



Environmental

CERTIFICATE OF ANALYSIS

| | | | |
|--------------|--|-------------------------|---|
| Work Order | : EW1400614 | Page | : 1 of 7 |
| Client | : WOLLONGONG CITY COUNCIL | Laboratory | : Environmental Division NSW South Coast |
| Contact | : MR WAYDE PETERSON | Contact | : Glenn Davies |
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| Project | : Whytes Gully Stage 3 Bores & Surface Water Quarterly | QC Level | : NEPM 2013 Schedule B(3) and ALS QCS3 requirement |
| Order number | : 3015425 | Date Samples Received | : 27-FEB-2014 |
| C-O-C number | : ---- | Issue Date | : 07-MAR-2014 |
| Sampler | : Craig Wilson | No. of samples received | : 23 |
| Site | : ---- | No. of samples analysed | : 23 |
| Quote number | : WL/090/11 Stage 3 | | |

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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Environmental 

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General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **Ionic Balance out of acceptable limits for samples various due to analytes not quantified in this report.**
- **Sites GMW102 & Leachate - Dry at time of sampling.**
Site GABH01 - Found destroyed at time of sampling.



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

| Signatories | Position | Accreditation Category |
|------------------|------------------------|-------------------------|
| Aneta Prosaroski | Client Liaison Officer | Laboratory - Wollongong |
| Ankit Joshi | Inorganic Chemist | Sydney Inorganics |
| Ashesh Patel | Inorganic Chemist | Sydney Inorganics |
| Raymond Commodor | Instrument Chemist | Sydney Inorganics |
| Shobhna Chandra | Metals Coordinator | Sydney Inorganics |



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

| | | | | GMW102 | GMW103 | GMW104 | GMW105 | GMW108S |
|--|-------------|------|---------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | | | 27-FEB-2014 10:35 | 27-FEB-2014 10:50 | 27-FEB-2014 10:30 | 27-FEB-2014 11:05 | 27-FEB-2014 11:50 |
| Compound | CAS Number | LOR | Unit | EW1400614-001 | EW1400614-002 | EW1400614-003 | EW1400614-004 | EW1400614-005 |
| EA015: Total Dissolved Solids | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | ---- | 1580 | 659 | 186 | 650 |
| ED037P: Alkalinity by PC Titrator | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | ---- | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | ---- | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | ---- | 347 | 410 | 46 | 345 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | ---- | 347 | 410 | 46 | 345 |
| ED041G: Sulfate (Turbidimetric) as SO4 2- by DA | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | ---- | 138 | 56 | 13 | 40 |
| ED045G: Chloride Discrete analyser | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | ---- | 491 | 90 | 32 | 123 |
| ED093F: Dissolved Major Cations | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | ---- | 203 | 60 | 6 | 19 |
| Magnesium | 7439-95-4 | 1 | mg/L | ---- | 70 | 34 | 3 | 13 |
| Sodium | 7440-23-5 | 1 | mg/L | ---- | 159 | 137 | 41 | 198 |
| Potassium | 7440-09-7 | 1 | mg/L | ---- | <1 | <1 | <1 | 2 |
| EK055G: Ammonia as N by Discrete Analyser | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | ---- | 0.02 | 0.05 | 0.01 | 0.04 |
| EN055: Ionic Balance | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | ---- | 23.7 | 11.9 | 2.09 | 11.2 |
| Total Cations | ---- | 0.01 | meq/L | ---- | 22.8 | 11.8 | 2.33 | 10.7 |
| Ionic Balance | ---- | 0.01 | % | ---- | 1.81 | 0.64 | ---- | 2.39 |
| EN67 PK: Field Tests | | | | | | | | |
| pH | ---- | 0.1 | pH Unit | ---- | 6.8 | 7.2 | 6.0 | 6.9 |
| Electrical Conductivity (Non Compensated) | ---- | 1 | µS/cm | ---- | 2390 | 1240 | 5970 | 1030 |
| Depth | ---- | 0.01 | m | ---- | 7.78 | 7.54 | 11.06 | 2.70 |
| Field Observations | ---- | 0.01 | -- | DRY | ---- | ---- | ---- | ---- |
| EP005: Total Organic Carbon (TOC) | | | | | | | | |
| Total Organic Carbon | ---- | 1 | mg/L | ---- | 1 | 2 | 1 | 9 |



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

| | | | | GMW108D | GMW109S | GMW109D | GMW110 | GMW111 |
|--|-------------|------|---------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | | | 27-FEB-2014 11:55 | 27-FEB-2014 09:10 | 27-FEB-2014 09:15 | 27-FEB-2014 09:30 | 27-FEB-2014 09:20 |
| Compound | CAS Number | LOR | Unit | EW1400614-006 | EW1400614-007 | EW1400614-008 | EW1400614-009 | EW1400614-010 |
| EA015: Total Dissolved Solids | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | 1730 | 880 | 959 | 2390 | 1320 |
| ED037P: Alkalinity by PC Titrator | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 455 | 412 | 224 | 564 | 441 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 455 | 412 | 224 | 564 | 441 |
| ED041G: Sulfate (Turbidimetric) as SO4 2- by DA | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 196 | 82 | 25 | 288 | 113 |
| ED045G: Chloride Discrete analyser | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 613 | 225 | 363 | 787 | 473 |
| ED093F: Dissolved Major Cations | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | 141 | 133 | 90 | 214 | 104 |
| Magnesium | 7439-95-4 | 1 | mg/L | 98 | 42 | 47 | 160 | 79 |
| Sodium | 7440-23-5 | 1 | mg/L | 433 | 165 | 185 | 442 | 340 |
| Potassium | 7440-09-7 | 1 | mg/L | <1 | 7 | 2 | 2 | 1 |
| EK055G: Ammonia as N by Discrete Analyser | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | 0.01 | 3.27 | 0.02 | 0.03 | 0.04 |
| EN055: Ionic Balance | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | 30.5 | 16.3 | 15.2 | 39.5 | 24.5 |
| Total Cations | ---- | 0.01 | meq/L | 33.9 | 17.4 | 16.5 | 43.1 | 26.5 |
| Ionic Balance | ---- | 0.01 | % | 5.38 | 3.45 | 3.86 | 4.43 | 3.91 |
| EN67 PK: Field Tests | | | | | | | | |
| pH | ---- | 0.1 | pH Unit | 6.8 | 6.4 | 7.2 | 6.7 | 7.0 |
| Electrical Conductivity (Non Compensated) | ---- | 1 | µS/cm | 3140 | 1590 | 1600 | 3870 | 2410 |
| Depth | ---- | 0.01 | m | 2.21 | 3.47 | 3.10 | 4.16 | 6.37 |
| EP005: Total Organic Carbon (TOC) | | | | | | | | |
| Total Organic Carbon | ---- | 1 | mg/L | 2 | 14 | <1 | 2 | 1 |



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

| | | | | GABH01 | GABH02 | GABH03 | GABH06S | GABH06D |
|--|-------------|------|---------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | | | 27-FEB-2014 10:45 | 27-FEB-2014 10:20 | 27-FEB-2014 10:10 | 27-FEB-2014 11:35 | 27-FEB-2014 11:25 |
| Compound | CAS Number | LOR | Unit | EW1400614-011 | EW1400614-012 | EW1400614-013 | EW1400614-014 | EW1400614-015 |
| EA015: Total Dissolved Solids | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | ---- | 3100 | 3430 | 1750 | 1600 |
| ED037P: Alkalinity by PC Titrator | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | ---- | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | ---- | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | ---- | 984 | 673 | 404 | 324 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | ---- | 984 | 673 | 404 | 324 |
| ED041G: Sulfate (Turbidimetric) as SO4 2- by DA | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | ---- | 166 | 198 | 217 | 201 |
| ED045G: Chloride Discrete analyser | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | ---- | 1060 | 1160 | 611 | 631 |
| ED093F: Dissolved Major Cations | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | ---- | 346 | 380 | 97 | 125 |
| Magnesium | 7439-95-4 | 1 | mg/L | ---- | 209 | 219 | 87 | 76 |
| Sodium | 7440-23-5 | 1 | mg/L | ---- | 601 | 483 | 480 | 440 |
| Potassium | 7440-09-7 | 1 | mg/L | ---- | 3 | 2 | <1 | 1 |
| EK055G: Ammonia as N by Discrete Analyser | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | ---- | 0.02 | 0.04 | 0.02 | 0.01 |
| EN055: Ionic Balance | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | ---- | 53.0 | 50.3 | 29.8 | 28.5 |
| Total Cations | ---- | 0.01 | meq/L | ---- | 60.7 | 58.0 | 32.9 | 31.7 |
| Ionic Balance | ---- | 0.01 | % | ---- | 6.74 | 7.17 | 4.85 | 5.31 |
| EN67 PK: Field Tests | | | | | | | | |
| pH | ---- | 0.1 | pH Unit | ---- | 6.6 | 6.5 | 7.0 | 6.8 |
| Electrical Conductivity (Non Compensated) | ---- | 1 | µS/cm | ---- | 5060 | 4920 | 3080 | 3000 |
| Depth | ---- | 0.01 | m | ---- | 5.01 | 0.60 | 2.40 | 1.92 |
| Field Observations | ---- | 0.01 | -- | DESTROYED | ---- | ---- | ---- | ---- |
| EP005: Total Organic Carbon (TOC) | | | | | | | | |
| Total Organic Carbon | ---- | 1 | mg/L | ---- | 6 | 4 | 1 | 1 |



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

| | | | | BH6 | Surface Water 1 | Surface Water 2 | Surface Water 3 | Surface Water 4 |
|--|-------------|------|---------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | | | 27-FEB-2014 09:40 | 27-FEB-2014 09:05 | 27-FEB-2014 08:45 | 27-FEB-2014 08:55 | 27-FEB-2014 08:25 |
| Compound | CAS Number | LOR | Unit | EW1400614-016 | EW1400614-017 | EW1400614-018 | EW1400614-019 | EW1400614-020 |
| EA015: Total Dissolved Solids | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | 2650 | 602 | 333 | 254 | 347 |
| EA025: Suspended Solids | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | ---- | 105 | 13 | 6 | 20 |
| ED037P: Alkalinity by PC Titrator | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 718 | 234 | 184 | 174 | 207 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 718 | 234 | 184 | 174 | 207 |
| ED041G: Sulfate (Turbidimetric) as SO4 2- by DA | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 288 | 29 | 14 | 13 | <1 |
| ED045G: Chloride Discrete analyser | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 954 | 184 | 74 | 50 | 74 |
| ED093F: Dissolved Major Cations | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | 134 | 62 | 39 | 46 | 47 |
| Magnesium | 7439-95-4 | 1 | mg/L | 137 | 33 | 19 | 23 | 25 |
| Sodium | 7440-23-5 | 1 | mg/L | 783 | 123 | 78 | 47 | 66 |
| Potassium | 7440-09-7 | 1 | mg/L | <1 | 8 | 8 | 5 | 6 |
| EK055G: Ammonia as N by Discrete Analyser | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | 0.08 | 0.29 | 0.08 | 0.02 | <0.01 |
| EN055: Ionic Balance | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | 47.2 | 10.5 | 6.06 | 5.16 | 6.22 |
| Total Cations | ---- | 0.01 | meq/L | 52.0 | 11.4 | 7.11 | 6.36 | 7.43 |
| Ionic Balance | ---- | 0.01 | % | 4.78 | 4.09 | 7.98 | 10.4 | 8.81 |
| EN67 PK: Field Tests | | | | | | | | |
| pH | ---- | 0.1 | pH Unit | 6.7 | 7.1 | 7.4 | 7.4 | 7.0 |
| Electrical Conductivity (Non Compensated) | ---- | 1 | µS/cm | 4720 | 1080 | 630 | 529 | 644 |
| Depth | ---- | 0.01 | m | 1.47 | ---- | ---- | ---- | ---- |
| EP005: Total Organic Carbon (TOC) | | | | | | | | |
| Total Organic Carbon | ---- | 1 | mg/L | 2 | 10 | 13 | 5 | 13 |



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

| | | | | Surface Water 5 | Surface Water 6 | Leachate | ---- | ---- |
|--|-------------|------|---------|-------------------|-------------------|-------------------|------|------|
| | | | | 27-FEB-2014 08:35 | 27-FEB-2014 09:25 | 27-FEB-2014 11:45 | ---- | ---- |
| | | | | EW1400614-021 | EW1400614-022 | EW1400614-023 | ---- | ---- |
| Compound | CAS Number | LOR | Unit | | | | | |
| EA015: Total Dissolved Solids | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | 321 | 317 | ---- | ---- | ---- |
| EA025: Suspended Solids | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | 14 | <5 | ---- | ---- | ---- |
| ED037P: Alkalinity by PC Titrator | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | ---- | ---- | ---- |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | ---- | ---- | ---- |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 207 | 174 | ---- | ---- | ---- |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 207 | 174 | ---- | ---- | ---- |
| ED041G: Sulfate (Turbidimetric) as SO4 2- by DA | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | <1 | 30 | ---- | ---- | ---- |
| ED045G: Chloride Discrete analyser | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 68 | 53 | ---- | ---- | ---- |
| ED093F: Dissolved Major Cations | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | 48 | 54 | ---- | ---- | ---- |
| Magnesium | 7439-95-4 | 1 | mg/L | 25 | 26 | ---- | ---- | ---- |
| Sodium | 7440-23-5 | 1 | mg/L | 63 | 52 | ---- | ---- | ---- |
| Potassium | 7440-09-7 | 1 | mg/L | 6 | 4 | ---- | ---- | ---- |
| EK055G: Ammonia as N by Discrete Analyser | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | 0.02 | 0.04 | ---- | ---- | ---- |
| EN055: Ionic Balance | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | 6.05 | 5.60 | ---- | ---- | ---- |
| Total Cations | ---- | 0.01 | meq/L | 7.35 | 7.20 | ---- | ---- | ---- |
| Ionic Balance | ---- | 0.01 | % | 9.64 | 12.5 | ---- | ---- | ---- |
| EN67 PK: Field Tests | | | | | | | | |
| pH | ---- | 0.1 | pH Unit | 6.9 | 7.6 | ---- | ---- | ---- |
| Electrical Conductivity (Non Compensated) | ---- | 1 | µS/cm | 661 | 580 | ---- | ---- | ---- |
| Field Observations | ---- | 0.01 | -- | ---- | ---- | DRY | ---- | ---- |
| EP005: Total Organic Carbon (TOC) | | | | | | | | |
| Total Organic Carbon | ---- | 1 | mg/L | 9 | 3 | ---- | ---- | ---- |