Monthly Environmental Data May 2016

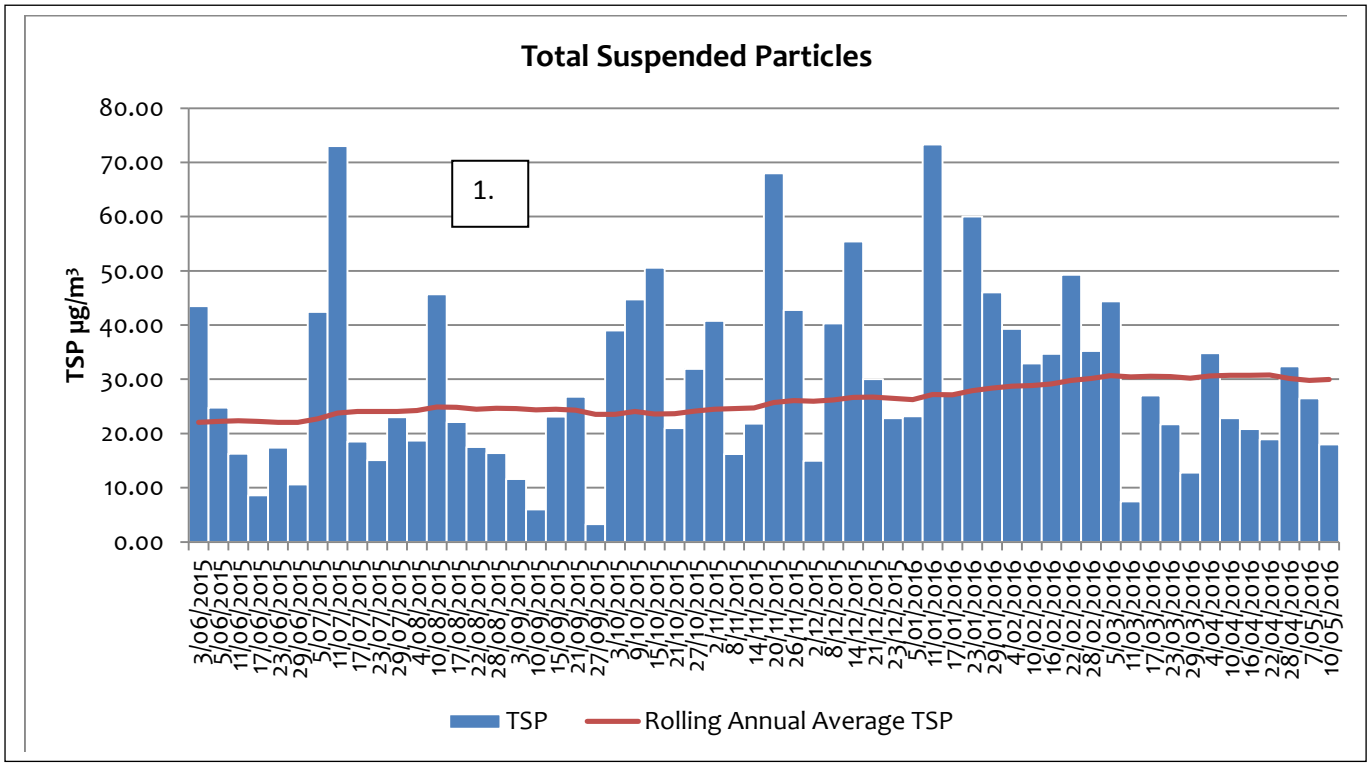
Contents

1 Air Quality

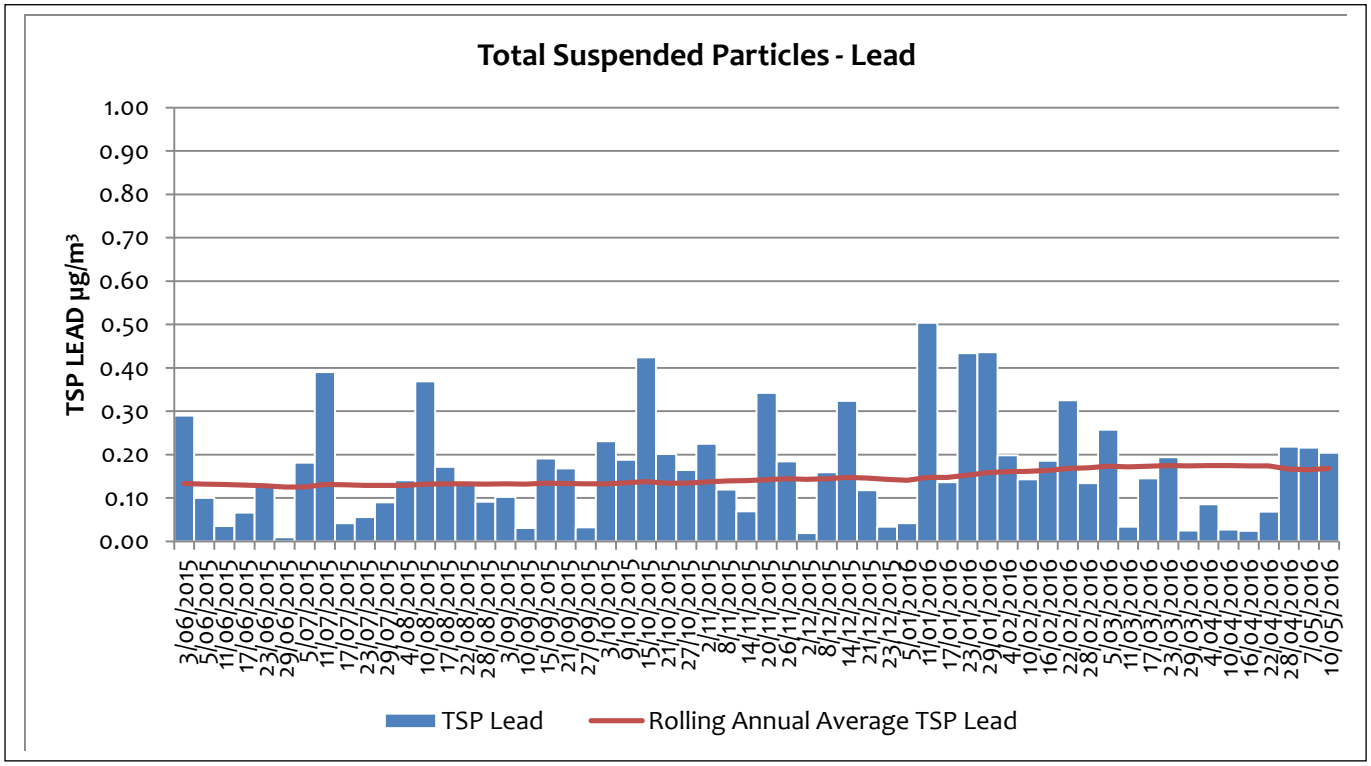
1.1 High Volume Air Samplers

EPL10 - SILVER TANK - ON SITE

DATE	TSP (µg/m^3)	Lead (µg/m^3)
7/05/2016	26.50	0.22
10/05/2016	18.00	0.20

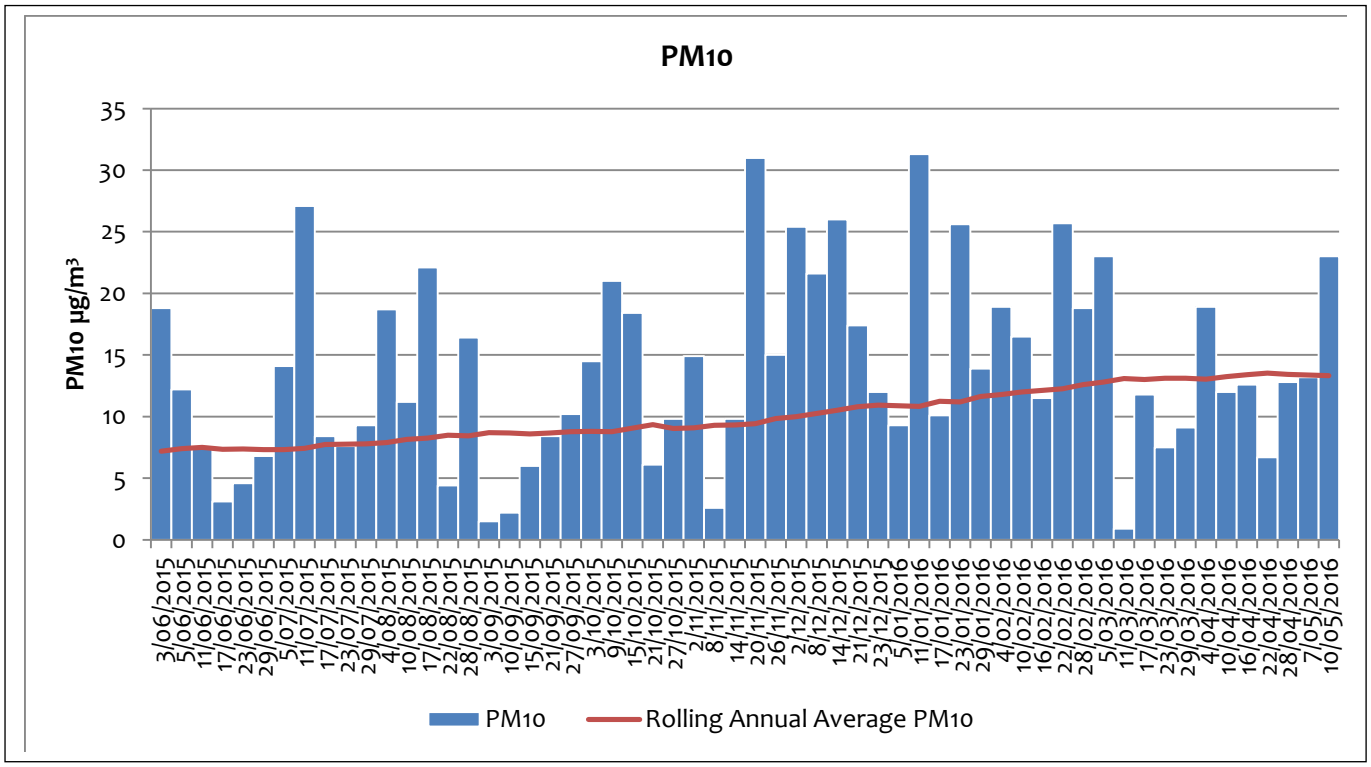


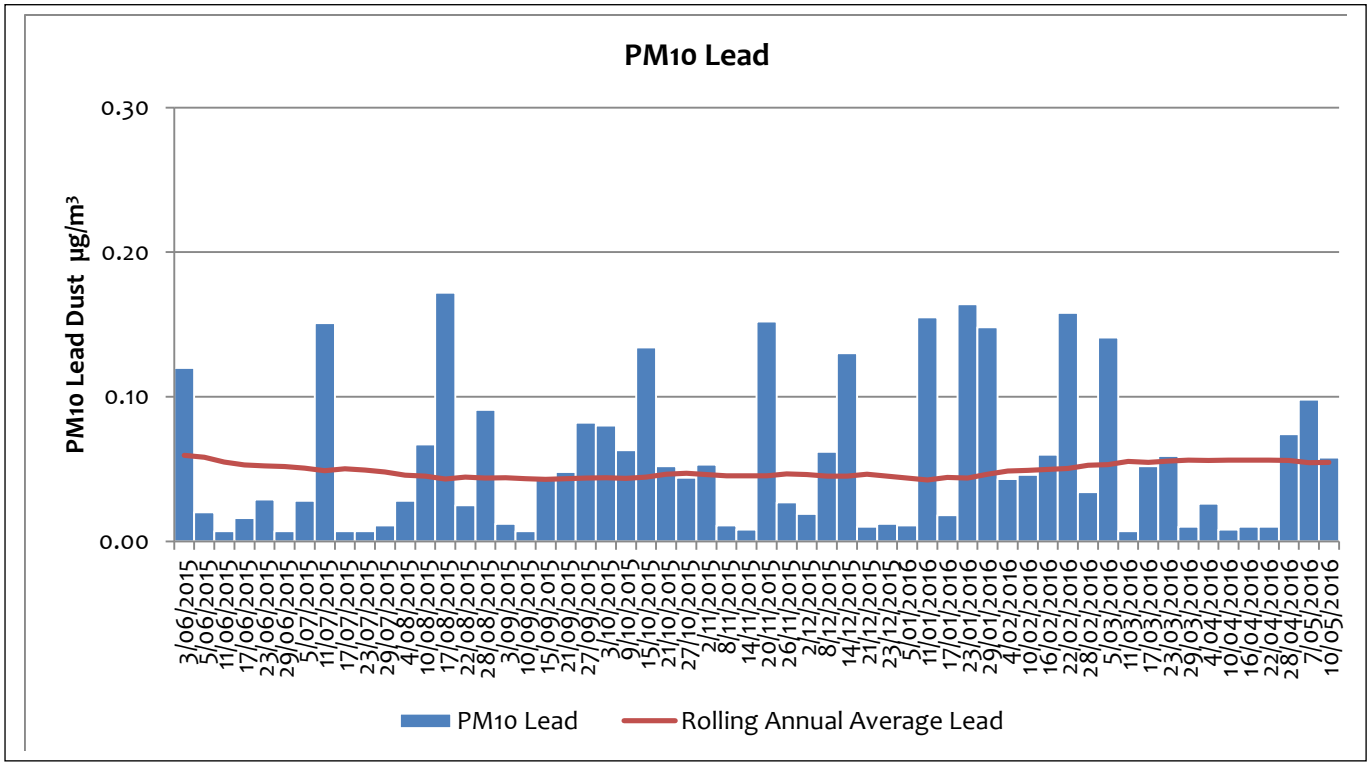
1. The spike on the 11th July also occurred when conditions were considered normal with 15km/h winds from a SE direction. Lab QC was okay, this may have been due to earthmoving activity (grading) in the local area. The spike on the 20th November coincides with 70kmh gusts coming from a westerly direction. On the 11th January gusts were recorded up to 65km/h in a WSW direction.



EPL11 - Silver Tank - On Site

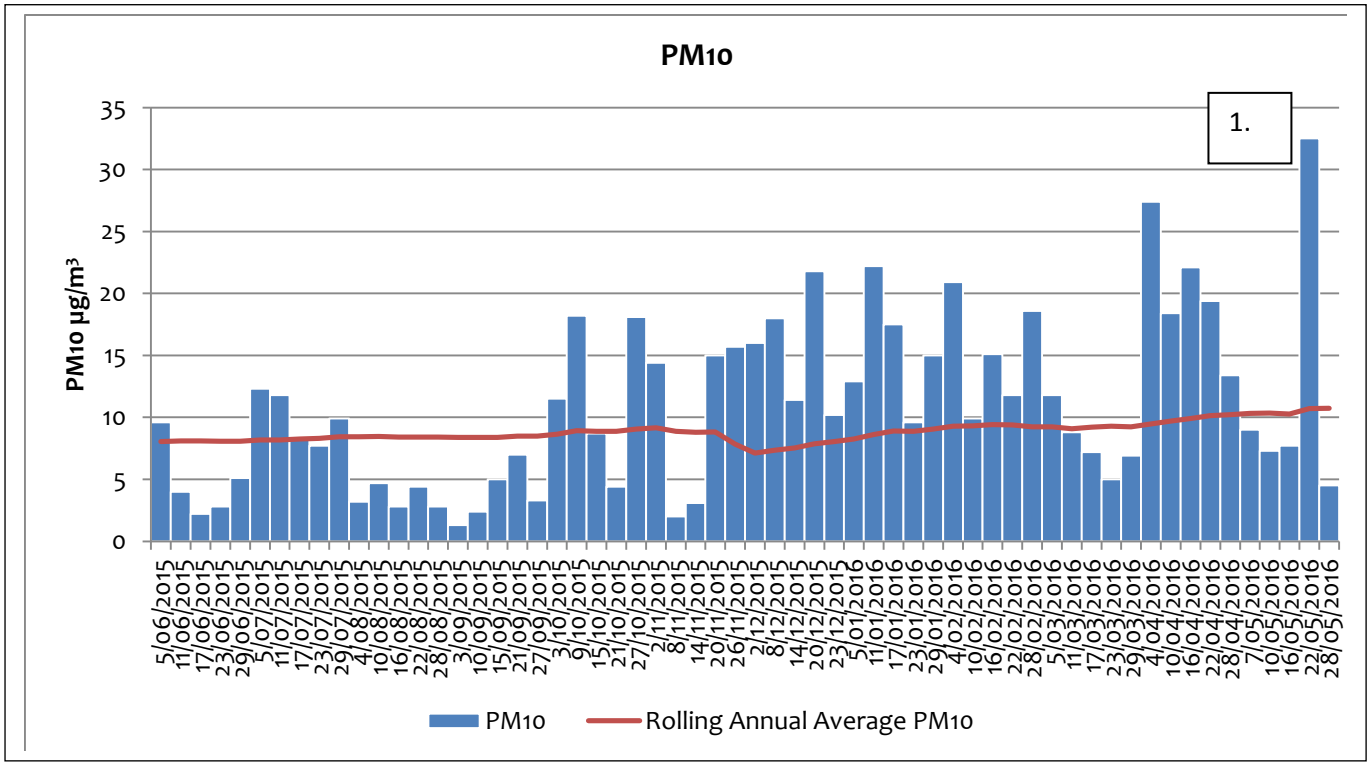
DATE	PM10 (µg/m^3)	Lead (µg/m^3)
7/05/2016	13.20	0.10
10/05/2016	23.00	0.06



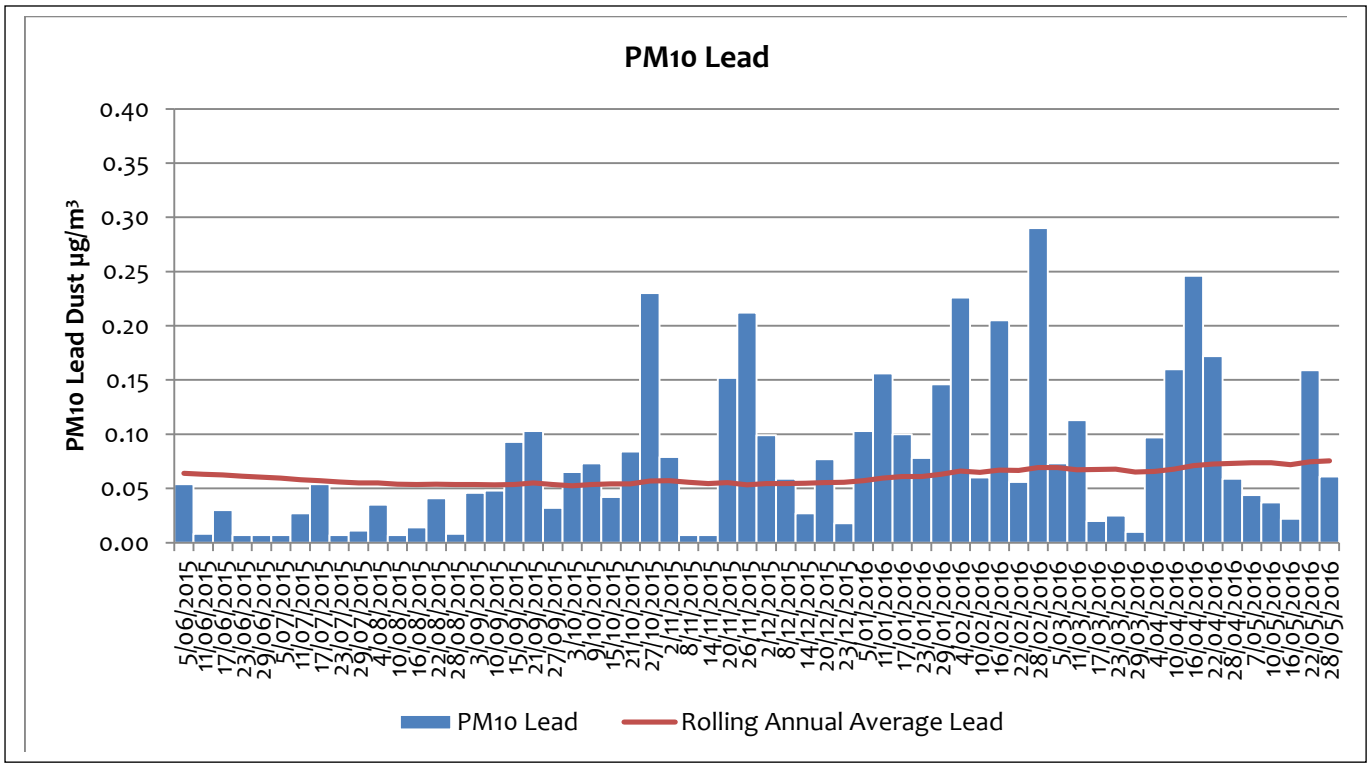


EPL12 - Blackwoods Pit – On Site

DATE	PM10 (µg/m^3)	Lead (µg/m^3)
7/05/2016	9.00	0.04
10/05/2016	7.30	0.04
16/05/2016	7.70	0.02
22/05/2016	32.50	0.16
28/05/2016	4.50	0.06



1. The spike on 22 June coincided with high winds in a NNW direction gusts were recorded up to 56km/h however levels were still below the maximum allowable 24hr average of 50µg/m^3.



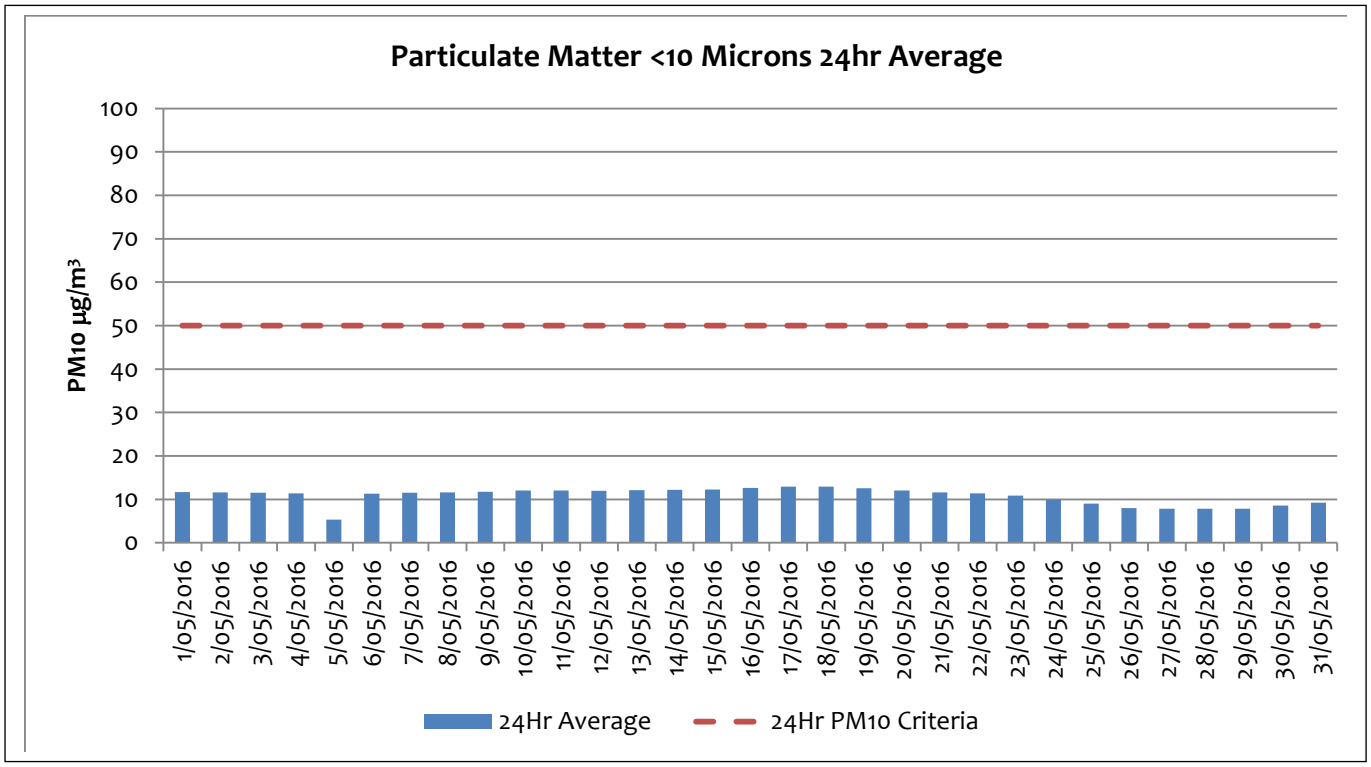
1.2 Tapered Element Oscillating Microbalance Sampling (TEOM)

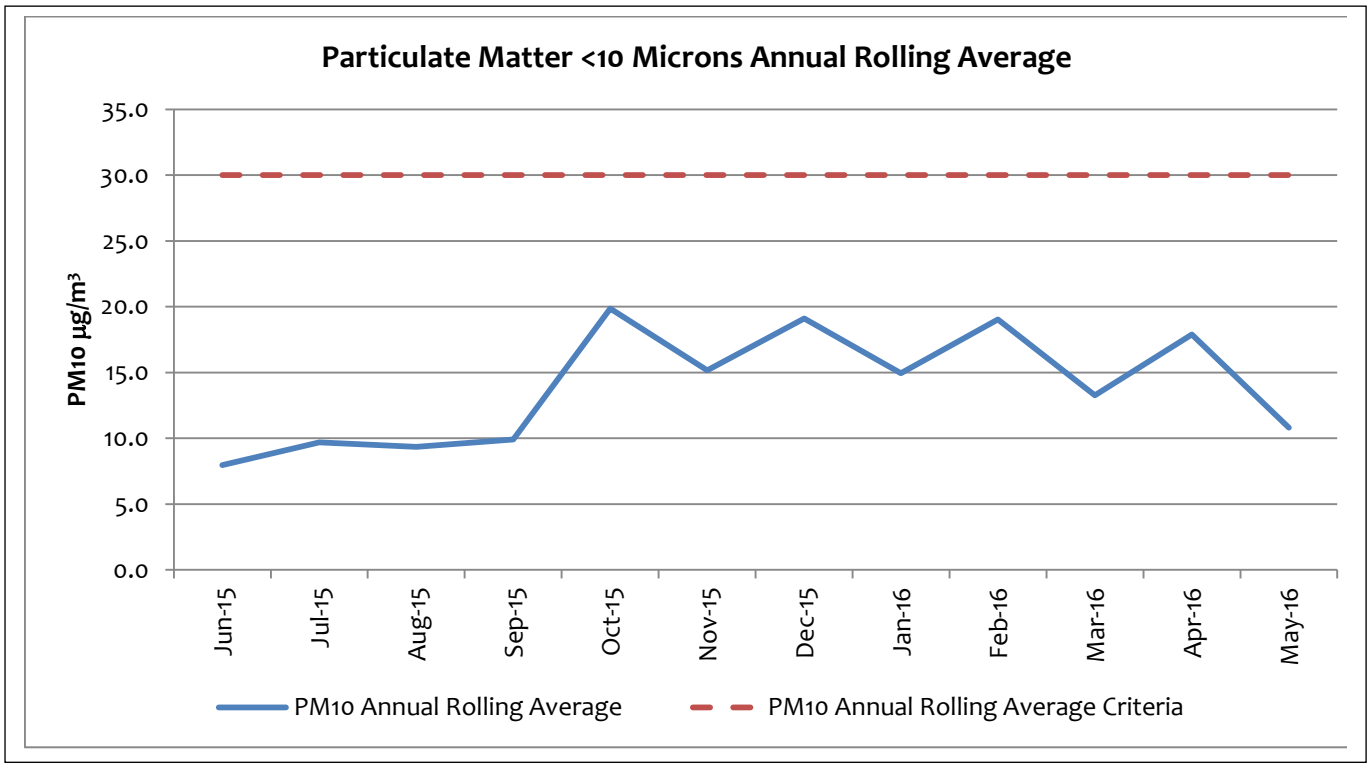
Particulate Matter <10 Microns 24Hr Average		
Date	TEOM 1 - EPL 13 (μg/m^3) Essential Water – Off Site	TEOM 2 – EPL 14 (μg/m^3) Blackwoods Pit – On Site
1/05/16	11.69	9.70
2/05/16	11.58	8.19
3/05/16	11.49	6.66
4/05/16	11.34	14.65
5/05/16	5.32	
6/05/16	11.30	
7/05/16	11.54	
8/05/16	11.55	See comment
9/05/16	11.72	
10/05/16	12.02	
11/05/16	12.01	
12/05/16	11.96	
13/05/16	12.09	
14/05/16	12.14	
15/05/16	12.25	
16/05/16	12.61	
17/05/16	12.90	
18/05/16	12.91	
19/05/16	12.51	
20/05/16	12.01	
21/05/16	11.59	
22/05/16	11.36	
23/05/16	10.85	
24/05/16	9.91	
25/05/16	9.02	
26/05/16	8.01	
27/05/16	7.80	
28/05/16	7.83	
29/05/16	7.81	
30/05/16	8.56	
31/05/16	9.22	

TEOM 2 was calibrated by an external manufacturer's technician on May 5. The technician failed to reset the machine which 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.

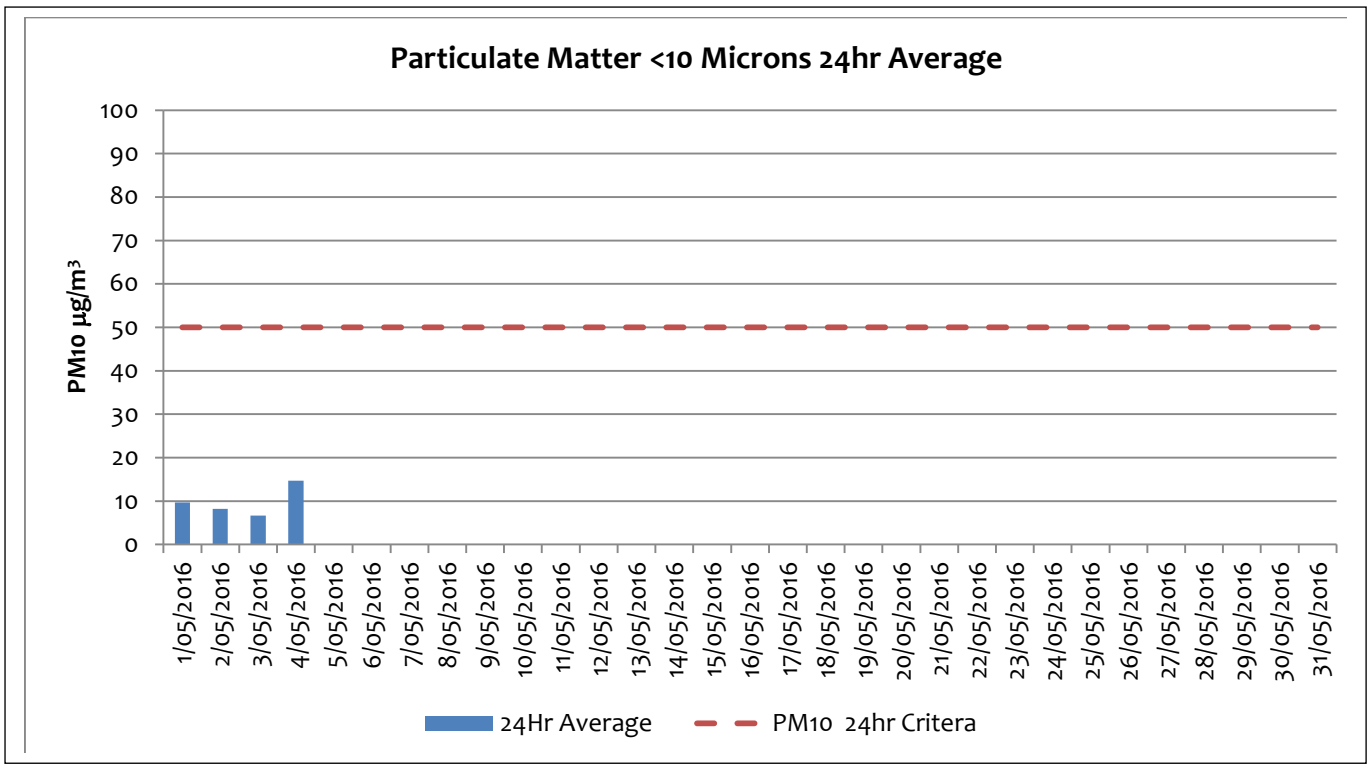
PM10 μg/m^3 12 Month Rolling Average												
	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16
TEOM 1 EPL13 Essential Water Off Site	8.0	9.7	9.4	9.9	19.8	15.2	19.1	15.0	19.0	13.3	17.9	10.8
TEOM 2 EPL14 Blackwoods Pit On Site	9.0	10.3	9.6	12.4	21.2	16.6	15.8	18.8	22.1	14.2	15.9	9.8

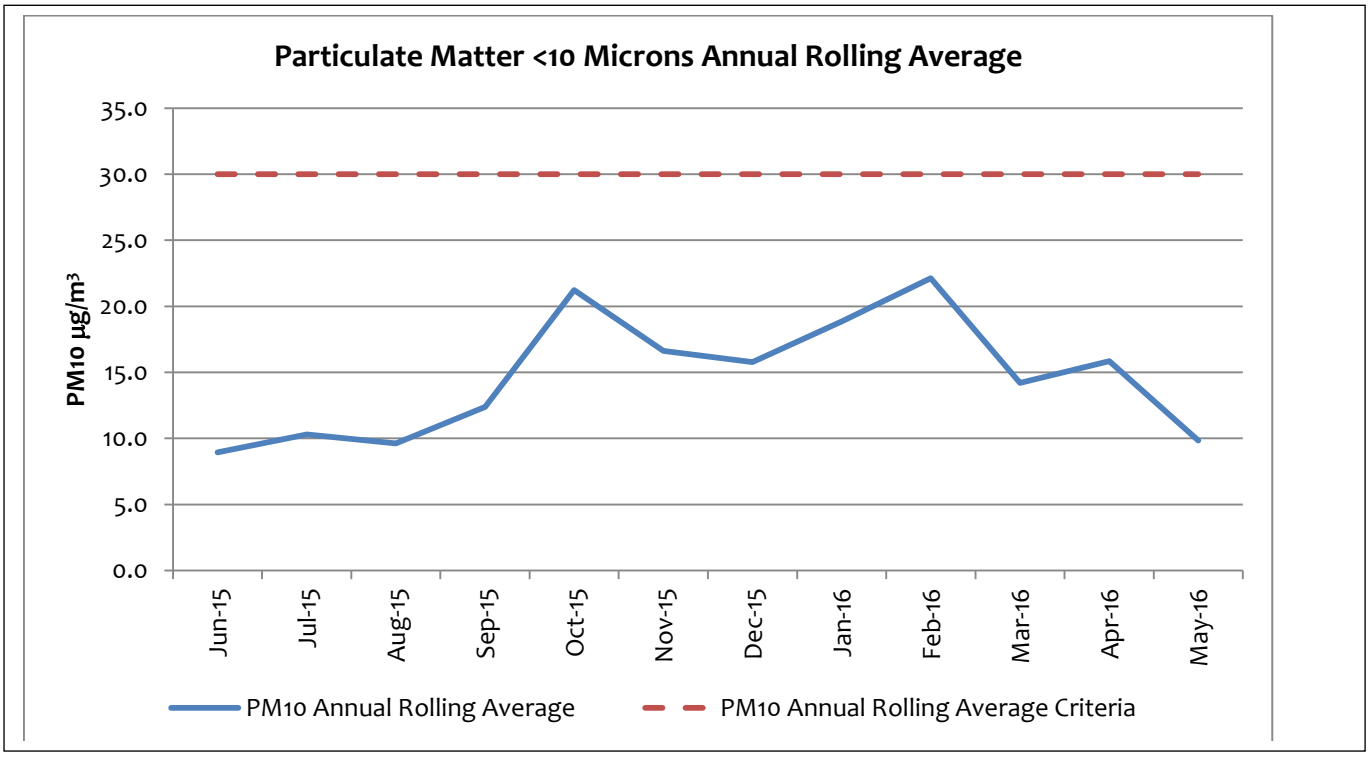
EPL13 – Essential Water – Off Site (TEOM1)





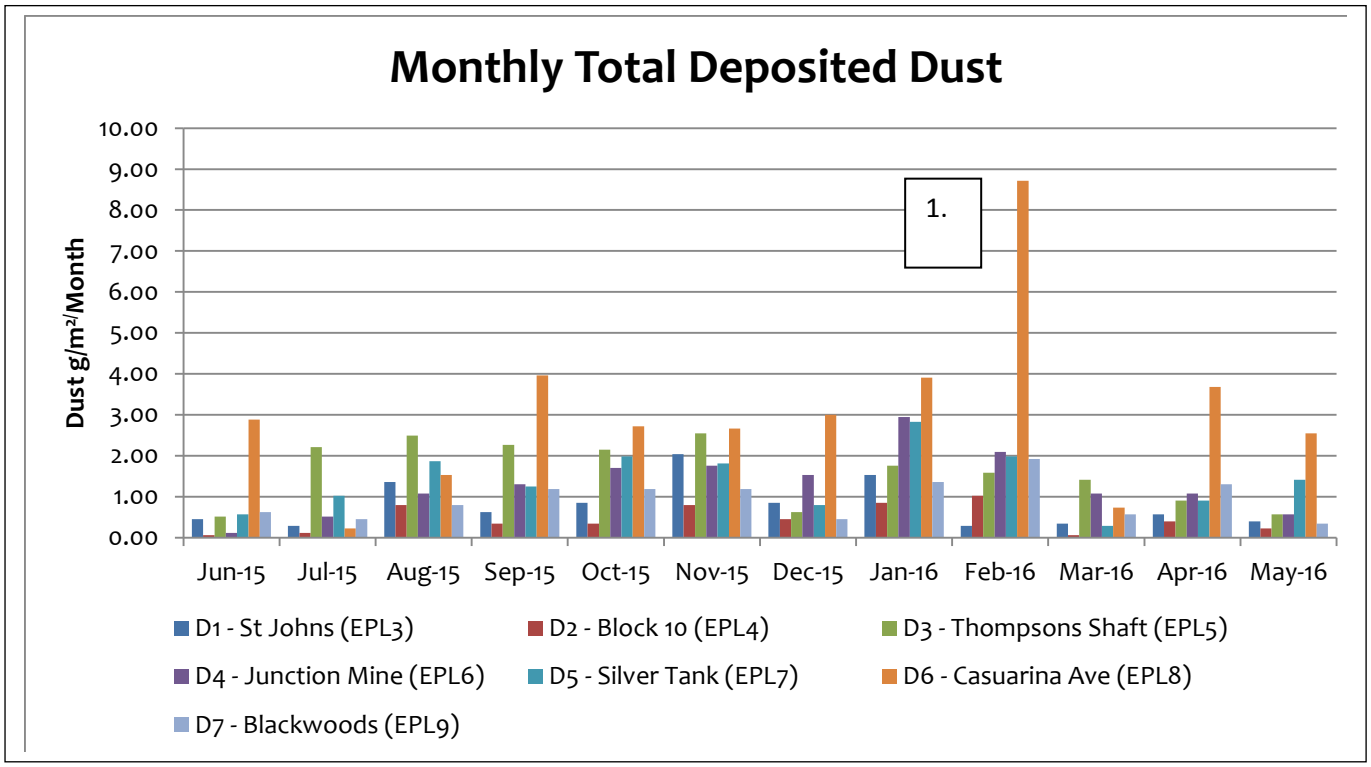
EPL14 – Blackwoods Pit – On Site (TEOM2)





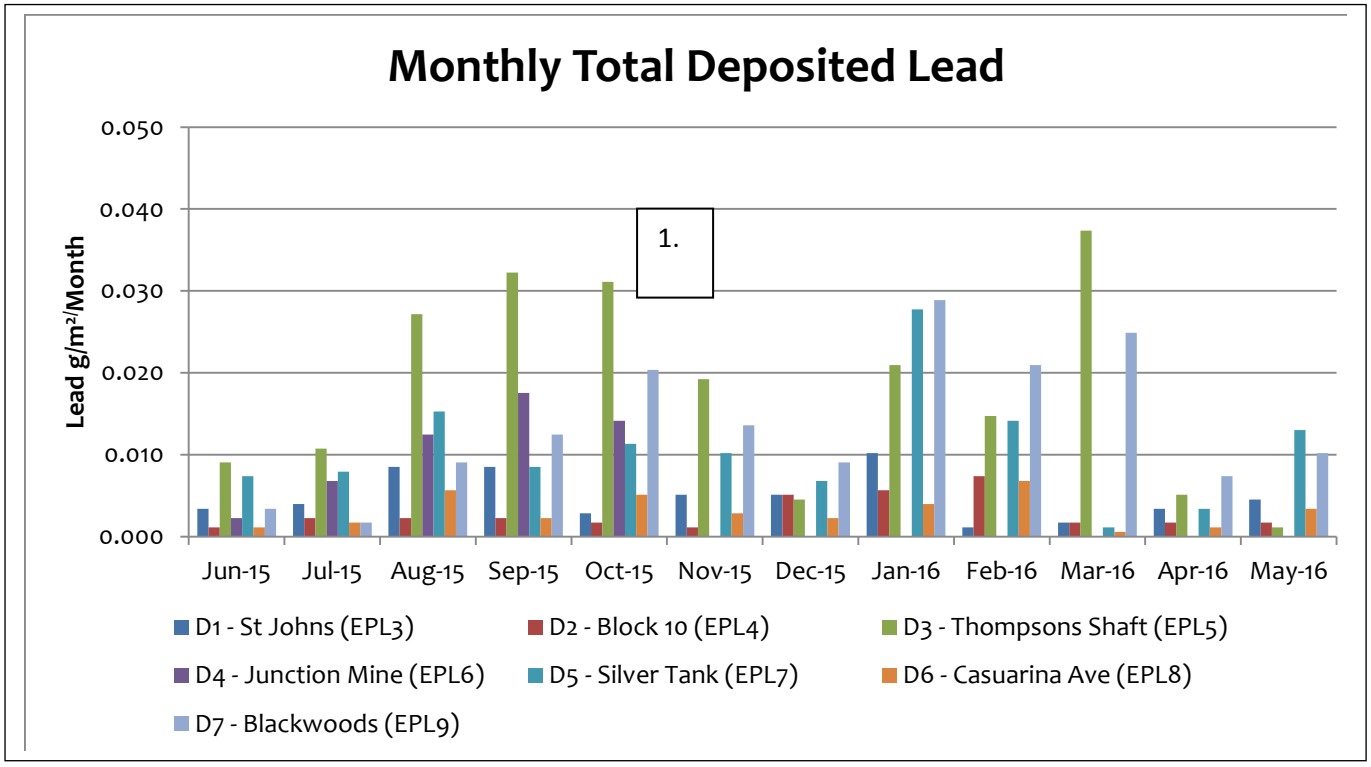
1.3 Dust Deposition Sampling

Total Deposited Dust (g/m$^{2/}$Month)							
Date	D1 (off site)	D2	D3	D4	D5	D6 (off site)	D7
May 2016	0.40	0.23	0.57	0.57	1.41	2.55	0.34
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.

Total Deposited Lead (g/m$^{2/}$Month)							
Date	D1 (Off Site)	D2	D3	D4	D5	D6 (Off Site)	D7
May 2016	0.005	0.002	0.001	0.000	0.013	0.003	0.010
Background Average	0.0000	0.001	0.0018	0.0040	0.0010	0.0020	0.0100



1. Samples at Thompson's shaft spiked in lead concentration in August, September, October and again in March. Nearby vegetation and buildings have been identified as potential sources. Nearby vegetation was removed in September and October. A clean up of the haul road adjacent Thompsons Shaft was also carried out in September. 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.

2 Blasting (Vibration and Overpressure) Monthly Review

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

Summary Block 7, Zinc Lode:

- 29 production firings
- 3 development firings
- 1 Blast 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 production blasts over 3mm/sec = **2.6%** (licence requirement <5%) calculated from 1st June 2015 until 31st May, 2016.

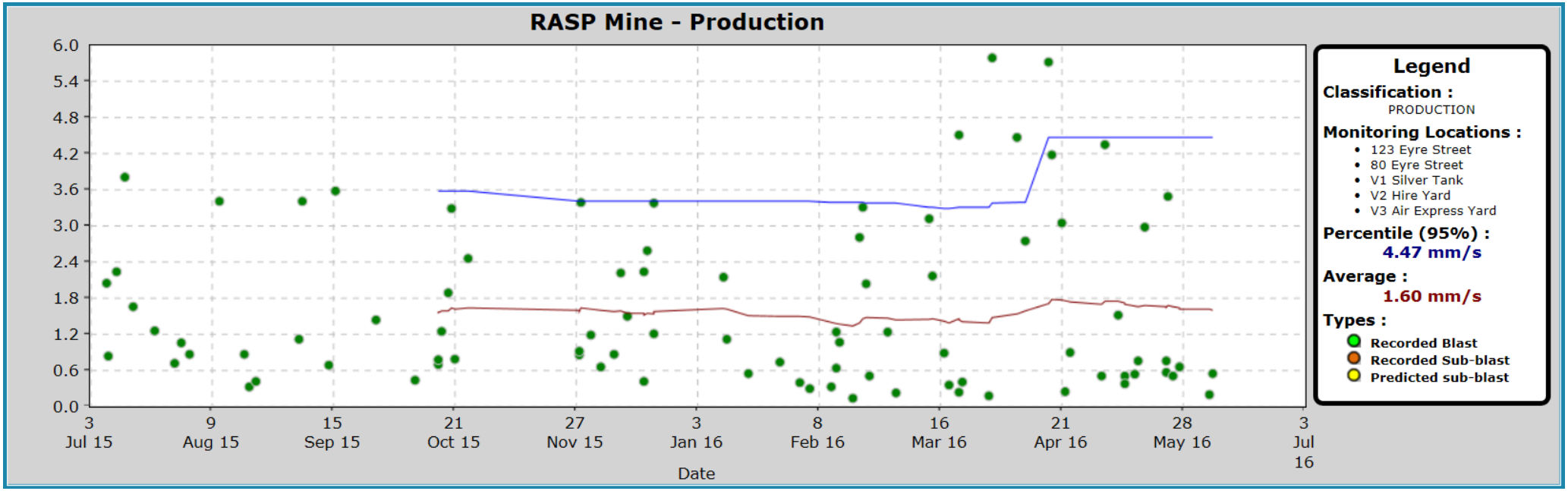
Summary Rest of Mine, Western Mineralisation and Main Lode:

- 10 production firings
- 134 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 = **0.33%** (licence requirement <5%) calculated from 1st June 2015 until 31st May, 2016.

12 Month Production Blast Performance



3 Noise

Quarterly noise monitoring is now complete as per the Pollution Reduction Program (PRP) on EPL 12559. Four noise assessments have been undertaken since November 2014. EMGA Mitchell McLennan Pty Limited (EMM) completed the analysis for all assessments.

A final summary report was produced by EMM for submission to the EPA. A licence variation was sought from the EPA and the PRP was removed from the licence on 18/3/2016.

Future noise monitoring will be undertaken as per the NSW Industrial Noise Policy. A single noise assessment will be conducted during 2016.

4 Water

4.1 Underground Water Sampled 3/5/16

		UG FEED	SHAFT 7
pH Value	pH Unit	6.71	6.78
Electrical Conductivity @ 25°C	µS/cm	11000	14100
Total Dissolved Solids @180°C	mg/L	10300	14200
Hydroxide Alkalinity as CaCO3	mg/L	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	14	15
Total Alkalinity as CaCO3	mg/L	14	15
Sulfate as SO4 - Turbidimetric	mg/L	3890	6120
Chloride	mg/L	1170	1590
Calcium	mg/L	445	488
Magnesium	mg/L	218	352
Sodium	mg/L	1260	1640
Cadmium	mg/L	1.7	2.75
Lead	mg/L	0.313	2.93
Manganese	mg/L	219	450
Zinc	mg/L	807	1140
Iron	mg/L	0.63	<0.05

4.2 Opportunistic Stormwater Samples 9/5/16

		Ryan St Dam	S44	S1A	Federation Way	S9-B2	Horwood Dam
pH Value	pH Unit	6.32	6.58	6.91	6.34	6.81	6.5
Electrical Conductivity @ 25°C	µS/cm	629	1280	207	713	414	11200
Total Dissolved Solids @180°C	mg/L	436	938	110	670	254	11000
Hydroxide Alkalinity as CaCO3	mg/L	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	2	12	15	3	13	7
Total Alkalinity as CaCO3	mg/L	2	12	15	3	13	7
Sulfate as SO4 - Turbidimetric	mg/L	287	486	63	342	137	4190
Chloride	mg/L	7	80	6	7	21	1390
Calcium	mg/L	67	148	26	62	48	496
Magnesium	mg/L	6	21	2	4	4	316
Sodium	mg/L	11	83	6	10	22	1540
Cadmium	mg/L	0.429	0.196	0.0203	0.926	0.0512	2.19
Lead	mg/L	0.272	0.666	0.179	1.64	0.557	2.24
Manganese	mg/L	18.4	6.3	1.01	21.7	2.26	318
Zinc	mg/L	58	33.7	3.31	112	8.57	545
Iron	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

4.3 Quarterly Groundwater Samples 17/5/16

		GW03	GW04	GW05	GW06	GW07	GW08	GW09	GW10	GW11	GW12	P1	P2	P3	P4
pH Value	pH Unit	5.18	7.17	6.38	6.44	6.35	6.31	7.57	7.27	7.11	6.53	7.29	6.78	6.75	7.13
Electrical Conductivity @ 25°C	µS/cm	14900	14400	16400	13400	12400	8410	10900	13000	4380	13100	14500	12800	11300	11200
Total Dissolved Solids @180°C	mg/L	12700	7040	15400	11700	11100	8070	9010	10900	3400	12000	10600	6990	11200	8990
Hydroxide Alkalinity as CaCO3	mg/L	<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
Bicarbonate Alkalinity as CaCO3	mg/L	2	297	140	52	32	11	361	228	93	78	54	58	64	60
Total Alkalinity as CaCO3	mg/L	2	297	140	52	32	11	361	228	93	78	54	58	64	60
Sulfate as SO4 - Turbidimetric	mg/L	5030	4860	6450	4900	4900	3760	3610	4680	1870	5660	4260	4810	5290	3800
Chloride	mg/L	3050	2650	2650	1890	1620	1140	1770	1540	450	1460	2920	1670	1200	1660
Calcium	mg/L	569	585	511	535	529	582	757	560	183	458	602	521	491	607
Magnesium	mg/L	391	520	664	431	330	211	514	480	146	549	324	348	318	241
Sodium	mg/L	2260	2290	2600	1990	1760	726	1210	1980	581	2050	2380	1860	1460	1640
Cadmium	mg/L	1.67	0.0433	0.812	0.65	3.50	1.47	0.012	0.54	0.0009	1.25	0.0207	1.26	2.69	0.387
Lead	mg/L	2.72	0.01	0.096	0.12	0.194	0.449	<0.001	0.001	0.001	0.046	0.067	3.43	4.32	0.23
Manganese	mg/L	330	23.3	336	242	321	317	0.178	42.8	50.9	58.5	13.6	244	350	93.7
Zinc	mg/L	277	14	279	148	275	394	1.1	50.5	37.7	163	1.7	231	585	64.9
Iron	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.05

4.4 Surface Water

Opportunistic surface water sampling was completed for EPL 29, 31 & 32during May 2016

Surface Water Table Nov 2015 to Nov 2016

EPA Identification Number	Frequency	Comment
EPL29 (Federation Way culvert)	2 x Per year when contains water	Sampled 9/5/16
EPL31 (Ryan Street Dam)	2 x Per year when contains water	Sampled 9/5/16
EPL32 (S1-A adjacent olive grove)	2 x Per year when contains water	Sampled 9/5/16
EPL33 (Horwood Dam)	2 x Per year when contains water	Sampled Jan & Feb 2016
EPL34 (Upstream Bonanza St)	2 x Per year when contains water	No sample - dry
EPL35 (Downstream Sydney Rd)	2 x Per year when contains water	No sample - dry

5 Weather Data

The automatic 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:

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	Su						WNW	54	02:18				WSW	26	1017.9				W	13	1016.4
2	Mo						W	35	11:59				W	9	1017.4				W	17	1014.2
3	Tu						NW	59	13:44				NW	26	1013.5				WNW	33	1010.1
4	We						WNW	35	14:29				NNE	6	1019.1				NW	15	1016.4
5	Th						NNW	37	11:00				NNE	11	1018.9				NNW	19	1015.1
6	Fr						NNE	28	22:53				N	9	1017.9				NE	9	1014.8
7	Sa						N	39	20:41				NE	15	1016.2				ENE	7	1012.1
8	Su						NNW	52	12:28				NE	11	1007.0				NNW	24	1002.5
9	Mo						NW	72	03:50				NW	33	1003.5				NW	39	1003.8
10	Tu						NW	48	00:04				WSW	31	1015.6				SW	26	1017.9
11	We						W	39	15:23				WNW	19	1023.7				W	24	1020.7
12	Th						WNW	30	09:14				WNW	22	1022.9				WNW	19	1021.0
13	Fr						NNE	30	12:34				ENE	6	1025.8				NNW	17	1022.5
14	Sa						NW	35	11:58				N	17	1023.5				NNW	24	1020.4
15	Su						NW	35	00:29				WNW	19	1020.3				W	20	1018.1
16	Mo						NNW	35	10:24				N	17	1018.9				NW	20	1016.1
17	Tu						S	35	09:15				S	28	1021.8				ESE	9	1019.2
18	We						WSW	28	13:07				W	13	1020.6				W	17	1018.6
19	Th						WNW	20	14:49				Calm		1022.9				W	9	1019.2
20	Fr						E	24	11:20				SE	15	1025.0				NE	9	1021.9
21	Sa						NNE	31	10:53				NE	17	1023.3				NNE	17	1018.5
22	Su						NNW	56	12:04				NNE	17	1016.9				NNW	35	1013.3
23	Mo						SW	59	00:12				SSW	33	1024.2				S	15	1022.7
24	Tu						NE	28	14:43				Calm		1024.6				NE	13	1020.6
25	We						N	41	21:52				NE	15	1016.8				N	17	1012.5
26	Th						NW	41	04:08				WNW	22	1008.7				SW	28	1008.6
27	Fr						W	65	18:04				NW	15	1013.4				NW	30	1009.6
28	Sa						WNW	37	01:35				WNW	26	1014.9				WSW	17	1015.3
29	Su						NNE	19	10:34				ENE	13	1021.1				WNW	11	1019.2
30	Mo						NE	35	11:31				NNE	24	1023.7				NNE	19	1021.4
31	Tu						ENE	31	00:01				NNE	17	1025.4				ENE	11	1024.3
Statistics for May 2016																					
Mean														17	1018.9					18	1016.4
Lowest													Calm		1003.5				ENE	7	1002.5
Highest							NW	72					#	33	1025.8				NW	39	1024.3
Total																					

Legend

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

6 Data Log

Sample	Date sent to lab	Result Received	Date Published
Hi Volume Samples	14/6/2016	20/6/2016	5/7/2016
TEOM	Real time	-	5/7/2016
Dust Deposition	9/6/2016	28/6/2016	5/7/2016
Water	17/5/2016	31/5/16	5/7/2016
Blast Vibration and overpressure	Real Time	-	5/7/2016

7 Correction Log May 2016

There are no corrections for the previous month.

8 Attachments

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