
Conductivity @ 25 C	µS/cm	2	**240**	**190**	**7**	**180**
Total Dissolved Solids (by calculation)	mg/L	10	**140**	**110**	<10	**110**
Turbidity Method: AN119						
Turbidity	NTU	0.1	**63**	**66**	**0.5**	**27**
Alkalinity Method: AN135						
Total Alkalinity as CaCO3	mg/L	5	**130**	**100**	<5	**96**
Bicarbonate Alkalinity as CaCO3	mg/L	5	**130**	**100**	<5	**96**
Carbonate Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5	<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144						
Free Chlorine by DPD Colourimetric***	mg/L	0.5	**1.2**	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274						
Chloride	mg/L	1	**6**	**5**	<1	**5**
Fluoride by Ion Selective Electrode in Water Method: AN141						
Fluoride by ISE	mg/L	0.05	**0.32**	**0.27**	<0.05	**0.28**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114						
Total Suspended Solids Dried at 103-105°C	mg/L	5	**66**	**44**	<5	**16**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**0.005**	<0.005	<0.005	<0.005

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE109097.005 Water 20 Mar 2014 SW3	CE109097.006 Water 20 Mar 2014 LONGAMUNDI	CE109097.007 Water 20 Mar 2014 STANDARD	CE109097.008 Water 20 Mar 2014 DUP1
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281						
Total Kjeldahl Nitrogen	mg/L	0.05	**2.0**	**0.79**	**0.57**	**0.57**
Total Nitrogen (calc)	mg/L	0.05	**2.0**	**0.80**	**0.57**	**0.57**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.13**	**0.08**	**2.6**	**0.04**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Aluminium, Al	mg/L	0.005	**0.009**	**0.007**	<0.005	**0.006**
Calcium, Ca	mg/L	0.05	**26**	**23**	**0.13**	**20**
Iron, Fe	mg/L	0.005	<0.005	**0.026**	<0.005	**0.006**
Magnesium, Mg	mg/L	0.05	**5.6**	**4.4**	<0.05	**4.0**
Manganese, Mn	mg/L	0.005	**0.008**	**0.12**	<0.005	**0.009**
Molybdenum, Mo	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Potassium, K	mg/L	0.05	**8.1**	**4.7**	**0.13**	**4.3**
Sodium, Na	mg/L	0.5	**15**	**11**	**1.2**	**13**
Sulphur as Sulphate, SO4	mg/L	0.5	**2.6**	**1.6**	<0.5	**2.0**
Zinc, Zn	mg/L	0.005	<0.005	**0.012**	<0.005	**0.007**
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322						
Arsenic, As	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Cadmium, Cd	mg/L	0.0001	<0.0001	**0.0003**	<0.0001	<0.0001
Chromium, Cr	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001	**0.004**	**0.003**	<0.001	**0.002**
Lead, Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Selenium, Se	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304						
Silver, Ag	µg/L	0.05	<0.05	<0.05	<0.05	<0.05
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Rare Earth Metals in Solutions and Brines by ICPMS Method: IMS84V						
Uranium, U*^	µg/L	0.5	**0.9**	<0.5	<0.5	<0.5
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents	meq/L	-	**2.59**	**2.13**	-	**2.00**
Anion-Cation Balance	%	-100	**-2.8**	**-1.5**	-	**-2.7**
Sum of Anion Milliequivalents	meq/L	-	**2.74**	**2.19**	-	**2.11**

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB015475	mg/L	5	<5	0 - 2%	112%
Bicarbonate Alkalinity as CaCO3	LB015475	mg/L	5	<5		
Carbonate Alkalinity as CaCO3	LB015475	mg/L	5	<5		
Hydroxide Alkalinity as CaCO3	LB015475	mg/L	5	<5		

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride	LB015515	mg/L	1	<1	0 - 1%	102%

Conductivity and TDS by Calculation - Water Method: ME-(AU)-[ENV]AN106

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Conductivity @ 25 C	LB015477	µS/cm	2	<2	0%
Total Dissolved Solids (by calculation)	LB015477	mg/L	10	<10	0%

Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Fluoride by ISE	LB015455	mg/L	0.05	<0.05	0 - 6%	99 - 100%

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Mercury	LB015767	mg/L	0.00005	<0.00005	0%	97 - 101%

Metals (dissolved) in Water by GF AAS Method: ME-(AU)-[ENV]AN304

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Silver, Ag	LB015875	µg/L	0.05	<0.05	0%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium, Al	LB015801	mg/L	0.005	<0.005	0%	96%	97%
Calcium, Ca	LB015801	mg/L	0.05	<0.05	0%	102%	101%
Iron, Fe	LB015801	mg/L	0.005	<0.005	0%	103%	
Magnesium, Mg	LB015801	mg/L	0.05	<0.05	0%	99%	97%
Manganese, Mn	LB015801	mg/L	0.005	<0.005	1%	104%	
Molybdenum, Mo	LB015801	mg/L	0.005	<0.005	0%	101 - 102%	102%
Potassium, K	LB015801	mg/L	0.05	<0.05	0%	106 - 107%	107%
Sodium, Na	LB015801	mg/L	0.5	<0.5	0%	99 - 100%	96%
Sulphur as Sulphate, SO4	LB015801	mg/L	0.5	<0.5	0%	NA	NA
Zinc, Zn	LB015801	mg/L	0.005	<0.005	0%	104%	100%

Metals in Water (Dissolved) by ICPOES-USN Method: ME-(AU)-[ENV]AN320/AN322

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Arsenic, As	LB015810	mg/L	0.003	<0.003	0 - 32%	102 - 105%	113 - 124%
Cadmium, Cd	LB015810	mg/L	0.0001	<0.0001	0%	107 - 110%	107 - 128%
Chromium, Cr	LB015810	mg/L	0.001	<0.001	0%	100 - 102%	98 - 99%
Cobalt, Co	LB015810	mg/L	0.001	<0.001	0%	103 - 107%	92 - 97%
Copper, Cu	LB015810	mg/L	0.001	<0.001	0 - 2%	92 - 96%	97 - 105%
Lead, Pb	LB015810	mg/L	0.001	<0.001	0%	91 - 102%	90 - 96%
Nickel, Ni	LB015810	mg/L	0.001	<0.001	0%	108 - 110%	94%
Selenium, Se	LB015810	mg/L	0.003	<0.003	7%	90 - 96%	

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: ME-(AU)-[ENV]AN248

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB015486	mg/L	0.005	<0.005	0 - 2%	101 - 103%

pH in water Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH**	LB015476	pH Units	0.1	5.8	0 - 1%	99%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

TKN Kjeldahl Digestion by Discrete Analyser **Method: ME-(AU)-[ENV]AN281**

Parameter	QC Reference	Units	LOR	DUP %RPD
Total Kjeldahl Nitrogen	LB015479	mg/L	0.05	0 - 9%

Total and Volatile Suspended Solids (TSS / VSS) **Method: ME-(AU)-[ENV]AN114**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 103-105°C	LB015512	mg/L	5	<5	9 - 11%	93%

Total Phosphorus by Kjeldahl Digestion DA in Water **Method: ME-(AU)-[ENV]AN279/AN293**

Parameter	QC Reference	Units	LOR	DUP %RPD
Total Phosphorus (Kjeldahl Digestion)	LB015480	mg/L	0.02	1 - 7%

Turbidity **Method: ME-(AU)-[ENV]AN119**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Turbidity	LB015478	NTU	0.1	0.2	0 - 8%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2520 B.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN119	Turbidity by Nepholometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN121	This method is used to calculation the balance of major Anions and Cations in water samples and converts major ion concentration to milliequivalents and then summed. Anions sum and Cation sum is calculated as a difference and expressed as a percentage.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN135	Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported. APHA4500CO2 D.
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination, in the presence of a pH/complexation buffer, is used to determine the fluoride concentration. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN144	Commercially available DPD powders, which react with chlorine in solution to form a reddish pink dye. The chlorine concentration is estimated by measuring the intensity of colour produced on a colorimeter or by UV Vis spectrophotometer. The DPD powders contain diethyl-p-phenylenediamine, together with EDTA (to complex interfering metal ions) and a suitable buffer. Free and Total chlorine may be determined and combined chlorine calculated by their difference.
AN248	Nitrate / Nitrite by Auto Analyser: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Reference APHA 4500-NO3- F.
AN274	Chloride by Aquakem DA: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulphuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.
AN304	Filtered acidified sample analysed by GFAAS, referenced to APHA3113B.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN320/AN322	ICP-OES (Ultrasonic Nebuliser): After preservation with 10% nitric acid, a wide range of metals and some non-metals in solution can be measured by ICP- Ultrasonic nebulisation. Solutions are aspirated using an ultrasonic nebuliser into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN322	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

PRELIMINARY REPORT

CLIENT DETAILS		LABORATORY DETAILS	
Contact	Talia Warda	Manager	Jon Dicker
Client	ALTONA MINING LTD	Laboratory	SGS Cairns Environmental
Address	PO BOX 1466 WEST PERTH WA 6872	Address	Unit 2, 58 Comport St Portsmith QLD 4870
Telephone	61 8 94852929	Telephone	+61 07 4035 5111
Facsimile	61 8 94868700	Facsimile	+61 07 4035 5122
Email	TWarda@mbsenvironmental.com.au	Email	AU.Environmental.Cairns@sgs.com
Project	**Water samples**	SGS Reference	**CE109676 R0**
Order Number	(Not specified)	Report Number	0000017290
Samples	5	Date Reported	
		Date Received	01 May 2014

COMMENTS

This is an interim report. Final QC checks are yet to be completed.

Uranium subcontracted to SGS Sydney, Unit 16 33 Maddox St Alexandria NSW 2015, NATA Accreditation Number: 2562, Site Number: 4354, SE126533.

SIGNATORIES

Alyson Bergamo
Senior Laboratory Technician

Anthony Nilsson
Operations Manager

Jon Dicker
Manager Northern QLD

Maristela Ganzan
Metals Team Leader

Nathan Quinn
Micro Supervisor / Quality Co-ordinator

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE109676.001 Water 23 Apr 2014 Standard	CE109676.002 Water 23 Apr 2014 Dup 1	CE109676.003 Water 23 Apr 2014 Longamundi	CE109676.004 Water 23 Apr 2014 Dan Lynch
pH in water Method: AN101							
pH**	pH Units	0.1		**6.3**	**7.7**	**7.7**	**7.9**
Conductivity and TDS by Calculation - Water Method: AN106							
Conductivity @ 25 C	µS/cm	2		**8**	**260**	**260**	**260**
Total Dissolved Solids (by calculation)	mg/L	10		<10	**160**	**160**	**160**
Turbidity Method: AN119							
Turbidity	NTU	0.1		**0.3**	**73**	**62**	**29**
Alkalinity Method: AN135							
Total Alkalinity as CaCO3	mg/L	5		<5	**140**	**140**	**160**
Bicarbonate Alkalinity as CaCO3	mg/L	5		<5	**140**	**140**	**160**
Carbonate Alkalinity as CaCO3	mg/L	5		<5	<5	<5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5		<5	<5	<5	<5
Chlorine Free and Total DPD Method: AN144							
Free Chlorine by DPD Colourimetric***	mg/L	0.5		<0.5	<0.5	<0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274							
Chloride	mg/L	1		<1	**6**	**3**	**7**
Fluoride by Ion Selective Electrode in Water Method: AN141							
Fluoride by ISE	mg/L	0.05		<0.05	**0.31**	**0.30**	**0.30**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114							
Total Suspended Solids Dried at 103-105°C	mg/L	5		<5	**120**	**96**	**26**
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248							
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005		**0.007**	<0.005	**0.005**	<0.005

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name CE109676.001 Water 23 Apr 2014 Standard	CE109676.002 Water 23 Apr 2014 Dup 1	CE109676.003 Water 23 Apr 2014 Longamundi	CE109676.004 Water 23 Apr 2014 Dan Lynch
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281						
Total Kjeldahl Nitrogen	mg/L	0.05	**0.19**	**2.1**	**2.1**	**0.83**
Total Nitrogen (calc)	mg/L	0.05	**0.20**	**2.1**	**2.1**	**0.83**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.08**	**0.21**	**0.18**	**0.05**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321						
Aluminium, Al	mg/L	0.005	<0.005	**0.009**	**0.006**	**0.006**
Calcium, Ca	mg/L	0.05	**0.13**	**32**	**32**	**30**
Iron, Fe	mg/L	0.005	<0.005	**0.083**	**0.057**	**0.017**
Magnesium, Mg	mg/L	0.05	<0.05	**5.5**	**5.5**	**5.3**
Manganese, Mn	mg/L	0.005	<0.005	**0.058**	**0.026**	**0.047**
Molybdenum, Mo	mg/L	0.005	<0.005	<0.005	<0.005	<0.005
Potassium, K	mg/L	0.05	**0.13**	**5.9**	**5.9**	**6.1**
Sodium, Na	mg/L	0.5	**1.2**	**14**	**14**	**17**
Sulphur as Sulphate, SO4	mg/L	0.5	<0.5	**0.9**	**0.8**	**1.7**
Zinc, Zn	mg/L	0.005	<0.005	<0.005	<0.005	**0.005**
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322						
Arsenic, As	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Cadmium, Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium, Cr	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001	<0.001	**0.001**	**0.002**	**0.003**
Lead, Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Selenium, Se	mg/L	0.003	<0.003	<0.003	<0.003	<0.003
Metals (dissolved) in Water by GF AAS Method: AN304						
Silver, Ag	µg/L	0.05	**0.05**	<0.05	<0.05	<0.05
Mercury (dissolved) in Water Method: AN311/AN312						
Mercury	mg/L	0.00005	**0.00006**	<0.00005	**0.00036**	<0.00005
Rare Earth Metals in Solutions and Brines by ICPMS Method: IMS84V						
Uranium, U*^	µg/L	0.5	NVL	NVL	NVL	NVL
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121						
Sum of Cation Milliequivalents*	meq/L	-	**0.064**	**2.83**	**2.84**	**2.84**
Anion-Cation Balance	%	-100	**-2.8**	**-2.5**	**-1.4**	**-8.1**
Sum of Anion Milliequivalents*	meq/L	-	**0.067**	**2.98**	**2.91**	**3.34**

Parameter	Units	LOR	Sample Number: CE109676.005 Sample Matrix: Water Sample Date: 23 Apr 2014 Sample Name: Railway
pH in water Method: AN101			
pH**	pH Units	0.1	**7.9**
Conductivity and TDS by Calculation - Water Method: AN106			
Conductivity @ 25 C	µS/cm	2	**260**
Total Dissolved Solids (by calculation)	mg/L	10	**160**
Turbidity Method: AN119			
Turbidity	NTU	0.1	**28**
Alkalinity Method: AN135			
Total Alkalinity as CaCO3	mg/L	5	**160**
Bicarbonate Alkalinity as CaCO3	mg/L	5	**160**
Carbonate Alkalinity as CaCO3	mg/L	5	<5
Hydroxide Alkalinity as CaCO3	mg/L	5	<5
Chlorine Free and Total DPD Method: AN144			
Free Chlorine by DPD Colourimetric***	mg/L	0.5	<0.5
Chloride by Discrete Analyser in Water Method: AN274			
Chloride	mg/L	1	**7**
Fluoride by Ion Selective Electrode in Water Method: AN141			
Fluoride by ISE	mg/L	0.05	**0.30**
Total and Volatile Suspended Solids (TSS / VSS) Method: AN114			
Total Suspended Solids Dried at 103-105°C	mg/L	5	**8**

Parameter	Units	LOR	Sample Number: CE109676.005 Sample Matrix: Water Sample Date: 23 Apr 2014 Sample Name: Railway
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248			
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**0.006**
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281			
Total Kjeldahl Nitrogen	mg/L	0.05	**0.83**
Total Nitrogen (calc)	mg/L	0.05	**0.84**
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293			
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	**0.06**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321			
Aluminium, Al	mg/L	0.005	**0.006**
Calcium, Ca	mg/L	0.05	**30**
Iron, Fe	mg/L	0.005	**0.015**
Magnesium, Mg	mg/L	0.05	**5.3**
Manganese, Mn	mg/L	0.005	**0.046**
Molybdenum, Mo	mg/L	0.005	<0.005
Potassium, K	mg/L	0.05	**6.1**
Sodium, Na	mg/L	0.5	**17**
Sulphur as Sulphate, SO4	mg/L	0.5	**1.7**
Zinc, Zn	mg/L	0.005	<0.005
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322			
Arsenic, As	mg/L	0.003	<0.003
Cadmium, Cd	mg/L	0.0001	<0.0001
Chromium, Cr	mg/L	0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001
Copper, Cu	mg/L	0.001	**0.002**
Lead, Pb	mg/L	0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001
Selenium, Se	mg/L	0.003	<0.003

Parameter	Units	LOR	Sample Number: CE109676.005 Sample Matrix: Water Sample Date: 23 Apr 2014 Sample Name: Railway
Metals (dissolved) in Water by GF AAS Method: AN304			
Silver, Ag	µg/L	0.05	<0.05
Mercury (dissolved) in Water Method: AN311/AN312			
Mercury	mg/L	0.00005	<0.00005
Rare Earth Metals in Solutions and Brines by ICPMS Method: IMS84V			
Uranium, U*^	µg/L	0.5	NVL
Calculation of Anion-Cation Balance (SAR Calc) Method: AN121			
Sum of Cation Milliequivalents*	meq/L	-	**2.83**
Anion-Cation Balance	%	-100	**-8.5**
Sum of Anion Milliequivalents*	meq/L	-	**3.36**

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Alkalinity Method: ME-(AU)-[ENV]AN135

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Alkalinity as CaCO3	LB016404	mg/L	5	<5	0%	110%
Bicarbonate Alkalinity as CaCO3	LB016404	mg/L	5	<5		
Carbonate Alkalinity as CaCO3	LB016404	mg/L	5	<5		
Hydroxide Alkalinity as CaCO3	LB016404	mg/L	5	<5		

Chloride by Discrete Analyser in Water Method: ME-(AU)-[ENV]AN274

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride	LB016608	mg/L	1	<1	0 - 12%	101 - 102%

Conductivity and TDS by Calculation - Water Method: ME-(AU)-[ENV]AN106

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Conductivity @ 25 C	LB016405	µS/cm	2	<2	0 - 1%
Total Dissolved Solids (by calculation)	LB016405	mg/L	10	<10	0 - 1%

Fluoride by Ion Selective Electrode in Water Method: ME-(AU)-[ENV]AN141

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Fluoride by ISE	LB016468	mg/L	0.05	<0.05	0 - 7%	90 - 96%

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Mercury	LB016743	mg/L	0.00005	<0.00005	0%	95 - 103%

Metals (dissolved) in Water by GF AAS Method: ME-(AU)-[ENV]AN304

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Silver, Ag	LB016915	µg/L	0.05	<0.05	0%	98%

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Aluminium, Al	LB016836	mg/L	0.005	<0.005	0%	96%	121%
Calcium, Ca	LB016836	mg/L	0.05	<0.05	0%	104%	
Iron, Fe	LB016836	mg/L	0.005	<0.005	0%	104%	
Magnesium, Mg	LB016836	mg/L	0.05	<0.05	0%	99%	128%
Manganese, Mn	LB016836	mg/L	0.005	<0.005	0%	106%	
Molybdenum, Mo	LB016836	mg/L	0.005	<0.005	0%	102%	
Potassium, K	LB016836	mg/L	0.05	<0.05	0%	110%	
Sodium, Na	LB016836	mg/L	0.5	<0.5	0%	101%	127%
Sulphur as Sulphate, SO4	LB016836	mg/L	0.5	<0.5	0 - 1%	NA	NA
Zinc, Zn	LB016836	mg/L	0.005	<0.005	0%	108%	

Metals in Water (Dissolved) by ICPOES-USN Method: ME-(AU)-[ENV]AN320/AN322

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Arsenic, As	LB016841	mg/L	0.003	<0.003	0 - 8%	92%	119%
Cadmium, Cd	LB016841	mg/L	0.0001	<0.0001	0%	101%	104%
Chromium, Cr	LB016841	mg/L	0.001	<0.001	0%	92%	
Cobalt, Co	LB016841	mg/L	0.001	<0.001	0 - 4%	97%	
Copper, Cu	LB016841	mg/L	0.001	<0.001	3 - 6%	98%	106%
Lead, Pb	LB016841	mg/L	0.001	<0.001	0%	98%	97%
Nickel, Ni	LB016841	mg/L	0.001	<0.001	0%	97%	
Selenium, Se	LB016841	mg/L	0.003	<0.003	0 - 46%	86%	

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: ME-(AU)-[ENV]AN248

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB016487	mg/L	0.005	<0.005	0 - 40%	NA

pH in water Method: ME-(AU)-[ENV]AN101

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
pH**	LB016406	pH Units	0.1	5.7 - 5.8	0 - 1%	99 - 100%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula: *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

TKN Kjeldahl Digestion by Discrete Analyser **Method: ME-(AU)-[ENV]AN281**

Parameter	QC Reference	Units	LOR	DUP %RPD
Total Kjeldahl Nitrogen	LB016518	mg/L	0.05	1 - 3%

Total and Volatile Suspended Solids (TSS / VSS) **Method: ME-(AU)-[ENV]AN114**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Suspended Solids Dried at 103-105°C	LB016462	mg/L	5	<5	9 - 16%	98%

Total Phosphorus by Kjeldahl Digestion DA in Water **Method: ME-(AU)-[ENV]AN279/AN293**

Parameter	QC Reference	Units	LOR	DUP %RPD
Total Phosphorus (Kjeldahl Digestion)	LB016485	mg/L	0.02	0 - 1%

Turbidity **Method: ME-(AU)-[ENV]AN119**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Turbidity	LB016407	NTU	0.1	0.2	0 - 16%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2520 B.
AN114	Total Suspended and Volatile Suspended Solids: The sample is homogenised by shaking and a known volume is filtered through a pre-weighed GF/C filter paper and washed well with deionised water. The filter paper is dried and reweighed. The TSS is the residue retained by the filter per unit volume of sample. Reference APHA 2540 D. Internal Reference AN114
AN119	Turbidity by Nepholometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN121	This method is used to calculation the balance of major Anions and Cations in water samples and converts major ion concentration to milliequivalents and then summed. Anions sum and Cation sum is calculated as a difference and expressed as a percentage.
AN135	Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
AN135	Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported. APHA4500CO2 D.
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination, in the presence of a pH/complexation buffer, is used to determine the fluoride concentration. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN144	Commercially available DPD powders, which react with chlorine in solution to form a reddish pink dye. The chlorine concentration is estimated by measuring the intensity of colour produced on a colorimeter or by UV Vis spectrophotometer. The DPD powders contain diethyl-p-phenylenediamine, together with EDTA (to complex interfering metal ions) and a suitable buffer. Free and Total chlorine may be determined and combined chlorine calculated by their difference.
AN248	Nitrate / Nitrite by Auto Analyser: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Reference APHA 4500-NO3- F.
AN274	Chloride by Aquakem DA: Chloride reacts with mercuric thiocyanate forming a mercuric chloride complex. In the presence of ferric iron, highly coloured ferric thiocyanate is formed which is proportional to the chloride concentration. Reference APHA 4500Cl-
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulphuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.
AN304	Filtered acidified sample analysed by GFAAS, referenced to APHA3113B.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN320/AN322	ICP-OES (Ultrasonic Nebuliser): After preservation with 10% nitric acid, a wide range of metals and some non-metals in solution can be measured by ICP- Ultrasonic nebulisation. Solutions are aspirated using an ultrasonic nebuliser into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN322	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
		QFL	QC result is below the lower tolerance
**	Indicative data, theoretical holding time exceeded.	-	The sample was not analysed for this analyte
^	Performed by outside laboratory.	NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here:
http://www.sgs.com.au.pv.sgsv3/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf

APPENDIX 5: INTERIM (LOW RELIABILITY) SURFACE WATER TRIGGER VALUES FOR SCANLAN

Table A5-1: Interim (Low Reliability) Surface Water Trigger Values for Scanlan

Parameter	Units	LOR	Site Specific Data					EA Limits	
			N	Minimum	Maximum	20th percentile	80th percentile	TV	Contaminant
pH	pH units	0.1	28	6.2	9.1	7.2	8.0	6.0 to 7.5	5.5 to 8.5
EC	µS/cm	5	28	4	510	110	398	435	1000
TDS	mg/L	10	28	<10	300	66	236	Site specific	Ref. + 10%
Sulfate	mg/L	0.5	28	0.8	15	1.7	8.0	Site specific	1000
Fluoride	mg/L	0.05	28	<0.5	0.68	0.16	0.40	Site specific	2
Aluminium	mg/L	0.005	28	<0.005	0.47	0.006	0.136	0.055	5
Arsenic	mg/L	0.003	28	<0.003	<0.003	<0.003	<0.003	0.013	0.5
Cadmium	mg/L	0.0001	28	<0.0001	0.0003	<0.0001	<0.0001	0.0002	0.01
Chromium	mg/L	0.001	28	<0.001	<0.001	<0.001	<0.001	0.001 (as hexavalent Cr)	1
Cobalt	mg/L	0.001	28	<0.001	0.003	<0.001	<0.001	Site specific	1
Copper	mg/L	0.001	28	<0.001	0.030	0.002	0.004	0.0014	1
Lead	mg/L	0.001	28	<0.001	<0.001	<0.001	<0.001	0.0034	0.1
Manganese	mg/L	0.005	28	<0.005	0.38	<0.005	0.079	1.9	Ref. + 10%
Molybdenum	mg/L	0.005	28	<0.005	<0.01	<0.005	<0.005	0.034	0.15
Mercury	mg/L	0.0001	28	<0.0001	0.00036	<0.0001	<0.0001	0.0006	0.002
Nickel	mg/L	0.001	28	<0.001	0.002	<0.001	0.001	0.011	1
Selenium	mg/L	0.003	28	<0.003	0.005	<0.003	<0.003	0.011	0.02
Silver	mg/L	0.00005	28	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	Ref. + 10%
Uranium	mg/L	0.001	25	<0.0005	0.004	<0.0005	0.0014	Site specific	0.2
Zinc	mg/L	0.005	28	<0.005	0.018	<0.005	0.0096	0.008	20
Total N	mg/L	0.05	26	<0.05	4.4	0.62	1.7	0.15	
Total P	mg/L	0.05	26	<0.01	0.72	0.05	0.13	0.01	
Faecal coliforms	cfu/100 mL	-	13	9	>2400	24	1180	Site specific	Ref. + 10%
Chlorine	mg/L	0.5	13	<0.5	<0.5	<0.5	<0.5	3	

APPENDIX 6: INTERIM (LOW RELIABILITY) SEDIMENT VALUES FOR LITTLE EVA

Table A6-1: Interim (Low Reliability) Sediment Values for Little Eva

Parameter	Units	No	Minimum	Maximum	80th Percentile	Default EA Limit
Arsenic	mg/kg	18	1.7	4	3.0	20
Cadmium	mg/kg	18	<0.1	<0.3	<0.3	1.5
Chromium	mg/kg	18	9.6	34	29	80
Cobalt	mg/kg	18	4.2	26	12	-
Copper	mg/kg	18	9.9	130	94	65
Fluoride	mg/kg	11	<0.5	1.1	1.0	-
Lead	mg/kg	18	2.6	6.0	4.8	50
Manganese	mg/kg	18	170	900	772	-
Mercury	mg/kg	18	<0.01	<0.01	<0.01	0.15
Nickel	mg/kg	18	5.1	25	13	21
Selenium	mg/kg	18	<1	<3	<3	-
Silver	mg/kg	18	<0.2	<1	<1	1
Sulfate	mg/kg	18	<10	95	<50	-
Uranium	mg/kg	13	<0.5	1.0	<0.5	-
Zinc	mg/kg	18	2	25	11	200

APPENDIX 7: INTERIM (LOW RELIABILITY) SEDIMENT VALUES FOR BLACKARD

Table A7-1: Interim (Low Reliability) Sediment Values for Blackard

Parameter	Units	N	Minimum	Maximum	80th Percentile	Default EA Limit
Arsenic	mg/kg	5	2	23	Insufficient data	20
Cadmium	mg/kg	5	<0.1	<0.3	Insufficient data	1.5
Chromium	mg/kg	5	8.2	16	Insufficient data	80
Cobalt	mg/kg	5	7.3	13	Insufficient data	-
Copper	mg/kg	5	8.1	74	Insufficient data	65
Fluoride	mg/kg	4	0.7	1.5	Insufficient data	-
Lead	mg/kg	5	2	8	Insufficient data	50
Manganese	mg/kg	5	470	740	Insufficient data	-
Mercury	mg/kg	5	<0.01	<0.01	Insufficient data	0.15
Nickel	mg/kg	5	6.5	16	Insufficient data	21
Selenium	mg/kg	5	<1	<3	Insufficient data	-
Silver	mg/kg	5	<0.2	<1	Insufficient data	1
Sulfate	mg/kg	5	<10	37	Insufficient data	-
Uranium	mg/kg	4	<0.5	0.5	Insufficient data	-
Zinc	mg/kg	5	<2	25	Insufficient data	200

APPENDIX 8: INTERIM (LOW RELIABILITY) SEDIMENT VALUES FOR SCANLAN

Table A8-1: Interim (Low Reliability) Sediment Values for Scanlan

Parameter	Units	N	Minimum	Maximum	80th Percentile	Default EA Limit
Arsenic	mg/kg	29	<1	43	4.2	20
Cadmium	mg/kg	29	<0.1	0.7	<0.3	1.5
Chromium	mg/kg	29	7.3	38	17	80
Cobalt	mg/kg	29	4.6	33	12	-
Copper	mg/kg	29	15	130	51	65
Fluoride	mg/kg	23	<0.5	2.7	1.5	-
Lead	mg/kg	29	0.9	51	9	50
Manganese	mg/kg	29	170	4,800	872	-
Mercury	mg/kg	29	<0.01	<0.01	<0.01	0.15
Nickel	mg/kg	29	5.1	36	11	21
Selenium	mg/kg	29	<1	<3	<3	-
Silver	mg/kg	29	<0.2	0.4	<1	1
Sulfate	mg/kg	29	<10	210	60	-
Uranium	mg/kg	22	<0.5	2.4	0.9	-
Zinc	mg/kg	29	<2	180	17	200