CBased Environmental Pty Limited

ABN 62 611 924 264

Calga Quarry

Environmental Monitoring

Dust Deposition Gauges, Surface and Ground Waters and Meteorological Station

March 2018

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Date: 26 April 2018

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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 March 2018;
- Surface Water quality results for March 2018; and
- Meteorological report for March 2018.

The March 2018 dust deposition results for insoluble solids were generally increased when compared to February 2018. There were no excessively contaminated dust gauges this month. 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, D and F. Sites B were dry 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 not detected at any sites in March 2018.

Groundwater depth generally varied compared to January 2018, indicating water moving both towards and away from the surface. pH at all sites is in the acidic range and generally slightly increased when compared to the previous results. EC levels were similar or increased slightly at a majority of groundwater sites when compared to the January 2018 results.

The Calga Quarry weather station data recovery in March 2018 was approximately 100%. Data for March 2018 shows that rainfall recorded at the Calga Quarry was lower than the Gosford BOM mean rainfall and the Peats Ridge long term rainfall for March.

The rainfall comparison is provided below:

Calga Quarry	85.6 mm^
BOM Peats Ridge*	NA
BOM Gosford*	102.8 mm
BOM Peats Ridge Long term mean for March*	135.9 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).
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**.

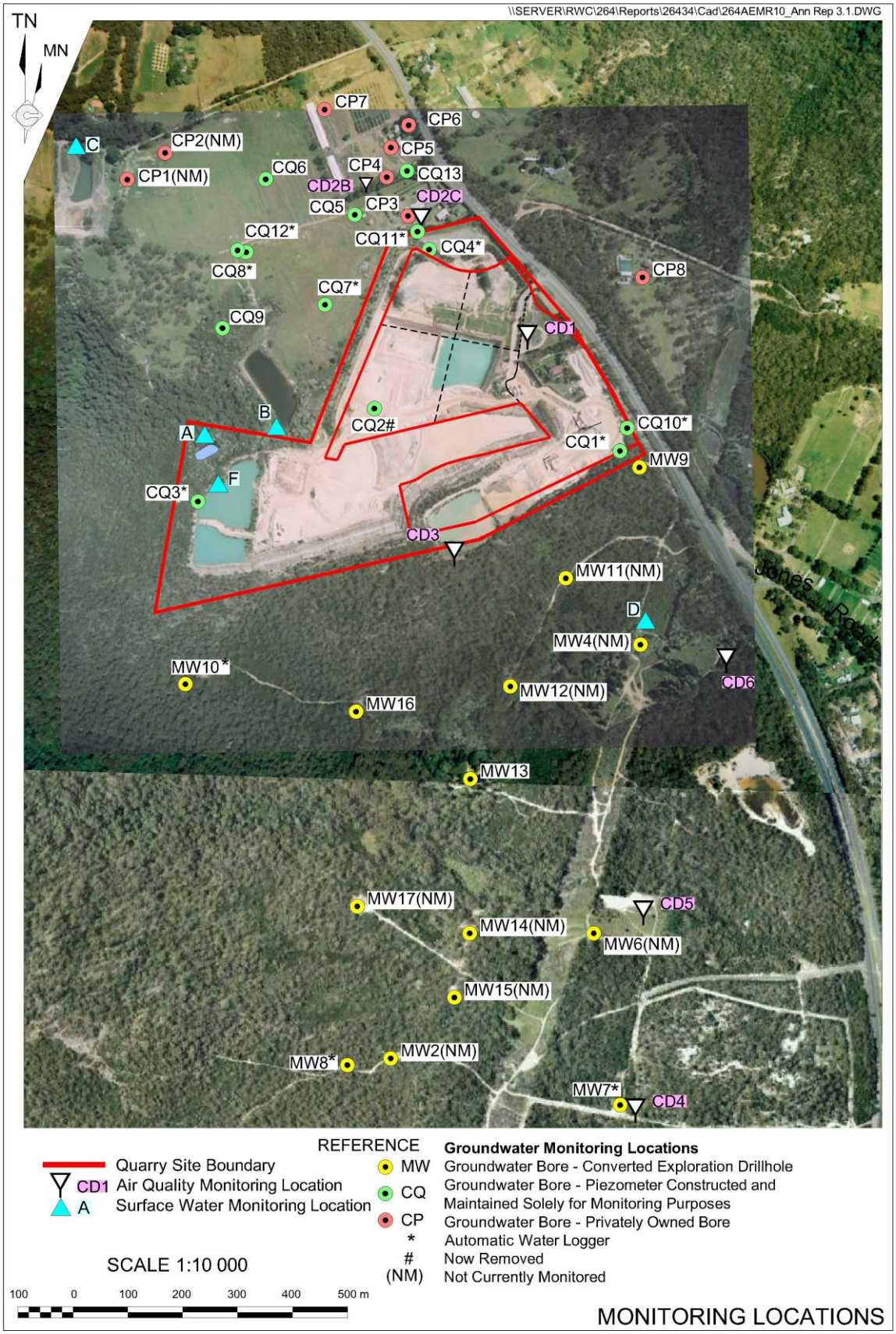


Figure 1: Hanson Calga Quarry environmental monitoring locations

2.0 Monthly Results

2.1 Dust Deposition Gauges

Table 1 displays the results for March 2018 and the project 12-month rolling average. Results are in g/m^2.month.

Table 1: Dust Deposition results: 2 March 2018 – 3 April 2018 (32 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	5.9	4.8	1.1	81	2.3
CD2c	2.1	1.3	0.8	62	1.1
CD3	1.5	0.9	0.6	60	1.1
CD4	1.2	0.5	0.7	42	0.7
CD5	0.9	0.5	0.4	56	0.7
CD6	1.3	0.7	0.6	54	0.9

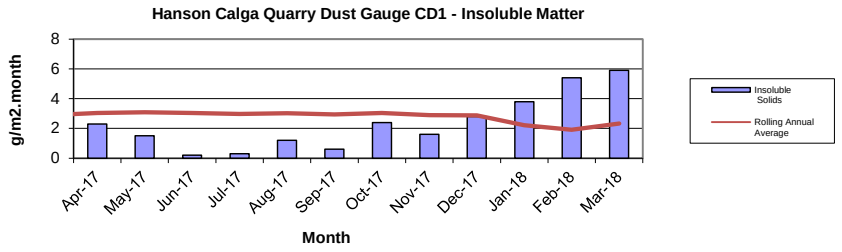
Insoluble Solids marked with an * indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen and seeds) and insects. Results in bold indicate insoluble solids levels above 3.7 g/m^2.month; the Development Consent's annual average amenity criteria at residential locations. The current rolling annual average is calculated from April 2017 to March 2018.

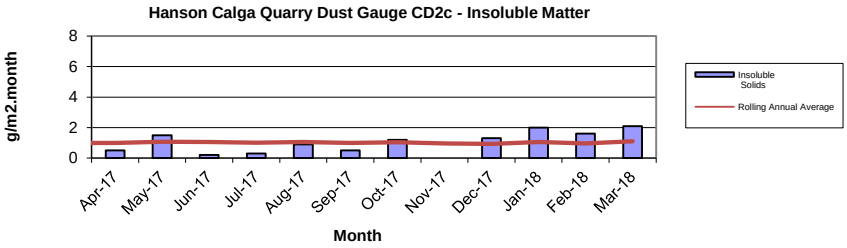
NA= Not Available.

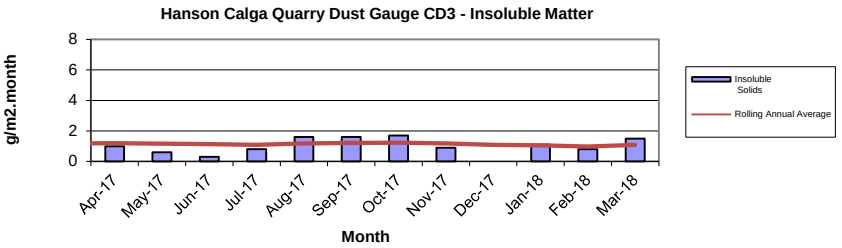
CD1 was installed on the 1 May 2006. CD2a was discontinued at the start of August 2006 due to quarry operations "mining out" the site of the gauge. The replacement gauge, Site CD2b, was located in a position adjacent to the boundary between B. Kashouli and F. & J. Gazzana in conformance with the Air 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.

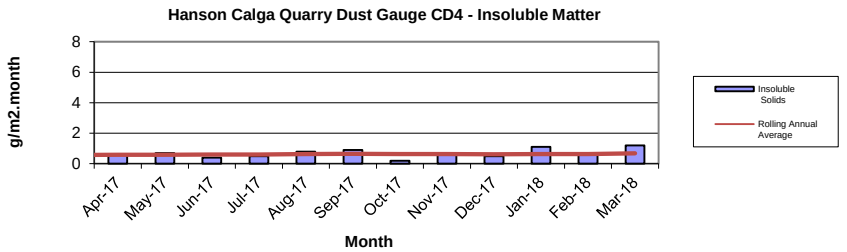
Dust deposition charts for all dust gauge sites appear in **Figure 2** below. The laboratory analysis is provided in **Appendix 1.**

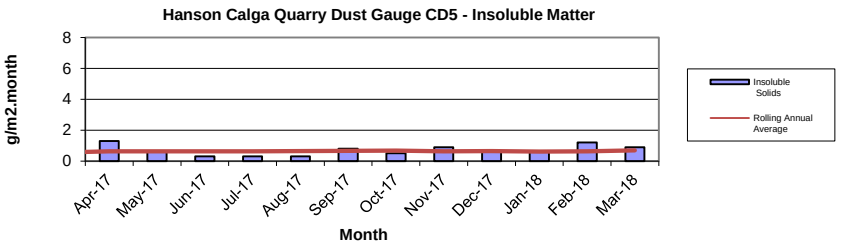
Figure 2: Dust Deposition Charts

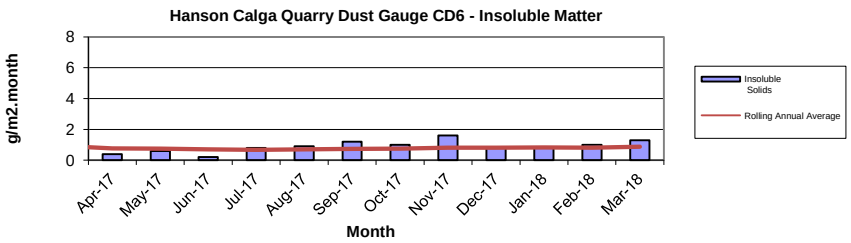












2.2 Surface Water Monitoring

Monthly surface water monitoring was conducted on the 3 April 2018 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1.**

Table 2: Monthly surface water monitoring – March 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	4.37	124	73	5	<5
B	Dry							
C1	Dam	Clear	Clear	4.94	114	78	9	<5
C2	Steady	Clear	Clear	6.67	112	76	10	<5
D	Trickle	Clear	Clear	6.37	104	72	<5	<5
F	Dam	Clear	Clear	5.52	105	70	5	<5

Samples were collected at sites A, C1, C2, D and F. Sites B were dry 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 not detected at any sites in March 2018.

2.2.1 Non-Routine Surface Water Sampling

No non-routine sampling was undertaken during March 2018.

2.3 Groundwater Monitoring

Bi-monthly groundwaters were sampled on 3 April 2018. 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 varied compared to January 2018, indicating water moving both towards and away from the surface. pH at all sites is in the acidic range and generally slightly increased when compared to the previous results. EC levels were similar or increased slightly at a majority of groundwater sites when compared to the January 2018 results.

Bi-monthly groundwater monitoring is next scheduled for May 2018.

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
CQ3	Voutos	* Monitor	10.53	10.87	5.95	134
CQ4	Voutos	* Monitor	8.78	11.40	5.39	114
CQ5	Gazzana	DIP Only	8.69	8.22	4.05	162
CQ6	Gazzana	DIP Only	16.00	Covered over in paddock		
CQ7	Gazzana	* Monitor	6.89	6.46	4.55	97
CQ8	Gazzana	* Monitor	11.03	6.83	4.19	131
CQ9	Gazzana	DIP Only	10.10	Blocked / Damaged		
CQ10	Voutos	* Monitor	NI	27.08	4.26	136
CQ11S	Gazzana	* Monitor	NI	11.94	5.21	139
CQ11D	Gazzana	* Monitor	NI	13.15	3.83	190
CQ12	Gazzana	* Monitor	NI	5.52	5.22	122
CQ13	Kashouli	* Monitor	NI	15.67	4.23	166
CP3	Gazzana	Domestic	10.40	Destroyed		
CP4	Kashouli	Domestic	13.63	No access - shed over bore		
CP5	Kashouli	Domestic	16.61	10.47	4.30	155
CP6	Kashouli	Domestic	16.27	12.72	4.37	154
CP7	Kashouli	Production	8.56	3.94	4.82	78
CP8	Rozmanec	Domestic	22.17	23.71	4.44	114
MW7	Rocla Bore	* Monitor	15.76	16.18	4.34	106
MW8	Rocla Bore	* Monitor	9.82	8.59	4.38	67
MW9	Rocla Bore	* Monitor	22.44	24.36	4.41	80
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		

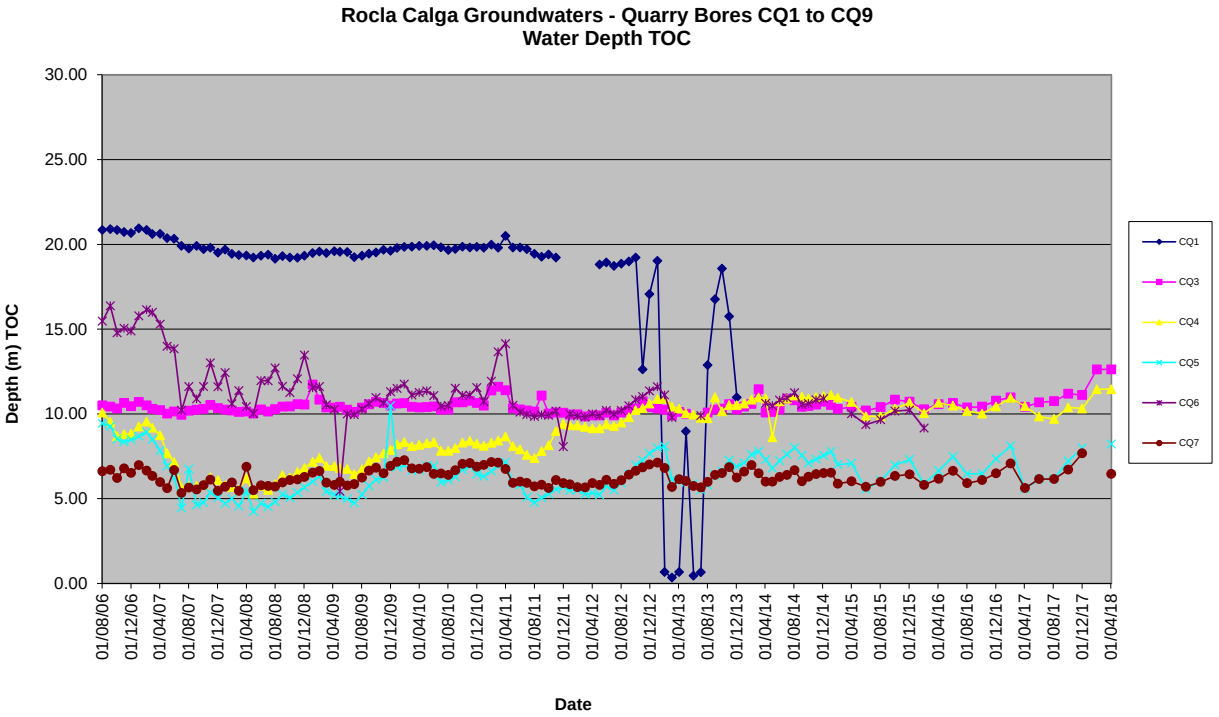
Notes:
TOC = Water level measured from top of bore case to water.
NM = Not Monitored – unable to sample water due to non-operational pump.
NR = Not Required by resident.
* = Logger Installed.
NI = These bores were not installed in April 2006 but are now operational. April 2006 was the first set of measurements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

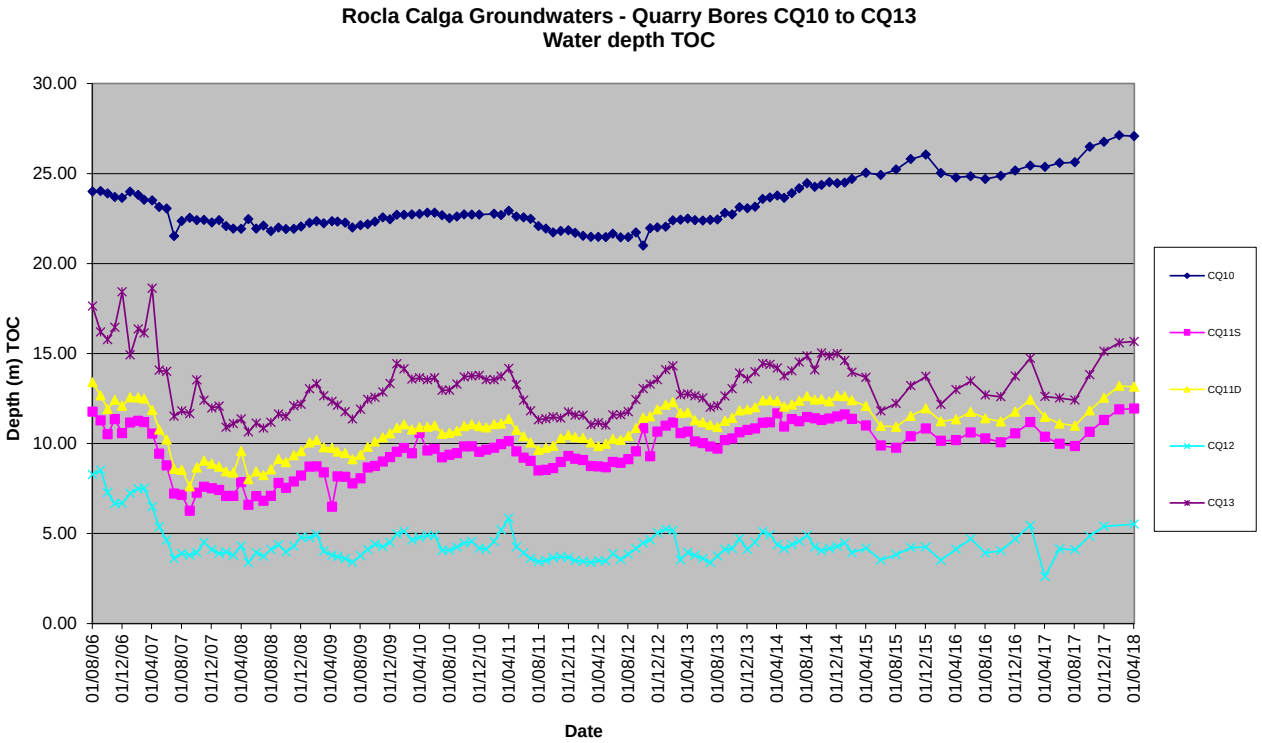
Shading is used to indicate the following trends in water depth (compared to the last reading):

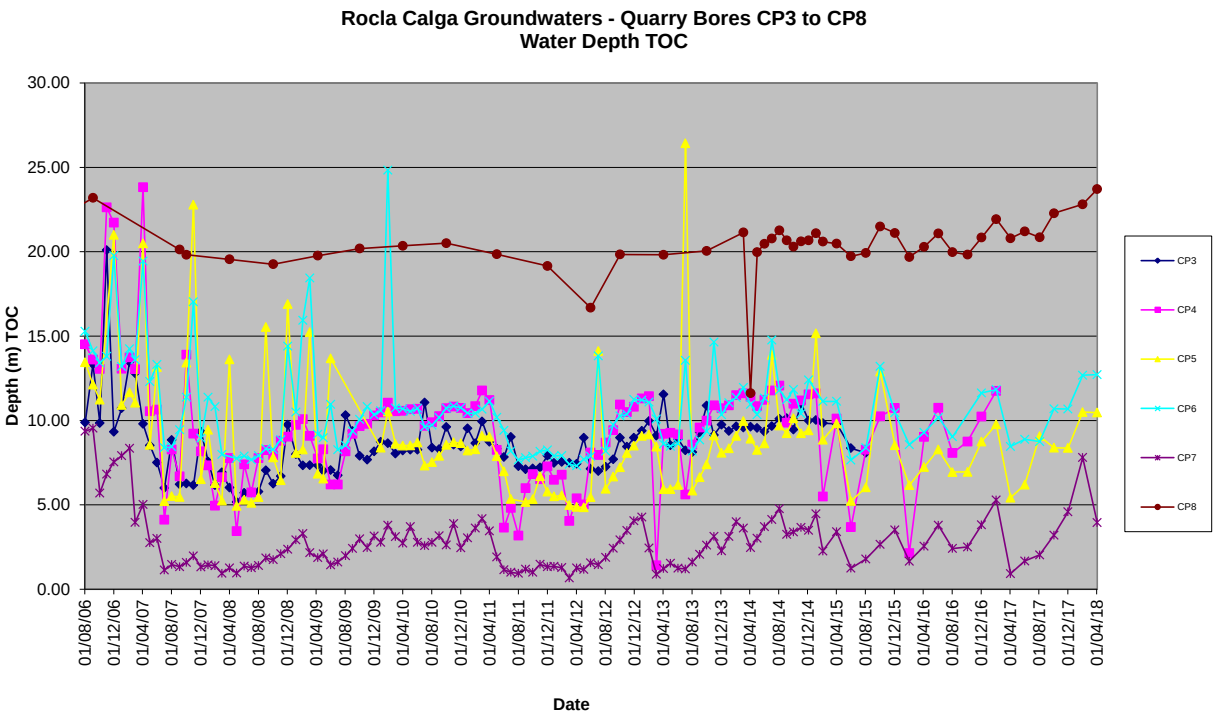
	Increase to ground water depth (water moved away from surface)
	Decrease to ground water depth (water moved towards surface)
	Stable water depth (+/- 0.01m)

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
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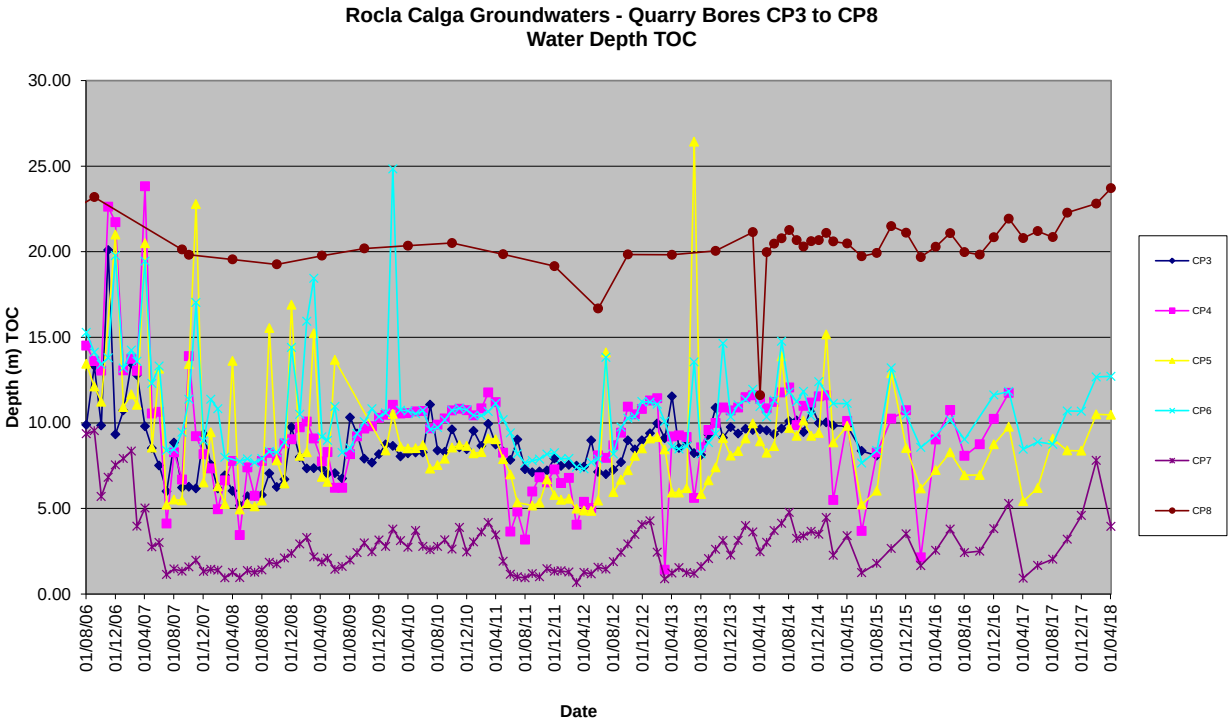
Date
CP3
CP4
CP5
CP6
CP7
CP8


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
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01/08/17
01/12/17
01/04/18
Date
CP3
CP4
CP5
CP6
CP7
CP8

2.4 Meteorological Monitoring

The Calga Quarry weather station data recovery in March 2018 was approximately 100%.

The weather station data follows and includes;

- Monthly data numerical summary;
- Weather charts of air temperature, humidity, heat index and wind chill, atmospheric pressure, solar radiation, evapotranspiration, rain, wind speed and data reception; and
- Wind rose (frequency distribution diagram of wind speed and direction).

Monthly weather statistics from 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 March 2018 shows that rainfall recorded at the Calga Quarry was lower than the Gosford BOM mean rainfall and the Peats Ridge long term rainfall for March.

The rainfall comparison is provided below:

Calga Quarry	85.6 mm^
BOM Peats Ridge*	NA
BOM Gosford*	102.6 mm
BOM Peats Ridge Long term mean for March*	135.9 mm

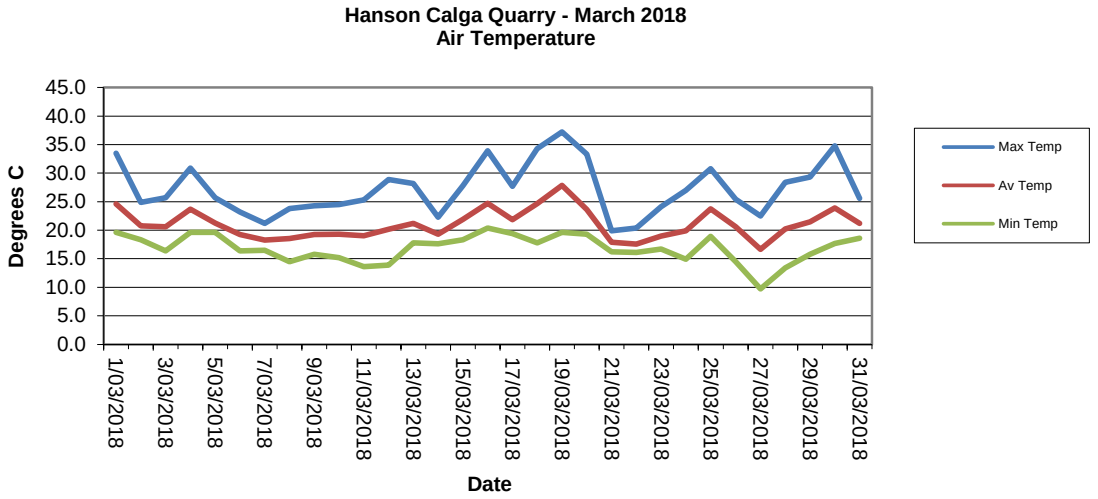
NA = Not Available
^Rain data not based on a full set of data.
*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au).

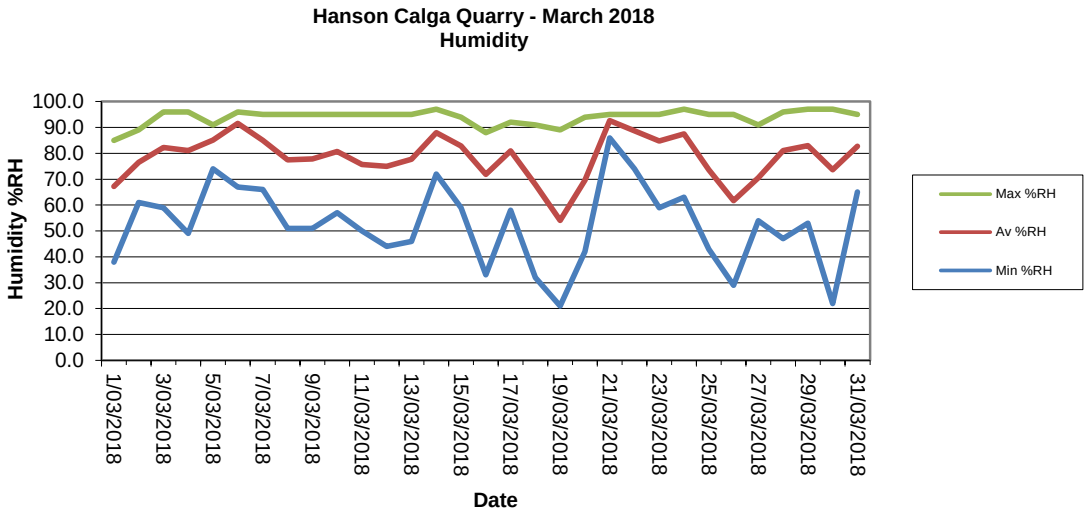
2.4.1 Monthly Meteorological Data Summary

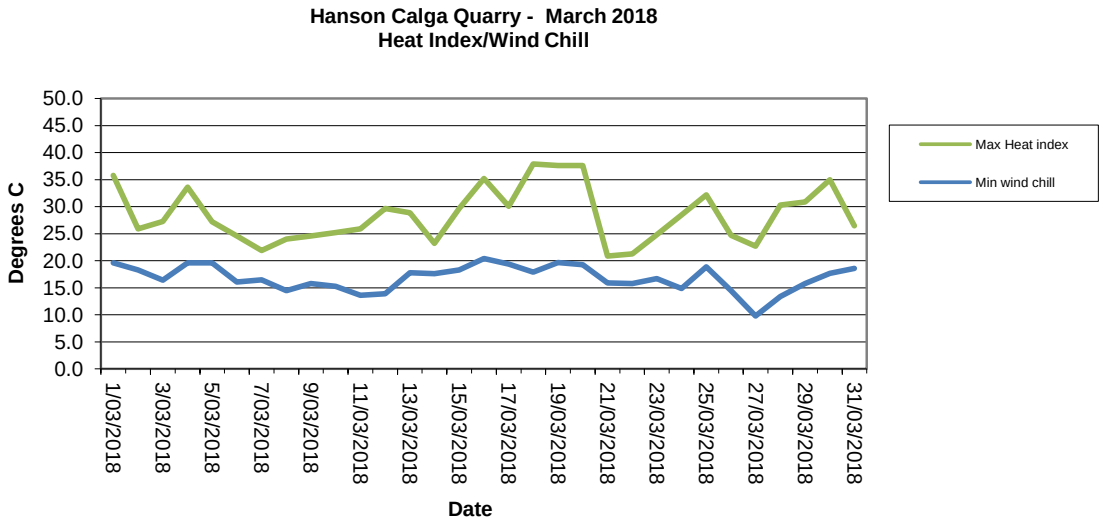
Summary **Mar-18** **Hanson - Calga**

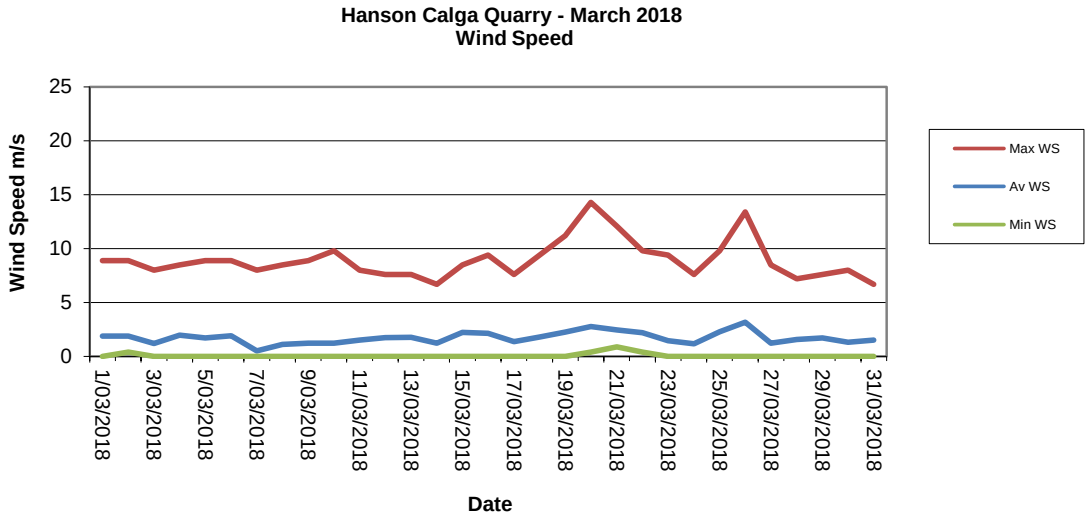
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	ET mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Solar Rad	Av Solar Rad	Max Solar Rad	Min Data %	Av data %	Max Data %
1/03/2018	19.6	24.6	33.5	38.0	67.1	85.0	0.0	3.7	0.0	1.9	8.9	19.6	35.8	1003.1	1005.4	1009.2	0.0	211.3	941.0	0	36.7	68.3
2/03/2018	18.3	20.8	24.9	61.0	76.5	89.0	0.0	3.7	0.4	1.9	8.9	18.3	25.9	1008.3	1010.5	1012.1	0.0	178.8	1064.0	24.9	45.9	96.3
3/03/2018	16.4	20.6	25.7	59.0	82.2	96.0	0.2	3.4	0.0	1.2	8.0	16.4	27.3	1007.5	1009.1	1010.9	0.0	211.5	1016.0	0.0	41.2	100.0
4/03/2018	19.6	23.7	30.9	49.0	81.0	96.0	0.0	4.6	0.0	2.0	8.5	19.6	33.6	1003.7	1006.1	1009.1	0.0	248.7	1000.0	32.0	47.1	58.5
5/03/2018	19.6	21.3	25.7	74.0	85.1	91.0	0.0	2.0	0.0	1.7	8.9	19.6	27.2	1008.0	1010.2	1012.3	0.0	80.8	390.0	24.0	48.7	87.7
6/03/2018	16.4	19.3	23.2	67.0	91.5	96.0	18.2	1.1	0.0	1.9	8.9	16.1	24.6	1010.9	1015.1	1020.0	0.0	79.7	1026.0	0.0	41.7	91.4
7/03/2018	16.5	18.3	21.2	66.0	85.0	95.0	3.8	1.0	0.0	0.5	8.0	16.5	21.9	1019.4	1021.6	1023.9	0.0	124.5	718.0	0.0	13.4	68.3
8/03/2018	14.5	18.5	23.8	51.0	77.5	95.0	0.0	3.2	0.0	1.1	8.5	14.5	24.0	1021.2	1022.4	1023.8	0.0	232.1	1087.0	0.0	30.1	80.3
9/03/2018	15.8	19.2	24.3	51.0	77.8	95.0	0.8	3.4	0.0	1.2	8.9	15.8	24.6	1020.9	1022.8	1024.7	0.0	178.3	812.0	12.6	60.9	88.6
10/03/2018	15.2	19.3	24.5	57.0	80.7	95.0	0.2	3.3	0.0	1.2	9.8	15.3	25.2	1021.9	1023.3	1024.7	0.0	185.6	1123.0	46.2	74.4	99.4
11/03/2018	13.6	19.0	25.3	50.0	75.6	95.0	0.0	3.9	0.0	1.5	8.0	13.6	25.9	1020.0	1021.8	1023.9	0.0	223.6	1167.0	62.5	83.5	96.9
12/03/2018	13.9	20.2	28.9	44.0	75.0	95.0	0.2	5.0	0.0	1.8	7.6	13.9	29.7	1013.8	1015.9	1019.6	0.0	256.6	911.0	72.6	87.2	98.8
13/03/2018	17.8	21.2	28.2	46.0	77.7	95.0	1.8	3.9	0.0	1.8	7.6	17.8	28.9	1011.8	1014.8	1017.9	0.0	194.9	926.0	55.7	80.4	99.7
14/03/2018	17.6	19.3	22.3	72.0	87.9	97.0	1.6	2.0	0.0	1.2	6.7	17.6	23.2	1015.9	1017.0	1018.3	0.0	107.7	644.0	23.7	51.7	81.8
15/03/2018	18.3	21.9	27.8	59.0	82.8	94.0	0.0	2.9	0.0	2.2	8.5	18.3	29.7	1008.8	1011.2	1016.2	0.0	158.3	828.0	53.5	94.5	100.0
16/03/2018	20.4	24.7	33.9	33.0	71.8	88.0	0.0	4.5	0.0	2.1	9.4	20.4	35.2	1005.4	1010.3	1014.6	0.0	193.3	859.0	81.8	89.1	100.0
17/03/2018	19.4	21.8	27.7	58.0	81.0	92.0	0.0	3.0	0.0	1.4	7.6	19.4	30.1	1011.1	1012.6	1014.2	0.0	174.0	787.0	85.2	95.3	100.0
18/03/2018	17.8	24.6	34.3	32.0	67.9	91.0	0.0	5.3	0.0	1.8	9.4	17.9	37.9	1008.5	1010.4	1012.7	0.0	249.6	860.0	83.1	86.6	89.2
19/03/2018	19.6	27.9	37.2	21.0	54.0	89.0	0.0	6.5	0.0	2.3	11.2	19.7	37.6	1004.7	1009.1	1013.1	0.0	243.1	850.0	74.8	86.7	97.2
20/03/2018	19.3	23.6	33.3	42.0	69.6	94.0	4.4	6.2	0.4	2.8	14.3	19.3	37.6	1008.7	1016.1	1021.8	0.0	317.1	939.0	75.1	91.1	100.0
21/03/2018	16.2	17.9	19.9	86.0	92.6	95.0	23.6	0.7	0.9	2.5	12.1	15.9	20.9	1021.0	1023.1	1024.6	0.0	39.0	197.0	78.5	89.3	100.0
22/03/2018	16.1	17.6	20.4	74.0	88.7	95.0	10.6	1.8	0.4	2.2	9.8	15.8	21.3	1021.4	1022.8	1024.6	0.0	100.0	622.0	74.2	87.1	98.5
23/03/2018	16.7	19.0	24.1	59.0	84.8	95.0	3.2	2.2	0.0	1.5	9.4	16.7	24.8	1018.1	1020.2	1022.2	0.0	133.0	754.0	90.5	97.5	100.0
24/03/2018	14.9	19.9	27.0	63.0	87.6	97.0	1.0	2.7	0.0	1.2	7.6	14.9	28.5	1011.0	1014.8	1018.6	0.0	155.6	870.0	87.7	96.1	100.0
25/03/2018	18.9	23.7	30.8	43.0	73.6	95.0	4.6	4.4	0.0	2.3	9.8	18.9	32.2	1000.7	1005.2	1010.8	0.0	201.8	871.0	82.5	94.0	98.8
26/03/2018	14.5	20.6	25.4	29.0	61.7	95.0	10.8	5.1	0.0	3.2	13.4	14.5	24.7	1000.1	1005.1	1011.9	0.0	236.2	854.0	83.4	94.4	100.0
27/03/2018	9.7	16.7	22.5	54.0	70.6	91.0	0.0	3.1	0.0	1.2	8.5	9.8	22.7	1011.6	1014.3	1015.7	0.0	169.2	851.0	85.5	94.5	100.0
28/03/2018	13.4	20.2	28.4	47.0	81.1	96.0	0.2	4.1	0.0	1.6	7.2	13.4	30.3	1011.0	1013.4	1015.4	0.0	235.1	818.0	86.2	96.7	100.0
29/03/2018	15.8	21.5	29.3	53.0	83.0	97.0	0.2	4.1	0.0	1.7	7.6	15.8	30.9	1010.4	1012.3	1014.2	0.0	231.3	844.0	82.8	96.8	100.0
30/03/2018	17.7	23.9	34.8	22.0	73.7	97.0	0.2	4.5	0.0	1.3	8.0	17.7	35.0	1007.3	1010.4	1013.9	0.0	231.4	818.0	86.2	92.8	98.8
31/03/2018	18.6	21.2	25.6	65.0	82.7	95.0	0.0	2.6	0.0	1.5	6.7	18.6	26.5	1013.5	1014.9	1017.4	0.0	140.9	701.0	87.1	94.1	100.0
Monthly	9.7	21.0	37.2	21	78	97	85.6	107.5	0	1.7	14.3	9.8	37.9	1000.1	1014.3	1024.7	0	184.6	1167	0	74.8	100

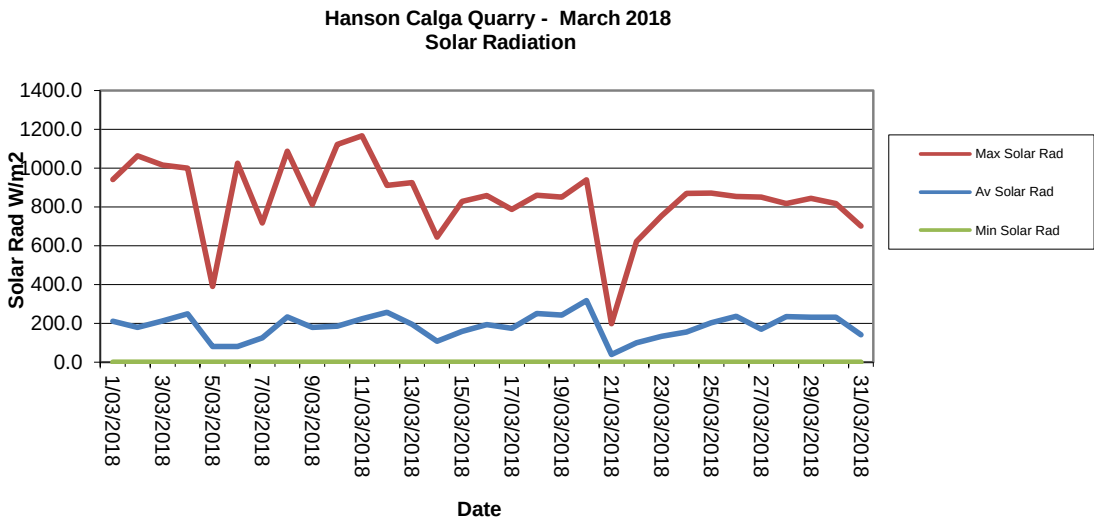
2.4.2 Monthly Weather Charts

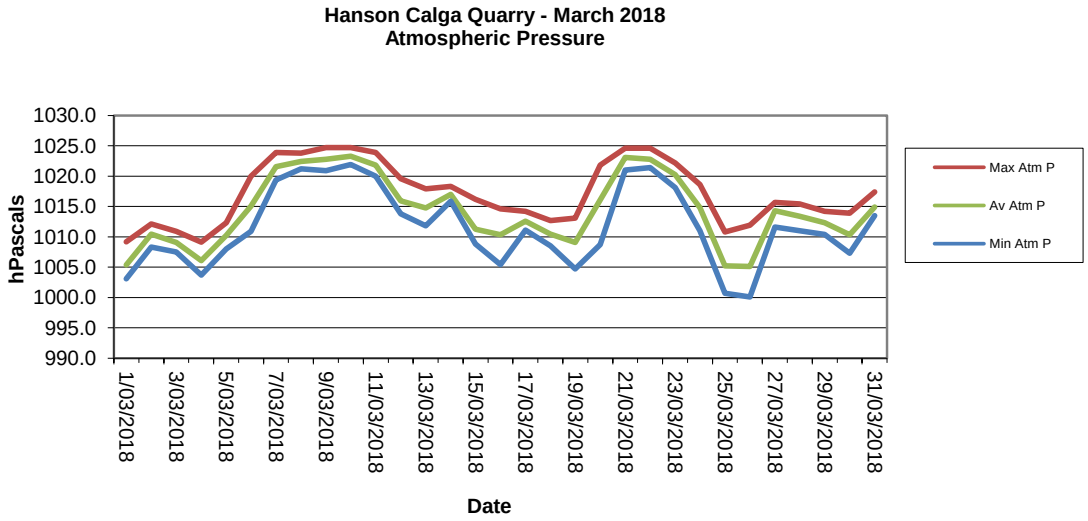


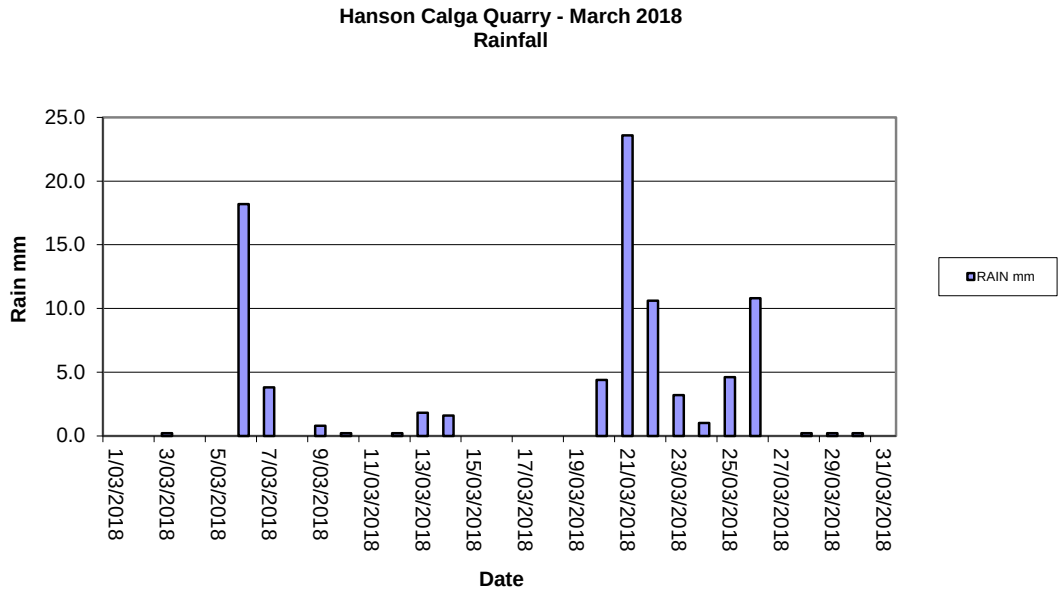


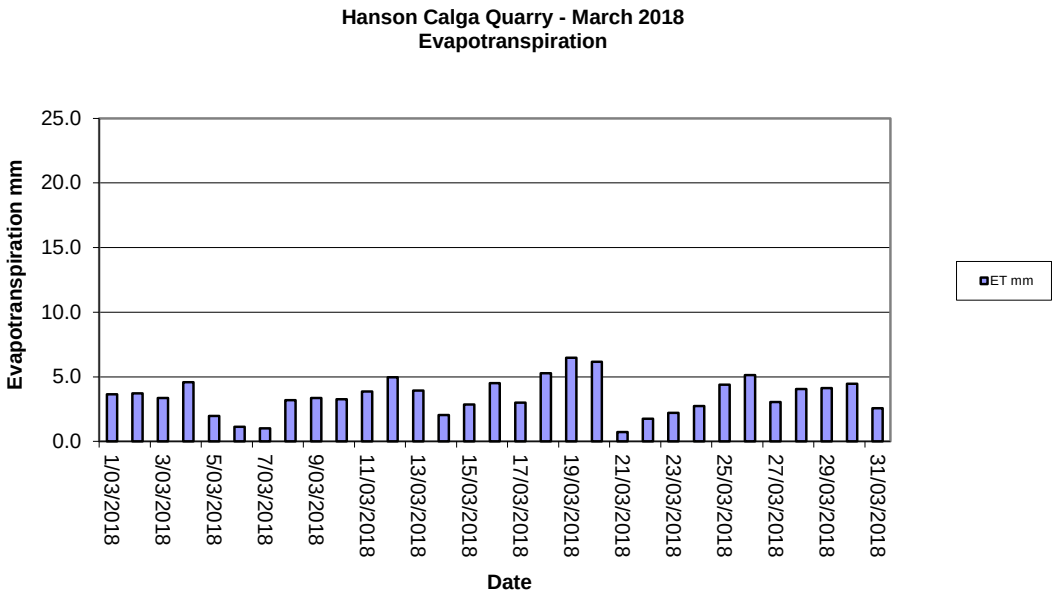


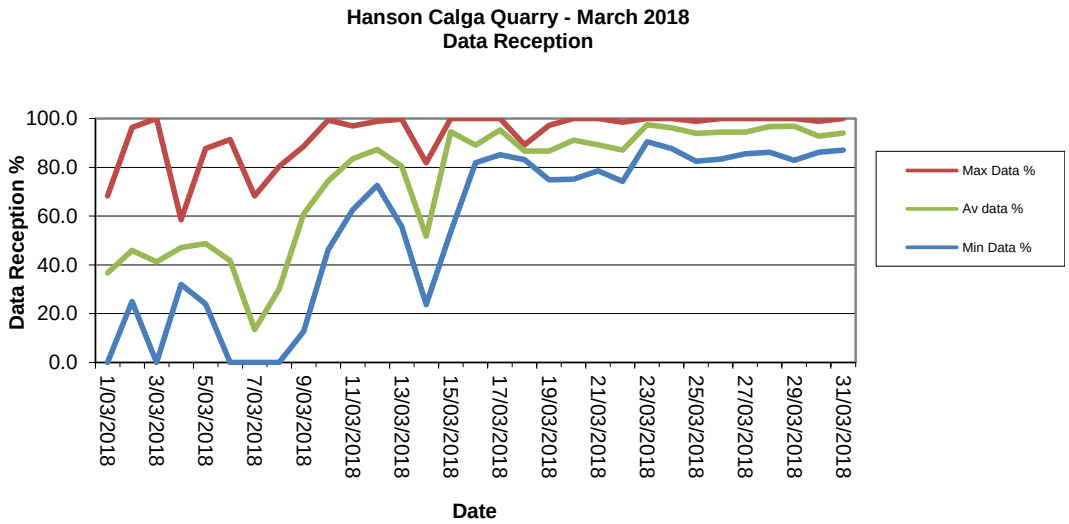

Hanson Calga Quarry - March 2018
Wind Speed
Wind Speed m/s
25
20
15
10
5
0
1/03/2018
3/03/2018
5/03/2018
7/03/2018
9/03/2018
11/03/2018
13/03/2018
15/03/2018
17/03/2018
19/03/2018
21/03/2018
23/03/2018
25/03/2018
27/03/2018
29/03/2018
31/03/2018
Date
Max WS
Av WS
Min WS


Hanson Calga Quarry - March 2018
Solar Radiation
Solar Rad W/m2
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
1/03/2018
3/03/2018
5/03/2018
7/03/2018
9/03/2018
11/03/2018
13/03/2018
15/03/2018
17/03/2018
19/03/2018
21/03/2018
23/03/2018
25/03/2018
27/03/2018
29/03/2018
31/03/2018
Date
Max Solar Rad
Av Solar Rad
Min Solar Rad


Hanson Calga Quarry - March 2018
Atmospheric Pressure
hPascals
1030.0
1025.0
1020.0
1015.0
1010.0
1005.0
1000.0
995.0
990.0
1/03/2018
3/03/2018
5/03/2018
7/03/2018
9/03/2018
11/03/2018
13/03/2018
15/03/2018
17/03/2018
19/03/2018
21/03/2018
23/03/2018
25/03/2018
27/03/2018
29/03/2018
31/03/2018
Date
Max Atm P
Av Atm P
Min Atm P


Hanson Calga Quarry - March 2018
Rainfall
Rain mm
25.0
20.0
15.0
10.0
5.0
0.0
1/03/2018
3/03/2018
5/03/2018
7/03/2018
9/03/2018
11/03/2018
13/03/2018
15/03/2018
17/03/2018
19/03/2018
21/03/2018
23/03/2018
25/03/2018
27/03/2018
29/03/2018
31/03/2018
Date
RAIN mm

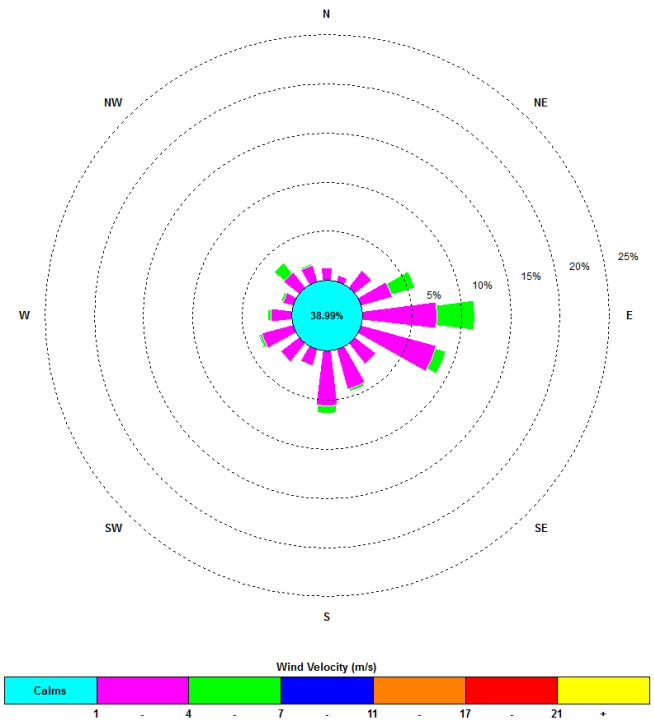

Hanson Calga Quarry - March 2018
Evapotranspiration
Evapotranspiration mm
25.0
20.0
15.0
10.0
5.0
0.0
1/03/2018
3/03/2018
5/03/2018
7/03/2018
9/03/2018
11/03/2018
13/03/2018
15/03/2018
17/03/2018
19/03/2018
21/03/2018
23/03/2018
25/03/2018
27/03/2018
29/03/2018
31/03/2018
Date
ET mm


Hanson Calga Quarry - March 2018
Data Reception
Data Reception %
100.0
80.0
60.0
40.0
20.0
0.0
1/03/2018
3/03/2018
5/03/2018
7/03/2018
9/03/2018
11/03/2018
13/03/2018
15/03/2018
17/03/2018
19/03/2018
21/03/2018
23/03/2018
25/03/2018
27/03/2018
29/03/2018
31/03/2018
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 March 2018 – 23:45, 31 March 2018



The predominant and most frequent, strongest winds also from the E. The maximum wind speed was 14.3 m/s from the SSW.

Appendix 1

Field Sheets

Chain of Custody

Laboratory Certificates

DEPOSITIONAL DUST MONITORING

Client: ..... **Hanson Calga Quarry** .....

Date Installed: 2.3.18

Date Collected: 3.4.18

Collection Start Time: 10.00

Collection Stop Time: 2.10

Sampled By: Leesa + Jonas

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	2.10	1999mL	✓		✓	✓	C S T	C O Bn Gn Gy	Y	Y		
CD2C	12.20	1999mL				✓	C S T	C O Bn Gn Gy	Y	Y		
CD3	10.00	1999mL	✓		✓	✓	C S T	C O Bn Gn Gy	Y	Y		
CD4	11.10	1999mL	✓		✓	✓	C S T	C O Bn Gn Gy	Y	Y		
CD5	11.30	1999mL	✓		✓	✓	C S T	C O Bn Gn Gy	Y	Y		
CD6	11.35	1999mL	✓		✓	✓	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				

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:

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:

FOR LAB USE ONLY
COOLER SEAL
Yes ..... No .....
Broken ..... Intact ...
COOLER TEMP: deg.C

Total unless specified

ANALYSIS REQUIRED

SAMPLE DATA				*CONTAINER DATA		Insoluable Soldi	Ash Residue	Combustable Matt	NOTES
SAMPLE ID	MATRIX	DATE ON	DATE OFF	TYPE & PRESERVATIVE	NO.				
CD1	Dust	2·3·18	3·4·18			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: Leesa King DATE: 3·4·18
OF: CBased Environmental TIME: 4·10
NAME: DATE:
OF: TIME:

RECEIVED BY
NAME: DATE: 3-3-18
OF: ALS TIME: 4·15pm
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

Environmental Division
Newcastle
Work Order Reference
EN1802333

Telephone : + 61 2 4014 2500

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN1802333**	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	: 03-Apr-2018 16:15
Order number	: ----	Date Analysis Commenced	: 04-Apr-2018
C-O-C number	: ----	Issue Date	: 06-Apr-2018 17:09
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*
Alison Graham	Supervisor - Inorganic	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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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 AS3580.10.1-2016. 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 2/03/18 - 3/04/18	CD2c 2/03/18 - 3/04/18	CD3 2/03/18 - 3/04/18	CD4 2/03/18 - 3/04/18	CD5 2/03/18 - 3/04/18
			Client sampling date / time	03-Apr-2018 00:00	03-Apr-2018 00:00	03-Apr-2018 00:00	03-Apr-2018 00:00	03-Apr-2018 00:00
Compound	CAS Number	LOR	Unit	EN1802333-001	EN1802333-002	EN1802333-003	EN1802333-004	EN1802333-005
				Result	Result	Result	Result	Result
EA120: Ash Content								
Ash Content	----	0.1	g/m².month	**4.8**	**1.3**	**0.9**	**0.5**	**0.5**
Ash Content (mg)	----	1	mg	**91**	**25**	**17**	**10**	**10**
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m².month	**1.1**	**0.8**	**0.6**	**0.7**	**0.4**
Combustible Matter (mg)	----	1	mg	**21**	**14**	**11**	**12**	**7**
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m².month	**5.9**	**2.1**	**1.5**	**1.2**	**0.9**
Total Insoluble Matter (mg)	----	1	mg	**112**	**39**	**28**	**22**	**17**

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)			*Client sample ID*	**CD6 2/03/18 - 3/04/18**	**----**	**----**	**----**	**----**
			Client sampling date / time	03-Apr-2018 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EN1802333-006**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EA120: Ash Content								
Ash Content	----	0.1	g/m².month	**0.7**	**----**	**----**	**----**	**----**
Ash Content (mg)	----	1	mg	**13**	**----**	**----**	**----**	**----**
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m².month	**0.6**	**----**	**----**	**----**	**----**
Combustible Matter (mg)	----	1	mg	**11**	**----**	**----**	**----**	**----**
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m².month	**1.3**	**----**	**----**	**----**	**----**
Total Insoluble Matter (mg)	----	1	mg	**24**	**----**	**----**	**----**	**----**

CBased Environmental Pty Limited

Date: 3·4·18

Todays Collection	
Time Start:	10·00
Time Finish:	2·30

Client : Hanson Calga

Project :

SURFACE WATERS

Site	Flow Rate	Odour	Sampling Time	Bottles	Water Turbidity	Water Colour	Comments
A	DAM	NO	2·30	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
B				~~1x 250ml GP, 1x 500mL GP, 1x PG~~	~~C S T~~	~~C LO O B G~~	Dry
C1	DAM	NO	1·40	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
C2	Steady	NO	1·45	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
D	Trickle	NO	11·40	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
F	DAM	NO	2·20	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: LKj

Sampled by: Leesa + Jonas

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: CBased Environmental Pty Ltd
POSTAL ADDRESS: PO Box 245 CESSNOCK NSW 2325
SEND REPORT TO: monitoringresults@cbased.com.au
SEND INVOICE TO: renae.mikka@cbased.com.au
DATA NEEDED BY: 5 working days
REPORT NEEDED BY: 5 working days
PROJECT ID: Hanson Quarry SW
QUOTE NO.: SYBQ-222-16
P.O. NO.:
COMMENTS/SPECIAL HANDLING/STORAGE OR DIPOSAL:

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:

FOR LAB USE ONLY
COOLER SEAL
Yes ..... No .....
Broken ..... Intact ...
COOLER TEMP: deg.C
IC 19.2

Total unless specified

ANALYSIS REQUIRED

SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	NO.	Ph	EC	TSS	TDS	O + G	NOTES
A	Water	3-4-18	2-30	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x	
~~B~~	~~Water~~			~~1x 250mlGP,1x 500mLGP,1xPG~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	
C1	Water		1-40	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x	
C2	Water		1-45	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x	
D	Water		11-40	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x	
F	Water		2-20	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x	
				TOTAL BOTTLES:							

RELINQUISHED BY:
NAME: Leesa Kiny
OF: CBased Environmental
DATE: 3-4-18
TIME: 4-10
NAME:
OF:
DATE:
TIME:

RECEIVED BY
NAME:
OF: ALS
DATE: 3-4-18
TIME: 4 20pm
NAME:
OF:
DATE:
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

Environmental Division
Sydney
Work Order Reference
ES1809552

Telephone : + 61-2-8784 8555

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1809552**	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	: Hanson Quarry SW	Date Samples Received	: 03-Apr-2018 16:14
Order number	:	Date Analysis Commenced	: 04-Apr-2018
C-O-C number	: ----	Issue Date	: 10-Apr-2018 12:20
Sampler	: CBased Environmental Pty Ltd		
Site	:		
Quote number	: SYBQ/222/16 and PLANNED EVENTS		
No. of samples received	: 5		
No. of samples analysed	: 5		

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*
Ankit Joshi	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.

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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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	D	F
			Client sampling date / time	03-Apr-2018 14:30	03-Apr-2018 13:40	03-Apr-2018 13:45	03-Apr-2018 11:40	03-Apr-2018 14:20
Compound	*CAS Number*	*LOR*	*Unit*	**ES1809552-001**	**ES1809552-002**	**ES1809552-003**	**ES1809552-004**	**ES1809552-005**
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	**4.37**	**4.94**	**6.67**	**6.37**	**5.52**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**124**	**114**	**112**	**104**	**105**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**73**	**78**	**76**	**72**	**70**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**5**	**9**	**10**	<5	**5**
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5

C Based Environmental Pty Limited

Todays Collection	
Time Start:	10-15
Time Finish:	2-40

Date: 3-4-18

GROUNDWATERS

Client : Hanson Calga

Project :

Site	DEPTH	Odour	Water Turbidity	Water Colour	1 pH	1 EC	2 pH	2 EC	Bottles (Apr/Oct)	Downloaded Logger? (Y/N)*
CQ3	10.87	NO	C S T	C LO O B G	5.85	132.5us	5.95	134.3us	1x 250ml GP, 1x 500mL GP, 1RP	Computer died
CQ4	11.40	NO	C S T	C LO O B G	5.18	107.8uS	5.39	113.5uS	1x 250ml GP, 1x 500mL GP, 1RP	Won't connect
CQ5	8.22	No	C S T	C LO O B G	4.07	162.0us	4.05	161.7us	1x 250ml GP, 1x 500mL GP, 1RP	
CQ6			~~C S T~~	~~C LO O B G~~	Coverd	over in	paddock		~~1x 250ml GP, 1x 500mL GP, 1RP~~	
CQ7	6.46	No	C S T	C LO O B G	4.61	97.6us	4.55	97.2us	1x 250ml GP, 1x 500mL GP, 1RP	yes
CQ8	6.83	NO	C S T	C LO O B G	4.40	130.0uS	4.19	130.9uS	1x 250ml GP, 1x 500mL GP, 1RP	yes
CQ9			~~C S T~~	~~C LO O B G~~	Blocked	/ Damaged			~~1x 250ml GP, 1x 500mL GP, 1RP~~	
CQ10	27.08	NO	C S T	C LO O B G	4.24	133.9us	4.26	135.7us	1x 250ml GP, 1x 500mL GP, 1RP	yes
CQ11S	11.94	NO	C S T	C LO O B G	5.14	137.9us	5.21	138.8us	1x 250ml GP, 1x 500mL GP, 1RP	No Won't Connect
CQ11D	13.15	NO	C S T	C LO O B G	4.90	140.6uS	3.83	190uS	1x 250ml GP, 1x 500mL GP, 1RP	Yes
CQ12	5.52	Yes	C S T	C LO O B G	5.07	129.7us	5.22	121.6us	1x 250ml GP, 1x 500mL GP, 1RP	Won't Connect
CQ13	15.67	NO.	C S T	C LO O B G	4.25	166.1us	4.23	165.8us	1x 250ml GP, 1x 500mL GP, 1RP	Won't Connect
CP3			~~C S T~~	~~C LO O B G~~					~~1x 250ml GP, 1x 500mL GP, 1RP~~	GONE
CP4			~~C S T~~	~~C LO O B G~~	NO Access	Shed	over	bore	~~1x 250ml GP, 1x 500mL GP, 1RP~~	
CP5	10.47	No	C S T	C LO O B G	4.30	167.8uS	4.30	154.7uS	1x 250ml GP, 1x 500mL GP, 1RP	
CP6	12.72	NO	C S T	C LO O B G	4.49	154.7uS	4.37	154.3uS	1x 250ml GP, 1x 500mL GP, 1RP	
CP7	3.94	No	C S T	C LO O B G	4.76	77.9us	4.82	78.3us	1x 250ml GP, 1x 500mL GP, 1RP	
CP8	23.71	NO	C S T	C LO O B G	4.62	113.3uS	4.44	114.4uS	1x 250ml GP, 1x 500mL GP, 1RP	
MW7	16.18	NO	C S T	C LO O B G	4.37	103.4us	4.34	105.6us	1x 250ml GP, 1x 500mL GP, 1RP	yes
MW8	8.59	NO	C S T	C LO O B G	4.42	67.9us	4.38	67.0us	1x 250ml GP, 1x 500mL GP, 1RP	Won't Connect
MW9	24.36	NO	C S T	C LO O B G	4.42	80.2us	4.41	79.8us	1x 250ml GP, 1x 500mL GP, 1RP	Won't Connect
MW10			~~C S T~~	~~C LO O B G~~	no access	track	unsafe		~~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~~					~~1x 250ml GP, 1x 500mL GP, 1RP~~	

*If unable to download logger please provide comment/ explanation above

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

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

pH/EC meter #:

Signed: [signature]

Sampled by: Leesa + Jonas