CBased Environmental Pty Limited
ABN 62 611 924 264

Calga Quarry

Environmental Monitoring

Dust Deposition Gauges, Surface and Ground Waters and Meteorological Station

December 2018

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Date: 21 January 2019

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

The December 2018 dust deposition results for insoluble solids were generally decreased when compared to November 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 and F. Sites B and D 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 December 2018.

Bi-monthly groundwater monitoring is next scheduled for January 2019.

Data for December 2018 shows that rainfall recorded at the Calga Quarry was above the Gosford BOM mean rainfall however below the Peats Ridge long term rainfall for December.

The rainfall comparison is provided below:

Calga Quarry	70.8 mm
BOM Peats Ridge*	NA
BOM Gosford*	52.4 mm
BOM Peats Ridge Long term mean for December*	92.4 mm

*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**.

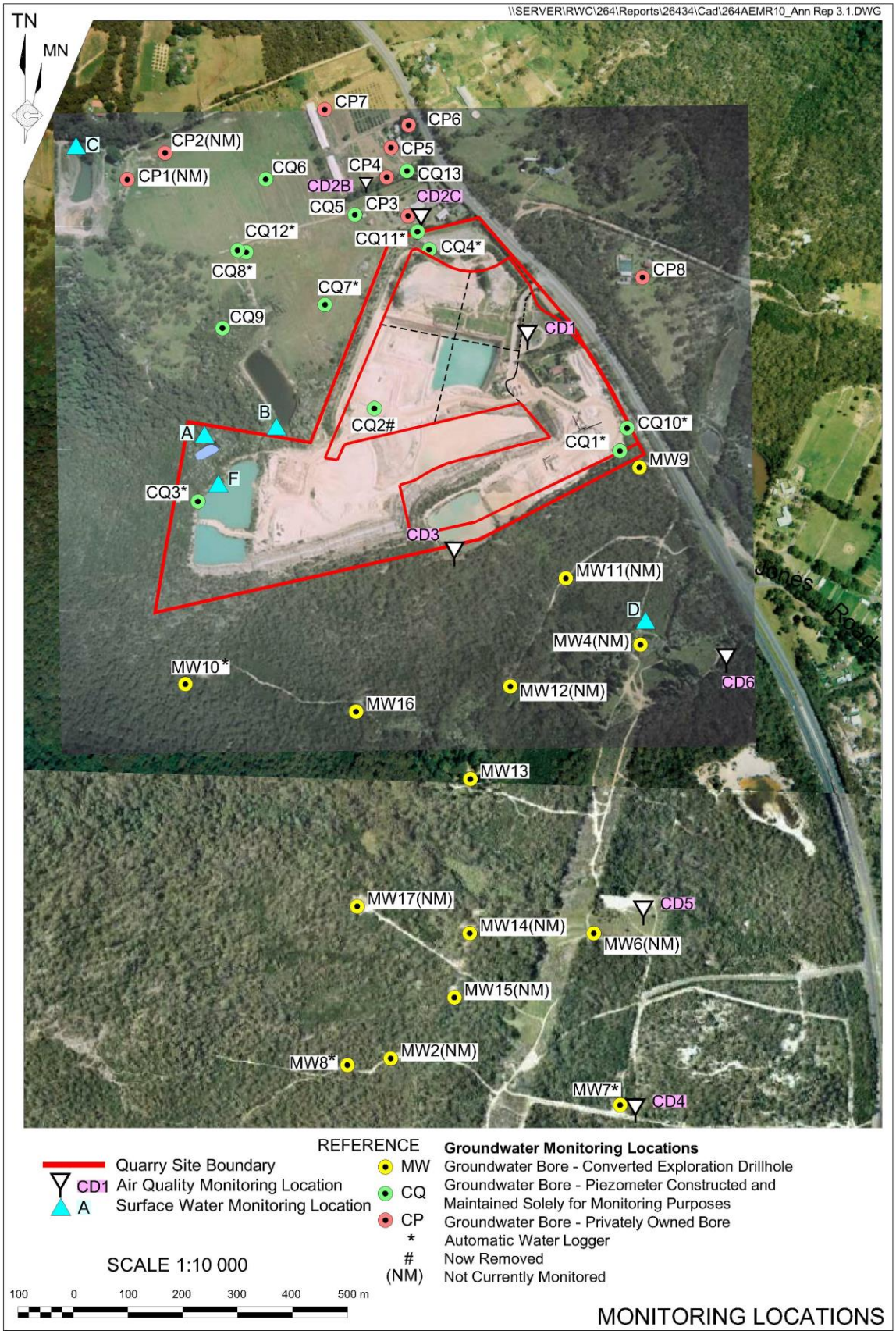


Figure 1: Hanson Calga Quarry environmental monitoring locations

2.0 Monthly Results

2.1 Dust Deposition Gauges

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

Table 1: Dust Deposition results: 4 December 2018 – 3 January 2019 (30 days)

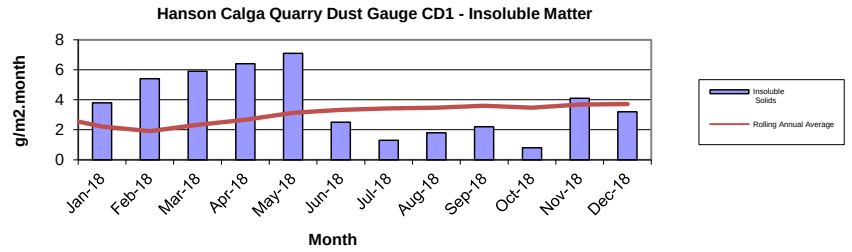
Site	Monthly Insoluble Solids *(g/m^2.month)*	Monthly Ash Residue *(g/m^2.month)*	Monthly Combustible Matter *(g/m^2.month)*	Monthly Ash Residue/ Insoluble Solids %	Rolling Annual Average Insoluble Solids *(g/m^2.month)*
CD1	3.2	2.5	0.7	78	3.7
CD2c	2.2	1.6	0.6	73	1.5
CD3	2.9	1.4	1.5	48	1.2
CD4	2.6	1.2	1.4	46	1.0
CD5	2.8	1.4	1.4	50	0.9
CD6	2.7	1.4	1.3	52	1.0

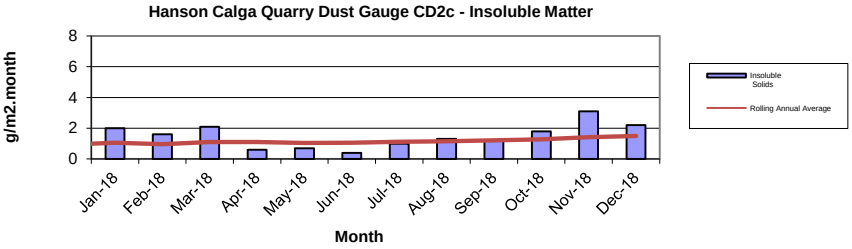
Insoluble Solids marked with an * indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen and seeds) and insects. Results in bold indicate insoluble solids levels above 3.7 g/m^2.month; the Development Consent's annual average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

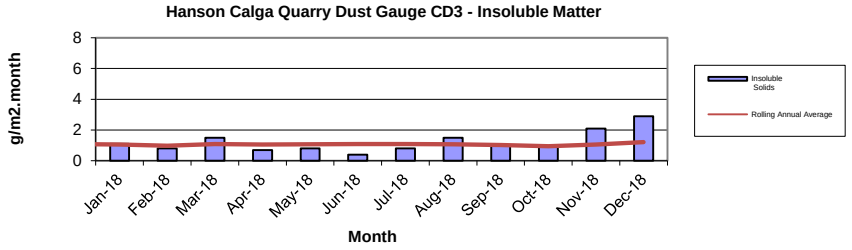
CD1 was installed on the 1 May 2006. CD2a was discontinued at the start of August 2006 due to quarry operations "mining out" the site of the gauge. The replacement gauge, Site CD2b, was located in a position adjacent to the boundary between B. Kashouli and F. & J. Gazzana in conformance with the Air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

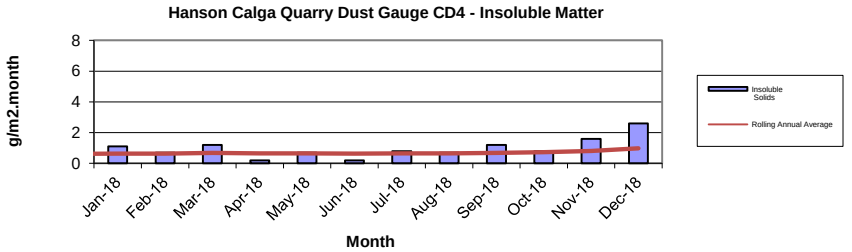
Dust deposition charts for all dust gauge sites appear in **Figure 2** below. The laboratory analysis is provided in **Appendix 1.**

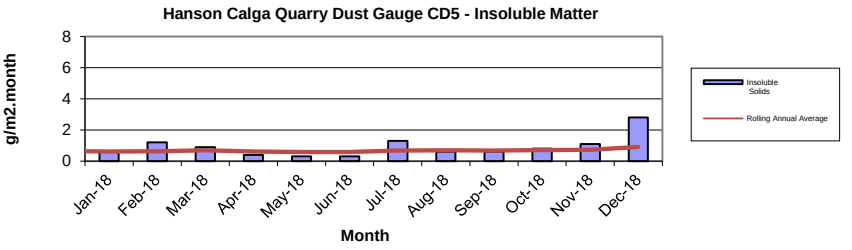
Figure 2: Dust Deposition Charts

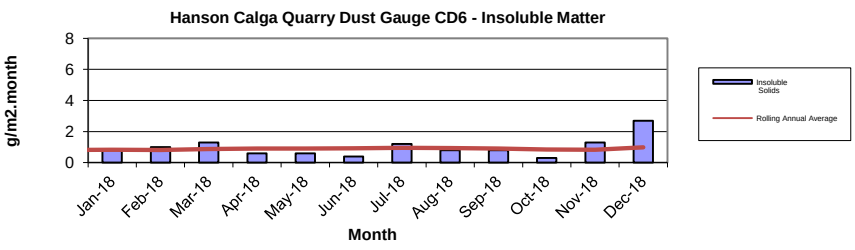












2.2 Surface Water Monitoring

Monthly surface water monitoring was conducted on the 3 January 2019 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1.**

Table 2: Monthly surface water monitoring – December 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	6.43	95	103	<5	<5
B	Dry							
C1	Dam	Brown	Slight	7.48	96	87	<5	<5
C2	Trickle	Clear	Clear	6.55	88	72	6	<5
D	Dry							
F	Dam	Clear	Clear	4.91	84	84	<5	<5

Samples were collected at sites A, C1, C2 and F. Sites B and D 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 December 2018.

2.2.1 Non-Routine Surface Water Sampling

Nil non-routine water sampling was undertaken during December 2018.

2.3 Groundwater Monitoring

Bi-monthly groundwater monitoring is next scheduled for January 2019.

2.4 Meteorological Monitoring

The Calga Quarry weather station data recovery in December 2018 was approximately 100%. Please note after a machine outage on the 14/12/2018 the wind direction was locked on in a north direction.

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).

An annual calibration was undertaken on the weather station during September 2018 and is next due in September 2019.

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 December 2018 shows that rainfall recorded at the Calga Quarry was above the Gosford BOM mean rainfall however below the Peats Ridge long term rainfall for December.

The rainfall comparison is provided below:

Calga Quarry	70.8 mm
BOM Peats Ridge*	NA
BOM Gosford*	52.4 mm
BOM Peats Ridge Long term mean for December*	92.4 mm

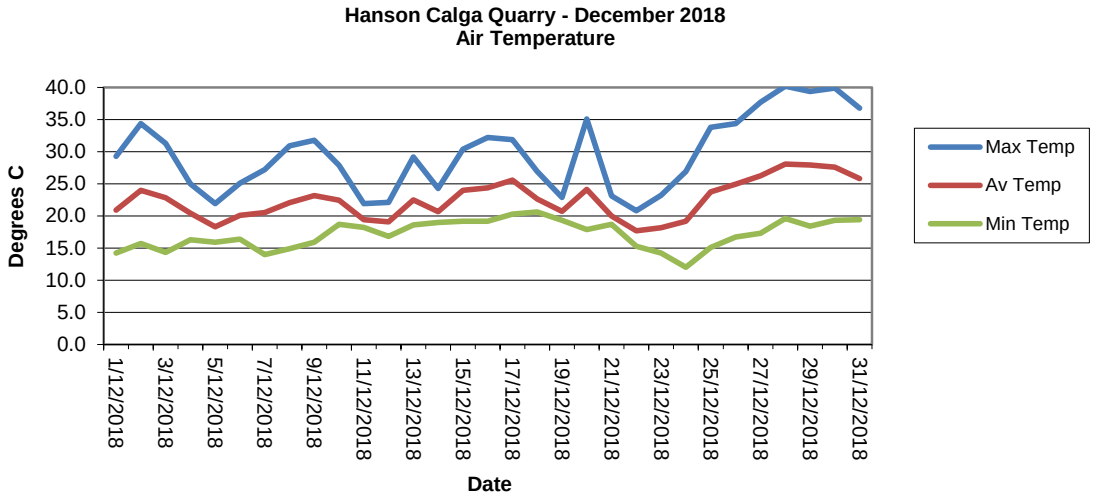
NA = Not Available
^Rain data not based on a full set of data.
*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au).

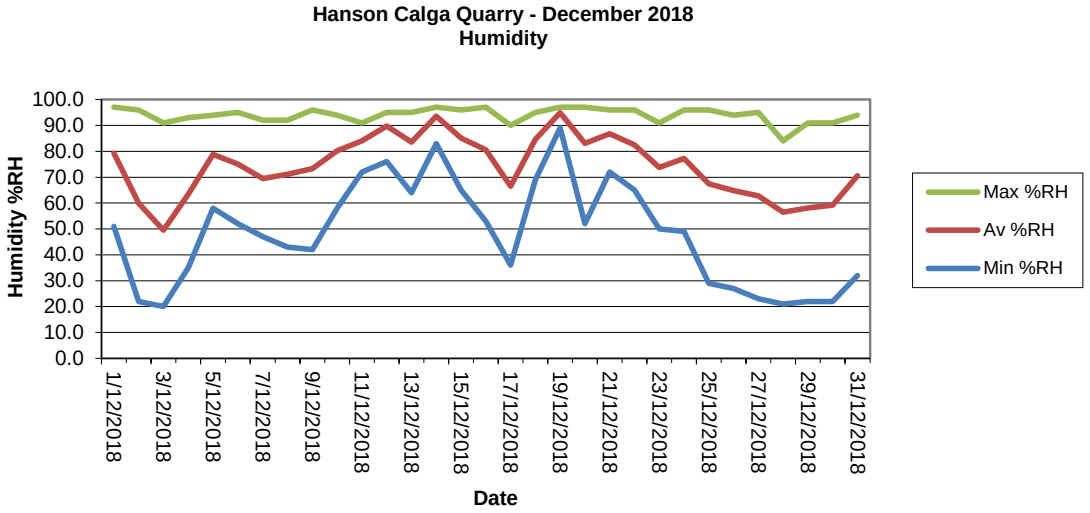
2.4.1 Monthly Meteorological Data Summary

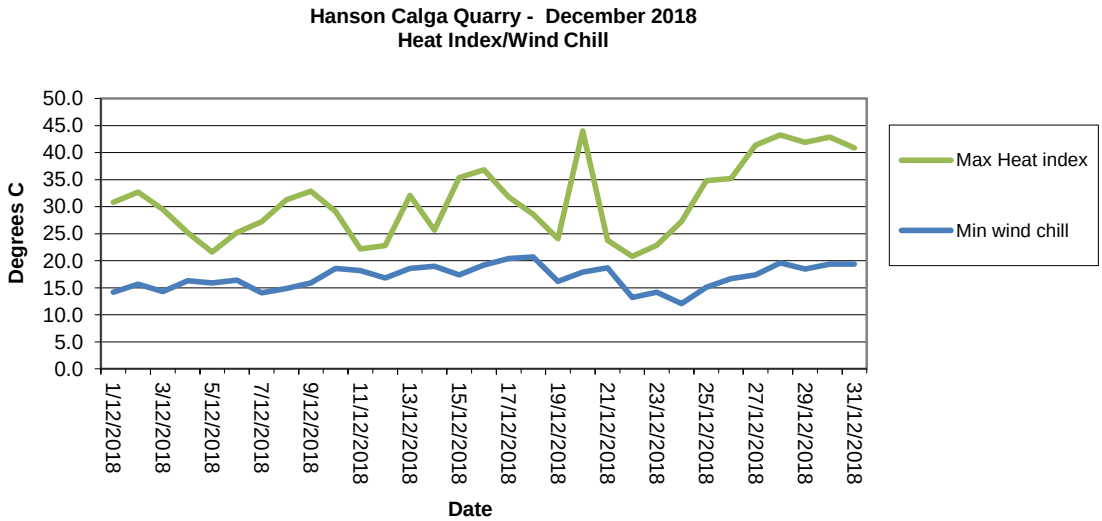
Summary **Dec-18** **Hanson - Calga**

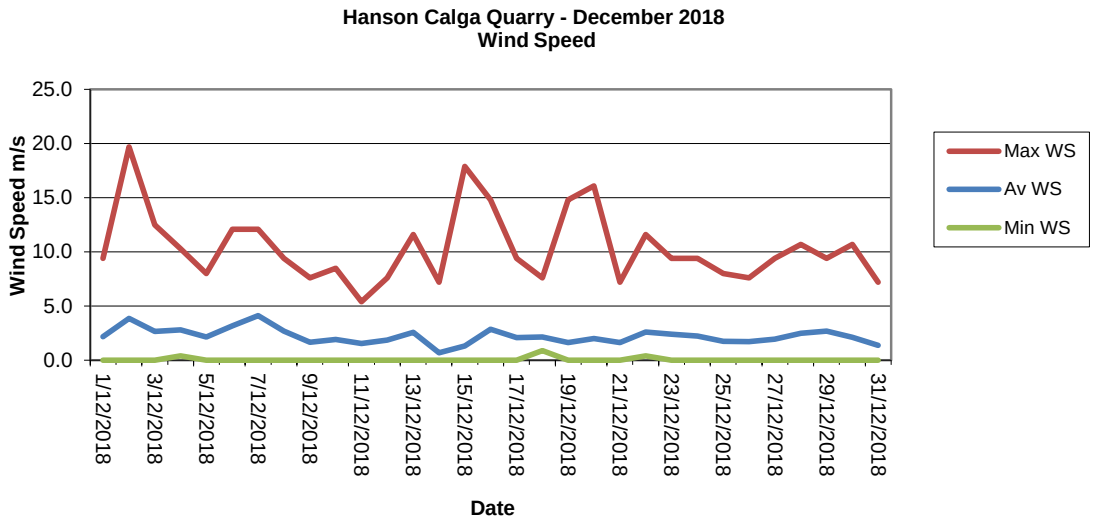
Date	Min Temp	Av Temp	Max Temp	Min %RH	Av %RH	Max %RH	RAIN mm	Min WS	Av WS	Max WS	Min wind chill	Max Heat index	Min Atm P	Av Atm P	Max Atm P	Min Data %	Av data %	Max Data %
1/12/2018	14.2	20.9	29.3	51.0	79.3	97.0	0.0	0.0	2.2	9.4	14.2	30.8	1006.7	1009.6	1013.3	40.0	71.3	96.0
2/12/2018	15.7	24.0	34.4	22.0	60.0	96.0	0.2	0.0	3.9	19.7	15.7	32.7	996.2	1001.9	1008.7	61.5	76.7	88.3
3/12/2018	14.3	22.8	31.3	20.0	49.5	91.0	0.0	0.0	2.7	12.5	14.3	29.5	1005.6	1008.3	1010.6	51.1	81.7	100.0
4/12/2018	16.3	20.4	25.0	35.0	63.4	93.0	0.0	0.4	2.8	10.3	16.3	25.2	1010.2	1014.8	1020.9	50.8	80.8	99.1
5/12/2018	15.9	18.3	21.9	58.0	78.8	94.0	0.2	0.0	2.1	8.0	15.9	21.6	1019.4	1022.0	1024.2	58.5	83.4	100.0
6/12/2018	16.4	20.1	25.1	52.0	75.1	95.0	1.4	0.0	3.2	12.1	16.4	25.2	1022.0	1023.2	1024.5	59.7	80.6	98.8
7/12/2018	14.0	20.5	27.2	47.0	69.5	92.0	0.0	0.0	4.1	12.1	14.1	27.2	1019.8	1022.1	1024.1	74.8	90.9	100.0
8/12/2018	14.9	22.1	30.9	43.0	71.2	92.0	0.0	0.0	2.7	9.4	14.9	31.3	1016.7	1019.3	1021.4	79.7	94.7	100.0
9/12/2018	15.9	23.2	31.8	42.0	73.3	96.0	0.2	0.0	1.7	7.6	15.9	32.9	1013.0	1016.1	1018.1	83.4	95.0	100.0
10/12/2018	18.7	22.4	27.9	58.0	80.2	94.0	0.0	0.0	1.9	8.5	18.6	29.1	1012.7	1015.3	1018.4	51.1	87.8	100.0
11/12/2018	18.2	19.4	21.9	72.0	84.0	91.0	0.4	0.0	1.6	5.4	18.2	22.2	1016.5	1018.3	1019.6	37.5	83.1	95.7
12/12/2018	16.8	19.1	22.1	76.0	89.8	95.0	0.6	0.0	1.9	7.6	16.8	22.8	1009.4	1014.2	1017.7	44.3	74.0	98.2
13/12/2018	18.6	22.5	29.2	64.0	83.6	95.0	6.6	0.0	2.6	11.6	18.6	32.1	997.4	1002.8	1009.3	33.8	63.6	92.9
14/12/2018	19.0	20.7	24.3	83.0	93.6	97.0	0.2	0.0	0.7	7.2	19.0	25.7	999.4	1002.7	1005.9	0.0	42.9	88.0
15/12/2018	19.2	24.0	30.4	65.0	85.1	96.0	27.0	0.0	1.3	17.9	17.4	35.4	1003.5	1005.7	1008.1	0.0	36.6	94.5
16/12/2018	19.2	24.4	32.2	53.0	80.6	97.0	0.6	0.0	2.9	14.8	19.2	36.8	1004.0	1006.3	1008.6	56.9	77.2	91.7
17/12/2018	20.3	25.6	31.9	36.0	66.5	90.0	0.0	0.0	2.1	9.4	20.4	31.8	1006.2	1008.6	1011.3	55.4	85.5	100.0
18/12/2018	20.6	22.6	26.9	69.0	84.6	95.0	0.2	0.9	2.2	7.6	20.7	28.6	1010.8	1012.9	1015.4	38.8	72.1	96.9
19/12/2018	19.3	20.7	22.9	89.0	94.9	97.0	21.0	0.0	1.6	14.8	16.2	24.1	1009.2	1013.4	1015.3	46.8	68.0	100.0
20/12/2018	17.9	24.1	35.1	52.0	83.1	97.0	8.2	0.0	2.0	16.1	17.9	44.0	996.2	1005.8	1012.2	44.3	65.5	100.0
21/12/2018	18.7	20.0	23.1	72.0	86.8	96.0	0.4	0.0	1.6	7.2	18.7	23.8	1006.1	1007.4	1008.7	44.6	75.4	100.0
22/12/2018	15.3	17.7	20.8	65.0	82.5	96.0	3.2	0.4	2.6	11.6	13.2	20.8	1005.6	1012.1	1018.1	55.4	86.8	96.6
23/12/2018	14.2	18.2	23.2	50.0	73.8	91.0	0.2	0.0	2.4	9.4	14.2	22.9	1018.3	1020.6	1023.1	76.9	90.6	100.0
24/12/2018	12.0	19.2	26.9	49.0	77.2	96.0	0.2	0.0	2.2	9.4	12.1	27.3	1018.6	1021.0	1023.1	62.2	82.0	100.0
25/12/2018	15.1	23.7	33.8	29.0	67.4	96.0	0.0	0.0	1.7	8.0	15.1	34.8	1014.6	1017.1	1019.9	55.7	69.7	84.0
26/12/2018	16.7	25.0	34.4	27.0	64.9	94.0	0.0	0.0	1.7	7.6	16.7	35.2	1013.2	1015.0	1017.3	57.5	67.7	80.3
27/12/2018	17.3	26.2	37.7	23.0	62.7	95.0	0.0	0.0	1.9	9.4	17.4	41.4	1009.8	1012.5	1015.0	51.7	64.6	76.0
28/12/2018	19.6	28.1	40.2	21.0	56.4	84.0	0.0	0.0	2.5	10.7	19.6	43.3	1009.7	1011.6	1013.4	51.7	67.6	81.8
29/12/2018	18.4	27.9	39.4	22.0	58.1	91.0	0.0	0.0	2.7	9.4	18.5	41.9	1010.8	1012.6	1014.3	66.2	80.0	98.8
30/12/2018	19.3	27.6	39.9	22.0	59.1	91.0	0.0	0.0	2.1	10.7	19.4	42.9	1011.7	1013.1	1014.7	70.5	83.9	98.5
31/12/2018	19.4	25.8	36.8	32.0	70.5	94.0	0.0	0.0	1.4	7.2	19.4	40.9	1007.9	1012.0	1014.1	65.8	77.0	90.8
Monthly	12.0	22.5	40.2	20	74	97	70.8	0	2.2	19.7	12.1	44.0	996.2	1012.8	1024.5	0	76.0	100

2.4.2 Monthly Weather Charts








Hanson Calga Quarry - December 2018
Wind Speed
Wind Speed m/s
25.0
20.0
15.0
10.0
5.0
0.0
1/12/2018
3/12/2018
5/12/2018
7/12/2018
9/12/2018
11/12/2018
13/12/2018
15/12/2018
17/12/2018
19/12/2018
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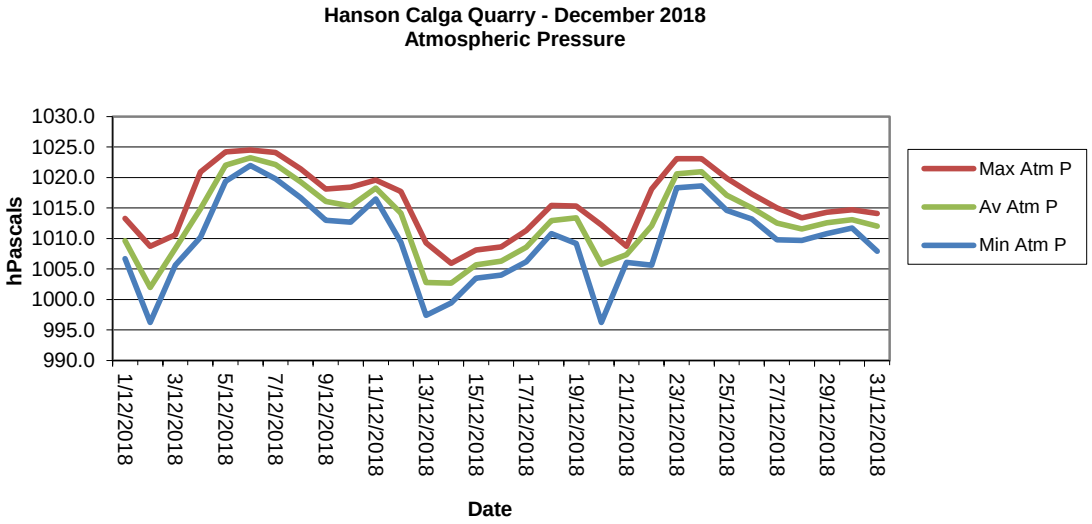
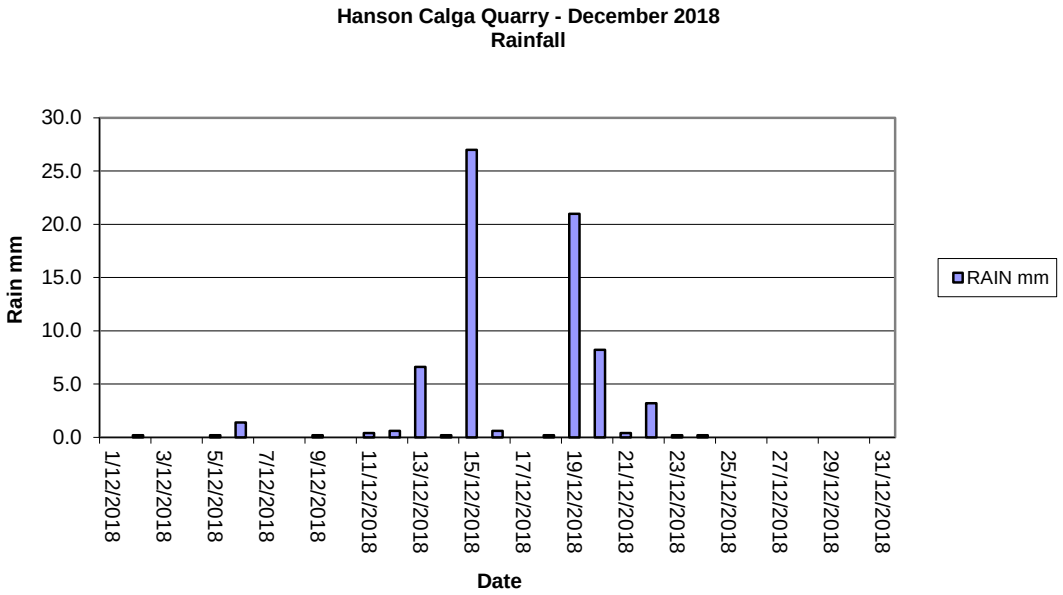
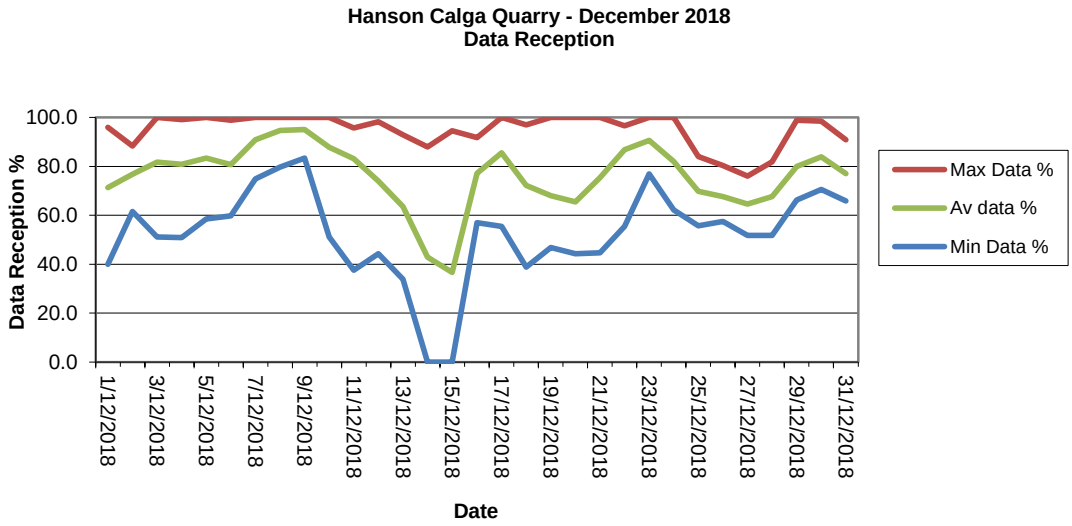
29/12/2018
31/12/2018
Date
Max WS
Av WS
Min WS


Hanson Calga Quarry - December 2018
Atmospheric Pressure
hPascals
1030.0
1025.0
1020.0
1015.0
1010.0
1005.0
1000.0
995.0
990.0
1/12/2018
3/12/2018
5/12/2018
7/12/2018
9/12/2018
11/12/2018
13/12/2018
15/12/2018
17/12/2018
19/12/2018
21/12/2018
23/12/2018
25/12/2018
27/12/2018
29/12/2018
31/12/2018
Date
Max Atm P
Av Atm P
Min Atm P

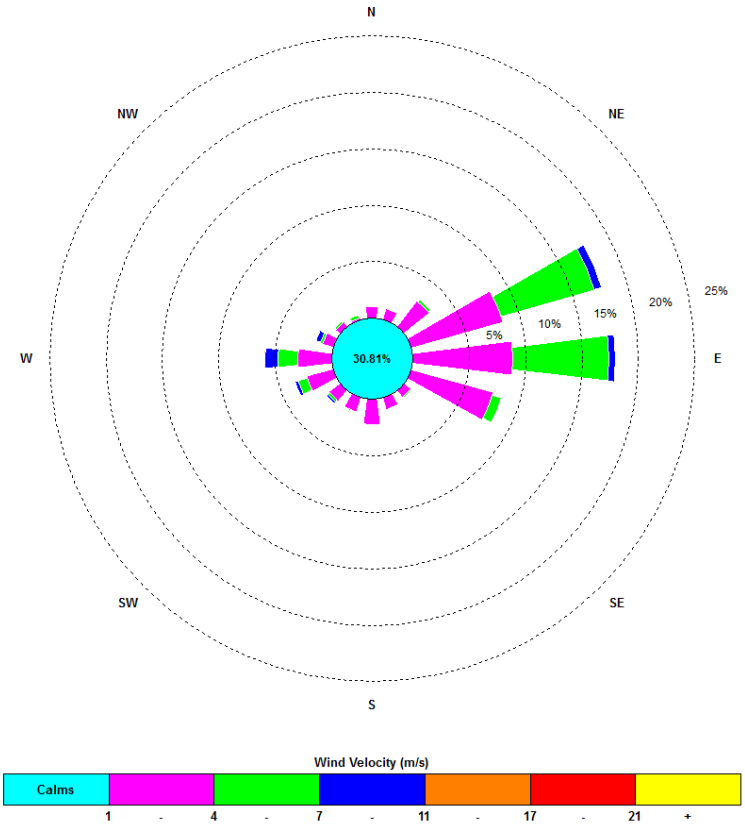

Hanson Calga Quarry - December 2018
Rainfall
Rain mm
30.0
25.0
20.0
15.0
10.0
5.0
0.0
1/12/2018
3/12/2018
5/12/2018
7/12/2018
9/12/2018
11/12/2018
13/12/2018
15/12/2018
17/12/2018
19/12/2018
21/12/2018
23/12/2018
25/12/2018
27/12/2018
29/12/2018
31/12/2018
Date
RAIN mm


Hanson Calga Quarry - December 2018
Data Reception
Data Reception %
100.0
80.0
60.0
40.0
20.0
0.0
1/12/2018
3/12/2018
5/12/2018
7/12/2018
9/12/2018
11/12/2018
13/12/2018
15/12/2018
17/12/2018
19/12/2018
21/12/2018
23/12/2018
25/12/2018
27/12/2018
29/12/2018
31/12/2018
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.

0:00, 1 December 2018 – 23: 45, 14 December 2018



The predominant winds were from the E and ENE, with most frequent, strongest winds from the E and ENE. The maximum wind speed was 19.7 m/s from the WSW.

Appendix 1

Field Sheets

Chain of Custody

Laboratory Certificates

DEPOSITIONAL DUST MONITORING

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

Date Installed: 4.12.18

Date Collected: 3.1.19

Collection Start Time: 9.00

Collection Stop Time: 10.10

Sampled By: Leesa & Jonas

Sampling ID: Hanson

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	9.25	1900	✓		✓	✓	C S T	C O Bn Gn Gy	Y	Y	—	
CD2C	10.00	1999	✓		✓		C S T	C O Bn Gn Gy	Y	Y	—	
CD3	9.10	1800	✓		✓	✓	C S T	C O Bn Gn Gy	Y	Y	—	
CD4	9.35	1999	✓		✓✓		C S T	C O Bn Gn Gy	Y	Y	—	
CD5	9.40	1999	✓		✓		C S T	C O Bn Gn Gy	Y	Y	—	
CD6	9.45	1999	✓		✓		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

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 (ice)

Yes ..... No .....

Broken ..... Intact ...

COOLER TEMP: deg.C

Total unless specified

LABORATORY BATCH NO.:

SAMPLERS:CBased Environmental Pty Ltd

Australian Laboratory Services 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 Soldi	Ash Residue	Combustable Matt	NOTES
SAMPLE ID	MATRIX	DATE ON	DATE OFF	TYPE & PRESERVATIVE	NO.				
CD1	Dust	4.12.18	3.1.19			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 : Jonas Gehin DATE: 3.1.19

OF: CBased Environmental TIME: 1300

NAME : DATE:

OF: TIME:

RECEIVED BY

NAME : DATE: 3/1/19

OF: ALS TIME: 13:46

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
EN1900030

Telephone : +61 2 4014 2500

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN1900030**	Page	: 1 of 4
Client	: **CBASED ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: All Deliverables	Contact	:
Address	: Unit 3 2 Enterprise Cres Singleton NSW 2330	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-Jan-2019 13:46
Order number	: ----	Date Analysis Commenced	: 04-Jan-2019
C-O-C number	: ----	Issue Date	: 10-Jan-2019 14:13
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 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 04/12/18 - 03/01/19	CD2c 04/12/18 - 03/01/19	CD3 04/12/18 - 03/01/19	CD4 04/12/18 - 03/01/19	CD5 04/12/18 - 03/01/19
				Client sampling date / time	03-Jan-2019 00:00	03-Jan-2019 00:00	03-Jan-2019 00:00	03-Jan-2019 00:00	03-Jan-2019 00:00
Compound	*CAS Number*	*LOR*	*Unit*		**EN1900030-001**	**EN1900030-002**	**EN1900030-003**	**EN1900030-004**	**EN1900030-005**
					Result	Result	Result	Result	Result
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**2.5**	**1.6**	**1.4**	**1.2**	**1.4**
Ash Content (mg)	----	1	mg		**44**	**28**	**24**	**22**	**25**
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		**0.7**	**0.6**	**1.5**	**1.4**	**1.4**
Combustible Matter (mg)	----	1	mg		**12**	**11**	**27**	**24**	**24**
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**3.2**	**2.2**	**2.9**	**2.6**	**2.8**
Total Insoluble Matter (mg)	----	1	mg		**56**	**39**	**51**	**46**	**49**

Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST** (Matrix: **AIR**)				Client sample ID	**CD6 04/12/18 - 03/01/19**	**----**	**----**	**----**	**----**
				Client sampling date / time	03-Jan-2019 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EN1900030-006**	**--------**	**--------**	**--------**	**--------**
					Result	----	----	----	----
EA120: Ash Content									
Ash Content	----	0.1	g/m².month		**1.4**	**----**	**----**	**----**	**----**
Ash Content (mg)	----	1	mg		**25**	**----**	**----**	**----**	**----**
EA125: Combustible Matter									
Combustible Matter	----	0.1	g/m².month		**1.3**	**----**	**----**	**----**	**----**
Combustible Matter (mg)	----	1	mg		**22**	**----**	**----**	**----**	**----**
EA141: Total Insoluble Matter									
Total Insoluble Matter	----	0.1	g/m².month		**2.7**	**----**	**----**	**----**	**----**
Total Insoluble Matter (mg)	----	1	mg		**47**	**----**	**----**	**----**	**----**

CBased Environmental Pty Limited

Date: 3.1.19

Todays Collection	
Time Start:	8.30
Time Finish:	10.20

Client : Hanson Calga

Project :

SURFACE WATERS

Site	Flow Rate	Odour	Sampling Time	Bottles	Water Turbidity	Water Colour	Comments
A	Dam	N	9.00	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
B	DRY		8.45	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
C1	Dam	N	10.05	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
C2	steady	N	10.10	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
D	DRY	—	9.45	1x 250ml GP, 1x 500mL GP, 1x PG	C S T	C LO O B G	
F	Dam	N	8.55	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:

Sampled by: Leesa + Jonas

CHAIN OF CUSTODY DOCUMENTATION

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:

FOR LAB USE ONLY
COOLER SEAL (ice)
Yes ..... No .....
Broken ..... 2.0 Intact ...
COOLER TEMP: 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:

Australian Laboratory Services Pty Ltd

SAMPLE DATA				CONTAINER DATA		ANALYSIS REQUIRED																				
SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	NO.	Ph	EC	TSS	TDS	O + G																NOTES
A	Water	3.1.19	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	3.1.19	10.05	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x																
C2	Water	1	10.10	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x																
D	Water			~~1x 250mlGP,1x 500mLGP,1xPG~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~																
F	Water	3.1.19	8.55	1x 250mlGP,1x 500mLGP,1xPG		x	x	x	x	x																
				TOTAL BOTTLES:																						

RELINQUISHED BY:

NAME : Jonas Gellin DATE: 3.1.19

OF: CBased Environmental TIME: 1300

NAME : DATE:

OF: TIME:

RECEIVED BY

NAME : DATE: 3/1/19

OF: ACS TIME: 13:46

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
Sydney
Work Order Reference
ES1900110

Telephone : + 61-2-8784 8555

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1900110**	Page	: 1 of 2
Client	: **CBASED ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS RENAE MIKKA	Contact	: Customer Services ES
Address	: Unit 3 2 Enterprise Cres Singleton NSW 2330	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 6571 3334	Telephone	: +61-2-8784 8555
Project	: Hanson Quarry SW	Date Samples Received	: 03-Jan-2019 13:47
Order number	:	Date Analysis Commenced	: 03-Jan-2019
C-O-C number	: ----	Issue Date	: 10-Jan-2019 13:05
Sampler	: ----		
Site	:		
Quote number	: SYBQ/222/16 and PLANNED EVENTS		
No. of samples received	: 4		
No. of samples analysed	: 4		

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.

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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.

- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Client sample ID	**A**	**C1**	**C2**	**F**	**----**
			Client sampling date / time	03-Jan-2019 09:00	03-Jan-2019 10:05	03-Jan-2019 10:10	03-Jan-2019 08:55	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES1900110-001**	**ES1900110-002**	**ES1900110-003**	**ES1900110-004**	**--------**
				Result	Result	Result	Result	----
EA005: pH								
pH Value	----	0.01	pH Unit	**6.43**	**7.48**	**6.55**	**4.91**	**----**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**95**	**96**	**88**	**84**	**----**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**103**	**87**	**72**	**84**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	**6**	<5	**----**
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	**----**