

Monthly Environmental Data September 2016

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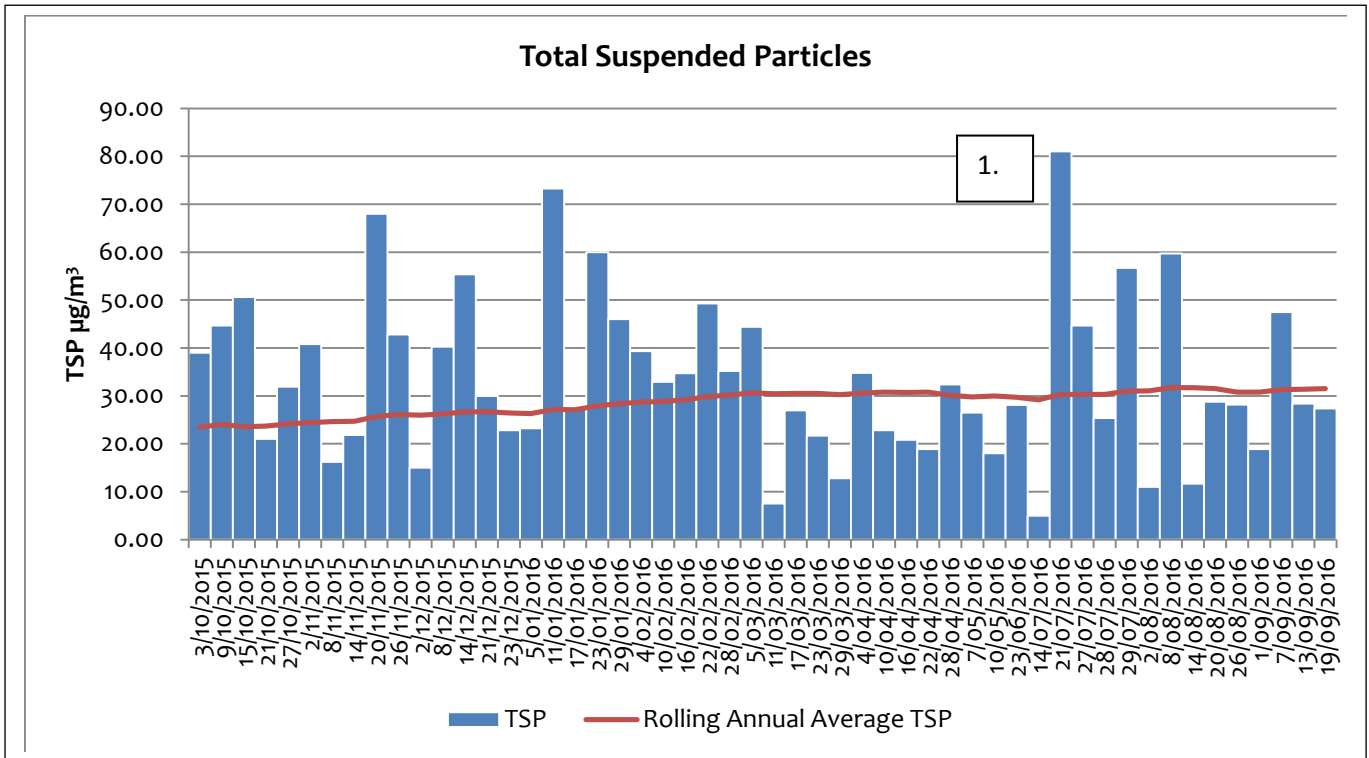
1 Air Quality

1.1 High Volume Air Samplers

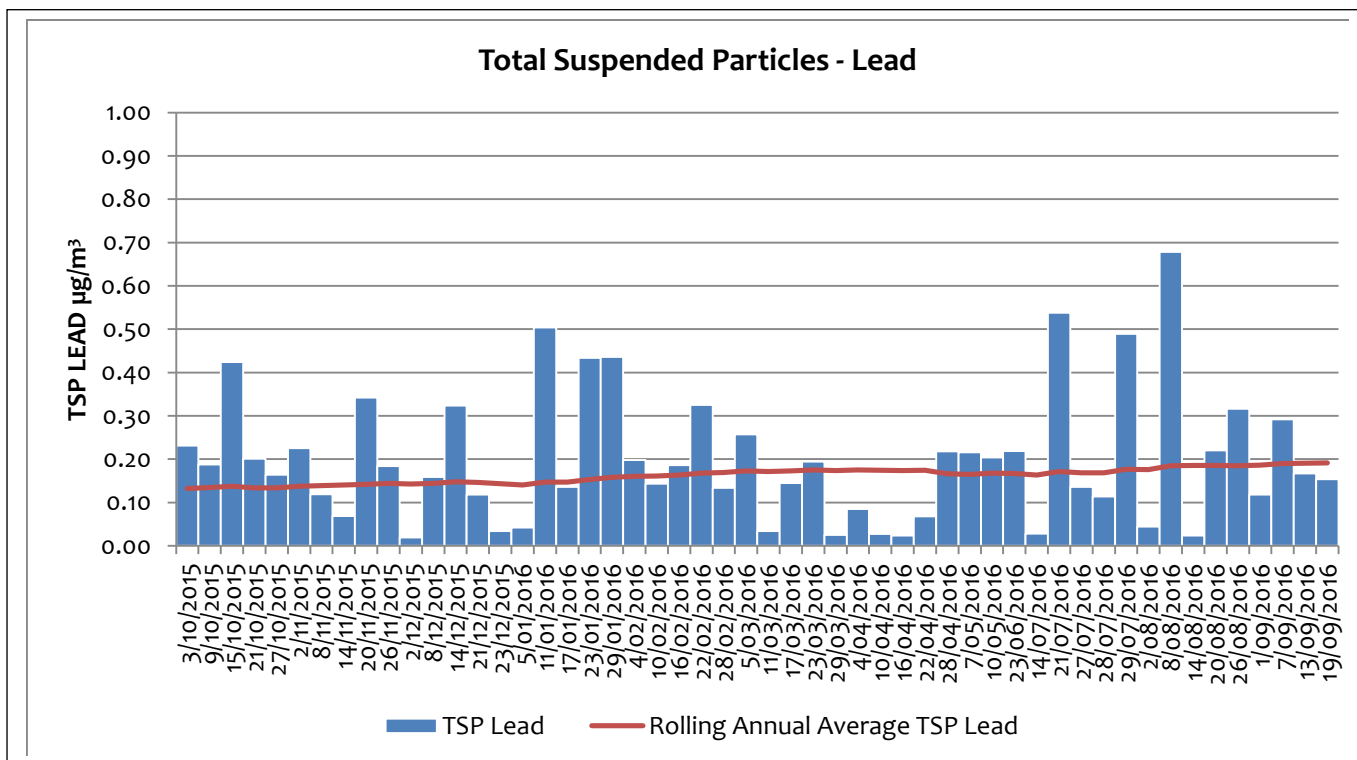
High volume air samplers at Silver Tank both failed calibration during May 2016. Both units were sent back to Ecotech in Melbourne for repair. The units were underservice for the duration of May. In early June the transformer located at Silver Tank failed thus rendering the local power source for high 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 ($\mu\text{g}/\text{m}^3$)	Lead ($\mu\text{g}/\text{m}^3$)
1/09/2016	18.90	0.12
7/09/2016	47.50	0.29
13/09/2016	28.40	0.17
19/09/2016	27.40	0.15
25/09/2016	Filter destroyed by high wind	



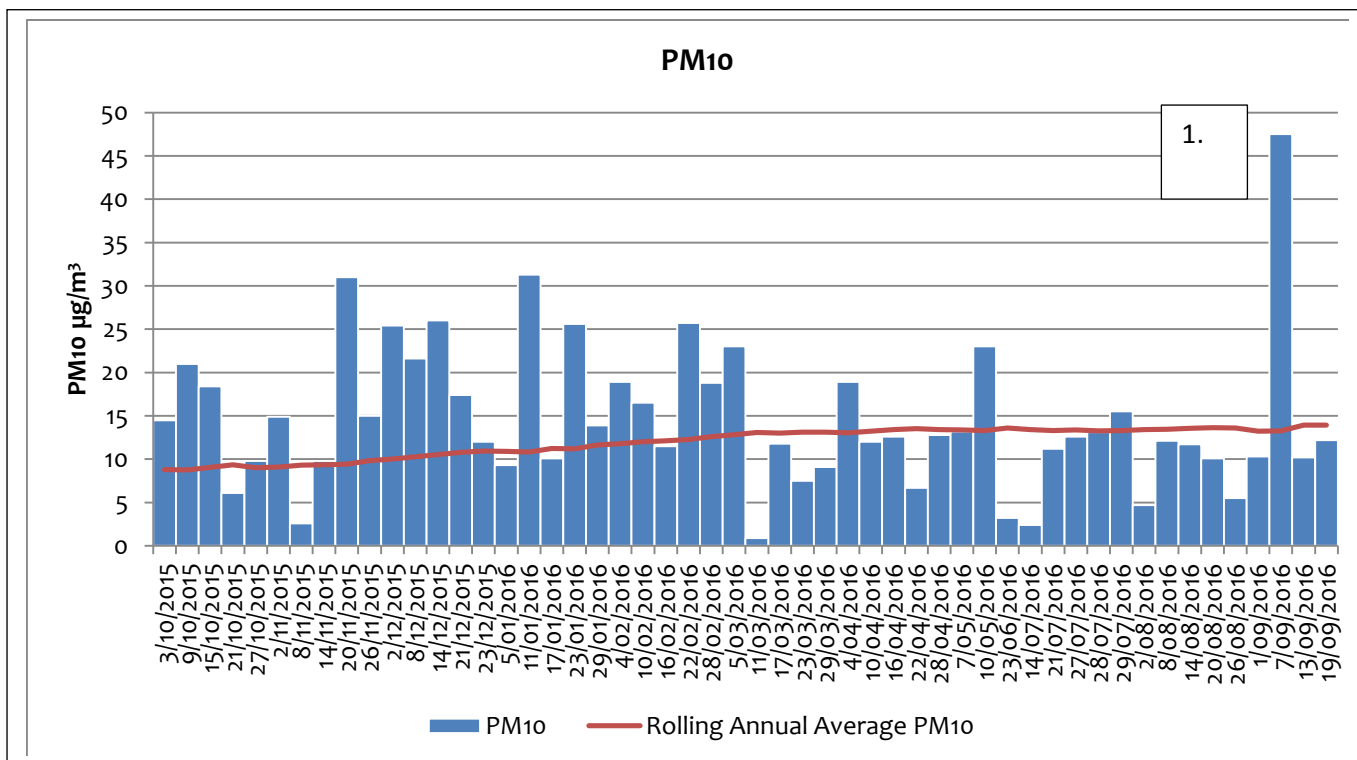
1. The spike on the 21st of July coincided with maintenance being performed on a genset from which the high volume samplers were powered. Some diesel contamination was found on the filters as a result of the diesel generator running nearby approximately 10m away. Values are still well below the Project Approval limit of 90 $\mu\text{g}/\text{m}^3$ as an annual average.

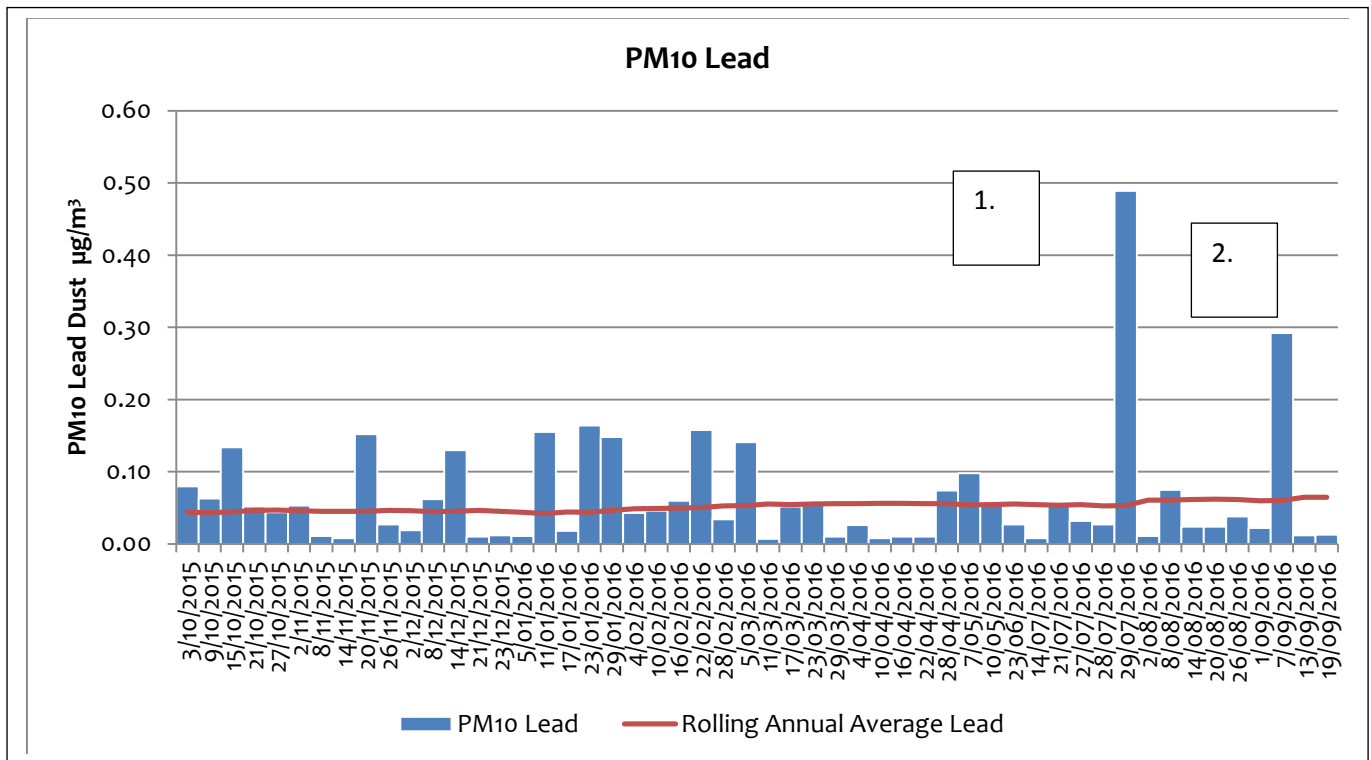


Averaged values are below the National Environment Protection (Ambient Air Quality) Measure standard of $0.50\mu\text{g}/\text{m}^3$ averaged over 1 year (no size limit).

EPL11 - Silver Tank Hi Vol PM10 - On Site

DATE	PM10 ($\mu\text{g}/\text{m}^3$)	Lead ($\mu\text{g}/\text{m}^3$)
1/09/2016	10.30	0.02
7/09/2016	47.50	0.29
13/09/2016	10.20	0.01
19/09/2016	12.20	0.01
25/09/2016	Filter destroyed by high wind	

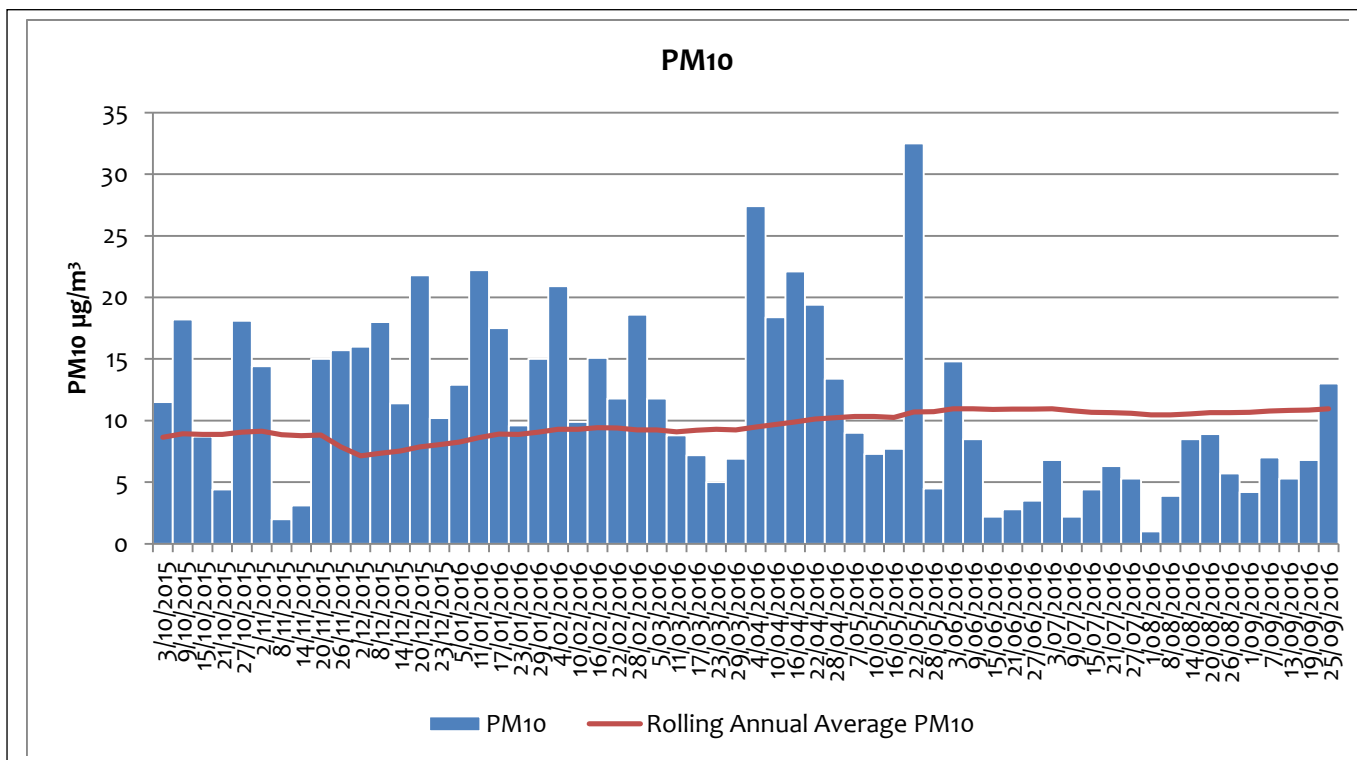




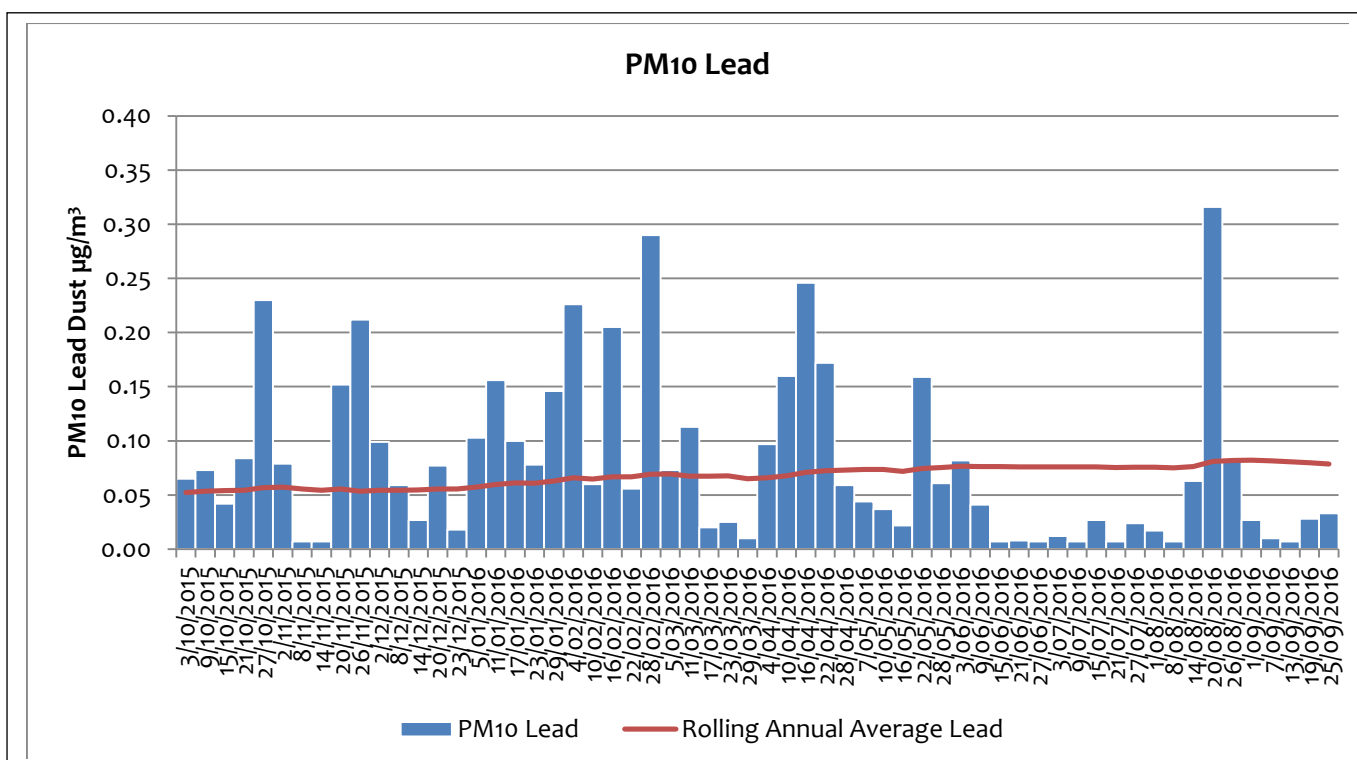
1. A spike in lead concentration occurred on July 29. A concentration of $0.49\mu\text{g}/\text{m}^3$ was recorded which may have been due to vehicles passing close by during servicing of a diesel genset which was powering the high volume sampler. Values are still below the National Environment Protection (Ambient Air Quality) Measure standard of $0.50\mu\text{g}/\text{m}^3$ averaged over 1 year (no size limit).
2. See comment on previous graph

EPL12 - Blackwoods Pit Hi Vol PM10 – On Site

DATE	PM10 ($\mu\text{g}/\text{m}^3$)	Lead ($\mu\text{g}/\text{m}^3$)
1/09/2016	4.20	0.03
7/09/2016	7.00	0.01
13/09/2016	5.30	0.01
19/09/2016	6.80	0.03
25/09/2016	13.00	0.03



Averaged values for PM10 are below the Project Approval limits of 50 $\mu\text{g}/\text{m}^3$ (24hr) and 30 $\mu\text{g}/\text{m}^3$ (annual).



Averaged values are below the National Environment Protection (Ambient Air Quality) Measure standard of 0.50 $\mu\text{g}/\text{m}^3$ averaged over 1 year (no size limit).

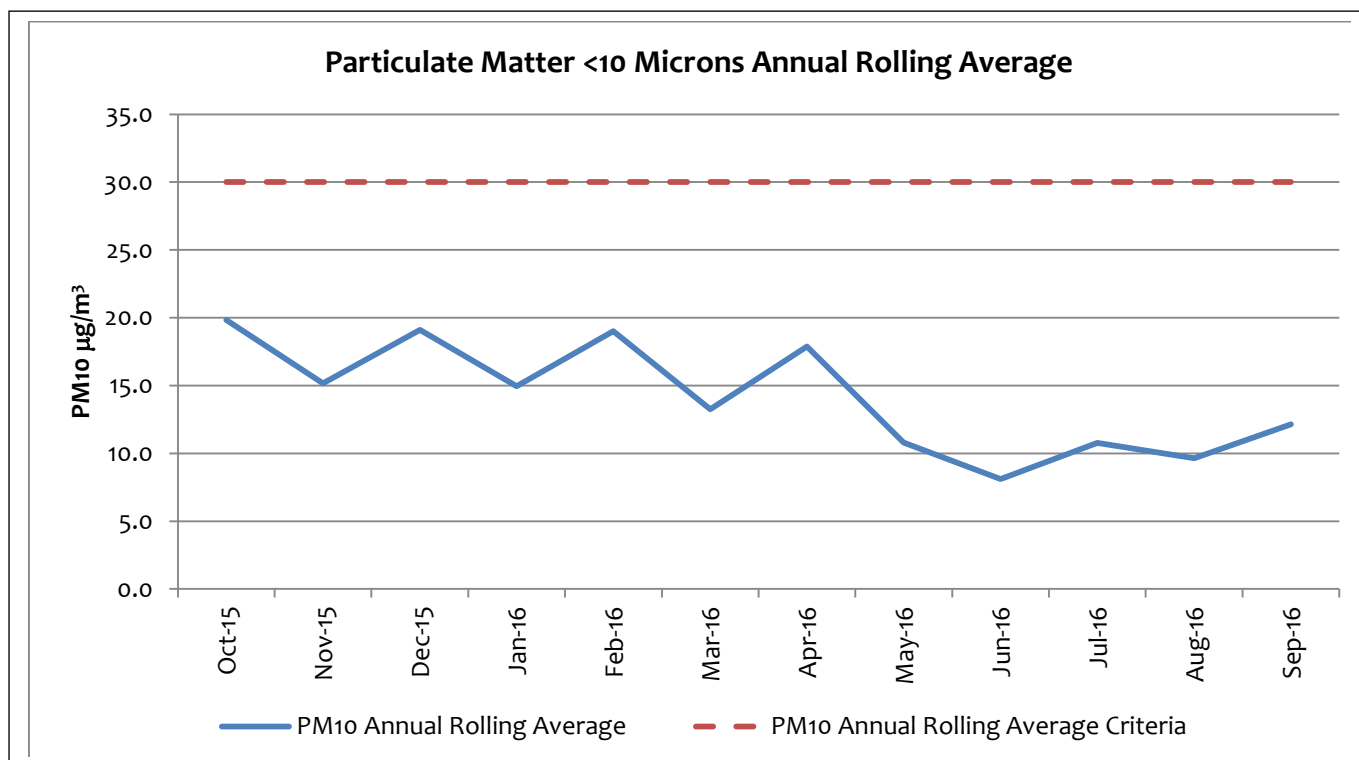
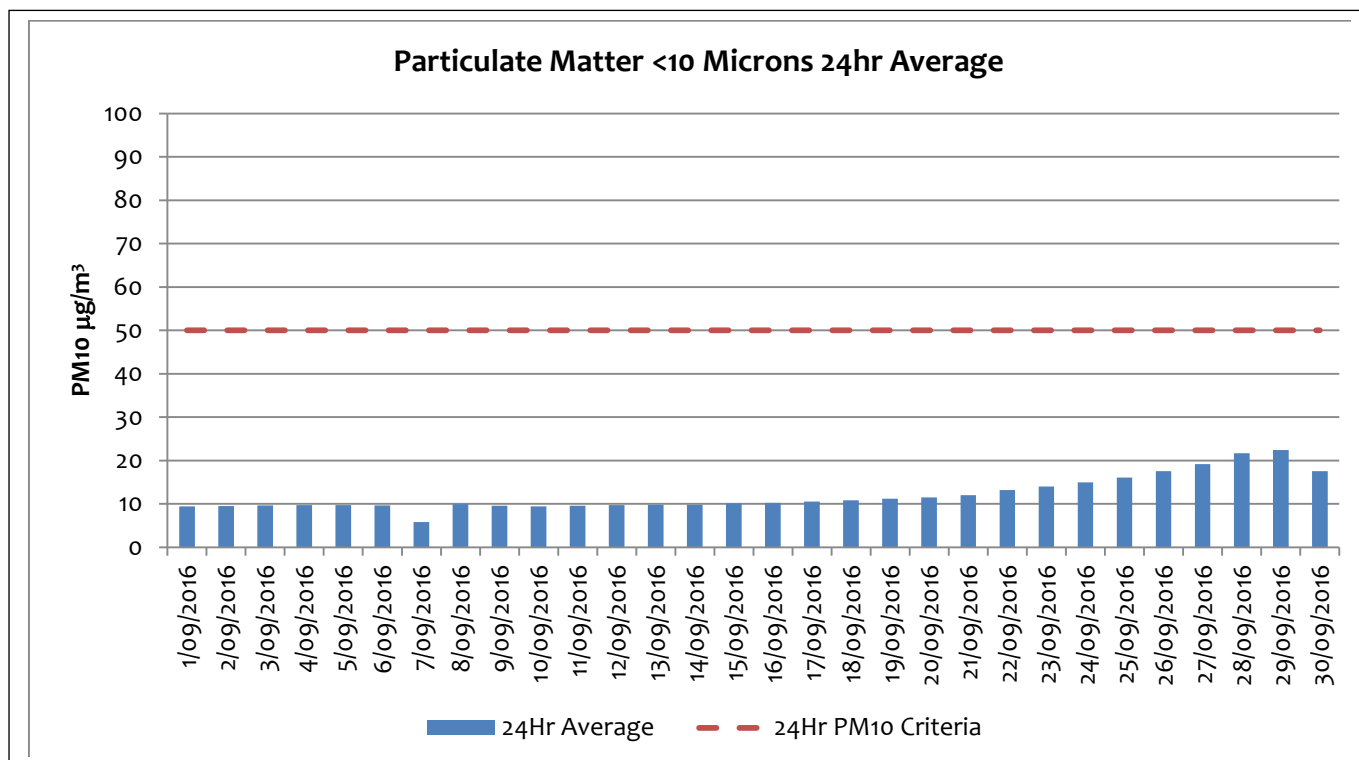
1.2 Tapered Element Oscillating Microbalance Sampling (TEOM)

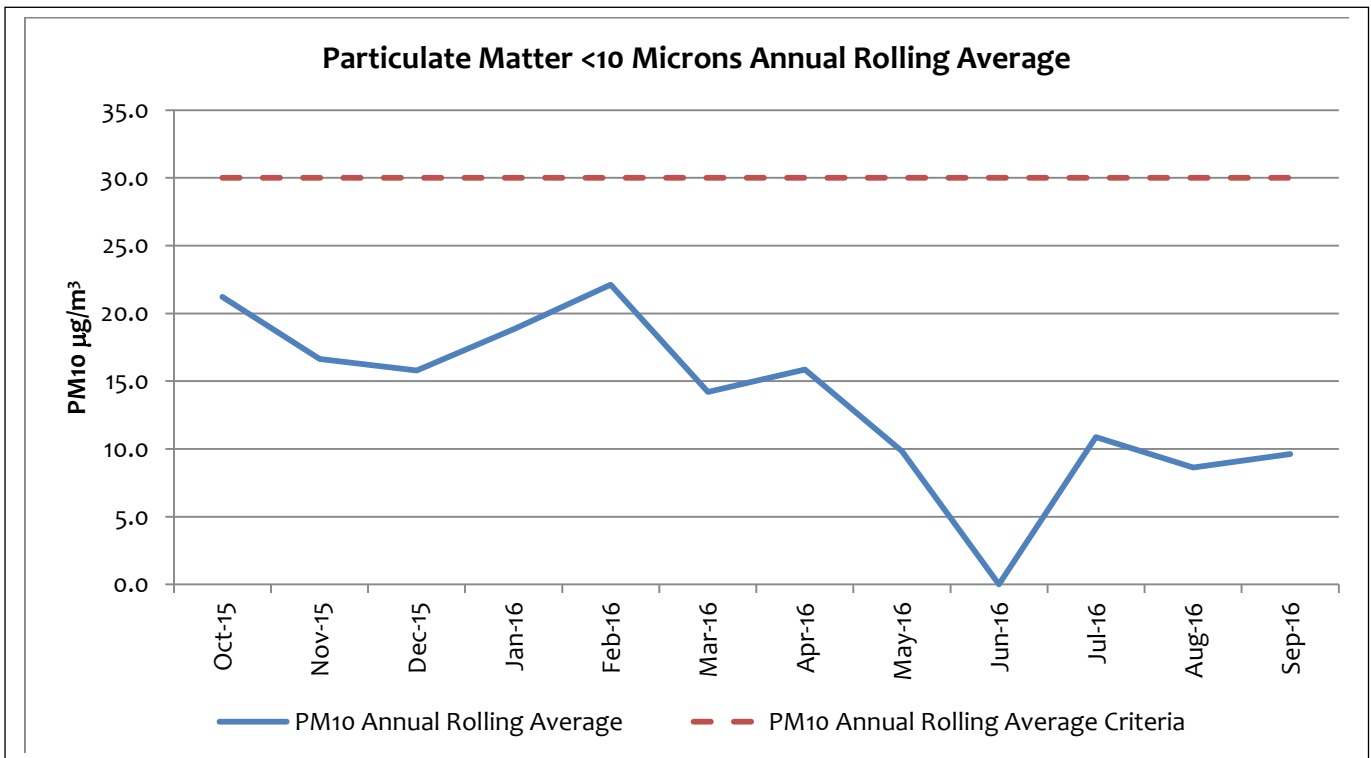
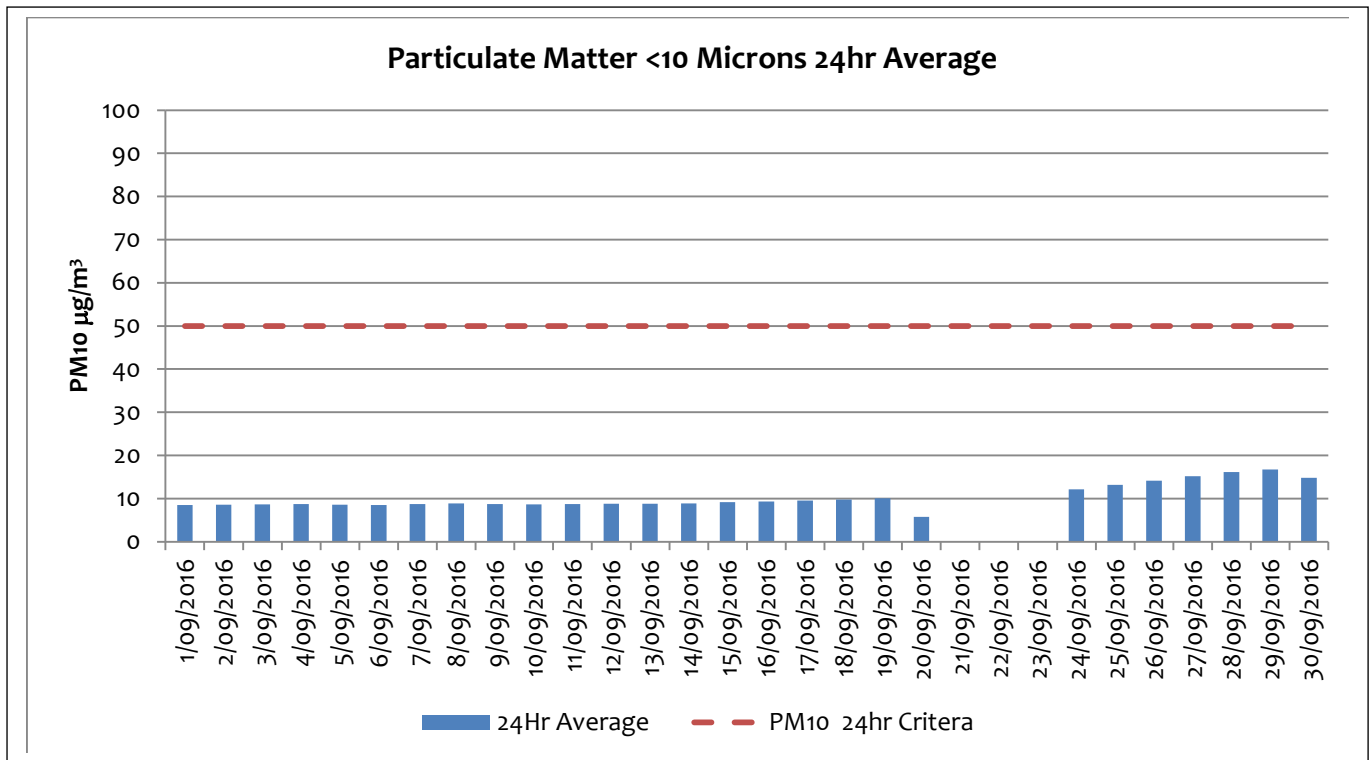
Particulate Matter <10 Microns 24Hr Average		
Date	TEOM 1 - EPL 13 ($\mu\text{g}/\text{m}^3$) Essential Water – Off Site	TEOM 2 – EPL 14 ($\mu\text{g}/\text{m}^3$) Blackwoods Pit – On Site
1/09/2016	9.41	8.50
2/09/2016	9.48	8.58
3/09/2016	9.61	8.66
4/09/2016	9.71	8.74
5/09/2016	9.70	8.59
6/09/2016	9.66	8.49
7/09/2016	5.83	8.69
8/09/2016	9.96	8.90
9/09/2016	9.58	8.73
10/09/2016	9.46	8.63
11/09/2016	9.59	8.72
12/09/2016	9.72	8.77
13/09/2016	9.80	8.82
14/09/2016	9.76	8.84
15/09/2016	10.07	9.18
16/09/2016	10.27	9.33
17/09/2016	10.55	9.55
18/09/2016	10.79	9.75
19/09/2016	11.17	10.08
20/09/2016	11.49	5.75
21/09/2016	12.03	Power outage
22/09/2016	13.22	0.00
23/09/2016	14.03	0.00
24/09/2016	14.99	12.17
25/09/2016	16.05	13.16
26/09/2016	17.54	14.15
27/09/2016	19.19	15.21
28/09/2016	21.64	16.13
29/09/2016	22.44	16.77
30/09/2016	17.55	14.84

A power outage occurred on the 21/9 due to lightning strike. Power was reinstated on the 22/9.

PM10 $\mu\text{g}/\text{m}^3$ 12 Month Rolling Average												
	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
TEOM 1 EPL13 Essential Water Off Site	19.8	15.2	19.1	15.0	19.0	13.3	17.9	10.8	8.1	10.8	9.6	12.1
TEOM 2 EPL14 Blackwoods Pit On Site	21.2	16.6	15.8	18.8	22.1	14.2	15.9	9.8	0.0	10.9	8.6	9.6

EPL13 – Essential Water – Off Site (TEOM1)

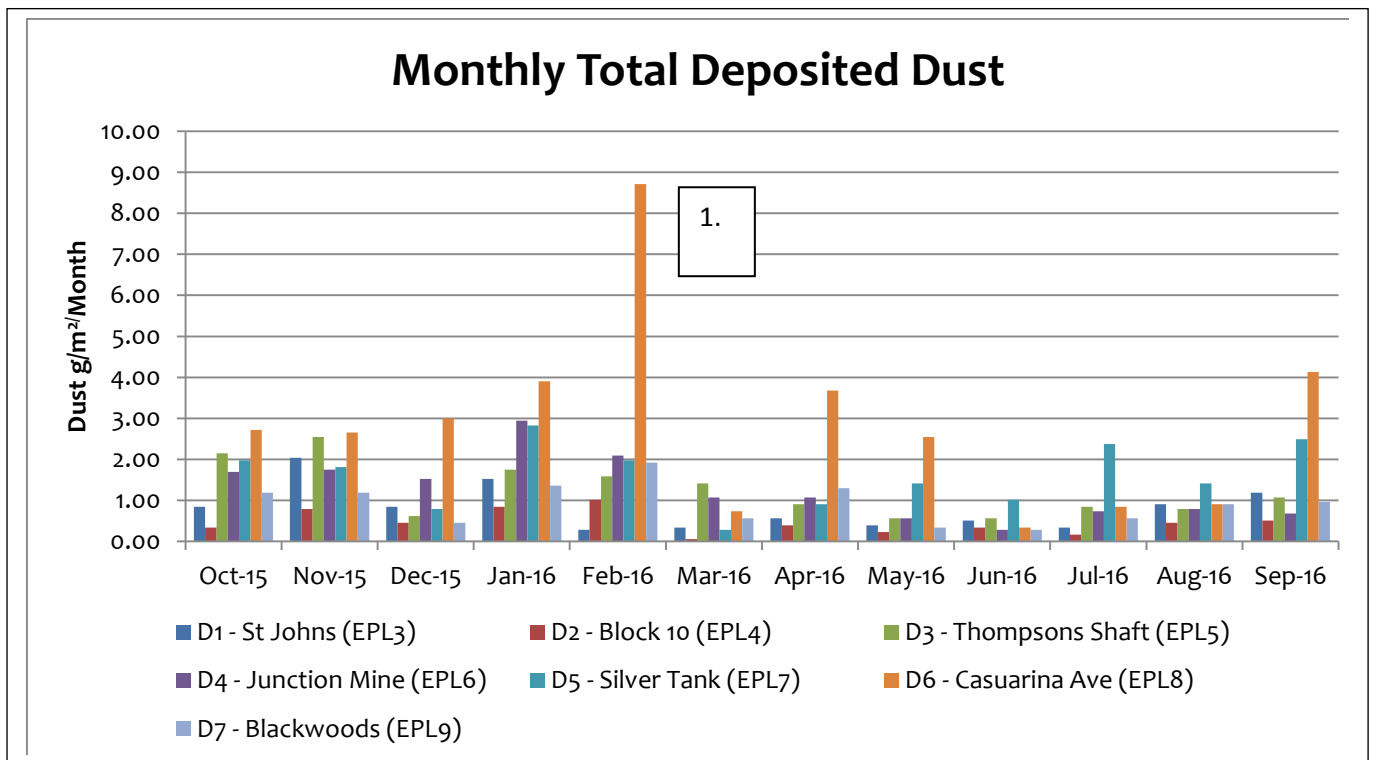




TEOM 2 was calibrated by an external manufacturer's technician on May 5. The technician failed to reset the machine, this lead to the machine failing to record data for the remainder of May and the whole of June. The error was found by the Environmental Officer during the monthly data download.

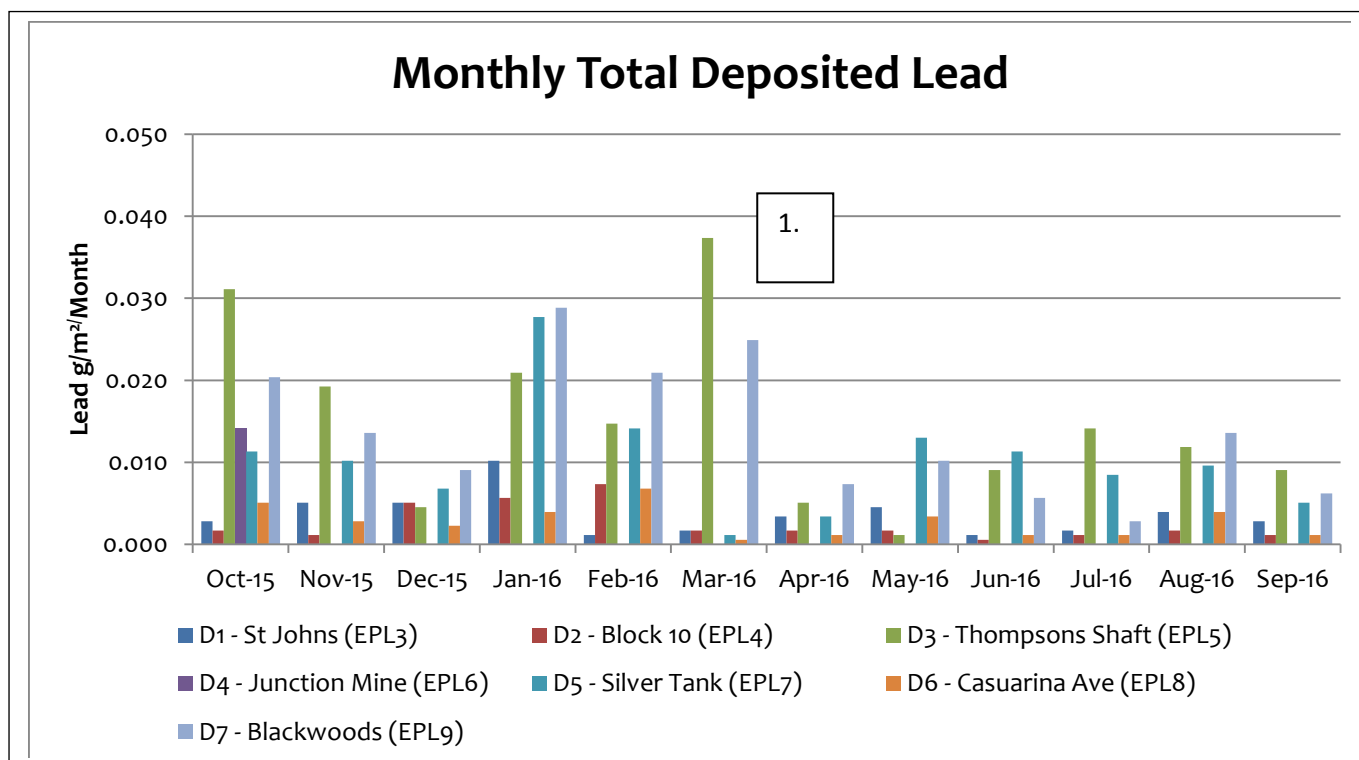
1.3 Dust Deposition Sampling

Total Deposited Dust (g/m ² /Month)							
Date	D1 (off site)	D2	D3	D4	D5	D6 (off site)	D7
September 2016	1.19	0.51	1.08	0.68	2.49	4.13	0.96
Background Average	4.0	3.1	4.3	5.7	n/a	5.8	n/a



- 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
September 2016	0.003	0.001	0.009	0.000	0.005	0.001	0.006
Background Average	0.0000	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)*

September Summary Block 7, Zinc Lode:

- 1 production firings
- 2 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 = **2.70%** (licence requirement <5%) calculated from 1st October 2015 until 30th September, 2016;
- % of production blasts over 3mm/sec = **3.64%** (licence pollution reduction plan target <5%) calculated from 1st October 2015 until 30th September, 2016;

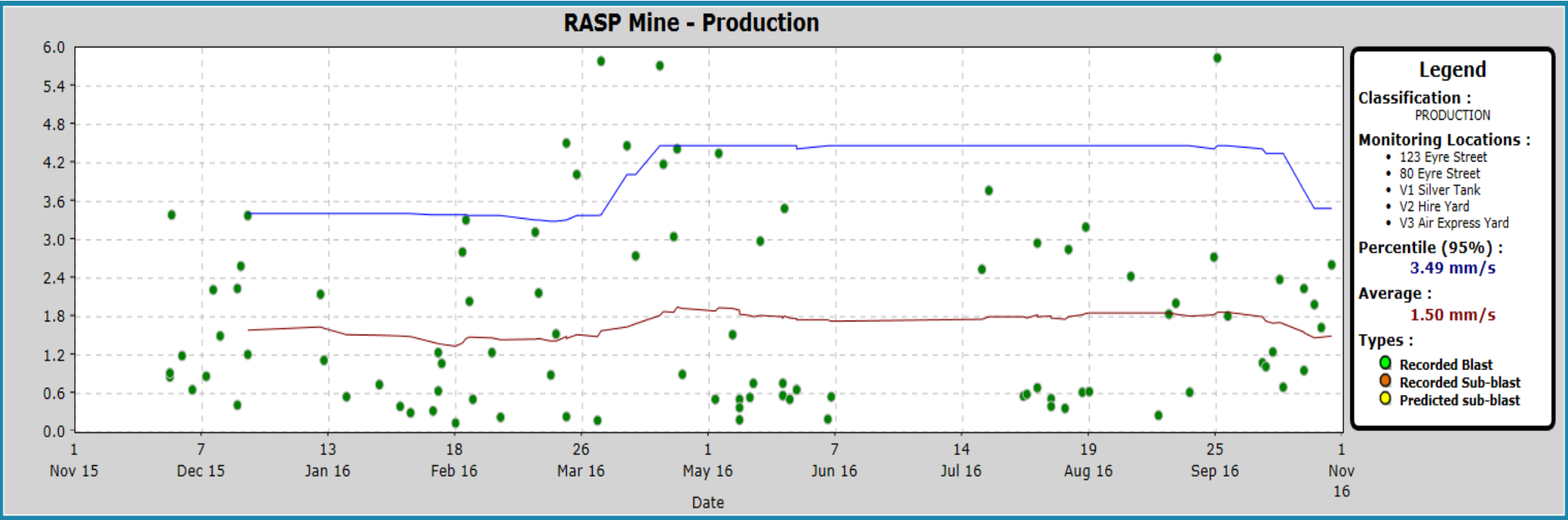
September Summary Rest of Mine, Western Mineralisation and Main Lode:

- 9 production firings
- 150 development firings
- 1 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 = **0.43%** (licence requirement <5%) calculated from 1st October 2015 until 30th September, 2016;
- % of production blasts over 5mm/sec = **7.02%** (licence performance target <5%) calculated from 1st October 2015 until 30th September, 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 Ground/Surface Water Sampled 6/9/2016

		UG FEED	SHAFT 7
pH Value	pH Unit	6.11	6.54
Electrical Conductivity @ 25°C	µS/cm	10600	12600
Total Dissolved Solids @180°C	mg/L	10600	12900
Hydroxide Alkalinity as CaCO3	mg/L	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	6	20
Total Alkalinity as CaCO3	mg/L	6	20
Sulfate as SO4 - Turbidimetric	mg/L	4500	5720
Chloride	mg/L	1280	1580
Calcium	mg/L	461	497
Magnesium	mg/L	212	301
Sodium	mg/L	1300	1560
Cadmium	mg/L	1.89	2.56
Lead	mg/L	0.879	2.22
Manganese	mg/L	268	553
Zinc	mg/L	892	1030
Iron	mg/L	1.77	<0.05

3.2 Downstream Locations (EPL Points 35 and 36) Sampled 20/09/2016

		DOWNSTREAM 1	DOWNSTREAM 2
pH Value	pH Unit	6.92	6.73
Electrical Conductivity @ 25°C	µS/cm	167	197
Total Dissolved Solids @180°C	mg/L	88	270
Hydroxide Alkalinity as CaCO ₃	mg/L	<1	<1
Carbonate Alkalinity as CaCO ₃	mg/L	<1	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	17	29
Total Alkalinity as CaCO ₃	mg/L	17	29
Sulfate as SO ₄ - Turbidimetric	mg/L	34	29
Chloride	mg/L	10	16
Calcium	mg/L	15	16
Magnesium	mg/L	2	3
Sodium	mg/L	7	14
Cadmium	mg/L	0.0031	0.0004
Lead	mg/L	0.01	0.004
Manganese	mg/L	0.813	0.024
Zinc	mg/L	2.18	0.111
Iron	mg/L	<0.05	0.25

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
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

September 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					km/h	local	°C	%	g th		km/h	hPa	°C	%	g th		km/h	hPa
1	Th	9.0	20.4	0.2			ENE	39	10:36	15.3	70	7	ENE	17	1017.8	18.8	43	3	NNE	11	1011.3
2	Fr	10.7	14.1	5.6			SSW	43	12:08	11.0		8	SSE	24	1006.3	12.3	91	7	S	31	1003.5
3	Sa	5.7	17.5	6.4			WSW	48	12:03	11.7	73	1	WSW	26	1016.1	16.9	45	2	W	33	1015.7
4	Su	4.1	15.7	0			S	20	10:20	10.1	75		SSW	9	1028.2	15.5	51		SW	11	1026.3
5	Mo	5.3	18.4	0			NE	31	13:31	13.6	64		ENE	17	1030.6	17.9	46		ENE	9	1026.6
6	Tu	5.0	20.8	0			N	30	10:13	14.5	71	1	NE	15	1028.4	20.4	38		E	11	1024.8
7	We	6.9	23.4	0			NE	41	12:11	17.3	58		NNE	24	1026.0	23.0	36		NE	22	1021.9
8	Th	12.5	25.6	0			N	52	10:47	19.2	52		NNE	37	1019.4	24.6	33	2	NNW	28	1014.2
9	Fr	12.0	16.7	23.2			N	56	00:27	14.2	67	4	WSW	30	1013.4	15.5	54		WSW	35	1012.7
10	Sa	6.3	17.2	0			SW	26	09:34	11.7	81	6	SW	17	1022.2	16.2	49	3	WSW	15	1019.4
11	Su	6.9	19.6	0			NW	26	12:47	14.1	65	8	NNE	13	1021.7	18.8	45		N	11	1018.0
12	Mo	7.2	21.7	0			NW	28	12:45	17.5	57		N	9	1020.5	21.1	33	2	NNW	11	1016.3
13	Tu	12.9	19.8	0			NNE	50	10:29	15.7	69	8	NNE	19	1014.5	16.1	74	8	NNW	24	1010.7
14	We	6.3	15.2	2.8			WNW	57	13:54	10.1	74		WNW	33	1014.0	13.6	41	3	WNW	39	1011.7
15	Th	6.6	16.9	0						11.8	71		W	22	1016.4	14.6	69	8	WSW	15	1014.1
16	Fr	6.3	18.7	0			N	41	12:56	13.6	68	1	ESE	6	1020.6	18.2	42	3	N	17	1017.7
17	Sa	7.2	20.2	0			N	39	16:22	15.1	51	6	NNE	17	1017.3	18.3	43	8	N	17	1013.6
18	Su	8.4	14.4	19.8			SSW	65	08:22	8.8	83	8	SSW	41	1013.1	13.8	51		SW	33	1012.1
19	Mo	2.8	17.0	0.2			N	35	14:45	12.1	57		E	15	1015.3	16.7	45	3	N	19	1012.1
20	Tu	8.0	16.5	0			S	54	16:14	14.8	62		NE	31	1011.0	12.8	90	8	ENE	30	1006.3
21	We	9.8	16.2	36.4			WSW	50	08:38	11.9	84	8	WSW	33	1013.0	14.6	67	8	WSW	31	1013.7
22	Th	5.6	14.3	0			SSW	43	01:41	10.1	61	3	S	28	1020.2	14.3	52	2	SW	17	1017.8
23	Fr	2.9	18.5	0.2			N	30	14:14	12.7	61		NNE	11	1016.7	18.4	41		NNW	13	1010.9
24	Sa	6.8	16.8	0			SW	46	21:58	15.7	52	8	NNE	20	1009.1	15.4	66	8	N	17	1006.2
25	Su	7.6	16.4	5.4			SW	41	00:03	11.6	58		SSW	28	1016.2	16.1	43		SW	19	1013.6
26	Mo	7.1	20.3	0			WNW	39	14:14	15.3	49		N	17	1015.6	19.8	35		WNW	22	1012.1
27	Tu	4.9	18.7	0			NW	30	15:34	12.4	57		SSW	11	1017.5	18.0	33		WNW	13	1014.0
28	We	7.0	25.0	0			N	81	19:53	17.6	49		NE	35	1009.0	23.7	43	8	N	28	998.3
29	Th	6.9	13.1	4.2			NW	87	11:44	10.0	58	1	NW	56	995.8	12.0	61	7	WNW	57	995.0
30	Fr	7.8	18.0	0.2			WNW	63	00:01	12.2	68	4	W	39	1003.7	16.2	59	7	W	41	1004.7
Statistics for September 2016																					
Mean		7.2	18.2							13.4	64	5		23	1016.3	17.1	50	5		22	1013.2
Lowest		2.8	13.1	0						8.8	49	1	ESE	6	995.8	12.0	33	2	ENE	9	995.0
Highest		12.9	25.6	36.4			NW	87		19.2	84	8	NW	56	1030.6	24.6	91	8	WNW	57	1026.6
Total				104.6																	

IDCJDW2168.201609 Prepared at 13:02 GMT on Friday 21 October 2016

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

Field monitoring data for September has been entered in to google forms. There are no attachments.