CBased Environmental Pty Limited
ABN 62 611 924 264

Calga Quarry

Environmental Monitoring

Dust Deposition Gauges, Surface and Ground Waters and Meteorological Station

May 2017

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Date: 22 June 2017

Executive Summary

CBased Environmental is contracted by Hanson 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 CBased Environmental and includes the following;

- Dust Deposition results for May 2017;
- Surface Water quality results for May 2017;
- Bi-monthly Ground Water quality results for May 2017; and
- Meteorological report for May 2017.

The May 2017 dust deposition results for insoluble solids were generally low and free of major contamination. All sites, on a rolling annual average basis, are currently below the Air Quality Management Plan exceedance level of 3.7g/m^2.month. Results were found to be representative of dust levels as determined by the Australian Standard.

Monthly surface water samples were collected at sites A, C1, C2 and F. Site B was dry and Site D was not flowing at the time of sampling. The samples were collected and analysed for a monthly sampling event. Results show pH within the slightly acidic range, low Electrical Conductivity, low Total Dissolved Solids and low Total Suspended Solids. Oil and Grease was below detectable levels (<5 mg/L) for all sites in May 2017.

Bi-monthly groundwaters were sampled on 2 June 2017. Groundwater depth generally increased compared to March 2017, indicating water moving away from the surface. pH at all sites is in the acidic range and generally remained slightly varied when compared to the previous results. EC levels were similar or increased slightly at a majority of groundwater sites when compared to the March 2017 results.

The Calga Quarry weather station data recovery in May 2017 was approximately 91%. Data for May 2017 shows that rainfall recorded at the Calga Quarry was lower than the Gosford BOM mean rainfall and the Peats Ridge long term rainfall for May.

The rainfall comparison is provided below:

Calga Quarry	17.6 mm
BOM Peats Ridge*	NA
BOM Gosford*	36.0 mm
BOM Peats Ridge Long term mean for May*	89.7 mm

NA = Not Available

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

Note: Differences in the daily rainfall readings between BOM and the Calga station may occur due to BOM stations reporting rainfall at 9am and the Calga station recording rainfall at midnight.

Sampling Program

Hanson Calga Quarry conducts environmental monitoring in accordance to Development Consent, OEH (EPA) licence and Environmental Management Plans. CBased Environmental are contracted to undertake dust deposition gauge, surface and groundwater and meteorological monitoring for the project. CBased 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. 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^2.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 bi-monthly for depth and water quality. 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. Metrological parameters are measured according to Australian Standard AS3580.14 "*Methods for sampling and analysis of ambient air. Meteorological monitoring for ambient air quality monitoring applications*"

The weather stations have the following sensor configuration;

- Air temperature
- Humidity
- Rainfall
- Atmospheric pressure
- Evaporation
- Solar radiation
- Wind speed
- Wind direction

CBased Environmental continued to operate the monitoring equipment and utilise site collections at their existing locations.

The locations of monitoring points are provided in **Figure 1**.

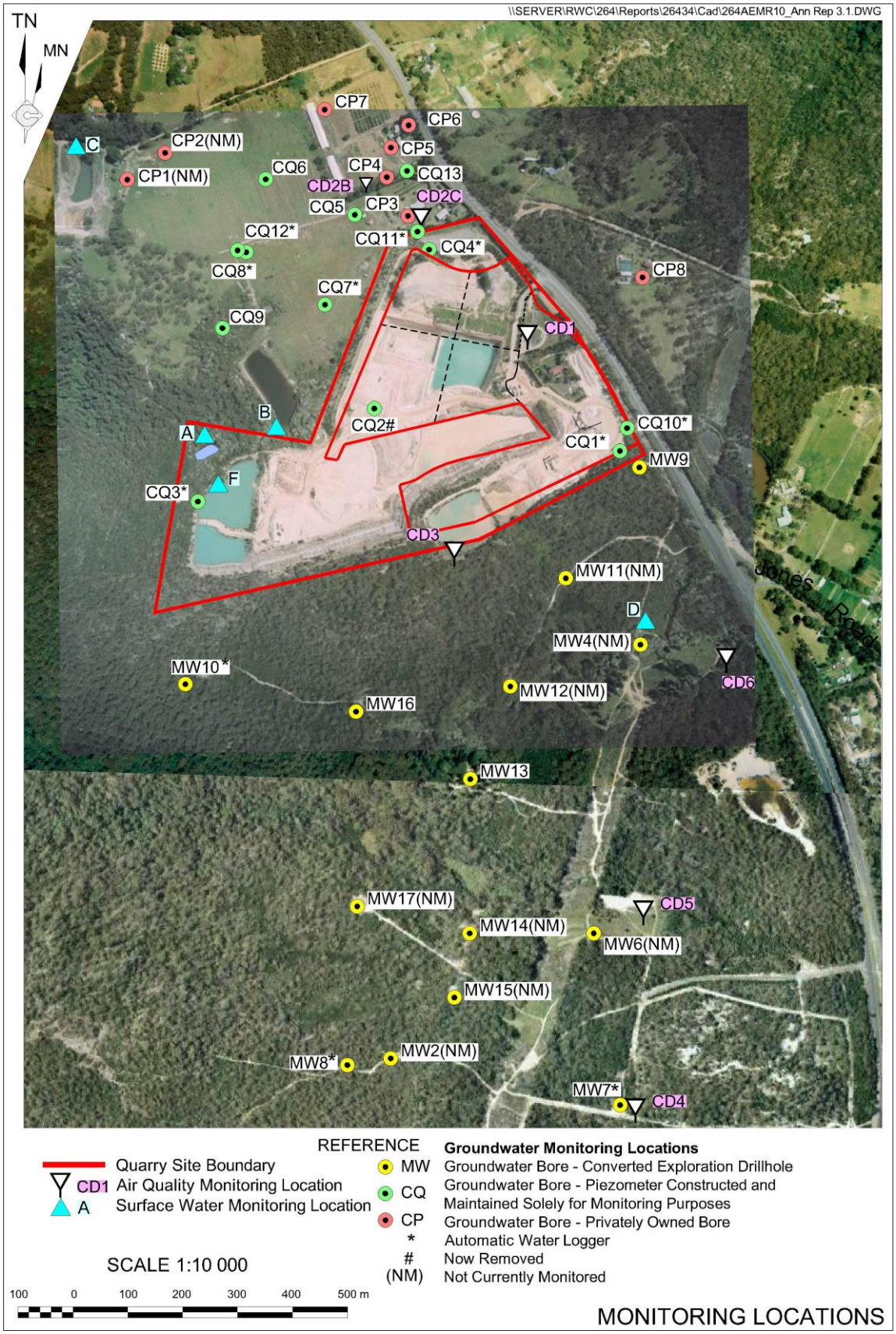


Figure 1: Hanson Calga Quarry environmental monitoring locations

2.0 Monthly Results

2.1 Dust Deposition Gauges

Table 1 displays the results for May 2017 and the project 12-month rolling average. Results are in g/m^2.month.

Table 1: Dust Deposition results: 3 May 2017 – 2 June 2017 (30 days)

Site	Monthly Insoluble Solids *(g/m^2.month)*	Monthly Ash Residue *(g/m^2.month)*	Monthly Combustible Matter *(g/m^2.month)*	Monthly Ash Residue/ Insoluble Solids %	Rolling Annual Average Insoluble Solids *(g/m^2.month)*
CD1	1.5	1.3	0.2	87	3.1
CD2c	1.5	0.9	0.6	60	1.1
CD3	0.6	0.2	0.4	33	1.2
CD4	0.7	0.2	0.5	29	0.6
CD5	0.6	0.2	0.4	33	0.6
CD6	0.6	0.2	0.4	33	0.8

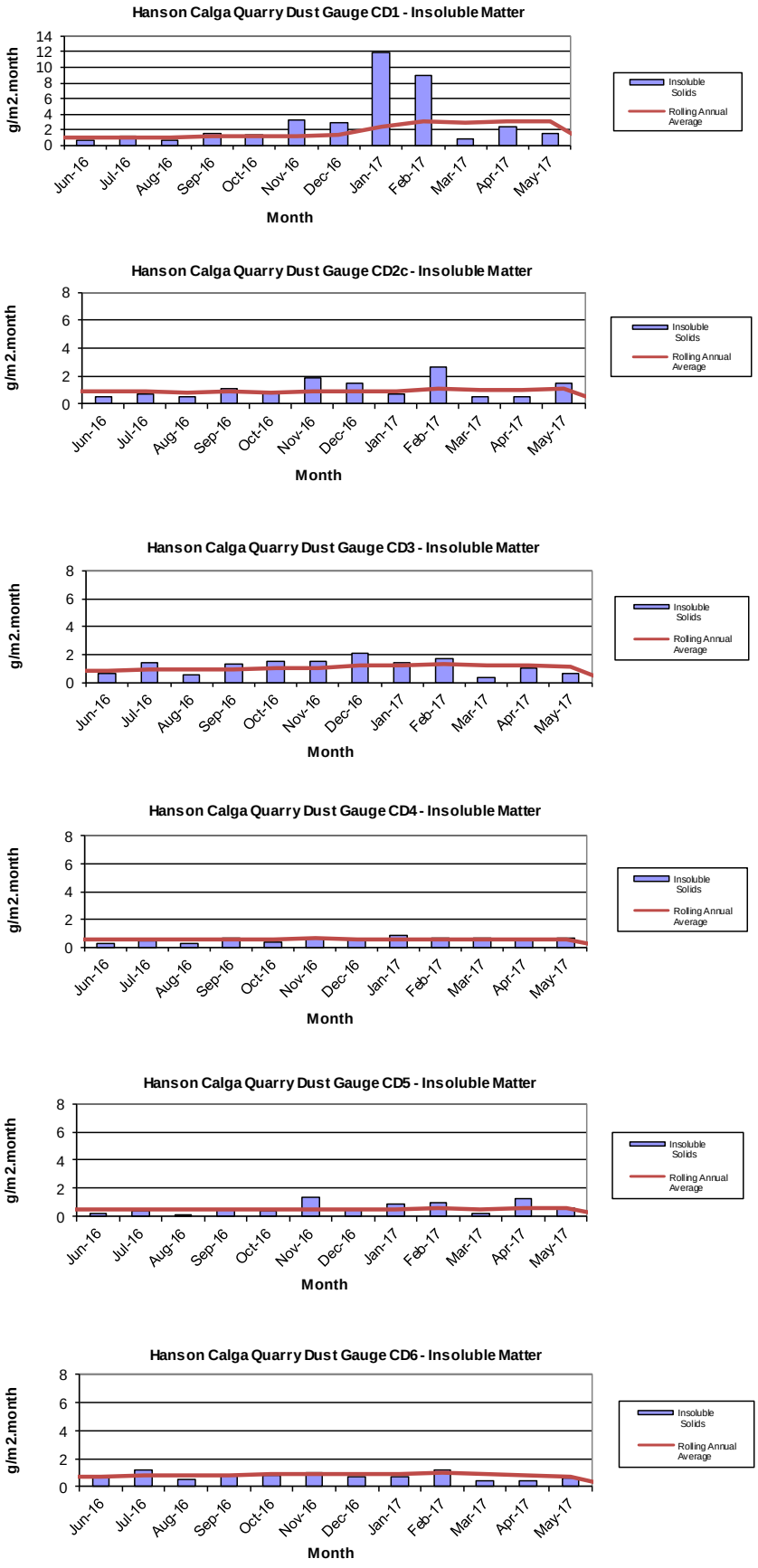
Insoluble Solids marked with an * indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen and seeds) and insects. Results in bold indicate insoluble solids levels above 3.7 g/m^2.month; the Development Consent's annual average amenity criteria at residential locations. The current rolling annual average is calculated from June 2016 to May 2017.

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 2** below. The laboratory analysis is provided in **Appendix 1.**

Figure 2: Dust Deposition Charts



2.2 Surface Water Monitoring

Monthly surface water monitoring was conducted on the 2 June 2017 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1.**

Table 2: Monthly surface water monitoring – May grab sample results

Site	Observed Flow Rate	Water Colour	Turbidity	pH	EC *(µS/cm)*	TDS *(mg/L)*	TSS *(mg/L)*	Oil and Grease *(mg/L)*
A	Dam	Clear	Clear	6.14	64	46	<5	<5
B	Dry							
C1	Dam	Clear	Clear	6.74	91	62	11	<5
C2	Slow	Clear	Clear	5.99	99	62	<5	<5
D	No flow							
F	Dam	Clear	Clear	6.22	70	54	18	<5

Samples were collected at sites A, C1, C2 and F. Site B was dry and Site D was not flowing at the time of sampling. The samples were collected and analysed for a monthly sampling event. Results show pH within the slightly acidic range, low Electrical Conductivity, low Total Dissolved Solids and low Total Suspended Solids. Oil and Grease was below detectable levels (<5 mg/L) at all sites in May 2017.

2.2.1 Non-Routine Surface Water Sampling

No non-routine sampling was undertaken during May 2017.

2.3 Groundwater Monitoring

Bi-monthly groundwaters were sampled on 2 June 2017. Water quality tests for pH and electrical conductivity were conducted by CBased 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 3 to 6.**

Groundwater depth generally increased compared to March 2017, indicating water moving away from the surface. pH at all sites is in the acidic range and generally remained slightly varied when compared to the previous results. EC levels were similar or increased slightly at a majority of groundwater sites when compared to the March 2017 results.

Bi-monthly groundwater monitoring is next scheduled for July 2017.

Table 3: Groundwater Quality Data

Reference	Bore	Type	Depth to water TOC *(m)* April 2006	Depth to water TOC *(m)* This report	pH This report	Electrical Conductivity *(µS/cm)* This report
CQ1	Voutos	* Monitor	20.59	Removed		
CQ3	Voutos	* Monitor	10.53	10.68	6.5	201
CQ4	Voutos	* Monitor	8.78	9.84	5.5	104
CQ5	Gazzana	DIP Only	8.69	6.15	4.9	130
CQ6	Gazzana	DIP Only	16.00	Removed		
CQ7	Gazzana	* Monitor	6.89	6.16	4.1	127
CQ8	Gazzana	* Monitor	11.03	5.88	4.8	117
CQ9	Gazzana	DIP Only	10.10	Unable to sample - pipe bent		
CQ10	Voutos	* Monitor	NI	25.59	4.4	131
CQ11S	Gazzana	* Monitor	NI	9.98	5.3	139
CQ11D	Gazzana	* Monitor	NI	11.11	5.0	144
CQ12	Gazzana	* Monitor	NI	4.15	3.9	122
CQ13	Kashouli	* Monitor	NI	12.53	4.4	173
CP3	Gazzana	Domestic	10.40	Destroyed		
CP4	Kashouli	Domestic	13.63	NM		
CP5	Kashouli	Domestic	16.61	6.19	4.5	170
CP6	Kashouli	Domestic	16.27	8.88	3.6	159
CP7	Kashouli	Production	8.56	1.67	4.1	92
CP8	Rozmanec	Domestic	22.17	21.20	4.3	121
MW7	Rocla Bore	* Monitor	15.76	15.25	4.7	103
MW8	Rocla Bore	* Monitor	9.82	7.16	4.9	64
MW9	Rocla Bore	* Monitor	22.44	23.58	4.6	78
MW10	Rocla Bore	* Monitor	15.41	No Access - track eroded		
MW13	Rocla Bore	DIP Only	NI	No Access - track eroded		
MW16	Rocla Bore	DIP Only	NI	No Access - tree across track		
MW17	Rocla Bore	DIP Only		No Access - tree across track		

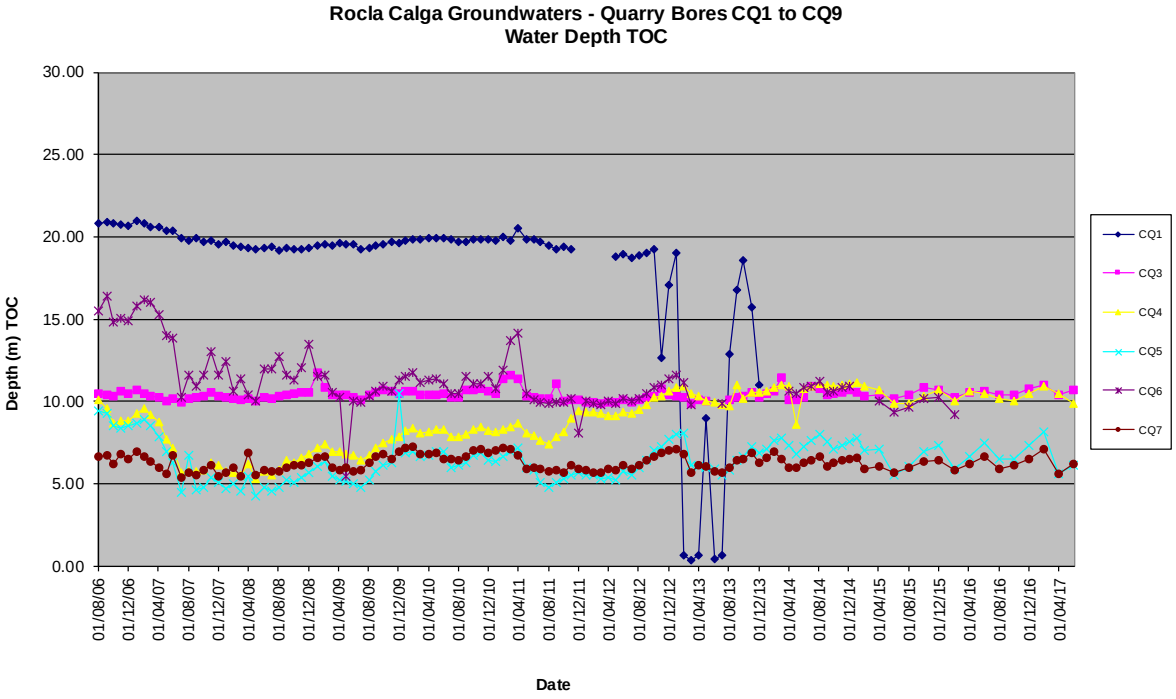
Notes:
TOC = Water level measured from top of bore case to water.
NM = Not Monitored – unable to sample water due to non-operational pump.
NR = Not Required by resident.
* = Logger Installed.
NI = These bores were not installed in April 2006 but are now operational. April 2006 was the first set of measurements taken by Carbon Based Environmental Pty Limited.

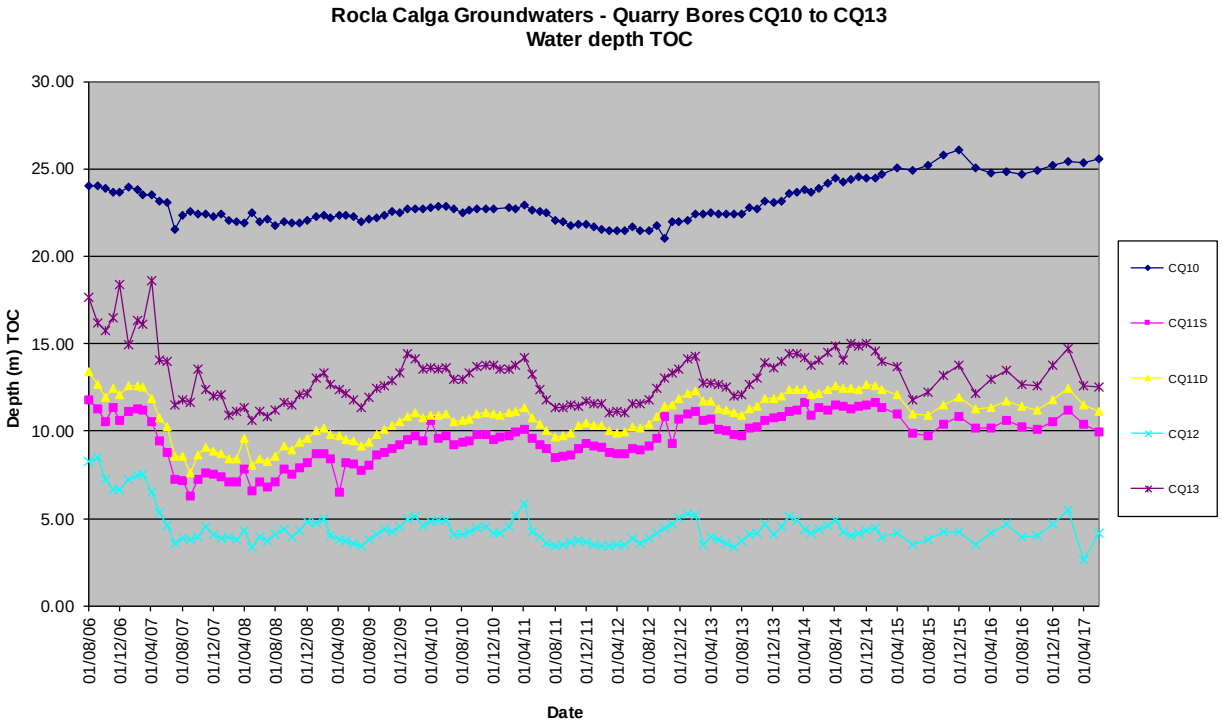
Shading is used to indicate the following trends in water depth (compared to the last reading):

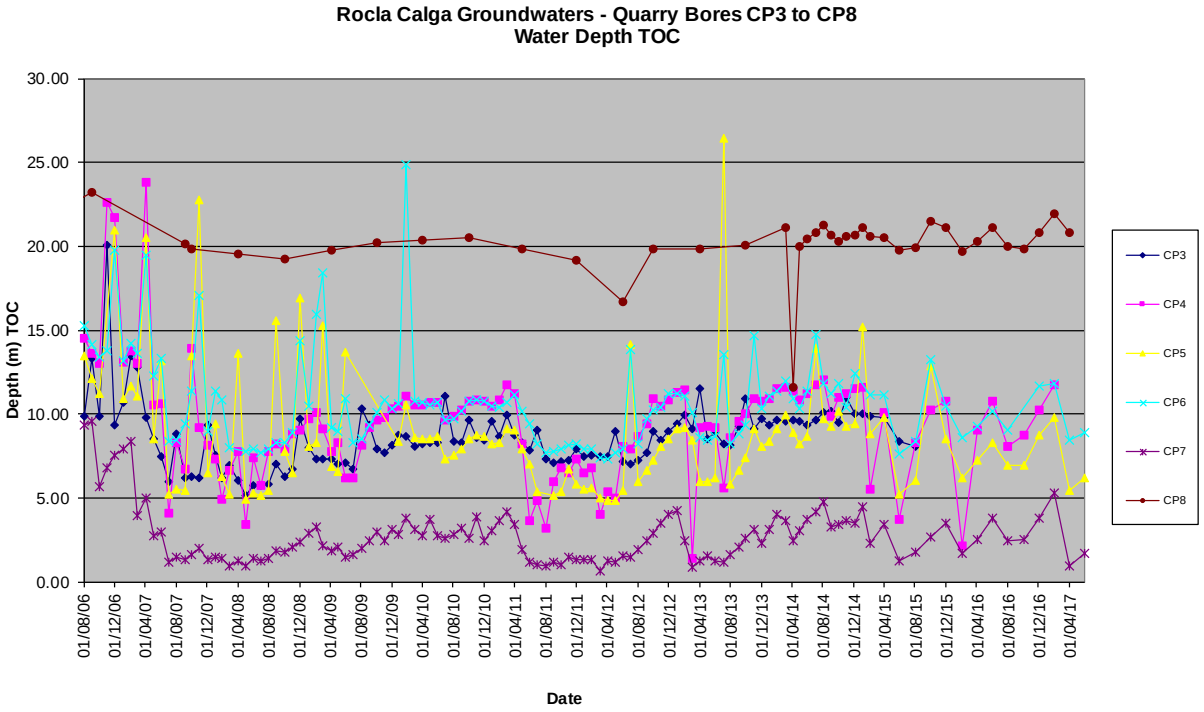
	Increase to ground water depth (water moved away from surface)
	Decrease to ground water depth (water moved towards surface)
	Stable water depth (+/- 0.01m)

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

Figures 3 to 6: Groundwater Depth Charts.






Rocla Calga Groundwaters - Quarry Bores CP3 to CP8
Water Depth TOC
Depth (m) TOC
30.00
25.00
20.00
15.00
10.00
5.00
0.00
01/08/06
01/12/06
01/04/07
01/08/07
01/12/07
01/04/08
01/08/08
01/12/08
01/04/09
01/08/09
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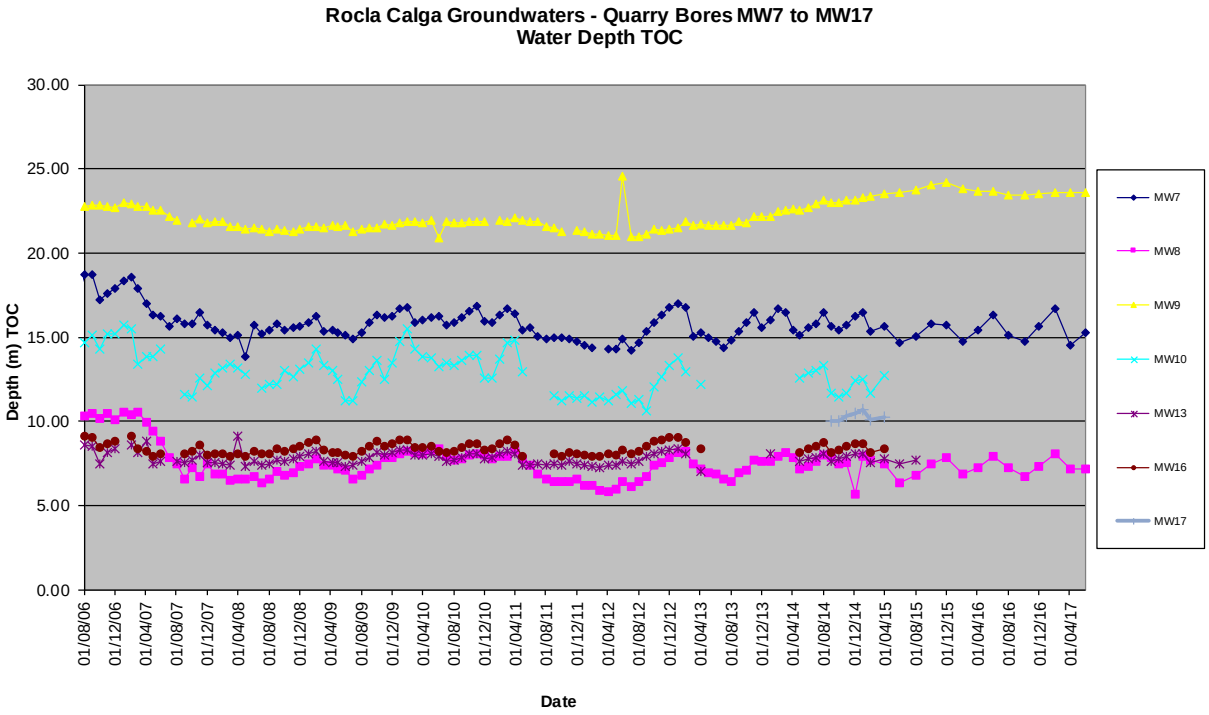
01/04/17
Date
CP3
CP4
CP5
CP6
CP7
CP8


Rocla Calga Groundwaters - Quarry Bores MW7 to MW17
Water Depth TOC
Depth (m) TOC
30.00
25.00
20.00
15.00
10.00
5.00
0.00
01/08/06
01/12/06
01/04/07
01/08/07
01/12/07
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01/12/15
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01/04/17
Date
MW7
MW8
MW9
MW10
MW13
MW16
MW17

2.4 Meteorological Monitoring

The Calga Quarry weather station data recovery in May 2017 was approximately 91% data was not recorded between 1 and 3 May 2017.

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 the nearby Bureau of Meteorology (BOM) at Peats Ridge station are no longer available. However, the long-term rainfall mean is available via a link on the Gosford BOM Daily Weather Observation page.

Data for May 2017 shows that rainfall recorded at the Calga Quarry was lower than the Gosford BOM mean rainfall and the Peats Ridge long term rainfall for May.

The rainfall comparison is provided below:

Calga Quarry	17.6 mm
BOM Peats Ridge*	NA
BOM Gosford*	36.0 mm
BOM Peats Ridge Long term mean for May*	89.7 mm

NA = Not Available
^Rain data not based on a full set of data.
*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au).

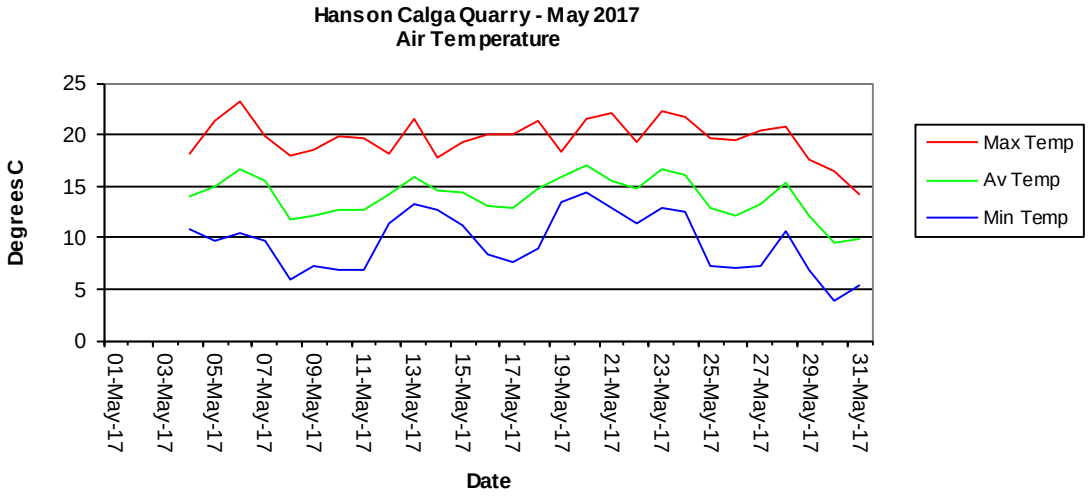
2.4.1 Monthly Meteorological Data Summary

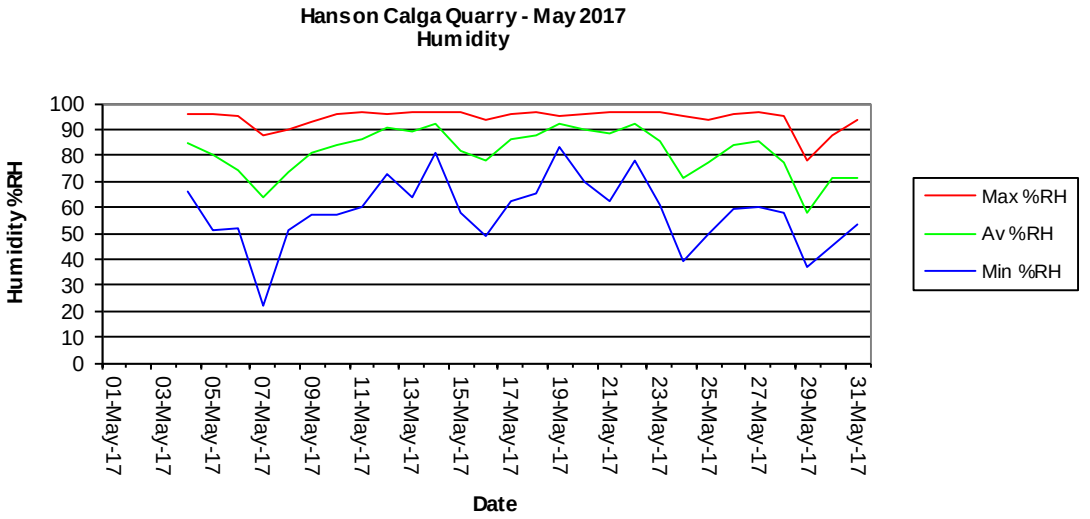
Summary **May-17** **Hanson - Calga**

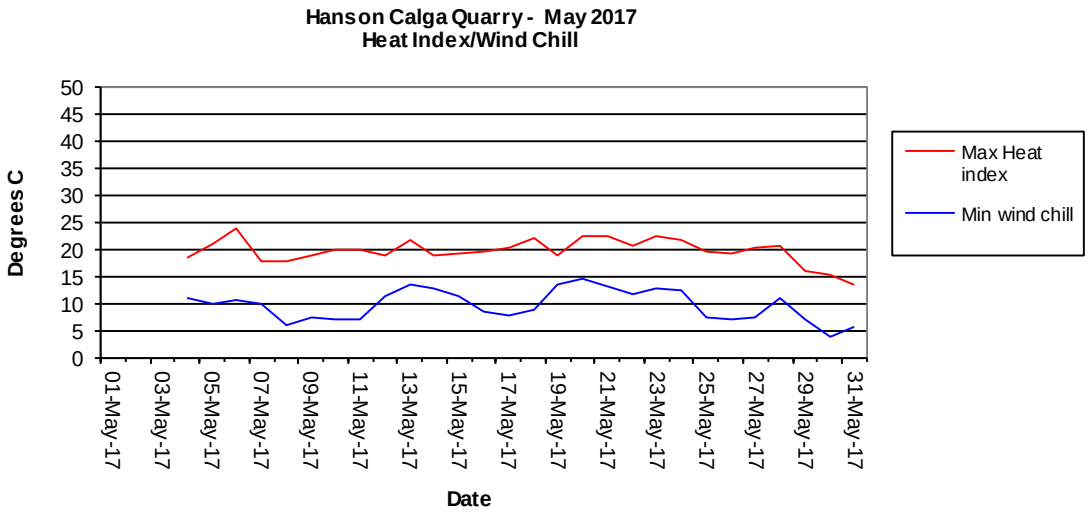
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Data %	Av data %	Max Data %
1/05/2017																		
2/05/2017																		
3/05/2017																		
4/05/2017	10.8	14.0	18.2	66.0	84.4	96.0	0.2	0.0	0.1	3.1	10.8	18.4	1026.3	1027.4	1028.8	44.0	77.9	100.0
5/05/2017	9.6	14.9	21.3	51.0	80.4	96.0	0.0	0.0	0.7	5.4	9.7	21.0	1024.2	1026.2	1028.3	36.9	83.9	100.0
6/05/2017	10.5	16.7	23.3	52.0	74.6	95.0	0.0	0.0	0.5	7.6	10.6	23.6	1018.3	1021.2	1024.3	46.2	91.4	100.0
7/05/2017	9.7	15.6	19.8	22.0	63.5	88.0	0.0	0.0	0.8	8.9	9.7	17.8	1017.1	1020.5	1023.5	48.6	86.9	100.0
8/05/2017	5.9	11.7	17.9	51.0	73.1	90.0	0.0	0.0	0.3	4.9	5.9	17.6	1022.0	1023.7	1025.0	46.8	82.6	100.0
9/05/2017	7.3	12.1	18.6	57.0	80.6	93.0	0.0	0.0	0.3	5.4	7.3	18.6	1021.0	1022.9	1024.3	50.5	75.6	100.0
10/05/2017	6.8	12.7	19.8	57.0	83.9	96.0	0.4	0.0	0.4	6.3	6.8	19.8	1019.0	1021.1	1022.7	55.4	91.6	100.0
11/05/2017	6.8	12.7	19.7	60.0	86.3	97.0	0.0	0.0	0.2	5.4	6.8	19.9	1019.6	1021.0	1022.4	21.5	90.5	100.0
12/05/2017	11.4	14.1	18.2	73.0	90.4	96.0	0.4	0.0	0.3	4.5	11.4	18.8	1021.2	1022.3	1024.3	51.4	81.2	100.0
13/05/2017	13.3	15.9	21.6	64.0	89.5	97.0	0.0	0.0	0.7	5.8	13.3	21.7	1018.4	1020.3	1022.3	52.3	72.6	100.0
14/05/2017	12.6	14.6	17.8	81.0	92.4	97.0	0.2	0.0	0.3	5.4	12.6	18.6	1014.9	1017.3	1019.2	50.8	83.3	100.0
15/05/2017	11.2	14.4	19.3	58.0	81.4	97.0	0.2	0.0	1.1	9.8	11.2	19.1	1010.9	1013.0	1014.9	51.7	89.0	100.0
16/05/2017	8.3	13.1	20.1	49.0	78.3	94.0	0.0	0.0	0.2	5.4	8.3	19.3	1013.0	1014.8	1017.6	64.6	82.5	100.0
17/05/2017	7.6	12.8	20.1	62.0	86.3	96.0	0.2	0.0	0.4	5.4	7.6	20.2	1017.5	1019.5	1021.7	67.4	91.9	100.0
18/05/2017	8.9	14.7	21.4	65.0	87.6	97.0	0.2	0.0	0.6	6.7	8.9	21.8	1020.8	1022.6	1024.5	59.4	92.2	100.0
19/05/2017	13.4	15.9	18.4	83.0	92.3	95.0	10.8	0.0	1.8	10.7	13.4	18.9	1015.8	1020.0	1023.5	61.2	90.4	100.0
20/05/2017	14.3	17.1	21.6	70.0	89.8	96.0	3.2	0.0	0.5	7.2	14.3	22.2	1012.2	1014.2	1015.7	51.4	91.3	100.0
21/05/2017	12.9	15.5	22.1	62.0	88.5	97.0	0.2	0.0	0.3	4.5	12.9	22.4	1015.0	1017.2	1019.8	46.8	86.0	100.0
22/05/2017	11.4	14.8	19.2	78.0	91.9	97.0	0.2	0.0	0.2	4.0	11.5	20.5	1018.9	1020.1	1021.9	51.7	87.5	100.0
23/05/2017	12.8	16.6	22.2	61.0	85.1	97.0	0.0	0.0	0.3	4.9	12.8	22.5	1013.8	1016.8	1019.7	43.7	79.1	99.4
24/05/2017	12.5	16.1	21.7	39.0	71.1	95.0	0.8	0.0	1.4	11.6	12.3	21.7	1009.4	1012.5	1016.0	64.6	87.8	100.0
25/05/2017	7.3	12.9	19.6	50.0	77.2	94.0	0.0	0.0	0.1	3.1	7.4	19.4	1015.8	1017.1	1018.8	74.2	92.1	100.0
26/05/2017	7.1	12.1	19.4	59.0	84.1	96.0	0.2	0.0	0.2	4.5	7.1	19.2	1016.2	1018.0	1019.5	71.7	92.4	100.0
27/05/2017	7.2	13.3	20.4	60.0	85.8	97.0	0.2	0.0	0.1	4.0	7.3	20.3	1013.5	1016.9	1019.5	33.2	94.8	100.0
28/05/2017	10.6	15.4	20.8	58.0	77.5	95.0	0.2	0.0	0.9	12.1	10.8	20.5	1006.7	1009.7	1013.3	96.0	99.8	100.0
29/05/2017	6.9	12.2	17.6	37.0	58.1	78.0	0.0	0.0	1.7	9.8	6.9	16.0	1010.9	1015.4	1020.3	72.9	93.2	100.0
30/05/2017	3.8	9.4	16.4	45.0	71.2	88.0	0.0	0.0	0.3	5.4	3.8	15.3	1017.7	1019.5	1020.9	81.8	94.8	100.0
31/05/2017	5.4	9.8	14.1	53.0	71.5	94.0	0.0	0.0	1.5	9.8	5.4	13.4	1020.0	1023.3	1027.6	67.7	93.1	100.0
Monthly	3.8	14.0	23.3	22	81	97	17.6	0	0.6	12.1	3.8	23.6	1006.7	1019.1	1028.8	21.5	87.7	100

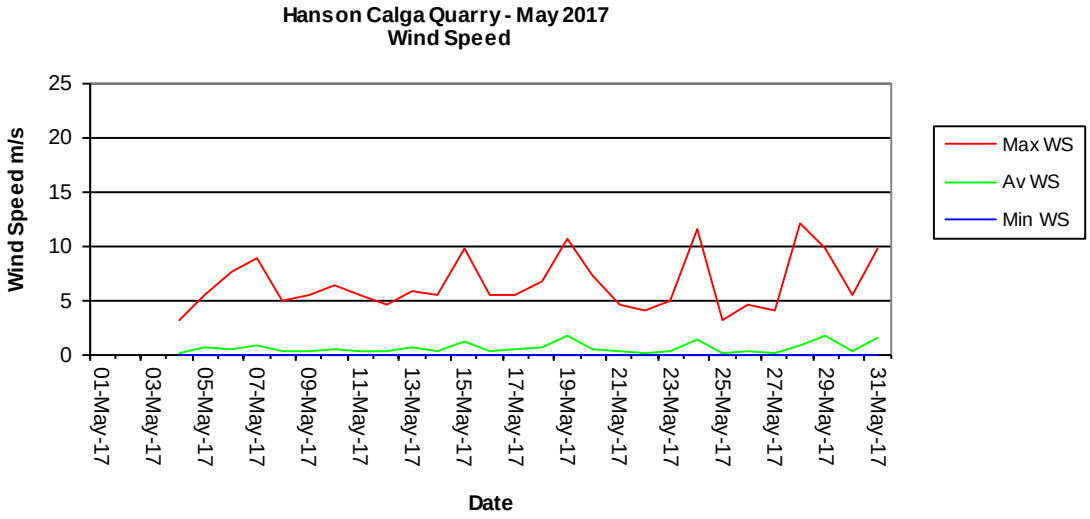
No data

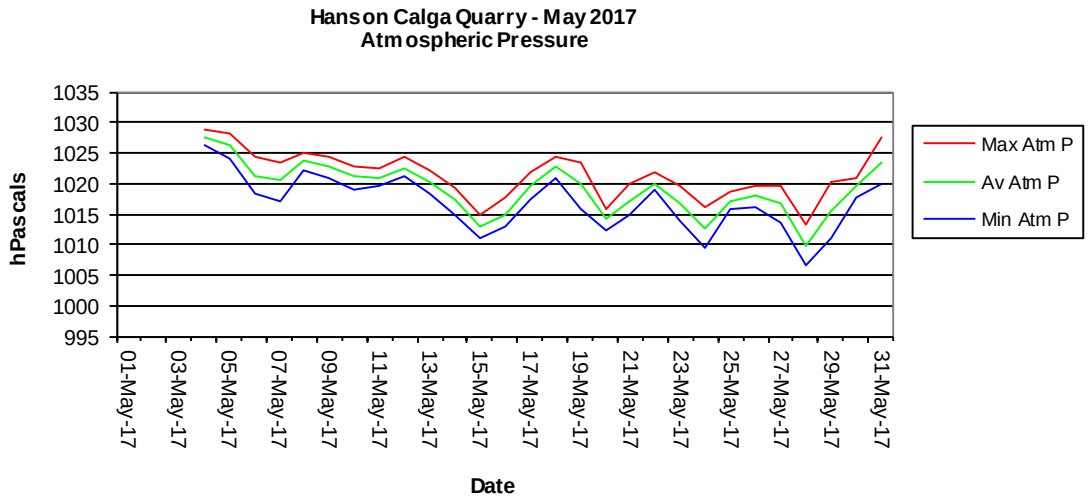
2.4.2 Monthly Weather Charts

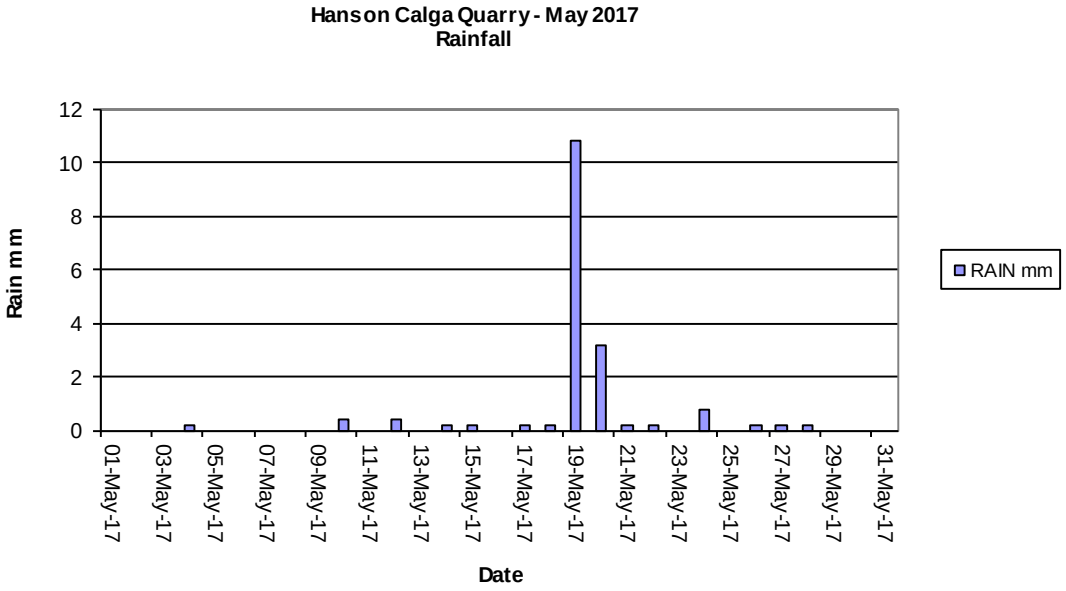


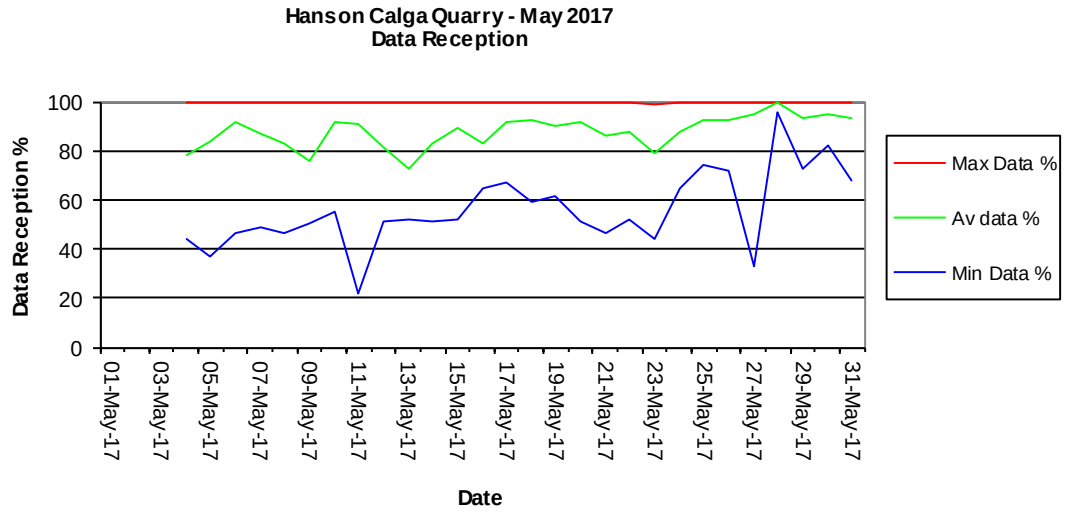





Hanson Calga Quarry - May 2017
Wind Speed
Wind Speed m/s
25
20
15
10
5
0
01-May-17
03-May-17
05-May-17
07-May-17
09-May-17
11-May-17
13-May-17
15-May-17
17-May-17
19-May-17
21-May-17
23-May-17
25-May-17
27-May-17
29-May-17
31-May-17
Date
Max WS
Av WS
Min WS


Hanson Calga Quarry - May 2017
Atmospheric Pressure
hPascals
1035
1030
1025
1020
1015
1010
1005
1000
995
01-May-17
03-May-17
05-May-17
07-May-17
09-May-17
11-May-17
13-May-17
15-May-17
17-May-17
19-May-17
21-May-17
23-May-17
25-May-17
27-May-17
29-May-17
31-May-17
Date
Max Atm P
Av Atm P
Min Atm P

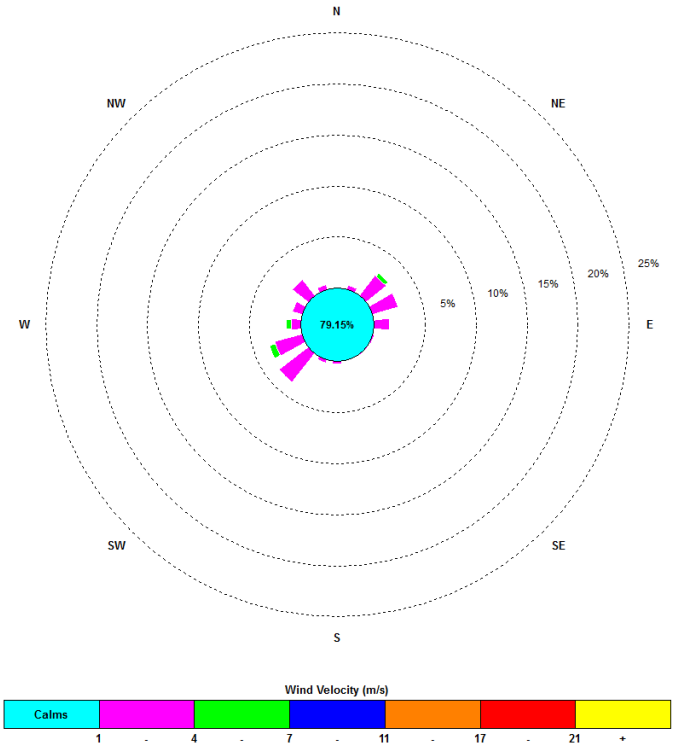

Hanson Calga Quarry - May 2017
Rainfall
Rain mm
12
10
8
6
4
2
0
01-May-17
03-May-17
05-May-17
07-May-17
09-May-17
11-May-17
13-May-17
15-May-17
17-May-17
19-May-17
21-May-17
23-May-17
25-May-17
27-May-17
29-May-17
31-May-17
Date
RAIN mm


Hanson Calga Quarry - May 2017
Data Reception
Data Reception %
100
80
60
40
20
0
01-May-17
03-May-17
05-May-17
07-May-17
09-May-17
11-May-17
13-May-17
15-May-17
17-May-17
19-May-17
21-May-17
23-May-17
25-May-17
27-May-17
29-May-17
31-May-17
Date
Max Data %
Av data %
Min Data %

2.4.3 Monthly Windrose Plot

Frequency plot of the average wind speed and average direction over each 15-minute sampling period. Wind is considered to be calm when at less than a 15-minute average of 1m/s.

00:15, 1 May 2017 – 23:45, 31 May 2017



The predominant winds were from the WSW and NE, with most frequent, strongest winds also from the WSW. The maximum wind speed was 12.1 m/s from the NNW.

Appendix 1

Field Sheets

Chain of Custody

Laboratory Certificates

DEPOSITIONAL DUST MONITORING

Client: ..... **Hanson Calga Quarry** ..... Date Installed: 3.5.17 Collection Start Time: 9:00 Sampled By: H. MACKINNON/C KING

Date Collected: 2.6.17 Collection Stop Time: 12:10 Sampling ID: .....

Site	Time Collected	Water Level (mL)	Insoluble Material (✔ = slight, ✔ ✔ = mod etc)				Water Turbidity	Water Colour	Stand Level (Y/N)	Funnel Level (Y/N)	New Funnel Diameter (mm)	Comments
			Insects	Bird droppings	Vegetation	Dust						
CD1	12:00	300	✔		✔	✔	C (S) T	(C) O Bn Gn Gy	Y	Y		
CD2C	10:30	400	✔		✔	✔	(C) S T	(C) O Bn Gn Gy	Y	Y		
CD3	9:10	300	✔		✔	✔	C (S) T	(C) O Bn Gn Gy	Y	Y		TREES ABOVE
CD4	10:00	300	✔		✔✔	✔	(C) S T	(C) O Bn Gn Gy	Y	Y		" "
CD5	9:40	500	✔			✔	(C) S T	(C) O Bn Gn Gy	Y	Y		
CD6	9:30	500	✔		✔	✔	(C) S T	(C) O Bn Gn Gy	Y	Y		
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				
							C S T	C O Bn Gn Gy				

Turbidity: C=Clear, S= Slight, T=Turbid (CIRCLE)

Colour: C=Clear, O=Orange, Bn=Brown, Gn=Green, Gy = Grey (CIRCLE)

Report broken funnels and replacement diameters

Signed: _____

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: CBased Environmental Pty Ltd

POSTAL ADDRESS: 47 Boomerang St CESSNOCK NSW 2325

SEND REPORT TO: monitoringresults@cbased.com.au

SEND INVOICE TO: admin@cbased.com.au, renae.mikka@cbased.com.au

DATA NEEDED BY: 7 working days

REPORT NEEDED BY: 7 working days

PROJECT ID: Hanson Calga Dusts

QUOTE NO.: SYBQ 222-16

P.O. NO.:

COMMENTS/SPECIAL HANDLING/STORAGE OR DIPOSAL:

FOR LAB USE ONLY
COOLER SEAL
Yes (NA)
Broken ..... Intact .....
COOLER TEMP 13 deg C

Total unless specified

LABORATORY BATCH NO.

SAMPLERS:CBased Environmental Pty Ltd

PHONE: 0265713334 E-MAIL: monitoringresults@cbased.com.au

REPORT FORMAT: HARD: Yes FAX: DISK: BULLETIN BOARD: E-MAIL: Yes

QC LEVEL: QCS1: QCS2: QCS3: Yes QCS4:

ANALYSIS REQUIRED

SAMPLE DATA				CONTAINER DATA		Insoluable Solids	Ash Residue	Combustable Matter	NOTES
SAMPLE ID	MATRIX	DATE ON	DATE OFF	TYPE & PRESERVATIVE	NO.				
CD1	Dust	3-5-17	2-6-17			x	x	x	
CD2c	Dust	"	"			x	x	x	
CD3	Dust	"	"			x	x	x	
CD4	Dust	"	"			x	x	x	
CD5	Dust	"	"			x	x	x	
CD6	Dust	"	"			x	x	x	

RELINQUISHED BY:

NAME : [signature]
DATE: 2-6-17
OF: CBased Environmental
TIME: 1-30
NAME :
DATE:
OF:
TIME:

RECEIVED BY

NAME : Mark S
DATE: 2/06/17
OF: ALS
TIME: 1.26pm
NAME :
DATE:
OF:
TIME:

METHOD OF SHIPMENT

CONSIGNMENT NOTE NO.

TRANSPORT CO. NAME.

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

AUSTRALIAN LABORATORY SERVICES P/L

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN1702344**	Page	: 1 of 4
Client	: **CBASED ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: All Deliverables	Contact	:
Address	: 47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: +61 02 6571 3334	Telephone	: +61 2 4014 2500
Project	: Hanson Calga Dusts	Date Samples Received	: 02-Jun-2017 13:26
Order number	: ----	Date Analysis Commenced	: 06-Jun-2017
C-O-C number	: ----	Issue Date	: 09-Jun-2017 18:29
Sampler	: CARBON BASED ENVIRONMENTAL PTY LTD		
Site	:		
Quote number	: SYBQ/222/16 and PLANNED EVENTS		
No. of samples received	: 6		
No. of samples analysed	: 6		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Analysis as per AS3580.10.1-2003. Samples passed through a 1mm sieve prior to analysis. NATA accreditation does not apply for results reported in g/m².mth as sampling data was provided by the client.

Analytical Results

Sub-Matrix: DEPOSITIONAL DUST (Matrix: AIR)				Client sample ID	CD1 03/05/17 - 02/06/17	CD2c 03/05/17 - 02/06/17	CD3 03/05/17 - 02/06/17	CD4 03/05/17 - 02/06/17	CD5 03/05/17 - 02/06/17
				Client sampling date / time	02-Jun-2017 00:00	02-Jun-2017 00:00	02-Jun-2017 00:00	02-Jun-2017 00:00	02-Jun-2017 00:00
Compound	CAS Number	LOR	Unit		EN1702344-001	EN1702344-002	EN1702344-003	EN1702344-004	EN1702344-005
					Result	Result	Result	Result	Result
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**1.3**	**0.9**	**0.2**	**0.2**	**0.2**
Ash Content (mg)	----	1	mg		**23**	**16**	**4**	**3**	**3**
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		**0.2**	**0.6**	**0.4**	**0.5**	**0.4**
Combustible Matter (mg)	----	1	mg		**4**	**10**	**6**	**9**	**7**
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**1.5**	**1.5**	**0.6**	**0.7**	**0.6**
Total Insoluble Matter (mg)	----	1	mg		**27**	**26**	**10**	**12**	**10**

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)				Client sample ID	**CD6 03/05/17 - 02/06/17**	----	----	----	----
				Client sampling date / time	02-Jun-2017 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EN1702344-006**	--------	--------	--------	--------
					Result	---	---	---	---
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**0.2**	----	----	----	----
Ash Content (mg)	----	1	mg		**3**	----	----	----	----
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		**0.4**	----	----	----	----
Combustible Matter (mg)	----	1	mg		**7**	----	----	----	----
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**0.6**	----	----	----	----
Total Insoluble Matter (mg)	----	1	mg		**10**	----	----	----	----

CBased Environmental Pty Limited

Date: 2-6-17

Todays Collection	
Time Start:	8:40
Time Finish:	11:45

Client : Hanson Calga

Project :

SURFACE WATERS

Site	Flow Rate	Odour	Sampling Time	Bottles	Water Turbidity	Water Colour	Comments
A	DAM	No	9:00	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
B			8:40	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	DRY
C1	DAM	N	11:30	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
C2	SLOW	N	11:40	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
D			9:25	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	No Flow
F	DAM	N	8:45	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
					C S T	C LO O B G	
					C S T	C LO O B G	
					C S T	C LO O B G	
					C S T	C LO O B G	
					C S T	C LO O B G	

Turbidity: C=Clear, S= Slight, T=Turbid (CIRCLE)

Colour: C=Clear, LO=Light Orange, O=Orange, B=Brown, G=Green (CIRCLE)

Signed: [signature]

Sampled by: Leesa + Hamish

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: CBased Environmental Pty Ltd

POSTAL ADDRESS: 47 Boomerang St CESSNOCK NSW 2325

SEND REPORT TO: monitoringresults@cbased.com.au

SEND INVOICE TO: admin@cbased.com.au, renae.mikka@cbased.com.au

DATA NEEDED BY: 7 working days

REPORT NEEDED BY: 7 working days

PROJECT ID: Hanson Quarry

QUOTE NO.: SYBQ-222-16

P.O. NO.:

COMMENTS/SPECIAL HANDLING/STORAGE OR DIPOSAL:

FOR LAB USE ONLY
COOLER SEAL
Yes (No)
Broken (Intact)
COOLER TEMP 13 deg C

Total unless specified

LABORATORY BATCH NO.:

SAMPLERS:CBased Environmental Pty Ltd

PHONE: 0265713334 E-MAIL: monitoringresults@cbased.com.au

REPORT FORMAT: HARD: Yes FAX: DISK: BULLETIN BOARD: E-MAIL: Yes

QC LEVEL: QCS1: QCS2: QCS3: Yes QCS4:

ANALYSIS REQUIRED

SAMPLE DATA				CONTAINER DATA		Ph	EC	TSS	TDS	O + G															NOTES
SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	NO.																				
A	Water	2-6-17	9:00	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x															
~~B~~	~~Water~~			~~1x 250mlGP,1x 500mLGP,1xPG~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~															
C1	Water	1	11:30	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x															
C2	Water	1	11:40	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x															
~~D~~	~~Water~~			~~1x 250mlGP,1x 500mLGP,1xPG~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~															
F	Water	1	8:45	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x															
				TOTAL BOTTLES:																					

RELINQUISHED BY:

NAME : Colin Davies DATE: 2-6-17

OF: Carbon Based Environmental TIME: 1-30

NAME : DATE:

OF: TIME:

RECEIVED BY

NAME : Mark S DATE: 2/06/17

OF: ALS TIME: 1:26pm

NAME : DATE:

OF: TIME:

METHOD OF SHIPMENT

CONSIGNMENT NOTE NO.

TRANSPORT CO. NAME.

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

AUSTRALIAN LABORATORY SERVICES P/L

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1713489**	Page	: 1 of 2
Client	: **CBASED ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: All Deliverables	Contact	: Customer Services ES
Address	: 47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6571 3334	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 02-Jun-2017 14:20
Order number	: ----	Date Analysis Commenced	: 02-Jun-2017
C-O-C number	: ----	Issue Date	: 08-Jun-2017 11:28
Sampler	: CARBON BASED ENVIRONMENTAL PTY LTD		
Site	:		
Quote number	: SYBQ/222/16 and PLANNED EVENTS		
No. of samples received	: 4		
No. of samples analysed	: 4		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Neil Martin	Team Leader - Chemistry	Chemistry, Newcastle West, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

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When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	A	C1	C2	F	----
			Client sampling date / time	02-Jun-2017 09:00	02-Jun-2017 11:30	02-Jun-2017 11:40	02-Jun-2017 08:45	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES1713489-001**	**ES1713489-002**	**ES1713489-003**	**ES1713489-004**	--------
				Result	Result	Result	Result	----
EA005: pH								
pH Value	----	0.01	pH Unit	**6.14**	**6.74**	**5.99**	**6.22**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**64**	**91**	**99**	**70**	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**46**	**62**	**62**	**54**	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	**11**	<5	**18**	----
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	----

Carbon Based Environmental Pty Limited

Todays Collection	
Time Start:	8:40
Time Finish:	12:10

Date: 2.6.17

Client : Hanson Calga

Project :

GROUNDWATERS

Site	DEPTH	Odour	Water Turbidity	Water Colour	1		2		Bottles (Apr/Oct)	Downloaded Logger? (Y/N)
					pH	EC	pH	EC		
CQ3	10.68	Yes	C S T	C LO O B G	6.56	218.4µS	6.52	201.2µS	1x 250ml GP, 1x 500mL GP, 1RP	Y
CQ4	9.84	N	C S T	C LO O B G	5.45	106.7µS	5.49	103.8µS	1x 250ml GP, 1x 500mL GP, 1RP	N
CQ5	6.15	N	C S T	C LO O B G	4.94	132.4µS	4.89	130.4µS	1x 250ml GP, 1x 500mL GP, 1RP	Cant Find
CQ6			C S T	C LO O B G	COVERED IN PADDOCK				1x 250ml GP, 1x 500mL GP, 1RP	N
CQ7	6.16	N	C S T	C LO O B G	4.12	122.8µS	4.10	126.7µS	1x 250ml GP, 1x 500mL GP, 1RP	Y
CQ8	5.88	N	C S T	C LO O B G	4.65	117.7µS	4.77	117.4µS	1x 250ml GP, 1x 500mL GP, 1RP	Y
CQ9			C S T	C LO O B G	STAND PIPE BENT / BLOCKED				1x 250ml GP, 1x 500mL GP, 1RP	
CQ10	25.59	Y	C S T	C LO O B G	4.59	130.1µS	4.44	130.7µS	1x 250ml GP, 1x 500mL GP, 1RP	Y
CQ11S	9.98	N	C S T	C LO O B G	5.21	139.4µS	5.27	138.7µS	1x 250ml GP, 1x 500mL GP, 1RP	N
CQ11D	11.11	N	C S T	C LO O B G	4.99	144.2µS	4.98	143.8µS	1x 250ml GP, 1x 500mL GP, 1RP	Y
CQ12	4.15	N	C S T	C LO O B G	4.01	121.5µS	3.94	122.1µS	1x 250ml GP, 1x 500mL GP, 1RP	Y
CQ13	12.53	N	C S T	C LO O B G	4.43	173.5µS	4.38	173.4µS	1x 250ml GP, 1x 500mL GP, 1RP	N
CP3			C S T	C LO O B G		GONE			1x 250ml GP, 1x 500mL GP, 1RP	
CP4			C S T	C LO O B G	SHED COLLAPSED				1x 250ml GP, 1x 500mL GP, 1RP	
CP5	6.19	N	C S T	C LO O B G	4.44	169.1µS	4.47	169.7µS	1x 250ml GP, 1x 500mL GP, 1RP	
CP6	8.88	N	C S T	C LO O B G	3.63	156.0µS	3.61	158.7µS	1x 250ml GP, 1x 500mL GP, 1RP	
CP7	1.67	N	C S T	C LO O B G	4.01	92.3µS	4.06	91.7µS	1x 250ml GP, 1x 500mL GP, 1RP	
CP8	21.20	N	C S T	C LO O B G	4.25	119.4µS	4.25	120.9µS	1x 250ml GP, 1x 500mL GP, 1RP	
MW7	15.25	N	C S T	C LO O B G	4.73	102.1µS	4.68	103.0µS	1x 250ml GP, 1x 500mL GP, 1RP	Y
MW8	7.16	N	C S T	C LO O B G	4.81	63.3µS	4.89	64.3µS	1x 250ml GP, 1x 500mL GP, 1RP	N
MW9	23.58	N	C S T	C LO O B G	4.63	82.3µS	4.59	78.4µS	1x 250ml GP, 1x 500mL GP, 1RP	N
MW10			C S T	C LO O B G	TREES OVER TRACKS				1x 250ml GP, 1x 500mL GP, 1RP	
MW13			C S T	C LO O B G	"	"	"		1x 250ml GP, 1x 500mL GP, 1RP	
MW16			C S T	C LO O B G	"	"	"		1x 250ml GP, 1x 500mL GP, 1RP	
MW17			C S T	C LO O B G	UNSAFE TREES				1x 250ml GP, 1x 500mL GP, 1RP	

Turbidity: C=Clear, S= Slight, T=Turbid (CIRCLE)

Colour: C=Clear, LO=Light Orange, O=Orange, B=Brown, G=Green (CIRCLE)

pH/EC meter #: 12

Signed:

Sampled by: H. MACKINNON
L. KING.