SURFACE WATER, DEPOSITIONAL DUST, HVAS AND METEOROLOGICAL MONITORING

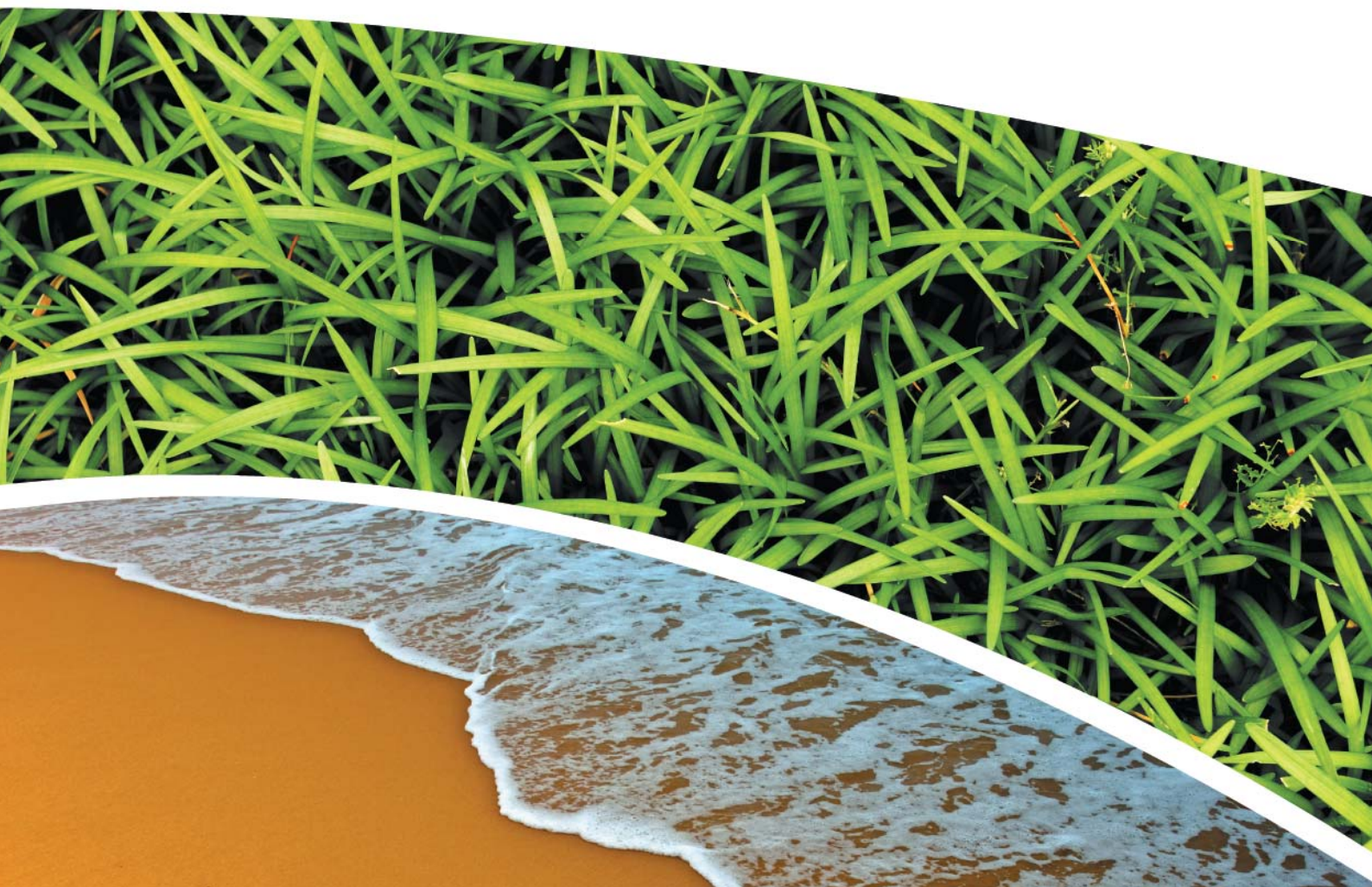
Prepared for Pine Dale Mine Community Consultative Committee

Prepared by RCA Australia

RCA ref 6880-1727/0

November 2016

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL



RCA AUSTRALIA
ABN 53 063 515 711
92 Hill Street, CARRINGTON NSW 2294
Telephone: +61 2 4902 9200
Facsimile: +61 2 4902 9299
Email: administrator@rca.com.au
Internet: www.rca.com.au

DOCUMENT STATUS						
Rev No	Comment	Author	Reviewer	Approved for Issue (Project Manager)		
				Name	Signature	Date
/0	Final	C Rocher	K Tripp	K Tripp		16.12.16

DOCUMENT DISTRIBUTION				
Rev No	Copies	Format	Issued to	Date
/0	1	Electronic (email)	Pine Dale Mine – Graham Goodwin graham.goodwin@energyaustralia.com.au	16.12.16
/0	1	Electronic (email)	EnergyAustralia- Mark Frewin mark.frewin@energyaustralia.com.au	16.12.16
/0	1	Electronic (email)	Lithgow City Council – Andrew Muir andrew.muir@lithgow.nsw.gov.au	16.12.16
/0	1	Electronic report	RCA – job archive	16.12.16

RCA LE ref 6880-1727/0

16 December 2016

Pine Dale Mine
PO Box 202
WALLERAWANG NSW 2845

Attention Mr Graham Goodwin

REPORT COMPILED FOR

PINE DALE MINE COMMUNITY CONSULTATIVE COMMITTEE

DETAILING SURFACE WATER, GROUNDWATER DEPOSITIONAL DUST, HVAS AND METEOROLOGICAL MONITORING

NOVEMBER 2016

Robert Carr & Associates Pty Ltd
T/A RCA Australia ABN 53 063 515 711

92 Hill St, PO Box 175 Carrington NSW 2294
Ph 02 **4902 9200 Fax** 02 **4902 9299**

Email administrator@rca.com.au
Web www.rca.com.au

1 GENERAL COMMENTS

Job Number: 6880.
Date Samples Received: During the month of November 2016.
Samples received were sampled by RCA Laboratories – Environmental staff.

This report satisfies the requirements to monitor environmental parameters as presented in the Pine Dale Mine Environmental Protection Licence (EPL 4911).

2 ANALYTICAL PROCEDURES

The analytical procedures used by RCA Laboratories – Environmental (NATA Accreditation number 9811) are based on established internationally recognised procedures such as APHA and Australian Standards. Analytical test methods are detailed in **Table 1**. ALS Environmental has been used to obtain analysis of anions, cations and dissolved metals (NATA Accreditation number 825).

Table 1 *Analytical Test Methods*

ANALYSIS	METHOD	UNITS	ANALYSING LABORATORY	NATA / NON-NATA ANALYSIS
Determination of Suspended Particulate Matter	ENV-LAB003	$\mu g/m^3$	RCA Laboratories – Environmental	NATA Analysis
Determination of Particulate Matter – Deposited Matter	ENV-LAB004	g/m^2.month	RCA Laboratories – Environmental	NATA Analysis
pH	ENV-LAB006	pH	RCA Laboratories – Environmental	NATA Analysis
Conductivity	ENV-LAB010	µS/cm	RCA Laboratories – Environmental	NATA Analysis
Total Suspended Solids	ENV-LAB009	mg/L	RCA Laboratories – Environmental	NATA Analysis
Turbidity	ENV-LAB037	NTU	RCA Laboratories - Environmental	NATA Analysis
Oil and Grease	ENV-LAB022	mg/L	RCA Laboratories - Environmental	Non-NATA Analysis
Major Anions (Alkalinity, Cl, SO_4)	ED037, ED041, ED045	mg/L	ALS	NATA Analysis
Major Cations (Ca, Mg, Na, K)	ED093	mg/L	ALS	NATA Analysis
Dissolved Metals	EG020F	mg/L	ALS	NATA Analysis

3 WATER MONITORING RESULTS

3.1 GROUNDWATER

A total of 2 on-site groundwater samples were collected during the month of November 2016. Sampling at Bores P2, P3 and P7a are no longer required under the new sampling regime undertaken in accordance with Project Approval (PA 10_0041) and the Pine Dale Mine Water Management Plan (Report No. 613/20). This sampling regime commenced 1 August 2013. Water quality analysis results are shown in **Table 2**.

Table 2 *Groundwater Analysis Results – Quarterly Monitoring*

ANALYSIS	UNITS	P6	P7
Sample Number	-	11166880011	11166880012
Date Sampled	-	07/11/16	7/11/16
Time Sampled	-	12:54	13:57
Depth to Water from Surface	m	23.05	6.11
Water Level (AHD)	m	893.90	888.29
Temperature	°C	18.0	16.0
pH	pH	***5.62***	***5.87***
Conductivity	µS/cm	***1300***	760
Turbidity	NTU	94	
Dissolved Oxygen	mg/L	4.3	
TSS	mg/L	59	
Oil and Grease	mg/L	<5	
Bicarbonate Alkalinity ($CaCO_3$)	mg/L	35	197
Total Alkalinity ($CaCO_3$)	mg/L	35	197
Sulfate (as SO_4)	mg/L	667	89
Chloride	mg/L	39	81
Calcium	mg/L	124	43
Magnesium	mg/L	60	49
Sodium	mg/L	57	47
Potassium	mg/L	18	7
Cobalt (dissolved)	mg/L	0.054	
Manganese (dissolved)	mg/L	2.33	
Nickel (dissolved)	mg/L	0.106	
Zinc (dissolved)	mg/L	0.569	
Iron (dissolved)	mg/L	21.1	<0.05
Trigger Levels			
pH trigger level	pH	6.2 – 8.0	6.3 – 8.0
Conductivity trigger level	µS/cm	1180	852
Water Level (AHD) #	m	887.90	883.28

NOTES: *****Depth relative to ground level (not standpipe height).

Indicates analysis was not required

Results shown in ***italics*** indicates exceedance of trigger level

Groundwater monitoring locations are shown in **Appendix 1**.

3.2 EPA SURFACE WATER MONITORING

Routine quarterly surface water monitoring was undertaken during November 2016. Water quality analysis results are shown in **Table 3**.

Table 3 *EPA Surface Water Monitoring*

ANALYSIS	UNITS	EPA Point 2 Neubecks Ck Upstream	EPA Point 3 Neubecks Ck Downstream	EPA Point 14 Coxs River Downstream
Sample Number	-	11166880009	11166880004	11166880010
Date Sampled	-	7/11/2016	7/11/2016	7/11/2016
Time Sampled	-	12:46	14:12	12:46
Temperature	°C	19.5	20.5	19.5
pH	pH	***6.81***	7.25	***8.08***
Conductivity	µS/cm	363	***2500***	865
Sulfate	NTU	85	1020	94
Dissolved Iron	mg/L	<0.05	0.09	0.1
Total Suspended Solids	mg/L	<5	7	<5
Turbidity	mg/L	19	11	5
Trigger Levels*				
pH	pH	7.1 – 8.0	6.4 – 8.0	7.5 – 8.0
Conductivity	µS/cm	2055	2223	1166
Total Suspended Solids	mg/L	30	30	30

Results shown in ***italics*** indicates exceedance of trigger level

4 AIR QUALITY MONITORING RESULTS

4.1 HIGH VOLUME AIR SAMPLERS (HVAS)

HVAS at this facility conform to AS/NZS 3580.9.3:2015, AS/NZS 3580.9.6:2003 and AS/NZS 3580.1.1:2007.

HVAS Total Suspended Particulate analysis results are shown in **Table 4**. PM_{10} Suspended Particulate Matter results are shown in **Table 5**.

Table 4 *Total Suspended Particulates (µg/m³ 0°C 101.3 kPa)*

RUN DATE	TSP (µg/m^3)	SAMPLE NUMBER	FILTER NUMBER	DATE FILTER OFF	TIME FILTER OFF	FIELD TECH	HOURS RUN
01-Nov-16	32	11166880031	9314072	02-Nov-16	15:40	Client	24.00
07-Nov-16	25	11166880033	9314074	08-Nov-16	16:20	Client	24.00
13-Nov-16	32	11166880035	9314076	17-Nov-16	18:25	Client	24.00
19-Nov-16	29	11166880037	9314078	22-Nov-16	6:25	Client	24.00
25-Nov-16	22	11166880039	9326499	29-Nov-16	12:00	Client	24.00

Table 5 *Suspended Particulate Matter PM_{10} ($\mu g/m^3$ 0^oC 101.3 kPa)*

RUN DATE	PM_{10} ($\mu g/m^3$)	SAMPLE NUMBER	FILTER NUMBER	DATE FILTER OFF	TIME FILTER OFF	FIELD TECH	HOURS RUN
01-Nov-16	10	11166880032	9314073	02-Nov-16	15:45	Client	24.00
07-Nov-16	17	11166880034	9314075	08-Nov-16	16:25	Client	24.00
13-Nov-16	11	11166880036	9314077	17-Nov-16	18:30	Client	24.01
19-Nov-16	15	11166880038	9314079	22-Nov-16	6:30	Client	24.00
25-Nov-16	<1*	11166880040	9326500	29-Nov-16	12:05	Client	24.00

* Sample result inaccurate due to piece missing from filter when received.

4.1.1 TSP Summary

The EPA Annual Mean TSP allowable limit is 90µg/m^3. All TSP HVAS results recorded during this monitoring period are in compliance with consent conditions, as the *current rolling annual mean* (from December 2015 to November 2016) for the TSP unit is 19.2µg/m^3, which is well below the allowable limit of 90µg/m^3.

4.1.2 PM_{10} Summary

The EPA 24h Maximum PM_{10} allowable limit is 50µg/m^3. The EPA Annual Mean PM_{10} allowable limit is 30µg/m^3. All PM_{10} HVAS results recorded during this monitoring period conform to consent conditions, as the *current rolling annual mean* for the PM_{10} unit is 9.2µg/m^3, which is below the allowable limit of 30µg/m^3. The 24 hour maximum allowable limit of 50µg/m^3 was not exceeded during the month of November 2016.

4.1.3 Comments

HVAS monitoring locations are shown in **Appendix 1**.
Graphical HVAS results presentations are shown in **Appendix 2**.

4.2 DEPOSITIONAL DUST

Depositional Dust Gauges at this facility conform to AS/NZS 3580.10.1:2003 and AS/NZS 3580.1.1:2007. Depositional Dust monitoring results are shown in **Table 6**.

Table 6 *Depositional Dust Monitoring - Deposited Matter – November 2016*

SAMPLE NUMBER	DEPOSIT GAUGE	DATE SAMPLE STARTED	DATE SAMPLE COMPLETED	NUMBER OF DAYS	NOTES	INSOLUBLE SOLIDS (g/m^2.month)	ASH (g/m^2.month)	COMBUSTIBLE MATTER (g/m^2.month)
11166880021	D1	6/10/2016	7/11/2016	32	RN	-	-	-
11166880022	D2	6/10/2016	7/11/2016	32	I	0.5	0.2	0.3
11166880023	D3	6/10/2016	7/11/2016	32	I	1.2	0.7	0.5
11166880024	D4	6/10/2016	7/11/2016	32	IT	0.5	0.1	0.4
11166880025	D5	6/10/2016	7/11/2016	32	I	0.4	0.1	0.3
11166880026	D6	6/10/2016	7/11/2016	32	I	0.5	0.2	0.3

Glossary of Terms Used in Notes:

I	Insects (eg, Ants, Spiders)	IT	Insects and bird droppings
RN	Invalid sample: bottle and funnel missing		

4.2.1 Allowable Depositional Dust Limits

The EPA Long Term (Annual Average) Dust Limit is $4g/m^2$ per month. All Depositional Dust results during this monitoring period are in compliance with consent conditions. The Annual Average for Dust Gauges D1, D2, D3, D4, D5 and D6 are all less than or equal to $1.1g/m^2$ per month, which is below the allowable Annual Average Long Term Limit of $4g/m^2$ per month.

Depositional Dust monitoring locations are shown in **Appendix 1**. Graphical Depositional Dust results are shown in **Appendix 2**.

5 BLASTING RESULTS

No blasting was undertaken during this month as mining operations have ceased since the end of March 2014.

6 NOISE MONITORING RESULTS

Routine quarterly noise monitoring was not required to be undertaken this month. The next round of quarterly noise monitoring is due to be undertaken January 2017.

7 OPERATIONAL ACTIVITIES

All of the approved minable reserves at the Pine Dale Mine have now been exhausted. Operational mining and the last coal sales ceased as of the end of March 2014.

All former operators have been made redundant; however some statutory positions still remain. Pine Dale Mine has been placed in care and maintenance since April 2014.

8 SUMMARY

During the month of November 2016 environmental monitoring constituents were found to be generally in compliance with EPL 4911.

Standing water levels within the site groundwater bores were compliant with their respective trigger levels. The pH at both site groundwater bores were below the respective lower pH trigger level criteria. The electrical conductivity recorded at P6 exceeded the respective trigger level.

The EPA quarterly surface water monitoring sites were generally compliant with the respective trigger levels. The total suspended solids at the three surface water monitoring sites were found to be below the trigger level. The pH was below the respective trigger level at EPA surface water site Point 2. The pH at surface water site Point 14 was slightly above the upper pH trigger level. The electrical conductivity was below the respective trigger levels at sites Point 2 and Point 14; site Point 3 exceeded the electrical conductivity trigger level.

Rolling annual averages from both the TSP and PM_{10} High Volume Air Samplers are currently well below the EPA Annual Mean TSP and PM_{10} criterion of 90µg/m^3 and 30µg/m^3 respectively.

Currently there are no depositional dust gauge results which are greater than the EPA Long Term (annual average) criteria of 4g/m^2.month based upon a rolling average of the past 12 months.

Pine Dale Mine ceased operation in March 2014 and therefore no blasting occurred at the site.

Please contact the undersigned if you have any queries.

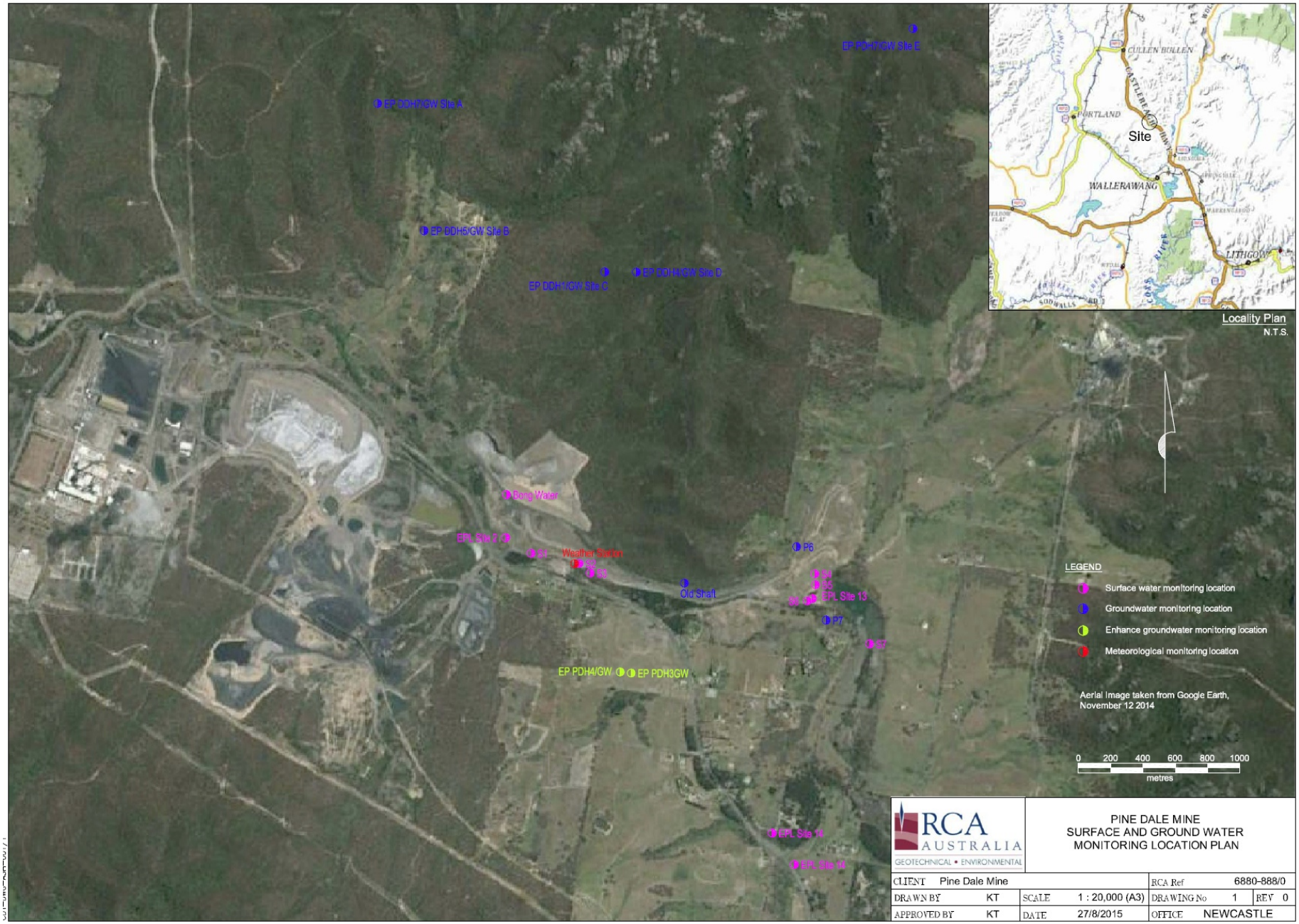
Yours sincerely

Carmen Rocher
Environmental Engineer
RCA Australia Pty Ltd trading as
RCA Laboratories – Environmental

Karen Tripp
Senior Environmental Scientist/Hygienist
RCA Australia Pty Ltd trading as
RCA Laboratories – Environmental

Appendix 1

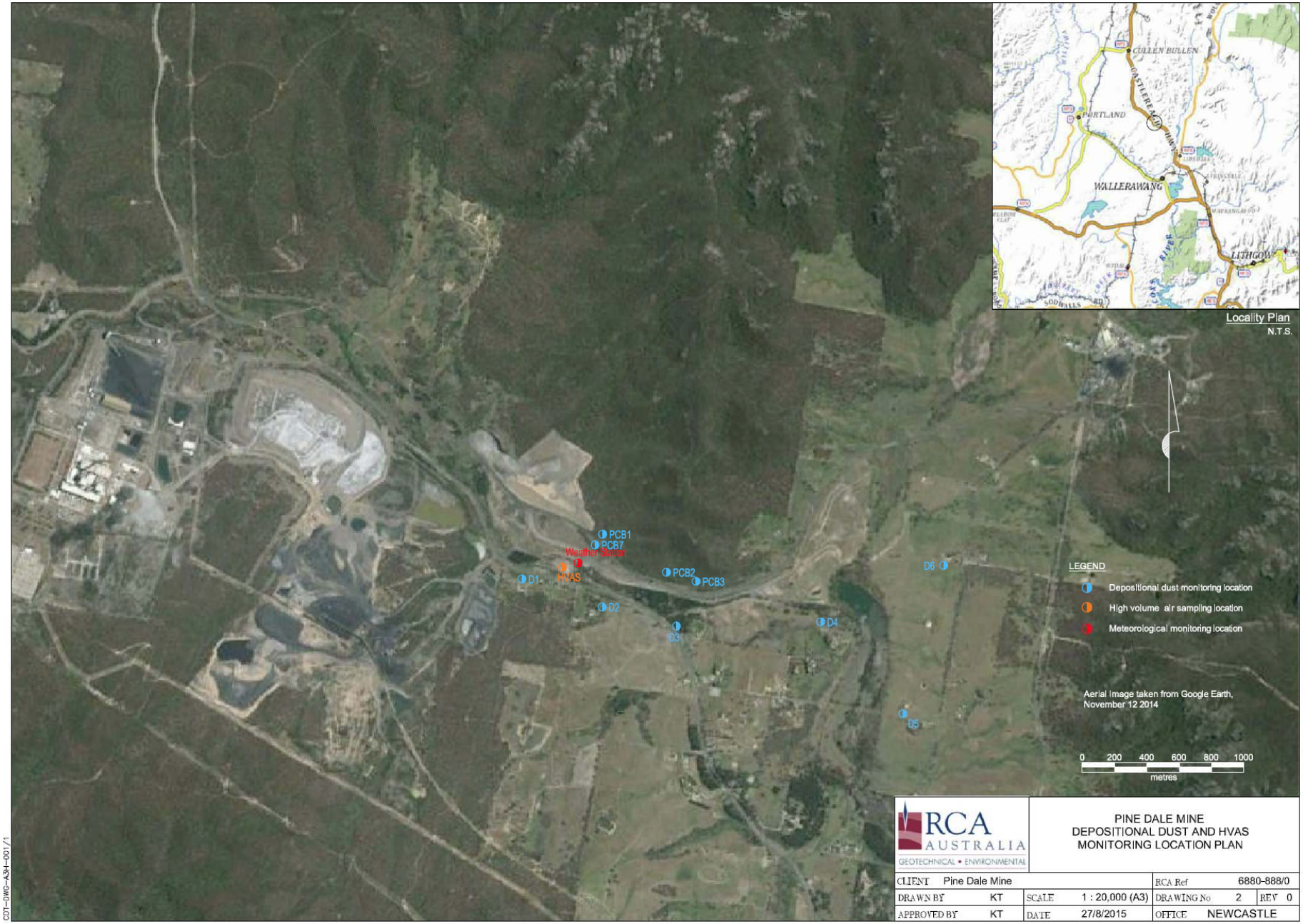
Surface Water Groundwater and Air Quality Monitoring Locations



RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

PINE DALE MINE
SURFACE AND GROUND WATER MONITORING LOCATION PLAN

CLIENT	Pine Dale Mine			RCA Ref	6880-888/0
DRAWN BY	KT	SCALE	1 : 20,000 (A3)	DRAWING No 1	REV 0
APPROVED BY	KT	DATE	27/8/2015	OFFICE	NEWCASTLE

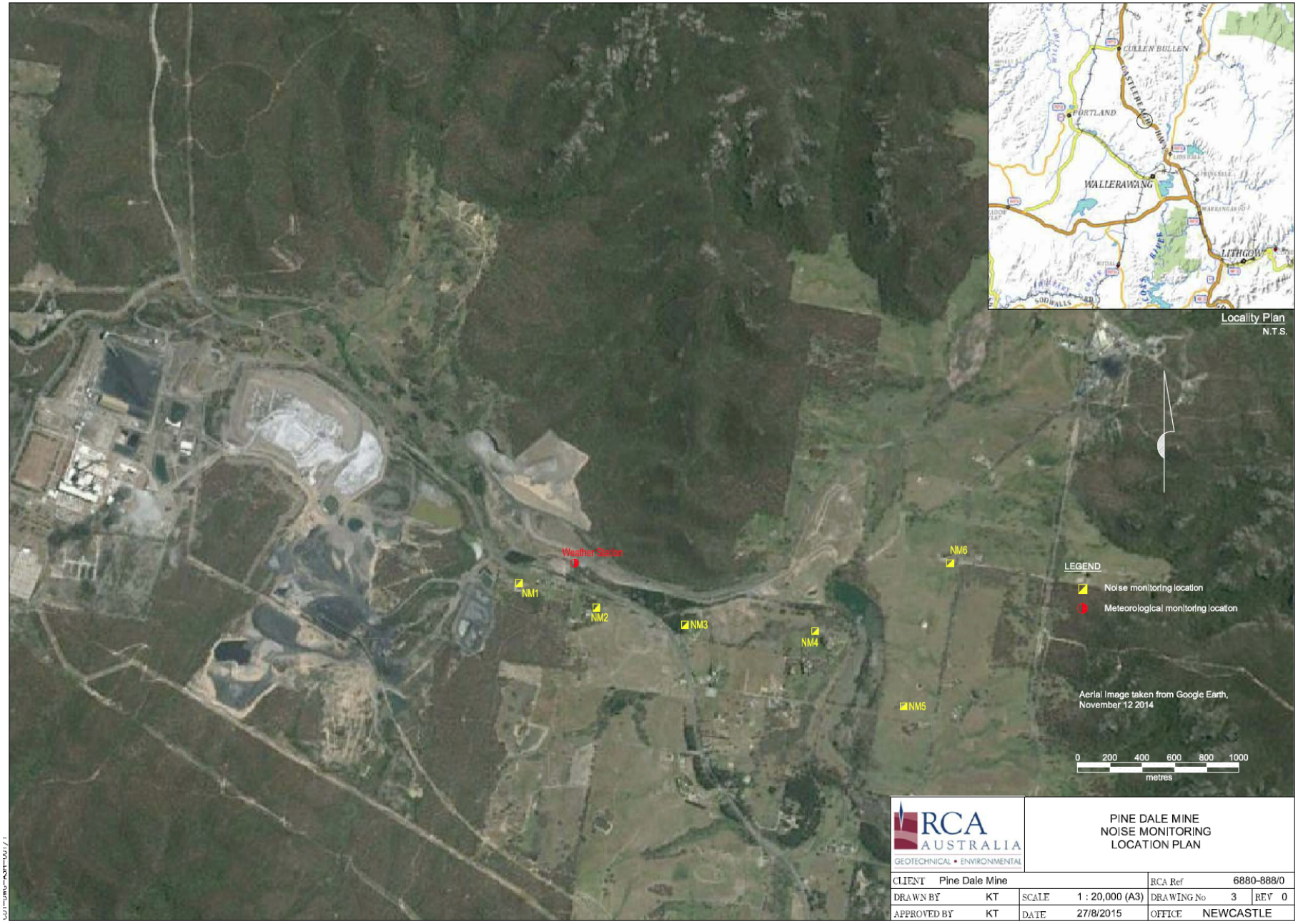


RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

PINE DALE MINE
DEPOSITIONAL DUST AND HVAS
MONITORING LOCATION PLAN

CLIENT	Pine Dale Mine			RCA Ref	6880-888/0
DRAWN BY	KT	SCALE	1 : 20,000 (A3)	DRAWING No	2 REV 0
APPROVED BY	KT	DATE	27/8/2015	OFFICE	NEWCASTLE

CDT-DWG-A3H-001/1



Locality Plan
N.T.S.

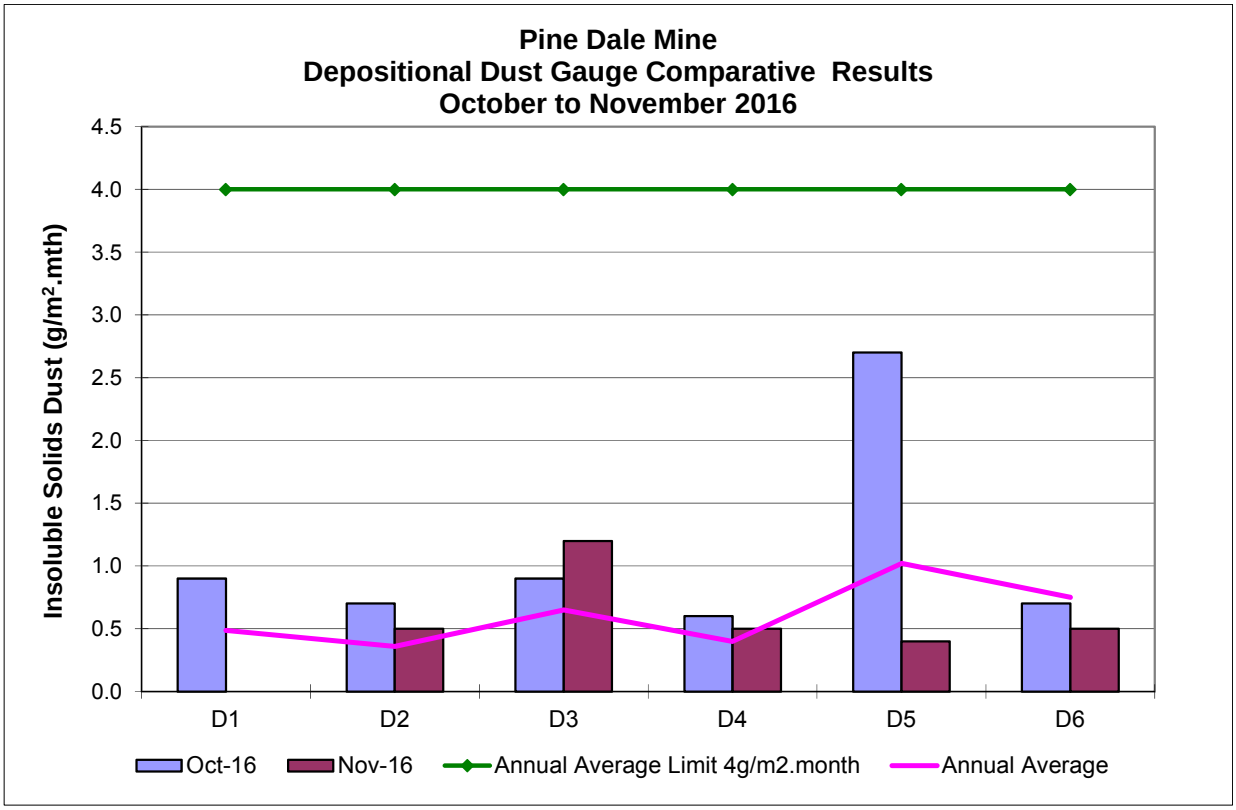
RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

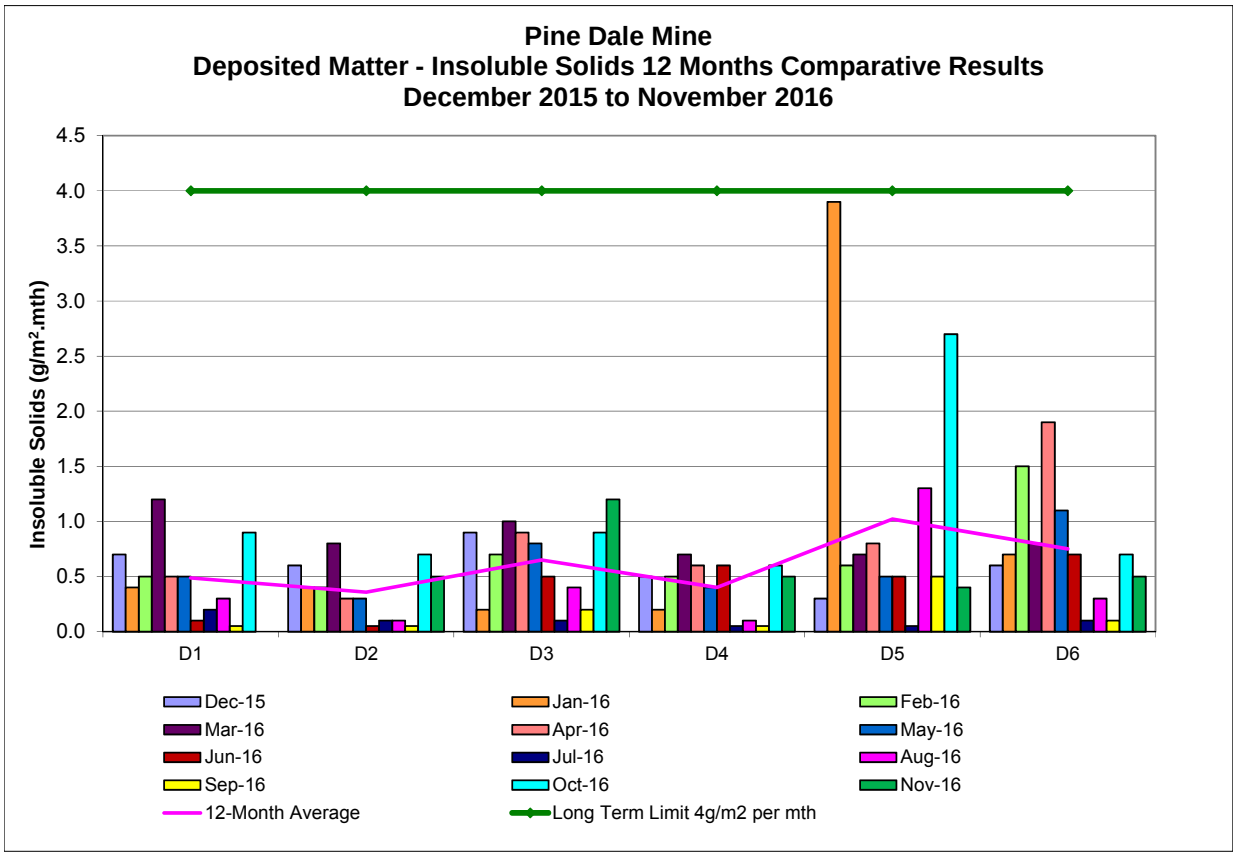
PINE DALE MINE
NOISE MONITORING
LOCATION PLAN

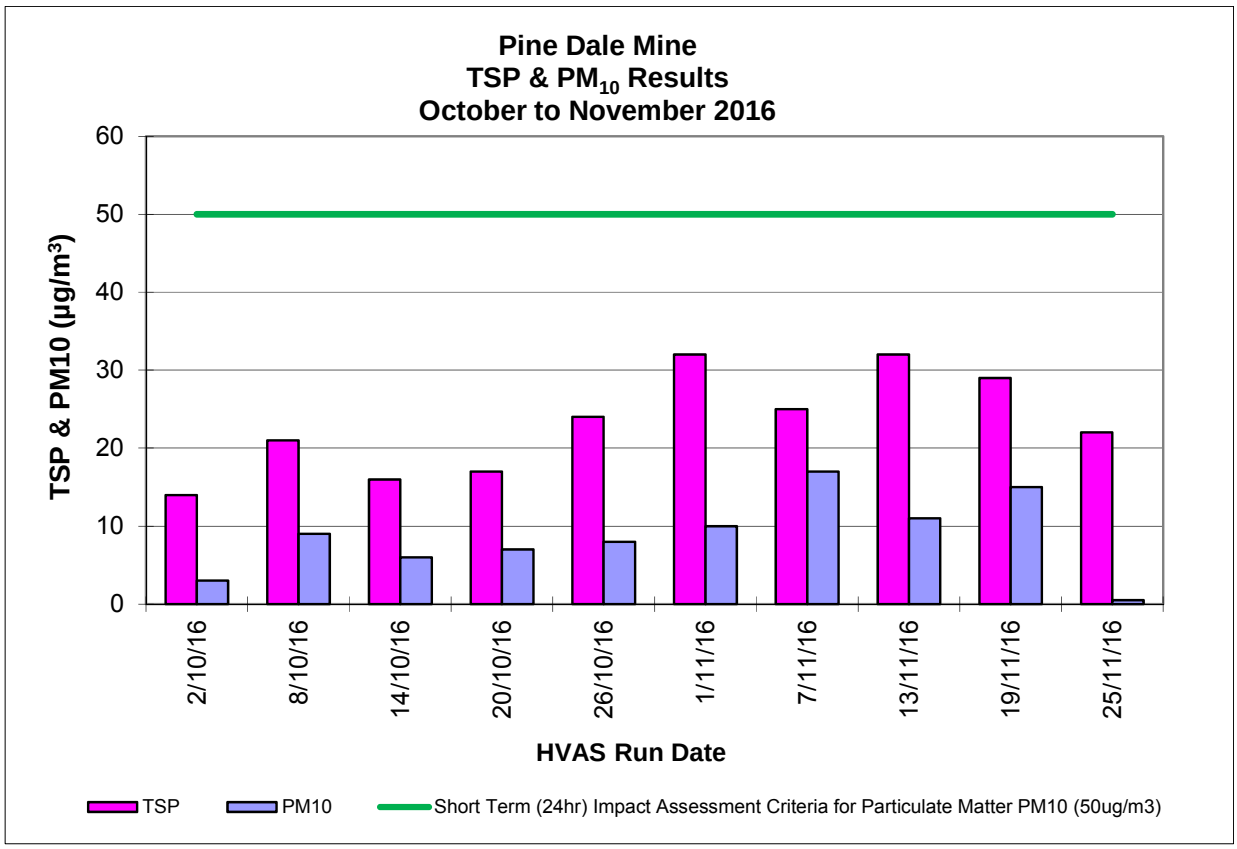
CLIENT	Pine Dale Mine			RCA Ref	6880-888/0
DRAWN BY	KT	SCALE	1 : 20,000 (A3)	DRAWING No 3	REV 0
APPROVED BY	KT	DATE	27/8/2015	OFFICE	NEWCASTLE

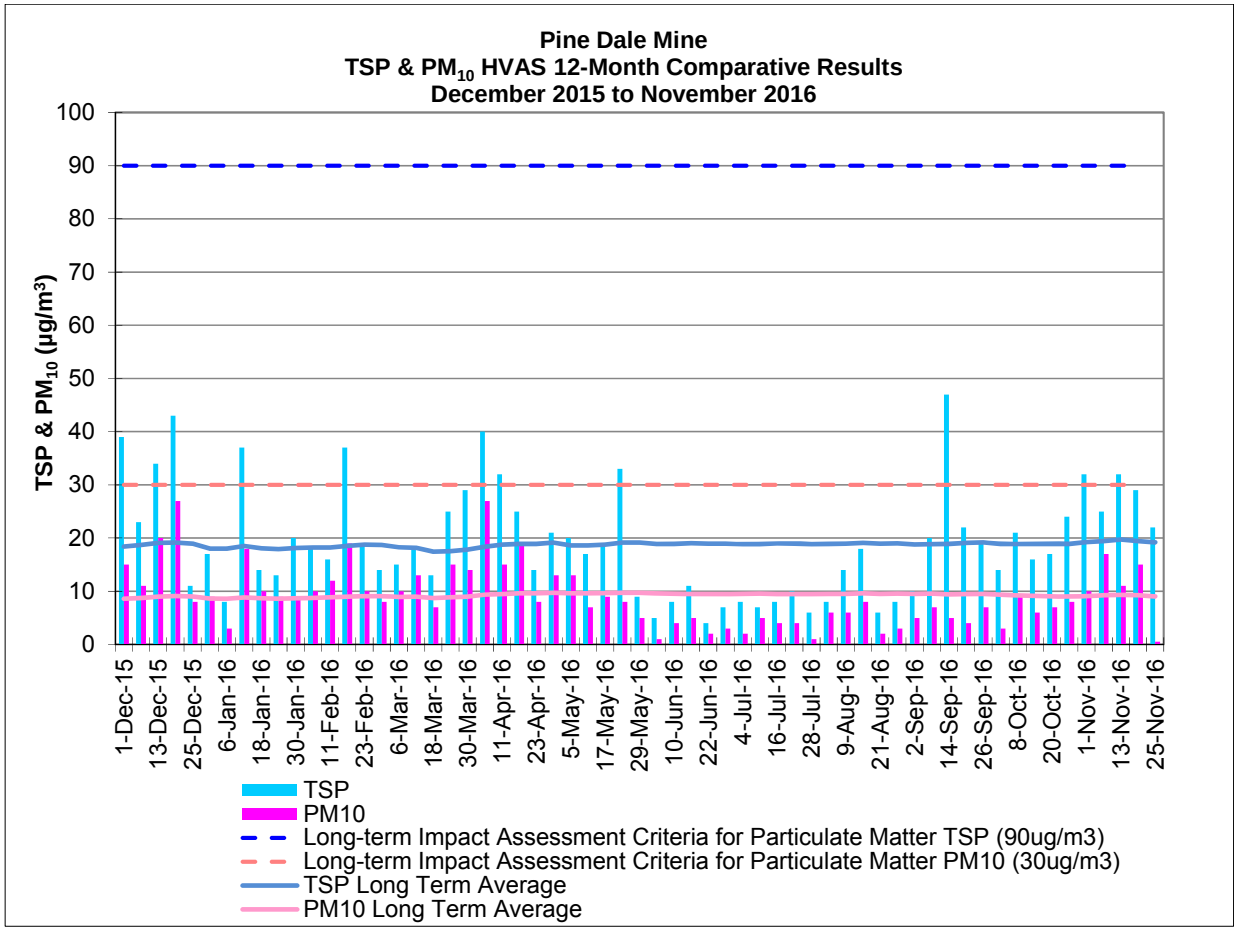
Appendix 2

Depositional Dust and HVAS Graphs


Pine Dale Mine
Depositional Dust Gauge Comparative Results
October to November 2016
Insoluble Solids Dust (g/m².mth)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
D1
D2
D3
D4
D5
D6
Oct-16
Nov-16
Annual Average Limit 4g/m2.month
Annual Average

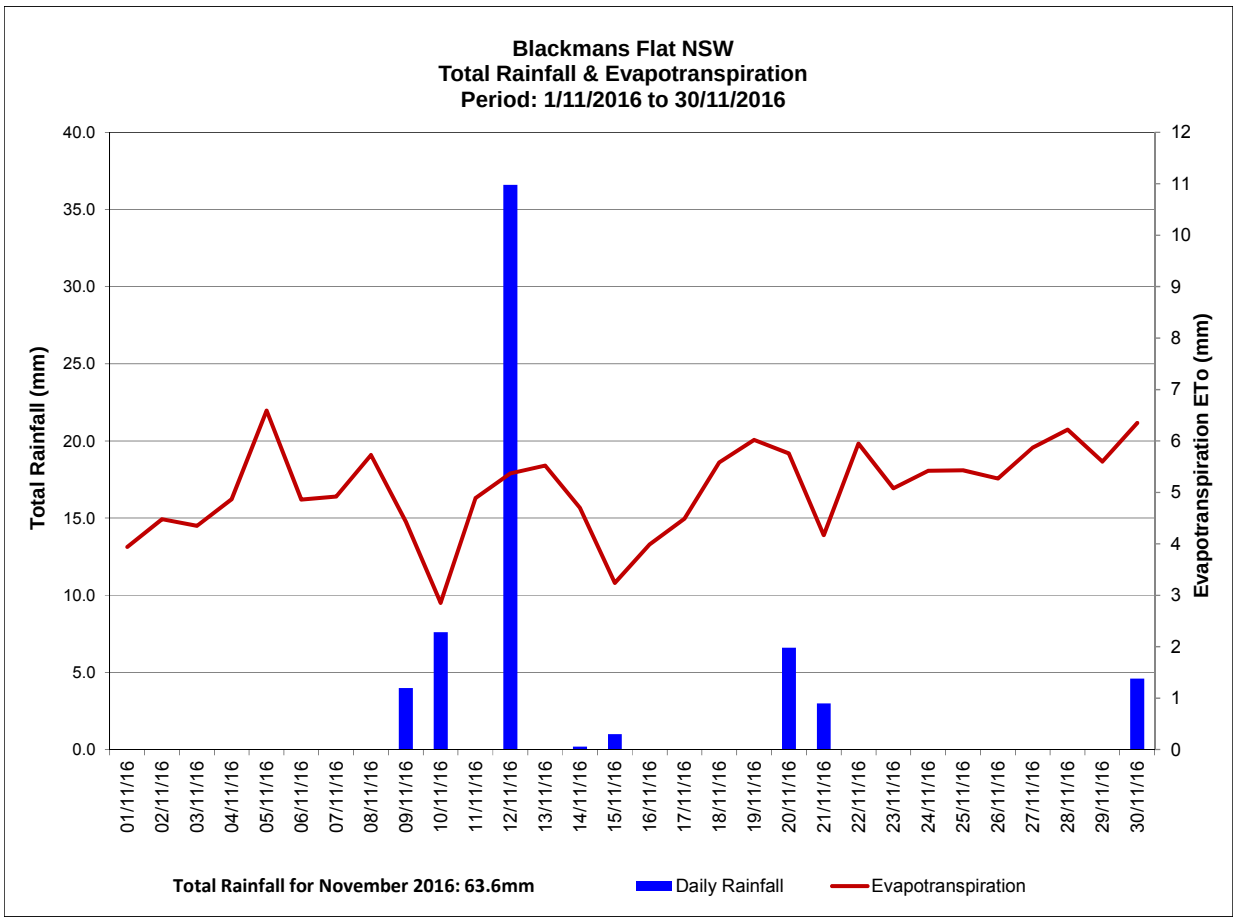

Pine Dale Mine
Deposited Matter - Insoluble Solids 12 Months Comparative Results
December 2015 to November 2016
Insoluble Solids (g/m².mth)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
D1
D2
D3
D4
D5
D6
Dec-15
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
12-Month Average
Long Term Limit 4g/m2 per mth

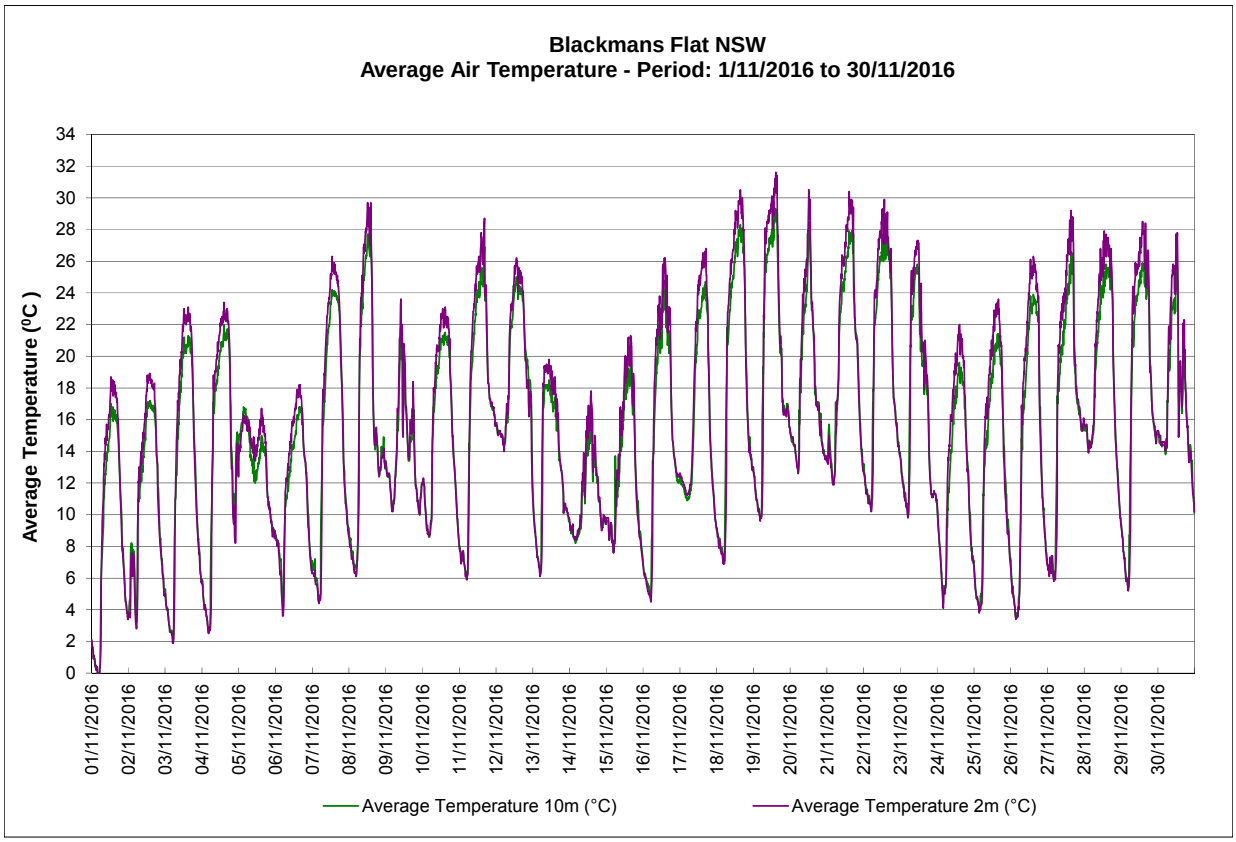

Pine Dale Mine
TSP & PM10 Results
October to November 2016
TSP & PM10 (µg/m³)
60
50
40
30
20
10
0
2/10/16
8/10/16
14/10/16
20/10/16
26/10/16
1/11/16
7/11/16
13/11/16
19/11/16
25/11/16
HVAS Run Date
TSP
PM10
Short Term (24hr) Impact Assessment Criteria for Particulate Matter PM10 (50ug/m3)

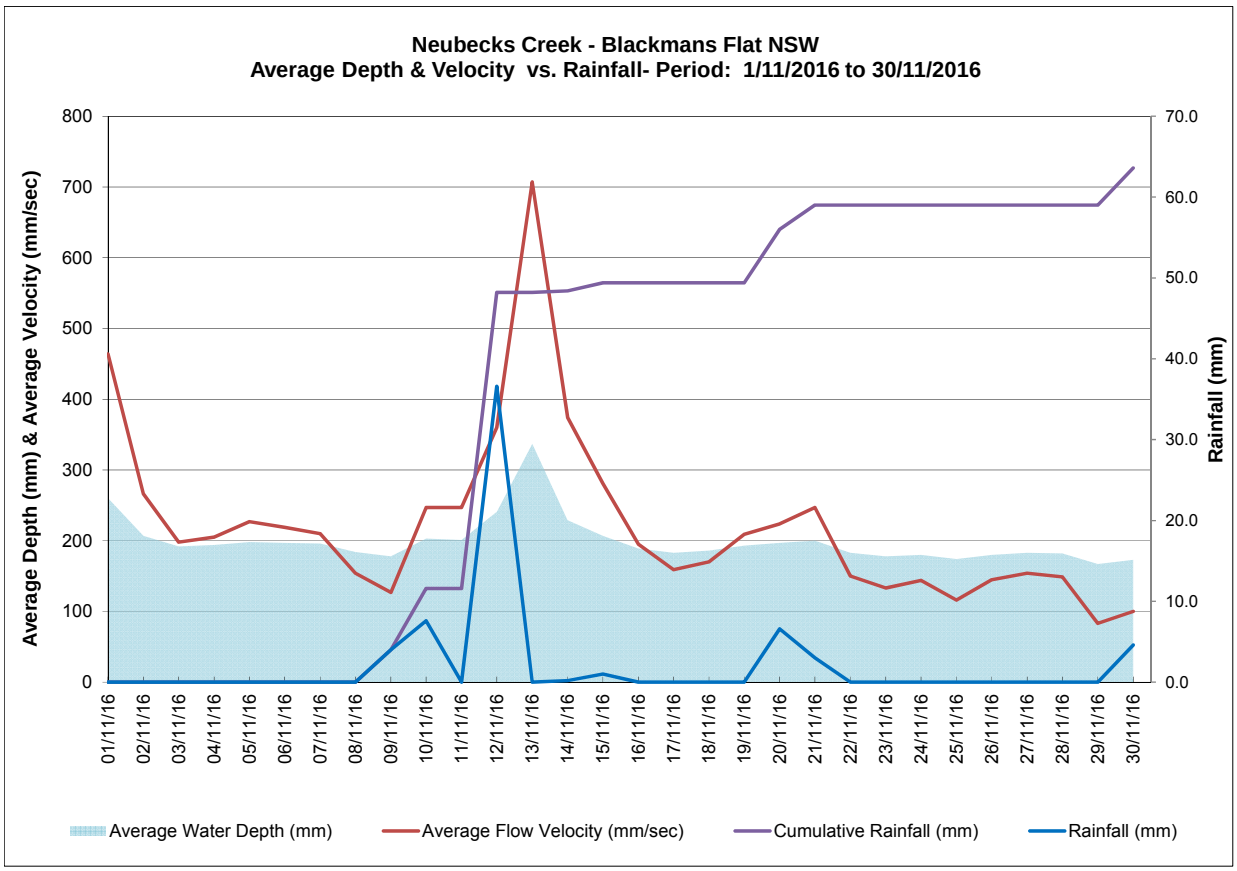

Pine Dale Mine
TSP & PM10 HVAS 12-Month Comparative Results
December 2015 to November 2016
TSP & PM10 (µg/m³)
100
90
80
70
60
50
40
30
20
10
0
1-Dec-15
13-Dec-15
25-Dec-15
6-Jan-16
18-Jan-16
30-Jan-16
11-Feb-16
23-Feb-16
6-Mar-16
18-Mar-16
30-Mar-16
11-Apr-16
23-Apr-16
5-May-16
17-May-16
29-May-16
10-Jun-16
22-Jun-16
4-Jul-16
16-Jul-16
28-Jul-16
9-Aug-16
21-Aug-16
2-Sep-16
14-Sep-16
26-Sep-16
8-Oct-16
20-Oct-16
1-Nov-16
13-Nov-16
25-Nov-16
TSP
PM10
Long-term Impact Assessment Criteria for Particulate Matter TSP (90ug/m3)
Long-term Impact Assessment Criteria for Particulate Matter PM10 (30ug/m3)
TSP Long Term Average
PM10 Long Term Average

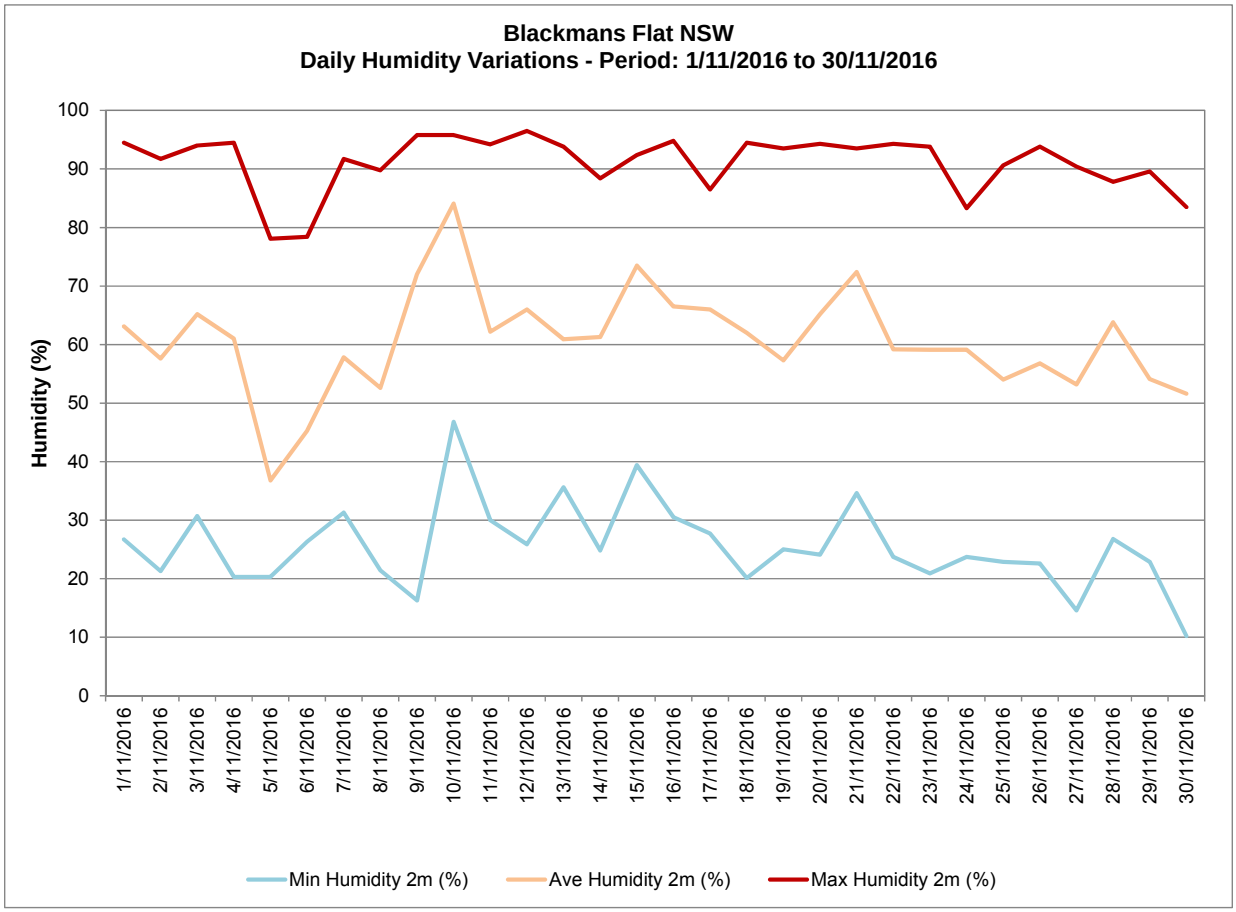
Appendix 3

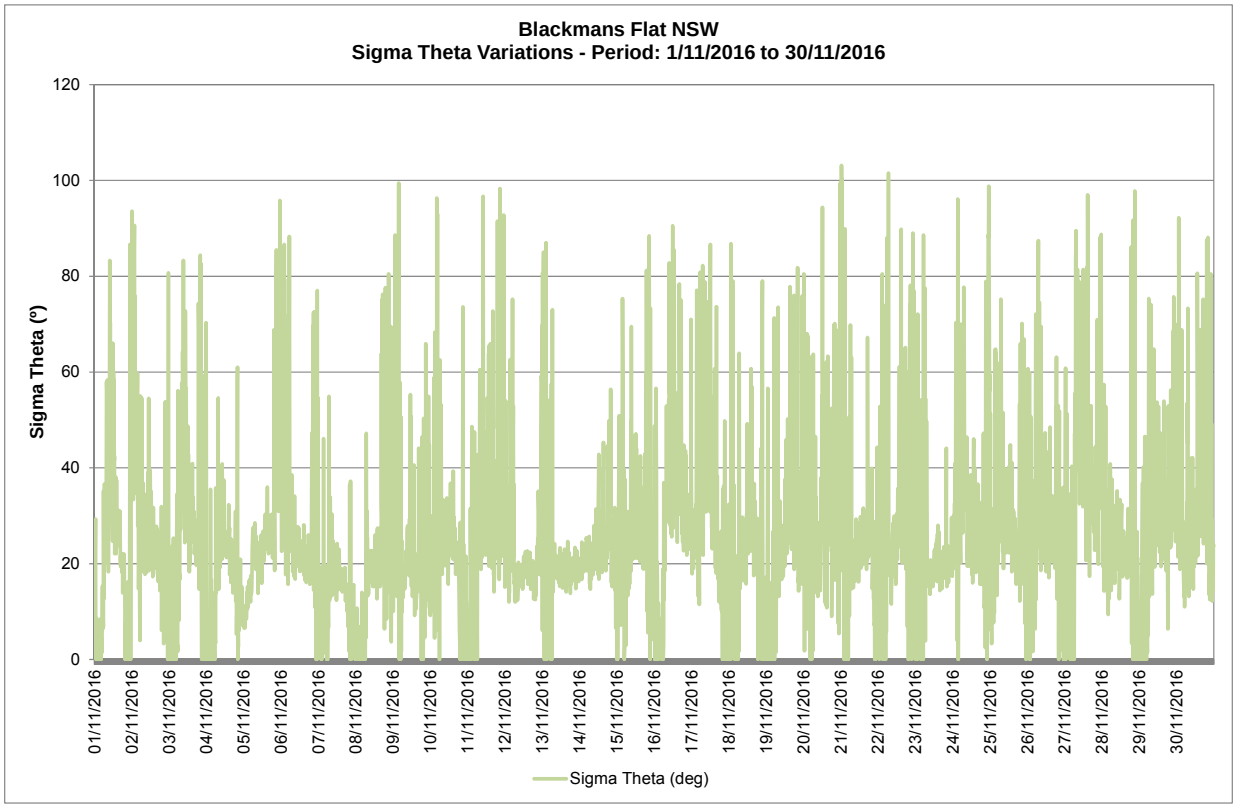
Meteorological Data

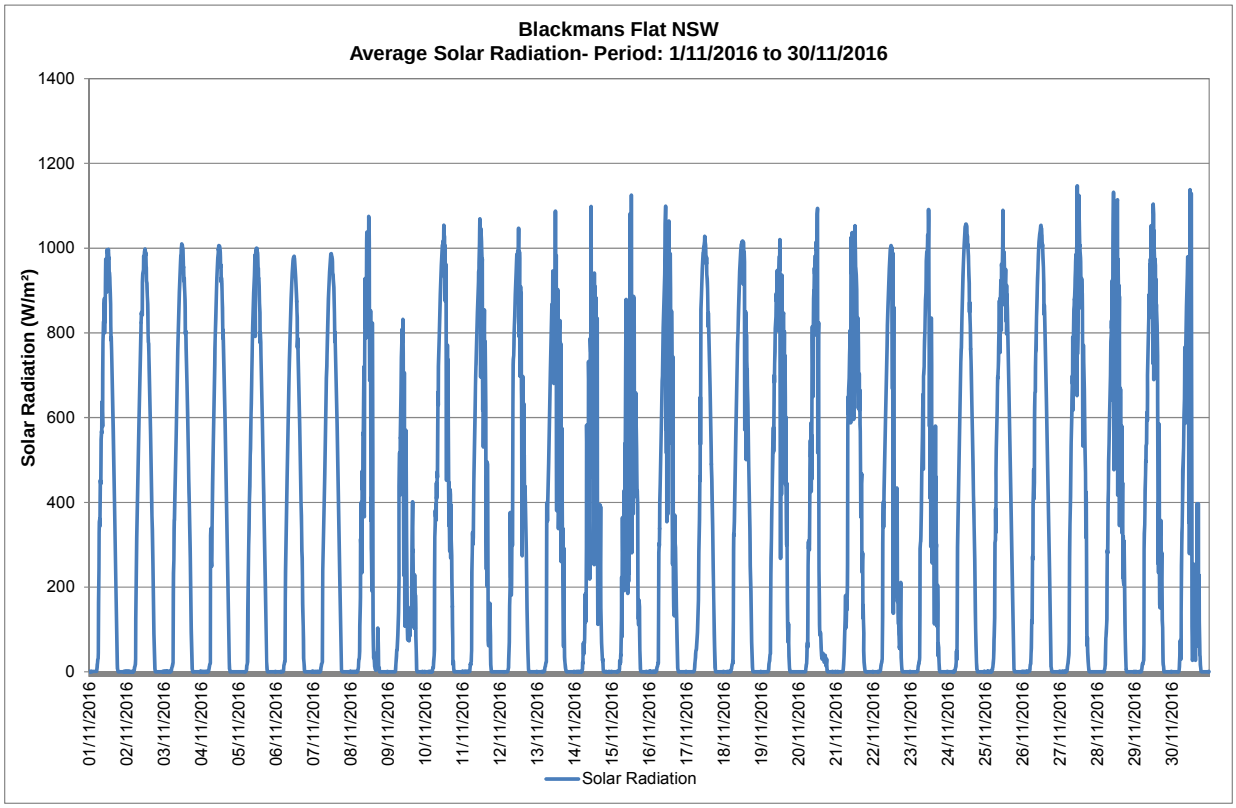

Blackmans Flat NSW
Total Rainfall & Evapotranspiration
Period: 1/11/2016 to 30/11/2016
Total Rainfall (mm)
Evapotranspiration ETo (mm)
Total Rainfall for November 2016: 63.6mm
Daily Rainfall
Evapotranspiration

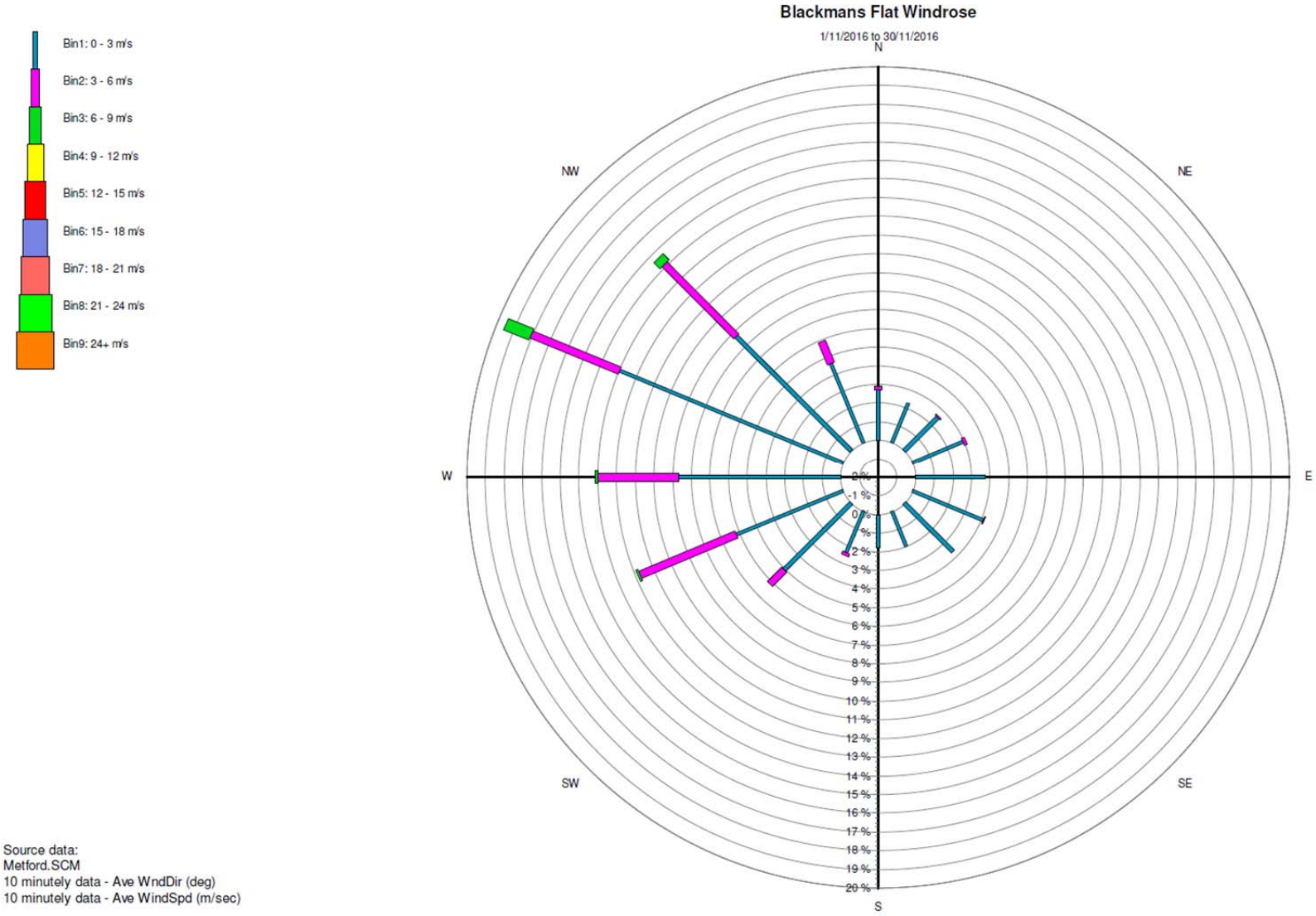

Blackmans Flat NSW
Average Air Temperature - Period: 1/11/2016 to 30/11/2016
Average Temperature (ºC)
Average Temperature 10m (°C)
Average Temperature 2m (°C)


Neubecks Creek - Blackmans Flat NSW
Average Depth & Velocity vs. Rainfall- Period: 1/11/2016 to 30/11/2016
Average Depth (mm) & Average Velocity (mm/sec)
Rainfall (mm)
800
700
600
500
400
300
200
100
0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
01/11/16
02/11/16
03/11/16
04/11/16
05/11/16
06/11/16
07/11/16
08/11/16
09/11/16
10/11/16
11/11/16
12/11/16
13/11/16
14/11/16
15/11/16
16/11/16
17/11/16
18/11/16
19/11/16
20/11/16
21/11/16
22/11/16
23/11/16
24/11/16
25/11/16
26/11/16
27/11/16
28/11/16
29/11/16
30/11/16
Average Water Depth (mm)
Average Flow Velocity (mm/sec)
Cumulative Rainfall (mm)
Rainfall (mm)


Blackmans Flat NSW
Daily Humidity Variations - Period: 1/11/2016 to 30/11/2016
Humidity (%)
100
90
80
70
60
50
40
30
20
10
0
1/11/2016
2/11/2016
3/11/2016
4/11/2016
5/11/2016
6/11/2016
7/11/2016
8/11/2016
9/11/2016
10/11/2016
11/11/2016
12/11/2016
13/11/2016
14/11/2016
15/11/2016
16/11/2016
17/11/2016
18/11/2016
19/11/2016
20/11/2016
21/11/2016
22/11/2016
23/11/2016
24/11/2016
25/11/2016
26/11/2016
27/11/2016
28/11/2016
29/11/2016
30/11/2016
Min Humidity 2m (%)
Ave Humidity 2m (%)
Max Humidity 2m (%)


Blackmans Flat NSW
Sigma Theta Variations - Period: 1/11/2016 to 30/11/2016
Sigma Theta (°)
120
100
80
60
40
20
0
01/11/2016
02/11/2016
03/11/2016
04/11/2016
05/11/2016
06/11/2016
07/11/2016
08/11/2016
09/11/2016
10/11/2016
11/11/2016
12/11/2016
13/11/2016
14/11/2016
15/11/2016
16/11/2016
17/11/2016
18/11/2016
19/11/2016
20/11/2016
21/11/2016
22/11/2016
23/11/2016
24/11/2016
25/11/2016
26/11/2016
27/11/2016
28/11/2016
29/11/2016
30/11/2016
Sigma Theta (deg)


Blackmans Flat NSW
Average Solar Radiation- Period: 1/11/2016 to 30/11/2016
Solar Radiation (W/m²)
1400
1200
1000
800
600
400
200
0
01/11/2016
02/11/2016
03/11/2016
04/11/2016
05/11/2016
06/11/2016
07/11/2016
08/11/2016
09/11/2016
10/11/2016
11/11/2016
12/11/2016
13/11/2016
14/11/2016
15/11/2016
16/11/2016
17/11/2016
18/11/2016
19/11/2016
20/11/2016
21/11/2016
22/11/2016
23/11/2016
24/11/2016
25/11/2016
26/11/2016
27/11/2016
28/11/2016
29/11/2016
30/11/2016
Solar Radiation



Source data:
Metford.SCM
10 minutely data - Ave WndDir (deg)
10 minutely data - Ave WindSpd (m/sec)