



CBased Environmental Pty Limited

ABN 62 611 924 264



Calga Quarry

Environmental Monitoring

**Dust Deposition, Surface Water,
Groundwater and Meteorological Data**

October 2020

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 20 November 2020

Executive Summary

CBased Environmental is contracted by Hanson Quarry Products to conduct environmental monitoring at the Calga Sand Quarry.

The monitoring includes:

- Dust deposition;
- Surface water; and
- A meteorological data.

This report was prepared by CBased Environmental and includes the following results for October 2020:

- Dust deposition;
- Surface water quality; and
- Meteorological parameters.

The October 2020 dust deposition results for insoluble solids showed:

- Decreased levels when compared to September 2020;
- No excessively contaminated dust gauges; and
- Rolling annual averages below the Air Quality Management Plan criteria of 3.7g/m².month.

Monthly surface water samples were collected at sites A, C1, C2, and F. Site B and D were not flowing/dry at the time of collection. 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 sites A, C1, C2, and F in October 2020.

The Calga Quarry weather station data recovery in October 2020 was approximately 26% due to technical difficulties, resulting in insufficient data for 1 to 23 October 2020. A summary of rainfall comparison is provided below.

Location	Rainfall (mm)
Calga Quarry	142.8mm
BOM Peats Ridge*	NA
BOM Gosford*	253.2mm
BOM Peats Ridge long-term mean for October*	85.3mm

Notes: NA = Not Available

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

BOM stations report rainfall at 9am

Calga Quarry station reports rainfall at midnight.

1.0 Sampling Programme

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 water, 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/m².month.

Six (6) dust deposition gauges are monitored as follows:

- CD1 – installed 1 May 2006. Gauges air quality impacts to the east of site operations;
- CD2c – located on a rehabilitated section of land between the extraction area and adjacent resident. Gauges air quality impacts to the north of site operations. Replaces former gauges CD2a and CD2b;
- CD3 – installed prior to May 2006. Gauges air quality impacts to the south of site operations;
- CD4 – installed 3 October 2006. Gauges air quality impacts to the south of site operations;
- CD5 – installed 14 December 2006. Gauges air quality impacts to the south of site operations; and
- CD6 installed 14 December 2006. Gauges air quality impacts to the south of the operations.

Dust gauge CD2a was discontinued at the start of August 2006 due to quarry operations “mining out” the site of the gauge. The replacement gauge, 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. 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. CD2b was replacement by dust gauge CD2c.

Surface water is 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. Laboratory analysis includes pH, electrical conductivity, total suspended solids, total dissolved solids and total oil and grease. Monitoring 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.

Groundwater is 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 station has the following sensor configuration:

- Air temperature;
- Humidity;
- Rainfall;
- Atmospheric pressure;
- Evaporation;
- Solar radiation;
- Wind speed; and
- 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**.

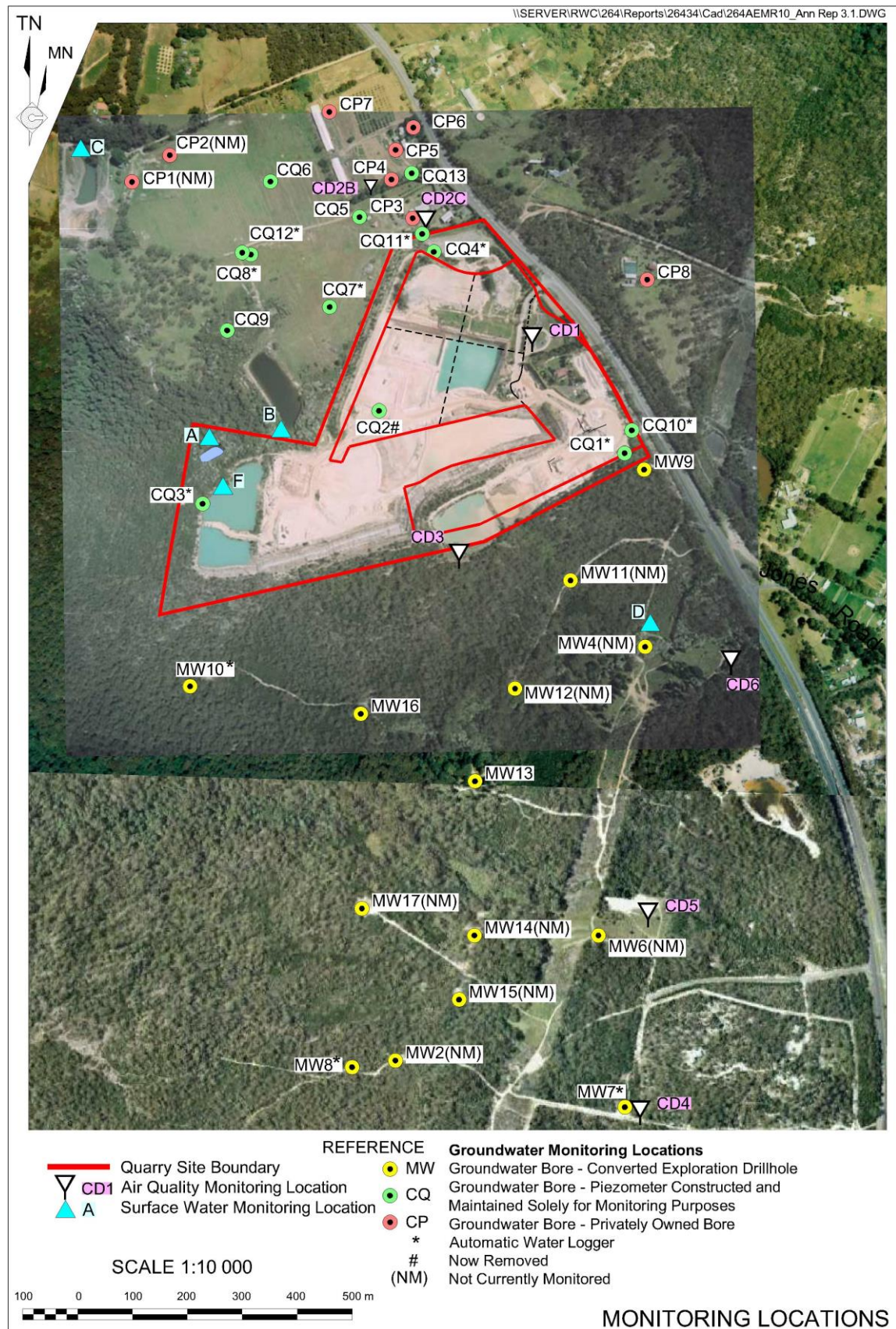


Figure 1: Hanson Calga Quarry Environmental Monitoring Locations

2.0 Results

2.1 Dust Deposition

The results for October 2020 and the project 12-month rolling average are provided **Table 1**.

Dust deposition charts for all dust gauge sites appear in **Figure 2** below. The field sheet, chain of custody documentation and laboratory analysis certificates are provided in **Appendix 1**.

Table 1: Dust Deposition Results: 1 October 2020 – 30 October 2020 (29 days)

Site	Monthly Insoluble Solids	Monthly Ash Residue	Monthly Combustible Matter	Monthly Ash Residue/ Insoluble Solids %	Rolling Annual Average Insoluble Solids
CD1	1.4	1.0	0.4	71	2.0
CD2c	1.1	0.5	0.6	45	1.6
CD3	0.3	0.2	0.1	67	1.6
CD4	0.5	0.2	0.3	40	1.3
CD5	0.2	0.2	<0.1	100	1.4
CD6	0.5	0.2	0.3	40	1.3

Notes:

Units in g/m².month unless indicated

Insoluble solid results 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 3.7g/m².month; the Development Consent's annual average amenity criteria at residential locations

The current rolling annual average is calculated from November 2019 to October 2020

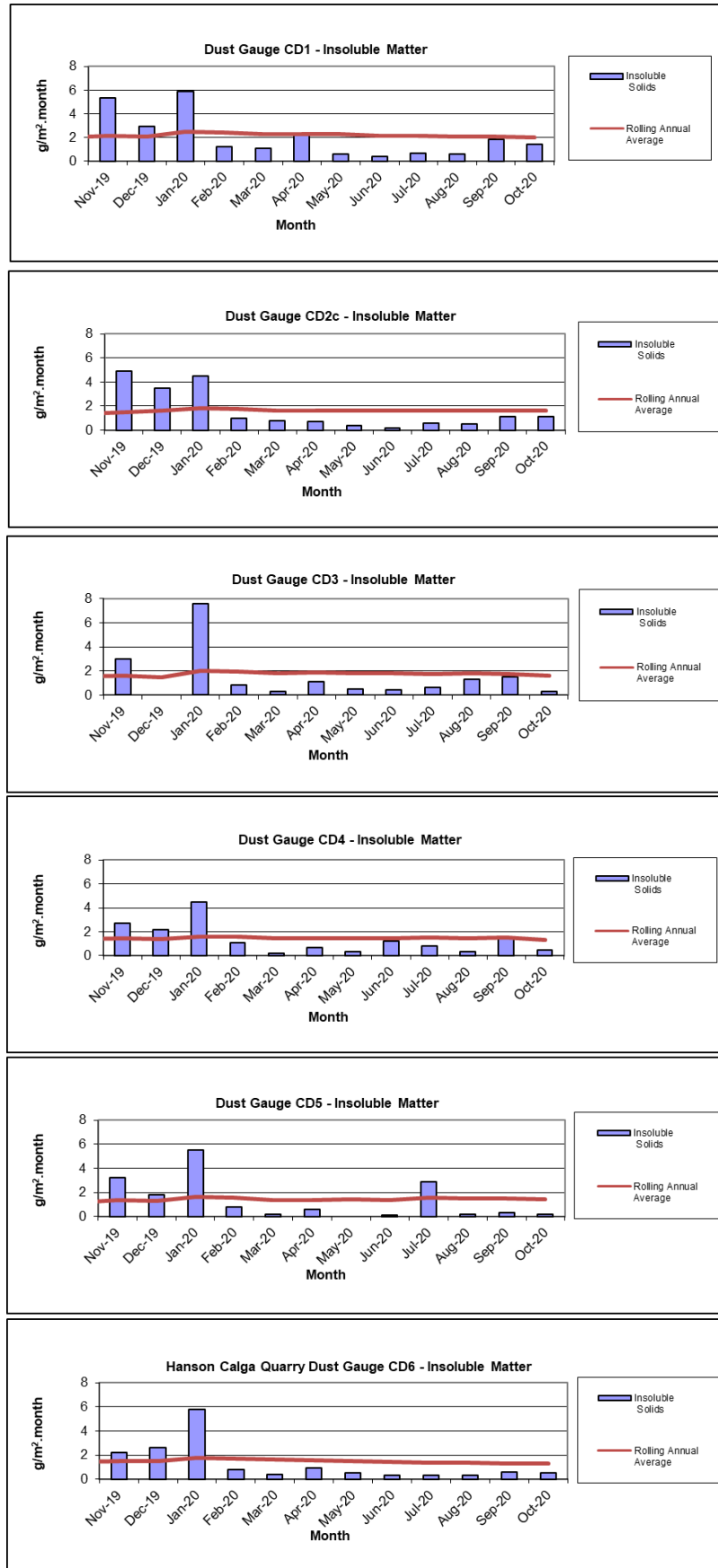


Figure 2: Summary Monthly/Annual Dust Deposition Results for Insoluble Solids

2.2 Surface Water (Monthly)

Monthly surface water monitoring was conducted on 8 October 2020 and results are provided in **Table 2**. The field sheet, chain of custody documentation and laboratory analysis certificates are provided in **Appendix 1**.

Samples were collected at sites A, C1, C2, and F. Site B and D were not flowing/dry at the time of collection.

Table 2: Monthly Surface Water Monitoring Results – October 2020

Site	Observed Flow Rate* (visual)	Water Colour* (visual)	Turbidity* (visual)	pH	EC (μ S/cm)	TDS (mg/L)	TSS (mg/L)	Oil and Grease (mg/L)
A	Dam	Clear	Clear	6.11	100	77	<5	<5
B	Not flowing							
C1	Dam	Clear	Clear	6.66	87	73	7	<5
C2	Trickle	Clear	Clear	6.13	105	79	<5	<5
D	Dry							
F	Dam	Clear	Clear	5.63	100	76	<5	<5

* Indicates field measurements. All other results are laboratory analysed

EC = Electrical conductivity

TDS = Total dissolved solids

TSS = Total suspended solids

2.2.1 Non-Routine Surface Water Sampling

No non-routine sampling was completed during October 2020.

2.3 Meteorological Data

The Calga Quarry weather station data recovery for October 2020 was approximately 26% due to technical difficulties, resulting in insufficient data for 1 to 23 October 2020.

The weather station data follows and includes:

- Monthly rainfall comparison between quarry data and BOM data. Refer to **Table 3**;
- Monthly data summary. Refer to **Table 4**;
- Weather charts of air temperature, humidity, heat index and wind chill, atmospheric pressure, solar radiation, evapotranspiration, rain, wind speed and data reception. Refer to **Figures 6 – 9**; and
- Wind rose (frequency distribution diagram of wind speed and direction). Refer to **Figure 10**.

A summary of rainfall comparison is provided in **Table 3**.

Table 3: Comparison of Local Rainfall – October 2020

Location	Rainfall (mm)
Calga Quarry	142.8mm
BOM Peats Ridge*	NA
BOM Gosford*	253.2mm
BOM Peats Ridge long-term mean for September*	85.3mm

Notes: NA = Not Available

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

BOM stations report rainfall at 9am

Calga Quarry station reports rainfall at midnight.

An annual calibration was undertaken on the weather station during April 2020 and is next due in March 2021. Please refer to **Appendix 1**.

Table 4: Summary of Monthly Meteorological Data – October 2020

Date	Temperature Min	Temperature Avg	Temperature Max	Relative Humidity Min	Relative Humidity Avg	Relative Humidity Max	Rain	Evapotranspiration	Wind Speed Min	Wind Speed Avg	Wind Speed Max	Wind Chill Min	Heat Index Max	Atmospheric Pressure Min	Atmospheric Pressure Avg	Atmospheric Pressure Max	Solar Radiation Min	Solar Radiation Avg	Solar Radiation Max	Data Min	Data Avg	Data Max
1/10/2020																						
2/10/2020																						
3/10/2020																						
4/10/2020																						
5/10/2020																						
6/10/2020																						
7/10/2020																						
8/10/2020																						
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20/10/2020																						
21/10/2020																						
22/10/2020																						
23/10/2020																						
24/10/2020	12.4	16.0	21.4	90.0	94.8	96.0	21.0	0.6	0.0	1.9	8.9	11.3	22.6	999.7	1004.3	1010.8	0.0	37.9	235.0	83.0	89.0	96.2
25/10/2020	11.9	13.0	14.3	91.0	96.1	98.0	104.4	0.8	1.8	3.3	14.8	10.1	14.6	1010.3	1012.1	1014.6	0.0	59.3	350.0	70.7	85.2	98.7
26/10/2020	11.7	12.8	16.2	86.0	96.4	98.0	11.6	1.0	1.3	2.9	14.3	10.2	16.3	1013.0	1015.8	1017.7	0.0	74.6	479.0	72.2	84.2	94.0
27/10/2020	12.4	14.9	18.1	76.0	87.5	95.0	0.2	1.8	0.0	1.0	7.2	12.5	18.2	1014.2	1015.8	1017.1	0.0	113.6	813.0	72.6	86.5	97.5
28/10/2020	14.4	16.0	20.1	72.0	89.6	97.0	0.4	2.1	0.0	1.0	6.7	14.4	20.4	1008.2	1011.3	1015.2	0.0	153.6	1197.0	52.4	84.7	94.3
29/10/2020	11.3	15.7	22.9	65.0	87.7	98.0	0.4	3.3	0.0	1.1	8.0	11.3	23.2	1005.9	1007.2	1008.6	0.0	234.3	1180.0	65.6	84.5	92.4
30/10/2020	15.8	18.6	24.4	51.0	84.8	96.0	2.0	3.5	0.0	2.5	9.8	15.7	24.2	1002.8	1005.4	1008.6	0.0	186.2	1014.0	71.6	92.3	100.0
31/10/2020	13.1	17.2	25.8	41.0	78.7	95.0	2.8	1.8	0.0	1.9	12.1	12.6	24.9	1002.3	1006.0	1008.8	0.0	151.8	959.0	81.1	87.5	98.7
Monthly	11.3	15.5	25.8	41	89	98	142.8	14.7	0.0	1.9	14.8	10.1	24.9	999.7	1009.7	1017.7	0.0	126.4	1197.0	52.4	86.7	100.0
Unit	Degrees Celcius (°C)			Percentage Relative Humidity			mm	mm	Metres per second (m/s)			°C	°C	Hector Pascals (hPa)			Watts per square metre (W/m ²)			Percentage (%)		

Missing data from 01/10/20 until 23/10/20 4.30pm due to technical difficulties resulting in insufficient data for 1 to 23 October 2020.

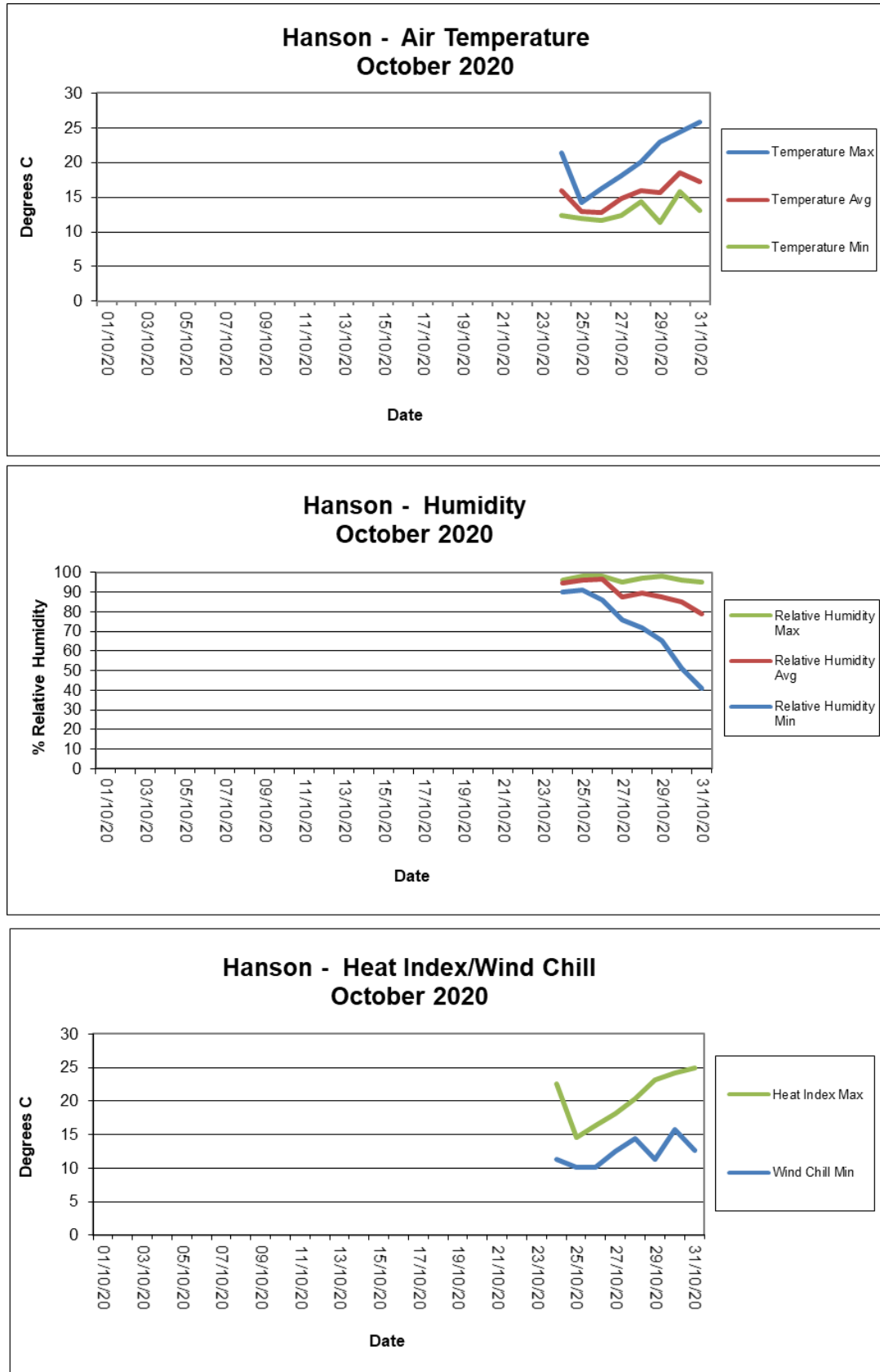


Figure 7 Summary of Monthly Temperature, Humidity and Heat Index Results

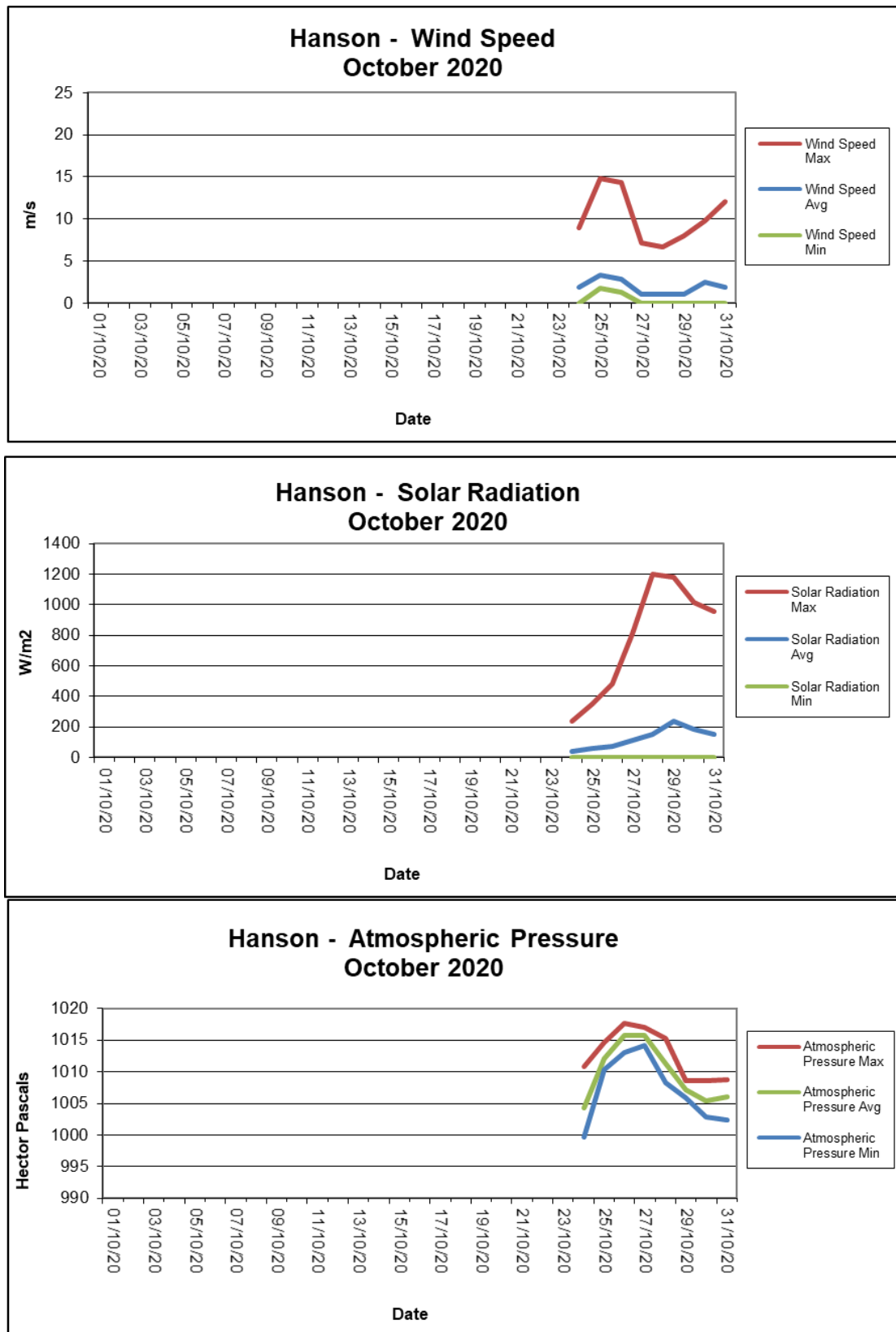


Figure 8 Summary of Monthly Wind Speed, Solar Radiation and Atmospheric Pressure Results

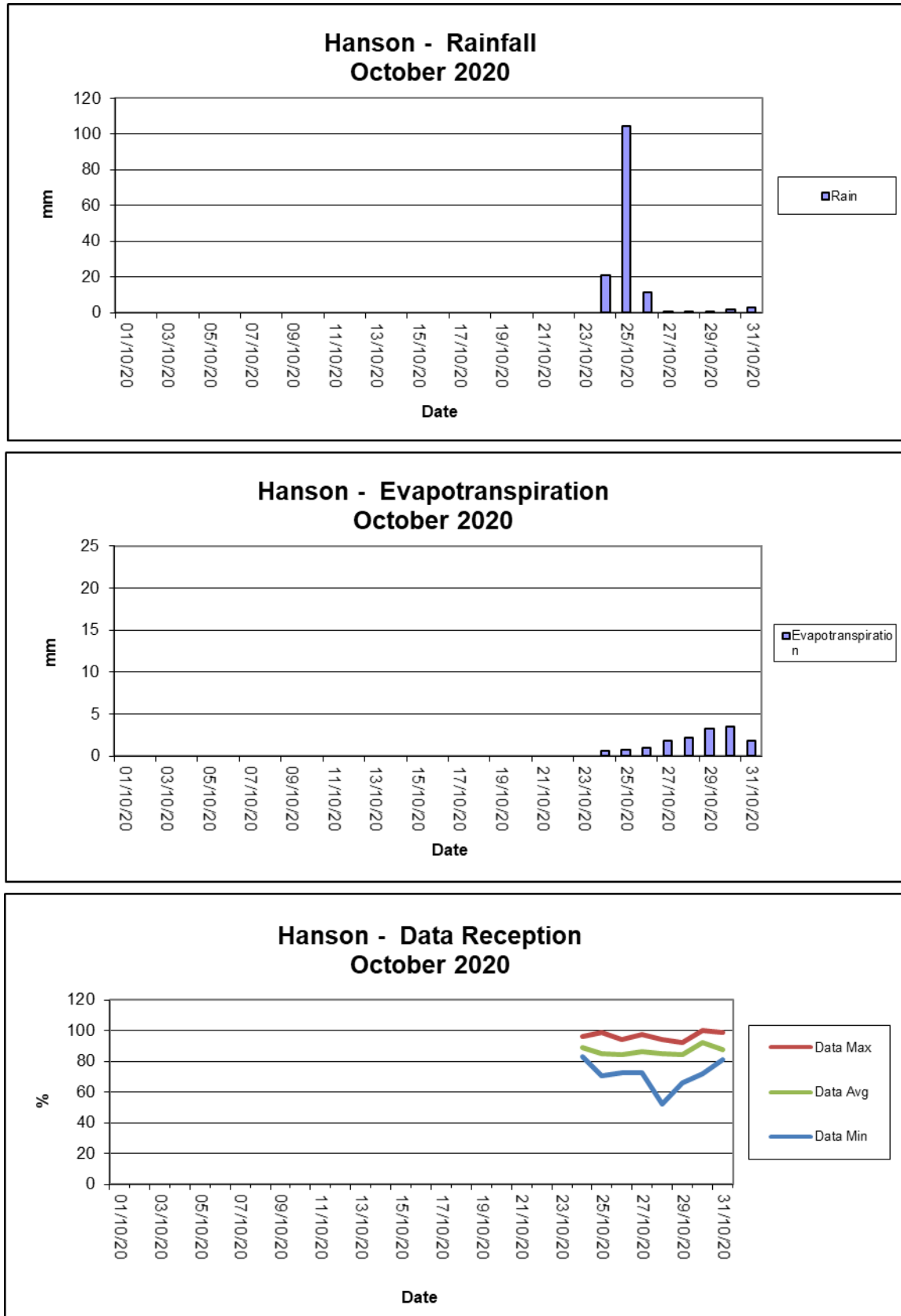


Figure 9 Summary of Monthly Rainfall, Evapotranspiration and Data Reception Results

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.

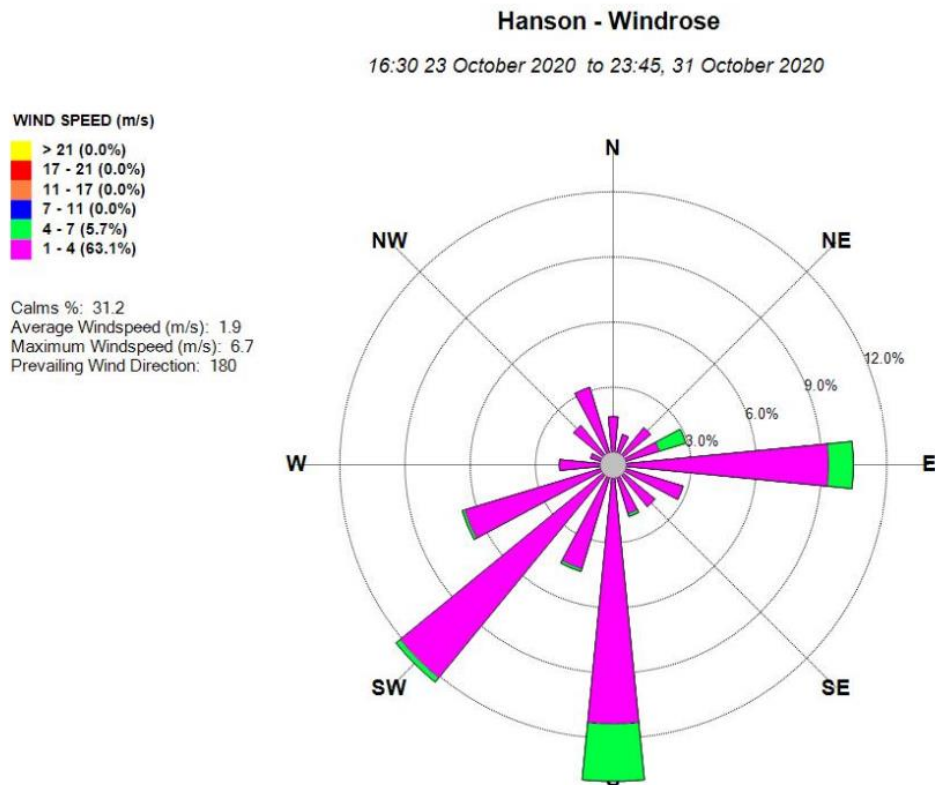


Figure 10: Monthly Windrose Plot – October 2020

The predominant wind for October was from the South, with most frequent, strongest winds from the South. The maximum wind speed was 6.7 m/s from the East. Insufficient data from 1 to 23 October 2020 due to technical difficulties on site.

Appendix 1

Field Sheets

Chain of Custody Documentation

Laboratory Analysis Certificates



Date Installed: 1.10.20
Date Collected: 30.10.20

Sampled By: ALEX SMITH

[illegible]

Report broken funnels and replacement diameters

Signed: 

[illegible]**AUSTRALIAN LABORATORY SERVICES P/L**

CERTIFICATE OF ANALYSIS

Work Order : **EN2007282**
Client : **CBASED ENVIRONMENTAL PTY LTD**
Contact : All Deliverables
Address : Unit 3 2 Enterprise Cres
 Singleton NSW 2330
Telephone : +61 02 6571 3334
Project : Hanson Calga Dusts
Order number : ----
C-O-C number : ----
Sampler : ALEX SMITH
Site :
Quote number : SYBQ/403/18 - COMPASS
No. of samples received : 6
No. of samples analysed : 6

Page : 1 of 4
Laboratory : Environmental Division Newcastle
Contact :
Address : 5/585 Maitland Road Mayfield West NSW Australia 2304

Telephone : +61 2 4014 2500
Date Samples Received : 30-Oct-2020 14:00
Date Analysis Commenced : 03-Nov-2020
Issue Date : 10-Nov-2020 14:11



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
Zoran Grozdanovski	Laboratory Operator	Newcastle - Inorganics, Mayfield West, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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 01/10/20 - 30/10/20	CD2c 01/10/20 - 30/10/20	CD3 01/10/20 - 30/10/20	CD4 01/10/20 - 30/10/20	CD5 01/10/20 - 30/10/20
Client sampling date / time				30-Oct-2020 00:00	30-Oct-2020 00:00	30-Oct-2020 00:00	30-Oct-2020 00:00	30-Oct-2020 00:00
Compound	CAS Number	LOR	Unit	EN2007282-001	EN2007282-002	EN2007282-003	EN2007282-004	EN2007282-005
				Result	Result	Result	Result	Result
EA120: Ash Content								
Ash Content	----	0.1	g/m ² .month	1.0	0.5	0.2	0.2	0.2
Ash Content (mg)	----	1	mg	17	9	4	4	3
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m ² .month	0.4	0.6	0.1	0.3	<0.1
Combustible Matter (mg)	----	1	mg	7	9	1	4	1
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m ² .month	1.4	1.1	0.3	0.5	0.2
Total Insoluble Matter (mg)	----	1	mg	24	18	5	8	4



Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST**
 (Matrix: **AIR**)

Client sample ID

				CD6 01/10/20 - 30/10/20	----	----	----	----
Client sampling date / time				30-Oct-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EN2007282-006	-----	-----	-----	-----
Result					----	----	----	----
EA120: Ash Content								
Ash Content	----	0.1	g/m ² .month	0.2	----	----	----	----
Ash Content (mg)	----	1	mg	4	----	----	----	----
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m ² .month	0.3	----	----	----	----
Combustible Matter (mg)	----	1	mg	4	----	----	----	----
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m ² .month	0.5	----	----	----	----
Total Insoluble Matter (mg)	----	1	mg	8	----	----	----	----



CBASED ENVIRONMENTAL PTY LIMITED

Date: 8.10.20

Client :
Project :

Hanson Calga

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	CST	CLOOBG	
B			8:50	1x 250ml GP, 1x 500ml GP, 1x PG	CST	CLOOBG	NOT FLOWING
C1	DAM	N	15:00	1x 250ml GP, 1x 500ml GP, 1x PG	CST	CLOOBG	
C2	TRICKLE	N	15:10	1x 250ml GP, 1x 500ml GP, 1x PG	CST	CLOOBG	
D			10:25	1x 250ml GP, 1x 500ml GP, 1x PG	CST	CLOOBG	DRY.
F	DAM	N	8:55	1x 250ml GP, 1x 500ml GP, 1x PG	CST	CLOOBG	

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

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

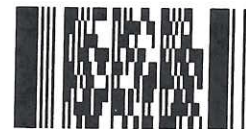
Signed:

Sampled by:

ALEX SMITH + MADDIE BROWN

[illegible]

Work Order Reference
ES2035465



Telephone : +61-2-8784 8555

CERTIFICATE OF ANALYSIS

Work Order : **ES2035465**
Client : **CBASED ENVIRONMENTAL PTY LTD**
Contact : All Deliverables
Address : Unit 3 2 Enterprise Cres
Singleton NSW 2330
Telephone : +61 02 6571 3334
Project : HANSON QUARRY SW
Order number : ----
C-O-C number : ----
Sampler : ALEX SMITH, Maddie Brown
Site :
Quote number : SYBQ/403/18 - EMD
No. of samples received : 4
No. of samples analysed : 4

Page : 1 of 2
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 09-Oct-2020 14:12
Date Analysis Commenced : 09-Oct-2020
Issue Date : 16-Oct-2020 10:40



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.

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Signatories

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<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Neil Martin	Team Leader - Chemistry	Chemistry, Newcastle West, NSW



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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 for sample 2 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				08-Oct-2020 09:00	08-Oct-2020 15:00	08-Oct-2020 15:10	08-Oct-2020 08:55	----
Compound	CAS Number	LOR	Unit	ES2035465-001	ES2035465-002	ES2035465-003	ES2035465-004	-----
				Result	Result	Result	Result	----
EA005: pH								
pH Value	----	0.01	pH Unit	6.11	6.66	6.13	5.63	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	100	87	105	100	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	77	73	79	76	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	7	<5	<5	----
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	----