



**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 2007**

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

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4 October 2007

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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 August 2007;
- Surface Water quality results for August 2007;
- Ground Water depth and quality results for August 2007; and
- Meteorological report for August 2007.

The August 2007 dust deposition results show a slight increase in dust deposition rates this month. 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 on the 4 September 2007. Most sites were not flowing at the time of sampling with only two samples collected; site F and a small dam below site F (additional to the Site Water Management Plan requirements). At the time of sample collection, there was no water discharge observed from the site. The samples were collected and analysed for a normal monthly sampling event. Results show very good quality water at both site F and the small dam below site F, with slightly alkaline pH, low Electrical Conductivity, low Total Suspended Solids, and no detectable Total Oil and Grease.

Normal monthly monitoring of groundwaters was undertaken on the 4 September 2007. Groundwater depths decreased at the majority of monitoring bores this month, indicating water moving towards the surface. Water quality parameters remained stable.

The meteorological station continued to return high data recovery and operated well in August 2007. The predominant winds were from the W-WNW. Recorded rainfall on site for August 2007 was 142.0mm, lower than that recorded at the BOM Peats Ridge Station, but higher than the Peats Ridge long-term average for August. Results are detailed below:

|  |         |
|--|---------|
| Rocla Calga Quarry                         | 142.0mm |
| BOM Peats Ridge*                           | 190.8mm |
| BOM Gosford*                               | 179.8mm |
| BOM Peats Ridge Long term mean for August* | 85.5mm  |

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

## 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 and Total Oil and Grease is conducted monthly when sites A to D are flowing and Site F, a dam. 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 August 2007 and the project average. Results are in g/m<sup>2</sup>.month.

**Table 1: Dust Deposition results: 2/8/2007 to 4/9/2007**

| Site | Monthly Insoluble Solids | Monthly Ash Residue | Monthly Combustible Matter | Monthly Ash Residue/ Insoluble Solids % | Current Project Average Insoluble Solids |
|------|--------------------------|---------------------|----------------------------|---|--|
| CD1  | 1.3                      | 0.6                 | 0.7                        | 46                                      | 1.4                                      |
| CD2b | 1.8                      | 0.9                 | 0.9                        | 50                                      | 1.4                                      |
| CD3  | 0.9                      | 0.3                 | 0.6                        | 33                                      | 0.8                                      |
| CD4  | 0.9                      | 0.3                 | 0.6                        | 33                                      | 1.0                                      |
| CD5  | 0.6                      | 0.2                 | 0.4                        | 33                                      | 1.0                                      |
| CD6  | 0.9                      | 0.5                 | 0.4                        | 55                                      | 1.3                                      |

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**.

Predominant winds were from the W-WNW, with strongest winds from the W.

Figure 1: Dust Deposition Charts

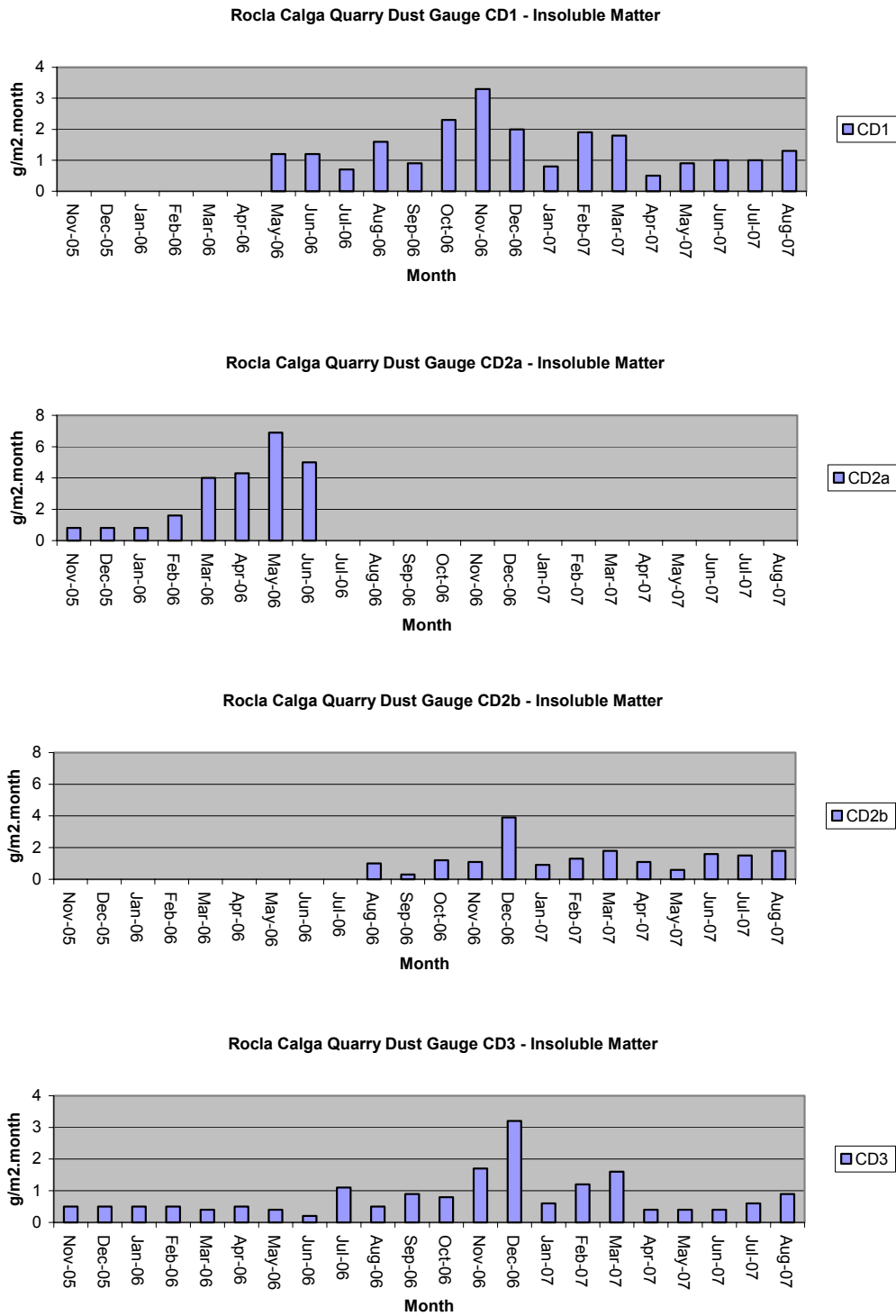
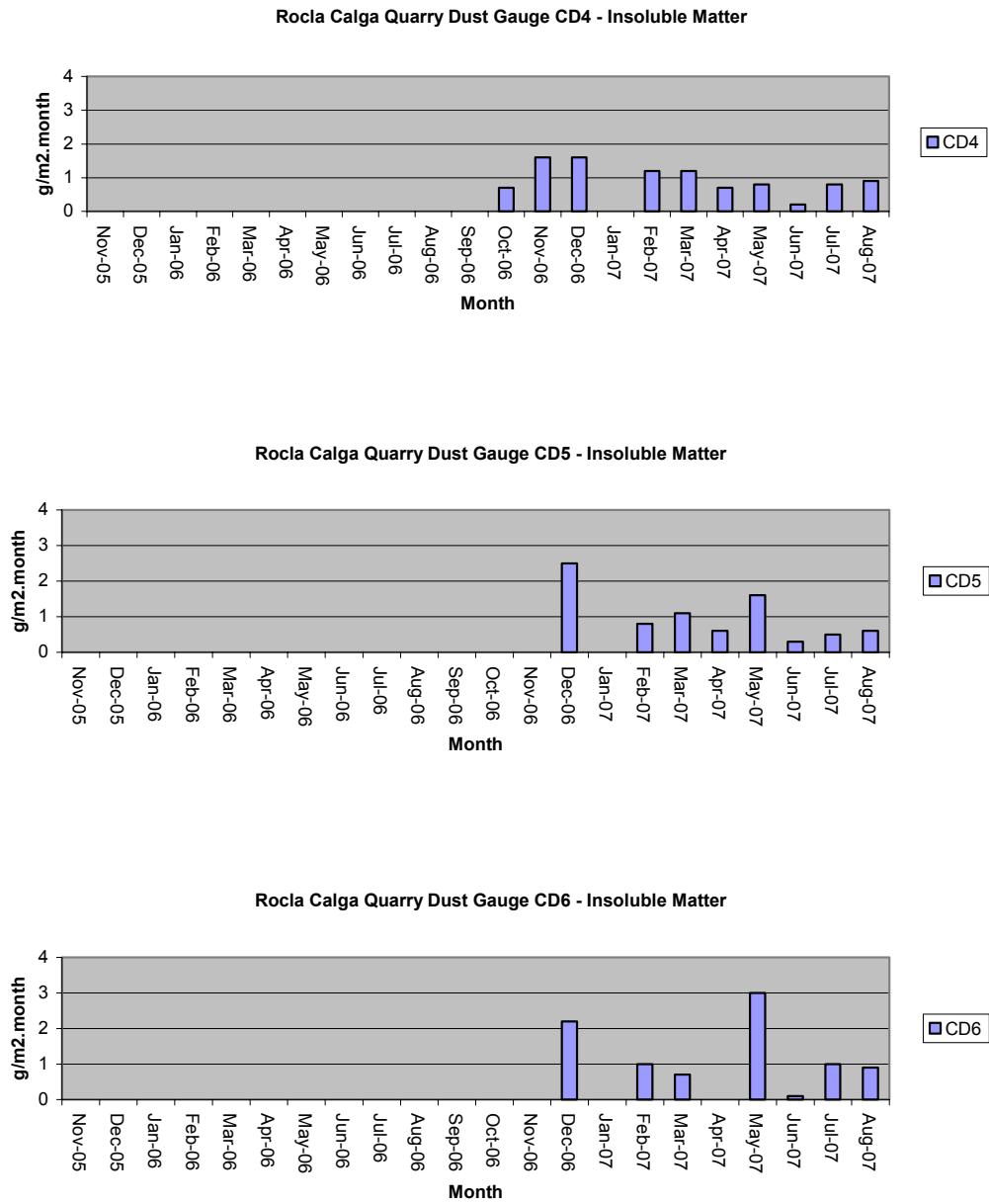


Figure 1 continued



## 2.2 WATER MONITORING

### 2.2.1 Surface Waters

Monthly surface water monitoring was conducted on the 4 September 2007. Results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1**.

**Table 2: Monthly surface water monitoring - grab sample results**

| Site                            | Observed Flow Rate | Water Colour | Turbidity | pH   | EC (uS/cm) | TSS (mg/l) | Oil and Grease (mg/l) |
|---------------------------------|--------------------|--------------|-----------|------|------------|------------|-----------------------|
| A                               | Not Flowing        | --           | --        | --   | --         | --         | --                    |
| B                               | Not Flowing        | --           | --        | --   | --         | --         | --                    |
| C                               | Not Flowing        | --           | --        | --   | --         | --         | --                    |
| D                               | Not Flowing        | --           | --        | --   | --         | --         | --                    |
| F                               | Dam                | Clear        | Clear     | 7.69 | 56         | 26         | <5                    |
| <b>Dam below F (Lower dam)*</b> | Dam                | Clear        | Clear     | 7.23 | 57         | 20         | <5                    |

At the time of sampling, there were no water discharges off site from any sampling location. \* The dam below Site F is not a requirement of the Site Water Management Plan.

There was no flow from any site at the time of sampling with two samples collected from dams; these were Site F and a small dam below site F, additional to the Site Water Management Plan requirements. The samples were collected and analysed for a monthly sampling event. Results show generally very good water quality with slightly alkaline pH, low Electrical Conductivity, low Total Suspended Solids and no detectable Total Oil and Grease.

### 2.2.2 Ground Waters

Ground waters were sampled on the 4 September 2007. 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**.

**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                           | 19.91                              | 4.7            | 135   |
| CQ2       | Voutos     | DIP Only   | 6.23                            | 4.68                               | 5.1            | 80  |
| CQ3       | Voutos     | * Monitor  | 10.53                           | 10.24                              | 6.0            | 130   |
| CQ4       | Voutos     | * Monitor  | 8.78                            | 5.75                               | 5.6            | 90  |
| CQ5       | Gazzana    | DIP Only   | 8.69                            | 4.62                               | 4.8            | 175   |
| CQ6       | Gazzana    | DIP Only   | 16.00                           | 10.88                              | 4.6            | 270   |
| CQ7       | Gazzana    | * Monitor  | 6.89                            | 5.54                               | 4.9            | 105   |
| CQ8       | Gazzana    | * Monitor  | 11.03                           | 6.70                               | 4.9            | 180   |
| CQ9       | Gazzana    | DIP Only   | 10.10                           | 9.05                               | 4.9            | 120   |
| CQ10      | Voutos     | * Monitor  | NI                              | 22.54                              | 4.9            | 140   |
| CQ11S     | Gazzana    | * Monitor  | NI                              | 6.26                               | 5.2            | 155   |
| CQ11D     | Gazzana    | * Monitor  | NI                              | 7.62                               | 6.0            | 120   |
| CQ12      | Gazzana    | * Monitor  | NI                              | 3.80                               | 4.7            | 150   |
| CQ13      | Kashouli   | * Monitor  | NI                              | 11.66                              | 5.2            | 190   |
| CP3       | Gazzana    | Domestic   | 10.40                           | 6.21                               | 5.0            | 155   |
| CP4       | Kashouli   | Domestic   | 13.63                           | 6.68                               | 5.0            | 245   |
| CP5       | Kashouli   | Domestic   | 16.61                           | 5.47                               | 4.4            | 245   |
| CP6       | Kashouli   | Domestic   | 16.27                           | 9.44                               | 4.6            | 255   |
| CP7       | Kashouli   | Production | 8.56                            | 1.33                               | 4.7            | 265   |
| CP8       | Rozmanec   | Domestic   | 22.17                           | 20.13                              | 4.8            | 155   |
| MW7       | Rocla Bore | * Monitor  | 15.76                           | 15.80                              | 4.9            | 130   |
| MW8       | Rocla Bore | * Monitor  | 9.82                            | 6.58                               | 5.4            | 95  |
| MW9       | Rocla Bore | * Monitor  | 22.44                           | NM                                 | NM             | NM  |
| MW10      | Rocla Bore | * Monitor  | 15.41                           | 11.59                              | 5.1            | 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.

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

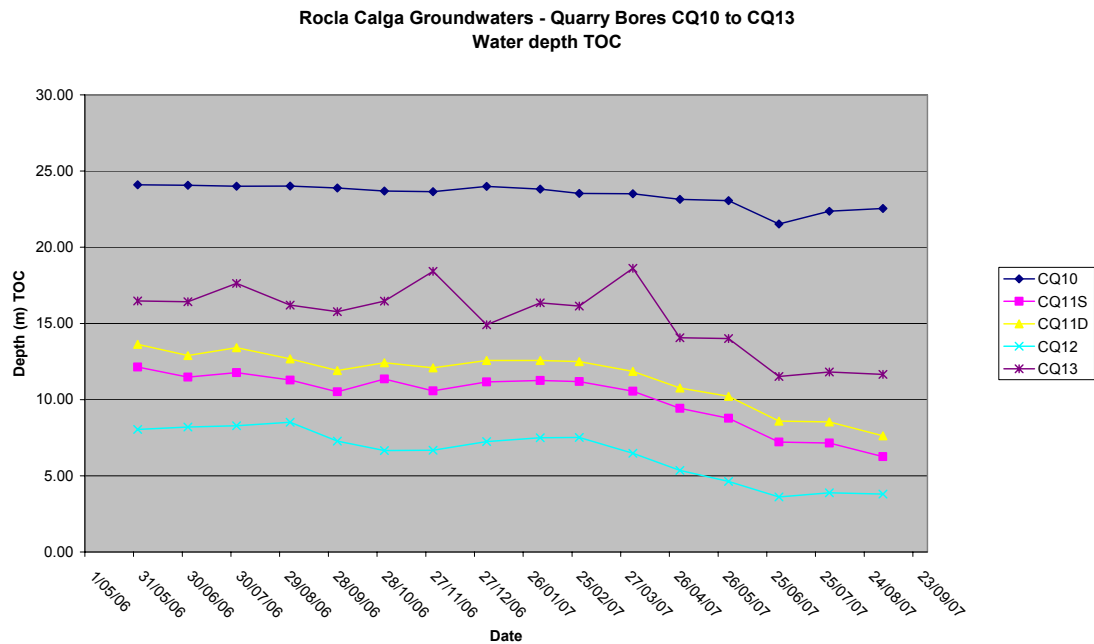
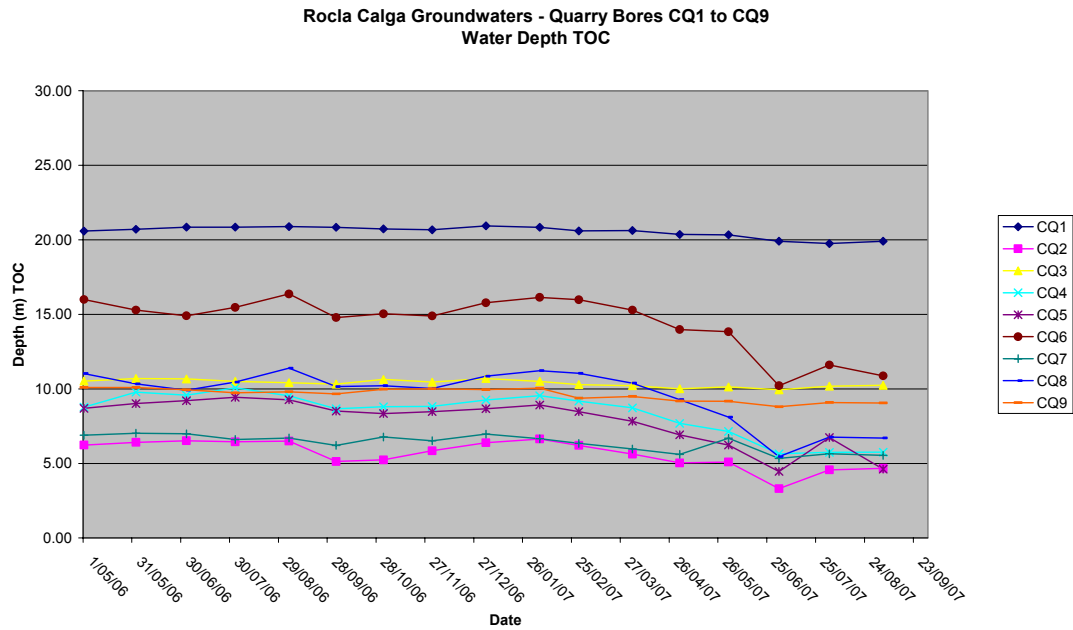
|  |  |
|--|--|
|  | Increase to ground water depth (water moved away from surface) |
|  | Decrease to ground water depth (water moved towards surface)   |
|  | Stable water depth (+/- 0.01m)                                 |

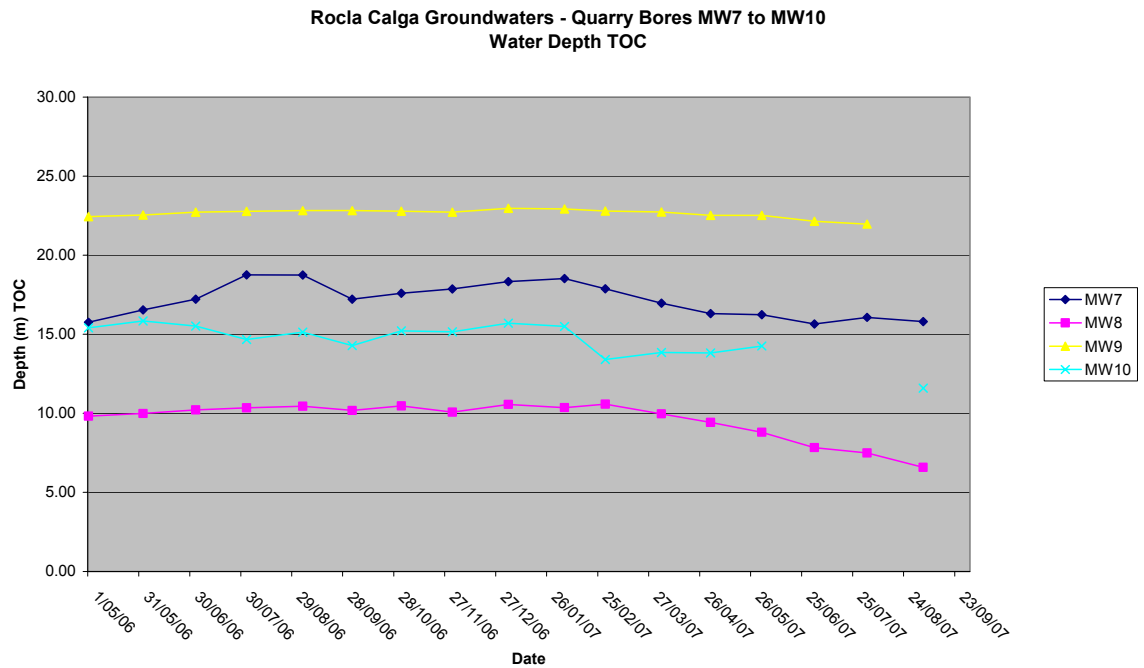
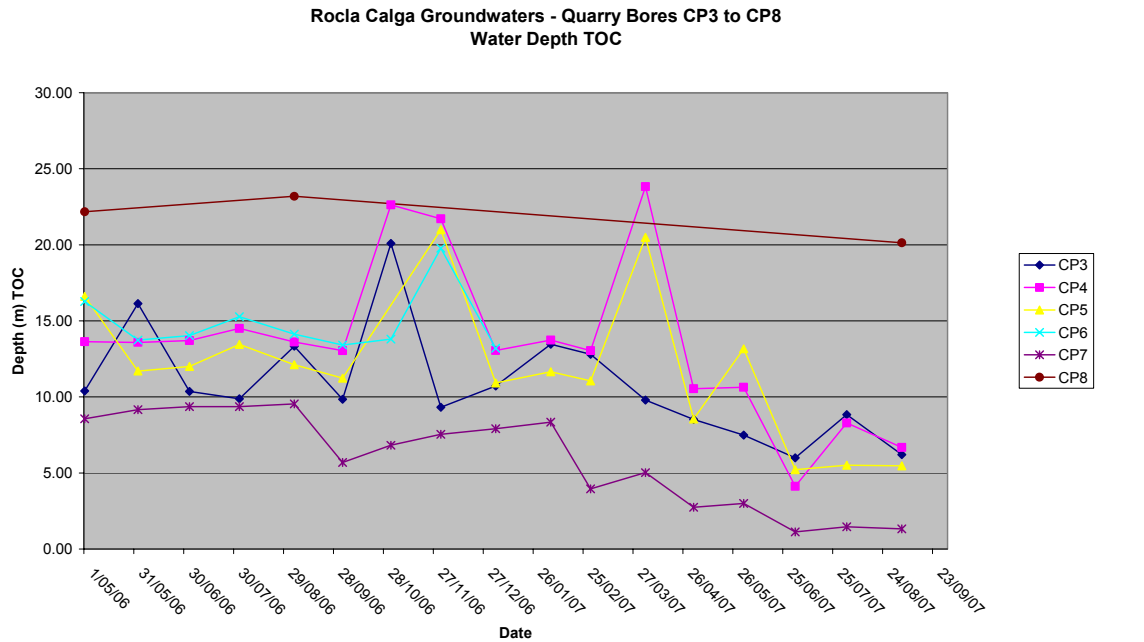
Water depth indicated decreases in groundwater depth (water moving towards the surface) at most monitoring bores this month. The CP series of bores generally show larger increases and decreases in depth to water due to pumping from the bores.

MW9 could not be monitored this month due to site access restrictions.

Longer term monitoring is required to fully evaluate groundwater depth trends.

**Figures 2 to 5: Groundwater Depth Charts.**





Groundwater quality results remained relatively stable and indicate slightly acidic water of low electrical conductivity. Detailed bi-annual water quality monitoring was carried out in April 2007 and is next due in October 2007.

Available groundwater loggers were downloaded.

## 2.3 METEOROLOGICAL MONITORING

The Rocla Calga Quarry weather station was fully operational in August 2007 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 August 2007 shows lower rainfall at the Rocla Calga Quarry station compared to the nearby Peats Ridge and Gosford BOM stations. The rainfall comparison is provided below:

|  |         |
|--|---------|
| Rocla Calga Quarry                         | 142.0mm |
| BOM Peats Ridge*                           | 190.8mm |
| BOM Gosford*                               | 179.8mm |
| BOM Peats Ridge Long term mean for August* | 85.5mm  |

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

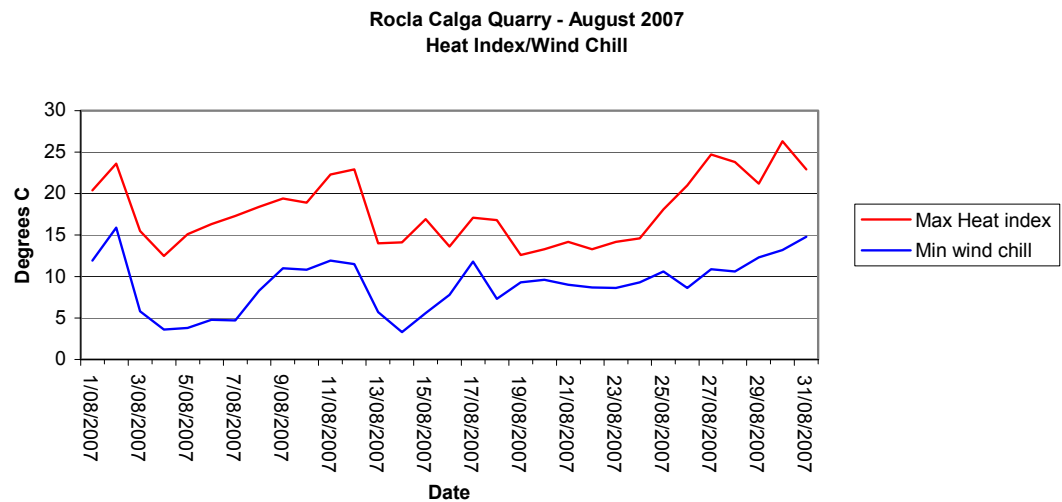
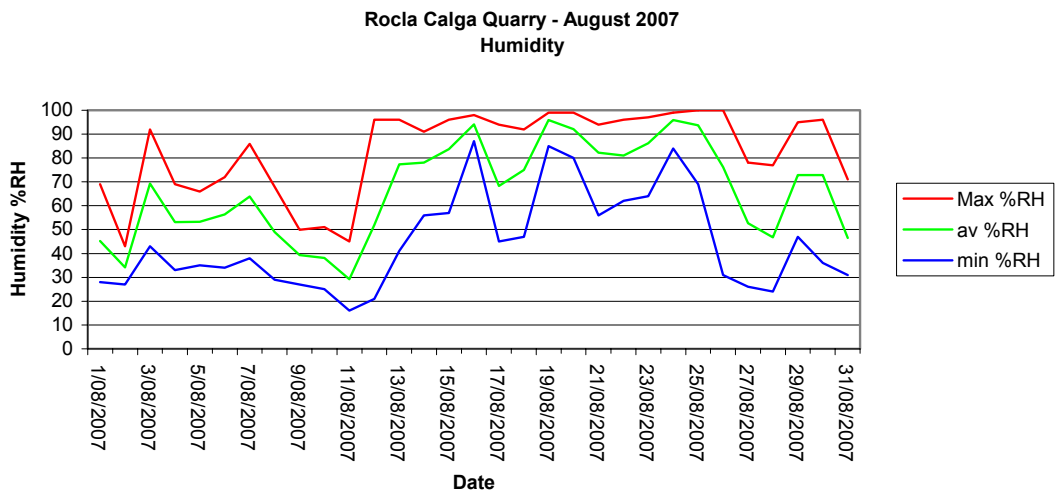
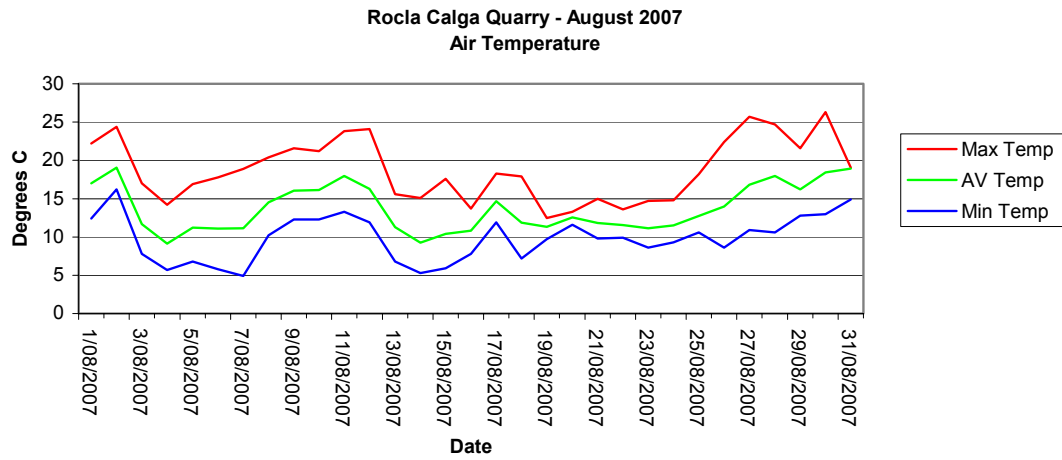
**Results are displayed in the following table and figures.**

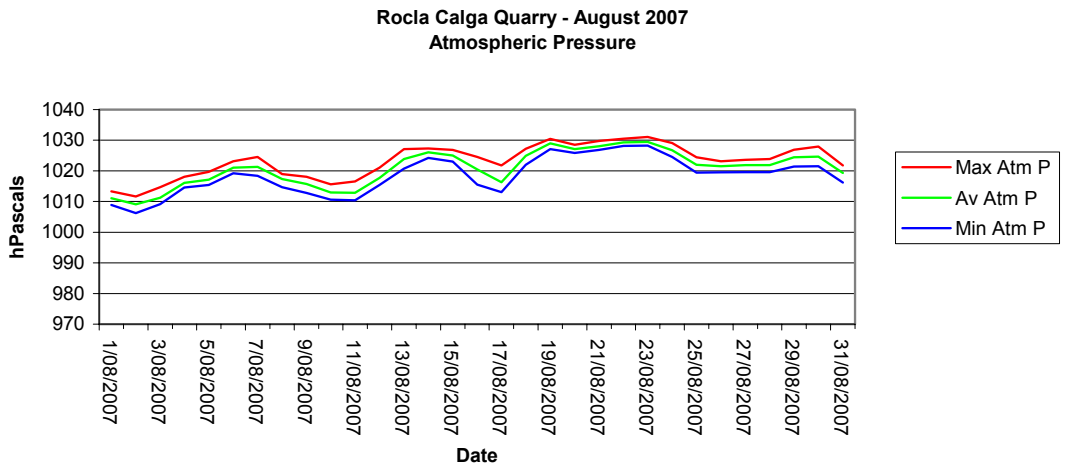
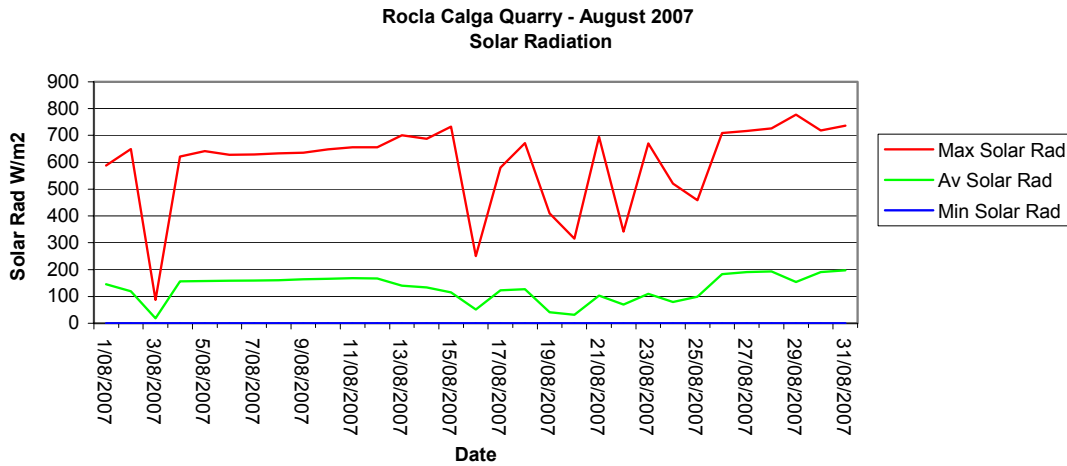
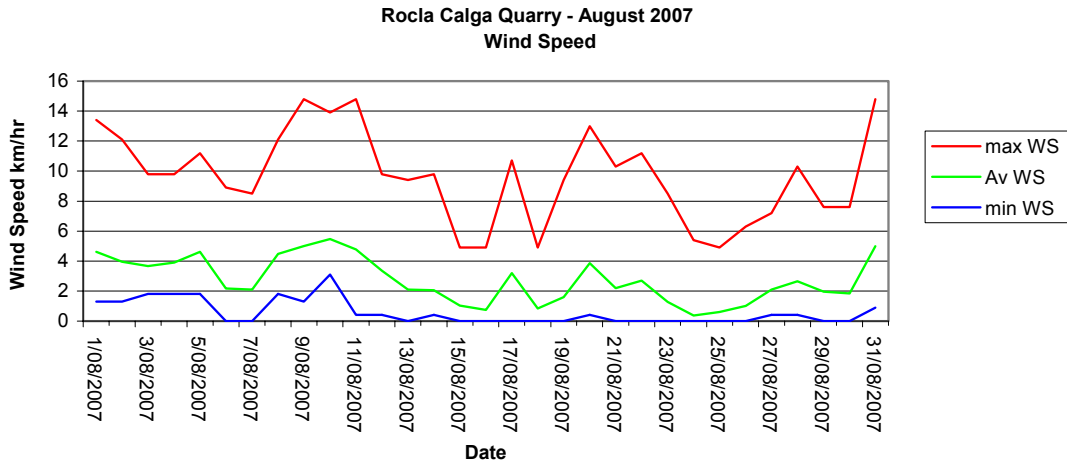
2.3.1 Monthly meteorological data summary

Summary Aug-07 Rocla - Calga

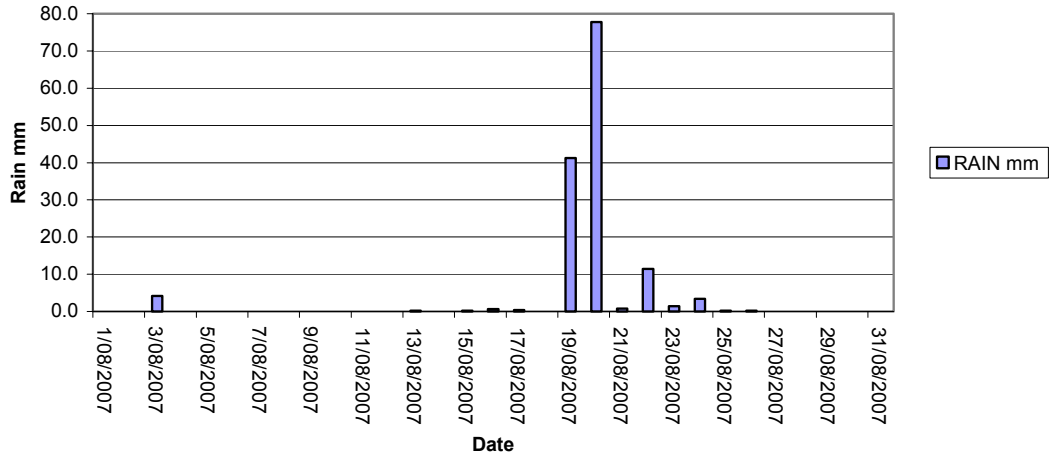
| Date       | Min Temp | AV Temp | Max Temp | min %RH | av %RH | Max %RH | RAIN mm | ET mm | min WS | Av WS | max WS | Min wind chill | Max Heat index | Min Atm P | Av Atm P | Max Atm P | Min Solar Rad | Av Solar Rad | Max Solar Rad | Min Data % | Av data % | Max Data % |
|------------|----------|---------|----------|---------|--------|---------|---------|-------|--------|-------|--------|----------------|----------------|-----------|----------|-----------|---------------|--------------|---------------|------------|-----------|------------|
| 1/08/2007  | 12.4     | 17.0    | 22.2     | 28      | 45     | 69      | 0.0     | 5.1   | 1.3    | 4.6   | 13.4   | 11.9           | 20.4           | 1008.9    | 1011.1   | 1013.3    | 0             | 145.7        | 588           | 85.1       | 99.8      | 100        |
| 2/08/2007  | 16.2     | 19.1    | 24.4     | 27      | 34     | 43      | 0.0     | 5.0   | 1.3    | 4.0   | 12.1   | 15.9           | 23.6           | 1006.2    | 1009.1   | 1011.6    | 0             | 118.9        | 649           | 99.4       | 100.0     | 100        |
| 3/08/2007  | 7.8      | 11.7    | 17       | 43      | 69     | 92      | 4.2     | 1.7   | 1.8    | 3.7   | 9.8    | 5.8            | 15.5           | 1009.2    | 1011.3   | 1014.7    | 0             | 18.8         | 87            | 97.1       | 99.5      | 100        |
| 4/08/2007  | 5.7      | 9.2     | 14.2     | 33      | 53     | 69      | 0.0     | 3.7   | 1.8    | 3.9   | 9.8    | 3.6            | 12.5           | 1014.6    | 1016.1   | 1018.1    | 0             | 156.1        | 621           | 90.6       | 99.1      | 100        |
| 5/08/2007  | 6.8      | 11.2    | 16.9     | 35      | 53     | 66      | 0.0     | 4.1   | 1.8    | 4.6   | 11.2   | 3.8            | 15.1           | 1015.4    | 1017.1   | 1019.7    | 0             | 156.8        | 642           | 94.4       | 99.5      | 100        |
| 6/08/2007  | 5.8      | 11.1    | 17.8     | 34      | 56     | 72      | 0.0     | 3.2   | 0      | 2.2   | 8.9    | 4.8            | 16.3           | 1019.2    | 1021.0   | 1023.1    | 0             | 158.3        | 628           | 96.2       | 99.3      | 100        |
| 7/08/2007  | 4.9      | 11.1    | 18.9     | 38      | 64     | 86      | 0.0     | 3.1   | 0      | 2.1   | 8.5    | 4.7            | 17.3           | 1018.4    | 1021.3   | 1024.5    | 0             | 159.7        | 629           | 97.1       | 99.6      | 100        |
| 8/08/2007  | 10.2     | 14.5    | 20.4     | 29      | 49     | 68      | 0.0     | 4.7   | 1.8    | 4.5   | 12.1   | 8.3            | 18.4           | 1014.7    | 1017.3   | 1018.9    | 0             | 160.9        | 633           | 97.7       | 99.7      | 100        |
| 9/08/2007  | 12.3     | 16.1    | 21.6     | 27      | 39     | 50      | 0.0     | 5.9   | 1.3    | 5.0   | 14.8   | 11             | 19.4           | 1012.8    | 1015.7   | 1018.1    | 0             | 163.8        | 635           | 97.4       | 99.9      | 100        |
| 10/08/2007 | 12.3     | 16.1    | 21.2     | 25      | 38     | 51      | 0.0     | 6.1   | 3.1    | 5.5   | 13.9   | 10.8           | 18.9           | 1010.6    | 1013.0   | 1015.6    | 0             | 166.3        | 648           | 98.8       | 99.9      | 100        |
| 11/08/2007 | 13.3     | 18.0    | 23.8     | 16      | 29     | 45      | 0.0     | 6.7   | 0.4    | 4.8   | 14.8   | 11.9           | 22.3           | 1010.4    | 1012.9   | 1016.6    | 0             | 168.2        | 656           | 98.8       | 100.0     | 100        |
| 12/08/2007 | 11.9     | 16.3    | 24.1     | 21      | 52     | 96      | 0.0     | 4.9   | 0.4    | 3.4   | 9.8    | 11.5           | 22.9           | 1015.4    | 1017.7   | 1021      | 0             | 167.3        | 656           | 92.7       | 99.6      | 100        |
| 13/08/2007 | 6.8      | 11.3    | 15.6     | 41      | 77     | 96      | 0.2     | 2.4   | 0      | 2.1   | 9.4    | 5.7            | 14             | 1020.7    | 1023.9   | 1027.1    | 0             | 139.6        | 701           | 89.8       | 99.1      | 100        |
| 14/08/2007 | 5.3      | 9.2     | 15.1     | 56      | 78     | 91      | 0.0     | 2.1   | 0.4    | 2.1   | 9.8    | 3.3            | 14.1           | 1024.3    | 1026.1   | 1027.3    | 0             | 133.9        | 687           | 95.3       | 99.1      | 100        |
| 15/08/2007 | 5.9      | 10.4    | 17.6     | 57      | 84     | 96      | 0.2     | 1.7   | 0      | 1.0   | 4.9    | 5.6            | 16.9           | 1023      | 1025.0   | 1026.8    | 0             | 115.5        | 733           | 94.4       | 99.1      | 100        |
| 16/08/2007 | 7.8      | 10.8    | 13.7     | 87      | 94     | 98      | 0.6     | 0.7   | 0      | 0.7   | 4.9    | 7.8            | 13.6           | 1015.5    | 1020.4   | 1024.5    | 0             | 51.1         | 251           | 97.1       | 99.6      | 100        |
| 17/08/2007 | 11.9     | 14.7    | 18.3     | 45      | 68     | 94      | 0.4     | 3.0   | 0      | 3.2   | 10.7   | 11.8           | 17.1           | 1013.1    | 1016.2   | 1021.8    | 0             | 122.9        | 580           | 98         | 99.9      | 100        |
| 18/08/2007 | 7.2      | 11.9    | 17.9     | 47      | 75     | 92      | 0.0     | 2.1   | 0      | 0.8   | 4.9    | 7.3            | 16.8           | 1022      | 1024.9   | 1027.2    | 0             | 126.4        | 671           | 92.7       | 99.5      | 100        |
| 19/08/2007 | 9.7      | 11.3    | 12.5     | 85      | 96     | 99      | 41.2    | 0.5   | 0      | 1.6   | 9.4    | 9.3            | 12.6           | 1027.1    | 1029.0   | 1030.4    | 0             | 41.7         | 410           | 96.5       | 99.3      | 100        |
| 20/08/2007 | 11.6     | 12.6    | 13.3     | 80      | 92     | 99      | 77.8    | 0.7   | 0.4    | 3.9   | 13     | 9.6            | 13.3           | 1025.9    | 1027.1   | 1028.5    | 0             | 31.5         | 316           | 87.4       | 98.1      | 100        |
| 21/08/2007 | 9.8      | 11.8    | 15       | 56      | 82     | 94      | 0.8     | 1.9   | 0      | 2.2   | 10.3   | 9              | 14.2           | 1026.8    | 1028.0   | 1029.8    | 0             | 103.1        | 695           | 95.6       | 99.6      | 100        |
| 22/08/2007 | 9.9      | 11.6    | 13.6     | 62      | 81     | 96      | 11.4    | 1.5   | 0      | 2.7   | 11.2   | 8.7            | 13.3           | 1028.1    | 1029.3   | 1030.5    | 0             | 69.1         | 342           | 92.7       | 99.4      | 100        |
| 23/08/2007 | 8.6      | 11.1    | 14.7     | 64      | 86     | 97      | 1.4     | 1.6   | 0      | 1.3   | 8.5    | 8.6            | 14.2           | 1028.2    | 1029.4   | 1031.1    | 0             | 109.7        | 670           | 95         | 99.4      | 100        |
| 24/08/2007 | 9.3      | 11.5    | 14.8     | 84      | 96     | 99      | 3.4     | 1.0   | 0      | 0.4   | 5.4    | 9.3            | 14.6           | 1024.5    | 1026.7   | 1029.1    | 0             | 79.5         | 520           | 94.4       | 99.0      | 100        |
| 25/08/2007 | 10.6     | 12.8    | 18.2     | 69      | 94     | 100     | 0.2     | 1.3   | 0      | 0.6   | 4.9    | 10.6           | 18.1           | 1019.4    | 1022.0   | 1024.4    | 0             | 98.8         | 459           | 97.7       | 99.7      | 100        |
| 26/08/2007 | 8.6      | 14.0    | 22.4     | 31      | 76     | 100     | 0.2     | 2.9   | 0      | 1.0   | 6.3    | 8.6            | 21             | 1019.5    | 1021.5   | 1023.1    | 0             | 183.1        | 709           | 96.8       | 99.8      | 100        |
| 27/08/2007 | 10.9     | 16.8    | 25.7     | 26      | 53     | 78      | 0.0     | 4.3   | 0.4    | 2.1   | 7.2    | 10.9           | 24.7           | 1019.6    | 1021.9   | 1023.6    | 0             | 191.2        | 717           | 96.5       | 99.6      | 100        |
| 28/08/2007 | 10.6     | 18.0    | 24.7     | 24      | 47     | 77      | 0.0     | 5.1   | 0.4    | 2.7   | 10.3   | 10.6           | 23.8           | 1019.6    | 1021.8   | 1023.9    | 0             | 193.4        | 726           | 95.6       | 99.4      | 100        |
| 29/08/2007 | 12.8     | 16.2    | 21.6     | 47      | 73     | 95      | 0.0     | 3.1   | 0      | 2.0   | 7.6    | 12.3           | 21.2           | 1021.4    | 1024.4   | 1026.9    | 0             | 154.5        | 777           | 95.3       | 99.8      | 100        |
| 30/08/2007 | 13       | 18.5    | 26.3     | 36      | 73     | 96      | 0.0     | 3.8   | 0      | 1.8   | 7.6    | 13.2           | 26.3           | 1021.5    | 1024.6   | 1028      | 0             | 190.8        | 719           | 95.9       | 99.7      | 100        |
| 31/08/2007 | 14.9     | 18.9    | 19.1     | 31      | 46     | 71      | 0.0     | 6.4   | 0.9    | 5.0   | 14.8   | 14.8           | 22.9           | 1016.2    | 1019.3   | 1021.8    | 0             | 197.8        | 736           | 98.2       | 99.8      | 100        |
| Monthly    | 4.9      | 13.7    | 26.3     | 16      | 66     | 100     | 142.0   | 99.9  | 0      | 2.7   | 14.8   | 3.3            | 26.3           | 1006.2    | 1020.8   | 1031.1    | 0             | 131.4        | 777           | 85.1       | 99.5      | 100        |

2.3.2 Monthly weather charts

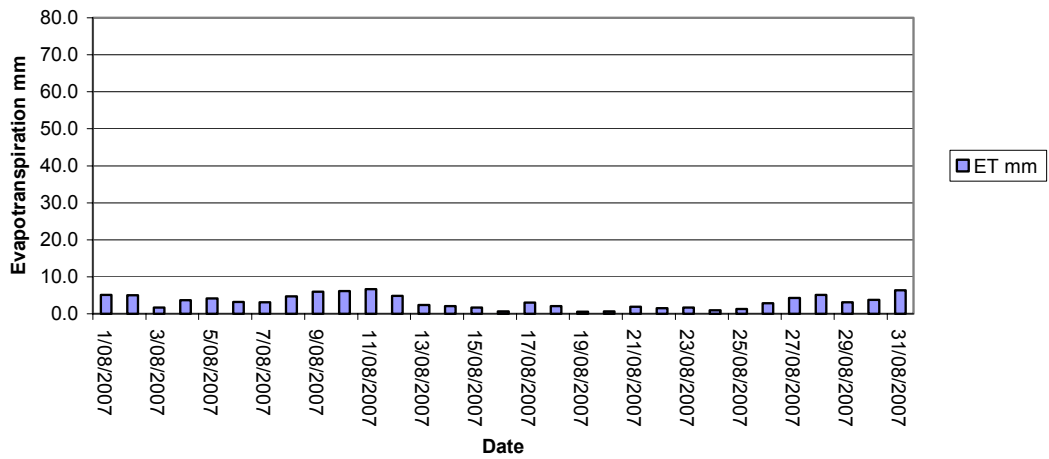




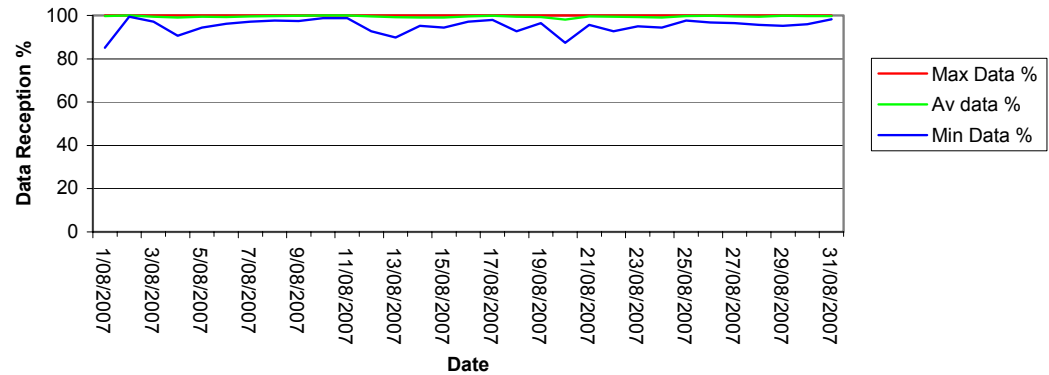
Rocla Calga Quarry - August 2007  
Rainfall



Rocla Calga Quarry - August 2007  
Evapotranspiration



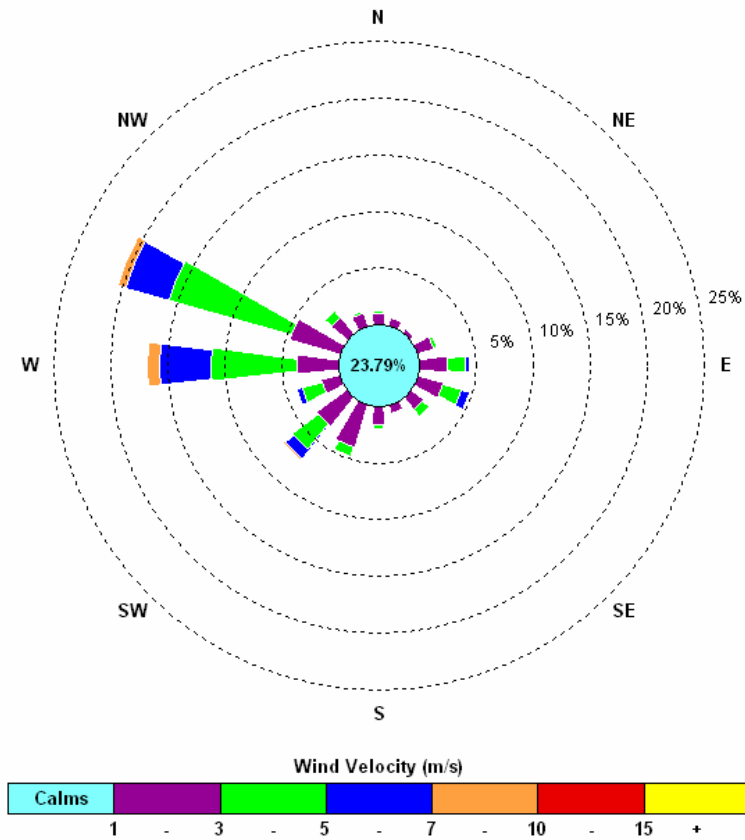
Rocla Calga Quarry - August 2007  
Data Reception



### 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 2007 – 23:45 31 August 2007



The windrose shows predominant winds from the W-WNW this month. The maximum wind speed was 14.8 m/s recorded on three occasions from the WNW, W and WSW.

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

**APPENDIX 2**

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

**Peats Ridge, New South Wales  
August 2007 Daily Weather Observations**



**Australian Government  
Bureau of Meteorology**

| Date                              | Day | Temps |      | Rain<br>mm | Evap<br>mm | Sun<br>hours | Max wind gust |      |       | 9am  |    |         |      |      |      | 3pm  |    |         |      |      |      |
|-----------------------------------|-----|-------|------|------------|------------|--------------|---------------|------|-------|------|----|---------|------|------|------|------|----|---------|------|------|------|
|                                   |     | Min   | Max  |            |            |              | Dirn          | Spd  | Time  | Temp | RH | Cld     | Dirn | Spd  | MSLP | Temp | RH | Cld     | Dirn | Spd  | MSLP |
|                                   |     | °C    | °C   |            |            |              |               | km/h | local | °C   | %  | eighths |      | km/h | hPa  | °C   | %  | eighths |      | km/h | hPa  |
| 1                                 | We  | 9.3   | 21.9 | 0          | 1.8        |              |               |      | 16.1  | 57   | 1  | NW      | 9    |      | 21.1 | 35   | 4  | NW      | 9    |      |      |
| 2                                 | Th  | 11.6  | 25.1 | 0          | 4.0        |              |               |      | 13.6  | 72   | 5  | NW      | 4    |      | 23.6 | 36   | 4  | NW      | 4    |      |      |
| 3                                 | Fr  | 12.9  | 13.3 | 0          | 4.2        |              |               |      | 13.3  | 60   | 8  | NW      | 4    |      | 9.7  | 93   | 8  | NW      | 4    |      |      |
| 4                                 | Sa  | 4.2   | 14.4 | 7.0        | 0.8        |              |               |      | 9.1   | 61   | 1  | NW      | 9    |      | 14.0 | 39   | 0  | NW      | 4    |      |      |
| 5                                 | Su  | 4.4   | 16.6 | 0          | 2.2        |              |               |      | 11.8  | 61   | 0  | NW      | 4    |      | 16.6 | 40   | 1  | SW      | 9    |      |      |
| 6                                 | Mo  | 4.6   | 17.6 | 0          | 2.0        |              |               |      | 10.4  | 69   | 0  | WNW     | 4    |      | 17.2 | 34   | 0  | SSW     | 9    |      |      |
| 7                                 | Tu  | 5.2   | 18.8 | 0          | 3.2        |              |               |      | 11.0  | 69   | 0  | NW      | 4    |      | 17.2 | 43   | 0  | NE      | 4    |      |      |
| 8                                 | We  | 8.2   | 20.7 | 0          | 2.6        |              |               |      | 13.7  | 58   | 0  | NW      | 9    |      | 20.1 | 35   | 0  | NW      | 4    |      |      |
| 9                                 | Th  | 7.2   | 21.8 | 0          | 3.2        |              |               |      | 15.3  | 47   | 0  | NW      | 9    |      |      |      |    |         |      |      |      |
| 10                                | Fr  | 9.8   | 20.8 | 0          | 4.0        |              |               |      | 14.7  | 50   | 3  | NW      | 9    |      | 20.1 | 28   | 5  | NW      | 19   |      |      |
| 11                                | Sa  | 11.3  |      | 0          | 5.4        |              |               |      | 15.6  | 39   | 0  | NW      | 4    |      |      |      |    |         |      |      |      |
| 12                                | Su  |       | 24.9 | 0          |            |              |               |      |       |      |    |         |      |      |      |      |    |         |      |      |      |
| 13                                | Mo  | 10.2  | 15.3 | 0          | 7.4        |              |               |      | 11.7  | 76   | 5  | E       | 9    |      | 13.4 | 62   | 5  | SE      | 9    |      |      |
| 14                                | Tu  | 3.9   | 15.6 | 0          | 2.4        |              |               |      | 9.6   | 66   | 0  | SSW     | 9    |      | 13.3 | 66   | 5  | SSW     | 4    |      |      |
| 15                                | We  | 3.7   | 16.3 | 0          | 1.8        |              |               |      | 10.9  | 90   | 1  | SW      | 4    |      | 14.3 | 70   | 5  | ESE     | 4    |      |      |
| 16                                | Th  | 7.6   | 16.1 | 0          | 1.4        |              |               |      | 11.9  | 95   | 8  | ENE     | 4    |      | 13.0 | 94   | 7  | ENE     | 4    |      |      |
| 17                                | Fr  | 11.3  | 18.1 | 3.2        | 0.2        |              |               |      | 16.0  | 76   | 5  | NW      | 9    |      |      |      |    |         |      |      |      |
| 18                                | Sa  | 5.8   | 17.3 | 0          | 2.2        |              |               |      | 13.2  | 65   | 3  | SSW     | 4    |      | 15.1 | 69   | 5  | SW      | 4    |      |      |
| 19                                | Su  | 8.8   | 13.2 | 0          | 1.6        |              |               |      | 11.6  | 95   | 8  | SW      | 4    |      | 12.2 | 100  | 8  | E       | 4    |      |      |
| 20                                | Mo  | 11.2  | 13.1 | 148.2      |            |              |               |      | 13.0  | 97   | 8  | ESE     | 19   |      | 12.7 | 97   | 8  | ESE     | 37   |      |      |
| 21                                | Tu  | 9.2   | 15.8 | 18.0       | 0.6        |              |               |      | 11.6  | 95   | 6  | S       | 4    |      |      |      |    |         |      |      |      |
| 22                                | We  | 9.2   | 13.6 | 7.0        | 1.0        |              |               |      | 11.5  | 96   | 8  | S       | 4    |      | 10.9 | 92   | 8  | SE      | 4    |      |      |
| 23                                | Th  | 6.9   | 15.0 | 2.8        | 1.2        |              |               |      | 12.6  | 82   | 7  | E       | 9    |      | 13.2 | 82   | 7  | E       | 4    |      |      |
| 24                                | Fr  | 8.0   | 14.6 | 1.4        | 1.4        |              |               |      | 11.1  | 99   | 8  | E       | 4    |      | 13.2 | 98   | 8  | E       | 4    |      |      |
| 25                                | Sa  | 10.6  |      | 2.8        | 1.0        |              |               |      | 12.0  | 97   | 8  | ESE     | 4    |      | 14.6 | 84   | 8  | ESE     | 4    |      |      |
| 26                                | Su  |       | 21.3 | 0          |            |              |               |      |       |      |    |         |      |      |      |      |    |         |      |      |      |
| 27                                | Mo  | 7.9   | 25.7 | 0.4        | 4.0        |              |               |      | 17.8  | 47   | 0  | WNW     | 19   |      | 23.6 | 33   | 1  | W       | 4    |      |      |
| 28                                | Tu  | 11.4  | 25.2 | 0          | 3.8        |              |               |      | 18.6  | 50   | 4  | NW      | 9    |      | 24.6 | 28   | 1  | NW      | 9    |      |      |
| 29                                | We  | 11.7  | 21.6 | 0          | 3.8        |              |               |      | 17.6  | 76   | 3  | SE      | 4    |      | 20.0 | 69   | 2  | ENE     | 9    |      |      |
| 30                                | Th  | 11.8  | 24.6 | 0          | 2.6        |              |               |      | 17.6  | 76   | 5  | NW      | 9    |      | 23.8 | 56   | 1  | NW      | 4    |      |      |
| 31                                | Fr  | 13.8  |      | 0          | 4.0        |              |               |      | 18.6  | 42   | 0  | NW      | 19   |      | 23.1 | 35   | 0  | WNW     | 37   |      |      |
| <b>Statistics for August 2007</b> |     |       |      |            |            |              |               |      |       |      |    |         |      |      |      |      |    |         |      |      |      |
| Mean                              |     | 8.7   | 18.5 |            | 2.6        |              |               |      | 13.5  | 71   | 3  |         | 7    |      | 16.8 | 60   | 4  |         | 8    |      |      |
| Lowest                            |     | 3.7   | 13.1 |            | 0.2        |              |               |      | 9.1   | 39   | 0  | #       | 4    |      | 9.7  | 28   | 0  | #       | 4    |      |      |
| Highest                           |     | 13.8  | 25.7 | 148.2      | 7.4        |              |               |      | 18.6  | 99   | 8  | #       | 19   |      | 24.6 | 100  | 8  | #       | 37   |      |      |
| Total                             |     |       |      | 190.8      | 73.6       |              |               |      |       |      |    |         |      |      |      |      |    |         |      |      |      |

Gosford, New South Wales  
August 2007 Daily Weather Observations



Australian Government  
Bureau of Meteorology

| Date                       | Day | Temps |      | Rain<br>mm | Evap<br>mm | Sun<br>hours | Max wind gust |      |       | 9am  |    |         |      |      |      | 3pm  |    |         |      |      |      |
|----------------------------|-----|-------|------|------------|------------|--------------|---------------|------|-------|------|----|---------|------|------|------|------|----|---------|------|------|------|
|                            |     | Min   | Max  |            |            |              | Dirn          | Spd  | Time  | Temp | RH | Cld     | Dirn | Spd  | MSLP | Temp | RH | Cld     | Dirn | Spd  | MSLP |
|                            |     | °C    | °C   |            |            |              |               | km/h | local | °C   | %  | eighths |      | km/h | hPa  | °C   | %  | eighths |      | km/h | hPa  |
| 1                          | We  | 4.9   | 23.7 | 0          |            |              | N             | 33   | 10:49 | 11.6 | 89 |         |      | Calm |      | 23.4 | 27 |         | NNW  | 13   |      |
| 2                          | Th  | 8.0   | 24.8 | 0          |            |              | NW            | 20   | 18:30 | 11.6 | 90 |         |      | Calm |      | 22.6 | 43 |         | NNW  | 2    |      |
| 3                          | Fr  | 11.4  | 13.9 | 0          |            |              | NNW           | 20   | 20:55 | 13.6 | 88 |         |      | WNW  | 6    | 11.3 | 90 |         | NW   | 9    |      |
| 4                          | Sa  | 3.1   | 16.3 | 5.0        |            |              | WNW           | 28   | 10:13 | 10.9 | 53 |         |      | WNW  | 4    | 15.6 | 30 |         | NW   | 7    |      |
| 5                          | Su  | 1.2   | 18.8 | 0          |            |              | SSW           | 24   | 10:51 | 13.6 | 55 |         |      | NNW  | 6    | 18.3 | 32 |         | NW   | 11   |      |
| 6                          | Mo  | 3.4   | 19.0 | 0          |            |              | NW            | 28   | 12:15 | 13.5 | 52 |         |      | NW   | 9    | 18.9 | 33 |         | WNW  | 4    |      |
| 7                          | Tu  | 1.6   | 19.6 | 0          |            |              | N             | 22   | 12:42 | 10.0 | 79 |         |      | Calm |      | 19.3 | 37 |         | NNE  | 7    |      |
| 8                          | We  | 4.0   | 22.1 | 0          |            |              | NNW           | 39   | 13:23 | 15.7 | 50 |         |      | NNW  | 15   | 21.9 | 27 |         | WNW  | 9    |      |
| 9                          | Th  | 4.7   | 23.4 | 0          |            |              | N             | 44   | 12:52 | 14.7 | 71 |         |      | Calm |      | 23.2 | 28 |         | NW   | 11   |      |
| 10                         | Fr  | 5.3   | 23.0 | 0          |            |              | NNW           | 39   | 11:03 | 15.6 | 51 |         |      | N    | 6    | 22.3 | 23 |         | NNW  | 17   |      |
| 11                         | Sa  | 5.8   | 26.0 | 0          |            |              | N             | 37   | 14:18 | 16.8 | 41 |         |      | N    | 9    | 25.2 | 15 |         | NNW  | 9    |      |
| 12                         | Su  | 7.9   | 25.1 | 0          |            |              | NNW           | 28   | 09:34 | 21.0 | 24 |         |      | NNW  | 13   | 19.2 | 68 |         | SSE  | 11   |      |
| 13                         | Mo  | 10.3  | 16.4 | 0          |            |              | SE            | 33   | 14:27 | 14.1 | 71 |         |      | SE   | 9    | 14.5 | 60 |         | SE   | 17   |      |
| 14                         | Tu  | 5.0   | 16.1 | 0          |            |              | SSE           | 22   | 13:43 | 11.5 | 63 |         |      | ESE  | 7    | 15.3 | 63 |         | SE   | 9    |      |
| 15                         | We  | 4.6   | 18.0 | 0          |            |              | ENE           | 20   | 14:47 | 11.8 | 89 |         |      |      |      | 16.6 | 59 |         | NE   | 6    |      |
| 16                         | Th  | 6.6   | 16.5 | 0          |            |              | NNW           | 20   | 11:57 | 11.8 | 99 |         |      | Calm |      | 15.1 | 91 |         |      |      |      |
| 17                         | Fr  | 10.0  | 20.4 | 2.8        |            |              | N             | 28   | 12:17 | 15.8 | 84 |         |      | NNE  | 4    | 19.4 | 41 |         | NW   | 9    |      |
| 18                         | Sa  | 4.6   | 19.0 | 0          |            |              | ESE           | 17   | 13:20 | 12.1 | 82 |         |      |      |      | 17.2 | 60 |         | SSE  | 7    |      |
| 19                         | Su  | 9.3   | 15.3 | 0          |            |              | S             | 48   | 16:23 | 14.2 | 63 |         |      | SSE  | 11   | 13.9 | 99 |         |      | Calm |      |
| 20                         | Mo  | 12.7  | 15.0 | 143.8      |            |              | SSE           | 46   | 04:04 | 13.8 | 98 |         |      | SE   | 17   | 13.9 | 97 |         | SSE  | 9    |      |
| 21                         | Tu  | 10.1  | 17.4 | 7.2        |            |              | S             | 35   | 12:42 | 13.4 | 87 |         |      | N    | 2    | 16.4 | 62 |         | SE   | 11   |      |
| 22                         | We  | 11.0  | 16.7 | 8.0        |            |              | SE            | 35   | 13:19 | 15.8 | 78 |         |      | SE   | 15   | 14.3 | 67 |         | SE   | 15   |      |
| 23                         | Th  | 9.4   | 16.6 | 0.6        |            |              | ESE           | 31   | 10:20 | 15.3 | 71 |         |      | ESE  | 7    | 15.5 | 62 |         | SE   | 13   |      |
| 24                         | Fr  | 9.3   | 16.9 | 3.2        |            |              | SSE           | 19   | 13:54 | 12.4 | 99 |         |      | NNW  | 2    | 14.4 | 94 |         |      | Calm |      |
| 25                         | Sa  | 10.5  | 18.1 | 6.6        |            |              | NW            | 17   | 13:49 | 13.6 | 99 |         |      | NNW  | 6    | 17.3 | 72 |         | ENE  | 6    |      |
| 26                         | Su  | 6.7   | 23.2 | 2.4        |            |              | NW            | 20   | 13:30 | 13.8 | 90 |         |      | Calm |      | 20.9 | 47 |         |      | Calm |      |
| 27                         | Mo  | 6.0   | 27.1 | 0.2        |            |              | WNW           | 24   | 15:13 | 16.9 | 71 |         |      | SE   | 4    | 26.9 | 25 |         | NW   | 6    |      |
| 28                         | Tu  | 6.1   | 26.4 | 0          |            |              | NNW           | 30   | 13:41 | 16.7 | 80 |         |      | Calm |      | 26.1 | 23 |         | NW   | 9    |      |
| 29                         | We  | 8.0   | 21.2 | 0          |            |              | SE            | 24   | 08:33 | 18.2 | 75 |         |      | SE   | 11   | 20.1 | 69 |         | ESE  | 11   |      |
| 30                         | Th  | 11.9  | 24.3 | 0          |            |              | ENE           | 22   | 15:08 | 19.0 | 79 |         |      | NNE  | 6    | 23.6 | 64 |         | ENE  | 9    |      |
| 31                         | Fr  | 9.9   | 24.8 | 0          |            |              | NNW           | 52   | 09:36 | 20.2 | 37 |         |      | NNW  | 19   | 24.8 | 31 |         | NNW  | 13   |      |
| Statistics for August 2007 |     |       |      |            |            |              |               |      |       |      |    |         |      |      |      |      |    |         |      |      |      |
| Mean                       |     | 7.2   | 20.2 |            |            |              |               |      |       | 14.5 | 72 |         |      | 6    |      | 18.9 | 52 |         |      | 8    |      |
| Lowest                     |     | 1.2   | 13.9 |            |            |              |               |      |       | 10.0 | 24 |         |      | Calm |      | 11.3 | 15 |         |      | Calm |      |
| Highest                    |     | 12.7  | 27.1 | 143.8      |            |              | NNW           | 52   |       | 21.0 | 99 |         | NNW  | 19   |      | 26.9 | 99 |         | #    | 17   |      |
| Total                      |     |       |      | 179.8      |            |              |               |      |       |      |    |         |      |      |      |      |    |         |      |      |      |