Monthly Environmental Data December 2016

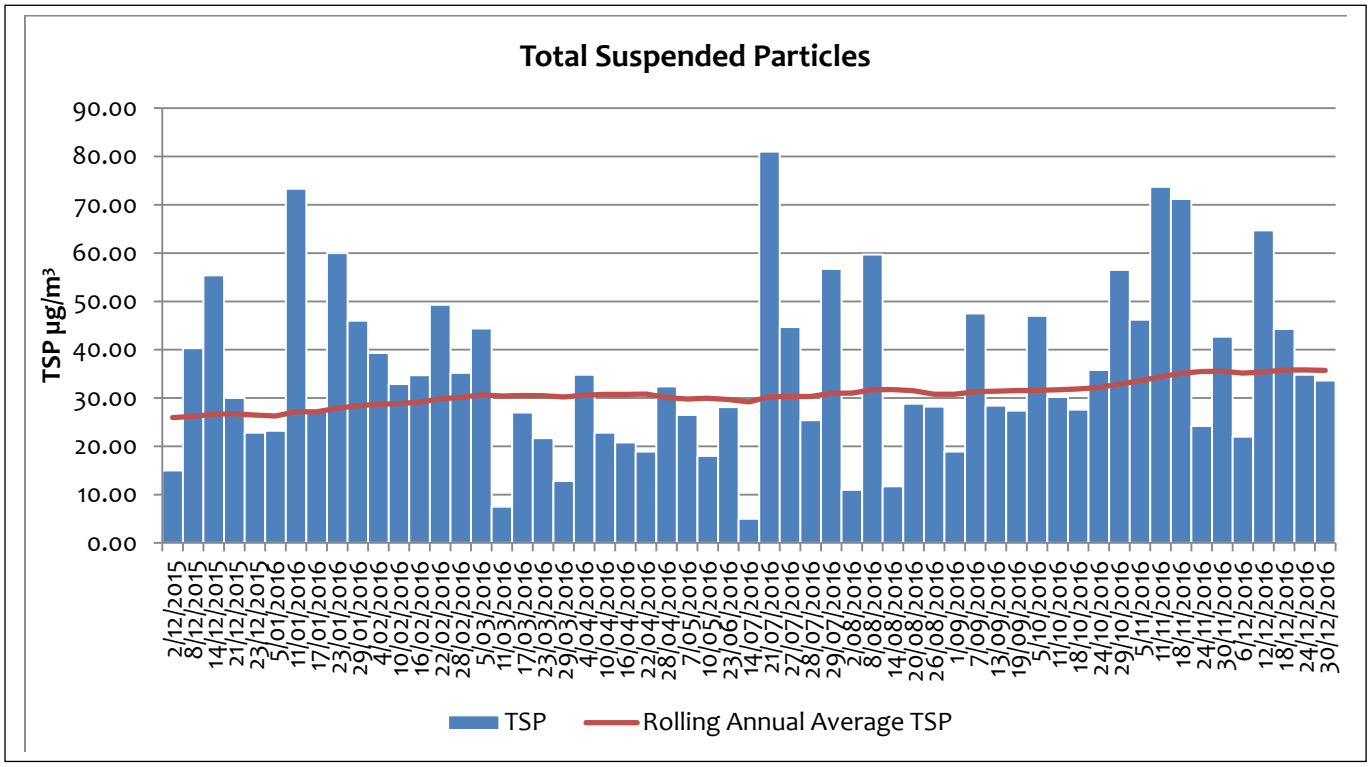
Contents

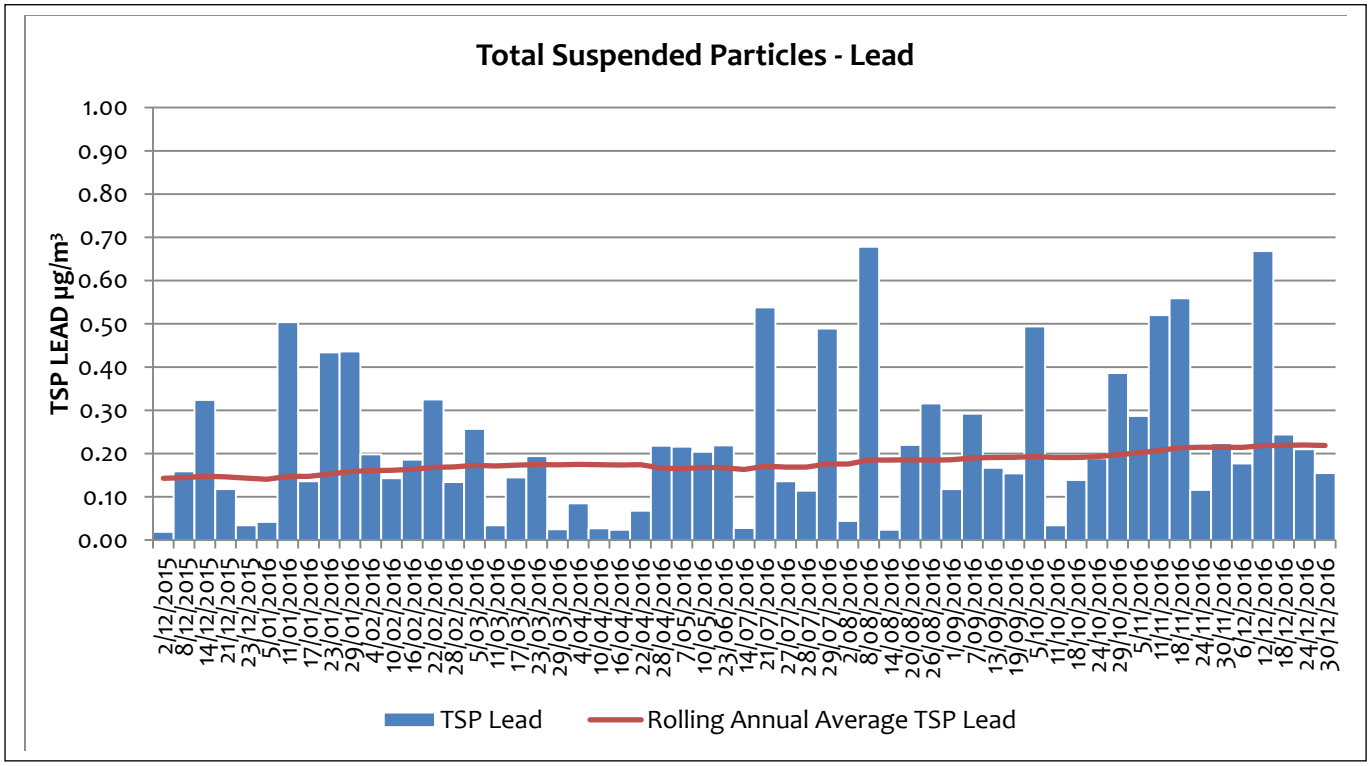
1 Air Quality

1.1 High Volume Air Samplers

EPL10 - SILVER TANK HI VOL TSP - ON SITE

DATE	TSP (µg/m^3)	Lead (µg/m^3)
6/12/2016	22.00	0.18
12/12/2016	64.70	0.67
18/12/2016	44.30	0.24
24/12/2016	34.80	0.21
30/12/2016	33.60	0.16

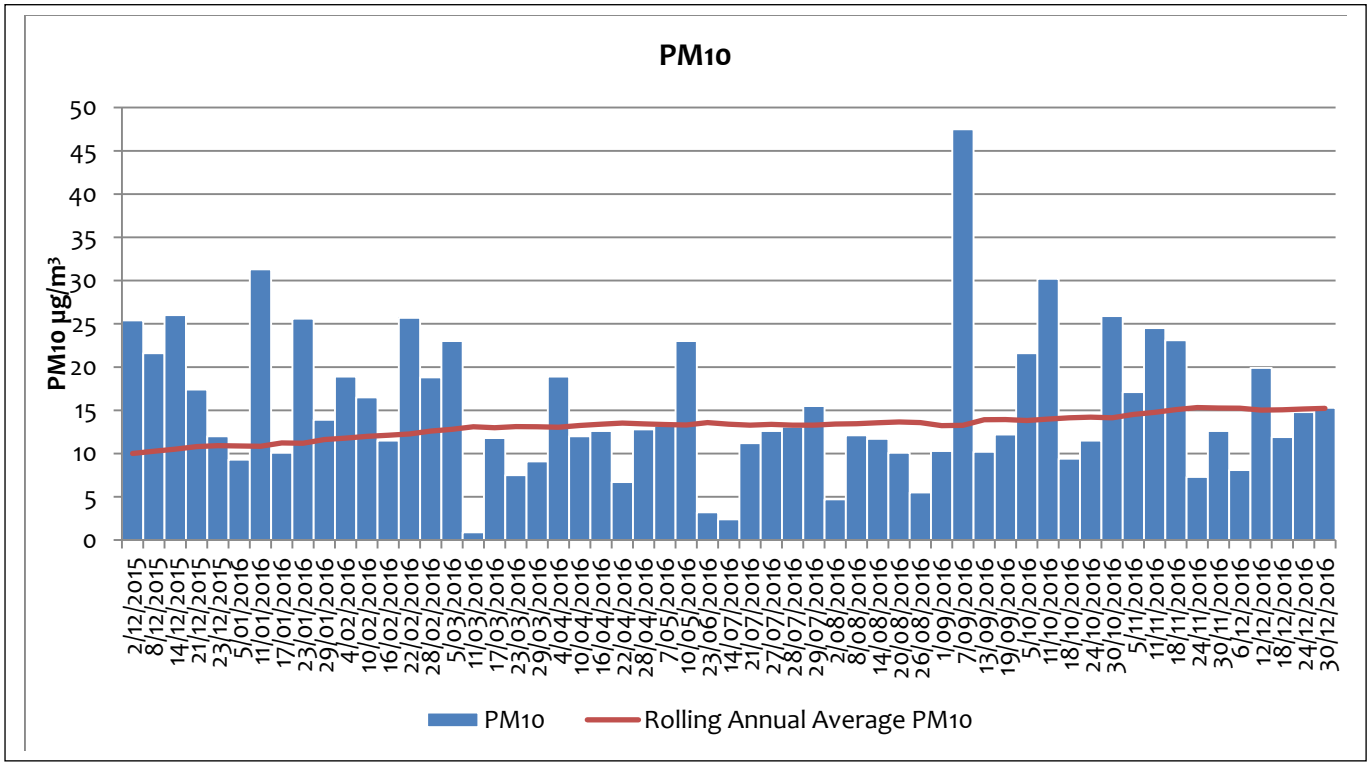


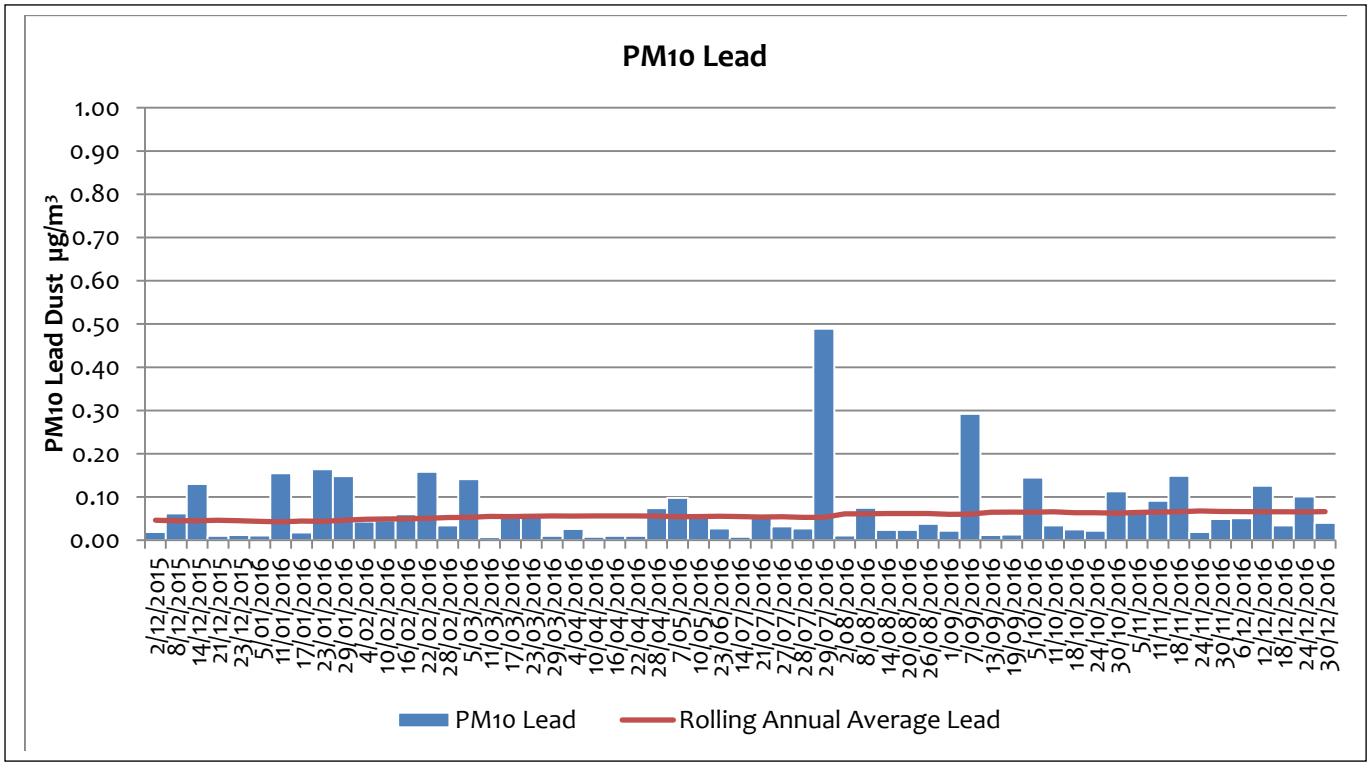


Averaged values are below the National Environment Protection (Ambient Air Quality) Measure standard of 0.50ug/m3 averaged over 1 year (no size limit).

EPL11 - Silver Tank Hi Vol PM10 - On Site

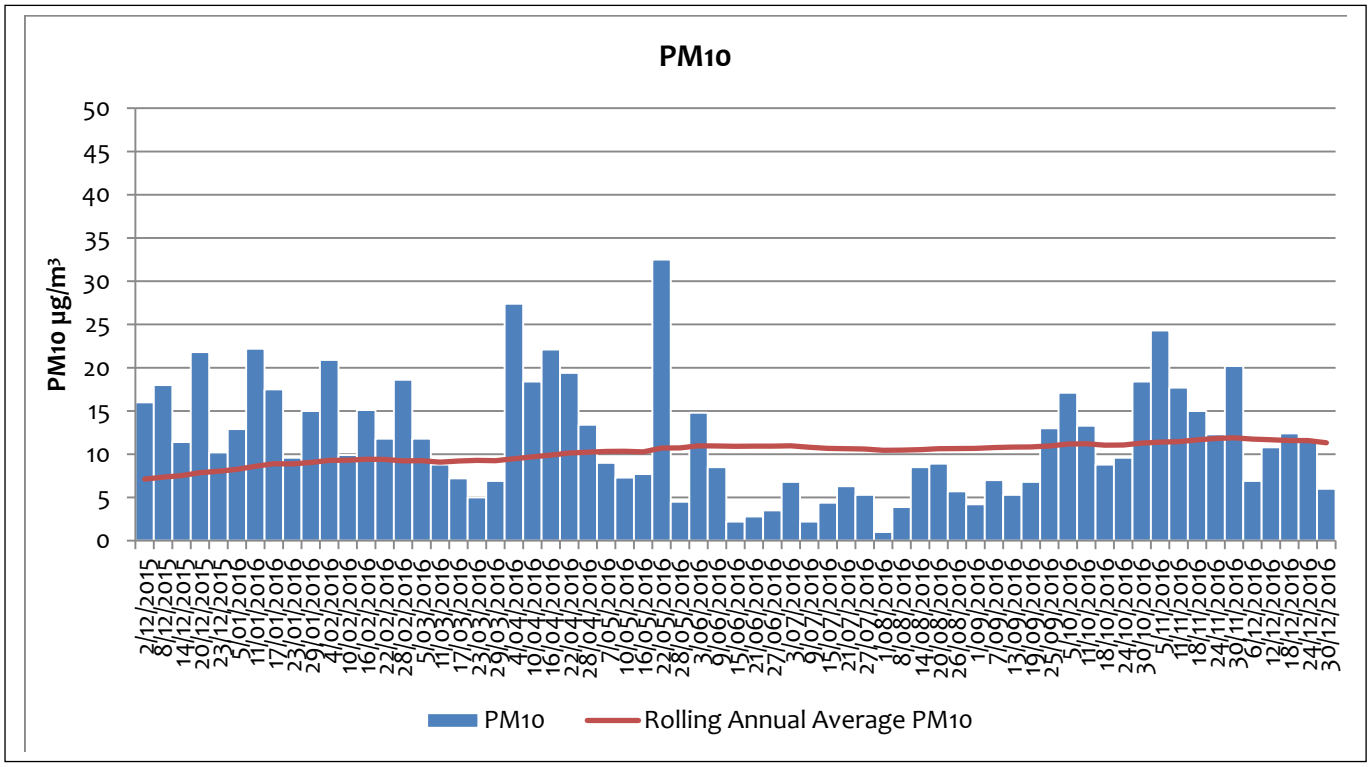
DATE	PM10 (µg/m^3)	Lead (µg/m^3)
6/12/2016	8.10	0.05
12/12/2016	19.90	0.13
18/12/2016	11.90	0.03
24/12/2016	14.80	0.10
30/12/2016	15.30	0.04


PM10
PM10 µg/m³
50
45
40
35
30
25
20
15
10
5
0
2/12/2015
8/12/2015
14/12/2015
21/12/2015
23/12/2015
5/01/2016
11/01/2016
17/01/2016
23/01/2016
29/01/2016
4/02/2016
10/02/2016
16/02/2016
22/02/2016
28/02/2016
5/03/2016
11/03/2016
17/03/2016
23/03/2016
29/03/2016
4/04/2016
10/04/2016
16/04/2016
22/04/2016
28/04/2016
7/05/2016
10/05/2016
23/06/2016
14/07/2016
21/07/2016
27/07/2016
28/07/2016
29/07/2016
2/08/2016
8/08/2016
14/08/2016
20/08/2016
26/08/2016
1/09/2016
7/09/2016
13/09/2016
19/09/2016
5/10/2016
11/10/2016
18/10/2016
24/10/2016
30/10/2016
5/11/2016
11/11/2016
18/11/2016
24/11/2016
30/11/2016
6/12/2016
12/12/2016
18/12/2016
24/12/2016
30/12/2016
PM10
Rolling Annual Average PM10

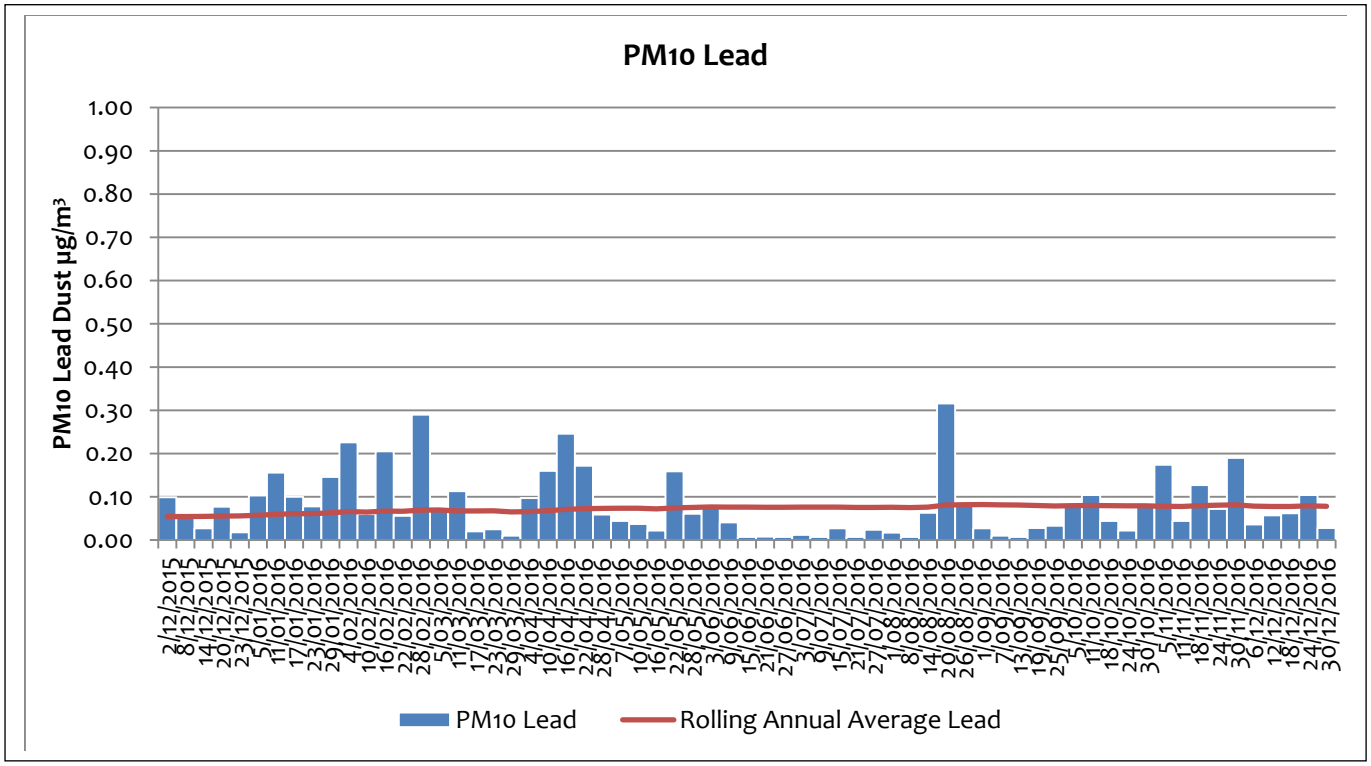

PM10 Lead
PM10 Lead Dust µg/m³
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
2/12/2015
8/12/2015
14/12/2015
21/12/2015
23/12/2015
5/01/2016
11/01/2016
17/01/2016
23/01/2016
29/01/2016
4/02/2016
10/02/2016
16/02/2016
22/02/2016
28/02/2016
5/03/2016
11/03/2016
17/03/2016
23/03/2016
29/03/2016
4/04/2016
10/04/2016
16/04/2016
22/04/2016
28/04/2016
7/05/2016
10/05/2016
23/06/2016
14/07/2016
21/07/2016
27/07/2016
28/07/2016
29/07/2016
2/08/2016
8/08/2016
14/08/2016
20/08/2016
26/08/2016
1/09/2016
7/09/2016
13/09/2016
19/09/2016
5/10/2016
11/10/2016
18/10/2016
24/10/2016
30/10/2016
5/11/2016
11/11/2016
18/11/2016
24/11/2016
30/11/2016
6/12/2016
12/12/2016
18/12/2016
24/12/2016
30/12/2016
PM10 Lead
Rolling Annual Average Lead

EPL12 - Blackwoods Pit Hi Vol PM10 – On Site

DATE	PM10 (µg/m^3)	Lead (µg/m^3)
6/12/2016	6.90	0.04
12/12/2016	10.80	0.06
18/12/2016	12.40	0.06
24/12/2016	11.60	0.10
30/12/2016	6.00	0.03



Averaged values for PM10 are below the Project Approval limits of 50ug/m3 (24hr) and 30ug/m3 (annual).

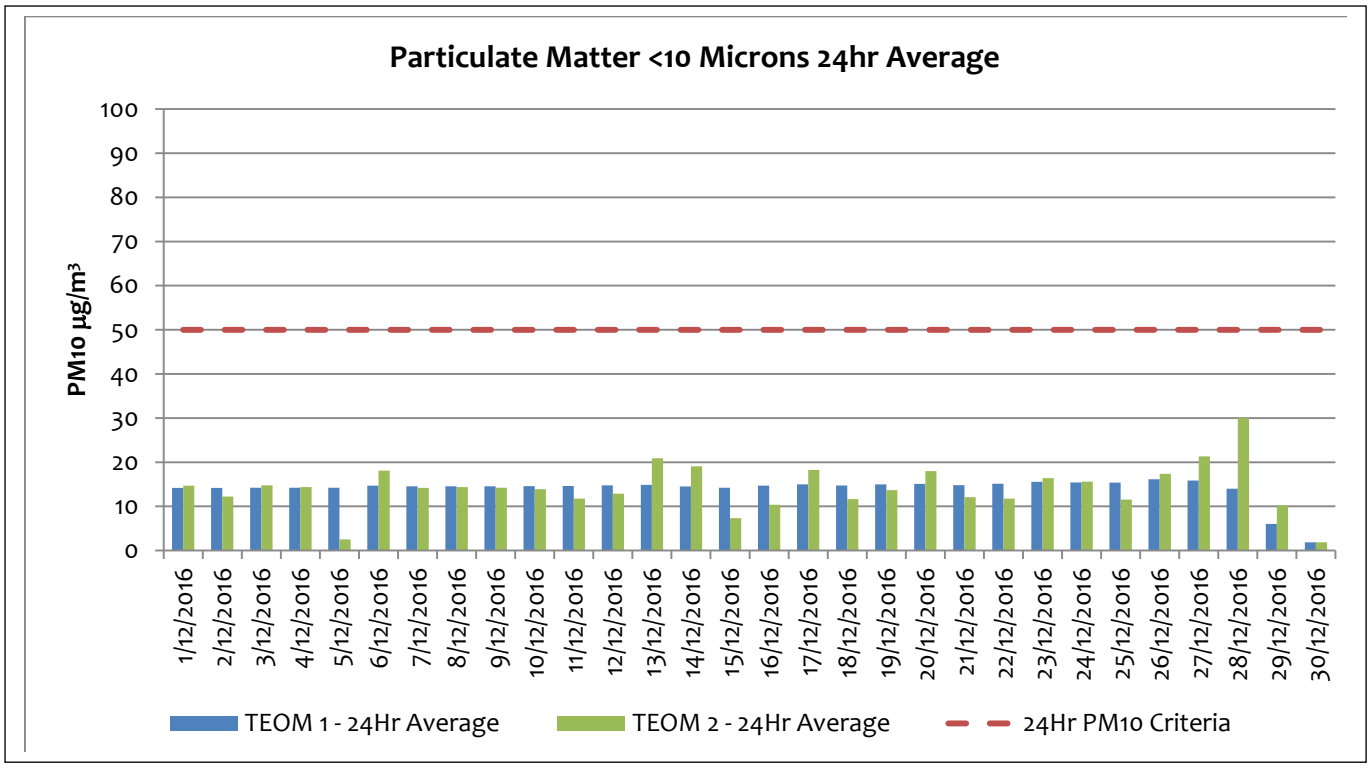


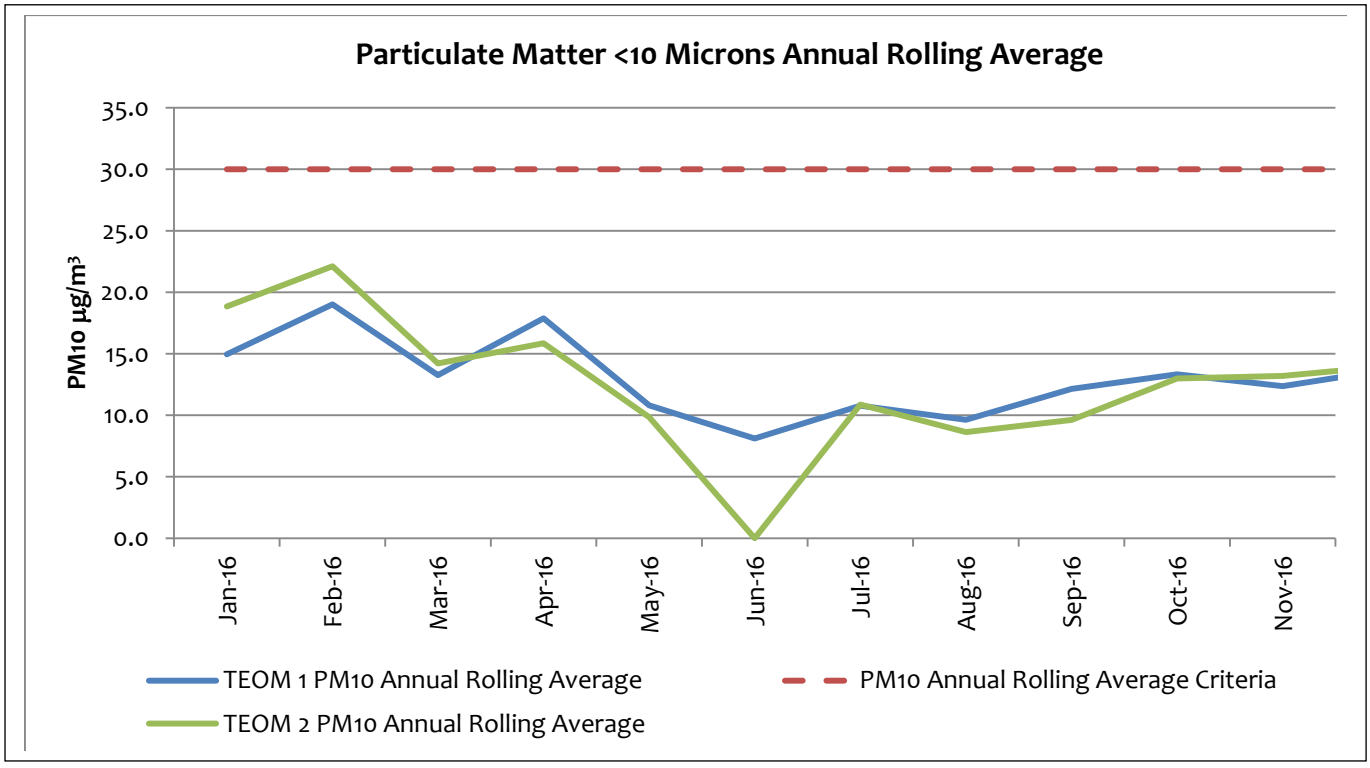
Averaged values are below the National Environment Protection (Ambient Air Quality) Measure standard of 0.50ug/m3 averaged over 1 year (no size limit).

1.2 Tapered Element Oscillating Microbalance Sampling (TEOM)

Particulate Matter <10 Microns 24Hr Average		
Date	TEOM 1 - EPL 13 (μg/m^3) Essential Water – Off Site	TEOM 2 – EPL 14 (μg/m^3) Blackwoods Pit – On Site
1/12/2016	14.18	14.70
2/12/2016	14.17	12.24
3/12/2016	14.24	14.77
4/12/2016	14.22	14.36
5/12/2016	14.21	2.50
6/12/2016	14.67	18.11
7/12/2016	14.53	14.19
8/12/2016	14.55	14.36
9/12/2016	14.55	14.22
10/12/2016	14.57	13.88
11/12/2016	14.60	11.77
12/12/2016	14.75	12.88
13/12/2016	14.86	20.91
14/12/2016	14.50	19.07
15/12/2016	14.22	7.34
16/12/2016	14.68	10.37
17/12/2016	14.98	18.25
18/12/2016	14.73	11.66
19/12/2016	14.99	13.66
20/12/2016	15.11	18.01
21/12/2016	14.82	12.08
22/12/2016	15.12	11.75
23/12/2016	15.54	16.41
24/12/2016	15.42	15.61
25/12/2016	15.39	11.55
26/12/2016	16.15	17.39
27/12/2016	15.85	21.33
28/12/2016	14.02	30.02
29/12/2016	6.03	10.21
30/12/2016	1.87	1.86
31/12/2016	3.44	8.82

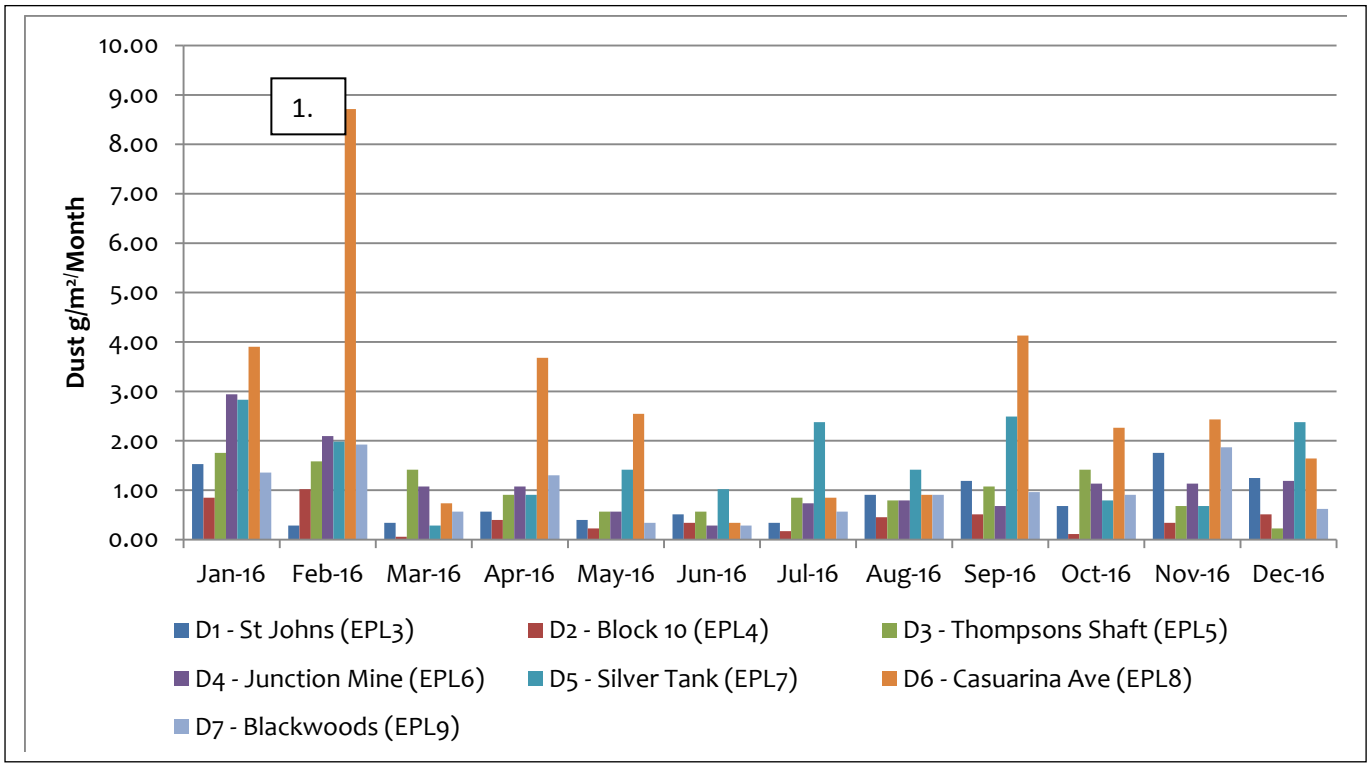
PM10 μg/m^3 12 Month Rolling Average												
	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
TEOM 1 EPL13 Essential Water Off Site	15.0	19.0	13.3	17.9	10.8	8.1	10.8	9.6	12.1	13.3	12.4	13.7
TEOM 2 EPL14 Blackwoods Pit On Site	18.8	22.1	14.2	15.9	9.8	0.0	10.9	8.6	9.6	13.0	13.2	14.0


Particulate Matter <10 Microns 24hr Average
PM10 µg/m³
100
90
80
70
60
50
40
30
20
10
0
1/12/2016
2/12/2016
3/12/2016
4/12/2016
5/12/2016
6/12/2016
7/12/2016
8/12/2016
9/12/2016
10/12/2016
11/12/2016
12/12/2016
13/12/2016
14/12/2016
15/12/2016
16/12/2016
17/12/2016
18/12/2016
19/12/2016
20/12/2016
21/12/2016
22/12/2016
23/12/2016
24/12/2016
25/12/2016
26/12/2016
27/12/2016
28/12/2016
29/12/2016
30/12/2016
TEOM 1 - 24Hr Average
TEOM 2 - 24Hr Average
24Hr PM10 Criteria


Particulate Matter <10 Microns Annual Rolling Average
PM10 µg/m³
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
TEOM 1 PM10 Annual Rolling Average
TEOM 2 PM10 Annual Rolling Average
PM10 Annual Rolling Average Criteria

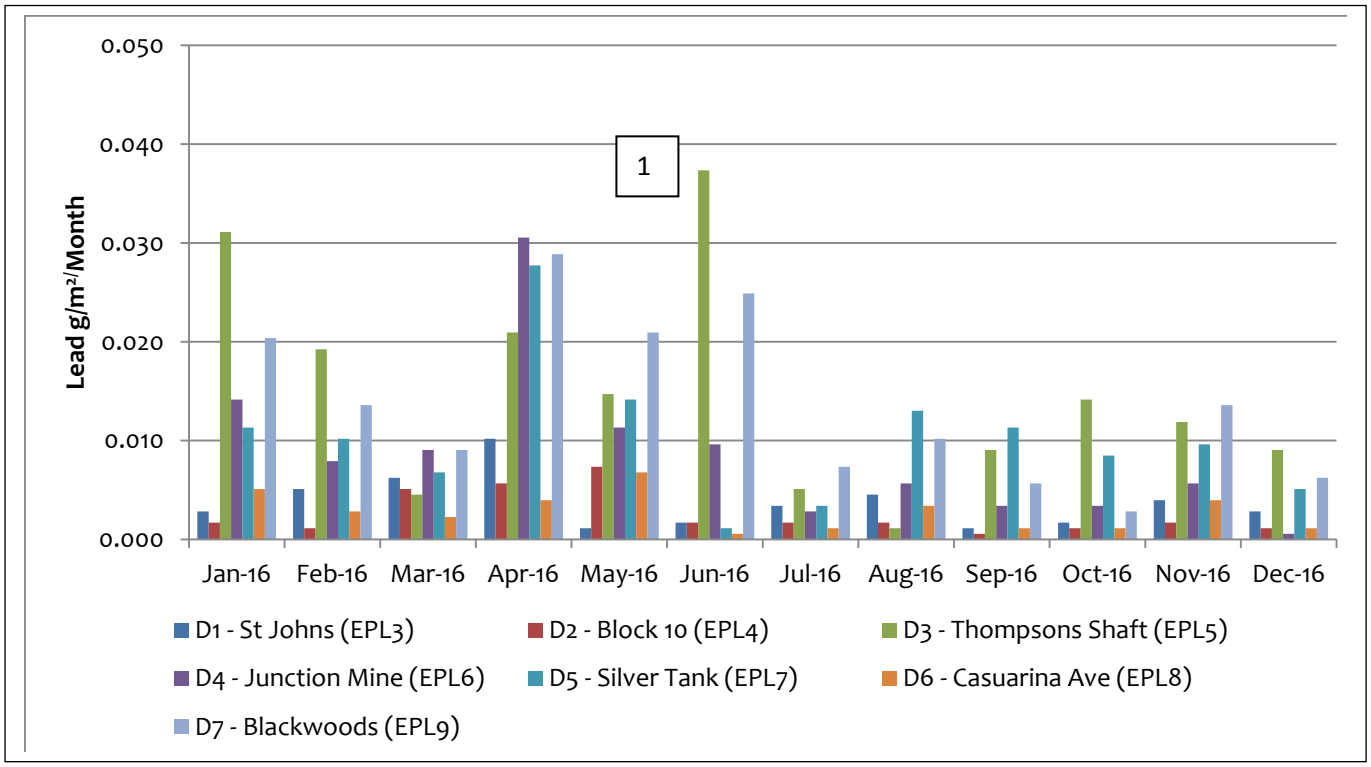
1.3 Dust Deposition Sampling

Total Deposited Dust (g/m$^{2/}$Month)							
Date	D1 (off site)	D2	D3	D4	D5	D6 (off site)	D7
November 2016	1.24	0.51	0.23	1.19	2.38	1.64	0.62
Background Average	4.0	3.1	4.3	5.7	n/a	5.8	n/a



1. When the sample for February was collected the sample stand had been relocated within the back yard of the residence. The resident was asked to move the stand back to its original location. Contamination from a nearby greenhouse is suspected in this sample. The maximum allowable total concentration of deposited dust is 4g/m2/month (annual average) with the maximum allowable contribution from the mine being 2g/m2/month (annual average) as per the site Environment Protection Licence. D6 Casuarina Avenue is the designated background sample all other sample sites are for measurement of site contribution.

Total Deposited Lead (g/m$^{2/}$Month)							
Date	D1 (Off Site)	D2	D3	D4	D5	D6 (Off Site)	D7
November 2016	0.006	0.003	0.001	0.006	0.008	0.002	0.001
Background Average	0.001	0.001	0.002	0.004	0.001	0.004	0.014



1. Samples at Thompson's shaft spiked in lead concentration in March 2016. Nearby vegetation and buildings have been identified as potential sources. Nearby vegetation was removed in October. A clean up of the haul road adjacent Thompsons Shaft was also carried out. The haul road will continue to be monitored. Further investigation is required with regard to nearby buildings, it is suspected the paint on the buildings contains lead and is in poor condition. There is also exposed remnant ore body at the surface in this location which may also contribute as a slightly higher than background influence. The dust bottle location was moved approximately 10m away from the buildings and has delivered a lower total deposited lead reading for December however levels are slightly higher again in January. Essential Water were performing earth works near the western boundary of the site during January which may have contributed in some way. Additionally some lead shipping containers were cleaned during January at the rail load out. The latest monthly results from April onwards have been much lower and coincide with the annual application of dust suppression chemical.

2 Blasting (Vibration and Overpressure)

<u>Note:</u> Vibration is recorded in Peak Particle Velocity (ppv), Overpressure is recorded in Decibels (dBL)

December Summary Block 7, Zinc Lode:

- 1 production firing
- 15 development firings
- 0 Blasts recorded a ppv of >3mm/s
- 0 Blasts recorded a ppv of >10mm/s
- 0 Blasts recorded an over pressure level over 115dBL
- 0 Blasts recorded an over pressure above 120dBL

12 Month Summary of Zinc Lode:

- % of all blasts over 3mm/sec = **2.95%** (licence requirement <5%) calculated from 31 Dec 2015 until 31 Dec, 2016;
- % of production blasts over 3mm/sec = **5.44%** (licence pollution reduction plan target <5%) calculated from 31 Dec 2015 until 31 Dec, 2016

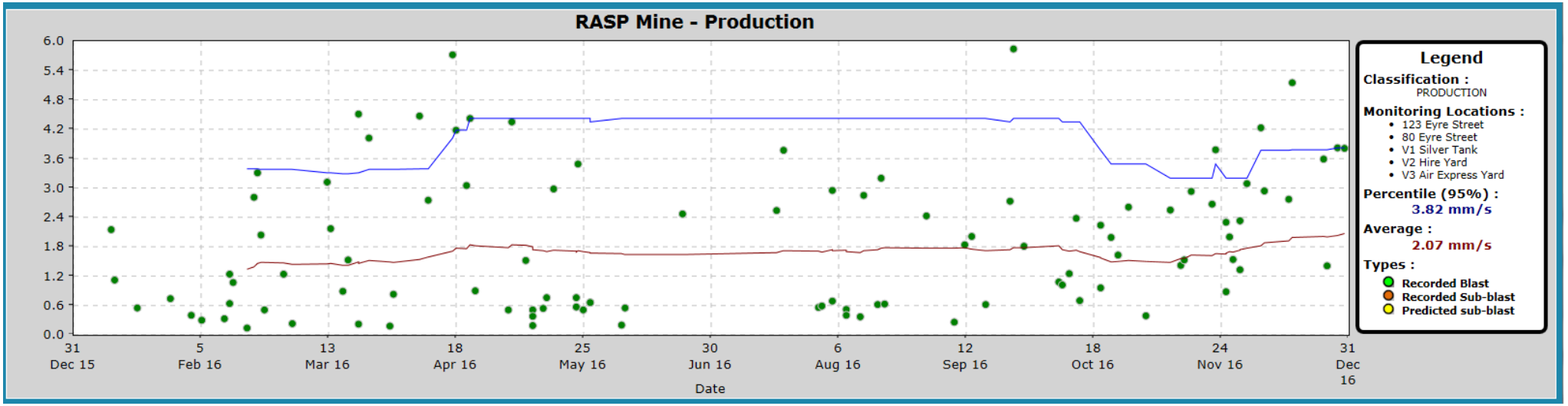
November Summary Rest of Mine, Western Mineralisation and Main Lode:

- 8 production firings
- 155 development firings
- 1 Blast recorded a ppv of >5mm/s
- 0 Blasts recorded a ppv of >10mm/s
- 0 Blasts recorded an over pressure level over 115dBL
- 0 Blasts recorded an over pressure above 120dBL

12 Month Summary Rest of Mine, Western Mineralisation and Main Lode:

- % of all blasts over 5mm/sec = **0.42%** (licence requirement <5%) calculated from 31 Dec 2015 until 31 Dec, 2016;
- % of production blasts over 5mm/sec = **5.69%** (licence performance target <5%) calculated from 31 Dec 2015 until 31 Dec, 2016

12 Month Production Blast Progress Chart



Noise

Noise monitoring is undertaken as per the NSW Industrial Noise Policy at a higher frequency of once per annum. A noise assessment was conducted during July 2016. The data was analysed by EMM and a report was produced, the report found the mine operations satisfied the relevant noise limits at all measured locations. The conclusions of the report are as follows:

EMM has completed a noise monitoring assessment of operational noise from RASP Mine activities at 15 assessment locations as per the site's PA (PA 07_0018). A review of the meteorological data from the site's weather station identified that noise limits were inapplicable for two of the 15 operator-attended measurements due to meteorological conditions. The monitoring assessment found that noise from RASP Mine operations satisfied the relevant noise limits at all locations. Furthermore, site noise was inaudible at three of the 15 locations. In summary, no non-compliances were observed during this session of monitoring.

3 Water

3.1 Groundwater

Last sampled October 2016.

3.2 Downstream Locations (EPL Points 35 and 36)

Not sampled during the current month. Last sampled during September 2016.

3.3 Surface Water Sample Record

Surface Water Table Dec 2015 to Dec 2016

EPA Identification Number	Frequency	Comment
EPL29 (Federation Way culvert) S31-1	2 x per year , six months apart	Sampled 9/5/16 & 21/7/16
EPL31 (Ryan Street Dam) S49	2 x per year , six months apart	Sampled 9/5/16 & 21/7/16
EPL32 (adjacent olive grove) S1A	2 x per year , six months apart	Sampled 9/5/16 & 21/7/16
EPL33 (Behind Bowls Club) S9-B2	2 x per year , six months apart	Sampled 9/5/16 & 21/7/16
EPL34 (Horwood Dam) Horwood Dam	2 x per year , six months apart	Sampled 10/2/16, 9/5/16, 21/7/16, 19/10/16
EPL35 (Upstream Bonanza St) Monitoring location 1 Downstream	2 x per year , six months apart	Sampled 1/8/16 & 20/9/16
EPL36 (Downstream Sydney Rd) Monitoring location 2 Downstream	2 x per year , six months apart	Sampled 1/8/16 & 20/9/16

*Due to the ephemeral nature of the surface water bodies at Rasp mine the sample frequency of six months apart is difficult to achieve. Sample times are dictated by the availability of water.

4 Weather Data

The weather station continuously monitors the following parameters as per point 55 of the Environmental Protection Licence.

POINT 55

Parameter	Sampling method	Units of measure	Averaging period	Frequency
Temperature at 10 metres	AM-4	degrees Celsius	15 minutes	Continuous
Wind Direction at 10 metres	AM-4	Degrees in a clockwise direction from True North	15 minutes	Continuous
Wind Speed at 10 metres	AM-4	metres per second	15 minutes	Continuous
Rainfall	AM-4	millimetres	1 hour	Continuous
Sigma theta	AM-2 & AM-4	Degrees	15 minutes	Continuous

The continuous data can be viewed at any time at the following web site using the username and password.

www.loggermonitor.com/login

user: CBHAdmin

pass: brokenhill

Summary reports for all licence parameters are available from the website however due to the 15 minute data being very large daily summary data was also obtained from the Bureau of Meteorology Broken Hill on the following page:

Broken Hill Airport, New South Wales
December 2016 Daily Weather Observations

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
		Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	Th	13.2	34.1	0			WSW	54	11:35	20.6	45		SSE	9	1008.8	33.0	13		W	26	1006.1
2	Fr	20.4	33.0	0			S	33	15:30	22.0	28	6	S	15	1010.8	31.3	21	4	SE	15	1008.9
3	Sa	17.3	36.6	0			NNW	35	14:46	25.5	28		SSE	17	1012.5	35.4	17	5	NW	20	1010.4
4	Su	24.5	39.8	0			WNW	78	16:18	30.6	25	8	N	13	1009.8	38.4	14	6	N	28	1003.8
5	Mo	24.0	31.2	0			SSW	56	15:30	26.8	47	6	S	20	1010.0	29.4	37	8	SSW	15	1009.3
6	Tu	16.7	22.5	3.6			S	24	10:41	17.2	84	8	Calm		1014.9	19.5	75	8	SSW	13	1014.6
7	We	12.1	31.3	0.2			NE	35	17:45	22.5	44		NE	22	1015.1	29.7	25		N	15	1011.1
8	Th	22.3	26.2	0			SW	67	14:48	24.1	58	8	NW	26	1004.1	25.3	23		SW	46	1005.7
9	Fr	9.9	24.3	0.2			S	46	10:16	14.9	53	7	S	28	1019.1	21.7	24		S	31	1017.4
10	Sa	9.5	28.3	0			SE	35	12:20	18.6	35		SSE	17	1022.0	25.8	18		SSE	13	1018.8
11	Su	16.0	31.8	0			SSE	43	11:20	24.0	26		SSE	17	1020.5	30.0	14		SSE	20	1017.7
12	Mo	17.3	36.1	0			NE	39	07:59	28.1	19		NE	30	1018.1	35.2	10		NNW	19	1014.6
13	Tu	21.8	38.2	0			NNW	57	07:58	32.4	15		NNW	37	1012.9	37.2	13		N	31	1008.7
14	We	23.0	25.6	1.0			S	44	09:25	25.2	69	8	S	20	1010.3	23.1	64	8	E	22	1010.1
15	Th	12.7	17.4	26.0			S	50	06:19	12.8	95	8	S	28	1013.4	14.4	86	8	SSE	30	1012.2
16	Fr	12.3	28.7	5.6			W	35	14:23	17.3	51	8	SW	13	1010.3	26.6	40		WNW	20	1007.2
17	Sa	16.3	28.8	0.2			S	50	20:26	19.8	48	1	SSW	31	1012.6	26.6	29		S	20	1012.2
18	Su	11.5	25.8	0			S	43	01:38	16.6	35		ESE	28	1020.2	24.0	18		ESE	17	1016.8
19	Mo	13.5	32.6	0			NE	33	07:14	23.7	23		NNE	22	1014.1	32.3	13	1	W	17	1009.9
20	Tu	23.7	33.0	0			SSW	41	09:36	31.0	30		W	24	1009.2	32.2	29		SSW	22	1008.7
21	We	15.1	29.3	0			S	44	02:11	18.0	48		SSE	30	1016.8	27.4	22		S	19	1014.6
22	Th	14.9	32.2	0			SE	35	12:57	22.7	36		SE	20	1016.0	30.5	20		S	9	1012.6
23	Fr	18.0	37.6	0			SSW	39	21:06	29.9	23		NNE	17	1013.0	36.6	14		SW	22	1009.8
24	Sa	23.6	36.8	0			SSE	31	09:55	31.2	27		S	17	1012.4	35.6	20	8	SW	9	1009.9
25	Su	24.0	39.7	0			NNE	39	07:08	31.2	27		NNE	26	1009.5	37.3	16	2	S	15	1006.8
26	Mo	28.2	38.8	0			N	59	09:21	32.2	29	8	N	33	1006.3	37.3	20	8	NNW	17	1004.0
27	Tu	23.7	39.3	0			N	61	13:28	31.9	33	8	NNE	30	1005.2	37.4	21	3	NNE	35	1001.0
28	We	25.2	33.2	0			NNW	69	00:28	28.0	66	8	NW	19	1002.7	25.4	79	5	NW	43	1002.6
29	Th	24.2	33.8	9.4			NNW	56	08:31	28.4	66	4	N	31	1004.1	27.2	74	8	NNW	20	1002.6
30	Fr	21.1	34.8	0.4			WNW	39	23:25	22.8	55	8	SSW	24	1004.2	32.0	29	4	W	17	1002.5
31	Sa	19.2	35.1	0			SSE	33	08:03	23.7	48		SSE	26	1006.6	32.3	27		ENE	9	1003.8
Statistics for December 2016																					
Mean		18.6	32.1							24.3	42	6		22	1011.8	30.0	29	5		21	1009.5
Lowest		9.5	17.4	0						12.8	15	1	Calm		1002.7	14.4	10	1	#	9	1001.0
Highest		28.2	39.8	26.0			WNW	78		32.4	95	8	NNW	37	1022.0	38.4	86	8	SW	46	1018.8
Total				46.6																	

Legend

Dir = Direction, **Spd**=Wind Speed, **Temp**=Temperature, **RH**=Relative Humidity, **CLD**=Cloud, **MSLP**=Mean Sea Level Pressure

5 Data Log

Sample	Result Received	Date Published
Hi Volume Samples	28/10/2016	7/11/2016
TEOM	Real time	7/11/2016
Dust Deposition	14/10/2016	7/11/2016
Water	13/9/2016	7/11/2016
Blast Vibration and overpressure	Real Time	7/11/2016

6 Correction Log

There are no corrections for the previous month

7 Attachments

There are no attachments.