Carbon Based Environmental
Pty Limited
ABN 74 102 920 285

# Rocla Quarry Products
## Calga Quarry

## Environmental Monitoring

## Dust Deposition Gauges, Surface and Ground Waters and Meteorological Station

## March 2013

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9 May 2013

# Executive Summary

Carbon Based Environmental is contracted by Rocla Quarry Products to conduct environmental monitoring at the Calga Sand Quarry.

The monitoring includes;

- Dust Deposition Gauges;
- Surface Waters;
- Groundwaters; and
- Meteorological Station.

This report was prepared by Carbon Based Environmental and includes the following;

- Dust Deposition results for March 2013;
- Surface Water quality results for March 2013;
- Groundwater depth and quality results for March 2013; and
- Meteorological report for March 2013.

The March 2013 dust deposition results for insoluble solids were generally similar when compared to those of February 2013. All sites, on a rolling annual average basis, are currently below the Air Quality Management Plan exceedance level of 3.7g/$m^2$.month. Results were found to be representative of dust levels as determined by the Australian Standard.

Surface water samples were collected for the normal monthly sampling event on the 3 April 2013 at sites A, B, D and F. Site C was inaccessible and unable to be sampled. At the time of sample collection, there was no water discharge observed from the site. Results show generally good water quality with all sites sampled maintaining steady pH within the slightly acidic range, and low Electrical Conductivity, Total Dissolved Solids and Total Suspended Solids. Oil and Grease was not detected at any site.

Groundwaters were sampled for normal monthly monitoring on 3 April 2013. Groundwater depth generally increased across the sampled groundwater bores when compared to last month. Groundwater pH and EC levels generally decreased across the bores this month.

The meteorological station data recovery for the month was approximately 100%. Recorded rainfall on site for March was 150.00 mm, which was similar to the Peats Ridge long-term average for March. A comparison is shown below:

| | |
|---|---|
| Rocla Calga Quarry | 150.00 mm |
| BOM Peats Ridge* | Not Available |
| BOM Gosford* | 193.8 mm |
| BOM Peats Ridge Long term mean for March* | 140.3 mm |

*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au).

**Note**: Differences in the daily rainfall readings between BOM and the Rocla station may occur due to BOM stations reporting rainfall at 9am and the Rocla station recording rainfall at midnight.

# 1.0 Sampling Program

Rocla Calga Quarry conducts environmental monitoring in accordance to Development Consent, OEH (EPA) licence and Environmental Management Plans. Carbon Based Environmental are contracted to undertake dust deposition gauge, surface and groundwater and meteorological monitoring for the project. Carbon Based Environmental commenced monitoring from the April 2006 monitoring period.

Dust deposition gauges are operated to the Australian Standard AS3580.10.1 "Methods for Sampling and Analysis of Ambient Air Method 10.1 Determination of Particulates—Deposited Matter—Gravimetric Method". Sampling is undertaken every 30 +/- 2 days and each gauge is analysed for insoluble solids and ash residue. The results are reported as $g/m^2$.month.

Surface waters are sampled in accordance with Australian Standards AS5667.1 "Guidance on the Design of Sample Programs, Sampling Techniques and the Preservation and Handling of Samples", AS5667.6 "Water Quality Sampling—Guidance on sampling of rivers and streams" and AS5667.4 "Water Quality Sampling—Guidance on sampling from lakes, natural and man-made". Surface water monitoring sites include local streams and dams. Basic analysis including pH, Electrical Conductivity, Total Suspended Solids, Total Dissolved Solids and Total Oil and Grease is conducted monthly at Sites A and F (dams) and when Sites B, C and D are flowing. Additional samples are collected when daily rainfall exceeds 50mm.

Groundwaters are sampled in accordance with Australian Standards AS5667.1 "Guidance on the Design of Sample Programs, Sampling Techniques and the Preservation and Handling of Samples" and AS5667.11 "Water Quality Sampling—Guidance on sampling of ground waters". Groundwater monitoring sites are sampled at least bi-monthly for water quality and at least quarterly for water level. Groundwater monitoring loggers continuously record water levels in a selection of bores.

Meteorological monitoring is conducted at the quarry and displayed on the site computer with a real time display. Wind parameters are measured according to Australian Standard AS 2923 "Ambient Air— Guide for Measurement of Horizontal Wind for Air Quality Applications".

The weather stations have the following sensor configuration;
Air temperature

- Humidity
- Rainfall
- Atmospheric pressure
- Evaporation
- Solar radiation
- Wind speed
- Wind direction

Carbon Based Environmental continued to operate the monitoring equipment and utilise site collections at their existing locations.

The locations of monitoring points are provided in **Figure 1**.


**Figure 1:** Rocla Calga Quarry environmental monitoring locations

# 2.0 Monthly Results

## 2.1 Dust Deposition Gauges

**Table 1** displays the results for March 2013 and the project 12 month rolling average. Results are in g/m$^2$.month.

**Table 1: Dust Deposition results: 4 March 2013 – 3 April 2013 (30 days)**

| Site | Monthly Insoluble Solids g/m$^2$.month | Monthly Ash Residue g/m$^2$.month | Monthly Combustible Matter g/m$^2$.month | Monthly Ash Residue/ Insoluble Solids % | Rolling Annual Average Insoluble Solids g/m$^2$.month |
|---|---|---|---|---|---|
| **CD1** | 0.6 | 0.5 | 0.1 | 83 | 1.4 |
| **CD2c** | 0.3 | 0.2 | 0.1 | 67 | 1.0 |
| **CD3** | 1.0 | 0.7 | 0.3 | 70 | 1.4 |
| **CD4** | 0.3 | 0.1 | 0.2 | 33 | 0.5 |
| **CD5** | 0.5 | 0.2 | 0.3 | 40 | 0.4 |
| **CD6** | 0.6 | 0.3 | 0.3 | 50 | 0.5 |

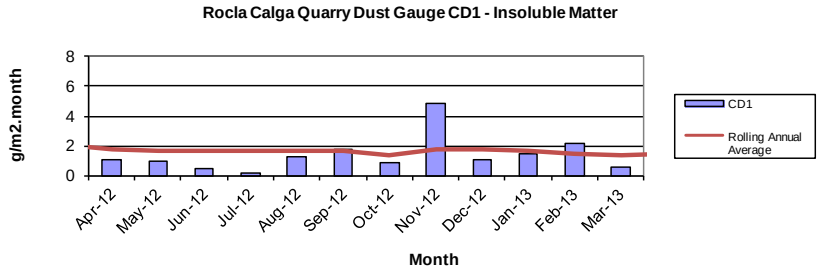
Insoluble Solids marked with an * indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen and seeds) and insects. Results in bold indicate insoluble solids levels above 3.7 g/m$^2$.month; the Development Consent's annual average amenity criteria at residential locations. The current rolling annual average is calculated from April 2012 to March 2013.

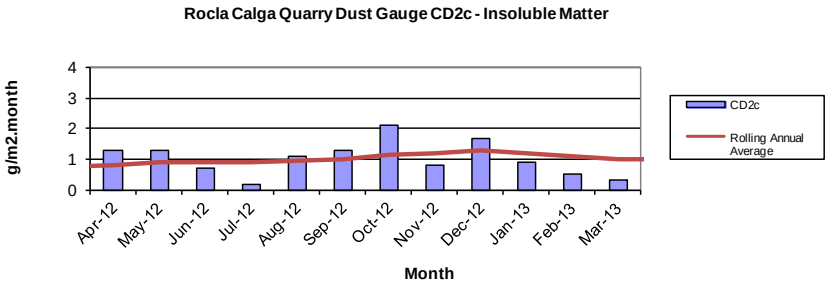
NA= Not Available.

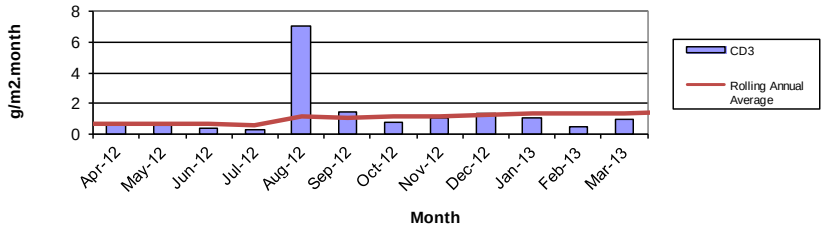
CD1 was installed on the 1 May 2006. CD2a was discontinued at the start of August 2006 due to quarry operations "mining out" the site of the gauge. The replacement gauge, Site CD2b, was located in a position adjacent to the boundary between B. Kashouli and F. & J. Gazzana in conformance with the Air Quality Management Plan. CD4 was installed on 3 October 2006, to gauge air quality impacts to the south of the site operations, as were CD5 and CD6 which were installed on the 14 December 2006. CD2b was discontinued at the end of January 2010 due to contamination of the gauge by non-quarry related vehicle movements on a track adjacent to the gauge. The replacement gauge, CD2c, was located on a rehabilitated section of land between the extraction area and adjacent resident.

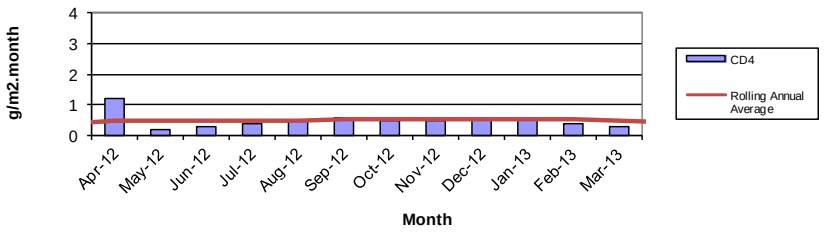
Dust deposition charts for all dust gauge sites appear in **Figure 2** below. The laboratory analysis is provided in **Appendix 1.**

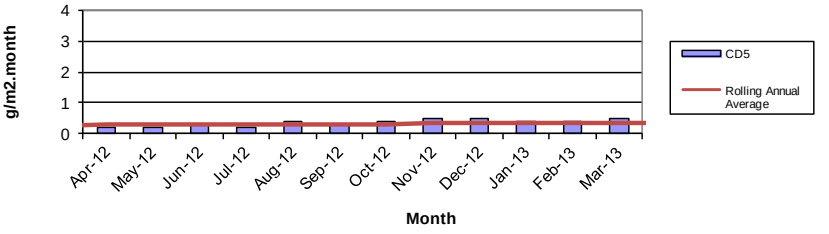
## Figure 2: Dust Deposition Charts

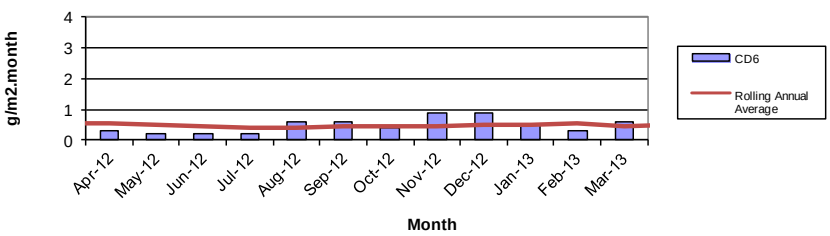


## 2.2 Surface Water Monitoring

Monthly surface water monitoring was conducted on the 3 April 2013 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1.**

**Table 2: Monthly surface water monitoring – March grab sample results**

| Site | Observed Flow Rate | Water Colour | Turbidity | pH | EC (µS/cm) | TDS (mg/L) | TSS (mg/L) | Oil and Grease (mg/L) |
|---|---|---|---|---|---|---|---|---|
| **A** | Dam | Brown | Slight | 6.51 | 59 | 54 | <5 | <5 |
| **B** | Dam | Clear | Clear | 6.61 | 81 | 83 | 14 | <5 |
| **C** | No Access | | | | | | | |
| **D** | Still | Brown | Slight | 5.49 | 106 | 85 | 41 | <5 |
| **F** | Dam | Clear | Clear | 6.21 | 56 | 43 | <5 | <5 |

At the time of sampling, there were no water discharges off site from any sampling location observed. Samples were collected at sites A, B, D and F. Site C was inaccessible and unable to be sampled this month. The samples were collected and analysed for a monthly sampling event. Results show pH within the acidic to neutral range, low Electrical Conductivity, low Total Dissolved Solids and low Total Suspended Solids. Oil and Grease was not detected at any site.

## 2.3 Groundwater Monitoring

Groundwaters were sampled on 3 April 2013. Water quality tests for pH and electrical conductivity were conducted by Carbon Based Environmental Pty Limited. For water quality purposes, water was purged from the bore until constant pH (+/- 0.1 pH units) and Electrical Conductivity (+/- 5%) was obtained between samples. Data is displayed in **Table 3** and **Figures 3 to 6.**

Groundwater depth generally increased across the sampled groundwater bores when compared to last month indicating water moving towards the surface.

pH levels generally decreased when compared to last month with the exception of CQ1 and CQ7 which increased. pH at all sites is in the slightly acidic to neutral range. EC levels generally decreased compared to the results obtained in February 2013. Exceptions were CQ1 and CQ3 which showed increases in EC this month.

**Table 3: Groundwater Quality Data**

| Reference | Bore | Type | Depth to water TOC (m) April 06 | Depth to water TOC (m) This report | pH This report | Electrical Conductivity (µS/cm) This report |
|---|---|---|---|---|---|---|
| **CQ1** | Voutos | * Monitor | 20.59 | 0.67 | 7.7 | 173 |
| **CQ3** | Voutos | * Monitor | 10.53 | 10.11 | 5.8 | 183 |
| **CQ4** | Voutos | * Monitor | 8.78 | 10.30 | 5.0 | 86 |
| **CQ5** | Gazzana | DIP Only | 8.69 | 6.03 | 4.3 | 146 |
| **CQ6** | Gazzana | DIP Only | 16.00 | NM | NM | NM |
| **CQ7** | Gazzana | * Monitor | 6.89 | 6.14 | 5.1 | 89 |
| **CQ8** | Gazzana | * Monitor | 11.03 | 5.51 | 4.6 | 137 |
| **CQ9** | Gazzana | DIP Only | 10.10 | 8.84 | 4.8 | 98 |
| **CQ10** | Voutos | * Monitor | NI | 22.49 | 4.9 | 161 |
| **CQ11S** | Gazzana | * Monitor | NI | 10.66 | 4.5 | 157 |
| **CQ11D** | Gazzana | * Monitor | NI | 11.73 | 4.6 | 144 |
| **CQ12** | Gazzana | * Monitor | NI | 3.95 | 4.4 | 108 |
| **CQ13** | Kashouli | * Monitor | NI | 12.75 | 4.5 | 217 |
| **CP3** | Gazzana | Domestic | 10.40 | 11.55 | 4.8 | 146 |
| **CP4** | Kashouli | Domestic | 13.63 | 9.21 | 5.9 | 189 |
| **CP5** | Kashouli | Domestic | 16.61 | 5.93 | 4.7 | 206 |
| **CP6** | Kashouli | Domestic | 16.27 | 8.60 | 4.5 | 175 |
| **CP7** | Kashouli | Production | 8.56 | 1.22 | 5.3 | 121 |
| **CP8** | Rozmanec | Domestic | 22.17 | 19.82 | 4.4 | 142 |
| **MW7** | Rocla Bore | * Monitor | 15.76 | 15.28 | 4.6 | 103 |
| **MW8** | Rocla Bore | * Monitor | 9.82 | 7.16 | 4.7 | 60 |
| **MW9** | Rocla Bore | * Monitor | 22.44 | 21.70 | 5.0 | 83 |
| **MW10** | Rocla Bore | * Monitor | 15.41 | 12.21 | 4.5 | 114 |
| **MW13** | Rocla Bore | DIP Only | NI | 7.04 | 5.1 | 93.3 |
| **MW16** | Rocla Bore | DIP Only | NI | 8.33 | 4.7 | 103 |

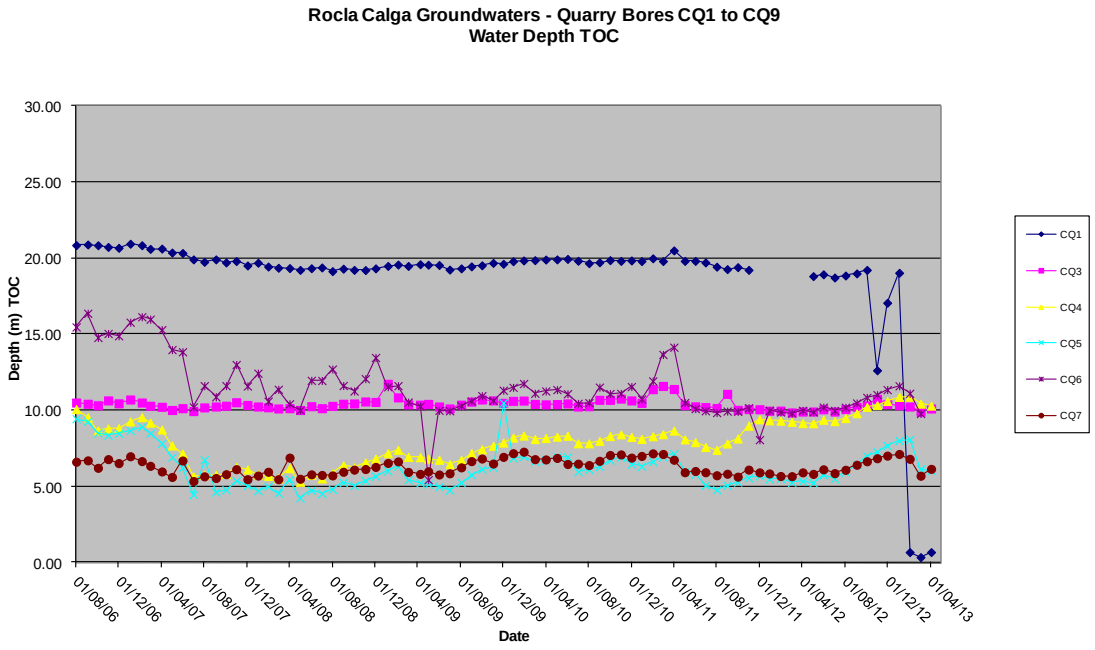
Notes:
TOC = Water level measured from top of bore case to water.
NM = Not Monitored – unable to sample water due to access restrictions.
NR = Not Required by resident.
* = Logger Installed.
NI = These bores were not installed in April 2006 but are now operational. April 2006 was the first set of measurements taken by Carbon Based Environmental Pty Limited.

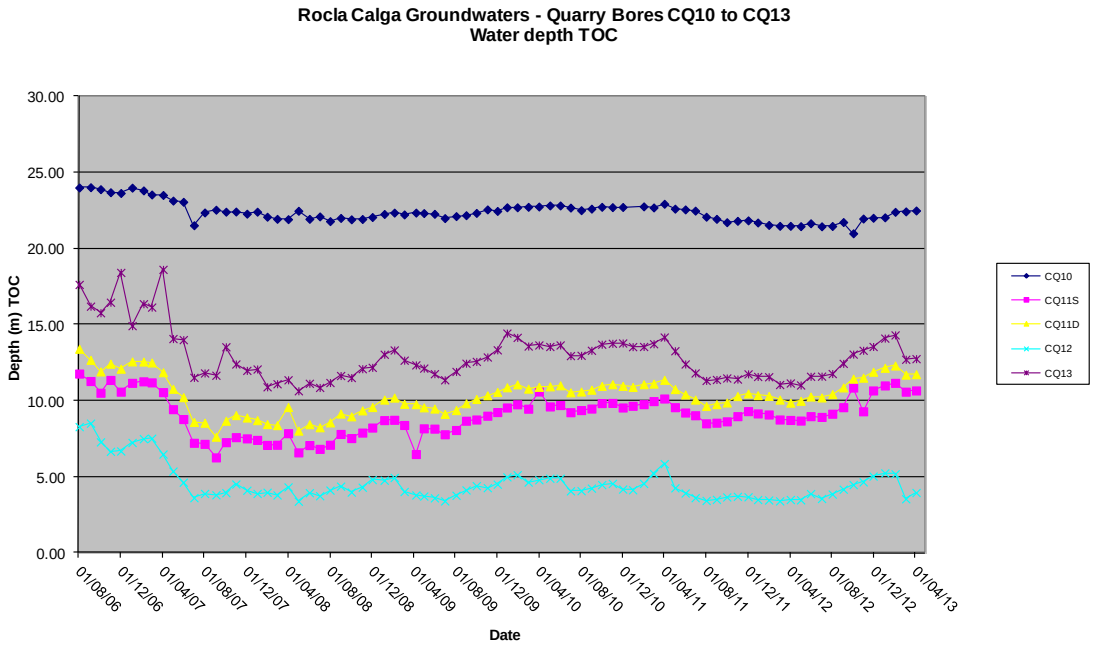
Shading is used to indicate the following trends in water depth (compared to the last reading):

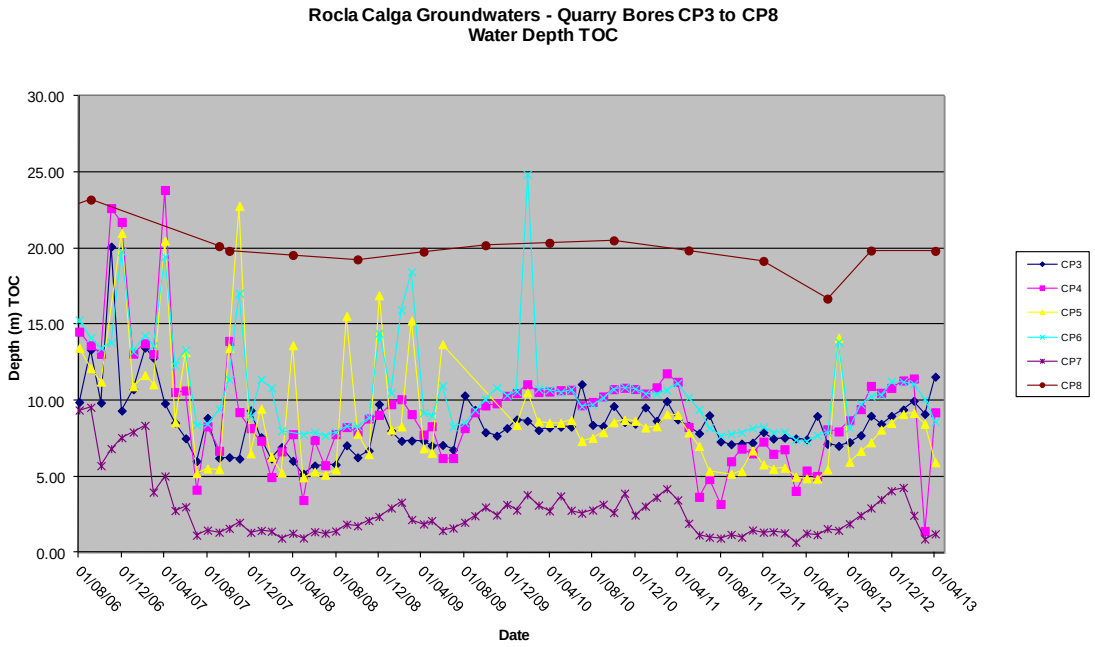
| | |
|---|---|
| | Increase to ground water depth (water moved away from surface) |
| | Decrease to ground water depth (water moved towards surface) |
| | Stable water depth (+/- 0.01m) |

Available groundwater loggers were downloaded and will be forwarded to the Rocla Calga Quarry groundwater consultant.

## Figures 3 to 6: Groundwater Depth Charts.




Rocla Calga Groundwaters - Quarry Bores CP3 to CP8
Water Depth TOC
Depth (m) TOC
30.00
25.00
20.00
15.00
10.00
5.00
0.00
01/08/06
01/12/06
01/04/07
01/08/07
01/12/07
01/04/08
01/08/08
01/12/08
01/04/09
01/08/09
01/12/09
01/04/10
01/08/10
01/12/10
01/04/11
01/08/11
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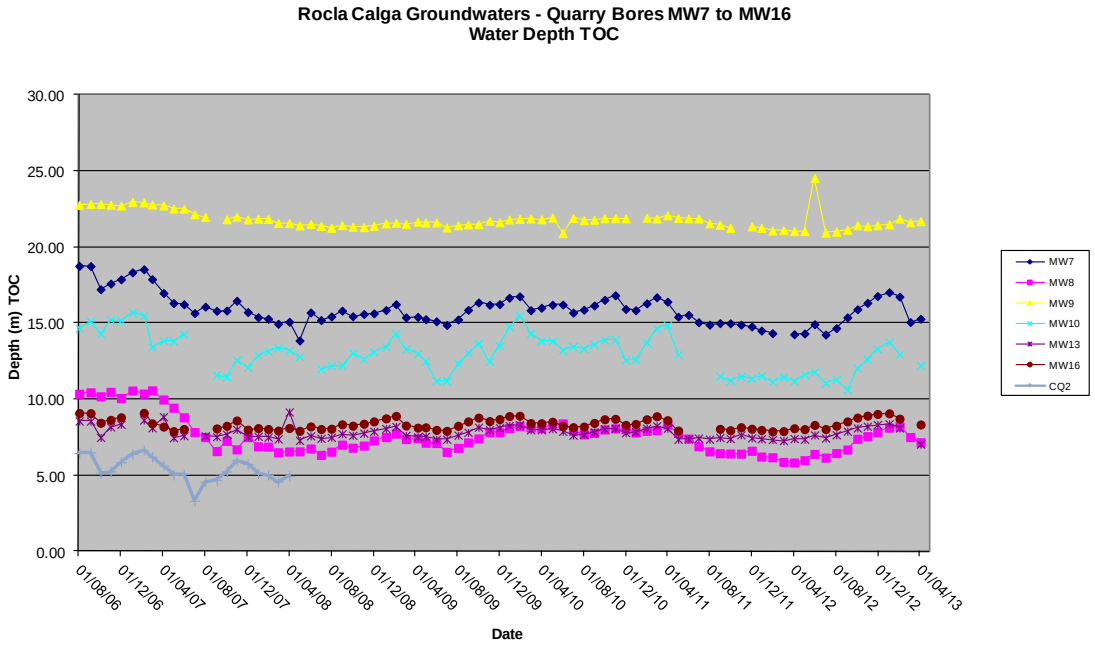
01/04/13
Date
CP3
CP4
CP5
CP6
CP7
CP8


Rocla Calga Groundwaters - Quarry Bores MW7 to MW16
Water Depth TOC
Depth (m) TOC
30.00
25.00
20.00
15.00
10.00
5.00
0.00
01/08/06
01/12/06
01/04/07
01/08/07
01/12/07
01/04/08
01/08/08
01/12/08
01/04/09
01/08/09
01/12/09
01/04/10
01/08/10
01/12/10
01/04/11
01/08/11
01/12/11
01/04/12
01/08/12
01/12/12
01/04/13
Date
MW7
MW8
MW9
MW10
MW13
MW16
CQ2

## 2.4 Meteorological Monitoring

The Rocla Calga Quarry weather station data recovery in March was approximately 100%. The weather station data follows and includes;

- Monthly data numerical summary;
- Weather charts of air temperature, humidity, heat index and wind chill, atmospheric pressure, solar radiation, evapotranspiration, rain, wind speed and data reception; and
- Wind rose (frequency distribution diagram of wind speed and direction).

Monthly weather statistics from the nearby Bureau of Meteorology (BOM) Gosford station is included in **Appendix 2** for comparison purposes. Data from the Peats Ridge BOM station for March 2013 was unavailable.

Data for March 2013 shows that rainfall recorded at the Rocla Calga Quarry was lower than the Gosford BOM station recorded rainfall. Recorded rainfall at Rocla Calga Quarry was similar to the the Peats Ridge long term mean rainfall for March. The rainfall comparison is provided below:

| | |
|---|---|
| Rocla Calga Quarry | 150.00 mm |
| BOM Peats Ridge* | Not Available |
| BOM Gosford* | 193.8 mm |
| BOM Peats Ridge Long term mean for March* | 140.3 mm |

*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au).

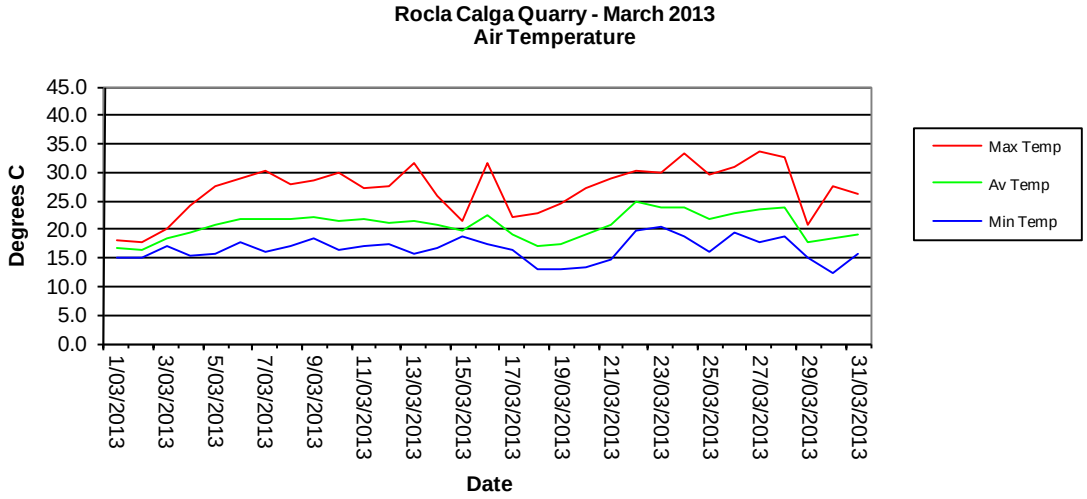
Results are displayed in the following table and figures.

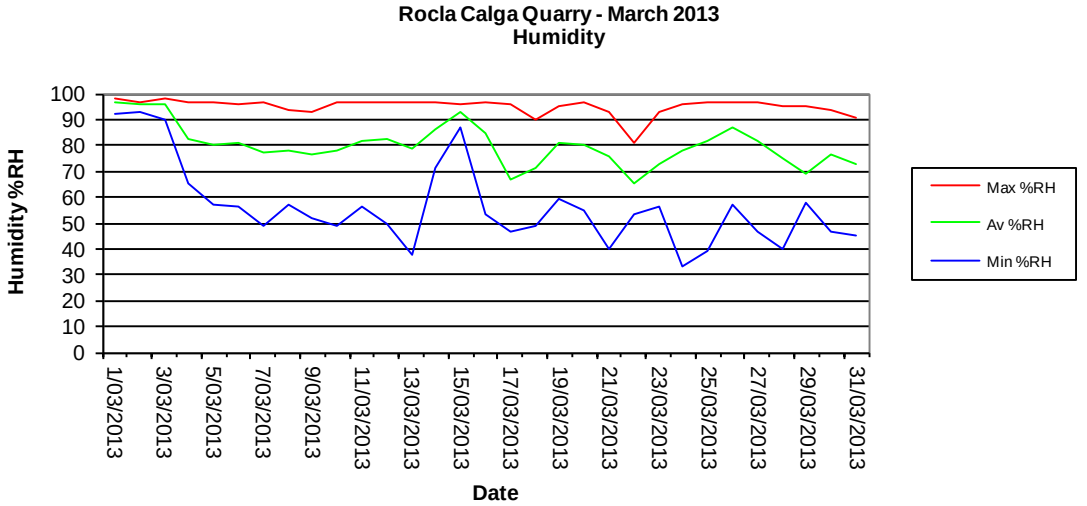
## 2.4.1 Monthly Meteorological Data Summary

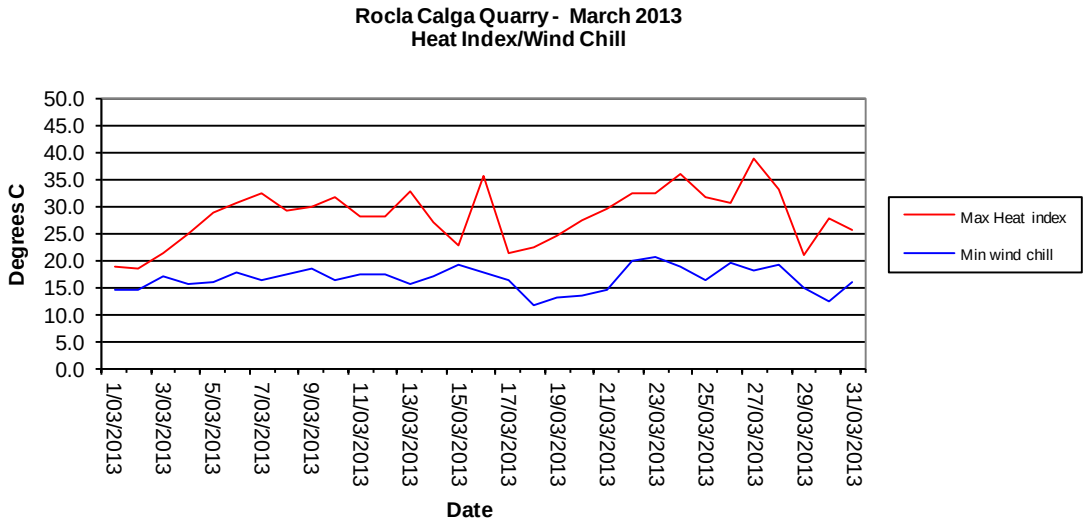
**Summary** **Mar-13** **Rocla - Calga**

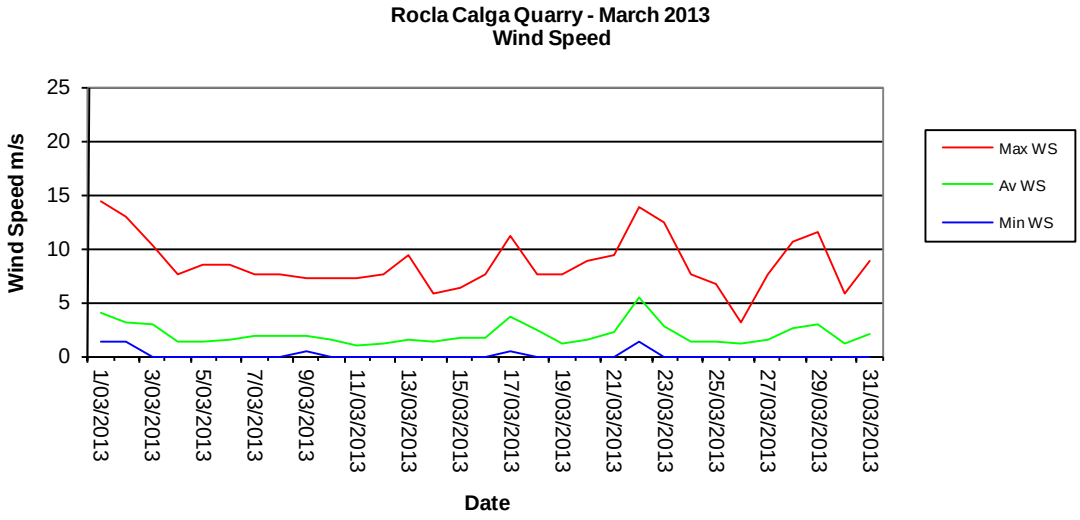
| Date | Min Temp | Av Temp | Max Temp | Min %RH | Av %RH | Max %RH | RAIN mm | ET mm | Min WS | Av WS | Max WS | Min wind chill | Max Heat index | Min Atm P | Av Atm P | Max Atm P | Min Solar Rad | Av Solar Rad | Max Solar Rad | Min Data % | Av data % | Max Data % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/03/2013 | 15.0 | 16.7 | 18.2 | 92 | 96 | 98 | 61.6 | 0.5 | 1.3 | 4.0 | 14.3 | 14.4 | 18.8 | 1009.4 | 1013.8 | 1018.0 | 0 | 32.0 | 181 | 83.3 | 95.4 | 100 |
| 2/03/2013 | 15.2 | 16.4 | 17.8 | 93 | 96 | 97 | 34.8 | 0.9 | 1.3 | 3.2 | 13 | 14.4 | 18.3 | 1017.4 | 1019.5 | 1021.1 | 0 | 58.3 | 276 | 96.8 | 99.5 | 100 |
| 3/03/2013 | 17.2 | 18.3 | 20.3 | 90 | 96 | 98 | 47.6 | 1.1 | 0 | 2.9 | 10.3 | 17.1 | 21.2 | 1018.9 | 1019.8 | 1021.2 | 0 | 75.8 | 419 | 92.7 | 99.6 | 100 |
| 4/03/2013 | 15.4 | 19.5 | 24.3 | 65 | 83 | 97 | 0.2 | 2.6 | 0 | 1.3 | 7.6 | 15.4 | 24.8 | 1019.4 | 1020.3 | 1021.5 | 0 | 133.5 | 459 | 83 | 98.2 | 100 |
| 5/03/2013 | 15.9 | 20.8 | 27.7 | 57 | 80 | 97 | 0.0 | 3.6 | 0 | 1.3 | 8.5 | 15.9 | 28.6 | 1018.2 | 1019.8 | 1020.9 | 0 | 199.3 | 1006 | 88.6 | 98.8 | 100 |
| 6/03/2013 | 17.8 | 21.7 | 28.8 | 56 | 81 | 96 | 0.0 | 3.4 | 0 | 1.5 | 8.5 | 17.8 | 30.4 | 1016.6 | 1018.4 | 1019.9 | 0 | 175.8 | 906 | 85.7 | 98.8 | 100 |
| 7/03/2013 | 16.2 | 21.9 | 30.3 | 49 | 77 | 97 | 0.0 | 3.9 | 0 | 1.8 | 7.6 | 16.2 | 32.5 | 1015.5 | 1017.7 | 1019.2 | 0 | 194.7 | 937 | 93.3 | 99.9 | 100 |
| 8/03/2013 | 17.2 | 21.8 | 27.9 | 57 | 78 | 94 | 0.0 | 3.3 | 0 | 1.8 | 7.6 | 17.2 | 29.0 | 1018.4 | 1019.8 | 1021.1 | 0 | 159.1 | 710 | 91.2 | 99.8 | 100 |
| 9/03/2013 | 18.3 | 22.3 | 28.7 | 52 | 76 | 93 | 0.0 | 2.9 | 0.4 | 1.8 | 7.2 | 18.4 | 29.7 | 1016.9 | 1018.9 | 1020.6 | 0 | 135.0 | 1081 | 93.3 | 99.8 | 100 |
| 10/03/2013 | 16.4 | 21.6 | 30.1 | 49 | 78 | 97 | 0.0 | 3.4 | 0 | 1.6 | 7.2 | 16.4 | 31.6 | 1015.4 | 1017.4 | 1019.0 | 0 | 169.5 | 873 | 99.7 | 100.0 | 100 |
| 11/03/2013 | 17.2 | 21.7 | 27.4 | 56 | 82 | 97 | 0.2 | 2.9 | 0 | 1.1 | 7.2 | 17.2 | 28.1 | 1017.0 | 1018.7 | 1020.2 | 0 | 152.1 | 637 | 95.9 | 99.8 | 100 |
| 12/03/2013 | 17.4 | 21.2 | 27.6 | 50 | 82 | 97 | 0.0 | 2.8 | 0 | 1.1 | 7.6 | 17.4 | 28.1 | 1015.8 | 1018.1 | 1020.3 | 0 | 145.6 | 913 | 88.3 | 99.5 | 100 |
| 13/03/2013 | 15.6 | 21.6 | 31.5 | 38 | 78 | 97 | 0.2 | 3.4 | 0 | 1.6 | 9.4 | 15.6 | 32.8 | 1008.7 | 1011.9 | 1016.1 | 0 | 171.7 | 905 | 90.6 | 99.8 | 100 |
| 14/03/2013 | 16.9 | 20.9 | 25.9 | 71 | 86 | 97 | 0.0 | 1.9 | 0 | 1.3 | 5.8 | 16.9 | 27.1 | 1007.7 | 1010.4 | 1013.5 | 0 | 100.3 | 456 | 90.6 | 99.5 | 100 |
| 15/03/2013 | 18.9 | 19.8 | 21.5 | 87 | 93 | 96 | 0.6 | 0.9 | 0 | 1.7 | 6.3 | 19.0 | 22.6 | 1012.8 | 1014.8 | 1016.4 | 0 | 53.2 | 341 | 93.9 | 99.6 | 100 |
| 16/03/2013 | 17.5 | 22.4 | 31.8 | 53 | 85 | 97 | 0.2 | 2.7 | 0 | 1.6 | 7.6 | 17.6 | 35.4 | 1006.2 | 1010.5 | 1015.8 | 0 | 142.3 | 851 | 93.3 | 99.9 | 100 |
| 17/03/2013 | 16.3 | 19.3 | 22.3 | 47 | 67 | 96 | 0.2 | 3.8 | 0.4 | 3.7 | 11.2 | 16.1 | 21.4 | 1007.1 | 1012.7 | 1018.6 | 0 | 131.0 | 965 | 100 | 100.0 | 100 |
| 18/03/2013 | 12.9 | 17.0 | 22.8 | 49 | 71 | 90 | 0.0 | 3.0 | 0 | 2.5 | 7.6 | 11.7 | 22.5 | 1018.0 | 1019.9 | 1022.4 | 0 | 136.5 | 722 | 84.5 | 99.7 | 100 |
| 19/03/2013 | 13.1 | 17.3 | 24.4 | 59 | 81 | 95 | 0.2 | 2.3 | 0 | 1.2 | 7.6 | 13.1 | 24.5 | 1021.2 | 1022.7 | 1024.9 | 0 | 128.6 | 953 | 94.4 | 99.9 | 100 |
| 20/03/2013 | 13.4 | 19.0 | 27.3 | 55 | 80 | 97 | 0.0 | 2.7 | 0 | 1.5 | 8.9 | 13.4 | 27.5 | 1020.2 | 1022.7 | 1025.0 | 0 | 136.7 | 990 | 97.4 | 100.0 | 100 |
| 21/03/2013 | 14.8 | 20.9 | 28.9 | 40 | 75 | 93 | 0.0 | 2.9 | 0 | 2.3 | 9.4 | 14.6 | 29.6 | 1012.1 | 1016.2 | 1020.9 | 0 | 116.5 | 688 | 91.8 | 99.8 | 100 |
| 22/03/2013 | 19.9 | 24.9 | 30.4 | 53 | 66 | 81 | 0.0 | 4.1 | 1.3 | 5.5 | 13.9 | 20.0 | 32.4 | 1010.4 | 1011.8 | 1013.8 | 0 | 81.2 | 559 | 98.8 | 99.9 | 100 |
| 23/03/2013 | 20.4 | 23.8 | 29.9 | 56 | 73 | 93 | 0.4 | 3.2 | 0 | 2.8 | 12.5 | 20.4 | 32.2 | 1011.2 | 1013.5 | 1015.6 | 0 | 119.7 | 818 | 98 | 99.9 | 100 |
| 24/03/2013 | 18.9 | 24.0 | 33.3 | 33 | 78 | 96 | 0.0 | 3.0 | 0 | 1.4 | 7.6 | 18.9 | 35.8 | 1009.2 | 1013.0 | 1015.2 | 0 | 135.5 | 806 | 93.3 | 99.9 | 100 |
| 25/03/2013 | 16.0 | 21.8 | 29.6 | 39 | 82 | 97 | 0.2 | 2.5 | 0 | 1.3 | 6.7 | 16.1 | 31.6 | 1013.5 | 1016.2 | 1018.4 | 0 | 132.1 | 778 | 93.9 | 99.8 | 100 |
| 26/03/2013 | 19.6 | 22.9 | 30.8 | 57 | 87 | 97 | 0.0 | 2.1 | 0 | 1.1 | 3.1 | 19.6 | 30.7 | 1014.4 | 1016.5 | 1018.7 | 0 | 109.4 | 834 | 92.4 | 99.9 | 100 |
| 27/03/2013 | 17.9 | 23.6 | 33.5 | 47 | 82 | 97 | 0.0 | 2.5 | 0 | 1.5 | 7.6 | 17.9 | 38.6 | 1014.0 | 1016.1 | 1018.3 | 0 | 119.9 | 764 | 92.1 | 99.7 | 100 |
| 28/03/2013 | 18.9 | 24.0 | 32.6 | 40 | 75 | 95 | 2.8 | 3.0 | 0 | 2.6 | 10.7 | 19.0 | 33.2 | 1010.5 | 1013.7 | 1016.0 | 0 | 106.1 | 852 | 89.5 | 99.1 | 100 |
| 29/03/2013 | 15.0 | 17.9 | 20.9 | 58 | 69 | 95 | 0.0 | 3.1 | 0 | 2.9 | 11.6 | 14.8 | 21.0 | 1011.6 | 1016.4 | 1018.6 | 0 | 125.6 | 888 | 92.4 | 99.6 | 100 |
| 30/03/2013 | 12.3 | 18.3 | 27.7 | 47 | 77 | 94 | 0.0 | 2.4 | 0 | 1.1 | 5.8 | 12.3 | 27.7 | 1010.1 | 1014.1 | 1017.9 | 0 | 122.4 | 734 | 93.6 | 99.9 | 100 |
| 31/03/2013 | 15.9 | 19.3 | 26.1 | 45 | 73 | 91 | 0.8 | 2.8 | 0 | 2.1 | 8.9 | 15.9 | 25.7 | 1008.1 | 1011.2 | 1015.3 | 0 | 111.0 | 885 | 98.2 | 100.0 | 100 |
| Monthly | 12.3 | 20.7 | 33.5 | 33 | 80 | 98 | 150.0 | 83.2 | 0 | 2.0 | 14.3 | 11.7 | 38.6 | 1006.2 | 1016.3 | 1025 | 0 | 126.1 | 1081 | 83 | 99.5 | 100 |

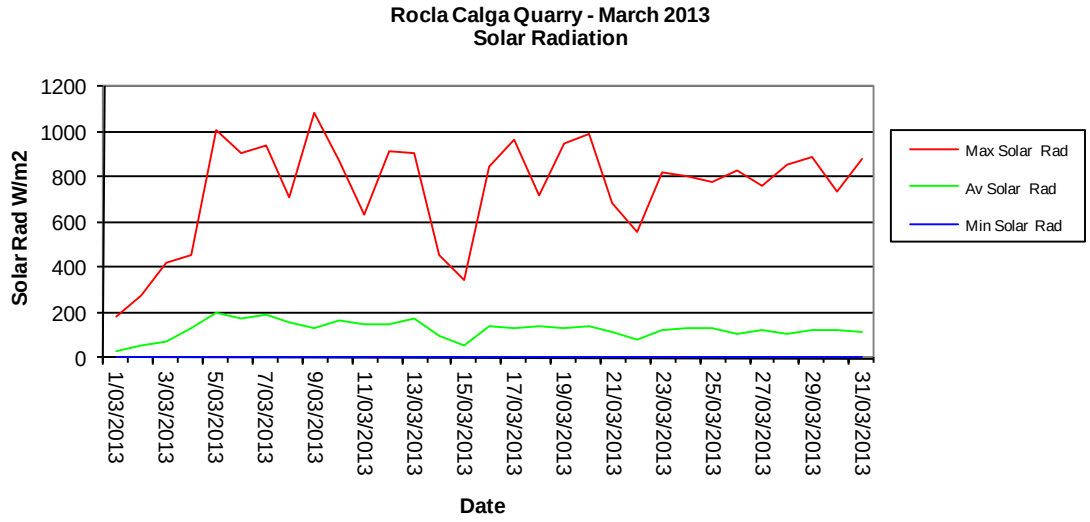
### 2.4.2 Monthly Weather Charts

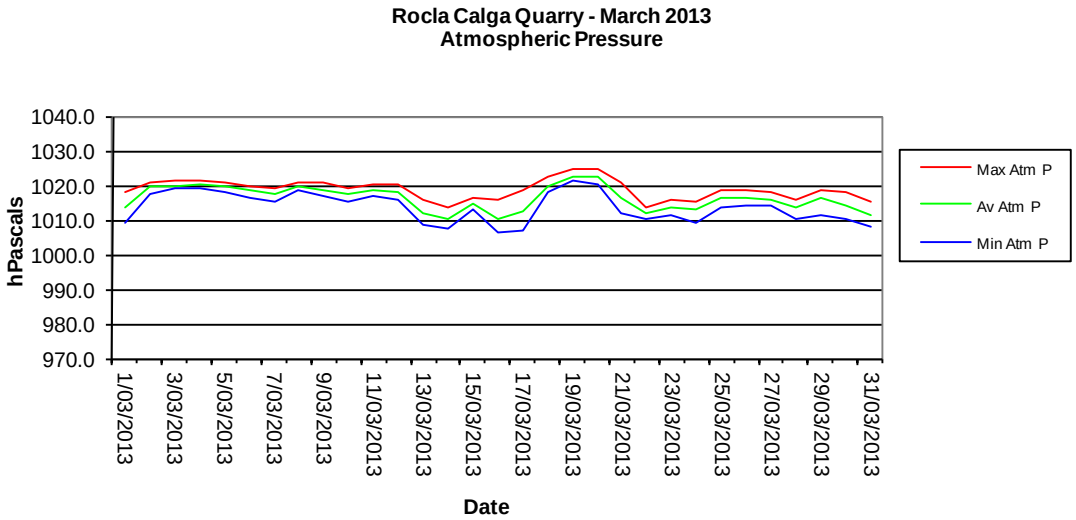


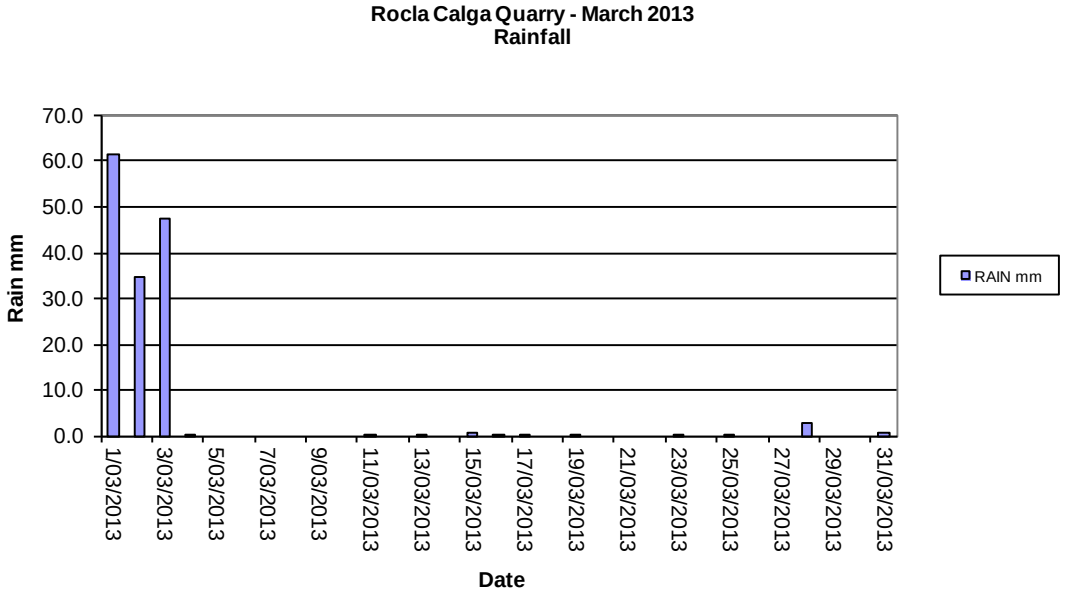



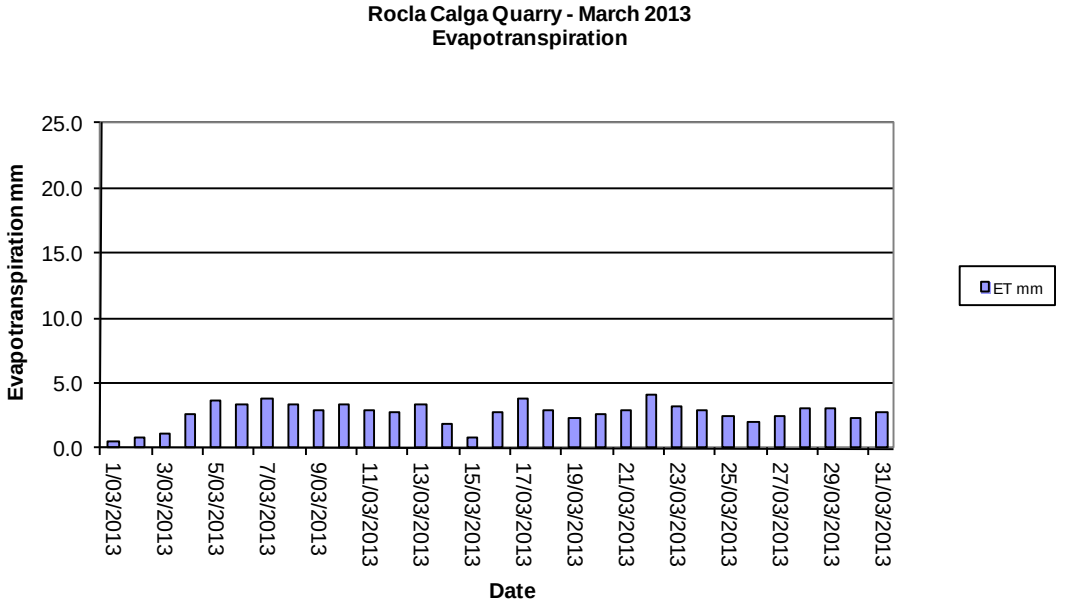



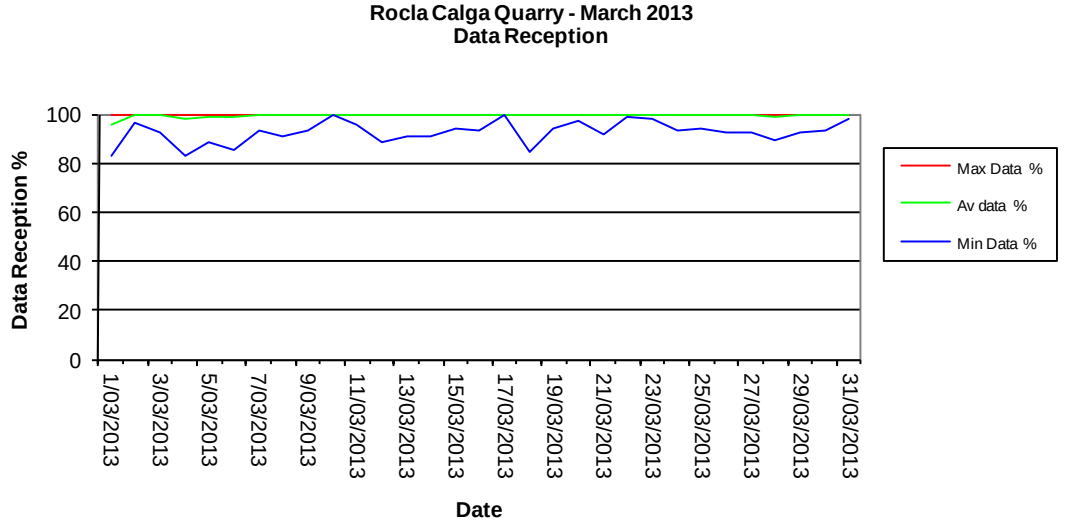

Rocla Calga Quarry - March 2013
Wind Speed
Wind Speed m/s
25
20
15
10
5
0
1/03/2013
3/03/2013
5/03/2013
7/03/2013
9/03/2013
11/03/2013
13/03/2013
15/03/2013
17/03/2013
19/03/2013
21/03/2013
23/03/2013
25/03/2013
27/03/2013
29/03/2013
31/03/2013
Date
Max WS
Av WS
Min WS


Rocla Calga Quarry - March 2013
Solar Radiation
Solar Rad W/m2
1200
1000
800
600
400
200
0
1/03/2013
3/03/2013
5/03/2013
7/03/2013
9/03/2013
11/03/2013
13/03/2013
15/03/2013
17/03/2013
19/03/2013
21/03/2013
23/03/2013
25/03/2013
27/03/2013
29/03/2013
31/03/2013
Date
Max Solar Rad
Av Solar Rad
Min Solar Rad


Rocla Calga Quarry - March 2013
Atmospheric Pressure
hPascals
1040.0
1030.0
1020.0
1010.0
1000.0
990.0
980.0
970.0
1/03/2013
3/03/2013
5/03/2013
7/03/2013
9/03/2013
11/03/2013
13/03/2013
15/03/2013
17/03/2013
19/03/2013
21/03/2013
23/03/2013
25/03/2013
27/03/2013
29/03/2013
31/03/2013
Date
Max Atm P
Av Atm P
Min Atm P


Rocla Calga Quarry - March 2013
Rainfall
Rain mm
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
1/03/2013
3/03/2013
5/03/2013
7/03/2013
9/03/2013
11/03/2013
13/03/2013
15/03/2013
17/03/2013
19/03/2013
21/03/2013
23/03/2013
25/03/2013
27/03/2013
29/03/2013
31/03/2013
Date
RAIN mm

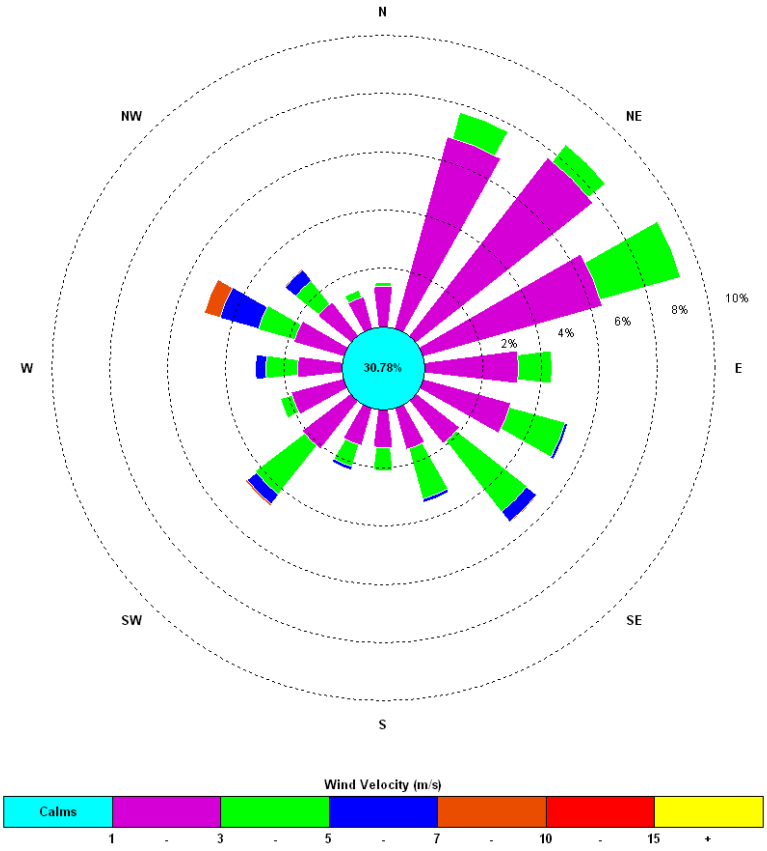

Rocla Calga Quarry - March 2013
Evapotranspiration
Evapotranspiration mm
25.0
20.0
15.0
10.0
5.0
0.0
1/03/2013
3/03/2013
5/03/2013
7/03/2013
9/03/2013
11/03/2013
13/03/2013
15/03/2013
17/03/2013
19/03/2013
21/03/2013
23/03/2013
25/03/2013
27/03/2013
29/03/2013
31/03/2013
Date
ET mm


Rocla Calga Quarry - March 2013
Data Reception
Data Reception %
100
80
60
40
20
0
1/03/2013
3/03/2013
5/03/2013
7/03/2013
9/03/2013
11/03/2013
13/03/2013
15/03/2013
17/03/2013
19/03/2013
21/03/2013
23/03/2013
25/03/2013
27/03/2013
29/03/2013
31/03/2013
Date
Max Data %
Av data %
Min Data %

### 2.4.3 Monthly Windrose Plot

Frequency plot of the average wind speed and average direction over each 15 minute sampling period. Wind is considered to be calm when less than a 15 minute average of 1m/s.

00:15, 01 March 2013 – 23:45, 31 March 2013




The predominant winds were from the ENE, with strongest winds from the WNW. The maximum wind speed was 14.3 m/s from the SE.

# Appendix 1

# Laboratory Certificates

ALS Group

Environmental Division

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| Work Order | : **EN1301229** | Page | : 1 of 4 |
| Client | : **CARBON BASED ENVIRONMENTAL** | Laboratory | : Environmental Division Newcastle |
| Contact | : MR COLIN DAVIES | Contact | : Peter Keyte |
| Address | : 47 BOOMERANG ST<br>CESSNOCK NSW, AUSTRALIA 2325 | Address | : 5 Rosegum Road Warabrook NSW Australia 2304 |
| E-mail | : cbased@bigpond.com | E-mail | : peter.keyte@als.com.au |
| Telephone | : +61 49904443 | Telephone | : 61-2-4968-9433 |
| Facsimile | : +61 02 49904442 | Facsimile | : +61-2-4968 0349 |
| Project | : ROCLA CALGA DUSTS | QC Level | : NEPM 1999 Schedule B(3) and ALS QCS3 requirement |
| Order number | : ---- | | |
| C-O-C number | : ---- | Date Samples Received | : 03-APR-2013 |
| Sampler | : CB | Issue Date | : 09-APR-2013 |
| Site | : ---- | | |
| | | No. of samples received | : 6 |
| Quote number | : ---- | No. of samples analysed | : 6 |

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

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* |
|---|---|---|
| Barbara Coupland | Quality Officer | Newcastle - Inorganics |

## General Comments

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Analysis as per AS3580.10.1-2003. Samples passed through a 1mm sieve prior to analysis. NATA accreditation does not apply for results reported in g/m².mth as sampling data was provided by the client.**

## Analytical Results

Sub-Matrix: **DUST** (Matrix: **AIR**)

| Compound | CAS Number | LOR | Unit | Client sample ID: CD1 04/03/13 - 03/04/13 | CD2c 04/03/13 - 03/04/13 | CD3 04/03/13 - 03/04/13 | CD4 04/03/13 - 03/04/13 | CD5 04/03/13 - 03/04/13 |
|---|---|---|---|---|---|---|---|---|
| *Client sampling date / time* | | | | 03-APR-2013 15:00 | 03-APR-2013 15:00 | 03-APR-2013 15:00 | 03-APR-2013 15:00 | 03-APR-2013 15:00 |
| | | | | EN1301229-001 | EN1301229-002 | EN1301229-003 | EN1301229-004 | EN1301229-005 |
| **EA120: Ash Content** | | | | | | | | |
| Ash Content | ---- | 0.1 | g/m².month | 0.5 | 0.2 | 0.7 | 0.1 | 0.2 |
| Ash Content (mg) | ---- | 1 | mg | 9 | 3 | 13 | 2 | 4 |
| **EA125: Combustible Matter** | | | | | | | | |
| Combustible Matter | ---- | 0.1 | g/m².month | 0.1 | 0.1 | 0.3 | 0.2 | 0.3 |
| Combustible Matter (mg) | ---- | 1 | mg | 1 | 3 | 5 | 4 | 4 |
| **EA141: Total Insoluble Matter** | | | | | | | | |
| Total Insoluble Matter | ---- | 0.1 | g/m².month | 0.6 | 0.3 | 1.0 | 0.3 | 0.5 |
| Total Insoluble Matter (mg) | ---- | 1 | mg | 10 | 6 | 18 | 6 | 8 |

## Analytical Results

| Sub-Matrix: DUST (Matrix: AIR) | | | | Client sample ID | CD6 04/03/13 - 03/04/13 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Client sampling date / time | 03-APR-2013 15:00 | ---- | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | | EN1301229-006 | ---- | ---- | ---- | ---- |
| **EA120: Ash Content** | | | | | | | | | |
| Ash Content | ---- | 0.1 | g/m².month | | 0.3 | ---- | ---- | ---- | ---- |
| Ash Content (mg) | ---- | 1 | mg | | 5 | ---- | ---- | ---- | ---- |
| **EA125: Combustible Matter** | | | | | | | | | |
| Combustible Matter | ---- | 0.1 | g/m².month | | 0.3 | ---- | ---- | ---- | ---- |
| Combustible Matter (mg) | ---- | 1 | mg | | 6 | ---- | ---- | ---- | ---- |
| **EA141: Total Insoluble Matter** | | | | | | | | | |
| Total Insoluble Matter | ---- | 0.1 | g/m².month | | 0.6 | ---- | ---- | ---- | ---- |
| Total Insoluble Matter (mg) | ---- | 1 | mg | | 11 | ---- | ---- | ---- | ---- |

ALS Group

Environmental Division

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **ES1307574** | Page | : 1 of 3 |
| Client | : CARBON BASED ENVIRONMENTAL | Laboratory | : Environmental Division Sydney |
| Contact | : MR COLIN DAVIES | Contact | : Client Services |
| Address | : 47 BOOMERANG ST<br>CESSNOCK NSW, AUSTRALIA 2325 | Address | : 277-289 Woodpark Road Smithfield NSW Australia 2164 |
| E-mail | : cbased@bigpond.com | E-mail | : sydney@alsglobal.com |
| Telephone | : +61 49904443 | Telephone | : +61-2-8784 8555 |
| Facsimile | : +61 02 49904442 | Facsimile | : +61-2-8784 8500 |
| Project | : ROCLA QUARRY | QC Level | : NEPM 1999 Schedule B(3) and ALS QCS3 requirement |
| Order number | : ---- | | |
| C-O-C number | : ---- | Date Samples Received | : 03-APR-2013 |
| Sampler | : CBE | Issue Date | : 10-APR-2013 |
| Site | : ---- | | |
| | | No. of samples received | : 4 |
| Quote number | : SY/428/12 | No. of samples analysed | : 4 |

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

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* |
|---|---|---|
| Ashesh Patel | Inorganic Chemist | Sydney Inorganics |
| Ashesh Patel | Inorganic Chemist | Sydney Inorganics |
| Barbara Coupland | Quality Officer | Newcastle - Inorganics |
| Hoa Nguyen | Senior Inorganic Chemist | Sydney Inorganics |

## General Comments

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EA015: TDS results has been confirmed by re-analysis.**

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | | Client sample ID | A | B | D | F | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Client sampling date / time | [03-APR-2013] | [03-APR-2013] | [03-APR-2013] | [03-APR-2013] | ---- |
| Compound | CAS Number | LOR | Unit | | ES1307574-001 | ES1307574-002 | ES1307574-003 | ES1307574-004 | ---- |
| **EA005: pH** | | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | | 6.51 | 6.61 | 5.49 | 6.21 | ---- |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | | 59 | 81 | 106 | 56 | ---- |
| **EA015: Total Dissolved Solids** | | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | | ---- | 83 | ---- | ---- | ---- |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | | 54 | ---- | 85 | 43 | ---- |
| **EA025: Suspended Solids** | | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | | <5 | 14 | 41 | <5 | ---- |
| **EP020: Oil and Grease (O&G)** | | | | | | | | | |
| Oil & Grease | ---- | 5 | mg/L | | <5 | <5 | <5 | <5 | ---- |

CARBON BASED ENVIRONMENTAL PTY LIMITED

| Todays Collection | |
|---|---|
| Time Start: | 8:20. |
| Time Finish: | |

Date: 3.4.13

Client : Rocla Calga

Project :

# GROUNDWATERS

| Site | DEPTH | Odour | Water Turbidity | Water Colour | 1 | | 2 | | Bottles (Apr/Oct) | Downloaded Logger? (Y/N) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | pH | EC | pH | EC | | |
| CQ1 | 0.67 | N | (C) S T | (C) LO O B G | 7.64 | 170.1 | 7.67 | 173.4 | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| CQ3 | 10.11 | Y | (C) S T | (C) LO O B G | 5.74 | 181.2 | 5.77 | 185.3 | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| CQ4 | 10.30 | N | (C) S T | (C) LO O B G | 87.1E | pH 5.01 | 86.3E | pH 5.04 | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| CQ5 | 6.03 | N | (C) S T | C LO O B G | 4.27 | 145.3 | 4.26 | 145.9 | 1x 250ml GP, 1x 1L GP, 1RP | |
| CQ6 | | | C S T | C LO O B G | | | | | ~~1x 250ml GP, 1x 1L GP, 1RP~~ | |
| CQ7 | 0.14 | N | (C) S T | (C) LO O B G | 5.12 | 89.7 | 5.10 | 89.4 | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| CQ8 | 5.51 | N | (C) S T | (C) LO O B G | 4.60 | 139.7 | 4.64 | 137.2 | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| CQ9 | 8.84 | N | (C) S T | (C) LO O B G | 4.84 | 99.0 | 4.80 | 98.4 | 1x 250ml GP, 1x 1L GP, 1RP | |
| CQ10 | 22.49 | N | (C) S T | C LO O B G | 4.83 | 160.0 | 4.87 | 161.0 | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| CQ11S | 10.66 | N | (C) S T | (C) LO O B G | 4.48 | 157.7 | 4.50 | 157.4 | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| CQ11D | 11.73 | N | (C) S T | (C) LO O B G | 4.55 | 145.9 | 4.55 | 144.0 | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| CQ12 | 3.95 | N | (C) | (C) | 4.67 | 141.4 | 4.42 | 107.5 | ~~250ml GP, 1x 1L GP, 1RP~~ | Y |
| CQ13 | 12.75 | N | (C) S T | (C) LO O B G | 4.49 | 216.4uS | 4.51 | 216.7uS | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| CP3 | 11.55 | N | (C) S T | (C) LO O B G | 4.76 | 146.7uS | 4.82 | 146.3uS | 1x 250ml GP, 1x 1L GP, 1RP | |
| CP4 | 9.21 | N | (C) S T | (C) LO O B G | 5.84 | 187.4 | 5.89 | 189.2 | 1x 250ml GP, 1x 1L GP, 1RP | |
| CP5 | 5.93 | N | (C) S T | (C) LO O B G | 4.63 | 205.1uS | 4.70 | 205.7uS | 1x 250ml GP, 1x 1L GP, 1RP | |
| CP6 | 8.60 | N | (C) S T | (C) LO O B G | 4.49 | 174.1 | 4.49 | 174.9 | 1x 250ml GP, 1x 1L GP, 1RP | |
| CP7 | 1.77 | N | (C) S T | (C) LO O B G | 5.24 | 120.0 | 5.26 | 121.9 | 1x 250ml GP, 1x 1L GP, 1RP | |
| CP8 | 19.82 | N | (C) S T | (C) LO O B G | 4.47 | 141.4 | 4.42 | 141.9 | 1x 250ml GP, 1x 1L GP, 1RP | Only required Apr/Oct |
| MW7 | 15.28 | N | (C) S T | (C) LO O B G | 4.61 | 105.7 | 4.60 | 103.4 | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| MW8 | 2.16 | N | (C) S T | (C) LO O B G | 4.67 | 59.4 | 4.71 | 59.7 | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| MW9 | 21.70 | N | (C) S T | (C) LO O B G | 5.03 | 84.1 | 5.03 | 83.2 | 1x 250ml GP, 1x 1L GP, 1RP | Y |
| MW10 | 14.21 | N | (C) S T | C LO O B G | 4.45 | 116.4 | 4.47 | 114.2 | 1x 250ml GP, 1x 1L GP, 1RP | N |
| MW13 | 1.64 | N | (C) S T | (C) LO O B G | 5.13 | 95.2 | 5.14 | 95.3 | 1x 250ml GP, 1x 1L GP, 1RP | |
| MW16 | 8.33 | N | (C) S T | (C) LO O B G | 4.72 | 1032 | 4.74 | 1030 | 1x 250ml GP, 1x 1L GP, 1RP | |

EFONKE

Turbidity: C=Clear, S= Slight, T=Turbid (CIRCLE)

Colour: C=Clear, LO=Light Orange, O=Orange, B=Brown, G=Green (CIRCLE)

pH/EC meter #:

Signed:_____

Sampled by:

pH 4 = 4.10 ✓

pH 7 = 7.03 ✓

ec:

# Appendix 2

# Additional Bureau of Meteorology Data from Peats Ridge and Gosford Monitoring Stations

# Gosford, New South Wales
# March 2013 Daily Weather Observations

Australian Government
Bureau of Meteorology

| Date | Day | Temps | | Rain | Evap | Sun | Max wind gust | | | 9am | | | | | | 3pm | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | | | | Dirn | Spd | Time | Temp | RH | Cld | Dirn | Spd | MSLP | Temp | RH | Cld | Dirn | Spd | MSLP |
| | | °C | °C | mm | mm | hours | | km/h | local | °C | % | eighths | | km/h | hPa | °C | % | eighths | | km/h | hPa |
| 1 | Fr | 16.9 | 19.5 | 59.2 | | | S | 46 | 14:37 | | | | SSE | 15 | | | | | SSE | 17 | |
| 2 | Sa | 16.5 | 19.9 | 49.8 | | | SE | 35 | 23:03 | 17.2 | 100 | | SE | 11 | | 18.8 | 99 | | SSE | 11 | |
| 3 | Su | 17.1 | 24.1 | 64.4 | | | SE | 35 | 14:27 | | | | SE | 11 | | 23.2 | 88 | | SE | 15 | |
| 4 | Mo | 14.6 | 25.1 | 6.0 | | | SE | 28 | 09:30 | 19.0 | 100 | | | Calm | | 24.0 | 63 | | ESE | 7 | |
| 5 | Tu | 15.8 | 26.2 | 0 | | | ENE | 28 | 13:15 | 22.2 | 98 | | NNE | 2 | | 24.8 | 54 | | NE | 11 | |
| 6 | We | 16.8 | 26.4 | 0.6 | | | E | 24 | 15:50 | 20.7 | 100 | | ESE | 2 | | 26.3 | 63 | | E | 11 | |
| 7 | Th | 14.4 | 27.2 | 0 | | | ESE | 30 | 12:52 | 20.0 | 100 | | | Calm | | 26.4 | 57 | | ENE | 11 | |
| 8 | Fr | 14.5 | 26.9 | 0.2 | | | NE | 24 | 14:00 | 19.8 | 100 | | NE | 2 | | 25.7 | 54 | | E | 11 | |
| 9 | Sa | 17.3 | 27.1 | 0.2 | | | ENE | 24 | 12:17 | 22.6 | 99 | | | Calm | | 25.6 | 62 | | ENE | 11 | |
| 10 | Su | 14.6 | 27.2 | 0 | | | ENE | 22 | 09:51 | 19.6 | 100 | | | Calm | | 26.3 | 57 | | NE | 7 | |
| 11 | Mo | 15.9 | 26.7 | 0.6 | | | NE | 24 | 16:49 | | | | | Calm | | 26.1 | 62 | | NE | 9 | |
| 12 | Tu | 16.8 | 26.7 | 0 | | | ESE | 22 | 14:21 | 20.8 | 100 | | | Calm | | 26.0 | 58 | | ENE | 9 | |
| 13 | We | 13.7 | 27.8 | 0 | | | NE | 28 | 15:15 | 19.0 | 100 | | | Calm | | 26.6 | 56 | | ENE | 9 | |
| 14 | Th | 15.0 | 26.1 | 0 | | | ESE | 22 | 09:11 | 21.8 | 100 | | SE | 9 | | 24.6 | 96 | | SE | 9 | |
| 15 | Fr | 19.9 | 22.3 | 0 | | | SE | 46 | 14:32 | 20.7 | 99 | | SSW | 2 | | 21.6 | 100 | | SE | 6 | |
| 16 | Sa | 16.7 | 28.7 | 1.6 | | | NNW | 20 | 12:04 | | | | | Calm | | 28.4 | 64 | | NE | 7 | |
| 17 | Su | 16.3 | 22.7 | 0 | | | S | 43 | 14:35 | 19.4 | 62 | | SSE | 11 | | 22.2 | 43 | | SE | 19 | |
| 18 | Mo | 11.0 | 22.0 | 4.6 | | | SE | 26 | 12:23 | 16.9 | 65 | | SW | 6 | | 20.8 | 54 | | SE | 11 | |
| 19 | Tu | 12.6 | 23.4 | 3.2 | | | S | 24 | 13:40 | 17.0 | 99 | | | Calm | | 22.7 | 51 | | SE | 13 | |
| 20 | We | 11.8 | 24.8 | 0.2 | | | NE | 24 | 15:05 | 15.8 | | | | Calm | | 24.4 | 54 | | NE | 9 | |
| 21 | Th | 12.4 | 27.0 | 0.2 | | | ENE | 28 | 14:15 | 17.2 | | | ENE | 2 | | 25.8 | | | ENE | 11 | |
| 22 | Fr | 16.6 | 31.1 | 0 | | | N | 39 | 09:25 | 25.5 | | | NNW | 17 | | 30.9 | | | N | 7 | |
| 23 | Sa | 18.5 | 30.0 | 0 | | | N | 26 | 11:19 | 23.0 | | | | Calm | | 26.0 | | | ESE | 7 | |
| 24 | Su | 19.4 | 31.1 | 0 | | | N | 20 | 13:24 | 22.6 | | | NNW | 7 | | 30.7 | | | NNW | 9 | |
| 25 | Mo | 15.2 | 27.6 | 0 | | | ESE | 22 | 13:42 | 21.3 | | | NE | 2 | | 26.4 | | | SE | 11 | |
| 26 | Tu | 18.1 | 28.3 | 0 | | | NE | 22 | 14:40 | 22.5 | | | | Calm | | 26.8 | | | ENE | 9 | |
| 27 | We | 15.9 | 29.5 | 0 | | | NNE | 22 | 14:34 | 20.3 | | | | Calm | | 29.2 | | | ENE | 9 | |
| 28 | Th | 16.9 | 32.4 | 0 | | | N | 33 | 14:12 | 21.3 | | | | Calm | | 32.1 | | | NNW | 13 | |
| 29 | Fr | 14.0 | 21.6 | 3.0 | | | SE | 28 | 12:39 | 18.9 | | | SSE | 6 | | 21.1 | | | SE | 13 | |
| 30 | Sa | 10.0 | 23.9 | 0 | | | ENE | 20 | 13:54 | 14.8 | | | | Calm | | 22.7 | | | E | 11 | |
| 31 | Su | 14.2 | 25.1 | 0 | | | WNW | 24 | 09:09 | 17.3 | | | | Calm | | 23.6 | | | SE | 9 | |
| **Statistics for March 2013** | | | | | | | | | | | | | | | | | | | | | |
| Mean | | 15.5 | 26.1 | | | | | | | 19.9 | 94 | | | 3 | | 25.3 | 65 | | | 10 | |
| Lowest | | 10.0 | 19.5 | | | | | | | 14.8 | 62 | | | Calm | | 18.8 | 43 | | SE | 6 | |
| Highest | | 19.9 | 32.4 | 64.4 | | | # | 46 | | 25.5 | 100 | | NNW | 17 | | 32.1 | 100 | | SE | 19 | |
| Total | | | | 193.8 | | | | | | | | | | | | | | | | | |

Observations were drawn from Gosford (Narara Research Station) AWS {station 061087}

The closest station with pressure observations is at Norah Head about 27 km to the northeast. The closest station with cloud and evaporation data is at Peats Ridge about 15 km to the northwest . The closest station with sunshine observations is at Sydney Airport about 59 km to the south.

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