Monthly Environmental Data November 2016

Contents

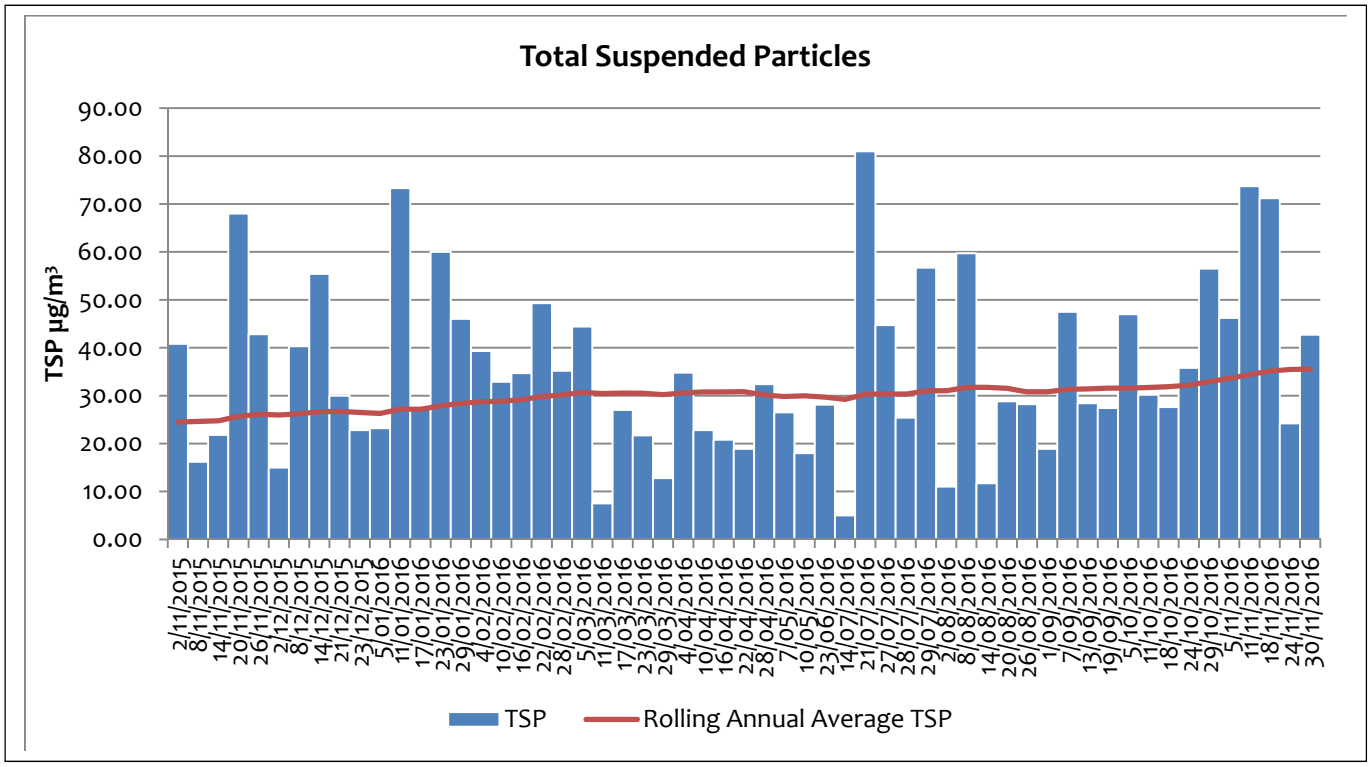
1 Air Quality

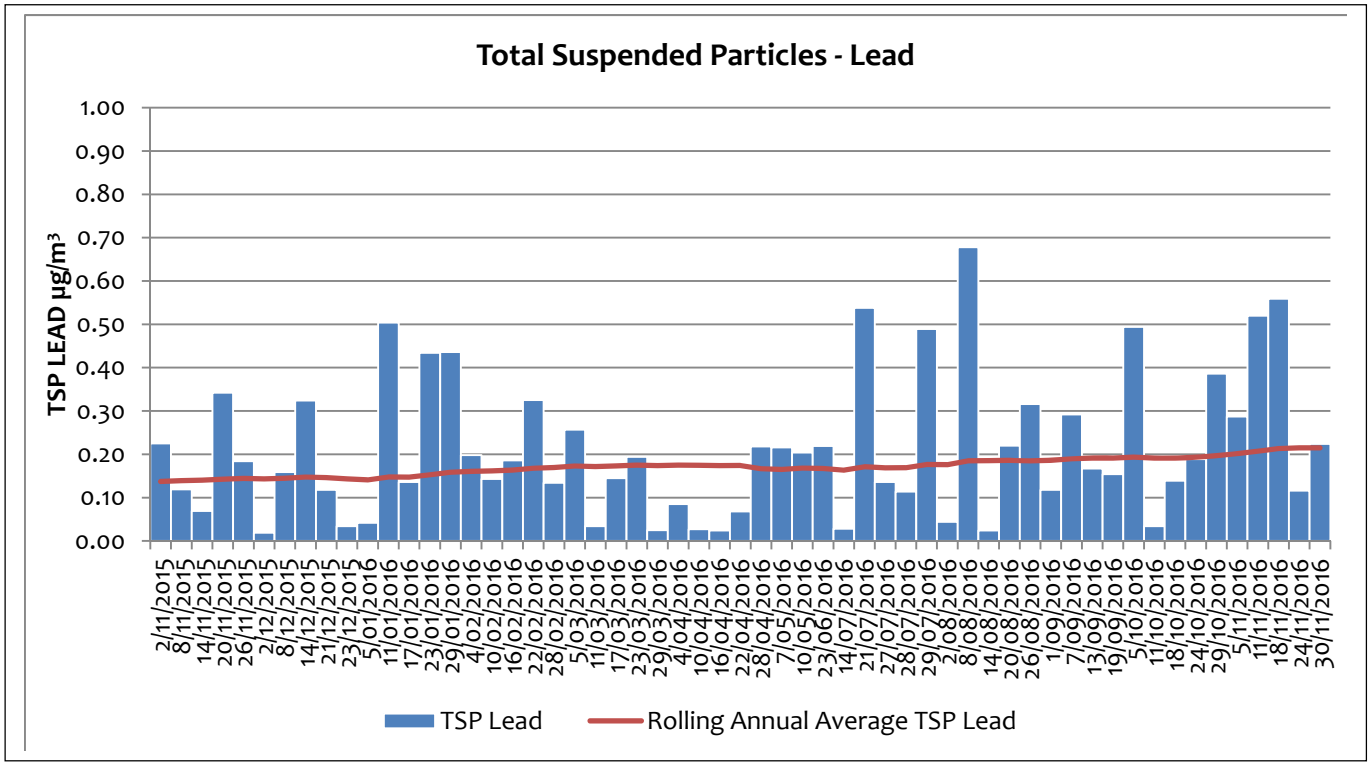
1.1 High Volume Air Samplers

High volume air samplers at Silver Tank both failed calibration during May 2016. Both units were sent back to Ecotech in Melbourne for repair. The units were underservice for the duration of May. In early June the transformer located at Silver Tank failed thus rendering the local power source for high volume samplers 1 and 2 under service. A back up genset was put in place to power the samplers however heavy diesel particulate contamination was found on the resulting filters. The EPA were approached on the 29 June proposing to shift the monitors to the closest operational switchboard near the change rooms. The EPA indicated their preferred option would be to leave the hi vols in situ and run a sufficient lead to them to provide power and avoid contamination (provided it can be done safely). Longer leads were put in place however subsequent samples found the genset was faulting under high voltage. The load on the genset was increased in an attempt to mitigate the high voltage faults and the supply was run through two separate UPS units but the problem persisted. Diagnosis was a possible fault with the genset. With all of the available gensets already in use the next alternative was to pair the high volume samplers with another genset close by. Another unit was in place operating at the essential communications hut adjacent the weather station. The high volume units are currently being trialled here. The first samples collected have again shown signs of diesel contamination even with 10 meters of separation between the genset and the samplers. Currently the ETA of the new transformer is 20 December 2016 as it will have to be engineered and custom built.

EPL10 - SILVER TANK HI VOL TSP - ON SITE

DATE	TSP (µg/m^3)	Lead (µg/m^3)
5/11/2016	46.20	0.29
11/11/2016	73.70	0.52
18/11/2016	71.20	0.56
24/11/2016	24.20	0.12
30/11/2016	42.70	0.22

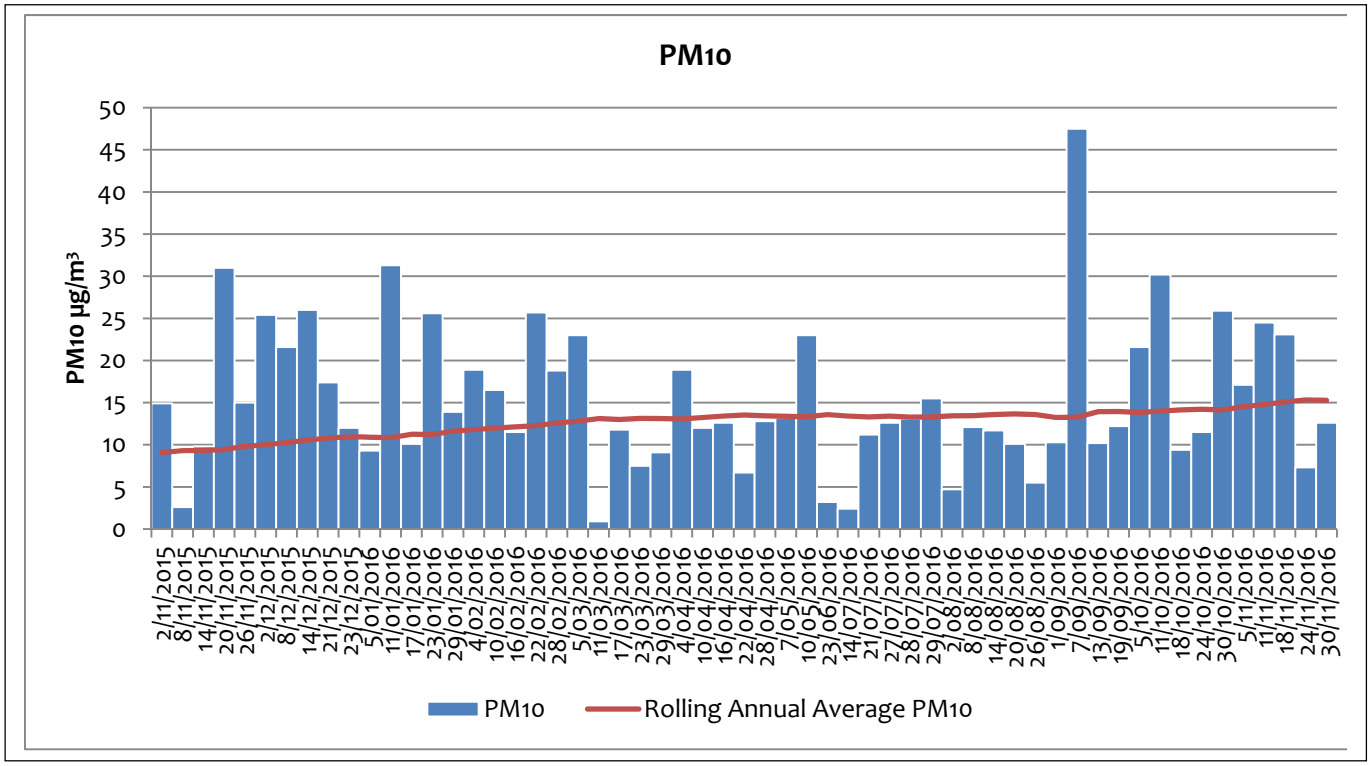




Averaged values are below the National Environment Protection (Ambient Air Quality) Measure standard of 0.50ug/m3 averaged over 1 year (no size limit).

EPL11 - Silver Tank Hi Vol PM10 - On Site

DATE	PM10 (µg/m^3)	Lead (µg/m^3)
5/11/2016	12.56	0.27
11/11/2016	11.79	0.13
18/11/2016	6.61	0.07
24/11/2016	7.38	0.04
30/11/2016	6.49	0.01


PM10
PM10 µg/m³
50
45
40
35
30
25
20
15
10
5
0
2/11/2015
8/11/2015
14/11/2015
20/11/2015
26/11/2015
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
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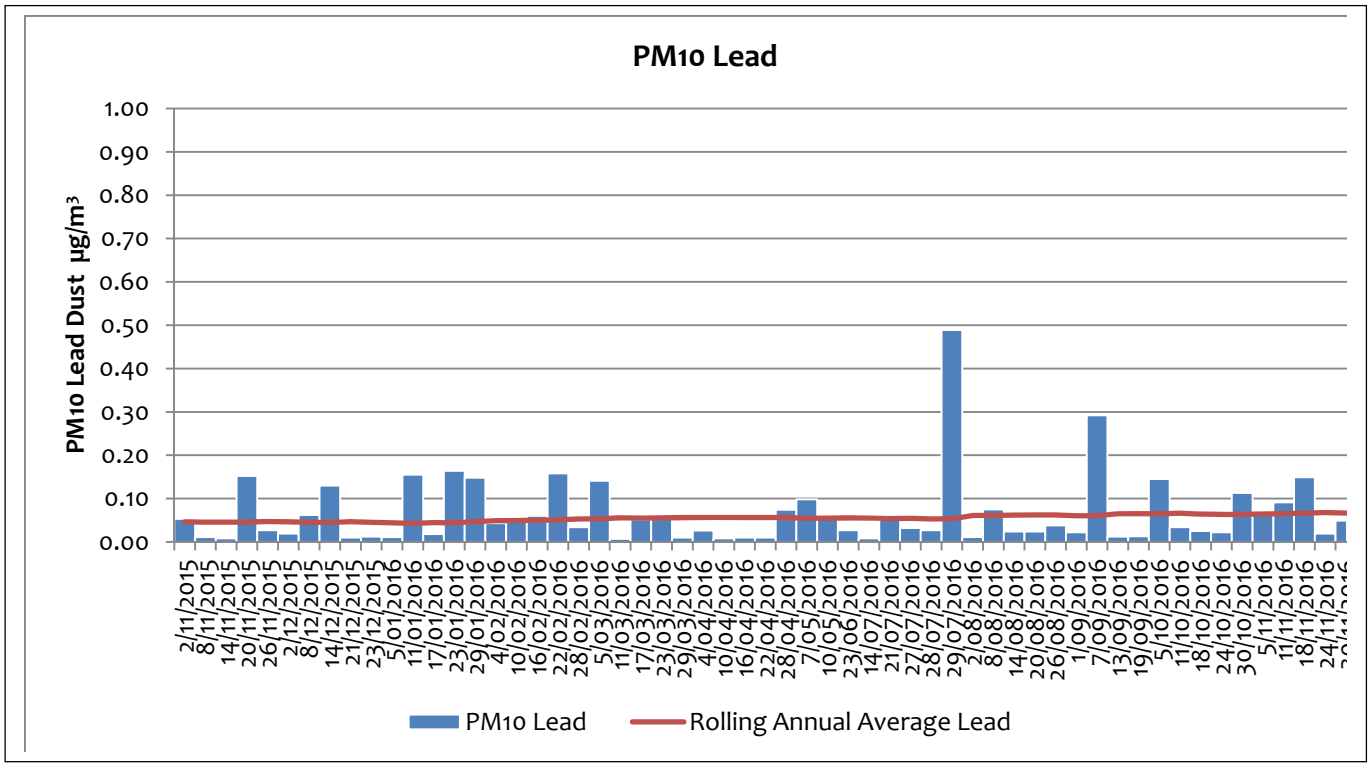
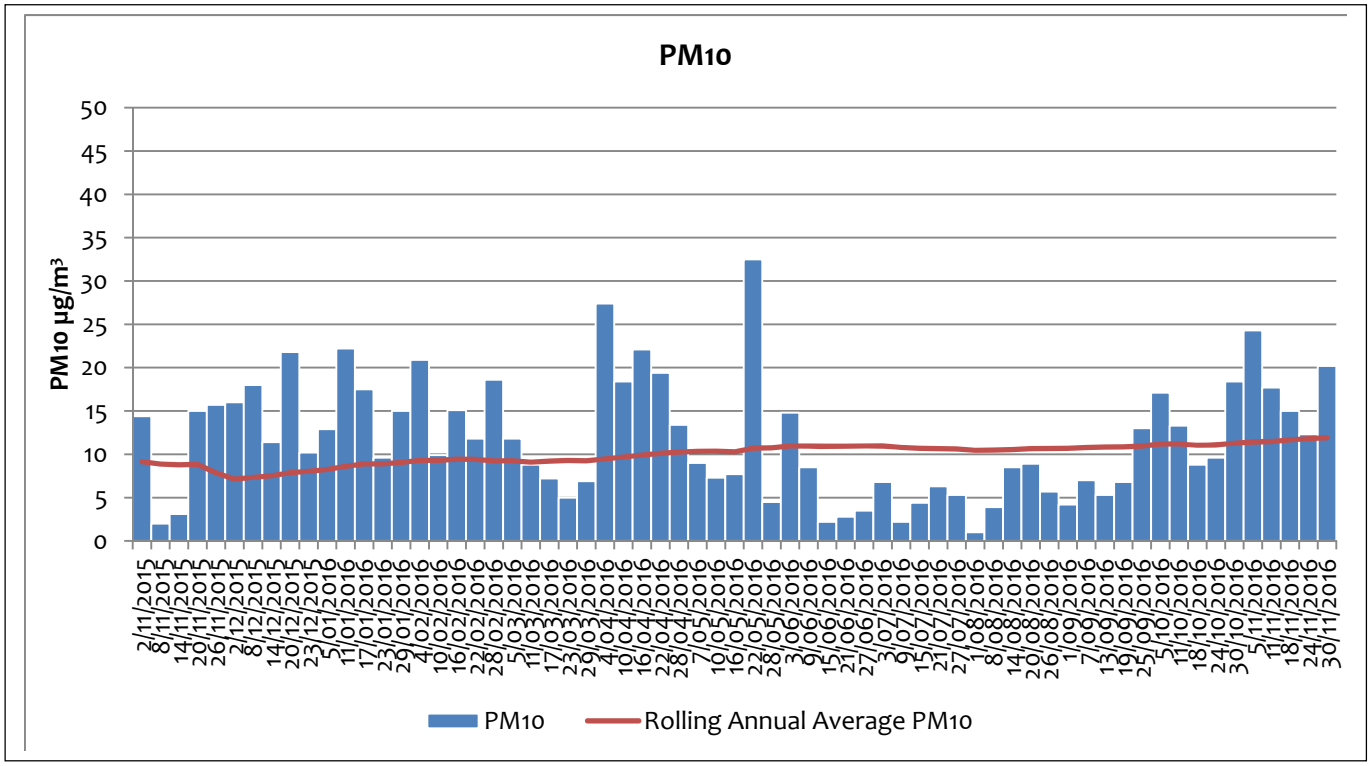
5/11/2016
11/11/2016
18/11/2016
24/11/2016
30/11/2016
PM10
Rolling Annual Average PM10

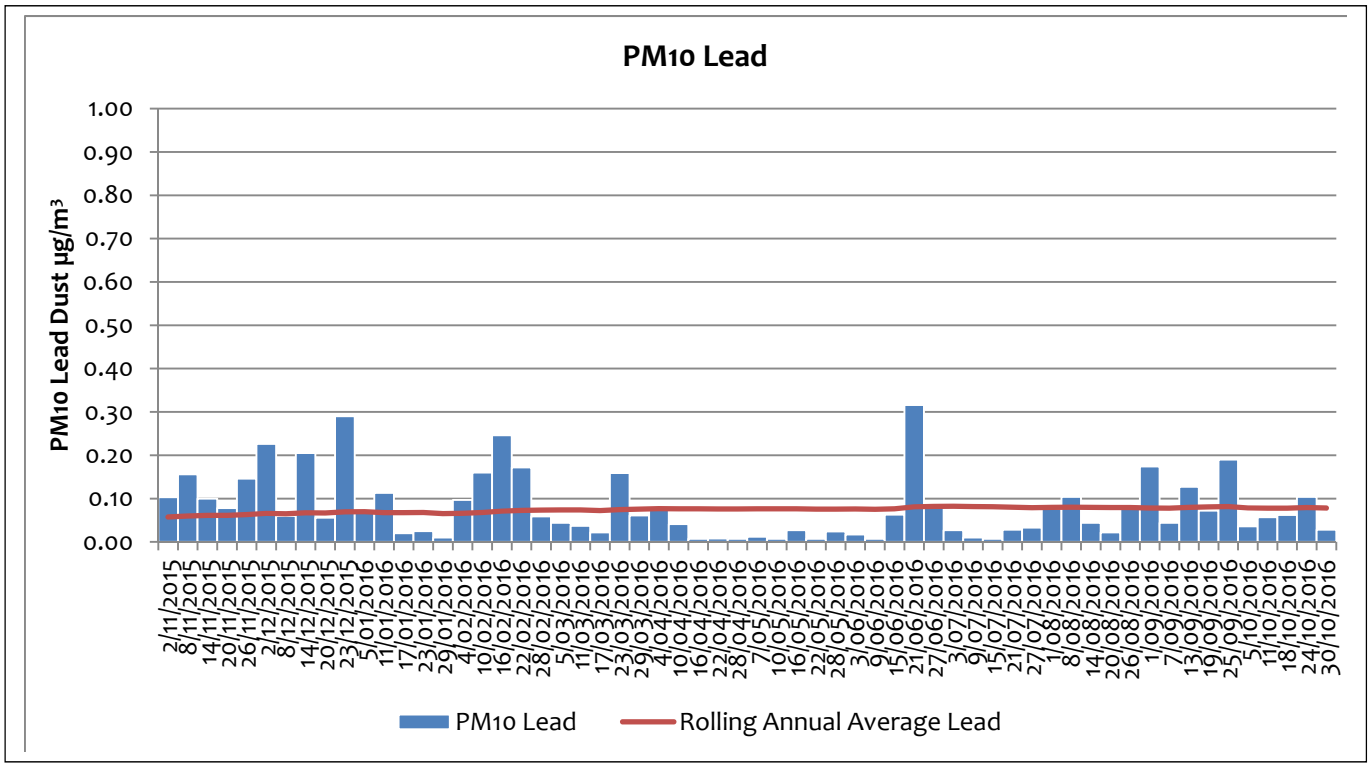


EPL12 - Blackwoods Pit Hi Vol PM10 – On Site

DATE	PM10 (µg/m^3)	Lead (µg/m^3)
1/11/2012	36.07	0.85
7/11/2012	8.99	0.34
13/11/2012	41.67	0.43
19/11/2012	30.71	0.32
25/11/2012	28.33	0.33



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



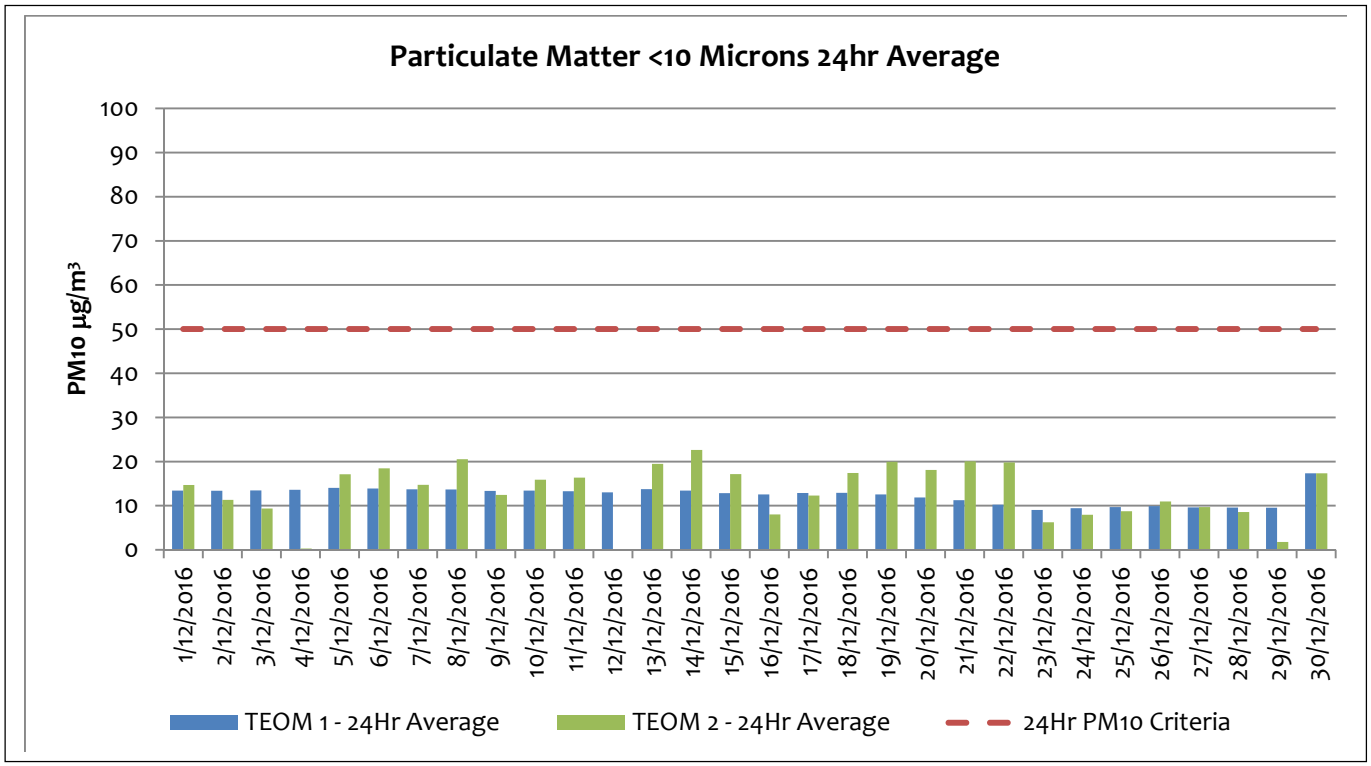
Averaged values are below the National Environment Protection (Ambient Air Quality) Measure standard of 0.50ug/m3 averaged over 1 year (no size limit).

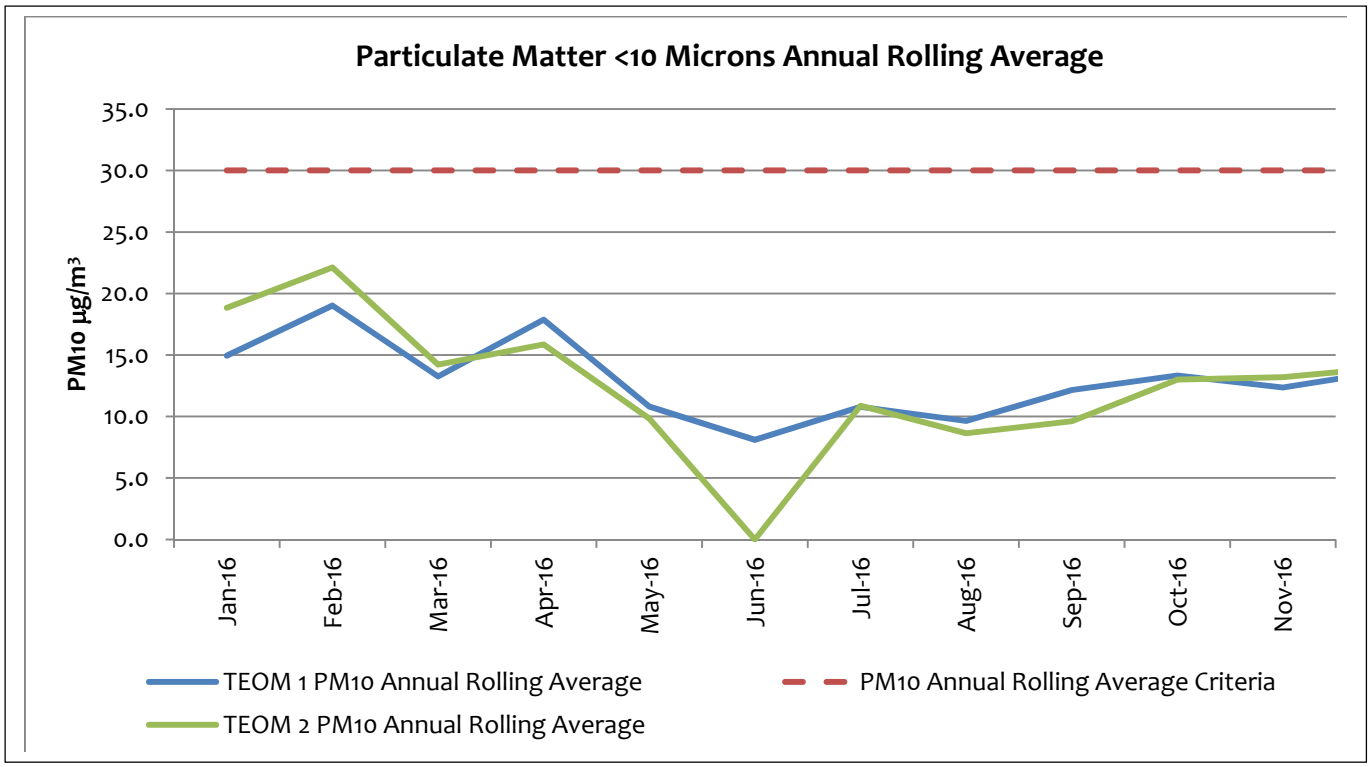
1.2 Tapered Element Oscillating Microbalance Sampling (TEOM)

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
1/11/2016	13.42	14.68
2/11/2016	13.38	11.32
3/11/2016	13.45	9.36
4/11/2016	13.61	0.29
5/11/2016	14.03	17.11
6/11/2016	13.91	18.46
7/11/2016	13.72	14.71
8/11/2016	13.67	20.52
9/11/2016	13.36	12.43
10/11/2016	13.41	15.89
11/11/2016	13.28	16.36
12/11/2016	13.03	0.00
13/11/2016	13.76	19.46
14/11/2016	13.42	22.65
15/11/2016	12.84	17.15
16/11/2016	12.55	8.03
17/11/2016	12.88	12.30
18/11/2016	12.93	17.41
19/11/2016	12.55	19.94
20/11/2016	11.87	18.09
21/11/2016	11.24	20.05
22/11/2016	10.25	19.81
23/11/2016	9.04	6.22
24/11/2016	9.44	7.95
25/11/2016	9.70	8.74
26/11/2016	9.89	10.97
27/11/2016	9.62	9.70
28/11/2016	9.59	8.56
29/11/2016	9.56	1.78
30/11/2016	17.34	17.34

PM10 μg/m^3 12 Month Rolling Average												
	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16
TEOM 1 EPL13 Essential Water Off Site	15.8	18.8	22.1	14.2	15.9	9.8	0.0	10.9	8.6	9.6	13.0	12.3
TEOM 2 EPL14 Blackwoods Pit On Site	15.8	18.8	22.1	14.2	15.9	9.8	0.0	10.9	8.6	9.6	13.0	13.2

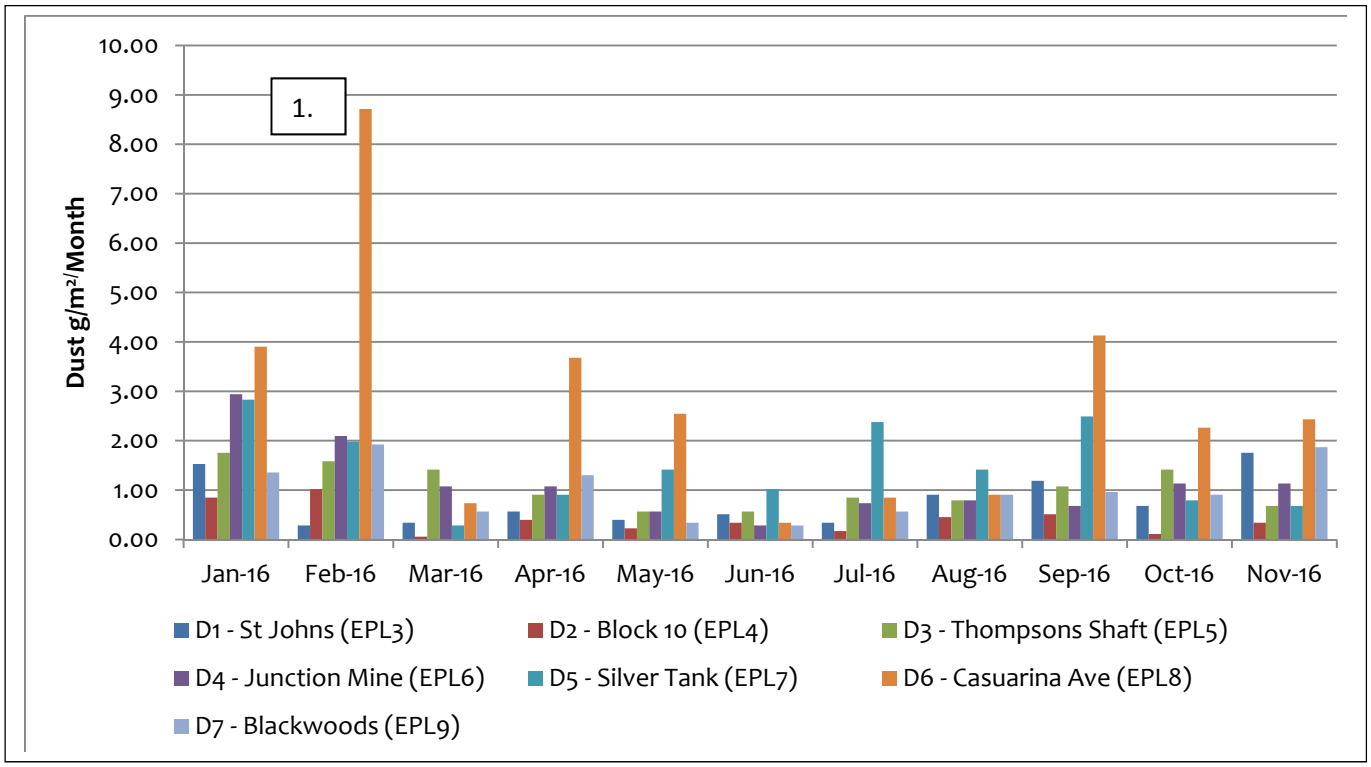
EPL13 – Essential Water – Off Site (TEOM1)





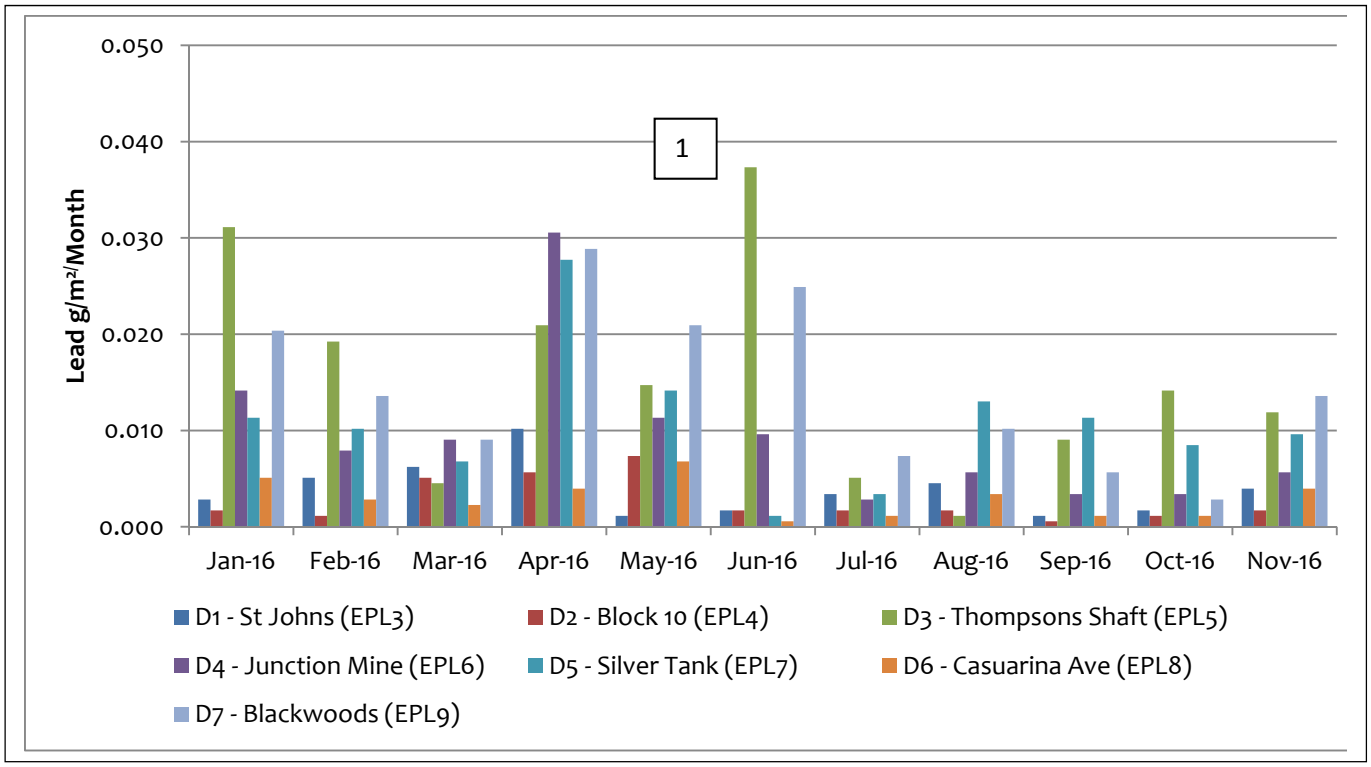
1.3 Dust Deposition Sampling

Total Deposited Dust (g/m$^{2/}$Month)							
Date	D1 (off site)	D2	D3	D4	D5	D6 (off site)	D7
November 2016	1.75	0.34	0.68	1.13	0.68	2.43	1.87
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	0.002	0.001	0.001	0.005	0.003	0.002	0.008
Background Average	0.001	0.001	0.0018	0.0040	0.0010	0.004	0.014



1. Samples at Thompson's shaft spiked in lead concentration in October (2015) and again 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)

***Note:** Vibration is recorded in Peak Particle Velocity (ppv), Overpressure is recorded in Decibels (dBL)*

November Summary Block 7, Zinc Lode:

- 2 production firing
- 8 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 1 December 2015 until 30 Nov, 2016;
- % of production blasts over 3mm/sec = **5.44%** (licence pollution reduction plan target <5%) %) calculated from 1 December 2015 until 30 Nov, 2016

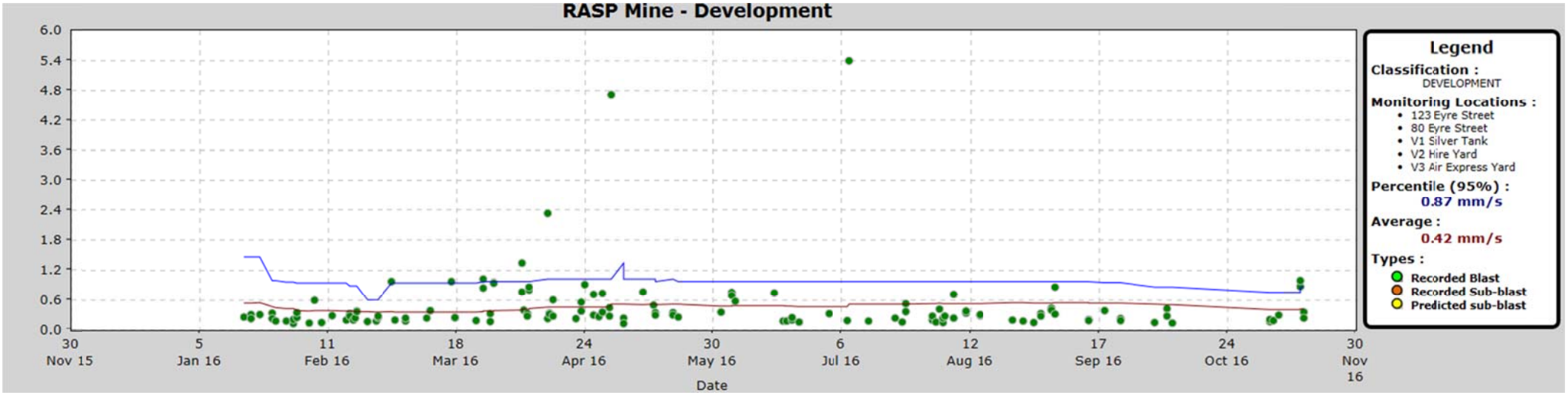
November Summary Rest of Mine, Western Mineralisation and Main Lode:

- 14 production firings
- 114 development firings
- 0 Blasts 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 1 December 2015 until 30 Nov, 2016;
- % of production blasts over 5mm/sec = **5.69%** (licence performance target <5%) %) calculated from 1 December 2015 until 30 Nov, 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 (sampled 17, 18 and 19 October) and Surface Water (sampled 19 October)

		UG FEED	SHAFT 7	GW01	GW03	GW04	GW05	GW06	GW07	GW08	GW09	GW10	GW11	GW12	GW16	Horwood Dam
pH Value	pH Unit	6.16	6.29	4.86	5.17	7.17	6.43	6.46	6.33	6.16	7.52	7.06	7.06	6.62	5.01	6.40
Electrical Conductivity @ 25°C	µS/cm	9900	13300	10900	14700	14400	16400	13300	12700	11300	12000	13600	4330	11300	5320	11200
Total Dissolved Solids @180°C	mg/L	7870	14100	10200	13600	9640	15600	11900	11500	11100	9340	11600	3540	10200	4960	9560
Hydroxide Alkalinity as CaCO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	47	49	<1	5	268	123	47	21	15	290	166	71	77	<1	8
Total Alkalinity as CaCO3	mg/L	47	49	<1	5	268	123	47	21	15	290	166	71	77	<1	8
Sulfate as SO4 - Turbidimetric	mg/L	4150	8100	4870	4700	4390	6640	4430	4550	4210	2830	4280	1670	4410	2890	4160
Chloride	mg/L	1250	1550	1220	3150	2850	3280	2510	1980	1820	2980	2620	469	1370	281	1540
Calcium	mg/L	496	544	293	576	598	545	567	545	576	935	622	239	396	474	501
Magnesium	mg/L	235	401	497	416	575	731	471	394	300	604	555	149	497	272	299
Sodium	mg/L	1300	1670	1610	2310	2500	2810	2130	1950	1410	1380	2240	583	2000	426	1400
Cadmium	mg/L	1.59	4.62	0.21	0.646	0.0466	0.679	0.936	16.1	1.95	0.018	0.82	0.0384	1.05	1.04	2.6
Lead	mg/L	0.11	2.31	0.313	1.37	0.035	0.18	0.118	0.789	0.711	0.002	0.011	0.013	0.042	0.08	1.59
Manganese	mg/L	247	630	328	563	26.2	323	267	302	586	0.435	46.1	33.7	51.8	12.2	339
Zinc	mg/L	837	1500	268	395	15.8	299	188	321	703	2.18	83.3	32	139	200	487
Iron	mg/L	0.05	0.12	0.21	46.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

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 Nov 2015 to Nov 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
November 2016 Daily Weather Observations

Date	Day	Temps Min °C	Temps Max °C	Rain mm	Evap mm	Sun hours	Max wind gust Dir	Max wind gust Spd km/h	Max wind gust Time local	9 am Temp °C	9 am RH %	9 am Cld 8th	9 am Dir	9 am Spd km/h	9 am MSLP hPa	3 pm Temp °C	3 pm RH %	3 pm Cld 8th	3 pm Dir	3 pm Spd km/h	3 pm MSLP hPa
1	Tu	6.6	23.5	0			W	39	14:32	15.3	39		SE	17	1015.9	22.7	22		WNW	22	1012.7
2	We	7.3	24.8	0			WNW	33	12:45	15.1	56		SSE	11	1020.0	22.9	27		W	13	1016.1
3	Th	8.6	28.2	0			W	30	15:27	17.8	39		SE	11	1019.9	26.6	16		WNW	13	1015.9
4	Fr	11.0	33.1	0			WNW	50	14:33	26.2	16		NW	20	1015.7	31.6	10		WNW	35	1011.4
5	Sa	10.4	23.6	0			SSW	48	00:33	13.7	54		S	31	1017.8	22.2	22		SSW	20	1016.1
6	Su	8.8	28.3	0			WSW	33	13:27	16.9	30		S	17	1017.4	26.5	11		SW	13	1012.8
7	Mo	15.7	33.9	0			NW	52	21:47	26.6	12		N	26	1008.3	32.7	9	7	NW	28	1004.1
8	Tu	14.2	25.4	0			NNW	54	00:19	16.4	68	7	S	31	1009.0	25.0	39		S	20	1007.7
9	We	11.2	28.3	0			SSE	33	06:58	18.2	39	7	SE	20	1011.2	26.8	20		SSE	13	1007.3
10	Th	12.7	29.2	0			ESE	24	01:43	20.7	35		SSW	11	1009.7	26.3	24	7	W	7	1008.9
11	Fr	17.5	36.4	0			NW	100	17:38	25.0	53		NNE	24	1006.1	35.1	26		N	31	999.8
12	Sa	17.3	29.2	3.8			WNW	69	14:44	23.0	32		WNW	33	1004.9	28.1	17		WNW	41	1003.4
13	Su	11.4	21.8	0			SW	69	15:58	15.9	48	1	W	43	1008.4	20.4	32	8	WSW	46	1007.6
14	Mo	10.4	23.5	0			SW	69	10:07	14.2	49	3	SW	37	1015.8	22.3	27		SSW	28	1015.0
15	Tu	9.5	25.2	0			SSW	35	13:14	14.6	59		S	20	1021.4	24.1	26		SW	19	1018.6
16	We	12.8	29.1	0			SE	30	13:53	20.3	40		ESE	13	1022.2	27.8	20		SE	17	1019.2
17	Th	17.0	34.7	0			NW	41	13:20	26.6	25		NNE	28	1018.6	33.7	12		NW	20	1014.7
18	Fr	19.3	32.6	0			SW	37	15:24	27.5	19		SSW	20	1014.4	31.7	20	8	SSW	24	1013.3
19	Sa	18.1	30.9	0			SSE	41	12:01	23.9	38	5	SSE	26	1015.8	27.0	33	8	S	20	1014.6
20	Su	18.6	37.7	0			N	59	18:56	29.6	25	5	ENE	17	1013.5	35.6	14	8	NW	19	1010.0
21	Mo	20.4	38.7	0.8			SW	59	20:39	32.9	18		N	28	1010.2	36.9	12	5	NNW	26	1006.8
22	Tu	17.5	27.0	1.6			S	56	20:58	21.7	55	8	E	30	1012.8	21.3	69	8	SSW	20	1012.2
23	We	10.1	22.0	6.8			SSW	56	08:27	13.8	67		S	37	1017.7	20.0	33		S	33	1016.0
24	Th	6.9	23.0	0.2			S	52	14:12	15.0	45		SE	20	1019.4	21.0	26		SSW	24	1016.9
25	Fr	8.9	25.1	0			SSW	44	13:56	15.0	53		S	22	1019.2	23.8	24		SSW	28	1017.4
26	Sa	11.4	26.1	0			SSE	39	12:11	17.5	46		SSE	22	1020.6	24.7	23		S	24	1018.1
27	Su	9.4	29.2	0			SW	39	15:16	19.1	39		SE	17	1018.8	27.8	15		SW	19	1015.4
28	Mo	12.3	34.5	0			SW	43	16:31	25.6	18		NNE	13	1014.8	32.0	11		WSW	17	1011.1
29	Tu	17.6	36.4	0			SW	50	14:27	23.7	26		SSW	17	1010.7	34.6	10		SW	30	1007.8
30	We	16.0	31.4	0			WSW	57	11:53	20.8	34	7	SSW	24	1010.3	27.7	27	6	SSE	9	1008.2
Statistics for November 2016																					
Mean		13.0	29.1							20.4	39	5		22	1014.7	27.3	22	7		22	1012.0
Lowest		6.6	21.8	0						13.7	12	1	#	11	1004.9	20.0	9	5	W	7	999.8
Highest		20.4	38.7	6.8			NW	100		32.9	68	8	W	43	1022.2	36.9	69	8	WSW	46	1019.2
Total				13.2																	

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.