SURFACE WATER, DEPOSITIONAL DUST, HVAS AND METEOROLOGICAL MONITORING

Prepared for Pine Dale Mine Community Consultative Committee

Prepared by RCA Australia

RCA ref 6880-1757/0

January 2018

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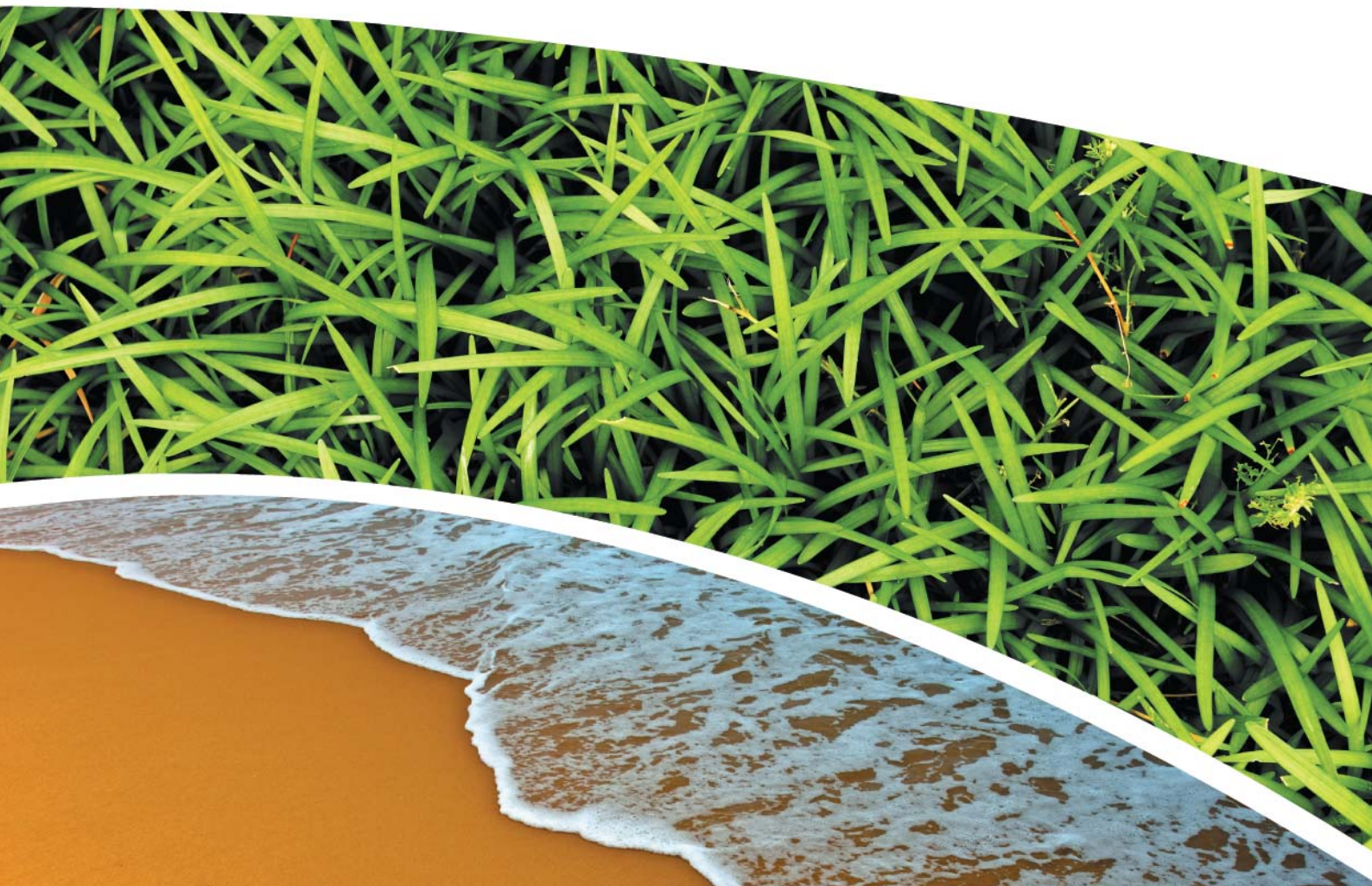

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16 January 2018

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

DECEMBER 2017

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1 GENERAL COMMENTS

Job Number: 6880.

Date Samples Received: During the month of December 2017.

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
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 December 2017. Water quality analysis results are shown in **Table 2**.

Table 2 *Groundwater Analysis Results – Monthly Monitoring*

ANALYSIS	UNITS	P6	P7
Sample Number	-	12176880009	12176880010
Date Sampled	-	11/12/2017	11/12/2017
Time Sampled	-	14:33	15:40
Depth to Water from Surface	m	25.03	6.97
Water Level (AHD)	m	891.92	887.43
Temperature	°C	16.5	16.5
pH	pH	***5.80***	6.31
Conductivity	µS/cm	***1450***	685
Turbidity	NTU	81	
Dissolved Oxygen	mg/L	4.0	
TSS	mg/L	69	
Oil and Grease	mg/L	<5	
Bicarbonate Alkalinity ($CaCO_3$)	mg/L	65	
Total Alkalinity ($CaCO_3$)	mg/L	65	
Sulfate (as SO_4)	mg/L	693	
Chloride	mg/L	36	
Calcium	mg/L	148	
Magnesium	mg/L	59	
Sodium	mg/L	51	
Potassium	mg/L	18	
Cobalt (dissolved)	mg/L	0.089	
Manganese (dissolved)	mg/L	3.07	
Nickel (dissolved)	mg/L	0.15	
Zinc (dissolved)	mg/L	0.054	
Iron (dissolved)	mg/L	46.6	
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 not required to be undertaken during December 2017. The next round of quarterly surface water monitoring is scheduled to be undertaken in February 2018.

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 3580.9.6:2015 and AS/NZS 3580.1.1:2016.

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
02-Dec-17	15	12176880029	9518240	04-Dec-17	8:30	Client	24.00
08-Dec-17	27	12176880031	9518242	11-Dec-17	16:03	K Hawes	24.02
14-Dec-17	49	12176880033	9518244	19-Dec-17	11:00	Client	24.00
20-Dec-17	46	12176880035	9518247	21-Dec-17	6:15	Client	24.00
26-Dec-17	7	12176880037	9518248	29-Dec-17	12:37	Client	24.00

Table 5 *Suspended Particulate Matter PM_{10} (µg/m^3 0^{o}C 101.3 kPa)*

RUN DATE	PM_{10} (µg/m^3)	SAMPLE NUMBER	FILTER NUMBER	DATE FILTER OFF	TIME FILTER OFF	FIELD TECH	HOURS RUN
02-Dec-17	7	12176880030	9518241	04-Dec-17	8:35	Client	24.00
08-Dec-17	11	12176880032	9518243	11-Dec-17	16:07	K Hawes	24.00
14-Dec-17	21	12176880034	9518245	19-Dec-17	11:05	Client	24.00
20-Dec-17	22	12176880036	9518246	21-Dec-17	6:20	Client	24.00
26-Dec-17	5	12176880038	9520037	29-Dec-17	12:43	Client	24.00

4.1.1 TSP Summary

The NSW 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 January to December 2017) for the TSP unit is 19.5µg/m^3, which is well below the allowable limit of 90µg/m^3.

4.1.2 PM_{10} Summary

The NSW EPA 24h Maximum PM_{10} allowable limit is 50µg/m^3. The EPA Annual Mean PM_{10} allowable limit is 25µg/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 9.5µg/m^3, which is below the allowable limit of 25µg/m^3. The 24 hour maximum allowable limit of 50µg/m^3 was not exceeded during the month of December 2017.

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 3580.10.1:2016 and AS/NZS 3580.1.1:2016. Depositional Dust monitoring results are shown in **Table 5**.

Table 3 *Depositional Dust Monitoring - Deposited Matter – December 2017*

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)
12176880019	D1	9/11/2017	11/12/2017	32	IT	0.8	0.4	0.4
12176880020	D2	9/11/2017	11/12/2017	32	I	0.6	0.3	0.3
12176880021	D3	9/11/2017	11/12/2017	32	I	0.9	0.6	0.3
12176880022	D4	9/11/2017	11/12/2017	32	I	0.6	0.1	0.5
12176880023	D5	9/11/2017	11/12/2017	32	I	0.4	0.1	0.3
12176880024	D6	9/11/2017	11/12/2017	32	I	0.1	<0.1	0.1

Glossary of Terms Used in Notes:

I Insects (eg, Ants, Spiders) IT Insects and tree litter

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 0.8g/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 during the January – March 2018 quarter.

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 December 2017 environmental monitoring constituents were found to be generally in compliance with EPL 4911 with the exception of pH and electrical conductivity in groundwater sample P6.

Standing water levels within the site groundwater bores were compliant with their respective trigger levels. All parameters in P7 were compliant with the site specific trigger levels. P6 reported a pH below the lower trigger level range criterion whilst the electrical conductivity exceeded the site specific 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 25µg/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.

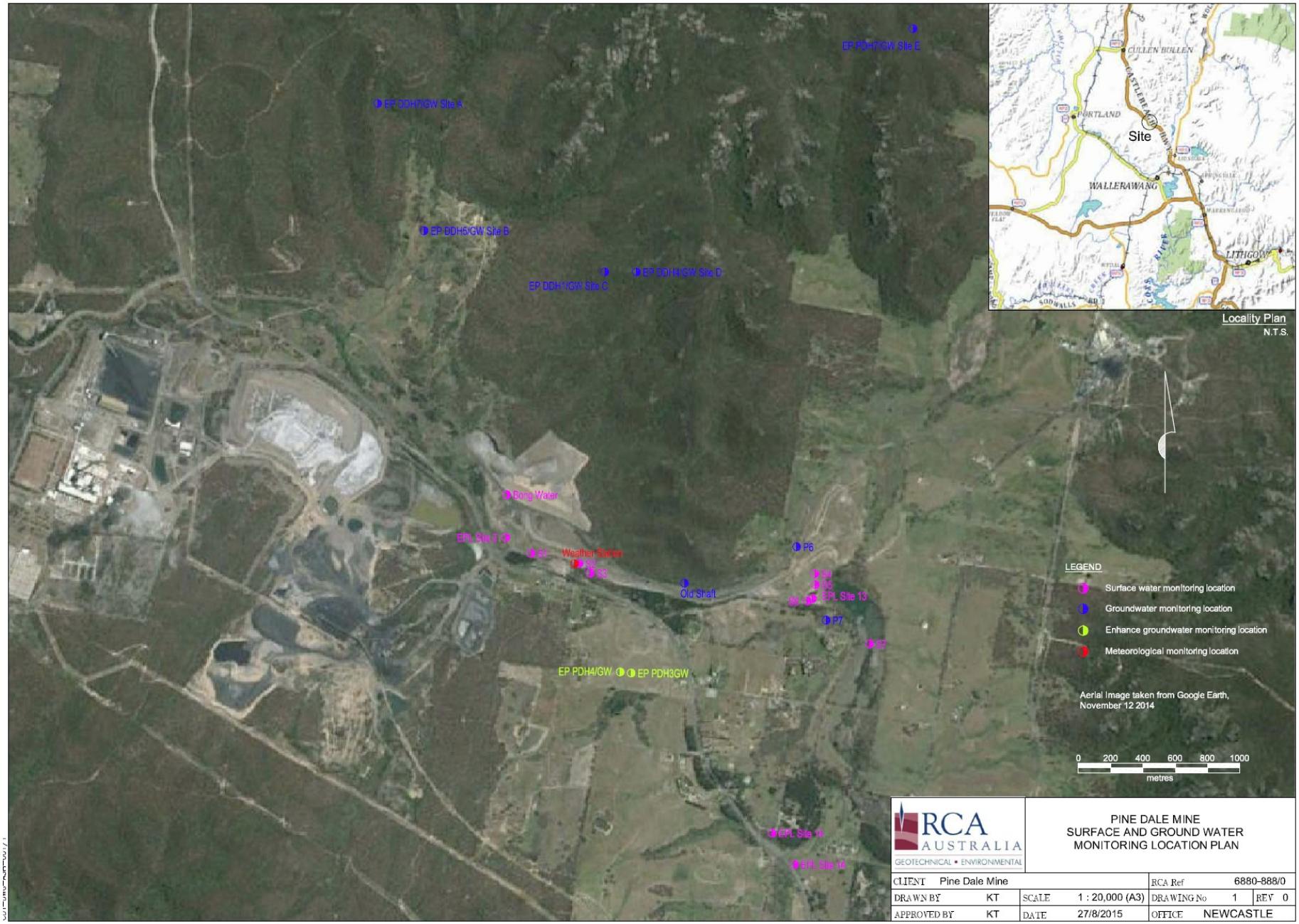
Yours sincerely

Katy Shaw
Environmental Scientist
RCA Australia Pty Ltd

Karen Tripp
Senior Environmental Scientist/Hygienist
RCA Australia Pty Ltd

Appendix 1

Surface Water Groundwater and Air Quality Monitoring Locations



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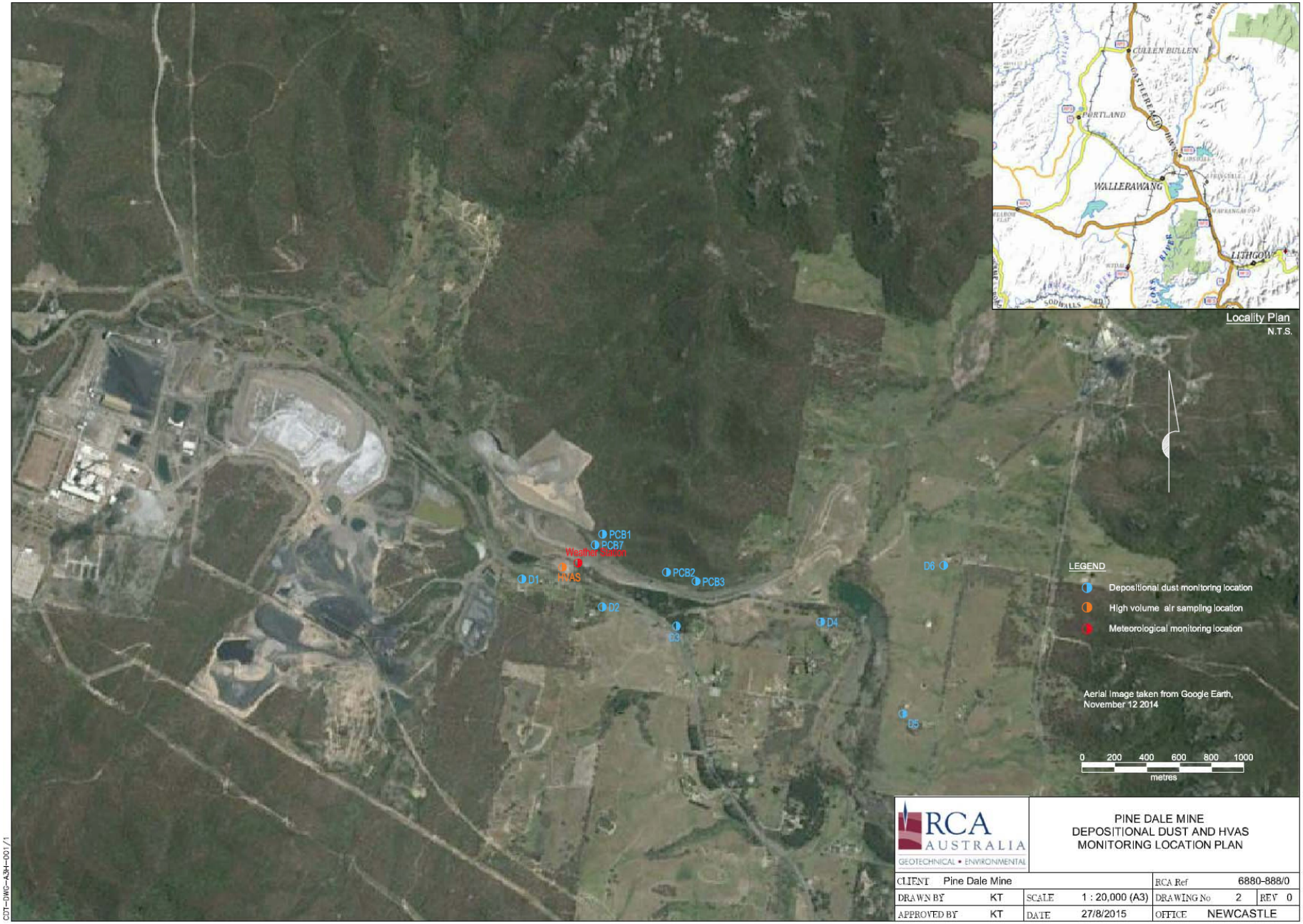
PINE DALE MINE
SURFACE AND GROUND WATER
MONITORING LOCATION PLAN

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



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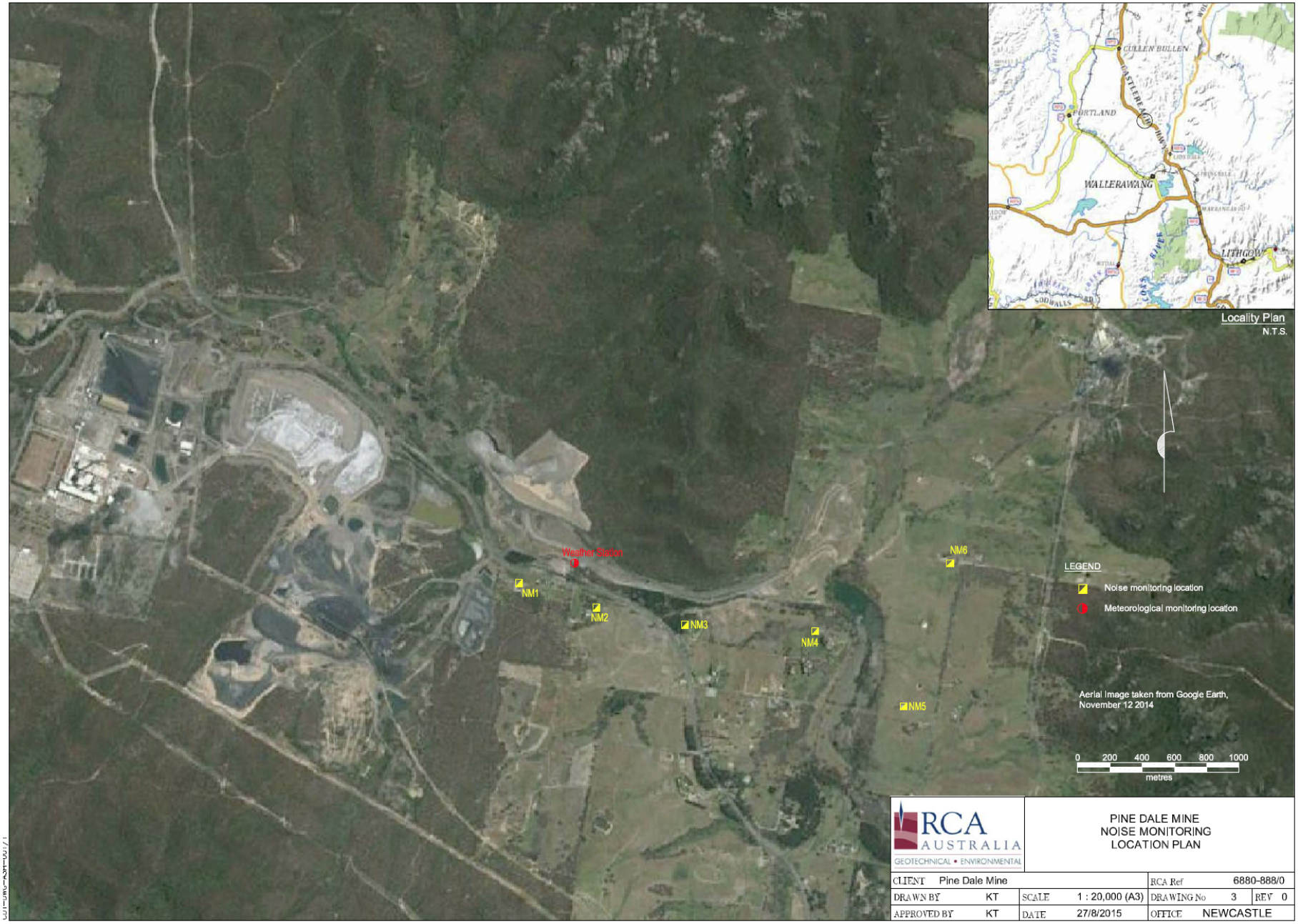
PINE DALE MINE
DEPOSITIONAL DUST AND HVAS
MONITORING LOCATION PLAN

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



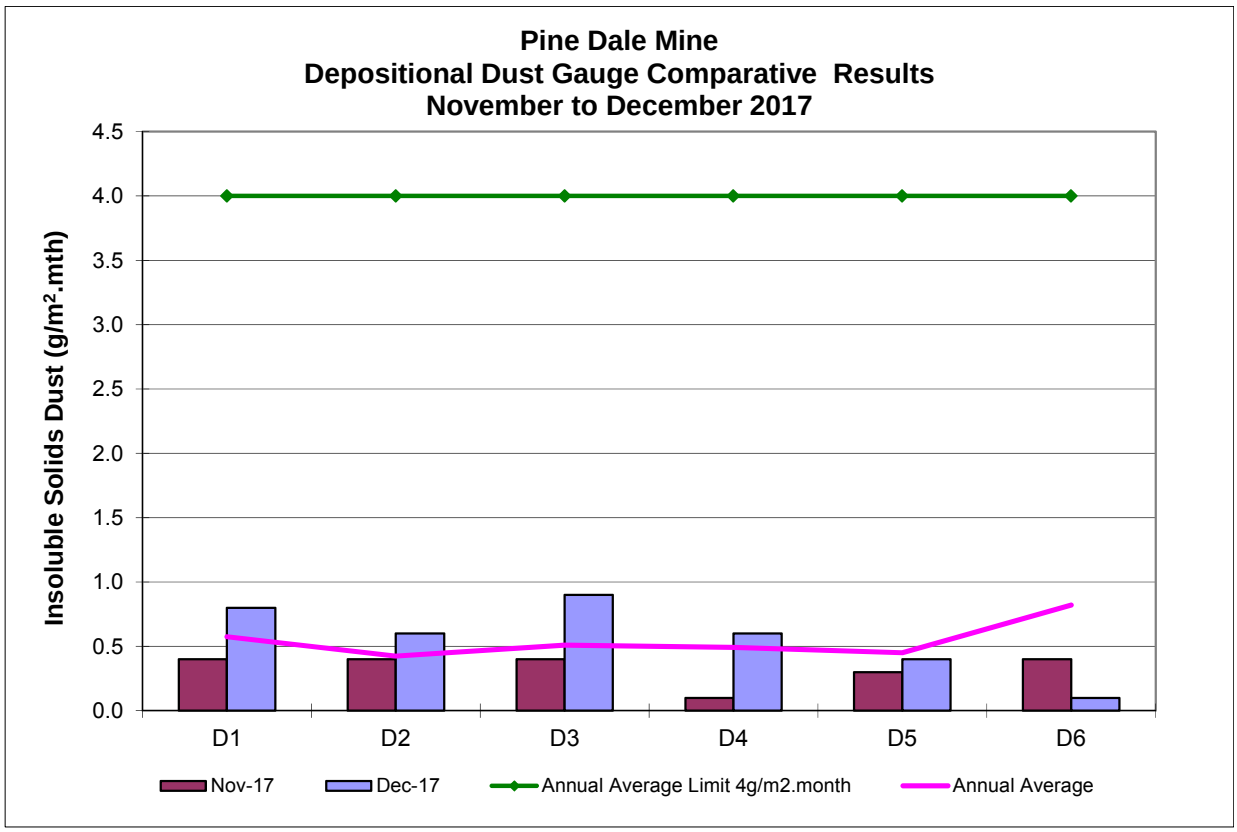
RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

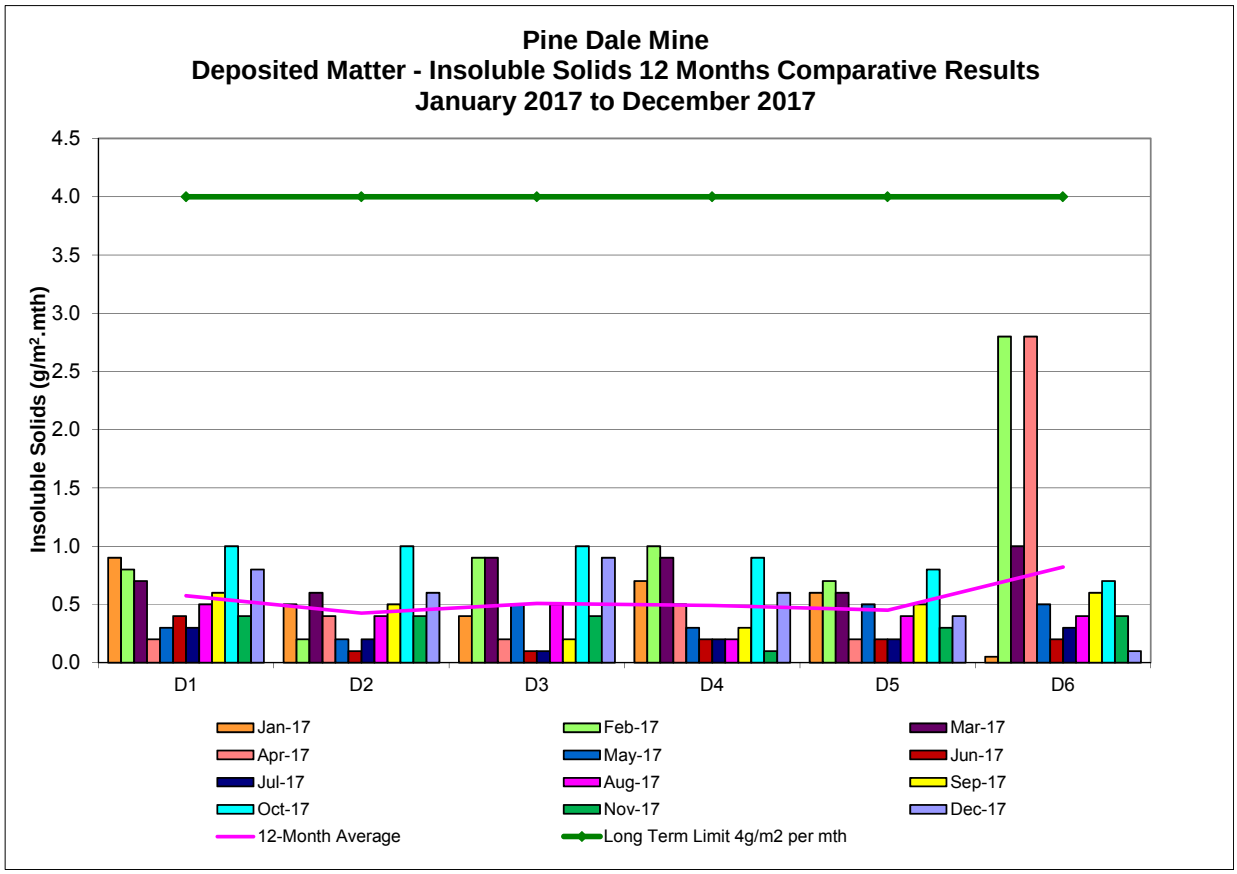
PINE DALE MINE
NOISE MONITORING
LOCATION PLAN

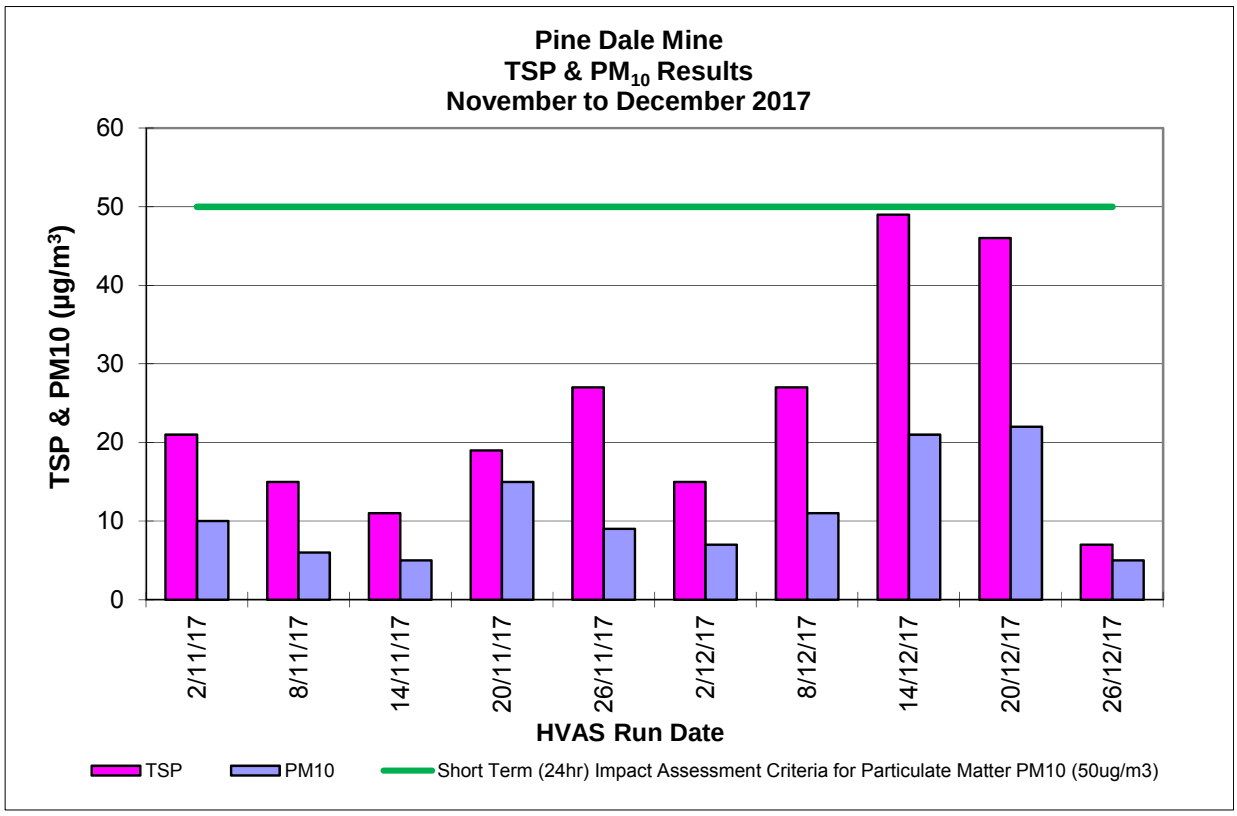
CLIENT	Pine Dale Mine			RCA Ref	6880-888/0
DRAWN BY	KT	SCALE	1 : 20,000 (A3)	DRAWING No 3	REV 0
APPROVED BY	KT	DATE	27/8/2015	OFFICE	NEWCASTLE

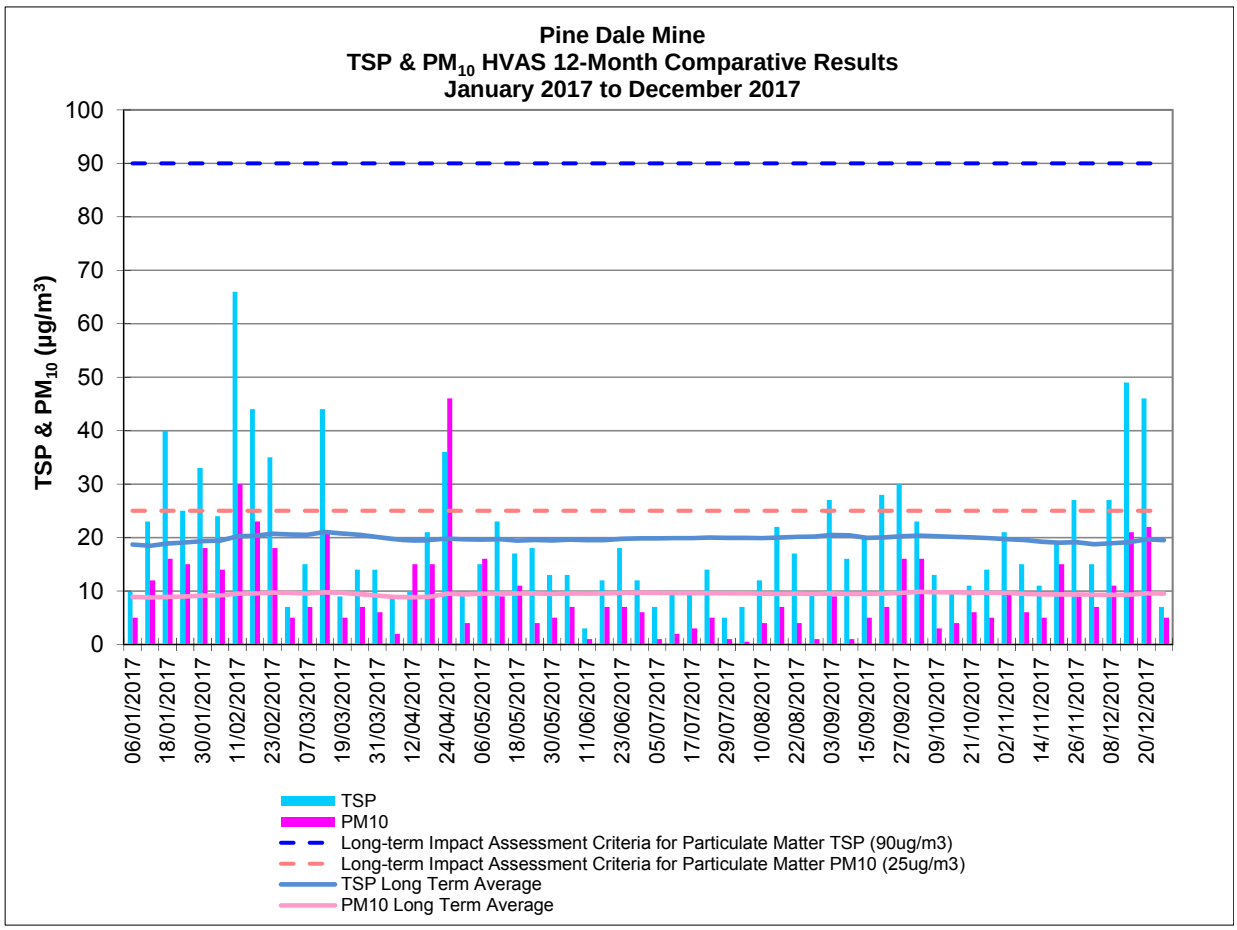
Appendix 2

Depositional Dust and HVAS Graphs


Pine Dale Mine
Depositional Dust Gauge Comparative Results
November to December 2017
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
Nov-17
Dec-17
Annual Average Limit 4g/m2.month
Annual Average

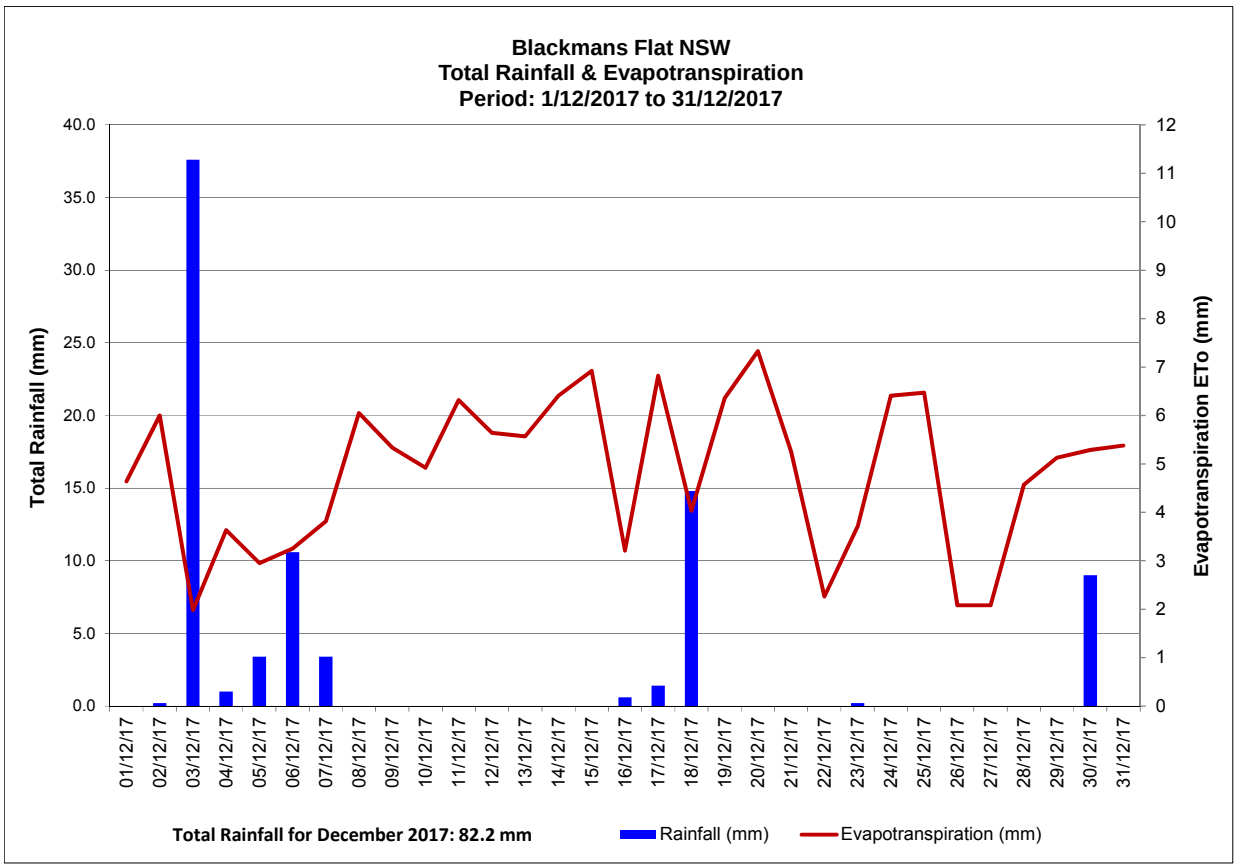

Pine Dale Mine
Deposited Matter - Insoluble Solids 12 Months Comparative Results
January 2017 to December 2017
Insoluble Solids (g/m².mth)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
D1
D2
D3
D4
D5
D6
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
12-Month Average
Long Term Limit 4g/m2 per mth

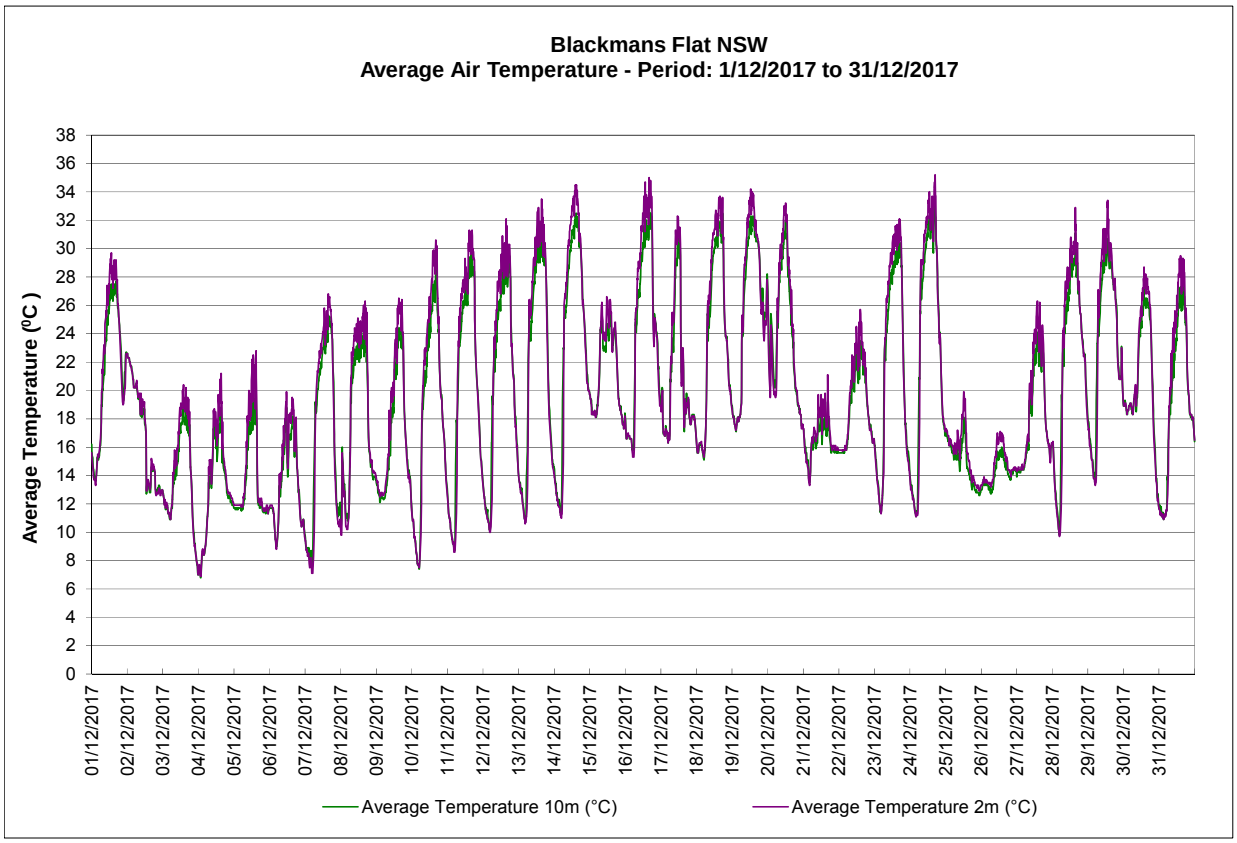

Pine Dale Mine
TSP & PM10 Results
November to December 2017
TSP & PM10 (µg/m³)
60
50
40
30
20
10
0
2/11/17
8/11/17
14/11/17
20/11/17
26/11/17
2/12/17
8/12/17
14/12/17
20/12/17
26/12/17
HVAS Run Date
TSP
PM10
Short Term (24hr) Impact Assessment Criteria for Particulate Matter PM10 (50ug/m3)

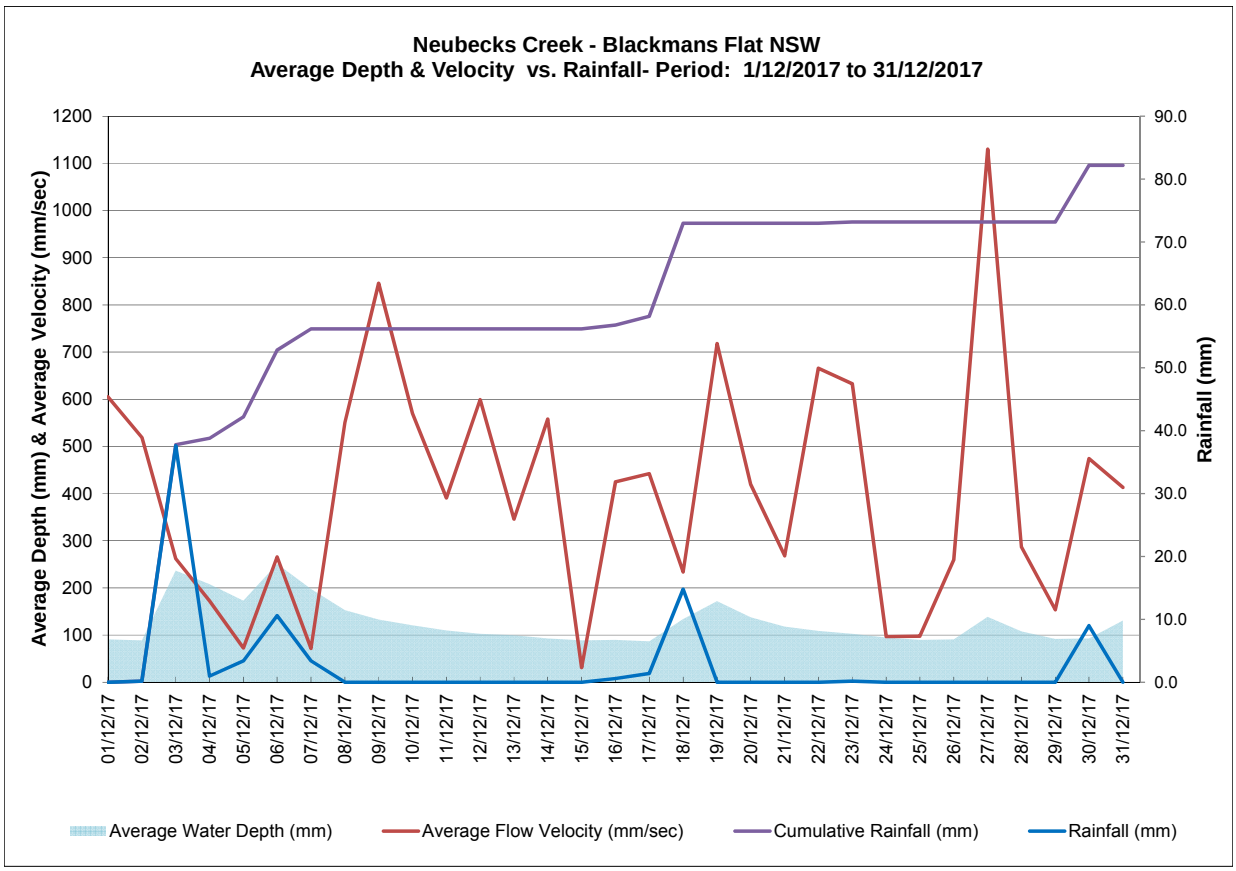

Pine Dale Mine
TSP & PM10 HVAS 12-Month Comparative Results
January 2017 to December 2017
TSP & PM10 (µg/m³)
100
90
80
70
60
50
40
30
20
10
0
06/01/2017
18/01/2017
30/01/2017
11/02/2017
23/02/2017
07/03/2017
19/03/2017
31/03/2017
12/04/2017
24/04/2017
06/05/2017
18/05/2017
30/05/2017
11/06/2017
23/06/2017
05/07/2017
17/07/2017
29/07/2017
10/08/2017
22/08/2017
03/09/2017
15/09/2017
27/09/2017
09/10/2017
21/10/2017
02/11/2017
14/11/2017
26/11/2017
08/12/2017
20/12/2017
TSP
PM10
Long-term Impact Assessment Criteria for Particulate Matter TSP (90ug/m3)
Long-term Impact Assessment Criteria for Particulate Matter PM10 (25ug/m3)
TSP Long Term Average
PM10 Long Term Average

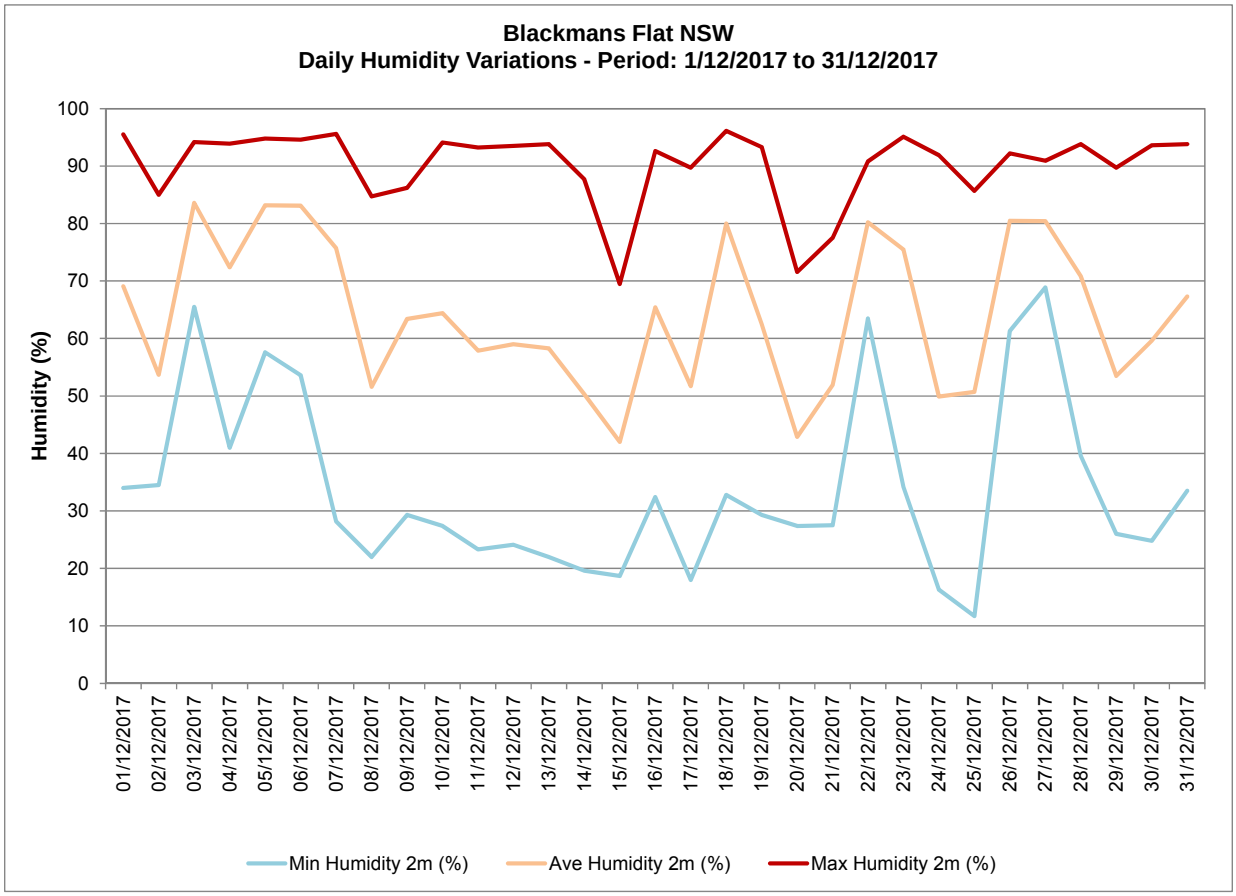
Appendix 3

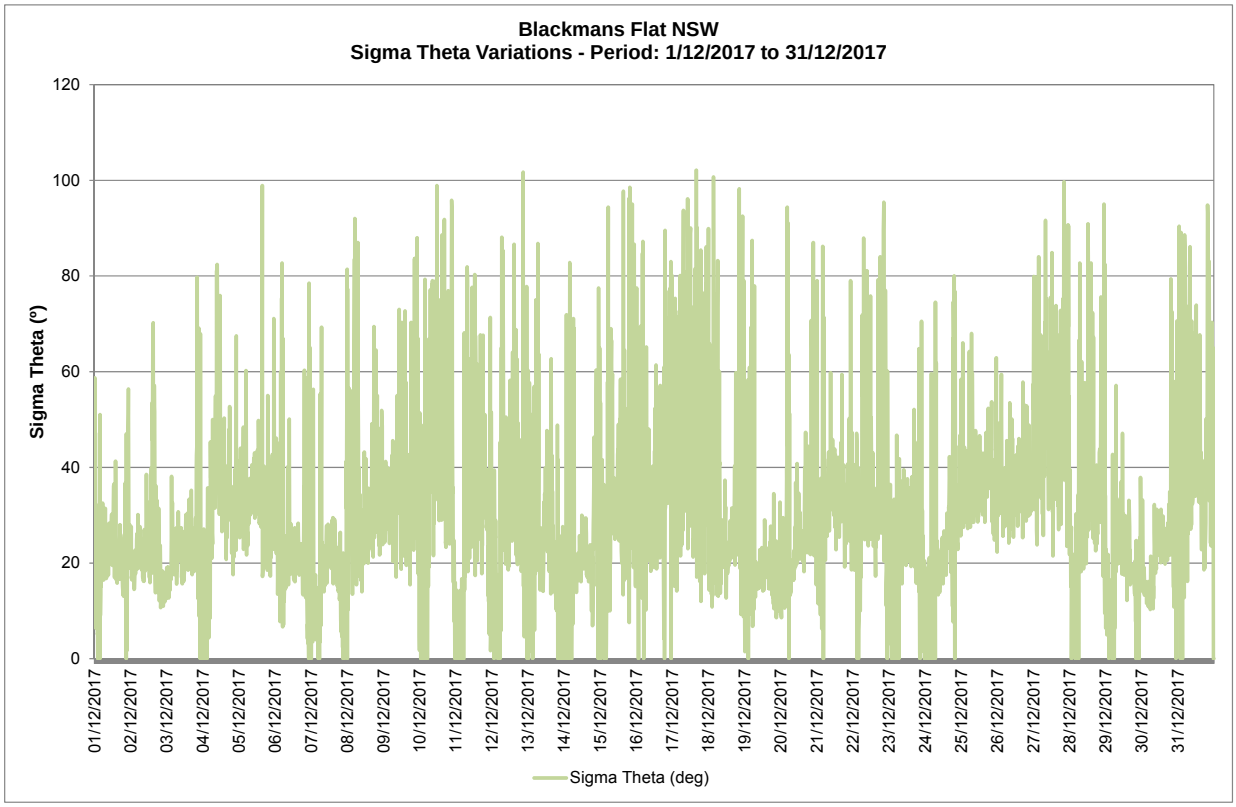
Meteorological Data


Blackmans Flat NSW
Total Rainfall & Evapotranspiration
Period: 1/12/2017 to 31/12/2017
Total Rainfall (mm)
Evapotranspiration ETo (mm)
Total Rainfall for December 2017: 82.2 mm
Rainfall (mm)
Evapotranspiration (mm)


Blackmans Flat NSW
Average Air Temperature - Period: 1/12/2017 to 31/12/2017
Average Temperature (ºC)
Average Temperature 10m (°C)
Average Temperature 2m (°C)


Neubecks Creek - Blackmans Flat NSW
Average Depth & Velocity vs. Rainfall- Period: 1/12/2017 to 31/12/2017
Average Depth (mm) & Average Velocity (mm/sec)
Rainfall (mm)
Average Water Depth (mm)
Average Flow Velocity (mm/sec)
Cumulative Rainfall (mm)
Rainfall (mm)


Blackmans Flat NSW
Daily Humidity Variations - Period: 1/12/2017 to 31/12/2017
Humidity (%)
Min Humidity 2m (%)
Ave Humidity 2m (%)
Max Humidity 2m (%)


Blackmans Flat NSW
Sigma Theta Variations - Period: 1/12/2017 to 31/12/2017
Sigma Theta (°)
120
100
80
60
40
20
0
01/12/2017
02/12/2017
03/12/2017
04/12/2017
05/12/2017
06/12/2017
07/12/2017
08/12/2017
09/12/2017
10/12/2017
11/12/2017
12/12/2017
13/12/2017
14/12/2017
15/12/2017
16/12/2017
17/12/2017
18/12/2017
19/12/2017
20/12/2017
21/12/2017
22/12/2017
23/12/2017
24/12/2017
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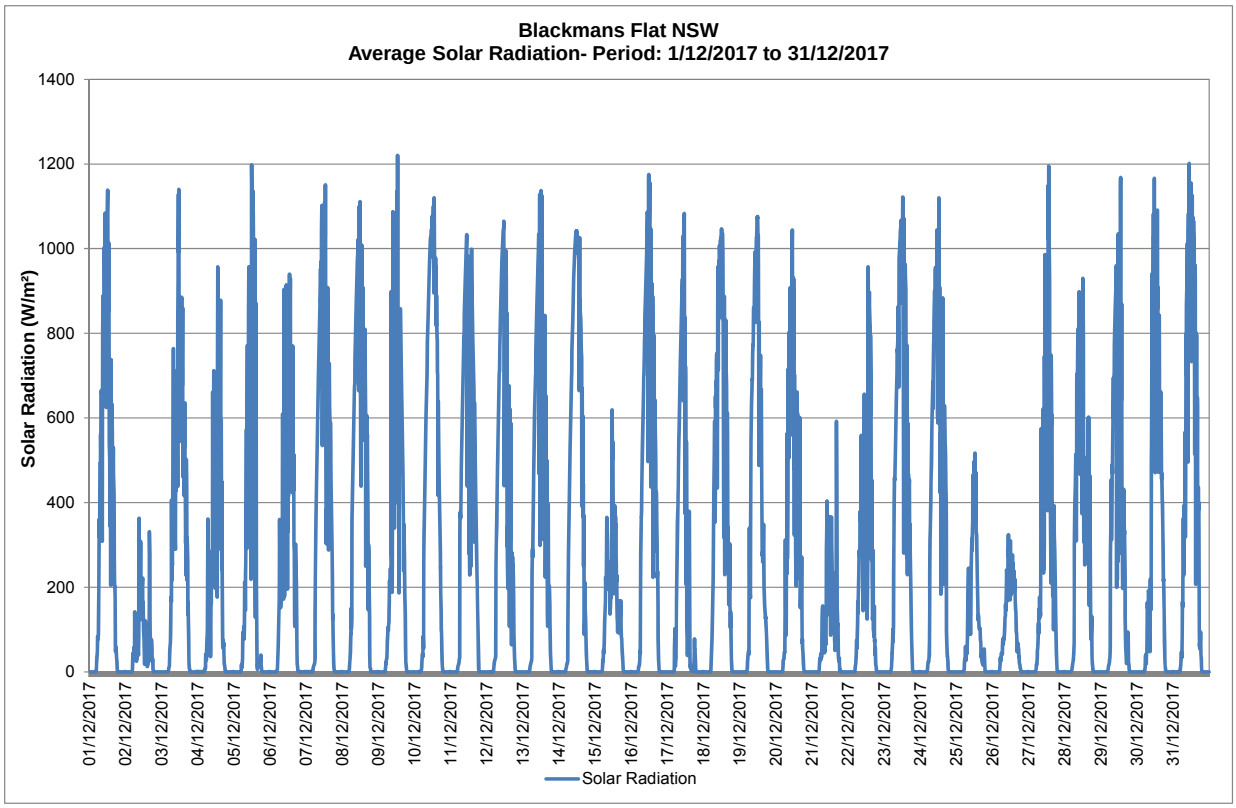
27/12/2017
28/12/2017
29/12/2017
30/12/2017
31/12/2017
Sigma Theta (deg)


Blackmans Flat NSW
Average Solar Radiation- Period: 1/12/2017 to 31/12/2017
Solar Radiation (W/m²)
1400
1200
1000
800
600
400
200
0
01/12/2017
02/12/2017
03/12/2017
04/12/2017
05/12/2017
06/12/2017
07/12/2017
08/12/2017
09/12/2017
10/12/2017
11/12/2017
12/12/2017
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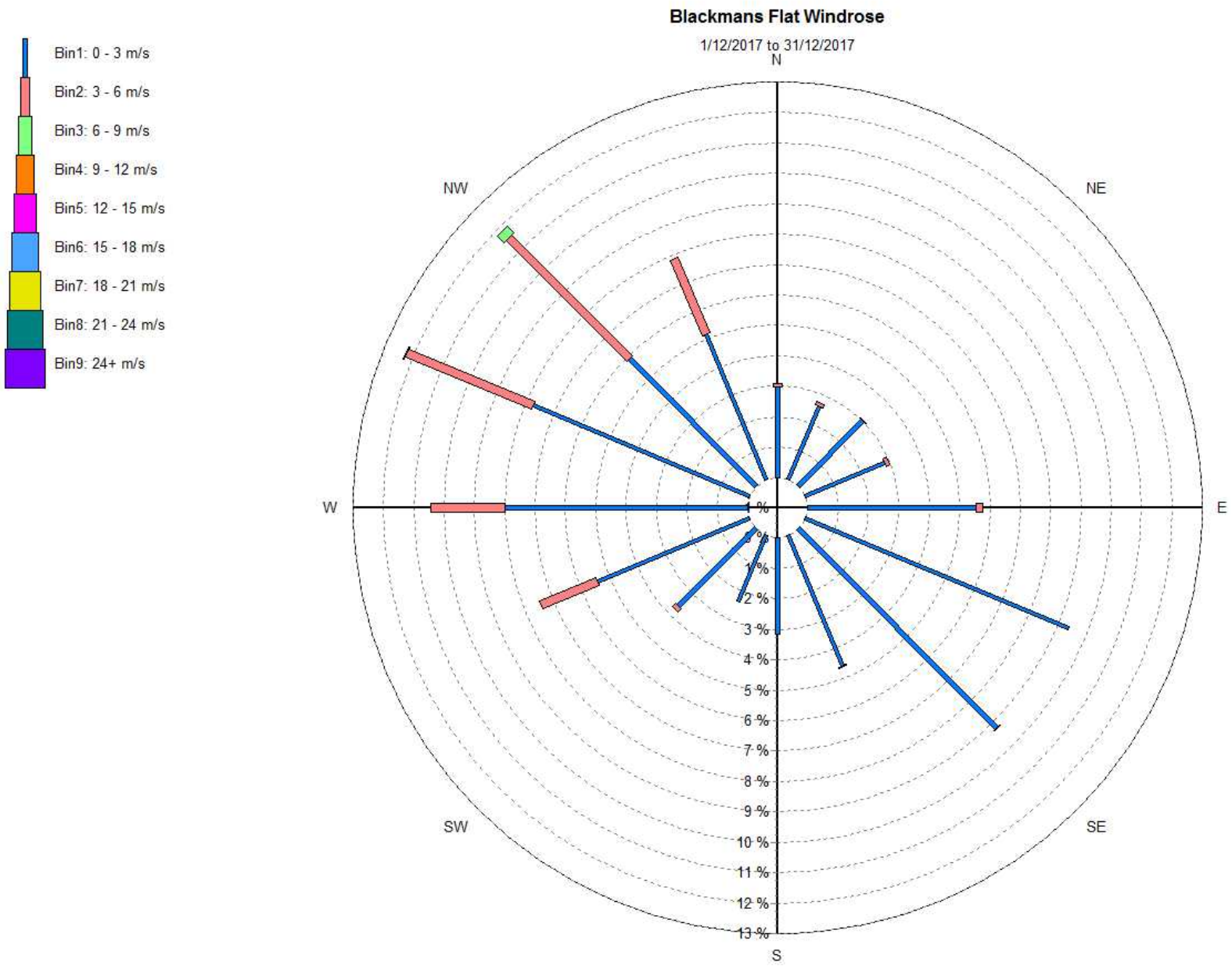
Solar Radiation


Blackmans Flat Windrose
1/12/2017 to 31/12/2017
N
NE
E
SE
S
SW
W
NW
Bin1: 0 - 3 m/s
Bin2: 3 - 6 m/s
Bin3: 6 - 9 m/s
Bin4: 9 - 12 m/s
Bin5: 12 - 15 m/s
Bin6: 15 - 18 m/s
Bin7: 18 - 21 m/s
Bin8: 21 - 24 m/s
Bin9: 24+ m/s
1 %
2 %
3 %
4 %
5 %
6 %
7 %
8 %
9 %
10 %
11 %
12 %
13 %