



**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**

**FEBRUARY 2009**

A handwritten signature in black ink that reads 'Colin Davies'.

---

Colin Davies BSc MEIA CENVP  
Environmental Scientist  
18 March 2009

© Carbon Based Environmental Pty Limited 2009. This document was prepared solely for the original recipient and no third party must rely or use any information without the consent of Carbon Based Environmental Pty Limited. Carbon Based Environmental Pty Limited and the author accept no responsibility to any third party who uses or relies upon the information contained in this report.

## 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;
- Ground Waters; and
- Meteorological Station.

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

- Dust Deposition results for February 2009;
- Surface Water quality results for February 2009;
- Ground Water depth and quality results for February 2009; and
- Meteorological report for February 2009.

The February 2009 dust deposition results were generally similar to January 2009. All sites, on a year to date average basis, are currently below the Air Quality Management Plan exceedence level of 3.7g/m<sup>2</sup>.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 5 March 2009 at sites A, C, and F. The other sites were not flowing at the time of sampling. At the time of sample collection, there was no water discharge observed from the site. Results show generally good quality water with all sites sampled maintaining pH within the slightly acidic range, low Electrical Conductivity, low Total Dissolved Solids and Total Suspended Solids and no detectable Oil and Grease.

Groundwaters were sampled for normal monthly monitoring on 5 March 2009. Groundwater depths decreased at the majority of monitoring bores this month, indicating water moving towards the surface. There was a slight increase in pH at all bores this month. EC levels generally remained stable.

The meteorological station data recovery for the month was approximately 100%. The predominant winds were from the E-ESE, with strongest winds from the ESE. Recorded rainfall on site for February was 225.0mm, higher than that recorded at the BOM Peats Ridge Station and above the Peats Ridge long-term average for February. Results are detailed below:

Rocla Calga Quarry	225.0mm
BOM Peats Ridge*	209.2mm
BOM Gosford*	254.4mm
BOM Peats Ridge Long term mean for February*	160.9mm

\*Data sourced from Bureau of Meteorology (BOM) website ([www.bom.gov.au](http://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, DEC (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<sup>2</sup>.month.

Surface water 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.

Groundwater sites are monitored 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.

## 2.0 MONTHLY RESULTS

### 2.1 DUST DEPOSITION GAUGES

**Table 1** displays the results for February 2009 and the project average. Results are in g/m<sup>2</sup>.month.

**Table 1: Dust Deposition results: 04-Feb-2009 to 05-Mar-2009**

Site	Monthly Insoluble Solids	Monthly Ash Residue	Monthly Combustible Matter	Monthly Ash Residue/ Insoluble Solids %	Current Project Average Insoluble Solids
CD1	1.8	1.5	0.3	83	1.3
CD2b	9.2*	7.5	1.7	81	1.7
CD3	1.8	1.0	0.8	56	0.8
CD4	1.3	0.6	0.7	46	1.0
CD5	1.4	0.6	0.8	43	0.9
CD6	0.9	0.5	0.4	56	1.2

Insoluble Solids marked with an \* indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen, seeds), and insects. Results in bold indicate insoluble solids levels above 3.7 g/m<sup>2</sup>.month, the Development Consent annual average amenity criteria at residential locations. Project average was calculated from the 28 October 2005 (start of the Development Consent period) from results supplied by Rocla or from the installation date of the gauges.

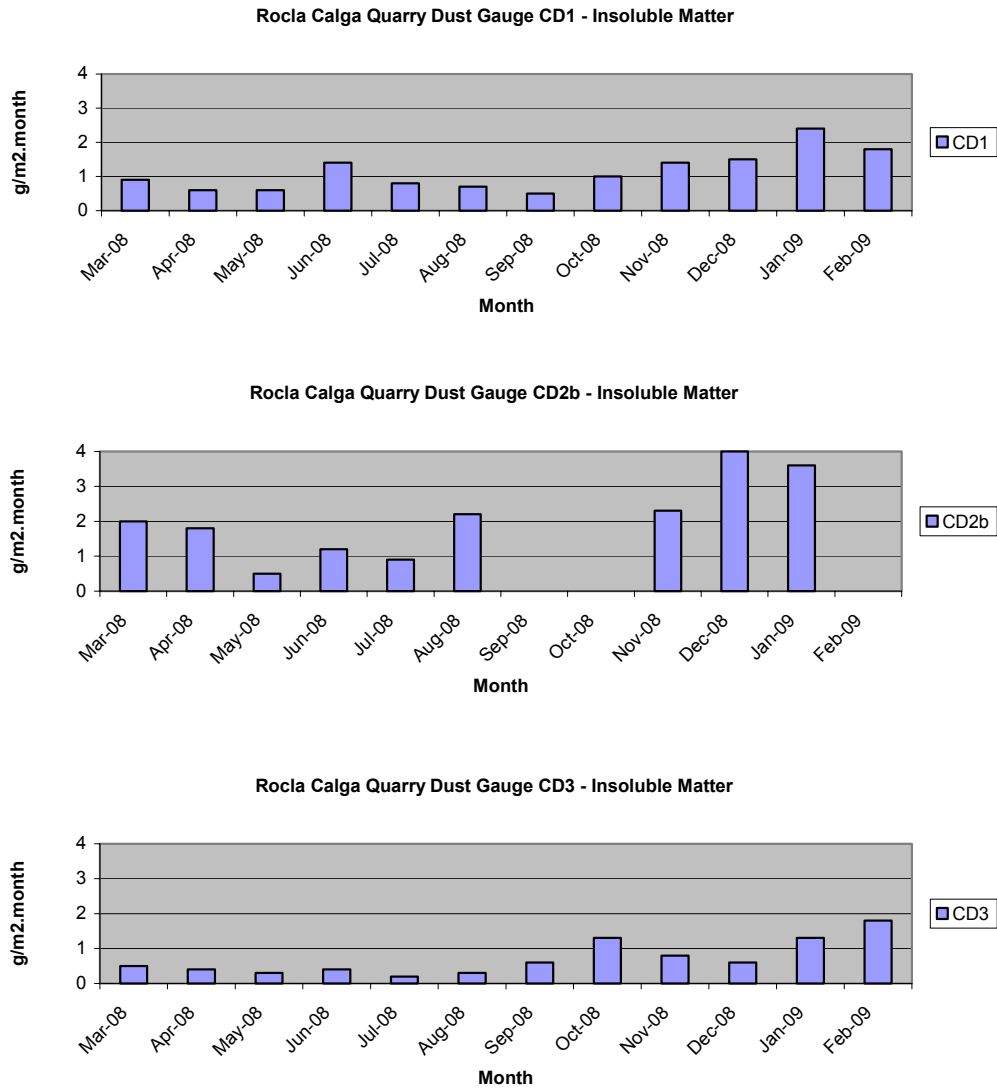
NA= Not Available.

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.

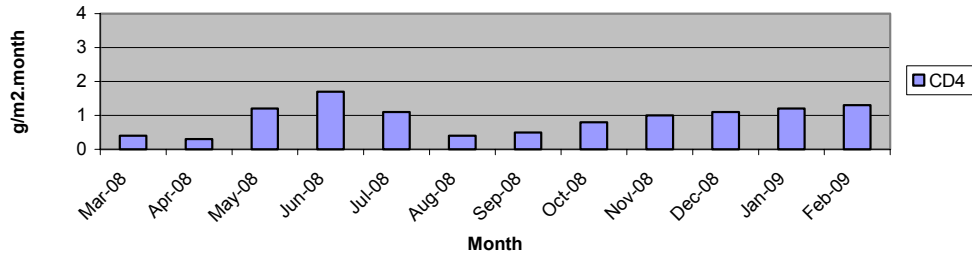
Dust deposition charts for all dust gauge sites appear in **Figure 1** below. The laboratory analysis is provided in **Appendix 1**.

The predominant winds were from the E-ESE, with strongest winds from the ESE.

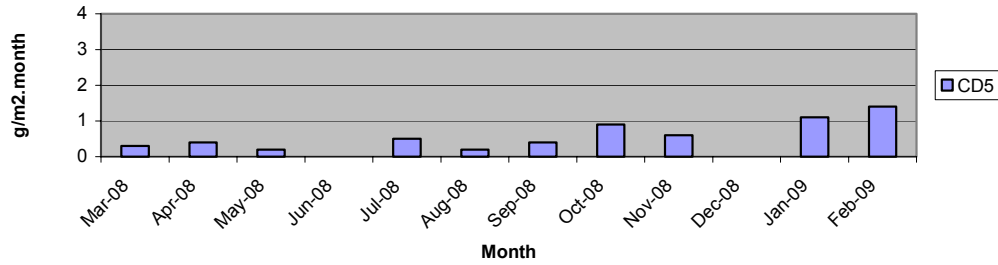
**Figure 1: Dust Deposition Charts**



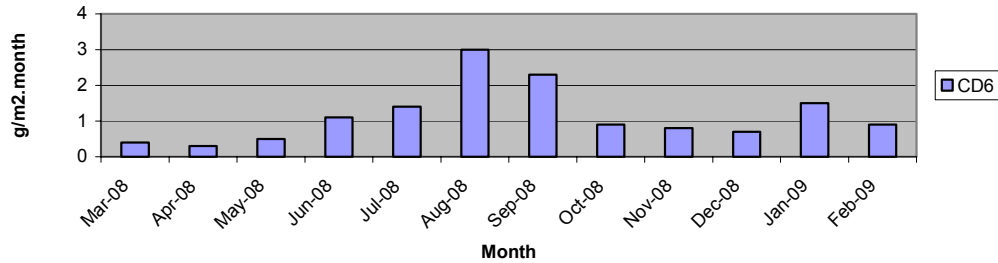
Rocla Calga Quarry Dust Gauge CD4 - Insoluble Matter



Rocla Calga Quarry Dust Gauge CD5 - Insoluble Matter



Rocla Calga Quarry Dust Gauge CD6 - Insoluble Matter



## 2.2 WATER MONITORING

### 2.2.1 Surface Waters

Monthly surface water monitoring was conducted on the 5 March 2009 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1**.

**Table 2: Monthly surface water monitoring – February 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	Clear	Clear	5.47	66	55	10	<5
B	Not Flowing	---	---	---	---	---	---	---
C	Trickle	Clear	Clear	5.55	92	66	5	<5
D	Not Flowing	---	---	---	---	---	---	---
F	Dam	Clear	Clear	5.39	62	45	8	<5

At the time of sampling, there were no water discharges off site from any sampling location.

There was a slight flow of water at site C at the time of sampling, and two samples were taken from dams A and F. The samples were collected and analysed for a monthly sampling event. Results show generally good water quality with slightly acidic pH, low Electrical Conductivity, low Total Dissolved Solids and Total Suspended Solids and no detectable Oil and Grease.

### 2.2.2 Ground Waters

Groundwaters were sampled on 5 March 2009. 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 2 to 5**.

Groundwater depths decreased at the majority of monitoring bores this month, indicating water moving towards the surface. The CP series of bores generally show larger increases and decreases in depth to water due to pumping from the bores. Longer term monitoring is required to fully evaluate groundwater depth trends.

There was a slight increase in pH at all bores this month. EC levels generally remained stable. Detailed biannual water quality monitoring was last conducted in October 2008 and is next due in April 2009.

**Table 3: Ground Water Quality Data**

Reference	Bore	Type	Depth to water TOC (m) April 06	Depth to water TOC (m) This report	pH This report	Electrical Conductivity (uS/cm) This report
CQ1	Voutos	* Monitor	20.59	19.48	4.2	150
CQ3	Voutos	* Monitor	10.53	10.38	5.8	160
CQ4	Voutos	* Monitor	8.78	6.93	4.8	110
CQ5	Gazzana	DIP Only	8.69	5.42	4.3	190
CQ6	Gazzana	DIP Only	16.00	10.53	4.2	250
CQ7	Gazzana	* Monitor	6.89	5.94	4.5	100
CQ8	Gazzana	* Monitor	11.03	5.74	4.3	190
CQ9	Gazzana	DIP Only	10.10	8.93	5.2	120
CQ10	Voutos	* Monitor	NI	22.23	4.3	180
CQ11S	Gazzana	* Monitor	NI	8.39	4.4	170
CQ11D	Gazzana	* Monitor	NI	9.78	5.8	150
CQ12	Gazzana	* Monitor	NI	4.02	4.3	160
CQ13	Kashouli	* Monitor	NI	12.65	5.1	200
CP3	Gazzana	Domestic	10.40	7.35	4.6	160
CP4	Kashouli	Domestic	13.63	9.09	NM	NM
CP5	Kashouli	Domestic	16.61	15.24	4.2	270
CP6	Kashouli	Domestic	16.27	18.44	4.2	230
CP7	Kashouli	Production	8.56	2.16	5.0	290
CP8	Rozmanec	Domestic	22.17	NR	NR	NR
MW7	Rocla Bore	* Monitor	15.76	15.37	4.4	130
MW8	Rocla Bore	* Monitor	9.82	7.37	4.6	100
MW9	Rocla Bore	* Monitor	22.44	21.52	4.4	110
MW10	Rocla Bore	* Monitor	15.41	13.29	4.5	130
MW13	Rocla Bore	DIP Only	NI	7.61	4.7	120
MW16	Rocla Bore	DIP Only	NI	8.26	4.5	130

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.

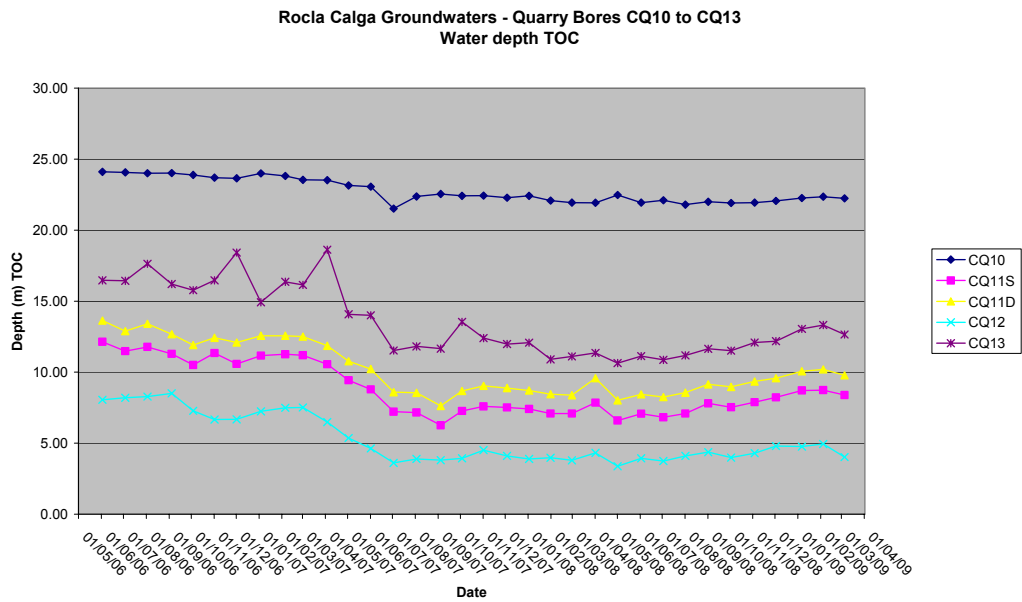
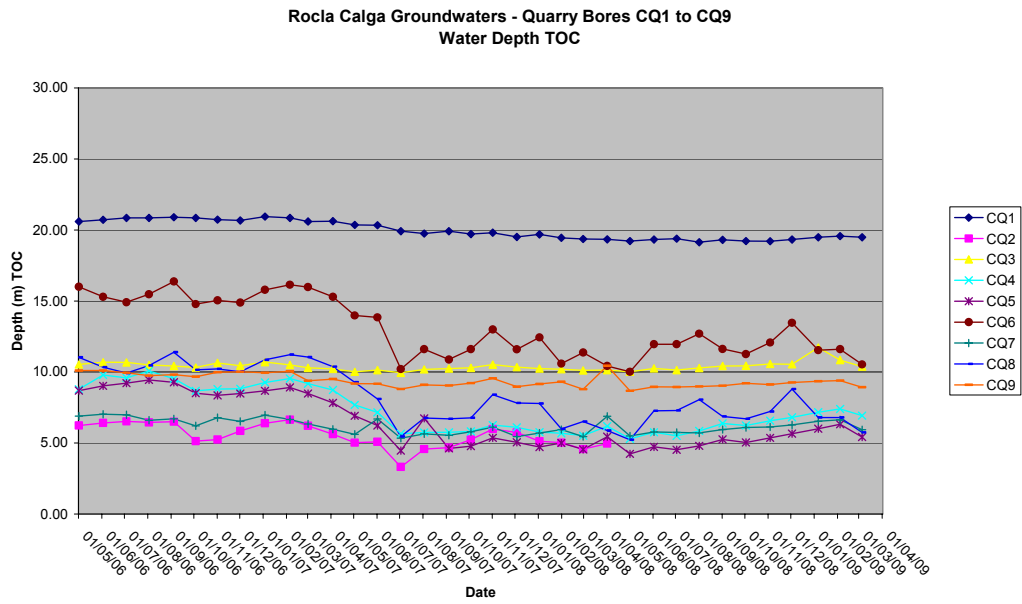
CQ2 was “mined out” in April 2008 and has been removed from the monitoring schedule.

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

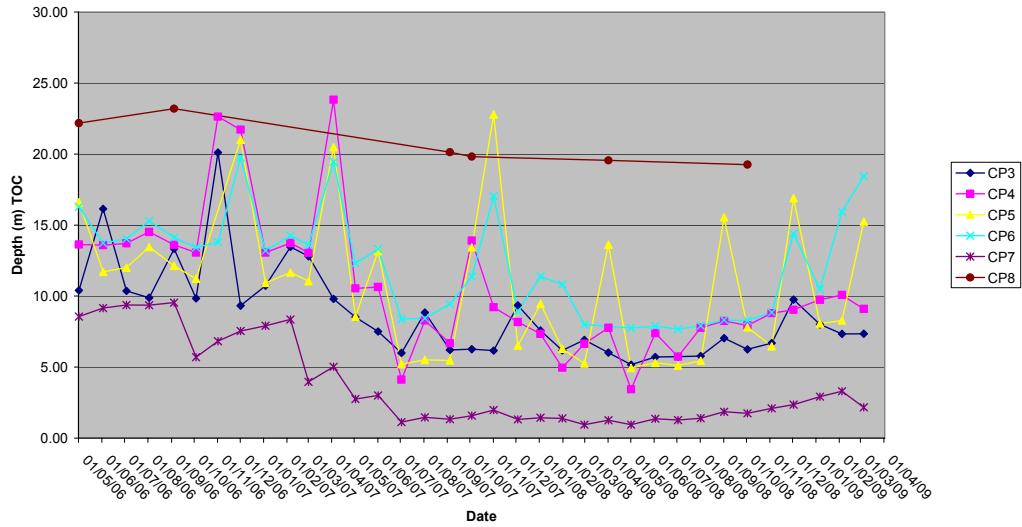
	Increase to ground water depth (water moved away from surface)
	Decrease to ground water depth (water moved towards surface)
	Stable water depth (+/- 0.01m)

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

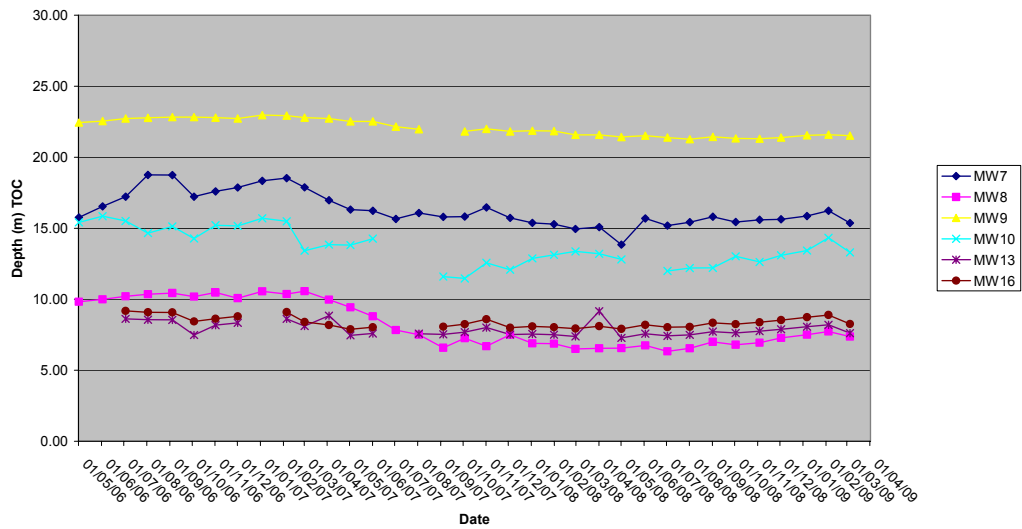
Figures 2 to 5: Groundwater Depth Charts.



Rocla Calga Groundwaters - Quarry Bores CP3 to CP8  
Water Depth TOC



Rocla Calga Groundwaters - Quarry Bores MW7 to MW16  
Water Depth TOC



### **2.3 METEOROLOGICAL MONITORING**

The Rocla Calga Quarry weather station data recovery in February 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 two nearby Bureau of Meteorology (BOM) stations, Peats Ridge and Gosford are included in **Appendix 2** for comparison purposes.

Data for February 2009 shows higher rainfall at the Rocla Calga Quarry station compared to the nearby Peats Ridge BOM station and lower than the Gosford BOM station. The rainfall comparison is provided below:

Rocla Calga Quarry	225.0mm
BOM Peats Ridge*	209.2mm
BOM Gosford*	254.4mm
BOM Peats Ridge Long term mean for February*	160.9mm

\*Data sourced from Bureau of Meteorology (BOM) website ([www.bom.gov.au](http://www.bom.gov.au))

**Results are displayed in the following table and figures.**

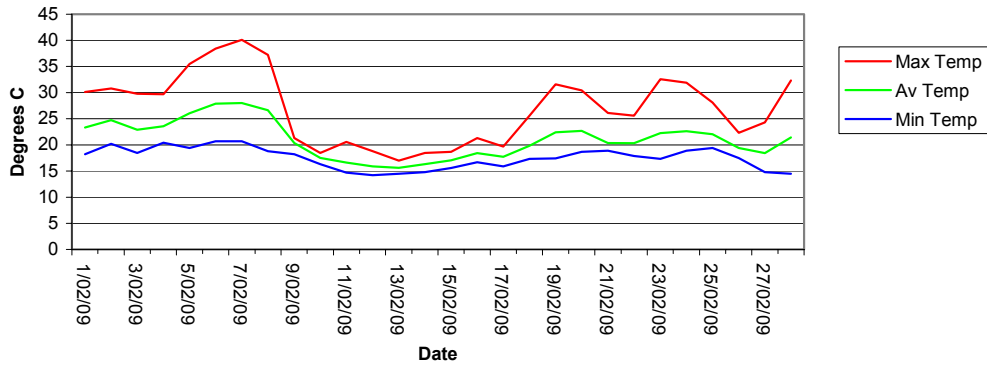
### 2.3.1 Monthly Meteorological Data Summary

Summary Feb-09 Rocla - Calga

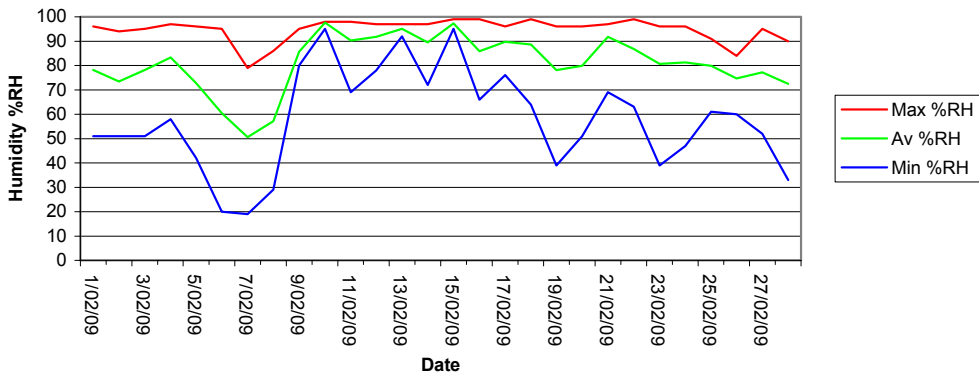
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	ET mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Solar Rad	Av Solar Rad	Max Solar Rad	Min Data %	Av data %	Max Data %
1/02/09	18.2	23.3	30.1	51	78	96	0.2	5.7	0	2.0	8.9	18.3	31.3	1011.4	1014.1	1016.9	0	311.9	1002	96.5	99.3	100
2/02/09	20.2	24.7	30.8	51	73	94	0.2	6.2	0	2.2	12.5	20.3	33.3	1008.9	1012.7	1016.4	0	320.1	1002	93	99.0	100
3/02/09	18.5	22.9	29.8	51	78	95	0.6	5.1	0	2.0	8.5	18.6	31.2	1007.9	1009.5	1011.7	0	272.7	1038	84.2	98.5	100
4/02/09	20.4	23.6	29.7	58	83	97	0.4	3.8	0	1.5	7.6	20.4	32.2	1006.8	1009.1	1011	0	207.0	880	86.5	99.0	100
5/02/09	19.4	26.0	35.5	42	73	96	0.2	6.1	0	1.5	9.8	19.4	40	1003.3	1006.2	1008.6	0	309.7	964	95.6	99.1	100
6/02/09	20.7	27.9	38.4	20	60	95	0.0	7.1	0	2.0	11.2	20.7	39.9	1004.9	1007.0	1009.8	0	305.2	958	94.2	99.6	100
7/02/09	20.7	28.0	40.1	19	51	79	0.0	7.3	0	2.1	10.7	20.8	39.9	1008.1	1009.9	1012.5	0	294.3	966	96.5	99.8	100
8/02/09	18.8	26.6	37.2	29	57	86	0.0	6.8	0	1.9	8.9	18.9	38.5	1004	1007.8	1010.7	0	317.3	975	92.4	99.5	100
9/02/09	18.2	20.4	21.3	80	86	95	3.4	1.3	0.9	2.1	8	18.2	22.2	1008.6	1010.4	1013.8	0	51.4	204	94.7	99.1	100
10/02/09	16.3	17.5	18.5	95	98	98	17.2	0.5	0.4	1.7	11.2	16.4	19.2	1007.9	1010.2	1012.3	0	36.6	176	89.8	97.7	100
11/02/09	14.7	16.6	20.6	69	90	98	11.2	1.8	0.4	2.6	8.5	13.7	20.8	1009.1	1011.0	1014.4	0	97.8	865	79.8	96.4	100
12/02/09	14.2	15.9	18.8	78	92	97	19.2	1.6	0	1.9	9.4	13.8	19.3	1013.7	1017.5	1022.3	0	113.0	795	84.5	97.7	100
13/02/09	14.5	15.6	17	92	95	97	24.4	1.1	0	2.1	9.8	14.2	17.2	1021.5	1023.4	1025.3	0	78.5	503	95.9	99.8	100
14/02/09	14.8	16.3	18.5	72	89	97	33.2	1.1	0	2.4	9.8	14.7	18.6	1016	1019.6	1023.3	0	60.6	391	93	99.2	100
15/02/09	15.6	17.0	18.7	95	97	99	46.0	0.8	0.4	2.3	10.7	15.4	19.3	1012.8	1013.9	1015.9	0	57.8	336	88.6	95.8	100
16/02/09	16.7	18.4	21.3	66	86	99	32.2	2.7	0.4	4.0	13.4	16.1	21	1013.7	1015.9	1017.9	0	124.6	647	93	99.1	100
17/02/09	15.9	17.7	19.7	76	90	96	8.6	1.1	0	2.0	9.4	15.9	20.2	1012.6	1015.0	1017.2	0	61.9	324	98.8	100.0	100
18/02/09	17.3	19.9	25.6	64	89	99	7.0	2.6	0	2.8	12.1	17	26.3	1006.3	1008.8	1012.3	0	154.2	793	88	99.8	100
19/02/09	17.4	22.4	31.6	39	78	96	0.0	4.1	0	1.4	8.5	17.4	33	1004	1006.6	1009.2	0	240.9	975	98.5	99.9	100
20/02/09	18.7	22.7	30.4	51	80	96	0.0	4.6	0	1.3	7.6	18.7	33.1	1008.2	1009.9	1012.6	0	268.0	1080	97.7	99.9	100
21/02/09	18.9	20.4	26.1	69	92	97	12.6	1.5	0	1.1	6.7	18.9	27.1	1009.7	1012.3	1015.6	0	88.2	896	87.4	98.7	100
22/02/09	17.9	20.3	25.6	63	87	99	0.6	3.5	0	1.3	6.3	17.9	26.1	1015	1016.5	1018.4	0	206.9	1048	92.1	99.6	100
23/02/09	17.3	22.3	32.6	39	81	96	7.4	4.5	0	1.5	11.6	17.3	35.4	1010.7	1014.5	1017.1	0	258.2	1039	95.6	99.4	100
24/02/09	18.9	22.6	31.9	47	81	96	0.2	4.8	0	2.4	8.5	18.9	34.1	1011.5	1013.1	1015.3	0	260.9	957	85.7	97.4	100
25/02/09	19.4	22.1	28.1	61	80	91	0.0	3.7	0	1.5	8.5	19.4	29.3	1012.5	1014.7	1018	0	205.6	1071	89.2	97.1	100
26/02/09	17.5	19.4	22.3	60	75	84	0.0	3.0	0	2.2	9.4	17.5	22	1016.9	1018.3	1020	0	145.6	1030	87.4	97.0	100
27/02/09	14.8	18.4	24.3	52	77	95	0.2	3.9	0.4	1.6	7.6	14.9	24.3	1013.3	1016.0	1019.1	0	219.2	1040	93.9	99.9	100
28/02/09	14.5	21.4	32.3	33	72	90	0.0	4.8	0	1.6	8.9	14.6	34.3	1004.1	1007.8	1013.6	0	257.8	1062	90.4	99.7	100
Monthly	14.2	21.1	40.1	19	81	99	225.0	101.2	0	2.0	13.4	13.7	40	1003.3	1012.6	1025.3	0	190.2	1080	79.8	98.8	100

2.3.2 Monthly weather charts

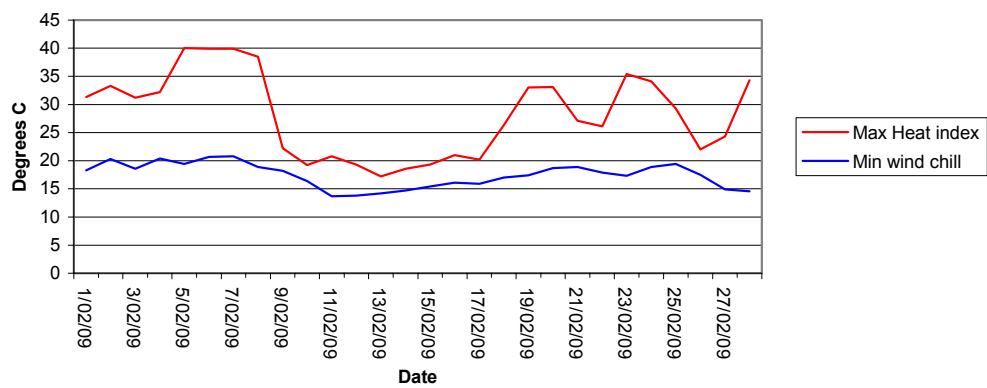
Rocla Calga Quarry - February 2009  
Air Temperature

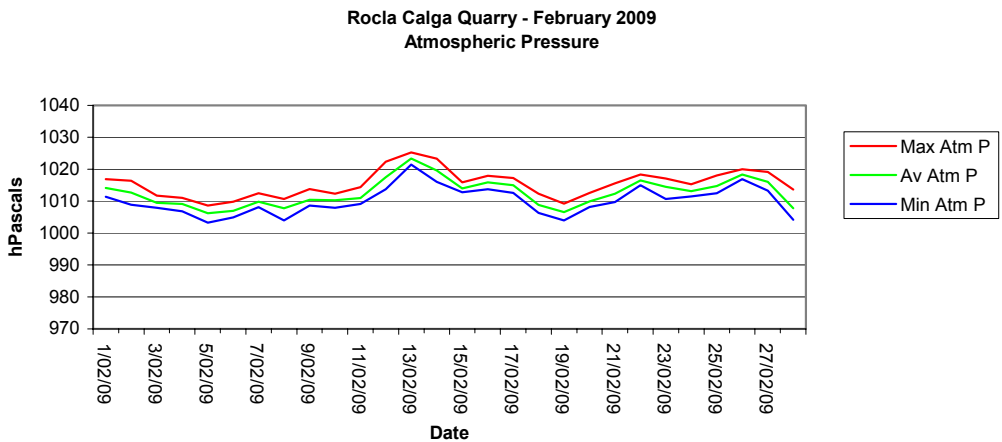
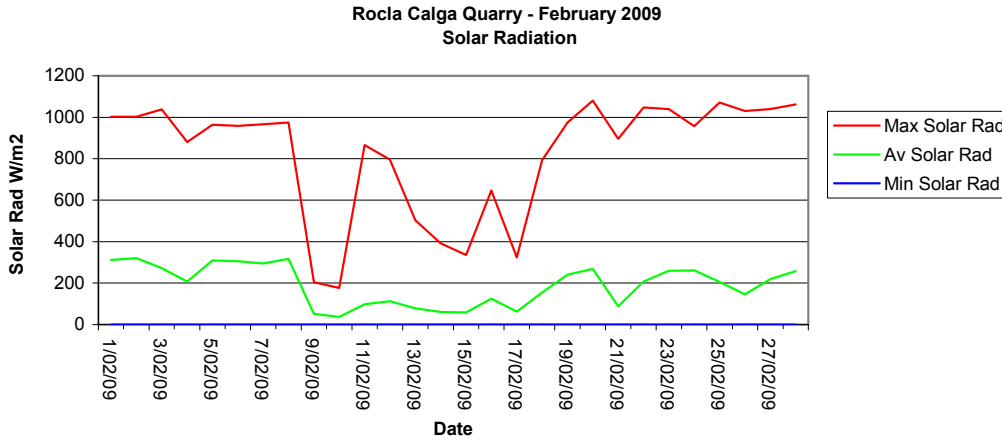
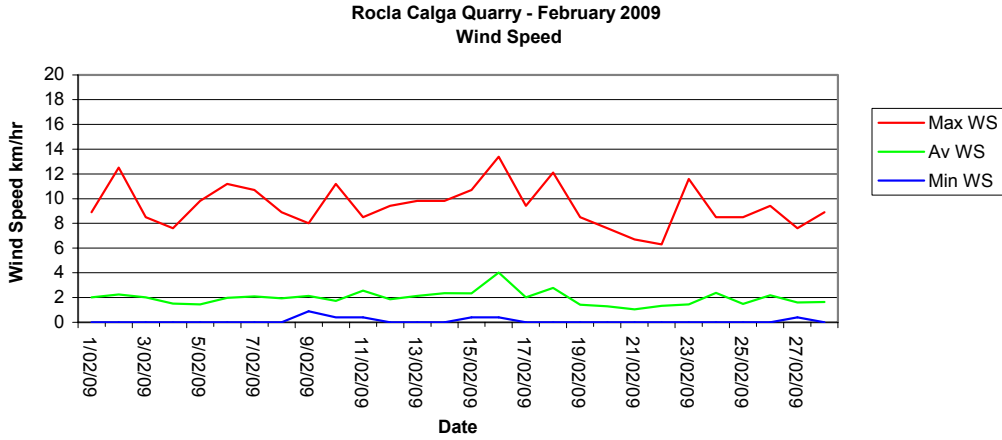


Rocla Calga Quarry - February 2009  
Humidity

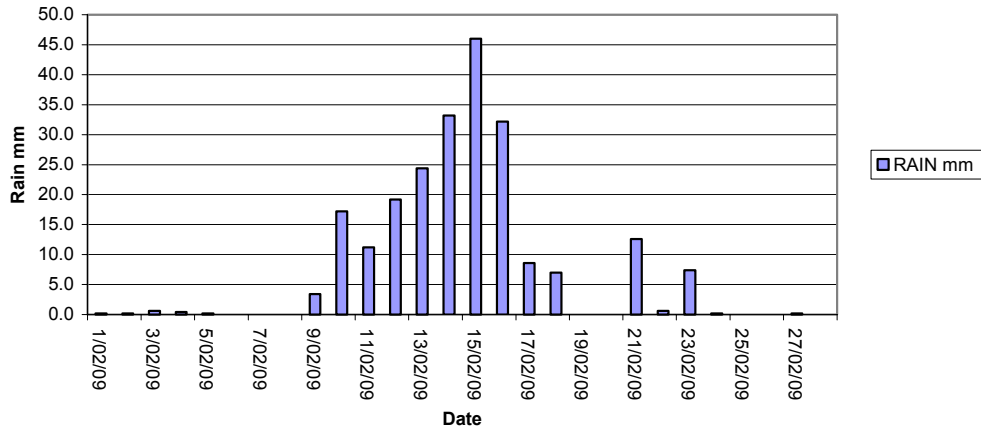


Rocla Calga Quarry - February 2009  
Heat Index/Wind Chill

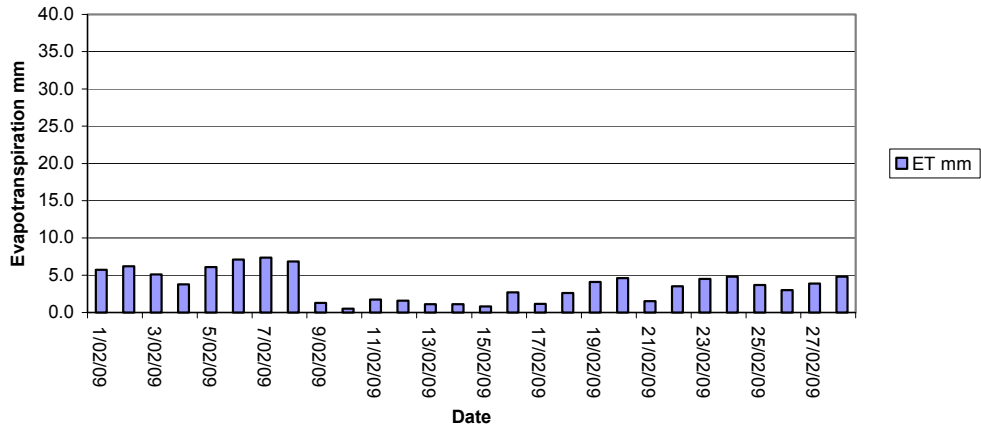




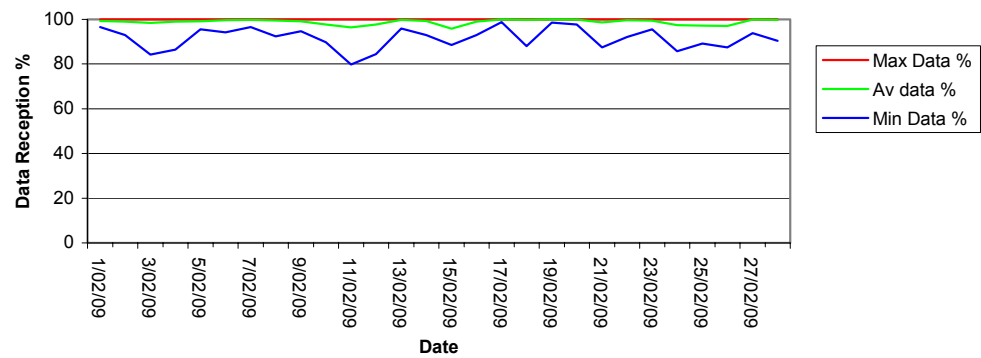
Rocla Calga Quarry - February 2009  
Rainfall



Rocla Calga Quarry - February 2009  
Evapotranspiration



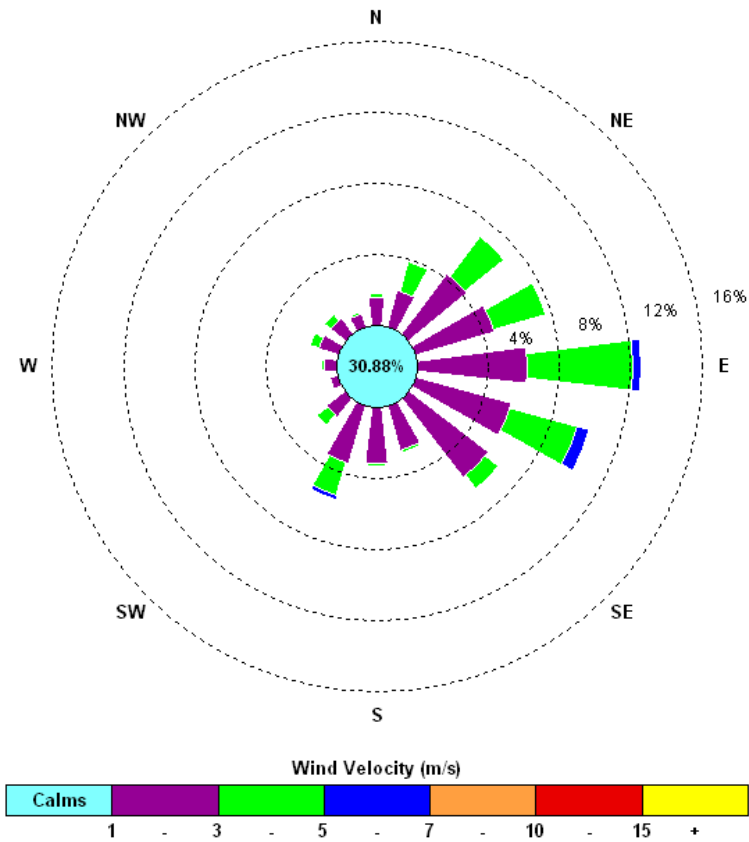
Rocla Calga Quarry - February 2009  
Data Reception



### 2.3.3 Windrose plot

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

00:00, 1 February 2009 – 23:45, 28 February 2009



The windrose shows predominant winds were from the E-ESE, with strongest winds from the ESE. The maximum wind speed was 13.4 m/s from the E.

**APPENDIX 1**  
**LABORATORY CERTIFICATES**

## **APPENDIX 2**

### **ADDITIONAL BUREAU OF METEOROLOGY DATA FROM PEATS RIDGE AND GOSFORD MONITORING STATIONS**



