



Carbon Based Environmental Pty Limited

ABN 74 102 920 285

Rocla Quarry Products Calga Quarry

Environmental Monitoring

Dust Deposition Gauges, Surface and Ground Waters and Meteorological Station

June 2015

A handwritten signature in black ink, appearing to read 'Colin Davies'.

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 20 July 2015

Executive Summary

Carbon Based Environmental is contracted by Rocla Quarry Products to conduct environmental monitoring at the Calga Sand Quarry.

The monitoring includes;

- Dust Deposition Gauges;
- Surface Waters;
- Groundwaters; and
- Meteorological Station.

This report was prepared by Carbon Based Environmental and includes the following;

- Dust Deposition results for June 2015;
- Surface Water quality results for June 2015; and
- Meteorological report for June 2015.

The June 2015 dust deposition results for insoluble solids were generally low and free of major contamination. All sites, on a rolling annual average basis, are currently below the Air Quality Management Plan exceedance level of 3.7g/m².month. Results were found to be representative of dust levels as determined by the Australian Standard.

Surface water samples were collected on 3 July 2015 at sites A, B D and F. Site C was inaccessible and was unable to be sampled this month. 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 site in June 2015.

Data for June 2015 shows that rainfall recorded at the Rocla Calga Quarry was lower than the Gosford BOM and the Peats Ridge long term, mean rainfall for June 2015. The rainfall comparison is provided below:

Rocla Calga Quarry	79.9 mm
BOM Peats Ridge*	NA
BOM Gosford*	100.6 mm
BOM Peats Ridge Long term mean for June*	99.5 mm

*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au). No data was available from the BOM Peats Ridge station for June 2015

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

Sampling Program

Rocla Calga Quarry conducts environmental monitoring in accordance to Development Consent, OEH (EPA) licence and Environmental Management Plans. Carbon Based Environmental are contracted to undertake dust deposition gauge, surface and groundwater and meteorological monitoring for the project. Carbon Based Environmental commenced monitoring from the April 2006 monitoring period.

Dust deposition gauges are operated to the Australian Standard AS3580.10.1 “Methods for Sampling and Analysis of Ambient Air Method 10.1 Determination of Particulates—Deposited Matter—Gravimetric Method”. Sampling is undertaken every 30 +/- 2 days and each gauge is analysed for insoluble solids and ash residue. The results are reported as g/m².month.

Surface 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. Wind parameters are measured according to Australian Standard AS 2923 “Ambient Air— Guide for Measurement of Horizontal Wind for Air Quality Applications”.

The weather stations have the following sensor configuration;

Air temperature

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

Carbon Based 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**.

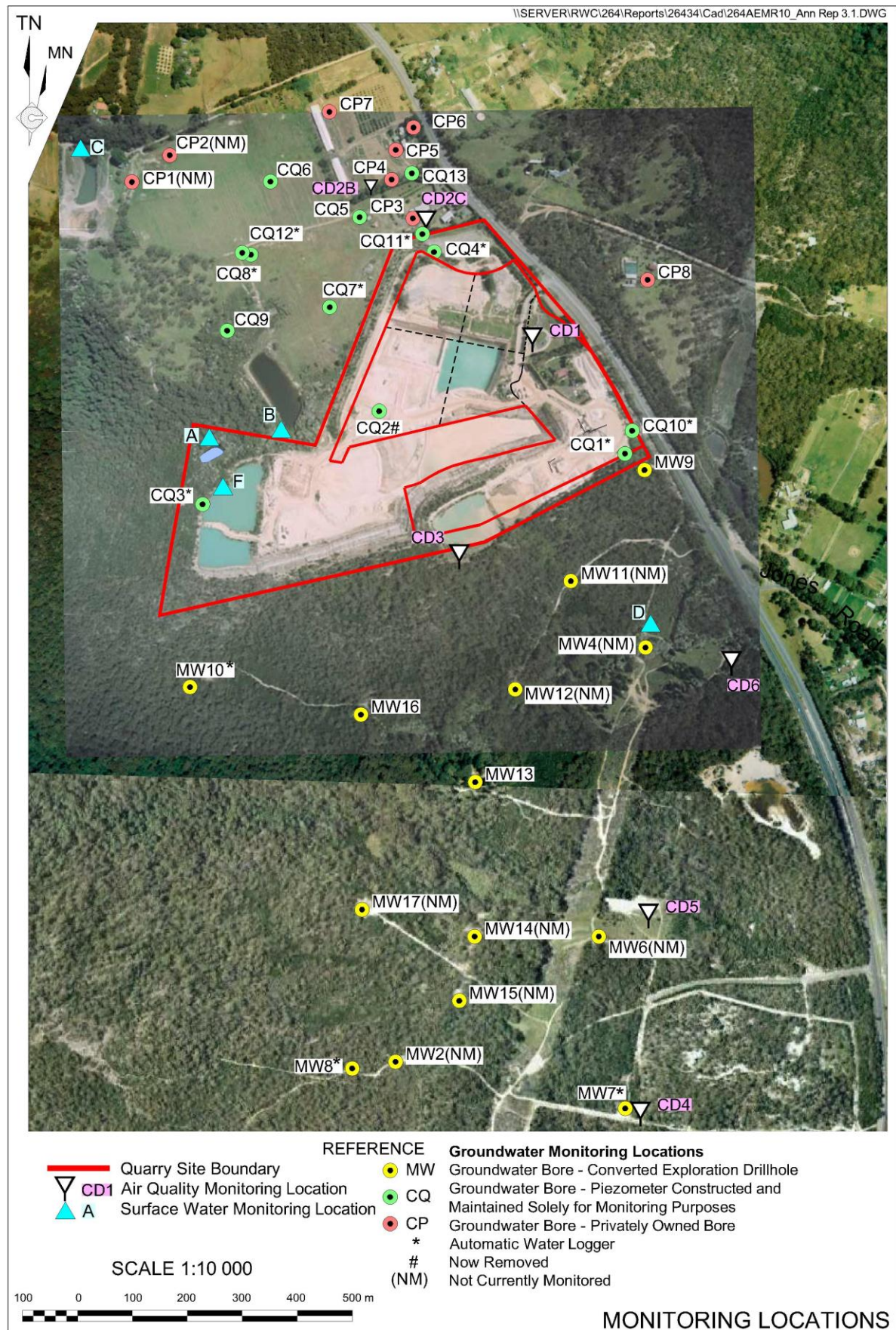


Figure 1: Rocla Calga Quarry environmental monitoring locations

2.0 Monthly Results

2.1 Dust Deposition Gauges

Table 1 displays the results for June 2015 and the project 12 month rolling average. Results are in g/m².month.

Table 1: Dust Deposition results: 1 June 2015 – 3 July 2015 (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	0.3	0.2	0.1	67	1.2
CD2c	0.3	0.2	0.1	67	1.4
CD3	0.2	0.2	<0.1	100	1.1
CD4	0.3	0.1	0.2	33	0.8
CD5	0.3	0.1	0.2	33	0.6
CD6	0.2	0.1	0.1	50	0.7

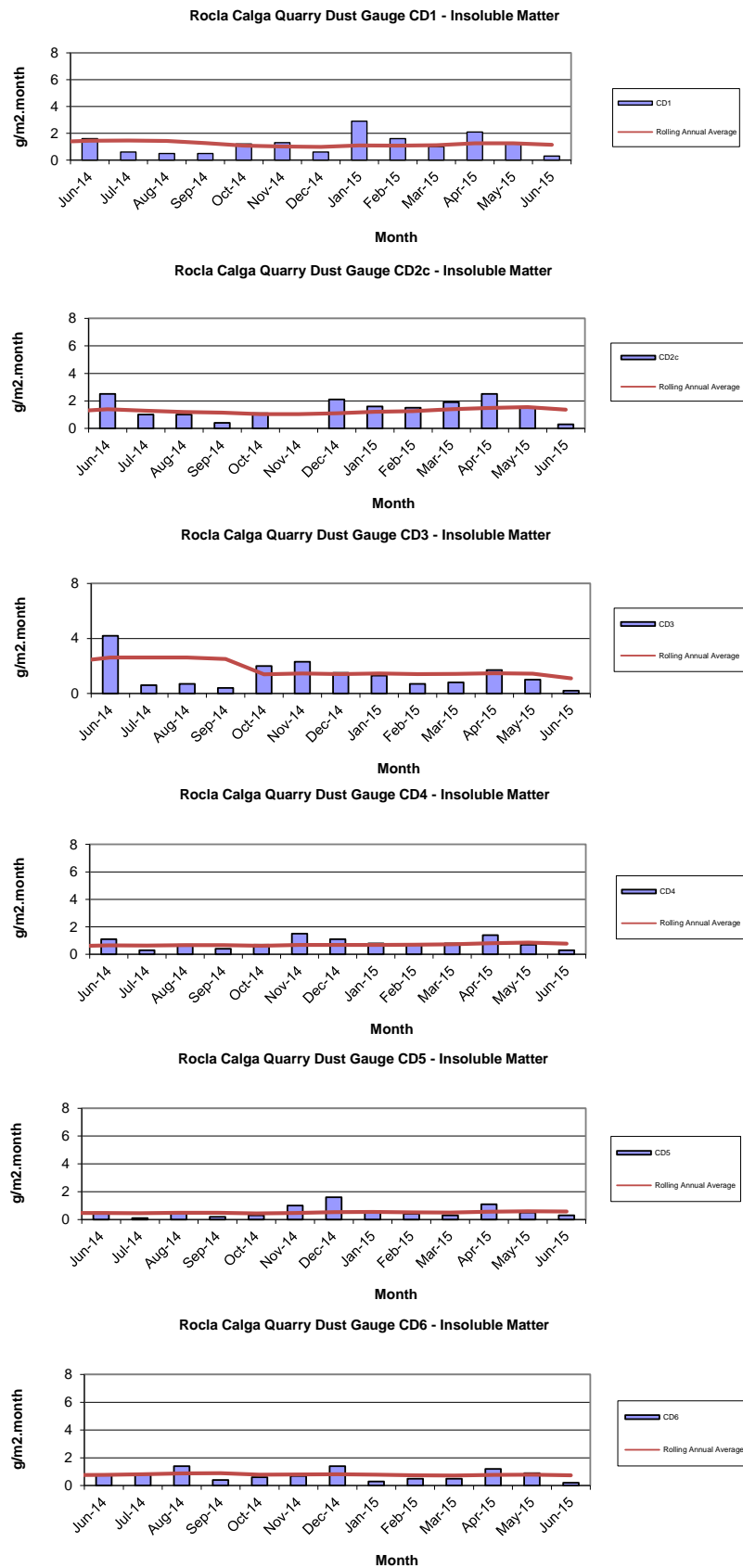
Insoluble Solids marked with an * indicate an excessively contaminated gauge. Contamination can include bird droppings, vegetation (such as plant matter, algae, pollen and seeds) and insects. Results in bold indicate insoluble solids levels above 3.7 g/m².month; the Development Consent's annual average amenity criteria at residential locations. The current rolling annual average is calculated from June 2014 to May 2015.

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 July 2015 and results are listed in **Table 2**. The laboratory analysis sheets are provided in **Appendix 1**.

Table 2: Monthly surface water monitoring – June 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	5.6	74	30	<5	<5
B	Trickle	Clear	Clear	6.6	77	44	<5	<5
C	No access							
D	Trickle	Clear	Clear	5.4	87	52	<5	<5
F	Dam	Clear	Clear	5.6	58	30	<5	<5

Samples were collected at sites A, B, D and F. Site C was inaccessible and was unable to be sampled this month. 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 site in June 2015.

2.2.1 Non-Routine Surface Water Sampling

No non routine sampling was undertaken during June 2015.

2.3 Groundwater Monitoring

Bi-monthly groundwater monitoring was conducted in June 2015 for the May 2015 reporting period and are next scheduled for July 2015.

2.4 Meteorological Monitoring

The Rocla Calga Quarry weather station data recovery in June 2015 was approximately 30% as no data was recorded between the 1 to 21 June 2015 after the relocation of the weather station. From the 1 to 21 June 2015 minimum and maximum temperature, rain and maximum wind data was substituted with data from the Gosford BOM.

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 June 2015 shows that rainfall recorded at the Rocla Calga Quarry was lower than the Gosford BOM and the Peats Ridge long term, mean rainfall for June 2015.

The rainfall comparison is provided below:

Rocla Calga Quarry	79.9 mm
BOM Peats Ridge*	NA
BOM Gosford*	100.6 mm
BOM Peats Ridge Long term mean for June*	99.5 mm

NA = Not Available

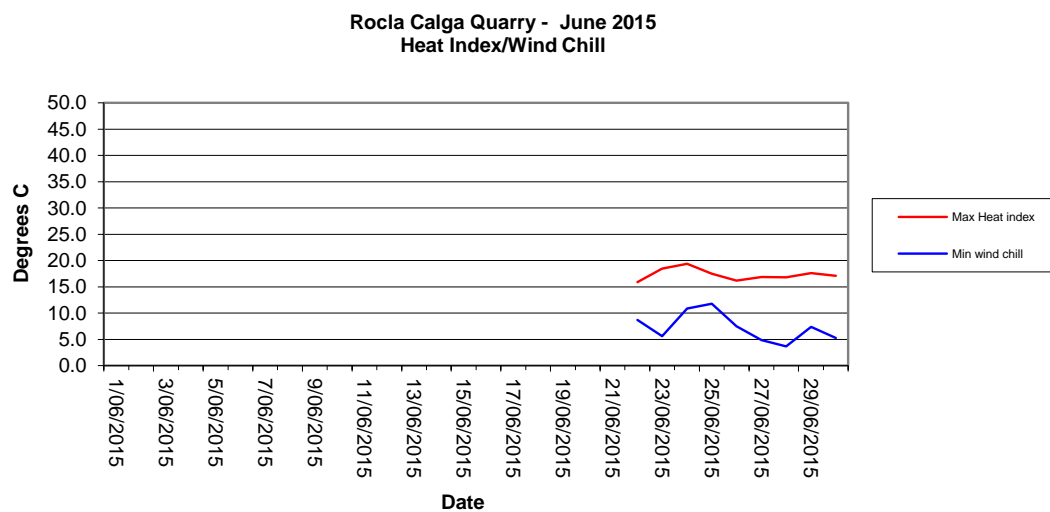
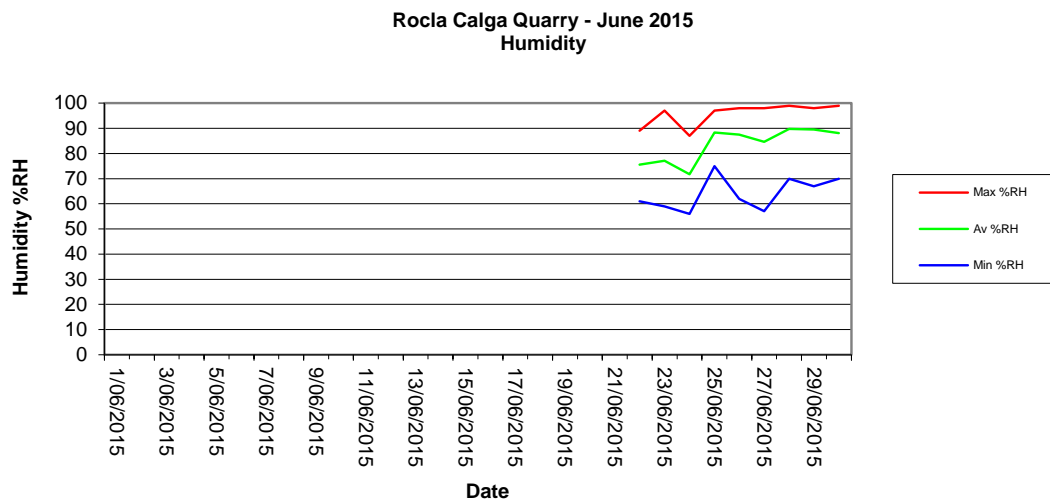
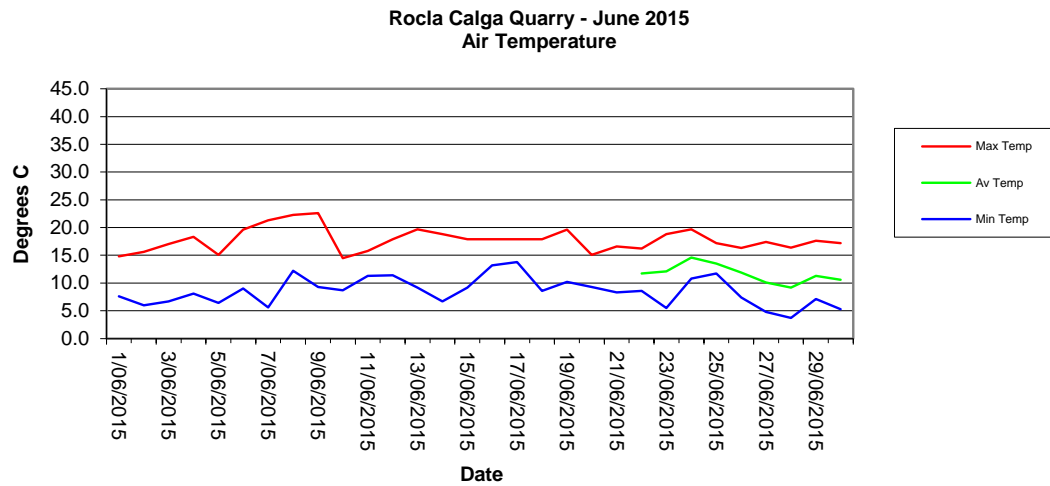
*Data sourced from Bureau of Meteorology (BOM) website (www.bom.gov.au).

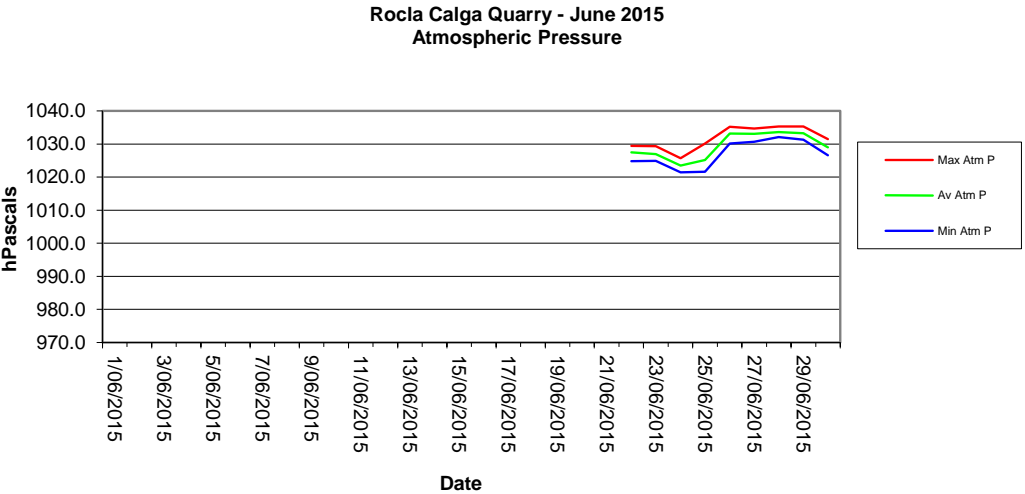
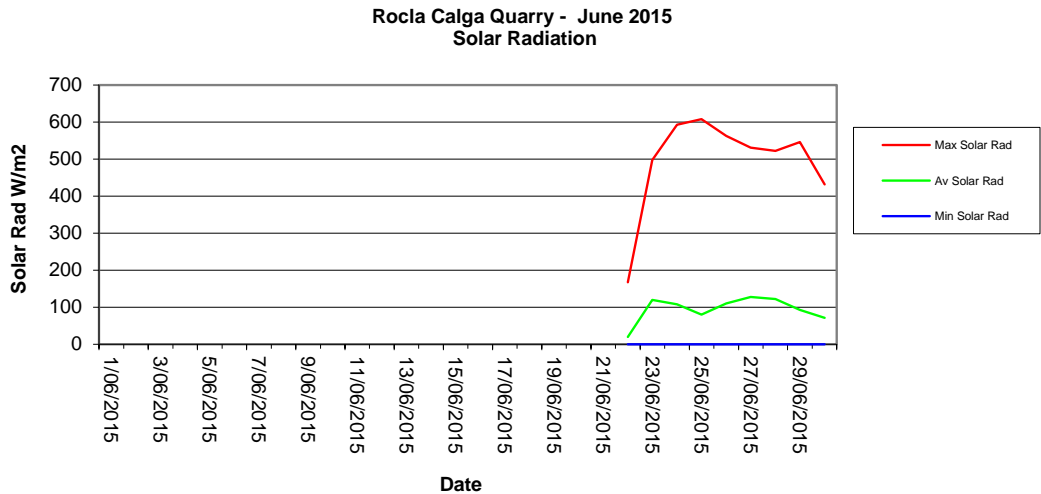
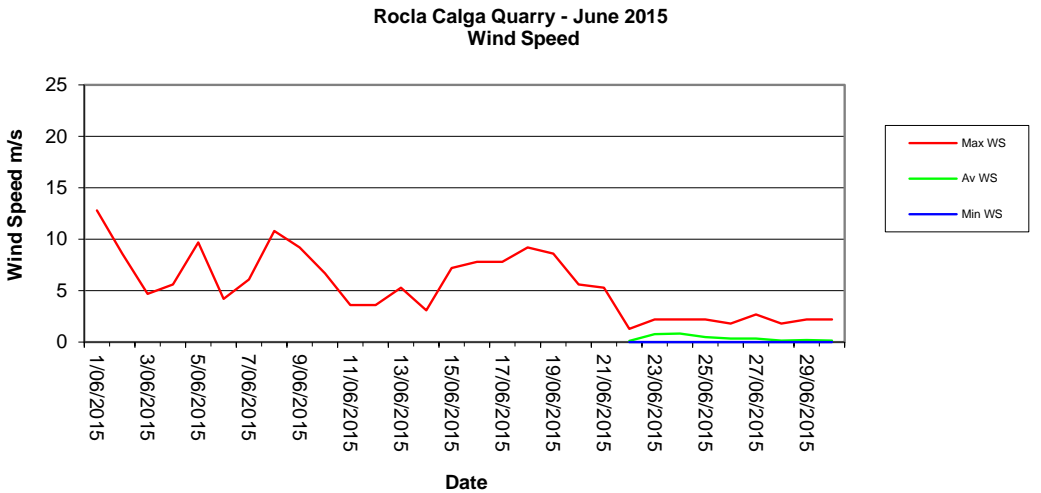
2.4.1 Monthly Meteorological Data Summary

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 %
1/06/2015	7.6		14.8				0.6				12.8											
2/06/2015	6.0		15.6				0.0				8.6											
3/06/2015	6.7		17.0				0.0				4.7											
4/06/2015	8.1		18.3				0.0				5.6											
5/06/2015	6.4		15.1				1.6				9.7											
6/06/2015	9.0		19.6				0.0				4.2											
7/06/2015	5.6		21.3				0.2				6.1											
8/06/2015	12.2		22.3				0.0				10.8											
9/06/2015	9.3		22.6				0.0				9.2											
10/06/2015	8.7		14.5				0.0				6.7											
11/06/2015	11.3		15.8				9.8				3.6											
12/06/2015	11.4		17.9				5.6				3.6											
13/06/2015	9.2		19.7				0.0				5.3											
14/06/2015	6.7		18.8				0.0				3.1											
15/06/2015	9.2		17.9				1.2				7.2											
16/06/2015	13.2		17.9				8.6				7.8											
17/06/2015	13.8		17.9				13.6				7.8											
18/06/2015	8.6		17.9				1.2				9.2											
19/06/2015	10.2		19.6				19.6				8.6											
20/06/2015	9.3		15.1				6.8				5.6											
21/06/2015	8.3		16.6				0.0				5.3											
22/06/2015	8.6	11.7	16.2	61.0	75.5	89.0	0.0	0.3	0.0	0.1	1.3	8.7	15.9	1024.8	1027.5	1029.4	0.0	19.3	167.0	0.0	27.1	97.7
23/06/2015	5.5	12.1	18.8	59.0	77.1	97.0	0.0	1.9	0.0	0.8	2.2	5.6	18.5	1024.9	1027.0	1029.3	0.0	119.2	498.0	36.0	81.4	97.7
24/06/2015	10.8	14.6	19.7	56.0	71.7	87.0	0.0	2.0	0.0	0.8	2.2	10.9	19.4	1021.4	1023.5	1025.7	0.0	107.7	593.0	41.2	71.0	94.4
25/06/2015	11.7	13.5	17.2	75.0	88.3	97.0	9.9	1.2	0.0	0.5	2.2	11.8	17.5	1021.6	1025.1	1030.1	0.0	80.1	608.0	43.3	75.8	97.7
26/06/2015	7.4	11.9	16.3	62.0	87.5	98.0	0.3	1.4	0.0	0.3	1.8	7.5	16.2	1030.1	1033.1	1035.2	0.0	110.2	563.0	29.5	79.6	97.7
27/06/2015	4.8	10.1	17.4	57.0	84.6	98.0	0.3	1.7	0.0	0.3	2.7	4.9	16.9	1030.7	1033.1	1034.7	0.0	127.8	531.0	48.2	77.2	96.8
28/06/2015	3.7	9.2	16.4	70.0	89.8	99.0	0.3	1.4	0.0	0.1	1.8	3.7	16.8	1032.1	1033.6	1035.3	0.0	121.8	522.0	74.3	83.2	93.6
29/06/2015	7.1	11.3	17.6	67.0	89.5	98.0	0.0	1.3	0.0	0.2	2.2	7.4	17.6	1031.3	1033.3	1035.3	0.0	92.3	546.0	59.6	83.9	97.4
30/06/2015	5.3	10.6	17.2	70.0	88.1	99.0	0.5	1.1	0.0	0.1	2.2	5.3	17.1	1026.6	1029.0	1031.5	0.0	71.3	432.0	50.6	84.6	98.0
Monthly	3.7	11.7	22.6	56	84	99	79.9	12.3	0	0.4	12.8	3.7	19.4	1021.4	1029.4	1035.3	0	94.4	608	0	73.8	98

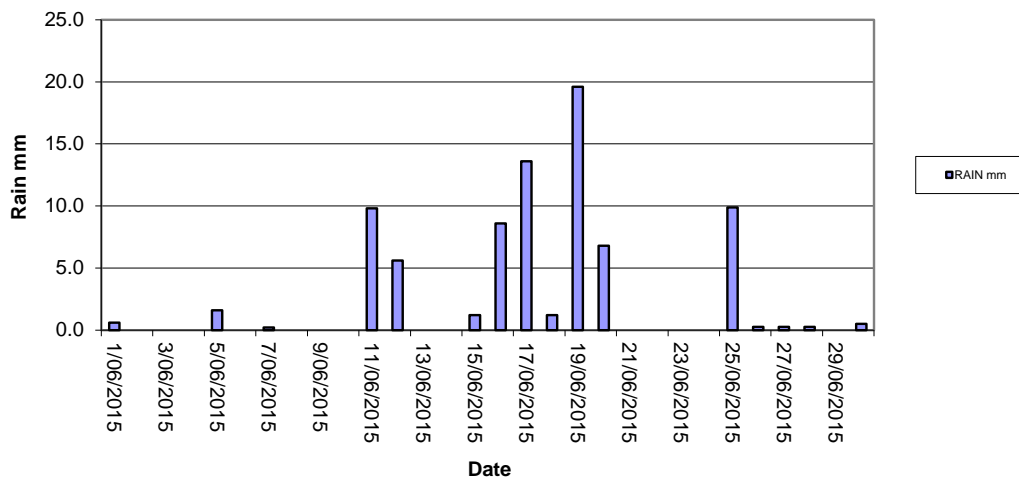
Data unavailable due to the relocation of the weather station. Where available weather data was substituted with data from the Gosford BOM from the 1 to 21 June 2015.

2.4.2 Monthly Weather Charts

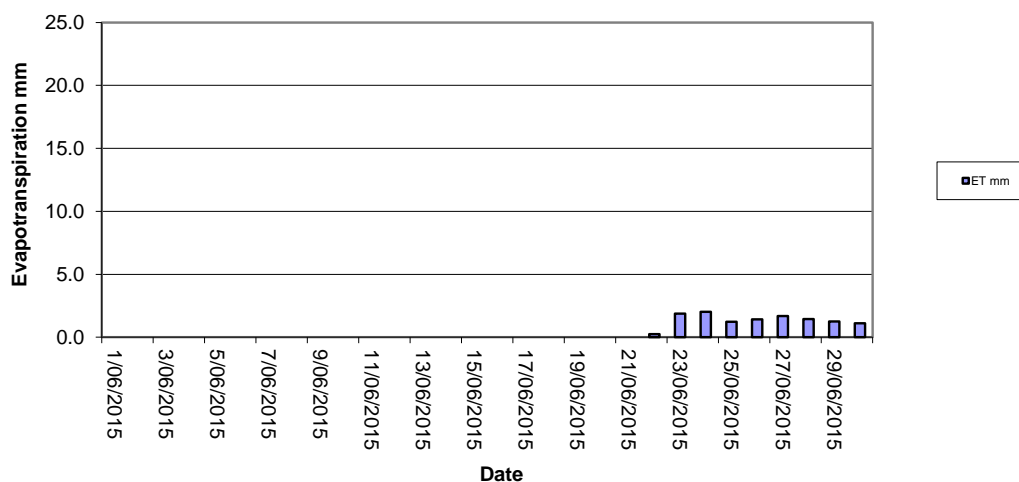




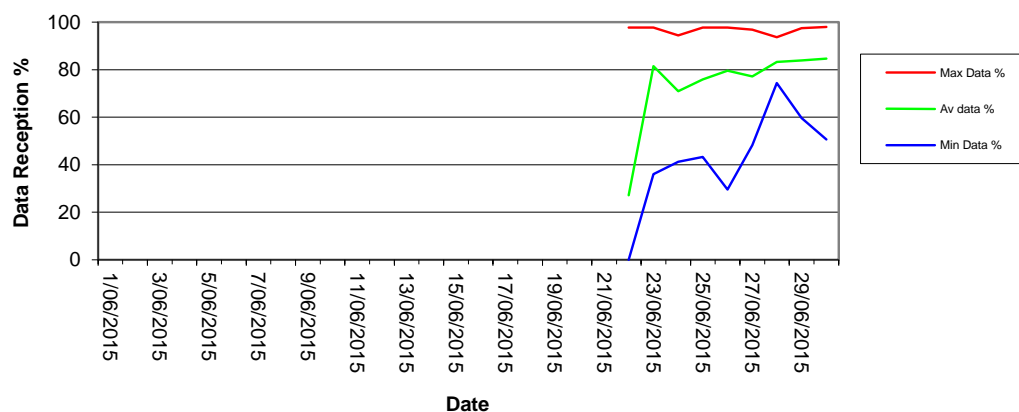
Rocla Calga Quarry - June 2015
Rainfall



Rocla Calga Quarry - June 2015
Evapotranspiration



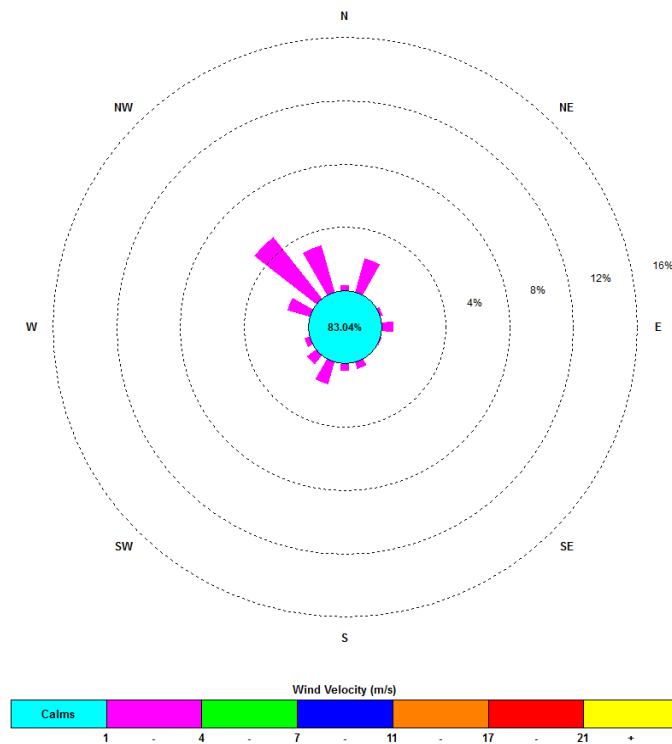
Rocla Calga Quarry - June 2015
Data Reception



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 less than a 15 minute average of 1m/s.

15:30, 22 June 2015 – 23:55, 30 June 2015



The predominant winds were from the NW, with most frequent, strongest winds from the N-NW. The maximum wind speed was 12.8 m/s from the WSW.

Please note: Wind data used for the wind rose is based on an incomplete set of data as data was unavailable from the 1 to 21 June 2015.

Appendix 1

Laboratory Certificates

CERTIFICATE OF ANALYSIS

Work Order	: EN1512233	Page	: 1 of 4
Client	: CARBON BASED ENVIRONMENTAL	Laboratory	: Environmental Division Newcastle
Contact	: MR COLIN DAVIES (cbased)	Contact	: Peter Keyte
Address	: 47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
E-mail	: cbased@bigpond.com	E-mail	: peter.keyte@alsglobal.com
Telephone	: +61 49904443	Telephone	: +61 2 4014 2500
Facsimile	: +61 02 49904442	Facsimile	: +61 2 4967 7382
Project	: Rocla Calga Dusts	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ---	Date Samples Received	: 03-Jul-2015 13:45
C-O-C number	: ---	Date Analysis Commenced	: 06-Jul-2015
Sampler	: ---	Issue Date	: 09-Jul-2015 15:27
Site	: ---		
Quote number	: ---	No. of samples received	: 6
		No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories

Position

Accreditation Category

Barbara Coupland

Quality Officer

Newcastle - Inorganics



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.

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

∅ = ALS is not NATA accredited for these tests.

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



Analytical Results

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

Client sample ID

				CD1 01/06/15 - 03/07/15	CD2c 01/06/15 - 03/07/15	CD3 01/06/15 - 03/07/15	CD4 01/06/15 - 03/07/15	CD5 01/06/15 - 03/07/15
Client sampling date / time				[03-Jul-2015]	[03-Jul-2015]	[03-Jul-2015]	[03-Jul-2015]	[03-Jul-2015]
Compound	CAS Number	LOR	Unit	EN1512233-001	EN1512233-002	EN1512233-003	EN1512233-004	EN1512233-005
				Result	Result	Result	Result	Result
EA120: Ash Content								
Ash Content	----	0.1	g/m ² .month	0.2	0.2	0.2	0.1	0.1
Ash Content (mg)	----	1	mg	4	4	4	1	1
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m ² .month	0.1	0.1	<0.1	0.2	0.2
Combustible Matter (mg)	----	1	mg	1	1	<1	4	4
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m ² .month	0.3	0.3	0.2	0.3	0.3
Total Insoluble Matter (mg)	----	1	mg	5	5	4	5	5



Analytical Results

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

Client sample ID

				CD6	----	----	----	----
				01/06/15 - 03/07/15	----	----	----	----
				[03-Jul-2015]	----	----	----	----
<i>Compound</i>	<i>CAS Number</i>	<i>LOR</i>	<i>Unit</i>	EN1512233-006	-----	-----	-----	-----
				Result	Result	Result	Result	Result
EA120: Ash Content								
Ash Content	----	0.1	g/m ² .month	0.1	----	----	----	----
Ash Content (mg)	----	1	mg	2	----	----	----	----
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m ² .month	0.1	----	----	----	----
Combustible Matter (mg)	----	1	mg	2	----	----	----	----
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m ² .month	0.2	----	----	----	----
Total Insoluble Matter (mg)	----	1	mg	4	----	----	----	----

CERTIFICATE OF ANALYSIS

Work Order	: ES1525373	Page	: 1 of 2
Client	: CARBON BASED ENVIRONMENTAL	Laboratory	: Environmental Division Sydney
Contact	: MR COLIN DAVIES (cbased)	Contact	:
Address	: 47 BOOMERANG ST CESSNOCK NSW, AUSTRALIA 2325	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: cbased@bigpond.com	E-mail	:
Telephone	: +61 49904443	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 49904442	Facsimile	: +61-2-8784 8500
Project	: ROCLA QUARRY	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ---	Date Samples Received	: 03-Jul-2015 13:45
C-O-C number	: ---	Date Analysis Commenced	: 03-Jul-2015
Sampler	: ---	Issue Date	: 10-Jul-2015 13:28
Site	: ---		
Quote number	: ---	No. of samples received	: 4
		No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

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- Analytical Results



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ISO/IEC 17025.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Merrin Avery	Supervisor - Inorganic	Newcastle - Inorganics



General Comments

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

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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.

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.

- Sampling time not provided. For operational reasons an assumed date/time (3pm on date of receipt) is used. Sample results may be affected if the analysis falls outside of actual holding time.
- EA005: conducted by ALS Water Chemistry, NATA accreditation no. 825, site no 3619.

Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Client sample ID

				A	B	D	F	----
Client sampling date / time				[03-Jul-2015]	[03-Jul-2015]	[03-Jul-2015]	[03-Jul-2015]	----
Compound	CAS Number	LOR	Unit	ES1525373-001	ES1525373-002	ES1525373-003	ES1525373-004	-----
				Result	Result	Result	Result	Result
EA005: pH								
pH Value	----	0.01	pH Unit	5.57	6.60	5.35	5.60	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	74	77	87	58	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	----	10	mg/L	30	44	52	30	----
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	----
EP020: Oil and Grease (O&G)								
^ Oil & Grease	----	5	mg/L	<5	<5	<5	<5	----