



**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**

**OCTOBER 2008**

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

---

Colin Davies BSc MEIA CENVP  
Environmental Scientist  
14 November 2008

© Carbon Based Environmental Pty Limited 2008. 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 October 2008;
- Surface Water quality results for October 2008;
- Ground Water depth and quality results for October 2008; and
- Meteorological report for October 2008.

The October 2008 dust deposition results were generally similar to September 2008. 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 3 November 2008 at sites A, D, 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 3 November 2008. Groundwater depths increased at the majority of monitoring bores this month, indicating water moving away from the surface. pH and EC levels generally remained stable.

The meteorological station continued to return high data recovery and operated well in October 2008. The predominant winds were from the NW-WNW and SSW, with strongest winds from the SW. Recorded rainfall on site for October 2008 was 77.6mm, similar to that recorded at the BOM Peats Ridge Station but below the Peats Ridge long-term average for October. Results are detailed below:

Rocla Calga Quarry	77.6mm
BOM Peats Ridge*	85.6mm
BOM Gosford*	108.4mm
BOM Peats Ridge Long term mean for October*	91.4mm

\*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 October 2008 and the project average. Results are in g/m<sup>2</sup>.month.

**Table 1: Dust Deposition results: 02-Oct-2008 to 03-Nov-2008 (32 days)**

Site	Monthly Insoluble Solids	Monthly Ash Residue	Monthly Combustible Matter	Monthly Ash Residue/ Insoluble Solids %	Current Project Average Insoluble Solids
CD1	1.0	0.9	0.1	90	1.2
CD2b	14.2*	8.5	5.7	60	1.5
CD3	1.3	0.7	0.6	54	0.8
CD4	0.8	0.5	0.3	63	1.0
CD5	0.9	0.6	0.3	67	0.9
CD6	0.9	0.6	0.3	67	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.

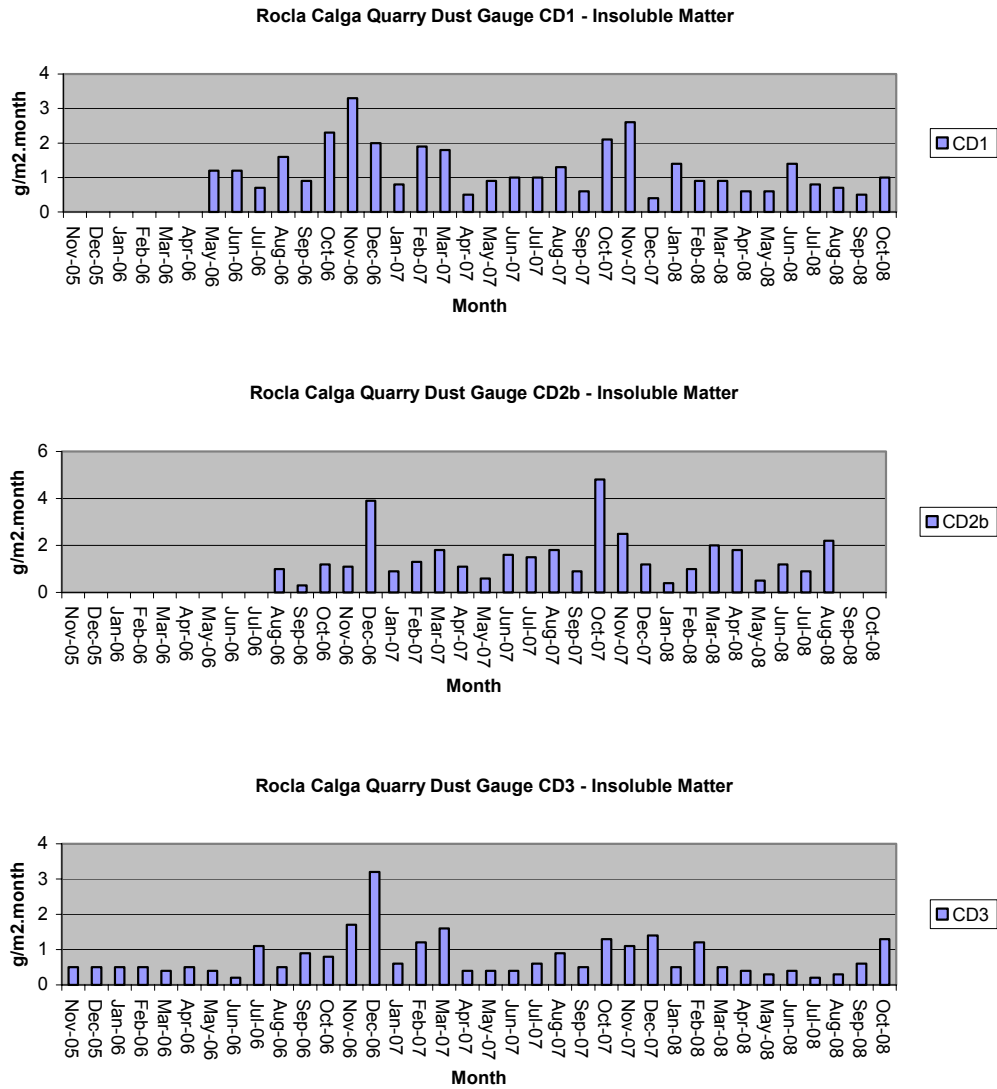
NA= Not Available.

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.

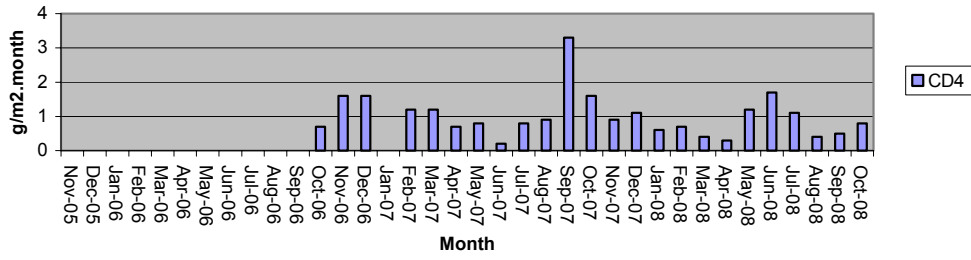
Dust deposition charts for all dust gauge sites appear in **Figure 1** below. The laboratory analysis is provided in **Appendix 1**.

The predominant winds were from the NW-WNW and SSW, with strongest winds from the SW.

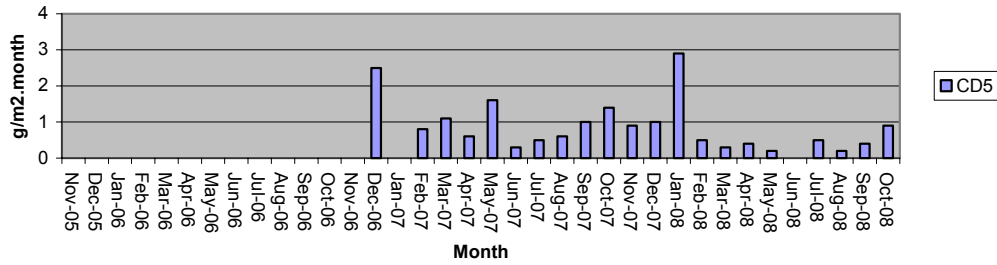
Figure 1: Dust Deposition Charts



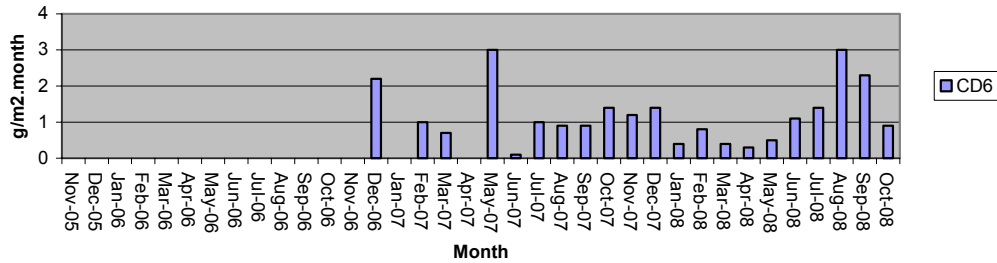
Rocla Calga Quarry Dust Gauge CD4 - Insoluble Matter



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 3 November 2008 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1**.

**Table 2: Monthly surface water monitoring - September 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)
<b>A</b>	Dam	Clear	Clear	6.01	63	44	2	<5
<b>B</b>	Not Flowing	---	---	---	---	---	---	---
<b>C</b>	Not Flowing	---	---	---	---	---	---	---
<b>D</b>	Steady	Clear	Clear	5.68	101	61	1	<5
<b>F</b>	Dam	Clear	Clear	5.55	65	49	5	<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 D 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. Total Oil and Grease was not detected at any of the sites sampled.

### 2.2.2 Ground Waters

Groundwaters were sampled on 3 November 2008. 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 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	19.21	4.2	130
CQ3	Voutos	* Monitor	10.53	10.57	5.6	110
CQ4	Voutos	* Monitor	8.78	6.57	4.5	80
CQ5	Gazzana	DIP Only	8.69	5.36	3.6	170
CQ6	Gazzana	DIP Only	16.00	12.07	3.6	240
CQ7	Gazzana	* Monitor	6.89	6.13	4.0	80
CQ8	Gazzana	* Monitor	11.03	7.22	3.4	170
CQ9	Gazzana	DIP Only	10.10	9.12	3.7	110
CQ10	Voutos	* Monitor	NI	21.93	4.0	140
CQ11S	Gazzana	* Monitor	NI	7.89	3.9	140
CQ11D	Gazzana	* Monitor	NI	9.35	5.6	110
CQ12	Gazzana	* Monitor	NI	4.30	3.7	130
CQ13	Kashouli	* Monitor	NI	12.09	4.7	170
CP3	Gazzana	Domestic	10.40	6.69	4.1	140
CP4	Kashouli	Domestic	13.63	8.80	4.2	200
CP5	Kashouli	Domestic	16.61	6.46	3.7	250
CP6	Kashouli	Domestic	16.27	8.86	3.6	210
CP7	Kashouli	Production	8.56	2.10	4.1	300
CP8	Rozmanec	Domestic	22.17	NR	NR	NR
MW7	Rocla Bore	* Monitor	15.76	15.59	4.0	110
MW8	Rocla Bore	* Monitor	9.82	6.94	4.2	90
MW9	Rocla Bore	* Monitor	22.44	21.30	3.9	80
MW10	Rocla Bore	* Monitor	15.41	12.63	4.0	110
MW13	Rocla Bore	DIP Only	NI	7.76	4.1	100
MW16	Rocla Bore	DIP Only	NI	8.38	4.1	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.

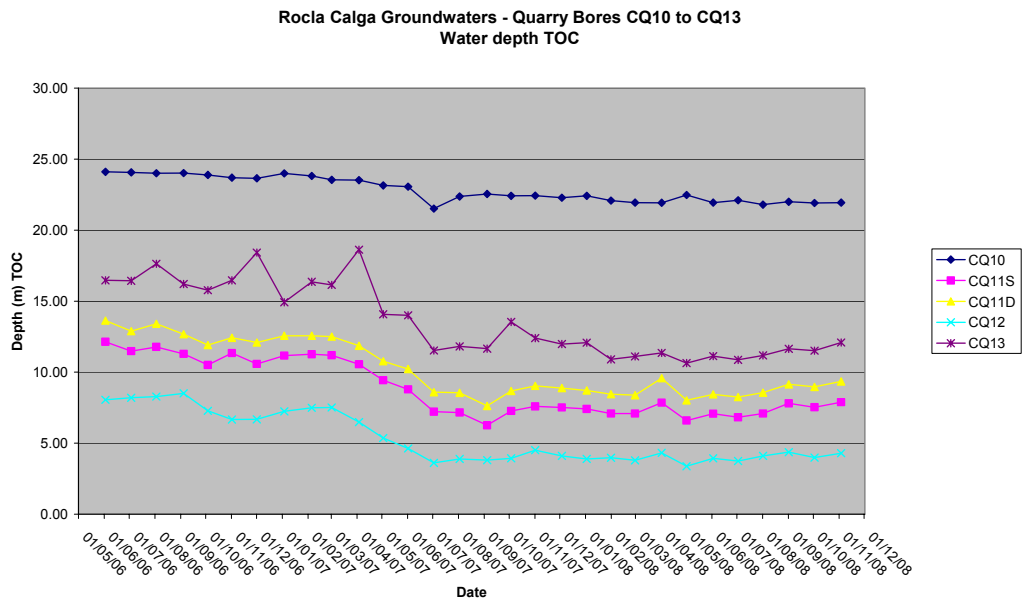
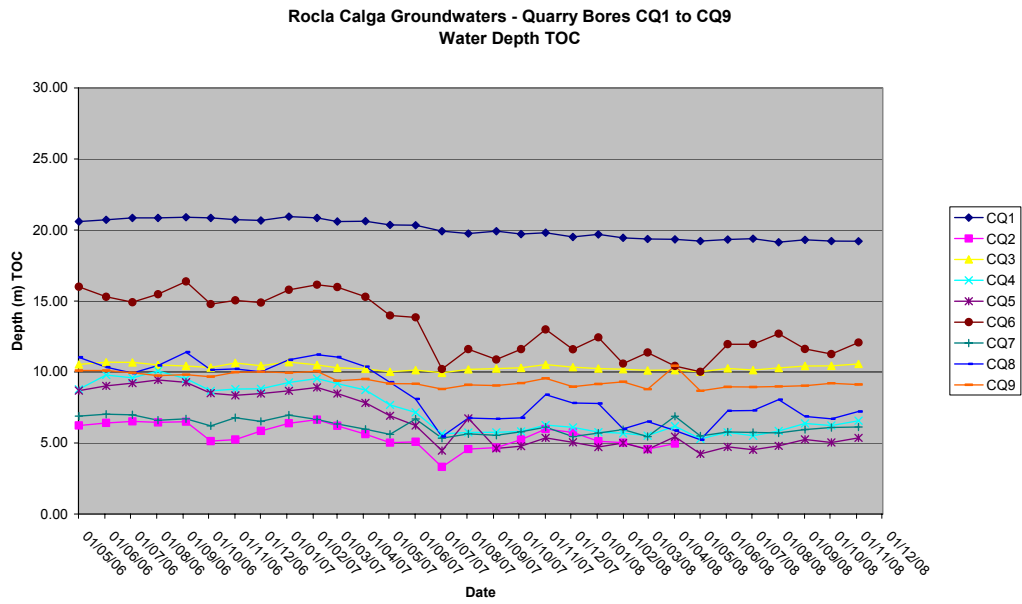
CQ2 was “mined out” in April 2008 and has been removed from the monitoring schedule.

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

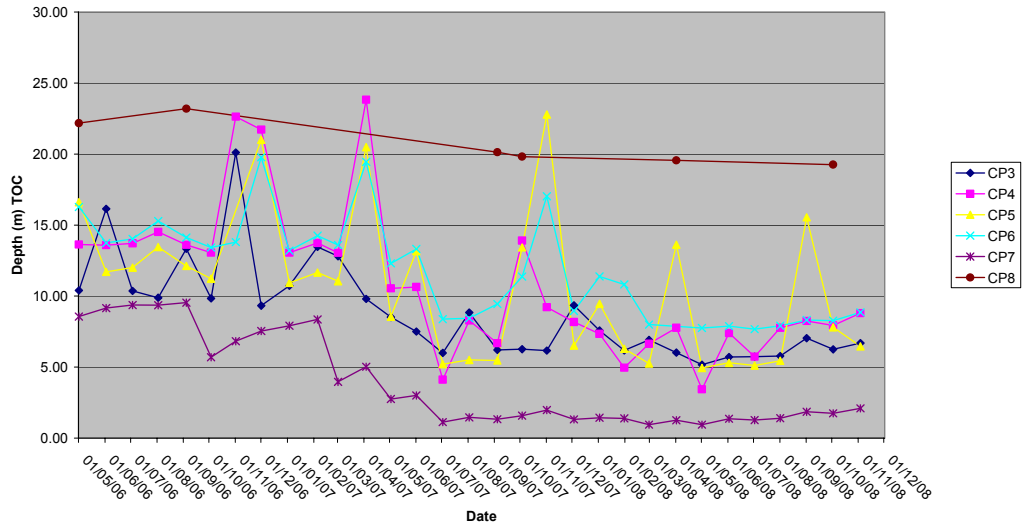
	Increase to ground water depth (water moved away from surface)
	Decrease to ground water depth (water moved towards surface)
	Stable water depth (+/- 0.01m)

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

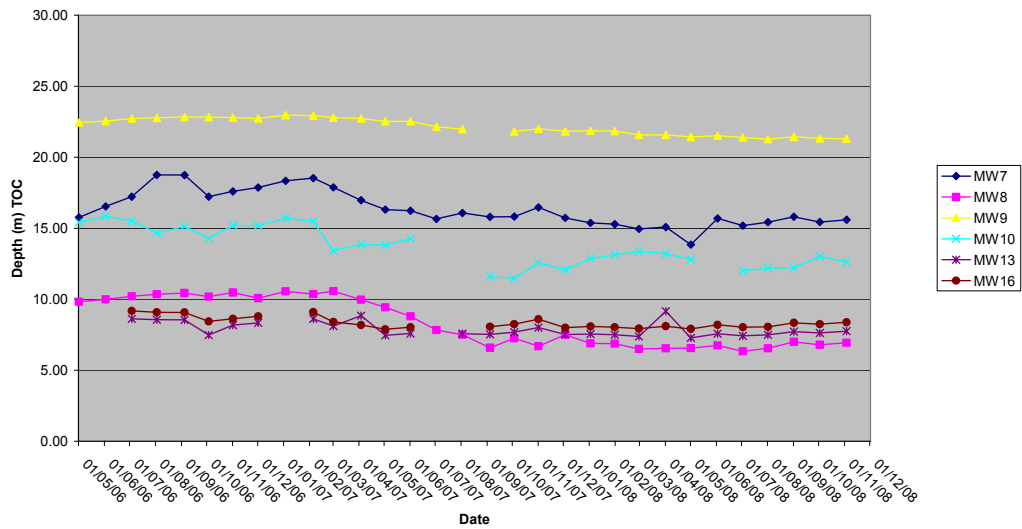
Figures 2 to 5: Groundwater Depth Charts.



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 was fully operational in October 2008 with approximately 100% data recovery. 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 October 2008 shows lower rainfall at the Rocla Calga Quarry station compared to the nearby Peats Ridge BOM station and Gosford BOM stations. The rainfall comparison is provided below:

Rocla Calga Quarry	77.6mm
BOM Peats Ridge*	85.6mm
BOM Gosford*	108.4mm
BOM Peats Ridge Long term mean for October*	91.4mm

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

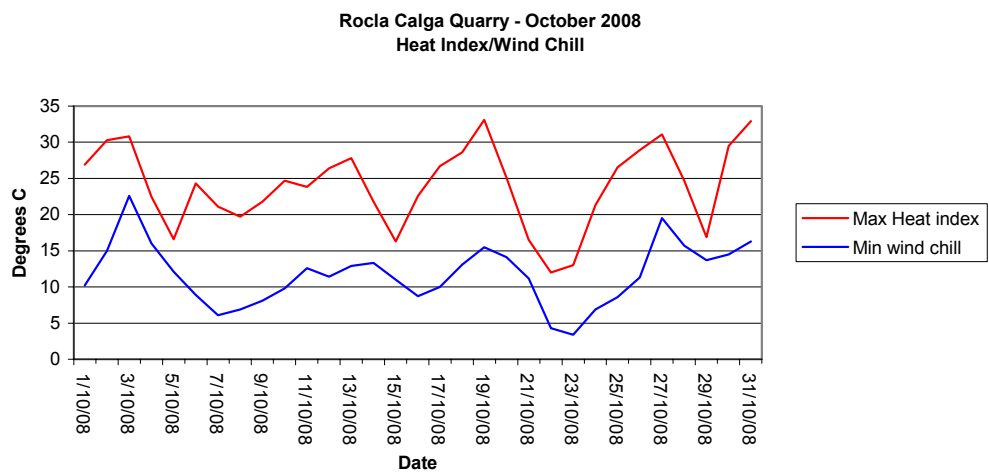
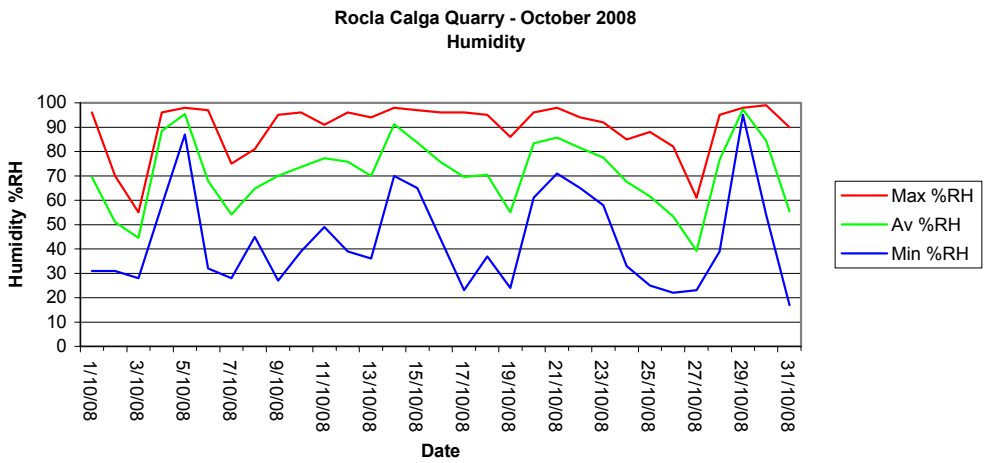
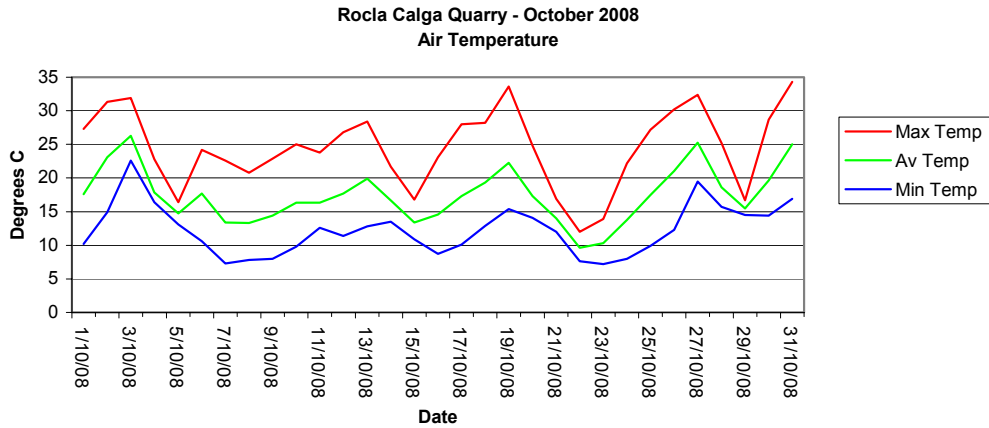
**Results are displayed in the following table and figures.**

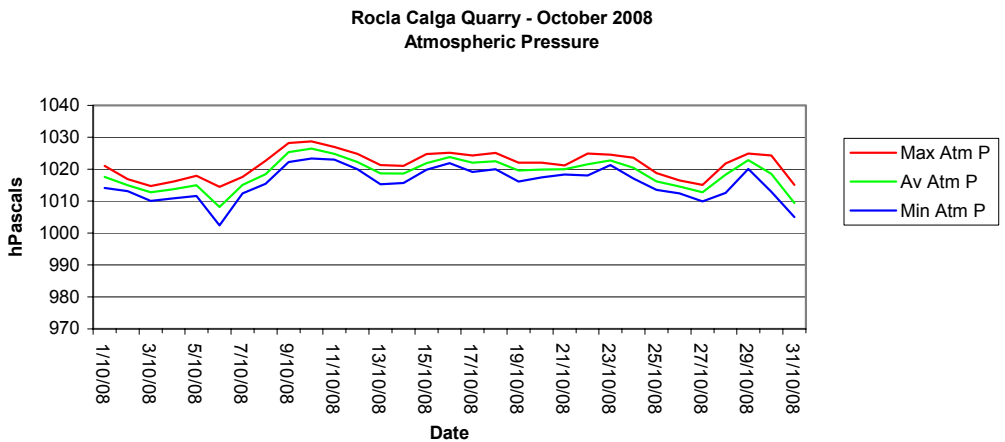
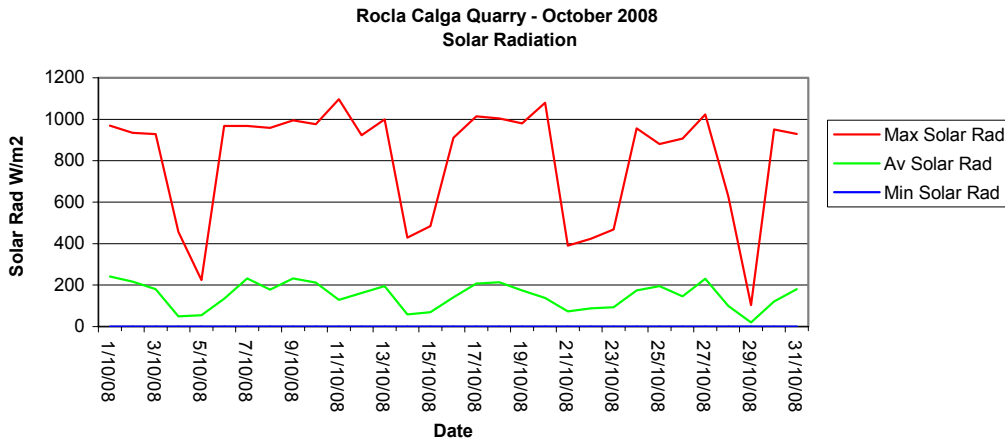
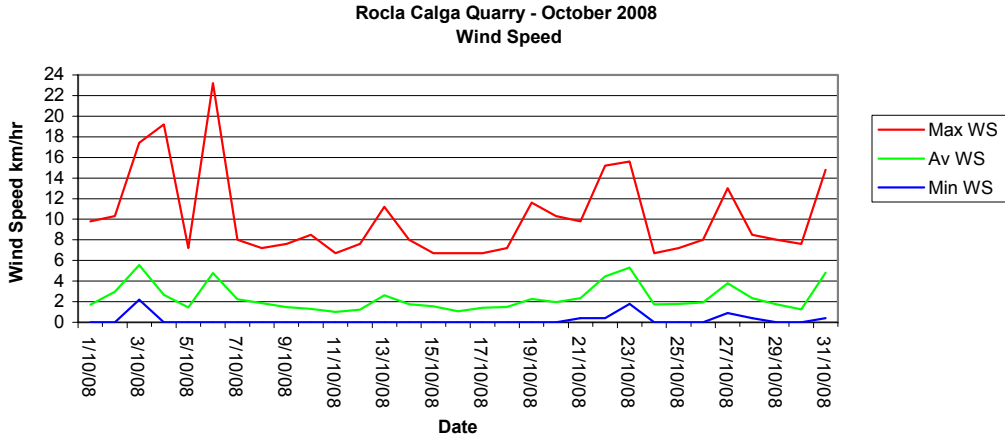
2.3.1 Monthly Meteorological Data Summary

Summary Oct-08 Rocla - Calga

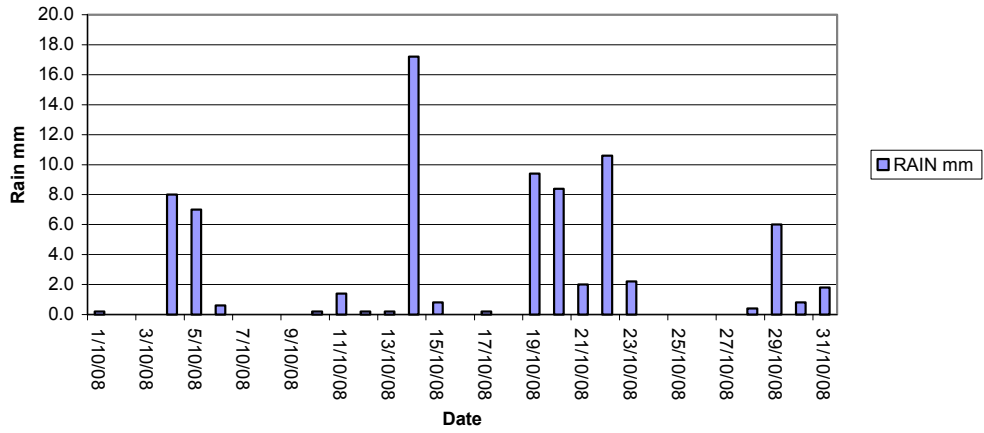
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	ET mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Solar Rad	Av Solar Rad	Max Solar Rad	Min Data %	Av data %	Max Data %
1/10/08	10.2	17.6	27.3	31	69	96	0.2	4.6	0	1.7	9.8	10.2	26.9	1014.1	1017.6	1021	0	241.9	969	97.1	99.8	100
2/10/08	14.9	23.1	31.3	31	51	70	0.0	5.6	0	3.0	10.3	15	30.3	1013.1	1015.0	1016.9	0	216.0	935	88	99.5	100
3/10/08	22.6	26.3	31.9	28	45	55	0.0	7.4	2.2	5.5	17.4	22.6	30.8	1010.1	1012.8	1014.7	0	180.5	928	95.6	99.7	100
4/10/08	16.4	17.8	22.8	58	88	96	8.0	1.4	0	2.7	19.2	16	22.5	1010.9	1013.7	1016.1	0	49.0	457	88.9	98.2	100
5/10/08	13.1	14.8	16.4	87	95	98	7.0	0.7	0	1.4	7.2	12.1	16.6	1011.6	1015.0	1017.9	0	54.1	224	96	99.9	100
6/10/08	10.6	17.7	24.2	32	68	97	0.6	9.9	0	4.8	23.2	8.9	24.3	1002.4	1008.2	1014.5	0	133.6	968	96.8	99.8	100
7/10/08	7.3	13.4	22.6	28	54	75	0.0	4.4	0	2.2	8	6.1	21.1	1012.4	1015.1	1017.6	0	231.8	968	98.5	99.9	100
8/10/08	7.8	13.3	20.8	45	65	81	0.0	3.4	0	1.9	7.2	6.9	19.7	1015.4	1018.4	1022.7	0	177.8	958	93.9	99.8	100
9/10/08	8	14.4	22.9	27	70	95	0.0	4.1	0	1.5	7.6	8.1	21.8	1022.2	1025.3	1028.2	0	232.7	994	93.3	99.8	100
10/10/08	9.8	16.3	25	39	74	96	0.2	3.8	0	1.3	8.5	9.8	24.7	1023.4	1026.5	1028.7	0	211.9	976	90.4	99.7	100
11/10/08	12.6	16.3	23.8	49	77	91	1.4	2.4	0	1.0	6.7	12.6	23.8	1023	1024.9	1027	0	128.3	1096	98.8	99.9	100
12/10/08	11.4	17.7	26.8	39	76	96	0.2	3.1	0	1.2	7.6	11.4	26.4	1020	1022.3	1024.8	0	161.4	923	87.1	99.8	100
13/10/08	12.8	19.9	28.4	36	70	94	0.2	4.2	0	2.6	11.2	12.9	27.8	1015.3	1018.7	1021.3	0	194.5	1000	97.1	99.9	100
14/10/08	13.5	16.7	21.7	70	91	98	17.2	1.2	0	1.8	8	13.3	21.8	1015.7	1018.7	1021	0	58.9	429	82.5	98.5	100
15/10/08	10.9	13.4	16.8	65	84	97	0.8	1.3	0	1.5	6.7	11	16.3	1019.8	1021.9	1024.7	0	69.5	484	94.4	99.8	100
16/10/08	8.7	14.6	23.1	44	76	96	0.0	2.6	0	1.1	6.7	8.7	22.6	1021.9	1023.8	1025.2	0	140.9	911	94.7	99.9	100
17/10/08	10.1	17.3	28	23	70	96	0.2	3.9	0	1.4	6.7	10	26.7	1019.1	1022.1	1024.3	0	207.7	1014	94.7	99.6	100
18/10/08	12.9	19.3	28.2	37	70	95	0.0	4.1	0	1.5	7.2	13.1	28.6	1020	1022.5	1025.1	0	214.0	1004	93.6	99.8	100
19/10/08	15.4	22.3	33.6	24	55	86	9.4	4.3	0	2.3	11.6	15.5	33.1	1016.1	1019.6	1022.1	0	174.2	980	91.8	99.0	100
20/10/08	14.1	17.3	24.8	61	83	96	8.4	2.6	0	1.9	10.3	14.1	25.1	1017.4	1019.9	1022.1	0	138.6	1079	84.5	99.1	100
21/10/08	12	14.0	16.9	71	86	98	2.0	1.5	0.4	2.3	9.8	11.2	16.5	1018.4	1020.0	1021.2	0	73.3	390	91.2	99.3	100
22/10/08	7.6	9.6	12	65	81	94	10.6	1.8	0.4	4.5	15.2	4.3	12	1018	1021.6	1024.9	0	87.9	424	84.8	97.3	100
23/10/08	7.2	10.3	13.9	58	77	92	2.2	2.4	1.8	5.3	15.6	3.4	13	1021.3	1022.7	1024.6	0	93.5	469	94.7	98.7	100
24/10/08	8	13.8	22.2	33	68	85	0.0	3.4	0	1.7	6.7	6.9	21.3	1017.1	1020.5	1023.6	0	174.4	956	92.1	99.7	100
25/10/08	9.9	17.5	27.2	25	62	88	0.0	4.0	0	1.8	7.2	8.6	26.5	1013.5	1016.2	1018.8	0	194.5	880	98.5	100.0	100
26/10/08	12.3	21.0	30.2	22	53	82	0.0	3.7	0	1.9	8	11.3	28.9	1012.4	1014.6	1016.5	0	146.6	906	87.4	99.8	100
27/10/08	19.5	25.3	32.4	23	39	61	0.0	7.4	0.9	3.8	13	19.5	31.1	1009.9	1012.7	1015.1	0	231.6	1023	98.8	100.0	100
28/10/08	15.7	18.6	25.2	39	77	95	0.4	2.5	0.4	2.4	8.5	15.7	24.7	1012.6	1018.3	1021.8	0	98.9	628	95.9	99.9	100
29/10/08	14.5	15.5	16.7	95	97	98	6.0	0.3	0	1.7	8	13.7	16.9	1020.1	1022.8	1024.9	0	20.1	103	99.1	100.0	100
30/10/08	14.4	19.7	28.7	54	84	99	0.8	2.3	0	1.3	7.6	14.5	29.5	1012.9	1018.6	1024.3	0	120.7	951	89.4	100.0	100
31/10/08	16.9	25.0	34.3	17	55	90	1.8	6.9	0.4	4.8	14.8	16.3	32.9	1005	1009.4	1015.1	0	180.9	929	83.9	99.1	100
Monthly	7.2	17.4	34.3	17	71	99	77.6	111.1	0	2.4	23.2	3.4	33.1	1002.4	1018.7	1028.7	0	149.7	1096	82.5	99.5	100

2.3.2 Monthly weather charts

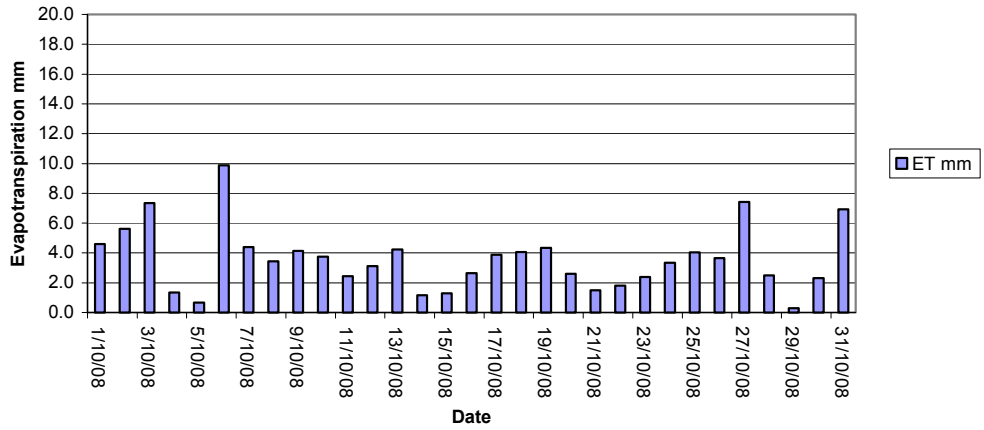




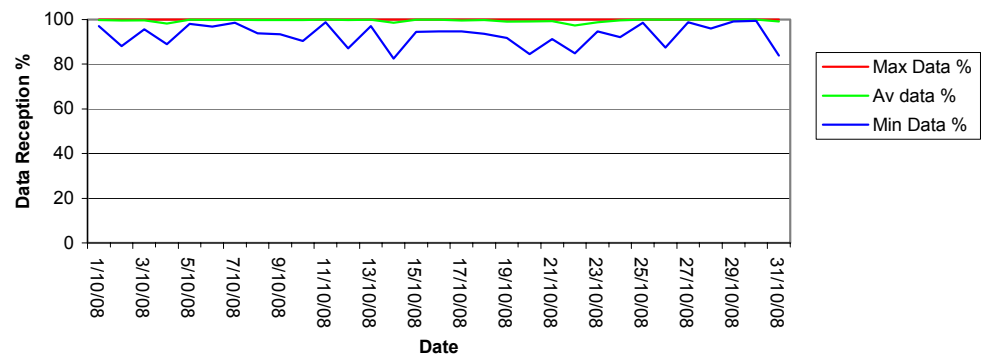
Rocla Calga Quarry - October 2008  
Rainfall



Rocla Calga Quarry - October 2008  
Evapotranspiration



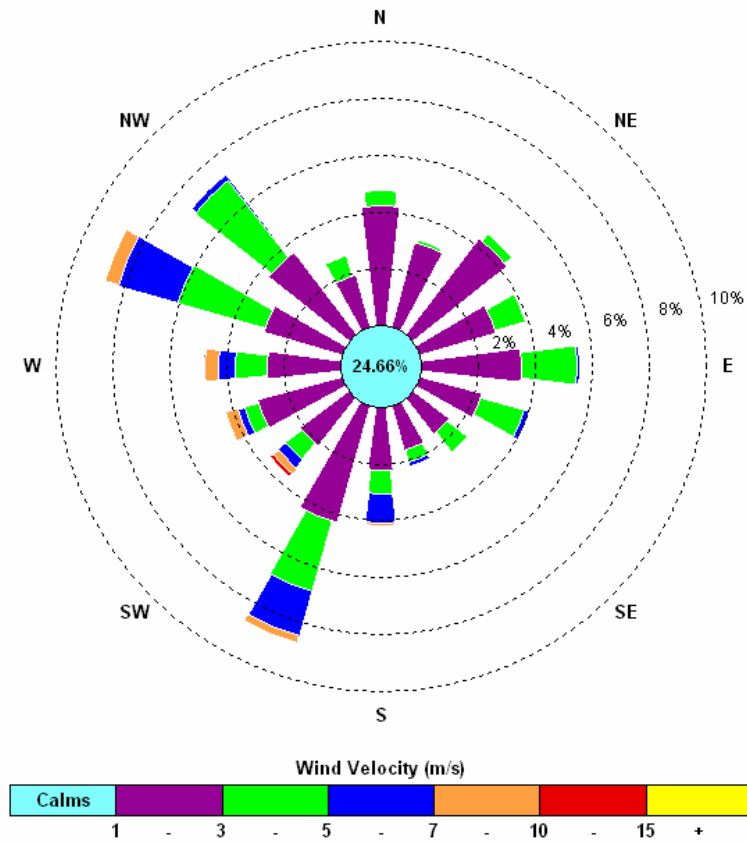
Rocla Calga Quarry - October 2008  
Data Reception



### 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 October 2008 – 23:45, 31 October 2008



The windrose shows predominant winds were from the NW-WNW and SSW, with strongest winds from the SW. The maximum wind speed was 23.2 m/s from the SW.

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

## **APPENDIX 2**

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



