



**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**

JANUARY 2007

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

Colin Davies BSc MEIA CENVP
Environmental Scientist
5 March 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 January 2007;
- Surface Water quality results for January 2007;
- Ground Water depth and quality results for January 2007; and
- Meteorological report for January 2007.

The January 2007 dust deposition results show slightly decreased 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/m².month. The three new dust deposition gauges located south of the quarry operations were all judged to be contaminated as additional material, not from normal dust deposition processes, was suspected of being added to each gauge. Results in uncontaminated gauges were found to be representative of dust levels as determined by the Australian Standard.

Surface Water samples were collected on the 2 February 2007. Most sites were dry or not flowing at the time of sampling with two samples collected; these were 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 discharges observed from the site. The samples were collected and analysed for a monthly sampling event. Results show very good quality water at site F with near neutral pH, low Electrical Conductivity, low Total Suspended Solids and no detectable Total Oil and Grease. The small dam below site F was slightly more acidic pH, having low Electrical Conductivity and Total Suspended Solids and no detectable Total Oil and Grease

Ground waters were sampled for the normal monthly monitoring on the 2 February 2007. Groundwater depths generally increased this month at monitoring bores indicating water moving away from the surface with relatively stable water quality, compared to last month.

The meteorological station continued to return high data recovery and operated well in January 2007. The recorded winds show dominant N to E, SSW and WNW winds. Recorded rainfall on site for January 2007 was slightly less than the BOM Peats Ridge Station and well below the Peats Ridge long term average. Results are detailed below:

Rocla Calga Quarry Environmental Monitoring – January 2007

Rocla Calga Quarry	63.2mm
BOM Peats Ridge*	67.6mm
BOM Gosford*	54.2mm
BOM Peats Ridge Long term mean for January*	120.1mm

*Data sourced from Bureau of Meteorology (BOM) website (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/m².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 with additional samples collected when daily rainfall exceeds 50mm.

Ground water 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

Where applicable, 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 January 2007 and the project average. Results are in g/m².month

Table 1: Dust Deposition results: 3/1/2007 to 2/2/2007.

Site	Monthly Insoluble Solids	Monthly Ash Residue	Monthly Combustible Matter	Monthly Insoluble Solids/Ash Residue %	Current Project Average Insoluble Solids
CD1	0.8	0.6	0.6	75	1.6
CD2b	0.9	0.8	0.1	89	1.4
CD3	0.6	0.5	0.1	83	0.8
CD4	519*	515*	4*	99*	1.3
CD5	126*	125*	1*	99*	2.5
CD6	9.3*	8.7*	0.6*	94*	2.2

Insoluble Solids marked with an * indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen or seeds), insects or some other interference to the gauge. Gauges CD4, CD5 and CD6 south of operations were all deemed contaminated this month as it is strongly suspected that material was added to the gauges by some unknown person or persons and the levels are not due to normal dust deposition processes. Results in bold indicate uncontaminated 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.

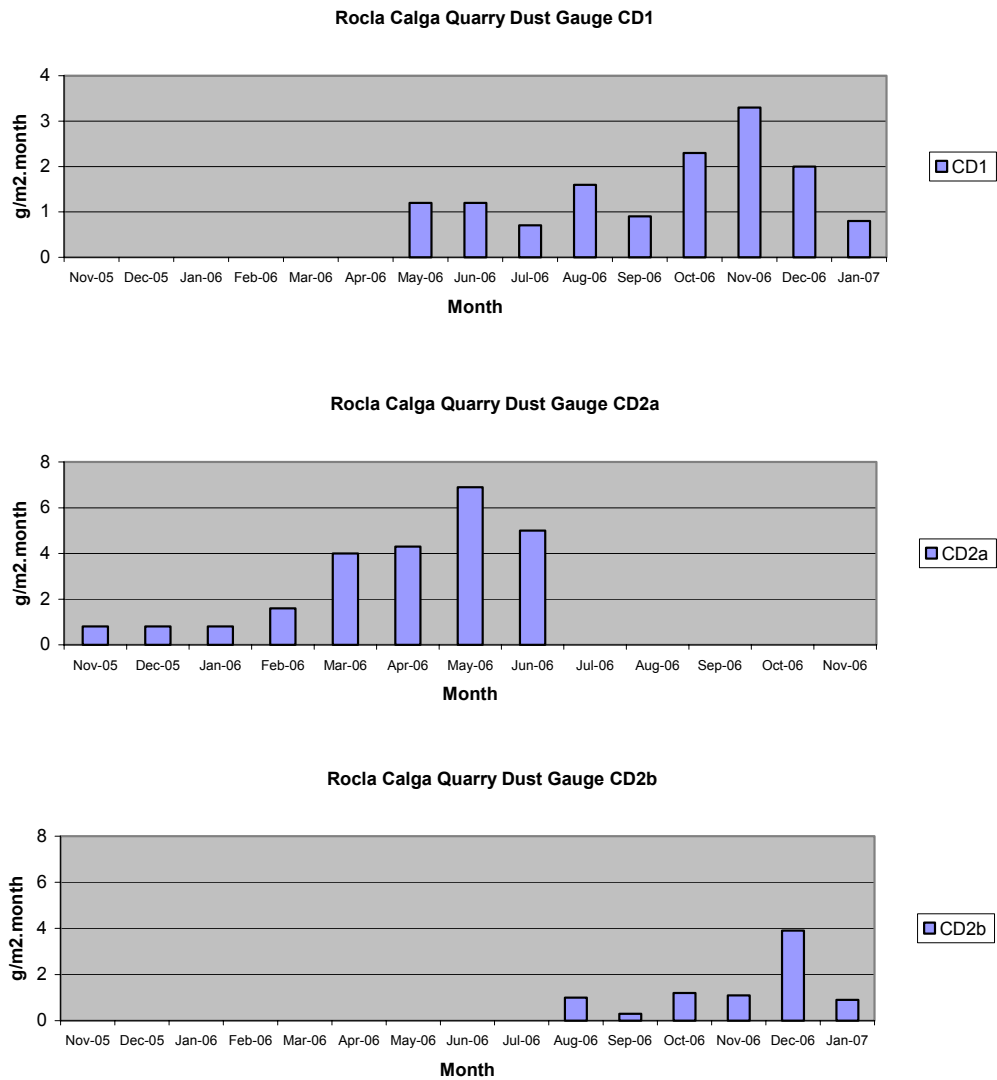
CD1 was installed on the 1 May 2006. CD2a was discontinued at the start of August 2006 due to quarry operations “mining out” the site of the gauge. The replacement gauge, Site CD2b, was located in a position adjacent to the boundary between B. Kashouli and F. & J. Gazzana in conformance with the Air 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. Of the gauges south of quarry operations, CD6 is the nearest gauge to the quarry followed by CD5 and then CD4.

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 NE to E, SSW and WNW.

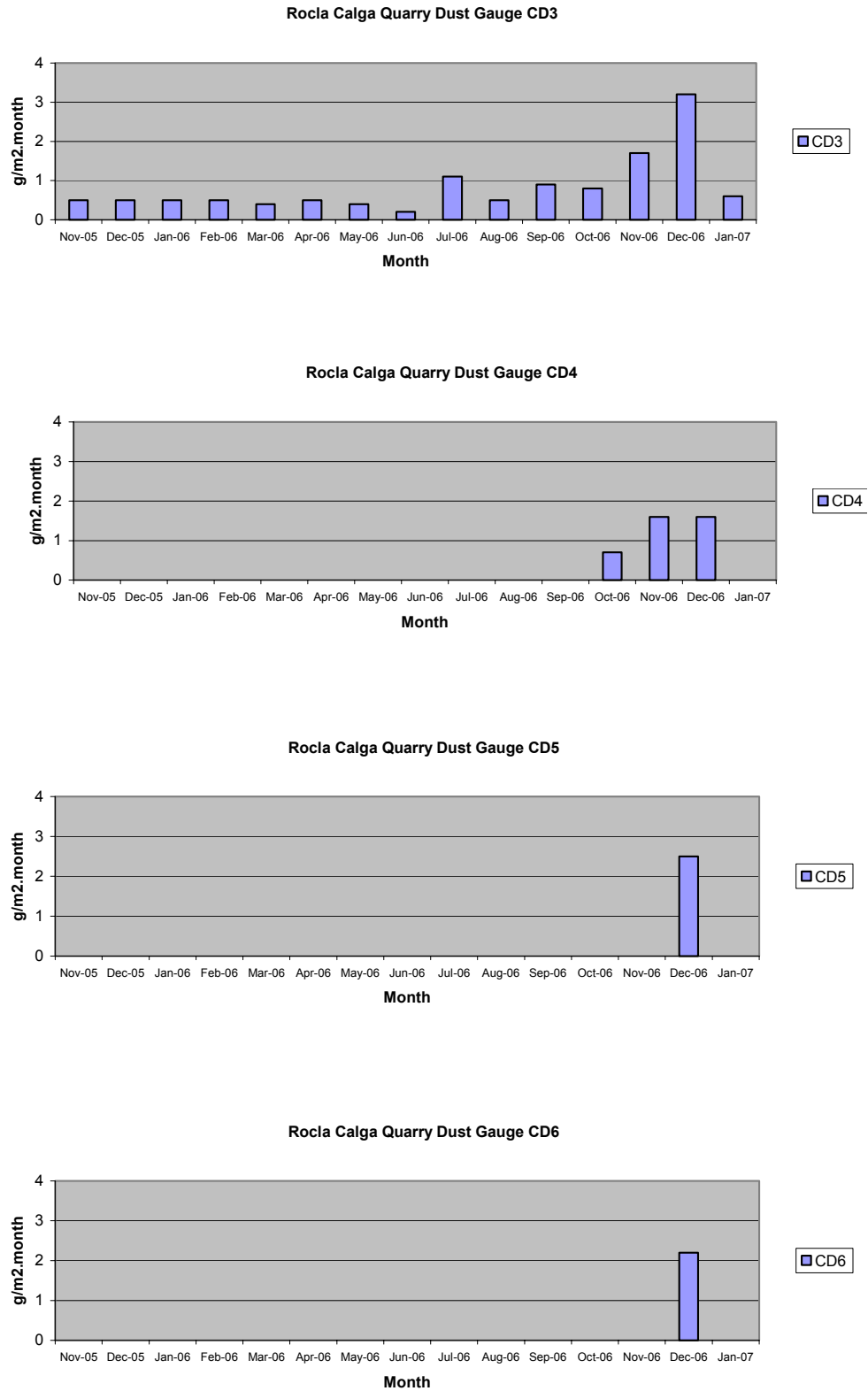
Rocla Calga Quarry Environmental Monitoring – January 2007

Figure 1: Dust Deposition Charts



Rocla Calga Quarry Environmental Monitoring – January 2007

Figure 1 (continued): Dust Deposition Charts



2.2 WATER MONITORING

2.2.1 Surface Waters

Monthly surface water monitoring was conducted on the 2 February 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 Description	Turbidity Description	pH	EC (uS/cm)	TSS (mg/l)	Oil and Grease (mg/l)
A	Dry	-	-	-	-	-	-
B	Dry	-	-	-	-	-	-
C	Dry	-	-	-	-	-	-
D	Dry	-	-	-	-	-	-
E	Dry	-	-	-	-	-	-
F	Dam	Clear	Low	5.13	101	2	<5
Dam below F (Lower dam)*	Dam	Clear	Low	5.31	98	2	<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.

Most sites were dry or not flowing at the time of sampling with two samples collected; these were 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 discharges observed from the site. The samples were collected and analysed for a monthly sampling event. Results show very good quality water at site F with slightly acidic pH, low Electrical Conductivity, low Total Suspended Solids and no detected Total Oil and Grease.

2.2.2 Ground Waters

Ground waters were sampled on the 2 February 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.**

Rocla Calga Quarry Environmental Monitoring – January 2007

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	20.84	4.5	130
CQ2	Voutos	DIP Only	6.23	6.64	4.9	70
CQ3	Voutos	* Monitor	10.53	10.5	6.1	135
CQ4	Voutos	* Monitor	8.78	9.54	4.9	95
CQ5	Gazzana	DIP Only	8.69	8.92	4.3	200
CQ6	Gazzana	DIP Only	16.00	16.14	4.3	270
CQ7	Gazzana	* Monitor	6.89	6.65	4.7	105
CQ8	Gazzana	* Monitor	11.03	11.22	4.3	200
CQ9	Gazzana	Dip Only	10.1	10.05	4.6	110
CQ10	Voutos	* Monitor	NI	23.81	5.3	125
CQ11s	Gazzana	* Monitor	NI	11.26	5.1	145
CQ11d	Gazzana	* Monitor	NI	12.56	5.7	130
CQ12	Gazzana	* Monitor	NI	7.49	4.4	145
CQ13	Kashouli	* Monitor	NI	16.36	4.8	195
CP3	Gazzana	Domestic	10.40	13.46	4.8	165
CP4	Kashouli	Domestic	13.63	13.74	NM	NM
CP5	Kashouli	Domestic	16.61	11.66	4.6	265
CP6	Kashouli	Domestic	16.27	14.25	4.4	225
CP7	Kashouli	Production	8.56	8.35	4.5	180
CP8	Rozmanec	Domestic	22.17	NR	NR	NR
MW7	Rocla Bore	* Monitor	15.76	18.53	4.7	135
MW8	Rocla Bore	* Monitor	9.82	10.36	4.7	95
MW9	Rocla Bore	* Monitor	22.44	22.93	4.6	95
MW10	Rocla Bore	* Monitor	15.41	15.49	4.4	135

Notes:

TOC = Water level measured from top of bore case to water.

NM = Not Monitored –unable to sample water due to restrictions in bore or pump not operational.

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 months reading):

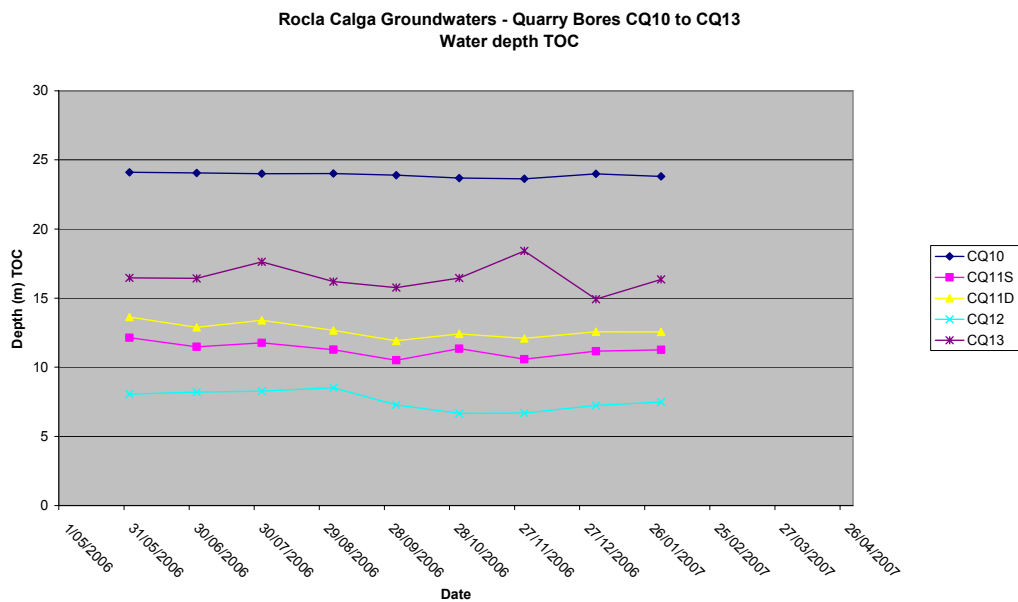
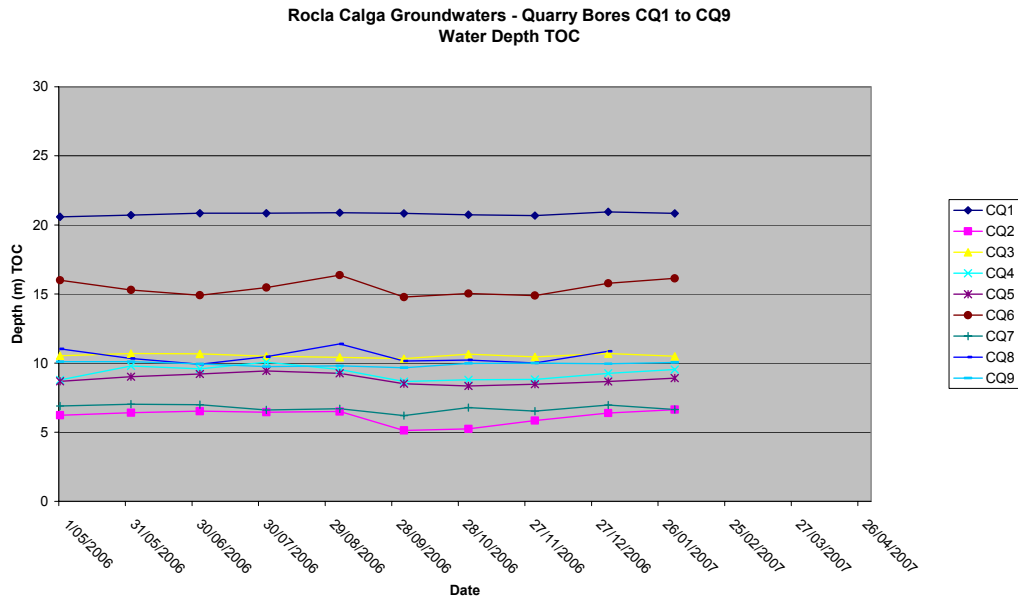
	Increase to ground water depth (water moved away from surface)
	Decrease to ground water depth (water moved towards surface)
	Stable water depth (+/- 0.01m)

Rocla Calga Quarry Environmental Monitoring – January 2007

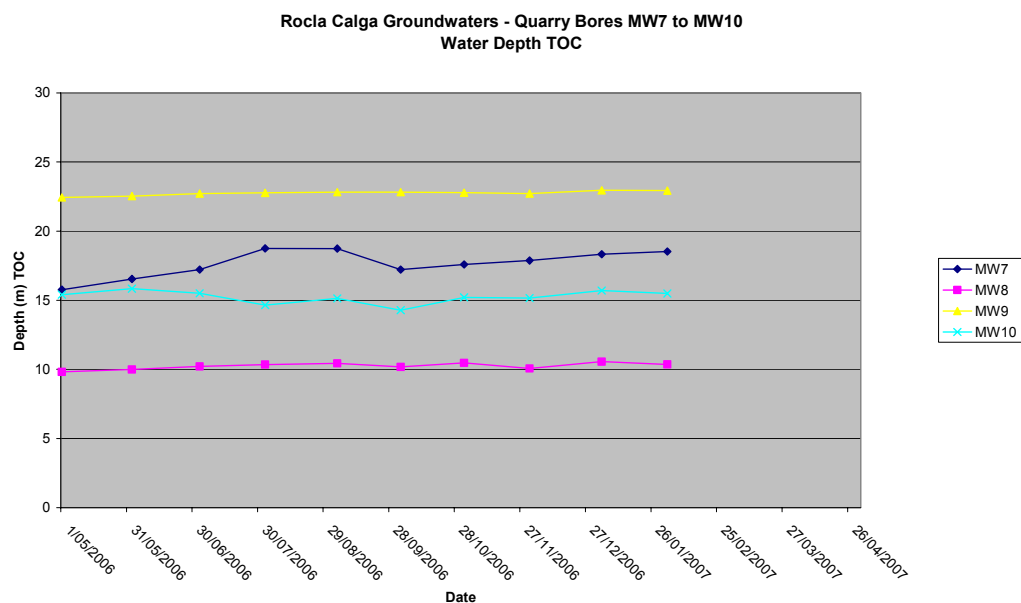
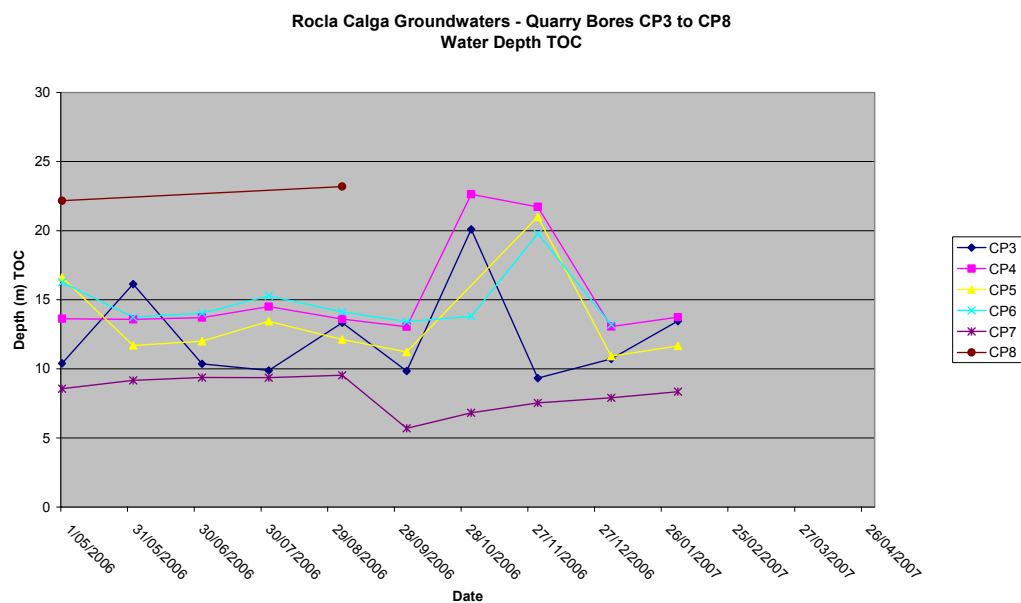
Water depth generally indicated slight increases to groundwater at most monitoring, CQ, CP and MW bores this month. The CP series of bores generally show larger increases and decreases in depth to water due to pumping from the bores.

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

Figures 2 to 5: Groundwater Depth Charts.



Rocla Calga Quarry Environmental Monitoring – January 2007



Groundwater quality results remained relatively stable compared to last month and indicate acidic water of low electrical conductivity. Detailed bi-annual water quality monitoring is next due in April 2007.

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

2.3 METEOROLOGICAL MONITORING

The Rocla Calga Quarry weather station was fully operational in January 2007 with 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.
- 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 January 2007 shows slightly lower rainfall at the Rocla Calga Quarry station compared to the nearby Peats Ridge BOM station but higher rainfall compared to the nearby Gosford BOM station. Rainfall was below average. The rainfall comparison is provided below.

Rocla Calga Quarry	63.2mm
BOM Peats Ridge*	67.6mm
BOM Gosford*	54.2mm
BOM Peats Ridge Long term mean for January*	120.1mm

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

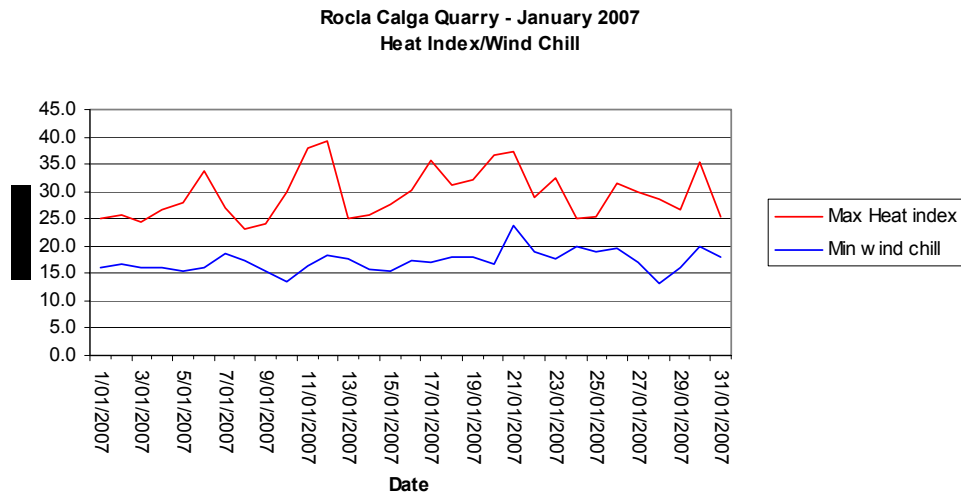
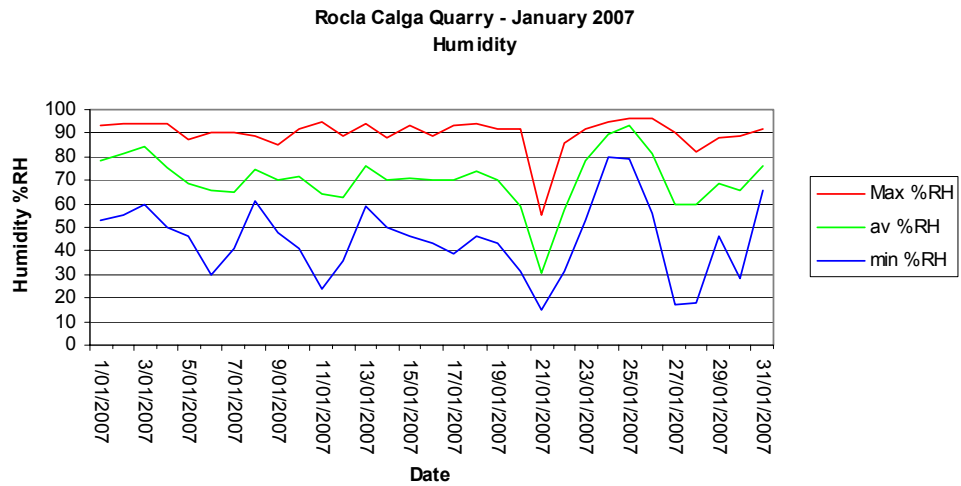
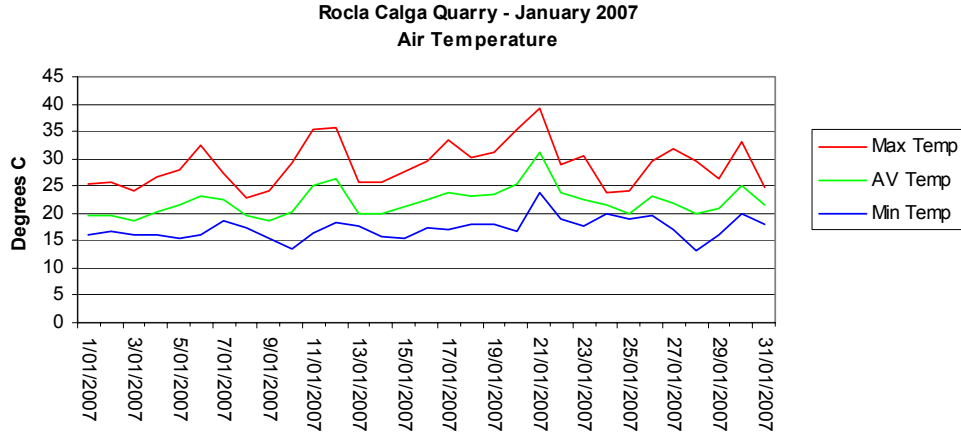
Results are displayed in the following table and figures.

Rocla Calga Quarry Environmental Monitoring – January 2007

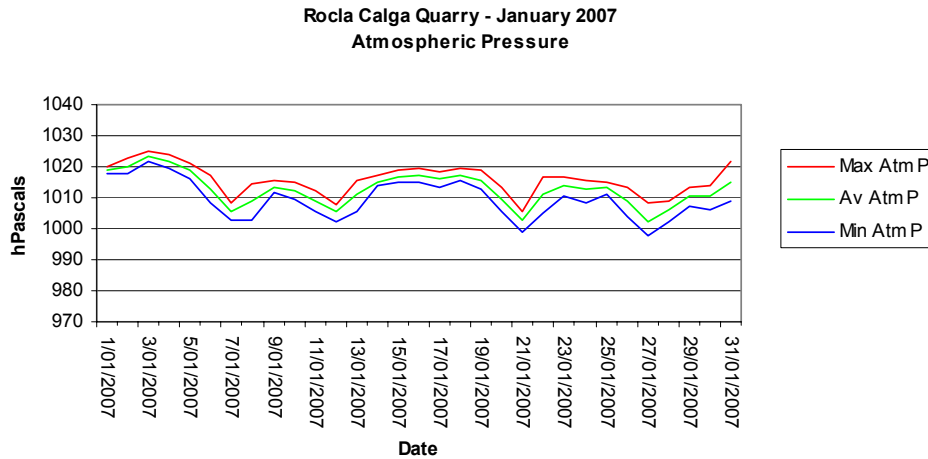
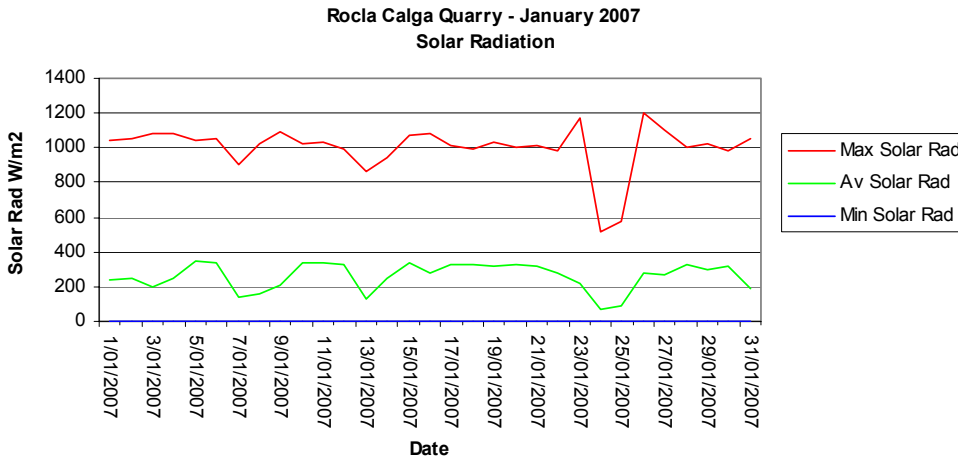
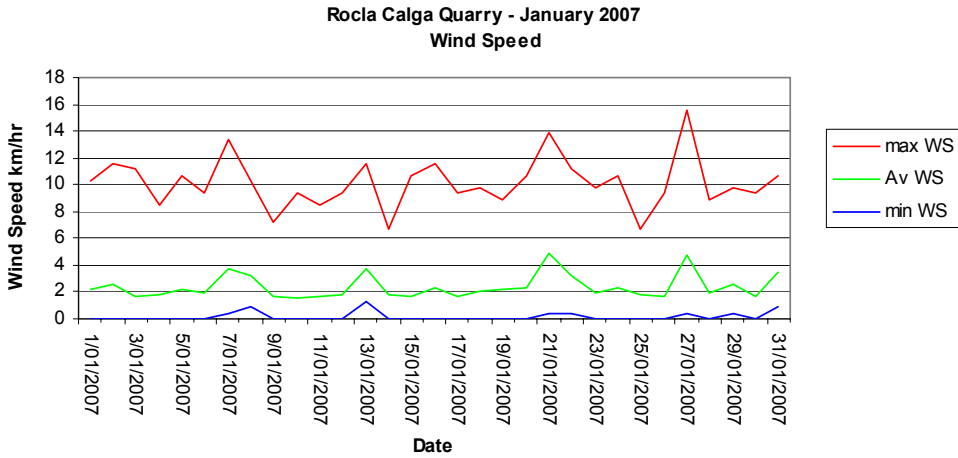
Summary Jan-07 Rocla - Calga

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 %
1/01/2007	16.1	19.6	25.3	53	78	93	6.8	4.5	0	2.2	10.3	16.1	25.2	1017.9	1018.9	1019.9	0	239.2	1039	92.1	99.7	100
2/01/2007	16.7	19.5	25.7	55	82	94	10.6	4.4	0	2.6	11.6	16.7	25.8	1018	1020.2	1022.6	0	246.3	1048	96.5	99.6	100
3/01/2007	16.1	18.6	24.1	60	84	94	4.4	3.5	0	1.6	11.2	16.1	24.5	1021.6	1023.3	1024.8	0	196.9	1082	96.8	99.4	100
4/01/2007	16.1	20.2	26.6	50	75	94	0.0	4.6	0	1.8	8.5	16.1	26.7	1019.3	1021.8	1024.1	0	252.3	1081	91.5	99.4	100
5/01/2007	15.3	21.4	28	46	68	87	0.0	6.6	0	2.2	10.7	15.4	27.9	1015.9	1018.7	1021.2	0	350.8	1039	98.2	99.8	100
6/01/2007	16.1	23.1	32.5	30	66	90	0.0	6.7	0	1.9	9.4	16.1	33.9	1008.3	1012.7	1017.1	0	340.7	1055	92.1	99.8	100
7/01/2007	18.5	22.5	27.4	41	65	90	2.8	4.1	0.4	3.7	13.4	18.6	26.9	1003	1005.5	1008.5	0	135.0	906	98.8	99.9	100
8/01/2007	17.2	19.7	22.9	61	75	89	0.0	3.5	0.9	3.3	10.3	17.2	23.3	1002.6	1008.7	1014.2	0	154.3	1026	97.7	99.8	100
9/01/2007	15.3	18.7	24.1	48	70	85	0.0	4.1	0	1.6	7.2	15.3	24.1	1011.4	1013.4	1015.3	0	212.4	1088	90.1	99.4	100
10/01/2007	13.6	20.2	29.3	41	71	92	0.0	6.1	0	1.6	9.4	13.6	29.8	1009.2	1012.1	1014.8	0	340.7	1022	96.8	99.6	100
11/01/2007	16.3	25.1	35.3	24	64	95	0.2	7.0	0	1.7	8.5	16.4	37.8	1005.7	1009.1	1012.5	0	339.9	1034	98.5	99.9	100
12/01/2007	18.3	26.4	35.7	36	62	89	0.0	6.8	0	1.9	9.4	18.3	39.1	1002.3	1005.4	1007.8	0	330.3	995	86.3	99.8	100
13/01/2007	17.6	20.0	25.8	59	76	94	0.2	3.2	1.3	3.8	11.6	17.6	25.2	1005.8	1010.9	1015.8	0	128.9	861	98.2	99.8	100
14/01/2007	15.8	20.0	25.8	50	71	88	0.0	4.6	0	1.7	6.7	15.8	25.7	1013.8	1015.2	1017.3	0	248.7	940	94.2	99.7	100
15/01/2007	15.5	21.1	27.7	46	71	93	0.0	5.9	0	1.7	10.7	15.5	27.7	1014.9	1016.9	1018.8	0	334.3	1068	95	99.4	100
16/01/2007	17.4	22.5	29.5	43	70	89	0.0	5.5	0	2.3	11.6	17.5	30.2	1015	1017.3	1019.3	0	274.4	1087	96.8	99.8	100
17/01/2007	16.9	23.8	33.5	39	70	93	0.0	6.3	0	1.7	9.4	16.9	35.6	1013.3	1016.2	1018.4	0	324.3	1008	92.1	99.8	100
18/01/2007	17.9	23.1	30.3	46	74	94	0.0	6.3	0	2.0	9.8	17.9	31.1	1015.3	1017.3	1019.3	0	328.8	992	97.7	99.9	100
19/01/2007	17.9	23.3	31.1	43	70	92	0.2	6.3	0	2.2	8.9	18.1	32.1	1012.6	1015.8	1018.8	0	318.1	1035	97.4	99.8	100
20/01/2007	16.6	25.5	35.5	31	59	92	0.0	7.5	0	2.3	10.7	16.6	36.7	1005.5	1009.6	1013.4	0	330.7	1005	98.2	99.9	100
21/01/2007	23.8	31.3	39.2	15	31	55	0.0	11.1	0.4	4.9	13.9	23.8	37.4	998.8	1002.7	1005.6	0	317.9	1015	99.7	100.0	100
22/01/2007	19.1	23.6	28.8	31	57	86	0.0	6.5	0.4	3.2	11.2	19.1	28.8	1004.8	1011.2	1016.7	0	279.4	984	86.3	99.8	100
23/01/2007	17.6	22.6	30.6	53	78	92	4.0	4.2	0	2.0	9.8	17.6	32.5	1010.3	1013.6	1016.6	0	215.6	1167	87.1	99.5	100
24/01/2007	19.9	21.6	23.9	80	90	95	31.6	1.5	0	2.3	10.7	19.9	25.2	1008.3	1012.7	1015.4	0	64.8	515	93.9	99.7	100
25/01/2007	19.1	20.0	24.1	79	93	96	1.8	1.4	0	1.8	6.7	19.1	25.3	1010.9	1013.3	1015	0	87.2	578	98.2	99.8	100
26/01/2007	19.6	23.1	29.5	56	81	96	0.2	4.7	0	1.6	9.4	19.6	31.6	1003.9	1008.9	1013.6	0	274.1	1199	98.8	100.0	100
27/01/2007	16.9	22.0	31.7	17	60	90	0.0	6.9	0.4	4.7	15.6	16.9	29.8	997.9	1002.3	1008.5	0	264.1	1098	96.2	99.8	100
28/01/2007	13.3	20.1	29.7	18	59	82	0.0	6.3	0	1.9	8.9	13.3	28.6	1002.5	1006.3	1008.7	0	327.4	1004	96.5	99.6	100
29/01/2007	16.1	20.8	26.4	46	68	88	0.0	5.7	0.4	2.5	9.8	16.1	26.6	1007.3	1010.6	1013.5	0	302.2	1020	96.2	99.4	100
30/01/2007	19.8	25.2	33.1	28	66	89	0.0	6.3	0	1.7	9.4	19.8	35.2	1006.2	1010.5	1013.7	0	314.9	984	95.9	99.8	100
31/01/2007	18.1	21.4	24.6	66	76	92	0.4	4.2	0.9	3.5	10.7	18.1	25.5	1009.1	1015.1	1021.4	0	191.5	1051	98.8	99.9	100
Monthly	13.3	22.1	39.2	15	70	96	63.2	166.1	0	2.4	15.6	13.3	39.1	997.9	1012.8	1024.8	0	260.2	1199	86.3	99.7	100

Rocla Calga Quarry Environmental Monitoring – January 2007

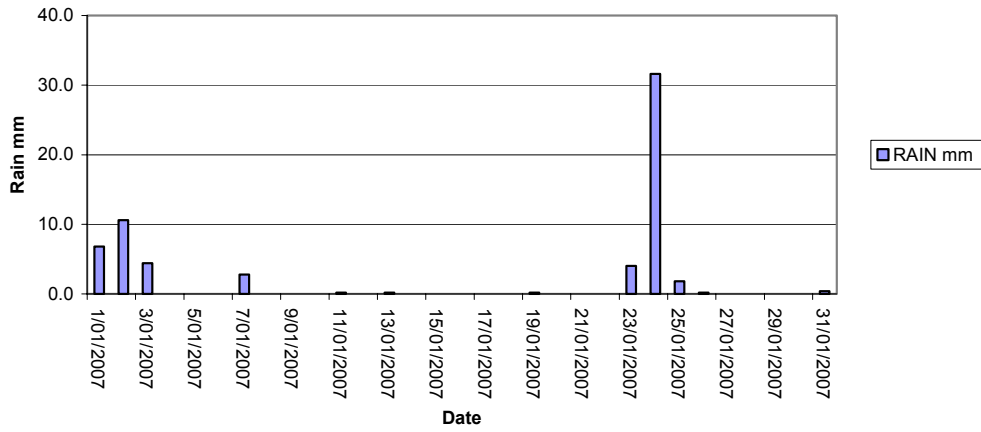


Rocla Calga Quarry Environmental Monitoring – January 2007

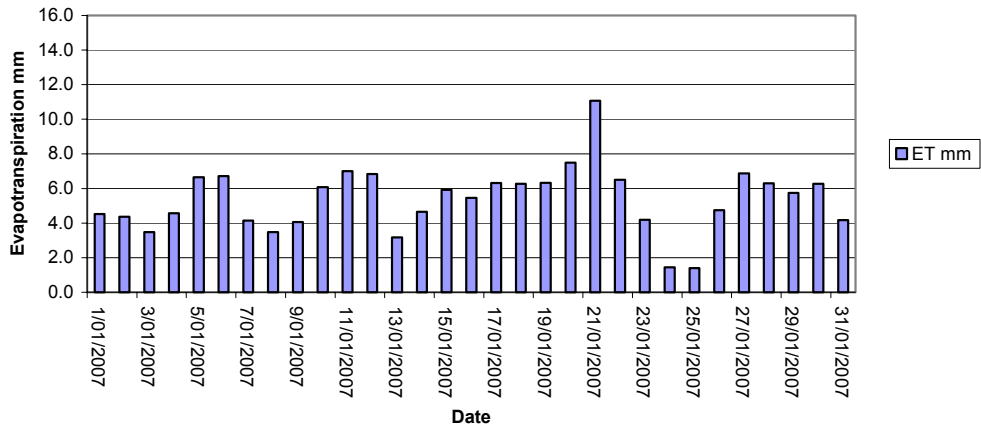


Rocla Calga Quarry Environmental Monitoring – January 2007

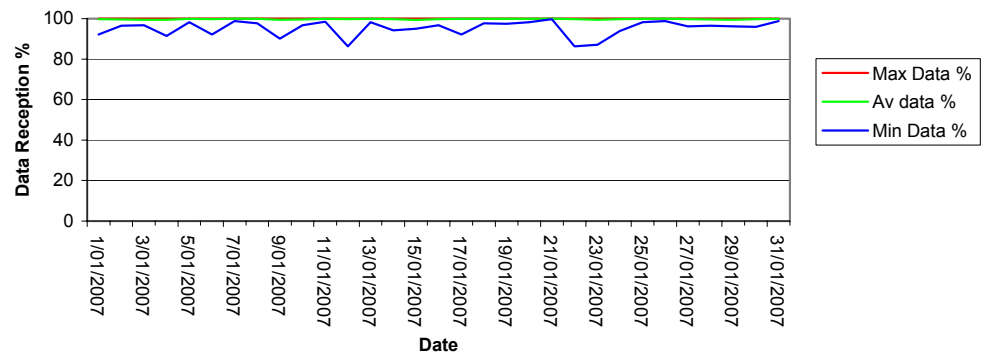
Rocla Calga Quarry - January 2007
Rain



Rocla Calga Quarry - January 2007
Evapotranspiration

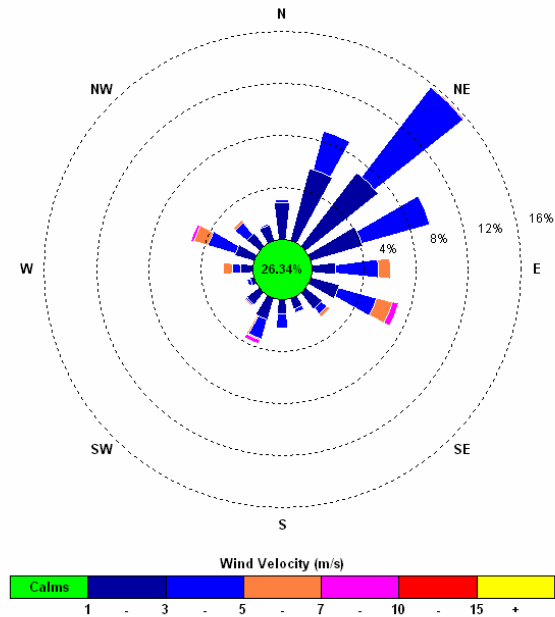


Rocla Calga Quarry - January 2007
Data Reception



2.4.3 Windrose plots

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.



The windrose shows dominant winds from the NNE to ESE, SSW and WNW. The maximum wind speed was 15.6m/s recorded from the S.

APPENDIX 1
LABORATORY CERTIFICATES

APPENDIX 2

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