



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

**August 2010**

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16 September 2010

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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;
- Groundwaters; and
- Meteorological Station.

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

- Dust Deposition results for August 2010;
- Surface Water quality results for August 2010;
- Groundwater depth and quality results for August 2010; and
- Meteorological report for August 2010.

The August 2010 dust deposition results were generally similar to July 2010. 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 1 September 2010 at sites A, C and F. Site B and D were dry. 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 low Electrical Conductivity, low Total Dissolved Solids, low Total Suspended Solids and no detectable Oil and Grease. pH levels remained stable and were within the slightly acidic range.

Groundwaters were sampled for normal monthly monitoring on 1 September 2010. Groundwater depths increased at the majority of monitoring bores this month, indicating water moving away from the surface. pH and EC levels remained relatively steady.

The meteorological station data recovery for the month was approximately 100%. The predominant winds were from the W - WSW, with strongest winds from the SSW and WSW. Recorded rainfall on site for August was 32.8mm, which was below that recorded at the BOM Peats Ridge Station and below the Peats Ridge long-term average for August. Results are detailed below:

Rocla Calga Quarry	32.8mm
BOM Peats Ridge*	44.4mm
BOM Gosford*	41.6mm
BOM Peats Ridge Long term mean for August*	79.8mm

\*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 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.

## 2.0 Monthly Results

### 2.1 Dust Deposition Gauges

**Table 1** displays the results for August 2010 and the project average. Results are in g/m<sup>2</sup>.month.

**Table 1: Dust Deposition results: 2-Aug-2010 to 2-Sep-2010**

Site	Monthly Insoluble Solids g/m <sup>2</sup> .month	Monthly Ash Residue g/m <sup>2</sup> .month	Monthly Combustible Matter g/m <sup>2</sup> .month	Monthly Ash Residue/ Insoluble Solids %	Rolling Annual Average Insoluble Solids g/m <sup>2</sup> .month
<b>CD1</b>	0.4	0.2	0.2	50	1.8
<b>CD2c</b>	0.3	0.2	0.1	67	1.3
<b>CD3</b>	0.1	0.1	<0.1	100	1.0
<b>CD4</b>	0.1	0.1	<0.1	100	1.1
<b>CD5</b>	0.1	0.1	<0.1	100	1.0
<b>CD6</b>	0.2	0.1	0.1	50	1.3

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<sup>2</sup>.month, the Development Consent annual average amenity criteria at residential locations. The current rolling annual average is calculated from September 2009 to August 2010.

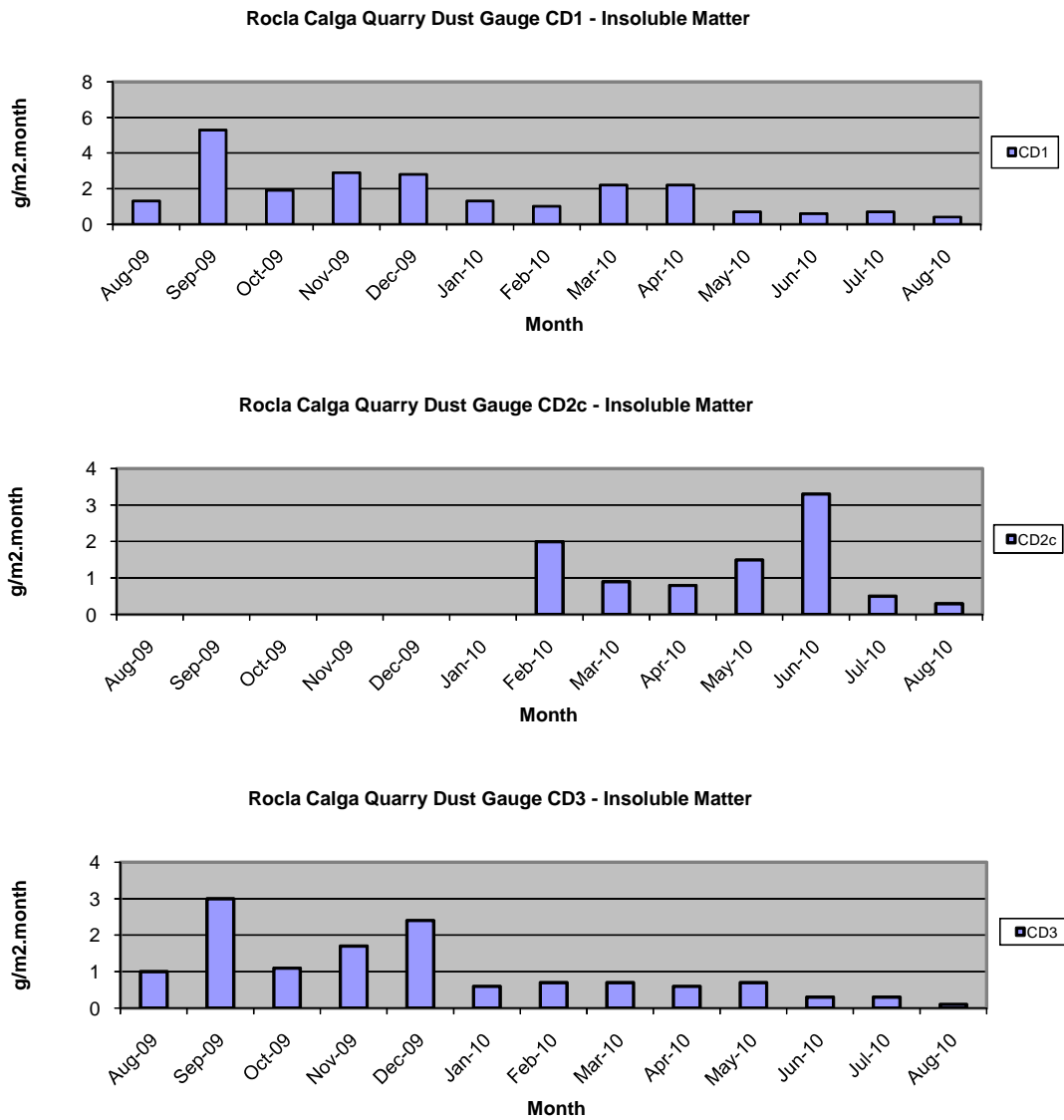
NA= Not Available.

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.

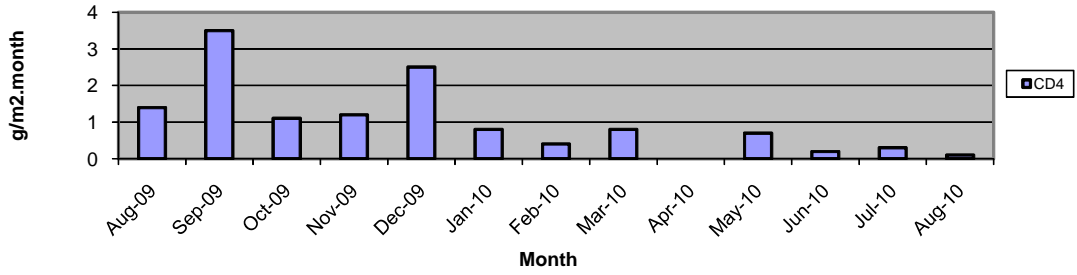
Dust deposition charts for all dust gauge sites appear in **Figure 1** below. The laboratory analysis is provided in **Appendix 1**.

The predominant winds were from the W - WSW, with strongest winds from the SSW and WSW.

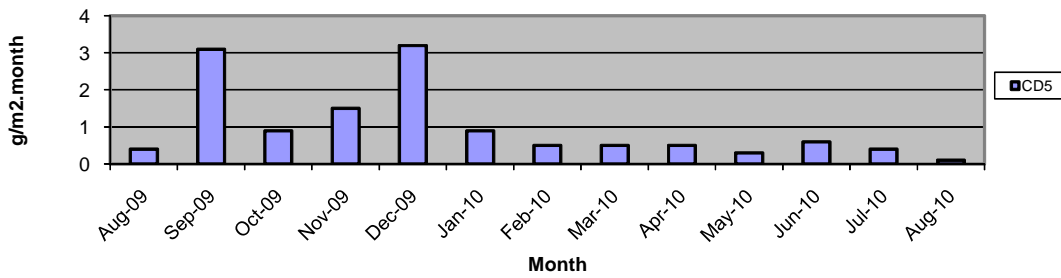
Figure 1: Dust Deposition Charts



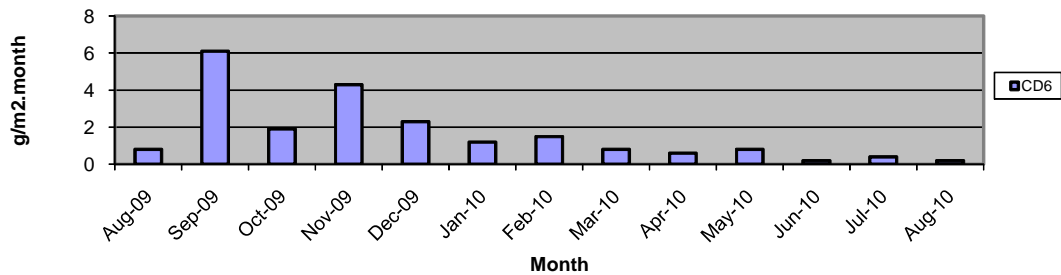
Rocla Calga Quarry Dust Gauge CD4 - Insoluble Matter



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 1 September 2010 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1**.

**Table 2: Monthly surface water monitoring – August 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	Still	Clear	Clear	4.97	85	69	5	<5
B	Dry	---	---	---	---	---	---	---
C	Still	Clear	Clear	5.43	115	87	4	<5
D	Dry	---	---	---	---	---	---	---
F	Still	Clear	Clear	5.80	92	52	4	<5

At the time of sampling, there were no water discharges off site from any sampling location. Site B and D were dry at the time of sampling. The samples were collected and analysed for a monthly sampling event. Results show generally good water quality with pH within the slightly acidic range, low Electrical Conductivity, low Total Dissolved Solids, low Total Suspended Solids and no detectable Oil and Grease.

### 2.2.2 Ground Waters

Groundwaters were sampled on 1 September 2010. 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 increased at the majority of monitoring bores this month, indicating water moving away from 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 remained relatively steady at all sites. Detailed biannual water quality monitoring was conducted during April 2010 and is next due in October 2010.

**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	19.72	4.5	120
CQ3	Voutos	* Monitor	10.53	10.68	5.6	120
CQ4	Voutos	* Monitor	8.78	7.98	4.6	80
CQ5	Gazzana	DIP Only	8.69	6.29	4.1	150
CQ6	Gazzana	DIP Only	16.00	11.51	4.0	170
CQ7	Gazzana	* Monitor	6.89	6.67	4.3	90
CQ8	Gazzana	* Monitor	11.03	6.63	4.1	150
CQ9	Gazzana	DIP Only	10.10	9.26	4.2	110
CQ10	Voutos	* Monitor	NI	22.61	5.3	180
CQ11S	Gazzana	* Monitor	NI	9.47	4.3	150
CQ11D	Gazzana	* Monitor	NI	10.71	4.9	130
CQ12	Gazzana	* Monitor	NI	4.24	4.1	140
CQ13	Kashouli	* Monitor	NI	13.30	4.7	190
CP3	Gazzana	Domestic	10.40	8.30	4.4	140
CP4	Kashouli	Domestic	13.63	10.25	4.9	210
CP5	Kashouli	Domestic	16.61	7.90	4.5	240
CP6	Kashouli	Domestic	16.27	10.17	4.1	200
CP7	Kashouli	Production	8.56	3.16	4.3	170
CP8	Rozmanec	Domestic	22.17	NR	NR	NR
MW7	Rocla Bore	* Monitor	15.76	16.15	4.7	120
MW8	Rocla Bore	* Monitor	9.82	7.77	4.6	80
MW9	Rocla Bore	* Monitor	22.44	21.79	4.2	80
MW10	Rocla Bore	* Monitor	15.41	13.59	4.1	130
MW13	Rocla Bore	DIP Only	NI	7.84	4.7	100
MW16	Rocla Bore	DIP Only	NI	8.43	4.3	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.

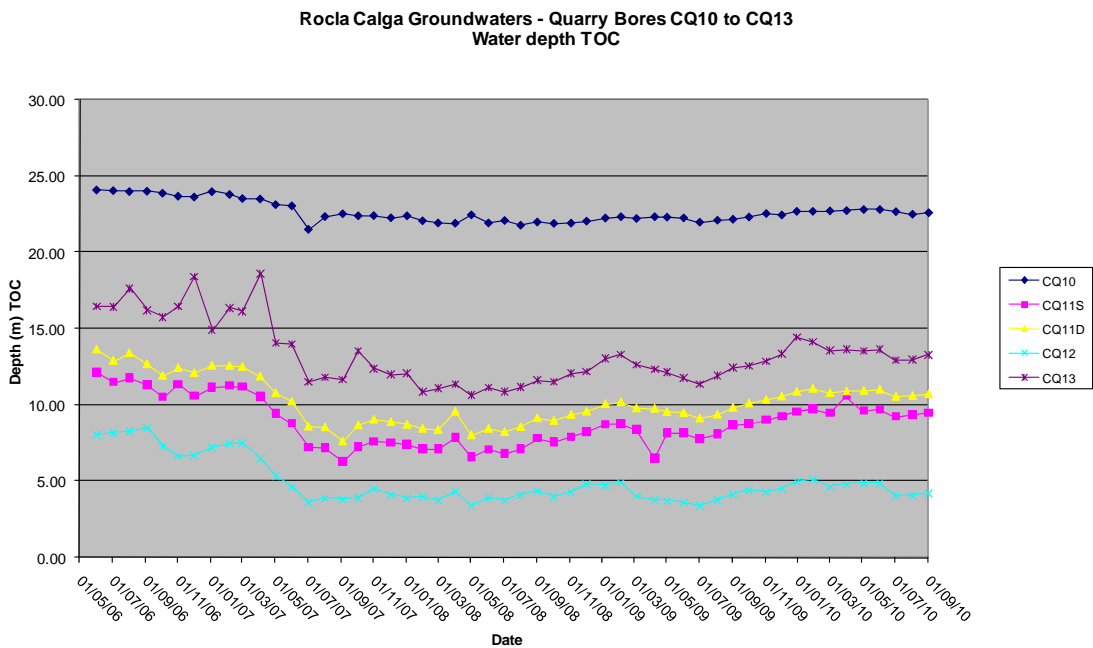
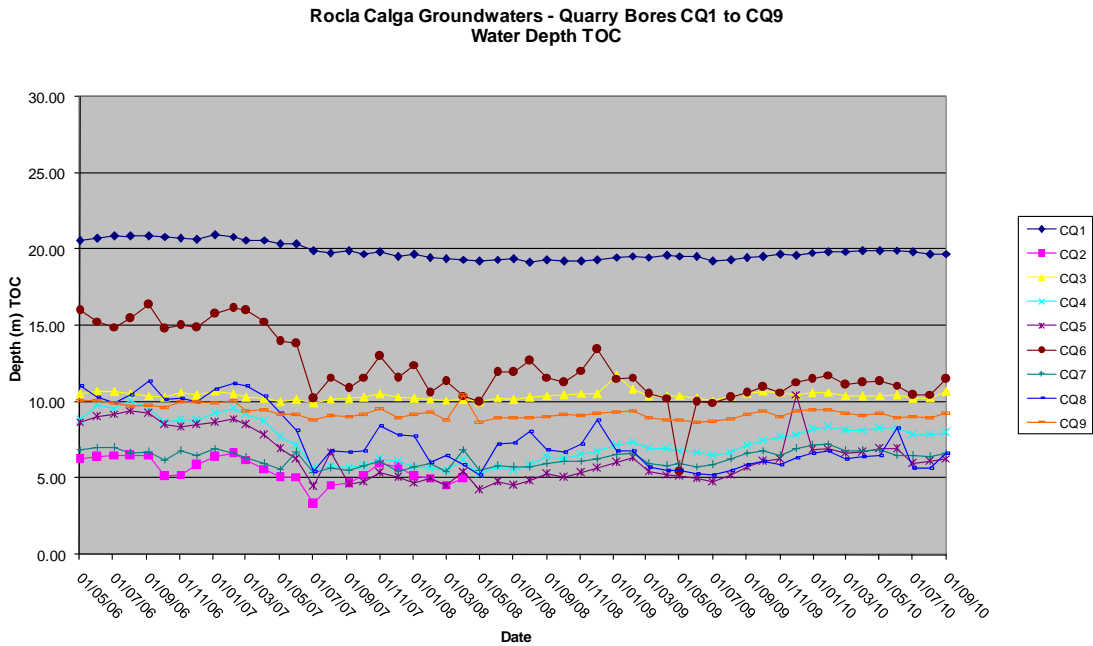
Shading is used to indicate the following trends in water depth (compared to the last reading):

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

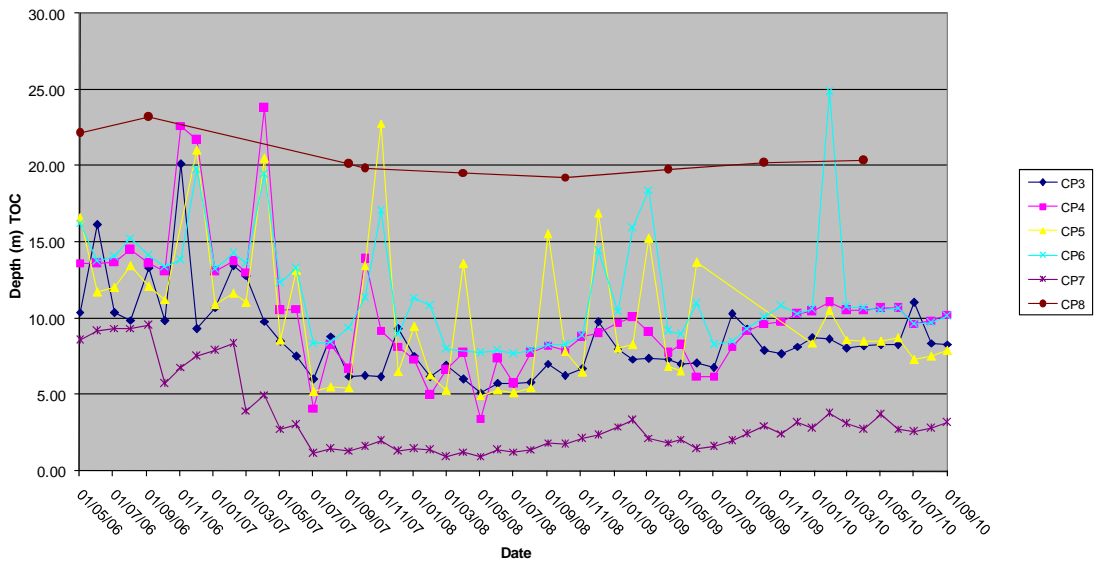
Available groundwater loggers were downloaded and will be forwarded to the Rocla Calga Quarry groundwater consultant.



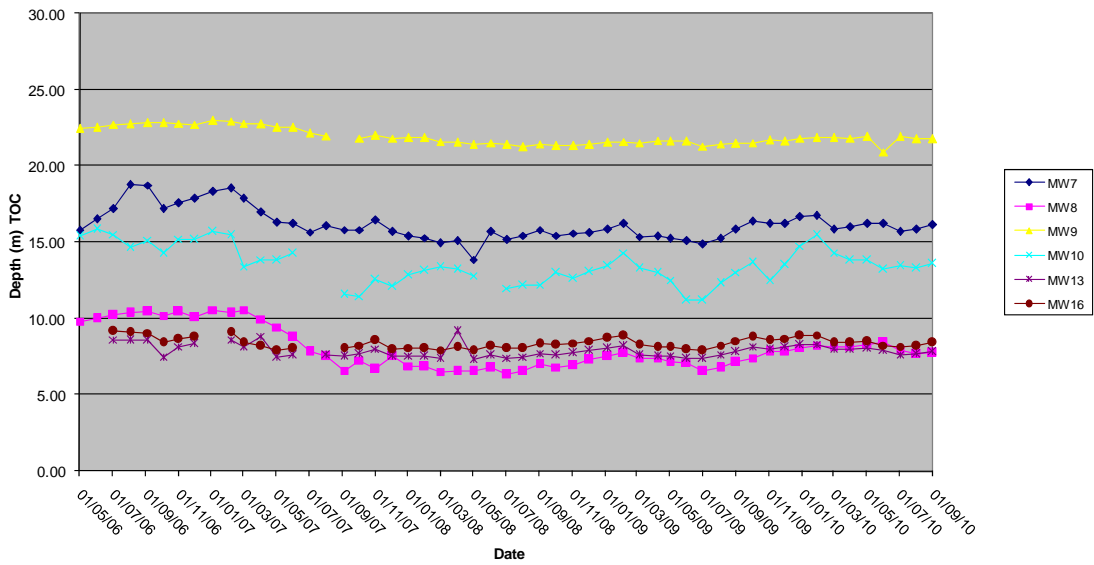
Figures 2 to 5: Groundwater Depth Charts.



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 August 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 August 2010 shows rainfall at the Rocla Calga Quarry below that which was recorded at nearby Peats Ridge BOM station and below that which was recorded at nearby Gosford BOM station. The rainfall comparison is provided below:

Rocla Calga Quarry	32.8mm
BOM Peats Ridge*	44.4mm
BOM Gosford*	41.6mm
BOM Peats Ridge Long term mean for August*	79.8mm

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

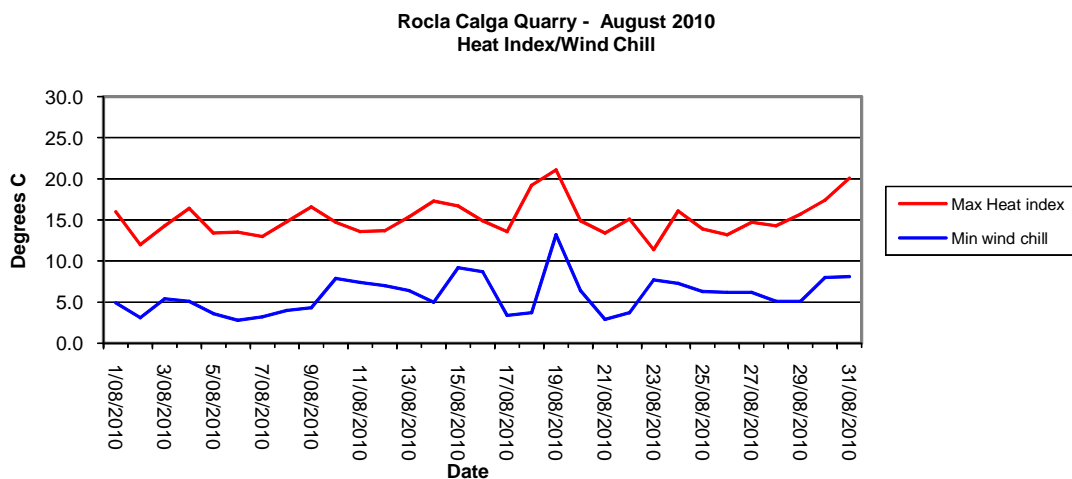
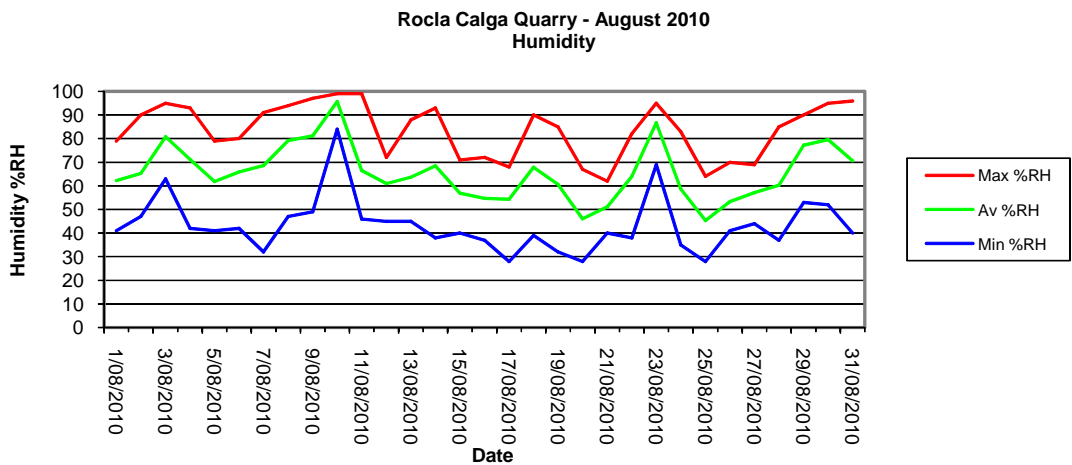
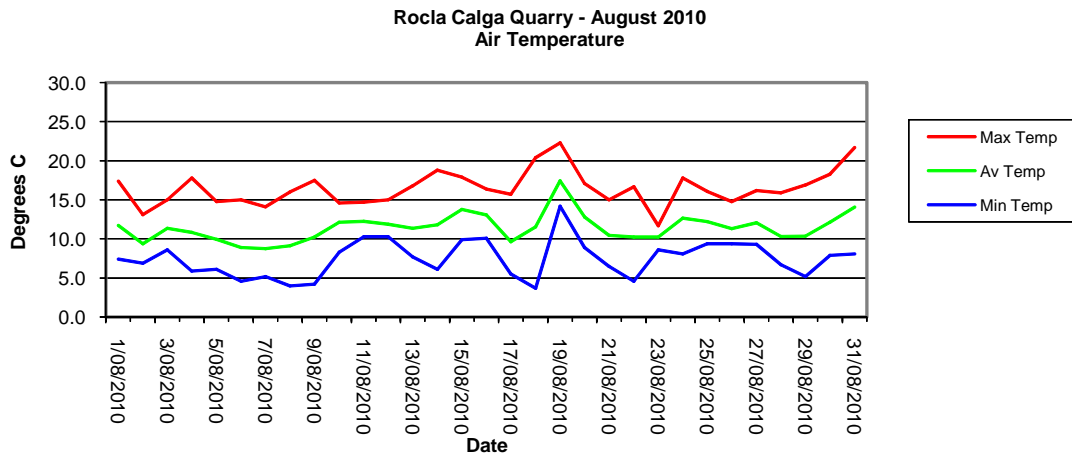
Results are displayed in the following table and figures.

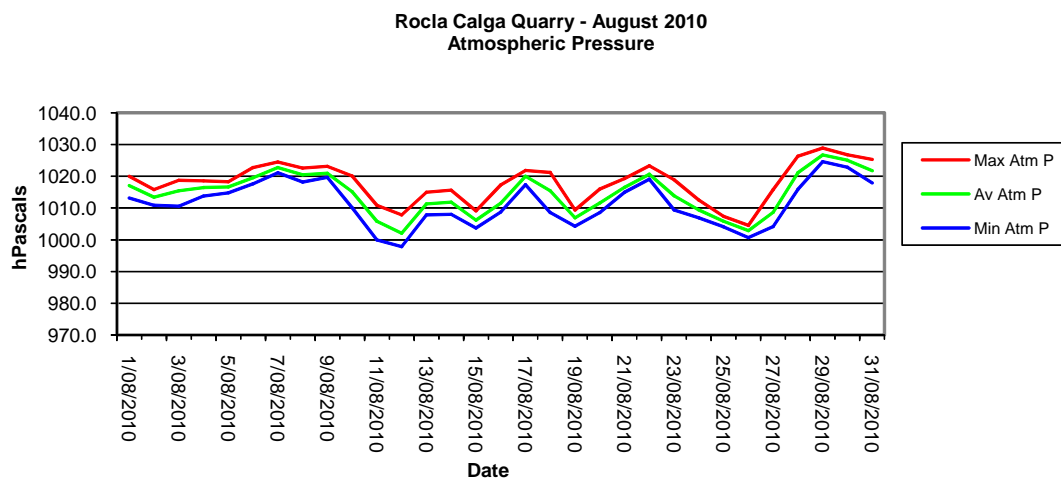
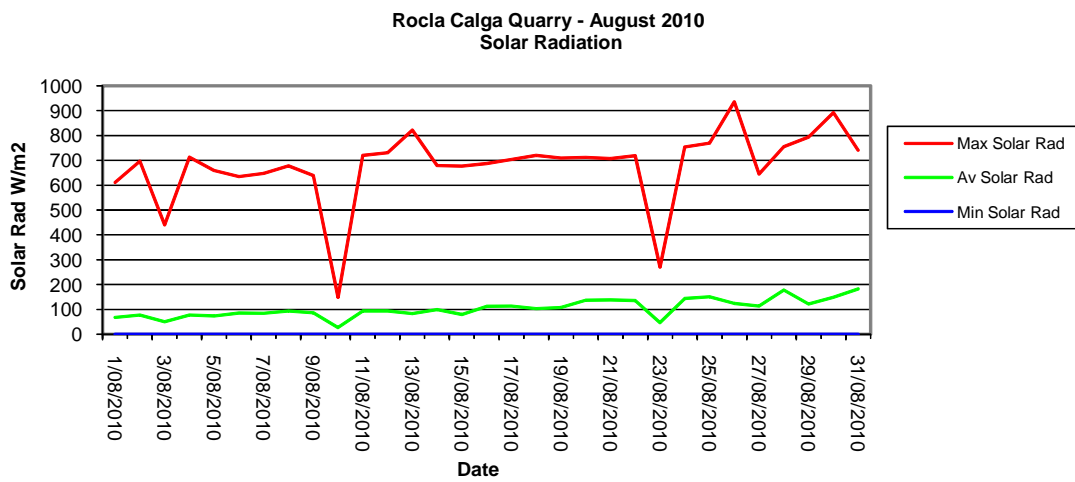
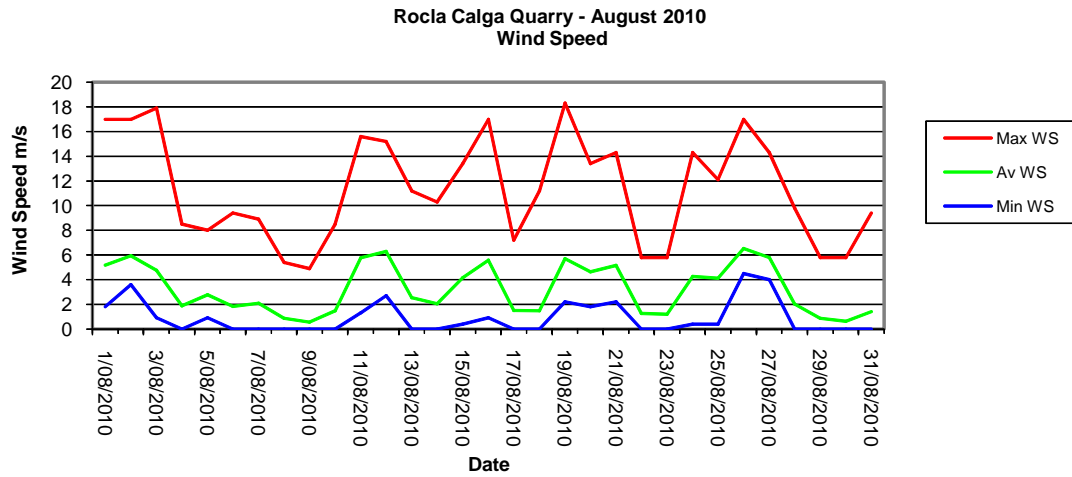
### 2.3.1 Monthly Meteorological Data Summary

Summary Aug-10 Rocla - Calga

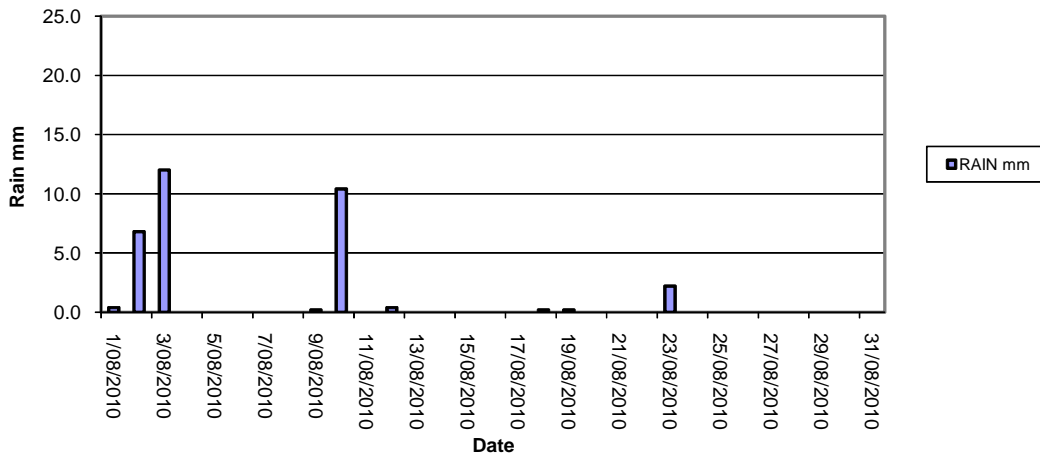
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	ET mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Solar Rad	Av Solar Rad	Max Solar Rad	Min Data %	Av data %	Max Data %
1/08/2010	7.4	11.7	17.4	41	62	79	0.4	3.0	1.8	5.2	17	4.9	16.0	1013.2	1017.1	1020.0	0	68.9	612	89.8	97.2	100
2/08/2010	6.9	9.4	13.1	47	65	90	6.8	2.8	3.6	5.9	17	3.1	12.0	1010.9	1013.4	1015.8	0	78.4	697	77.8	95.3	100
3/08/2010	8.6	11.3	15.0	63	81	95	12.0	1.6	0.9	4.7	17.9	5.4	14.3	1010.6	1015.4	1018.8	0	51.2	441	61.4	84.8	98.2
4/08/2010	5.9	10.9	17.8	42	71	93	0.0	1.7	0	1.9	8.5	5.1	16.4	1013.8	1016.5	1018.6	0	78.2	713	60.5	87.8	100
5/08/2010	6.1	9.9	14.8	41	62	79	0.0	2.1	0.9	2.8	8	3.6	13.4	1014.8	1016.7	1018.3	0	74.3	660	70.5	92.8	100
6/08/2010	4.6	8.9	15.0	42	66	80	0.0	2.0	0	1.8	9.4	2.8	13.5	1017.7	1019.6	1022.8	0	86.5	635	81	96.5	100
7/08/2010	5.2	8.8	14.1	32	69	91	0.0	1.9	0	2.1	8.9	3.2	13.0	1021.1	1022.8	1024.5	0	85.0	648	89.5	98.0	100
8/08/2010	4.0	9.1	16.0	47	79	94	0.0	1.5	0	0.9	5.4	4.0	14.8	1018.2	1020.5	1022.6	0	94.7	678	96.8	99.2	100
9/08/2010	4.2	10.2	17.5	49	81	97	0.2	1.5	0	0.5	4.9	4.3	16.6	1019.7	1021.0	1023.2	0	87.7	640	86.3	95.8	100
10/08/2010	8.3	12.2	14.6	84	96	99	10.4	0.4	0	1.5	8.5	7.9	14.7	1010.1	1015.2	1020.1	0	27.8	149	81.3	91.8	100
11/08/2010	10.3	12.3	14.7	46	67	99	0.0	3.1	1.3	5.8	15.6	7.4	13.6	1000.0	1005.9	1010.9	0	93.9	720	73.1	88.5	98.2
12/08/2010	10.3	11.9	15.0	45	61	72	0.4	3.7	2.7	6.3	15.2	7.0	13.7	997.8	1002.1	1007.8	0	94.9	731	78.7	90.9	99.1
13/08/2010	7.7	11.3	16.8	45	64	88	0.0	2.3	0	2.5	11.2	6.4	15.4	1007.8	1011.3	1015.0	0	83.9	822	87.4	97.2	100
14/08/2010	6.1	11.8	18.8	38	69	93	0.0	2.3	0	2.1	10.3	5.0	17.3	1008.0	1011.9	1015.6	0	100.4	680	93	98.8	100
15/08/2010	9.9	13.8	17.9	40	57	71	0.0	3.2	0.4	4.2	13.4	9.2	16.7	1003.7	1006.2	1009.1	0	80.6	677	92.4	99.4	100
16/08/2010	10.1	13.1	16.4	37	55	72	0.0	4.1	0.9	5.6	17	8.7	14.9	1008.8	1011.5	1017.3	0	113.5	688	85.1	97.5	100
17/08/2010	5.5	9.6	15.7	28	54	68	0.0	2.3	0	1.5	7.2	3.4	13.6	1017.4	1020.1	1021.9	0	114.3	704	89.2	98.6	100
18/08/2010	3.7	11.5	20.4	39	68	90	0.2	2.3	0	1.5	11.2	3.7	19.2	1008.6	1015.4	1021.2	0	103.9	720	93.6	98.4	100
19/08/2010	14.2	17.4	22.3	32	61	85	0.2	4.5	2.2	5.7	18.3	13.2	21.1	1004.3	1006.9	1009.4	0	108.0	710	93.9	99.7	100
20/08/2010	8.9	12.8	17.1	28	46	67	0.0	4.4	1.8	4.6	13.4	6.4	14.9	1008.6	1011.6	1016.0	0	137.8	712	97.1	99.7	100
21/08/2010	6.5	10.5	15.0	40	51	62	0.0	4.3	2.2	5.1	14.3	2.9	13.4	1015.0	1016.5	1019.3	0	138.4	708	98	99.5	100
22/08/2010	4.6	10.2	16.7	38	64	82	0.0	2.4	0	1.3	5.8	3.7	15.1	1019.1	1020.7	1023.3	0	136.5	719	92.7	99.5	100
23/08/2010	8.6	10.2	11.7	69	87	95	2.2	1.0	0	1.2	5.8	7.7	11.4	1009.4	1013.9	1018.9	0	47.3	271	96.8	99.5	100
24/08/2010	8.1	12.7	17.8	35	59	83	0.0	3.8	0.4	4.3	14.3	7.3	16.1	1006.9	1009.4	1012.5	0	145.0	754	88.9	98.4	100
25/08/2010	9.4	12.2	16.1	28	45	64	0.0	4.2	0.4	4.1	12.1	6.3	13.9	1004.1	1005.8	1007.4	0	151.3	770	87.7	98.5	100
26/08/2010	9.4	11.3	14.8	41	53	70	0.0	4.5	4.5	6.5	17	6.2	13.2	1000.7	1002.9	1004.5	0	125.1	936	92.7	98.6	100
27/08/2010	9.3	12.1	16.2	44	57	69	0.0	4.0	4	5.8	14.3	6.2	14.7	1004.2	1008.7	1015.8	0	114.2	645	90.6	97.1	100
28/08/2010	6.7	10.3	15.9	37	60	85	0.0	3.3	0	2.0	9.8	5.1	14.3	1015.9	1021.1	1026.4	0	179.0	756	91.8	98.1	100
29/08/2010	5.2	10.4	16.9	53	77	90	0.0	1.9	0	0.9	5.8	5.1	15.7	1024.6	1026.8	1028.9	0	122.7	794	91.8	99.4	100
30/08/2010	7.9	12.1	18.3	52	80	95	0.0	2.2	0	0.6	5.8	8.0	17.4	1022.9	1025.1	1026.8	0	149.5	893	92.1	99.3	100
31/08/2010	8.1	14.1	21.7	40	71	96	0.0	3.2	0	1.4	9.4	8.1	20.1	1017.9	1021.7	1025.4	0	183.2	742	90.9	99.4	100
Monthly	3.7	11.4	22.3	28	66	99	32.8	85.3	0	3.2	18.3	2.8	21.1	997.8	1014.6	1028.9	0	105.0	936	60.5	96.6	100

2.3.2 Monthly weather charts

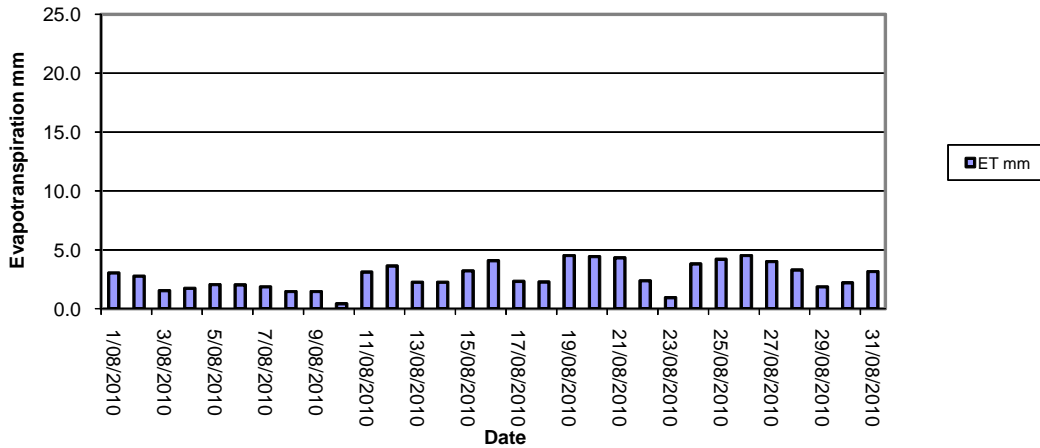




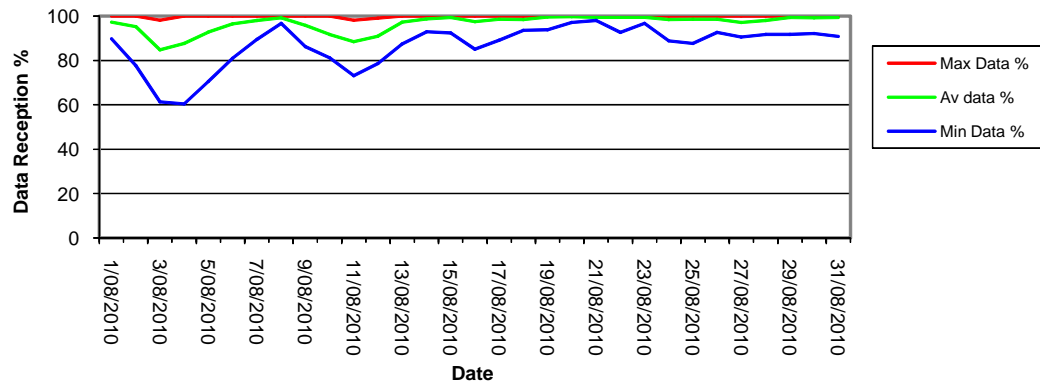
Rocla Calga Quarry - August 2010  
Rainfall



Rocla Calga Quarry - August 2010  
Evapotranspiration



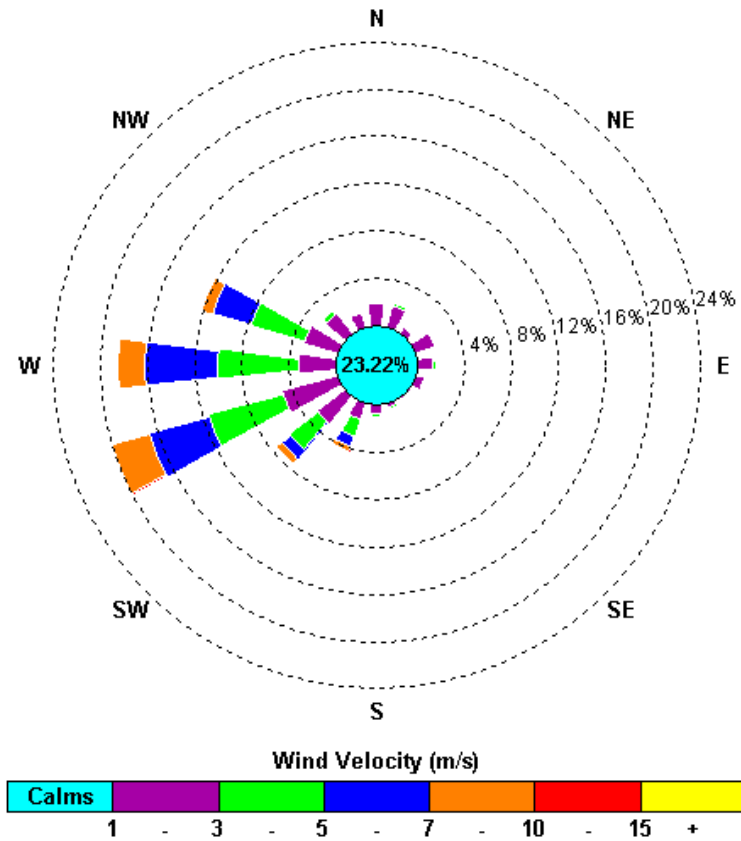
Rocla Calga Quarry - August 2010  
Data Reception



### 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 August 2010 – 23:45, 31 August 2010



The predominant winds were from the W - WSW, with strongest winds from the SSW and WSW. The maximum wind speed was 18.3m/s from the SW.



Appendix 1  
Laboratory Certificates

## Appendix 2

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



