



**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 2009

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Environmental Scientist
14 April 2009

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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 March 2009;
- Surface Water quality results for March 2009;
- Ground Water depth and quality results for March 2009; and
- Meteorological report for March 2009.

The March 2009 dust deposition results were generally similar to February 2009. All sites, on a year to date average basis, are currently below the Air Quality Management Plan exceedence level of 3.7g/m².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 2 April 2009 at sites A, B, C, D and F, as well as an additional site (“Inflow”). At the time of sample collection, there was no water discharge observed from the site. Results show generally good quality water with most 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. Site F did however show a marked increase in pH compared to last month. Sites B and D also returned slightly elevated TSS results which are likely to be caused by runoff from the recent rainfall.

Groundwaters were sampled for normal monthly monitoring on 8 April 2009. Groundwater depths decreased at the majority of monitoring bores this month, indicating water moving towards the surface. pH and EC levels remained relatively steady compared to the previous month.

The meteorological station data recovery for the month was approximately 100%. The predominant winds were from the NNE-ESE, with strongest winds from the ESE. Recorded rainfall on site for March was 71.4mm, higher than that recorded at the BOM Peats Ridge Station but below the Peats Ridge long-term average for March. Results are detailed below:

Rocla Calga Quarry	71.4mm
BOM Peats Ridge*	37.0mm
BOM Gosford*	80.6mm
BOM Peats Ridge Long term mean for March*	138.6mm

*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, 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/m².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 March 2009 and the project average. Results are in g/m².month.

Table 1: Dust Deposition results: 05-Mar-2009 to 02-Apr-2009

Site	Monthly Insoluble Solids	Monthly Ash Residue	Monthly Combustible Matter	Monthly Ash Residue/ Insoluble Solids %	Current Project Average Insoluble Solids
CD1	2.0	1.3	0.7	65	1.3
CD2b	10.4*	9.1	1.3	88	1.7
CD3	1.1	0.5	0.6	45	0.8
CD4	0.7	0.2	0.5	29	1.0
CD5	1.2	0.6	0.6	50	0.9
CD6	1.4	0.6	0.8	43	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/m².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.

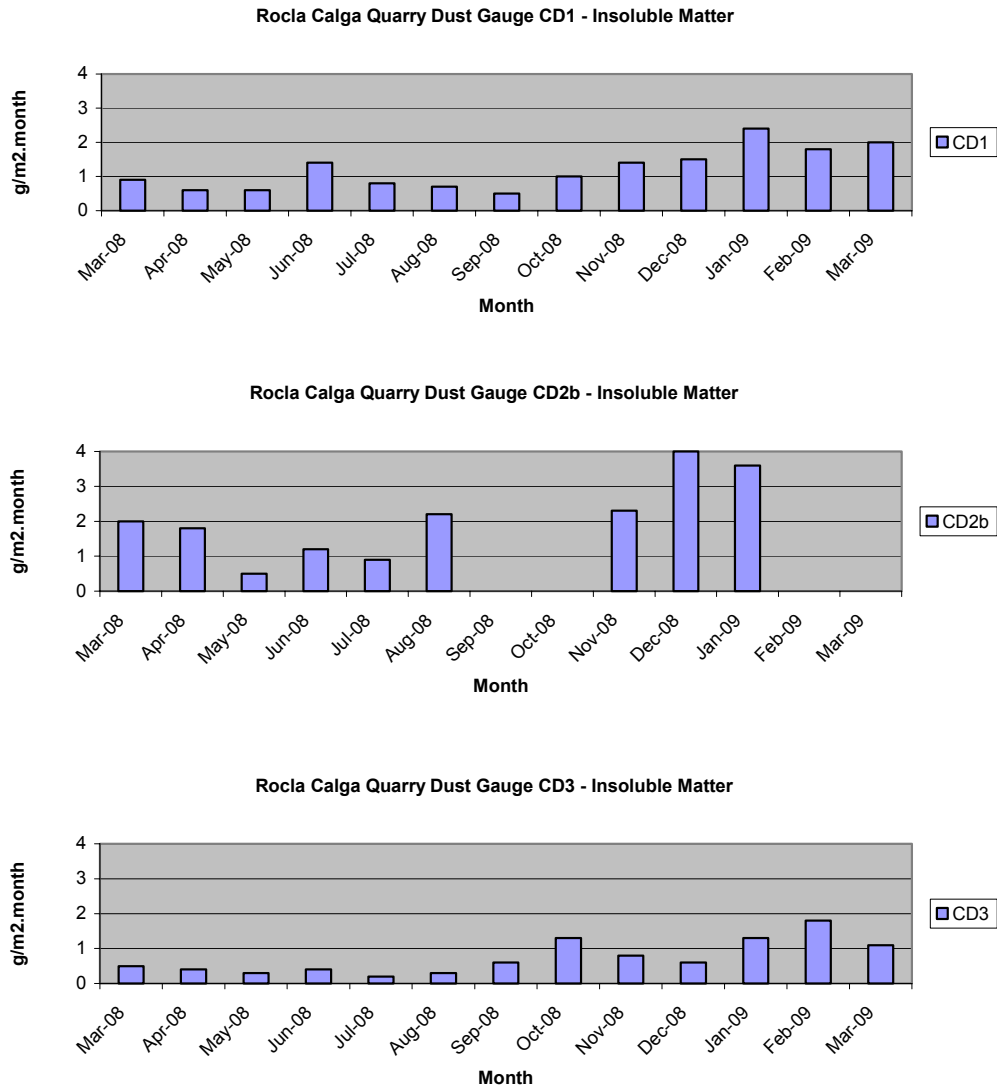
NA= Not Available.

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.

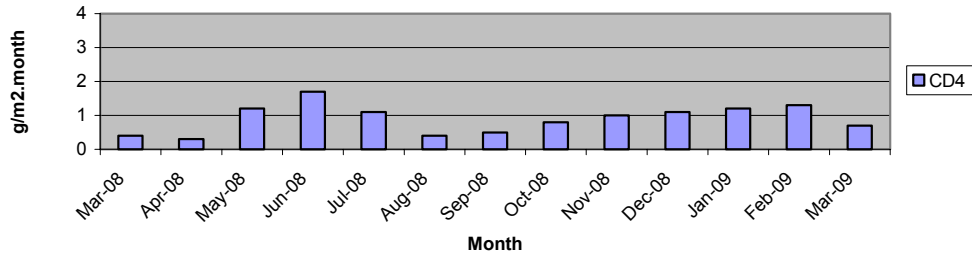
Dust deposition charts for all dust gauge sites appear in **Figure 1** below. The laboratory analysis is provided in **Appendix 1**.

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

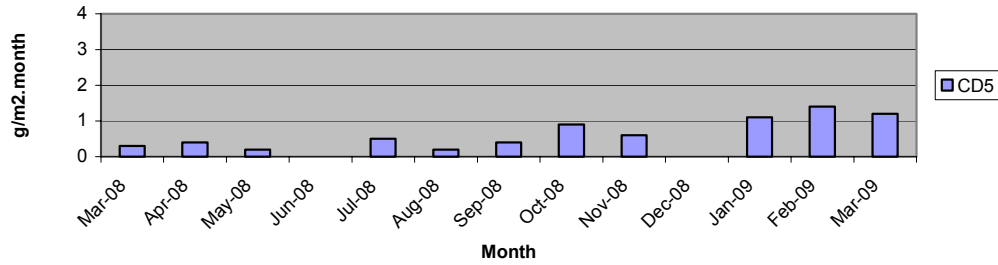
Figure 1: Dust Deposition Charts



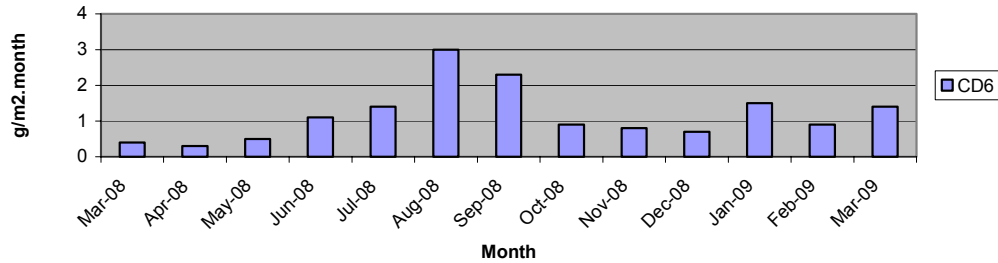
Rocla Calga Quarry Dust Gauge CD4 - Insoluble Matter



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 2 April 2009 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	Clear	Clear	5.42	66	46	4	<5
B	Steady	Clear	Clear	6.51	76	68	55	<5
C	Steady	Clear	Clear	6.24	83	59	18	<5
D	Slow	Brown	Clear	6.12	55	62	60	<5
F	Dam	Clear	Clear	8.80	71	46	12	<5
Inflow	---	---	---	6.04	45	65	22	<5

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

Sites B, C and D were flowing 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. Site F did however show a marked increase in pH compared to last month. Sites B and D also returned slightly elevated TSS results which are likely to be caused by runoff from the recent rainfall.

2.2.2 Ground Waters

Groundwaters were sampled on 8 April 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.

pH and EC levels generally remained steady. Detailed biannual water quality monitoring was conducted during April 2009 and is next due in October 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	19.59	4.3	130
CQ3	Voutos	* Monitor	10.53	10.36	5.9	140
CQ4	Voutos	* Monitor	8.78	6.91	4.9	80
CQ5	Gazzana	DIP Only	8.69	5.23	4.4	160
CQ6	Gazzana	DIP Only	16.00	10.27	4.2	240
CQ7	Gazzana	* Monitor	6.89	5.81	5.1	100
CQ8	Gazzana	* Monitor	11.03	5.54	4.4	170
CQ9	Gazzana	DIP Only	10.10	8.78	4.4	120
CQ10	Voutos	* Monitor	NI	22.35	4.6	180
CQ11S	Gazzana	* Monitor	NI	6.48	4.6	170
CQ11D	Gazzana	* Monitor	NI	9.76	5.9	130
CQ12	Gazzana	* Monitor	NI	3.79	4.3	160
CQ13	Kashouli	* Monitor	NI	12.34	5.2	190
CP3	Gazzana	Domestic	10.40	7.34	4.6	160
CP4	Kashouli	Domestic	13.63	7.74	NM	NM
CP5	Kashouli	Domestic	16.61	6.84	4.3	270
CP6	Kashouli	Domestic	16.27	9.18	4.2	230
CP7	Kashouli	Production	8.56	1.87	5.3	280
CP8	Rozmanec	Domestic	22.17	19.77	4.4	160
MW7	Rocla Bore	* Monitor	15.76	15.40	4.4	120
MW8	Rocla Bore	* Monitor	9.82	7.42	4.6	90
MW9	Rocla Bore	* Monitor	22.44	21.66	4.4	80
MW10	Rocla Bore	* Monitor	15.41	12.98	4.7	130
MW13	Rocla Bore	DIP Only	NI	7.51	4.7	100
MW16	Rocla Bore	DIP Only	NI	8.12	4.6	110

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.

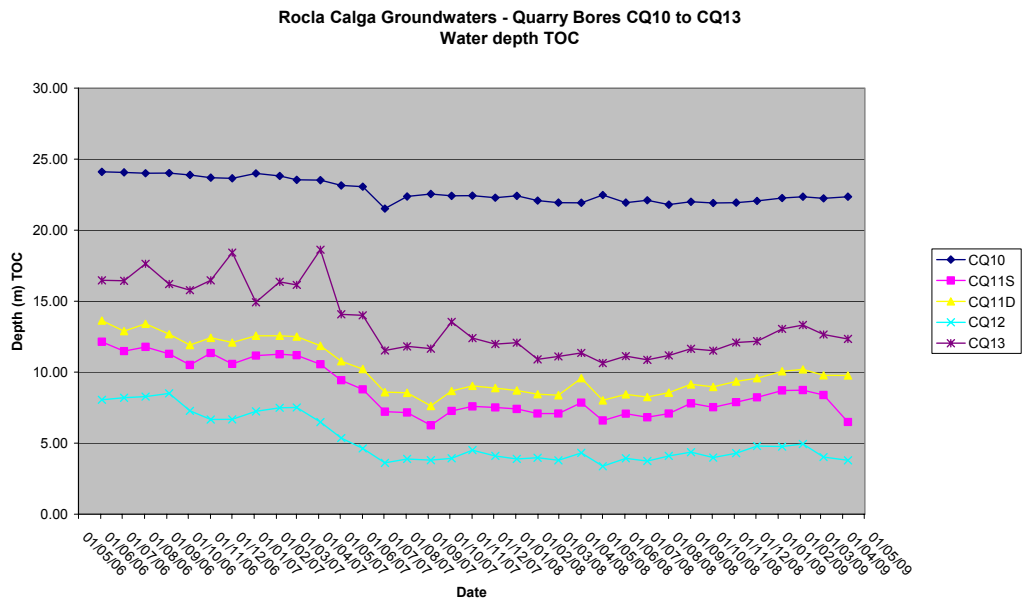
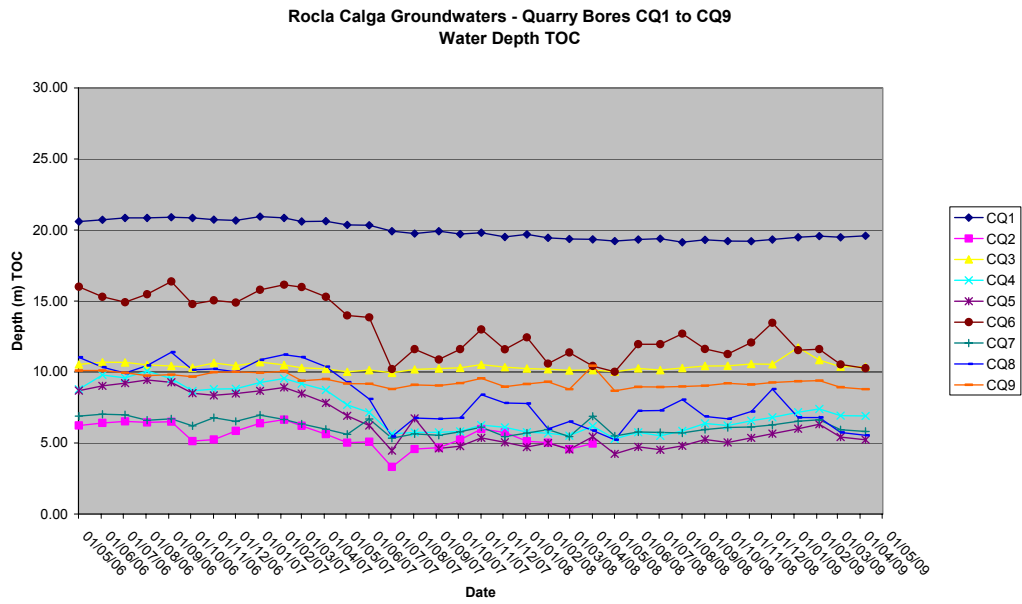
CQ2 was “mined out” in April 2008 and has been removed from the monitoring schedule.

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

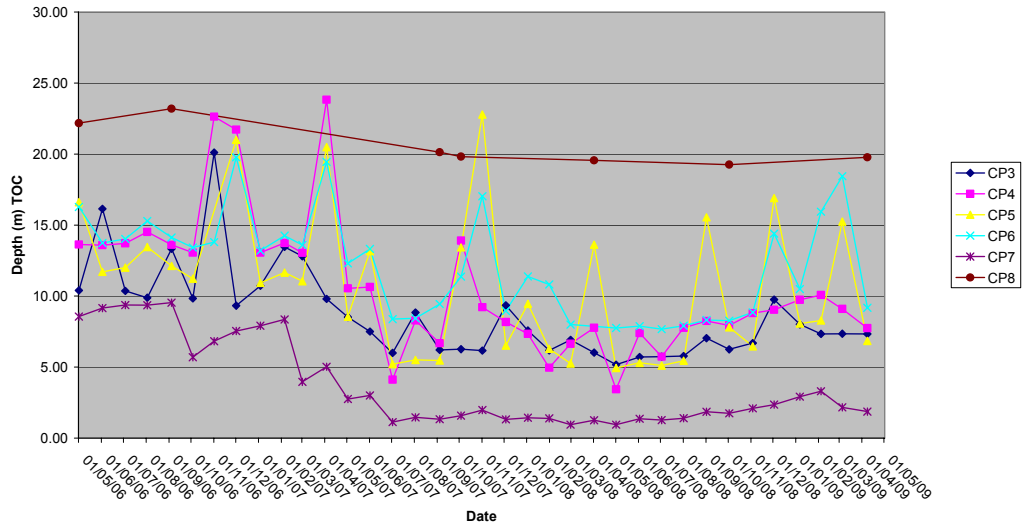
	Increase to ground water depth (water moved away from surface)
	Decrease to ground water depth (water moved towards surface)
	Stable water depth (+/- 0.01m)

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

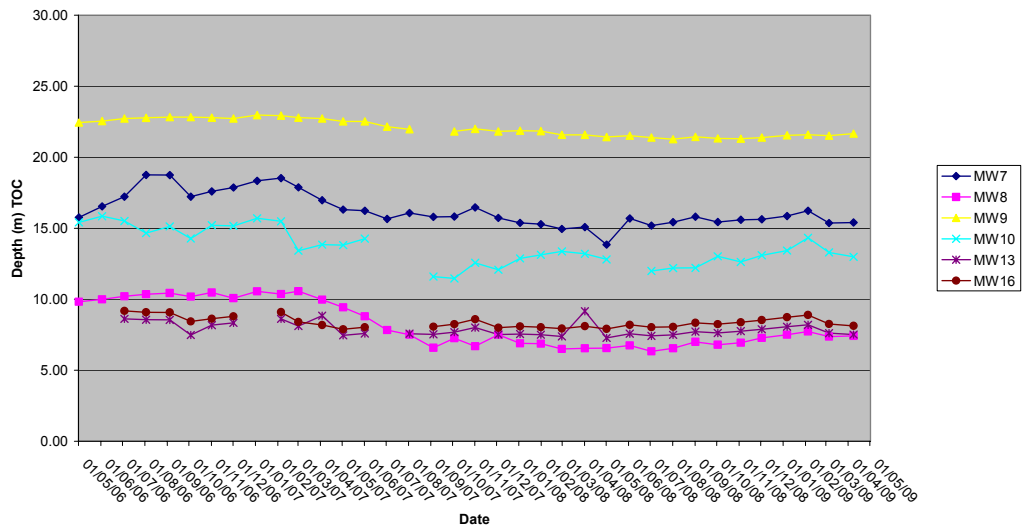
Figures 2 to 5: Groundwater Depth Charts.



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 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 two nearby Bureau of Meteorology (BOM) stations, Peats Ridge and Gosford are included in **Appendix 2** for comparison purposes.

Data for March 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	71.4mm
BOM Peats Ridge*	37.0mm
BOM Gosford*	80.6mm
BOM Peats Ridge Long term mean for March*	138.6mm

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

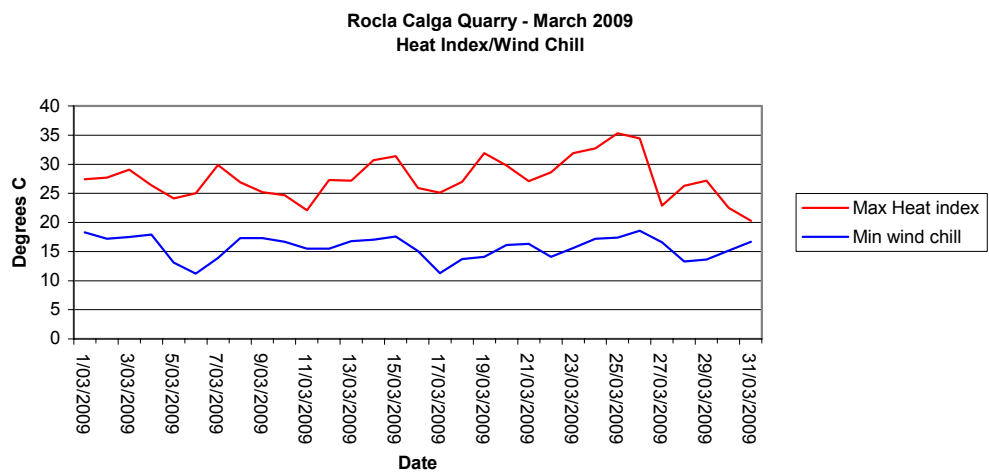
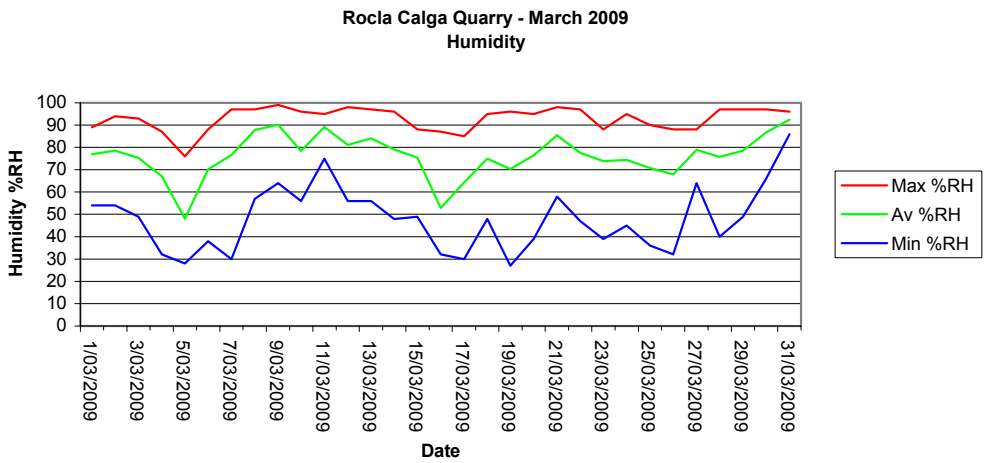
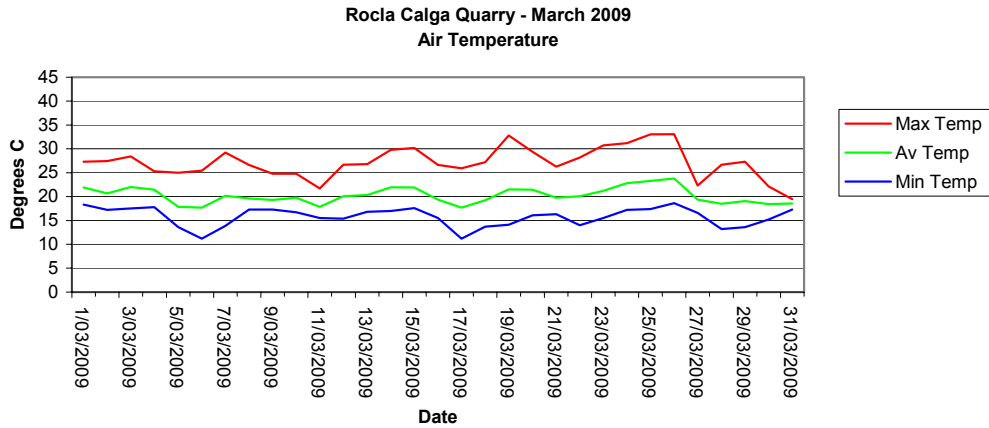
Results are displayed in the following table and figures.

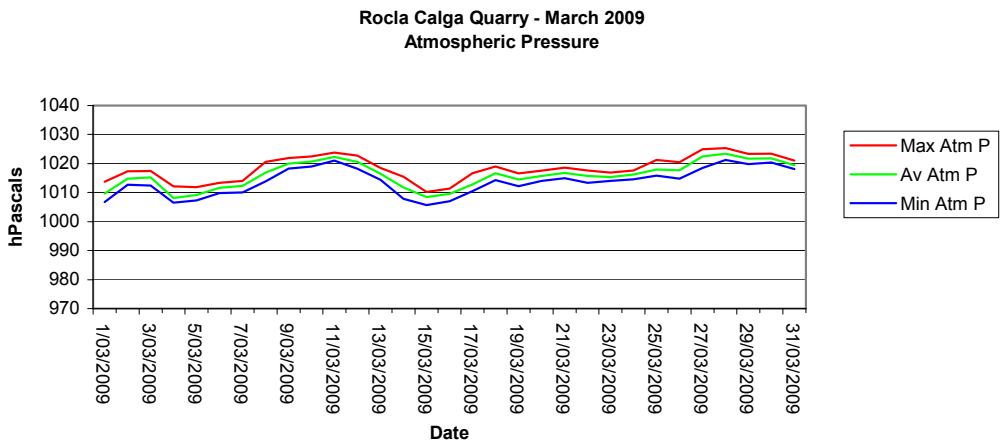
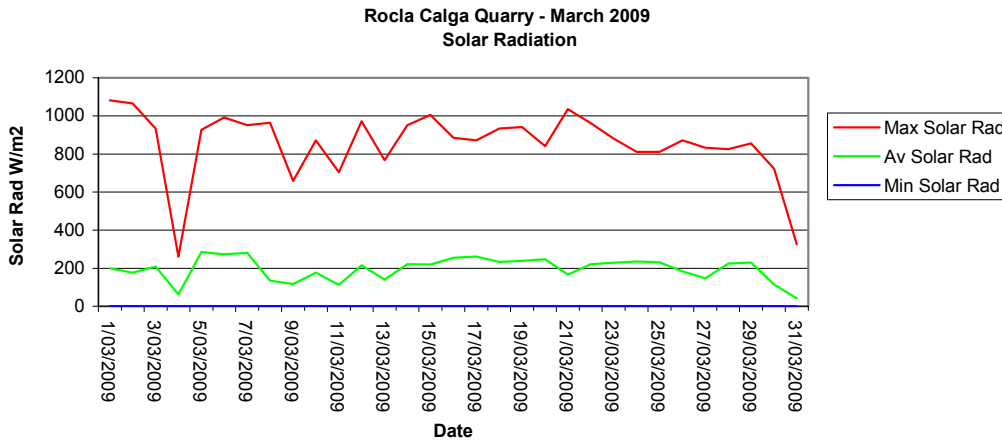
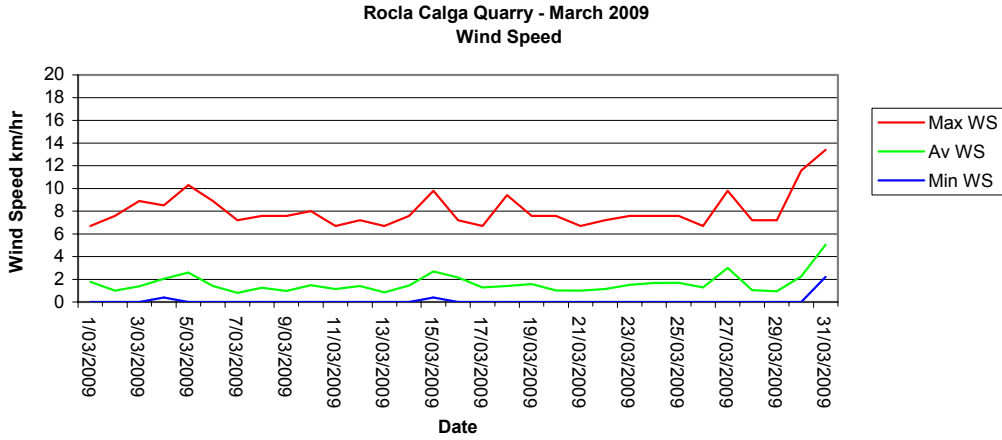
2.3.1 Monthly Meteorological Data Summary

Summary Mar-09 Rocla - Calga

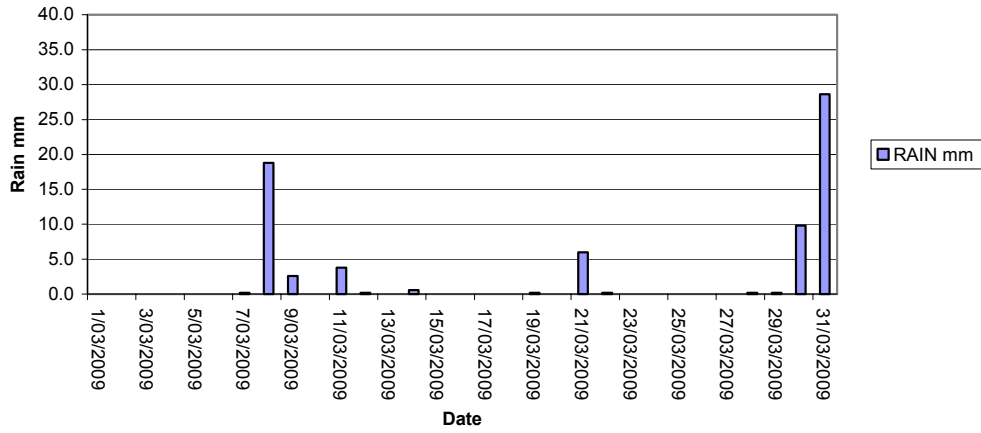
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	ET mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Solar Rad	Av Solar Rad	Max Solar Rad	Min Data %	Av data %	Max Data %
1/03/2009	18.3	21.9	27.3	54	77	89	0.0	3.9	0	1.8	6.7	18.3	27.4	1006.7	1009.6	1013.7	0	200.1	1082	96.2	99.8	100
2/03/2009	17.2	20.7	27.4	54	79	94	0.0	3.3	0	1.0	7.6	17.2	27.7	1012.7	1014.7	1017.3	0	175.9	1066	76	99.2	100
3/03/2009	17.5	22.0	28.4	49	75	93	0.0	3.8	0	1.4	8.9	17.5	29.1	1012.4	1015.3	1017.4	0	207.7	933	97.4	99.6	100
4/03/2009	17.8	21.4	25.3	32	67	87	0.0	2.1	0.4	2.0	8.5	17.9	26.4	1006.5	1008.1	1012.1	0	62.7	260	94.4	99.0	100
5/03/2009	13.6	17.8	25	28	48	76	0.0	6.1	0	2.6	10.3	13.1	24.1	1007.3	1009.2	1011.8	0	284.2	927	97.1	99.9	100
6/03/2009	11.2	17.7	25.4	38	70	88	0.0	4.6	0	1.4	8.9	11.2	25	1009.8	1011.6	1013.3	0	273.9	992	98.5	99.9	100
7/03/2009	13.9	20.2	29.2	30	77	97	0.2	4.6	0	0.8	7.2	13.9	29.9	1010	1012.3	1014	0	280.6	952	77.8	98.2	100
8/03/2009	17.3	19.6	26.6	57	88	97	18.8	2.3	0	1.3	7.6	17.3	26.9	1013.8	1016.8	1020.6	0	134.4	965	89.5	98.0	100
9/03/2009	17.3	19.3	24.8	64	90	99	2.6	1.9	0	1.0	7.6	17.3	25.2	1018.3	1020.0	1021.9	0	116.8	658	88.3	97.9	100
10/03/2009	16.7	19.7	24.8	56	78	96	0.0	3.4	0	1.5	8	16.7	24.7	1018.9	1020.7	1022.5	0	176.3	872	91.8	99.3	100
11/03/2009	15.5	17.9	21.7	75	89	95	3.8	2.0	0	1.1	6.7	15.5	22.1	1021	1022.2	1023.8	0	112.3	704	85.7	99.4	100
12/03/2009	15.4	20.0	26.7	56	81	98	0.2	3.7	0	1.4	7.2	15.5	27.3	1018.2	1020.5	1022.7	0	215.4	971	86.8	98.2	100
13/03/2009	16.8	20.3	26.8	56	84	97	0.0	2.4	0	0.9	6.7	16.8	27.2	1014.4	1016.5	1018.5	0	140.1	767	94.2	99.9	100
14/03/2009	17	21.9	29.8	48	79	96	0.6	4.0	0	1.5	7.6	17	30.7	1007.8	1011.8	1015.4	0	221.9	951	93.6	99.1	100
15/03/2009	17.6	21.9	30.2	49	76	88	0.0	4.4	0.4	2.7	9.8	17.6	31.4	1005.7	1008.4	1010.2	0	220.4	1005	84.8	97.5	100
16/03/2009	15.5	19.4	26.6	32	53	87	0.0	5.2	0	2.1	7.2	15.1	25.9	1007	1009.5	1011.4	0	255.1	885	86.8	99.3	100
17/03/2009	11.2	17.7	25.9	30	64	85	0.0	4.8	0	1.3	6.7	11.3	25.1	1010.5	1012.8	1016.7	0	262.3	872	88.9	99.8	100
18/03/2009	13.7	19.2	27.2	48	75	95	0.0	4.1	0	1.4	9.4	13.7	27	1014.3	1016.6	1018.9	0	232.1	934	82.5	98.9	100
19/03/2009	14.1	21.5	32.8	27	70	96	0.2	4.5	0	1.6	7.6	14.1	31.9	1012.2	1014.5	1016.6	0	238.4	941	88.9	99.1	100
20/03/2009	16.1	21.4	29.4	39	76	95	0.0	4.5	0	1.0	7.6	16.1	29.8	1014	1015.7	1017.5	0	246.8	841	74	96.2	100
21/03/2009	16.3	19.8	26.3	58	86	98	6.0	2.7	0	1.0	6.7	16.3	27.1	1015	1016.7	1018.6	0	167.0	1035	83.6	95.0	100
22/03/2009	14	20.0	28.2	47	78	97	0.2	3.9	0	1.1	7.2	14.1	28.6	1013.3	1015.7	1017.6	0	221.0	962	82.5	97.9	100
23/03/2009	15.5	21.2	30.7	39	74	88	0.0	4.3	0	1.5	7.6	15.6	31.9	1014	1015.3	1016.9	0	228.7	880	82.5	98.2	100
24/03/2009	17.2	22.8	31.2	45	74	95	0.0	4.6	0	1.7	7.6	17.2	32.7	1014.6	1016.2	1017.6	0	235.4	811	91.8	98.7	100
25/03/2009	17.4	23.3	33	36	71	90	0.0	4.7	0	1.7	7.6	17.4	35.3	1015.8	1017.9	1021.2	0	230.9	811	95.3	98.7	100
26/03/2009	18.6	23.8	33.1	32	68	88	0.0	3.8	0	1.3	6.7	18.6	34.4	1014.8	1017.7	1020.5	0	183.5	872	84.2	95.7	100
27/03/2009	16.6	19.3	22.3	64	79	88	0.0	3.0	0	3.0	9.8	16.6	22.9	1018.5	1022.4	1024.9	0	146.8	833	83.6	94.9	99.4
28/03/2009	13.2	18.5	26.7	40	76	97	0.2	3.8	0	1.1	7.2	13.3	26.3	1021.2	1023.4	1025.3	0	223.4	826	86.5	97.2	100
29/03/2009	13.6	19.1	27.3	49	79	97	0.2	3.8	0	0.9	7.2	13.6	27.2	1019.8	1021.7	1023.3	0	229.9	856	79.2	86.1	100
30/03/2009	15.2	18.4	22.1	66	87	97	9.8	2.2	0	2.3	11.6	15.2	22.5	1020.4	1021.8	1023.4	0	114.6	723	83.9	94.0	100
31/03/2009	17.3	18.5	19.5	86	92	96	28.6	1.1	2.2	5.0	13.4	16.7	20.3	1018.1	1019.4	1021	0	41.3	325	74.3	89.8	100
Monthly	11.2	20.2	33.1	27	76	99	71.4	113.3	0	1.6	13.4	11.2	35.3	1005.7	1016.0	1025.3	0	196.1	1082	74	97.6	100

2.3.2 Monthly weather charts

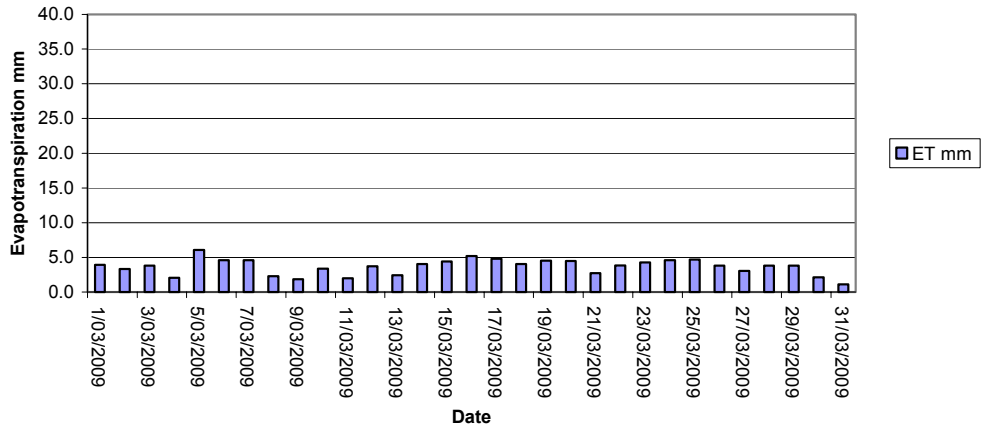




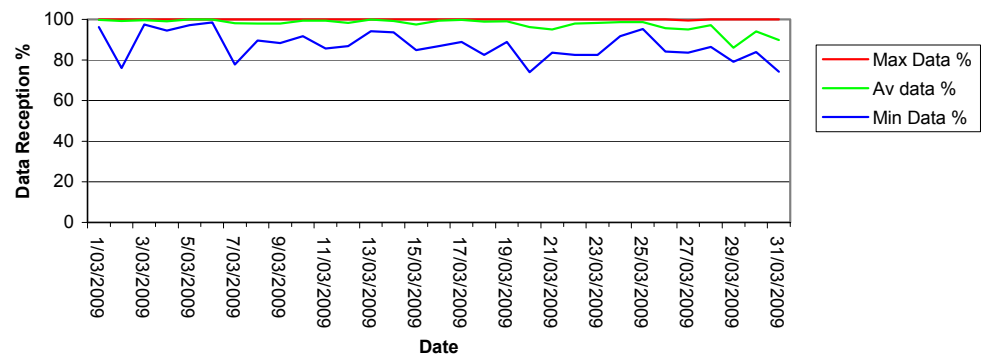
Rocla Calga Quarry - March 2009
Rainfall



Rocla Calga Quarry - March 2009
Evapotranspiration



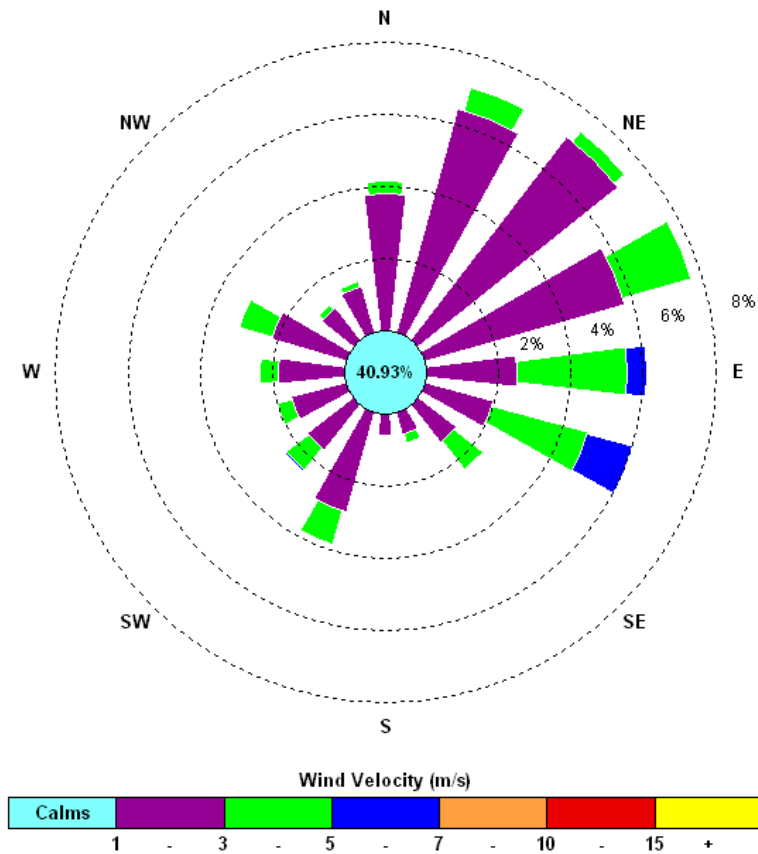
Rocla Calga Quarry - March 2009
Data Reception



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 March 2009 – 23:45, 31 March 2009



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

APPENDIX 1
LABORATORY CERTIFICATES

APPENDIX 2

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

