Monthly Environmental Monitoring Report

Yancoal Mt Thorley Warkworth

November 2017

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Revision History

Version No.	Person Responsible	Document Status	Date
1.0	**Environmental Advisor**	**Draft**	**12/01/2018**
1.1	**Environmental Specialist**	**Final**	**15/01/2018**

1.0 INTRODUCTION

This report has been compiled to provide a monthly summary of environmental monitoring results for Mt Thorley Warkworth (MTW). This report includes all monitoring data collected for the period 1st November to 30th November 2017.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

Meteorological data is collected at MTW's 'Charlton Ridge' meteorological station (refer to Figure 3: Air Quality Monitoring Locations).

2.1.1 Rainfall

Rainfall for the period is summarised in Table 1, the year-to-date trend and historical trend are shown in Figure 1.

Table 1: Monthly Rainfall MTW

2017	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
November	24.0	408.2

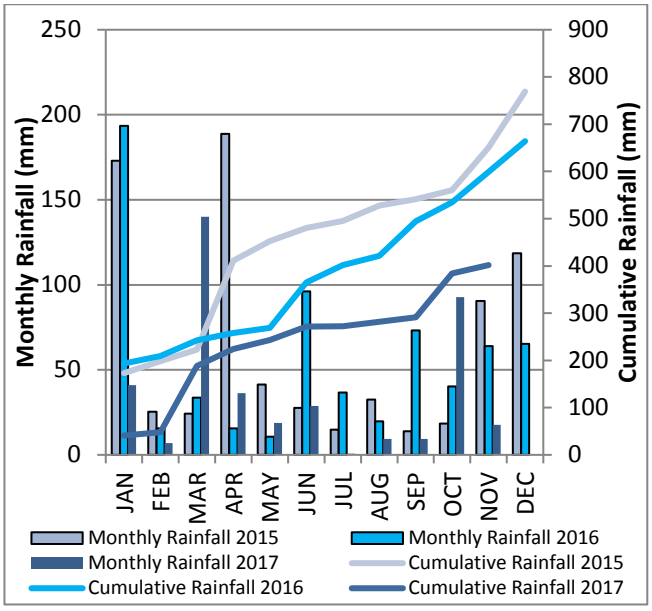

Figure 1: Rainfall Trend YTD

2.1.2 Wind Speed and Direction

Winds from the South – West were dominant throughout the reporting period as shown in Figure 2.

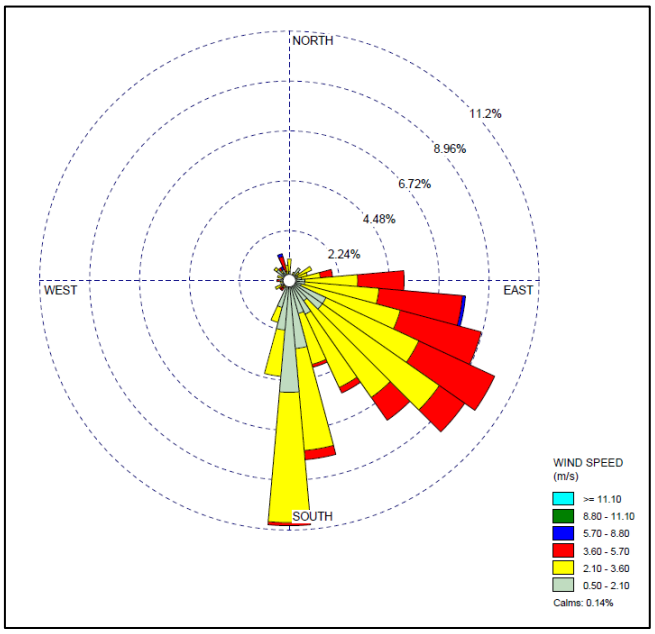

Figure 2: Charlton Ridge Wind Rose – November 2017

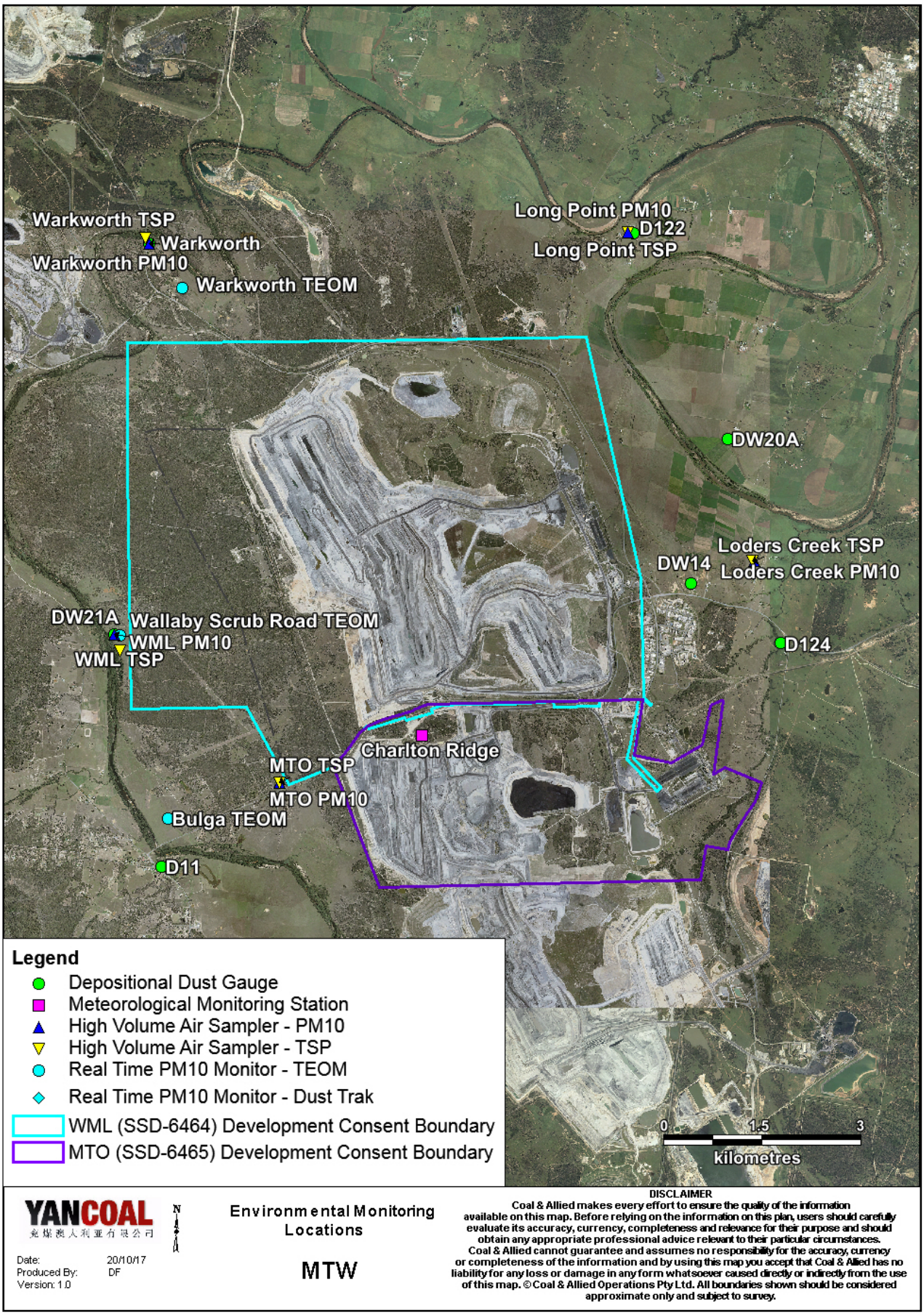

Figure 3: Air Quality Monitoring Locations

2.2 Depositional Dust

To monitor regional air quality, MTW operates and maintains a network of seven depositional dust gauges, situated on private and mine owned land surrounding MTW.

Figure 4 displays insoluble solids results from depositional dust gauges during the reporting period compared against the year-to-date average and the annual impact assessment criteria.

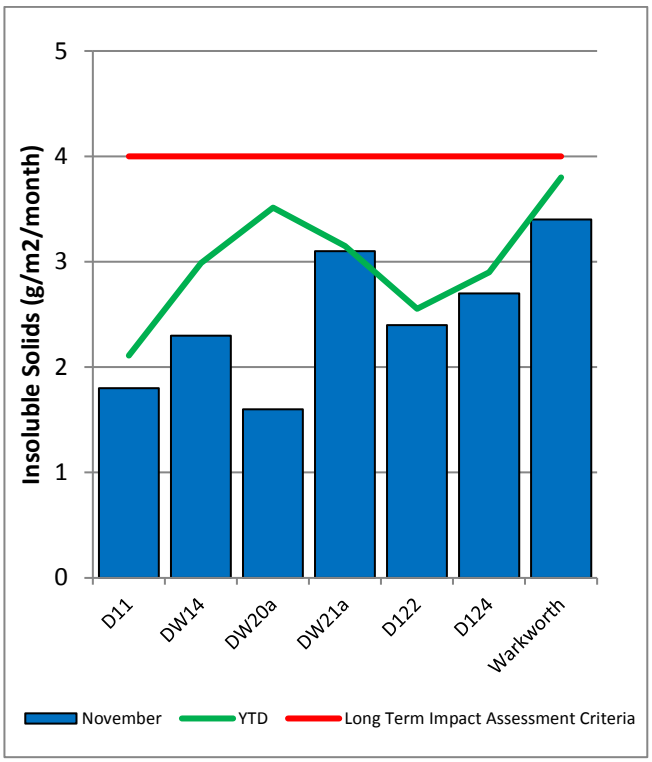

Figure 4: Depositional Dust – November 2017

2.3 Suspended Particulates

Suspended particulates are measured by a network of High Volume Air Samplers (HVAS) measuring Total Suspended Particulates (TSP) and Particulate Matter <10µm (PM_{10}). The location of these monitors can be found in Figure 3. Each HVAS was run for 24 hours on a six-day cycle in accordance with EPA requirements.

2.3.1 HVAS PM_{10} Results

Figure 5 shows the individual PM_{10} results at each monitoring station against the short term impact assessment criteria of 50µg/m³.

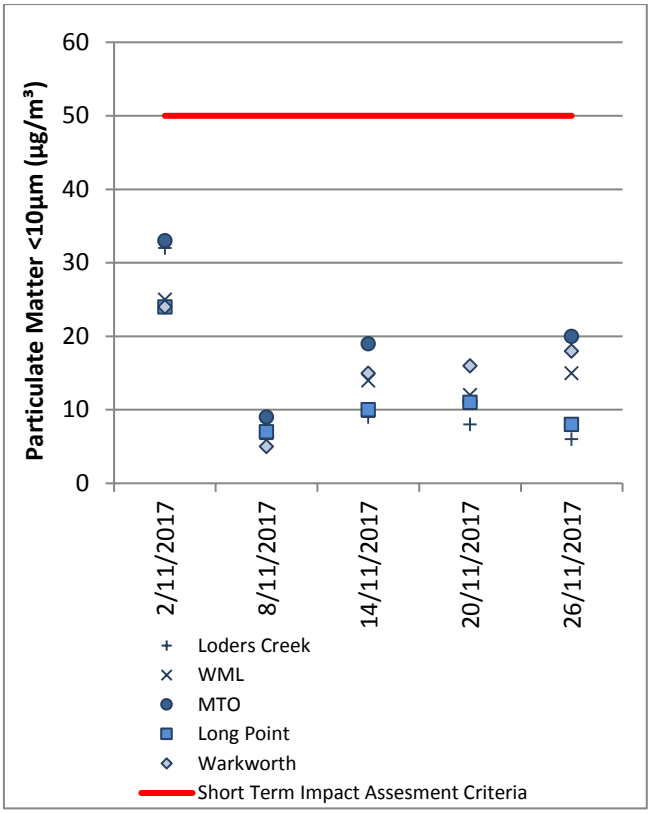

Figure 5: Individual PM_{10} Results – November 2017

Figure 6 shows the annual average PM_{10} results against the long term impact assessment criteria.

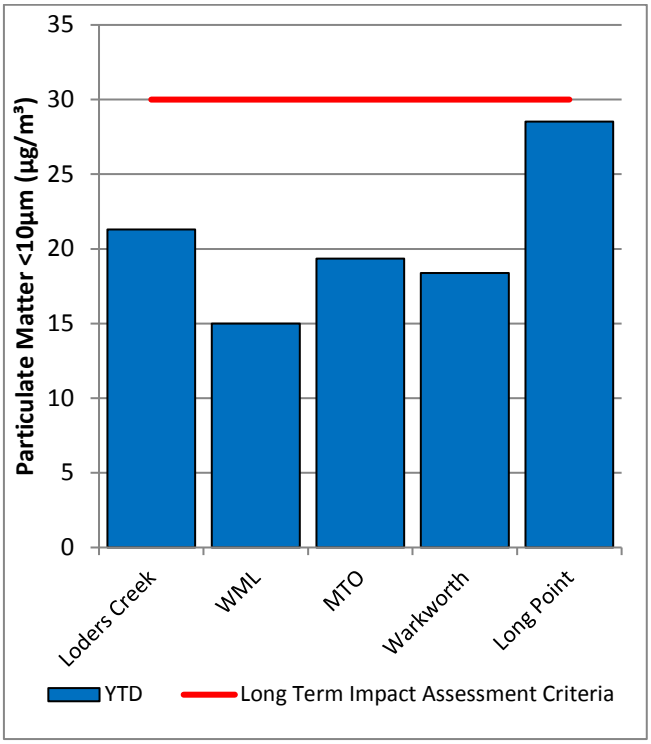

Figure 6: Annual Average PM_{10} – November 2017

2.3.2 TSP Results

Figure 7 shows the annual average TSP results compared against the long term impact assessment criteria of 90µg/m³.

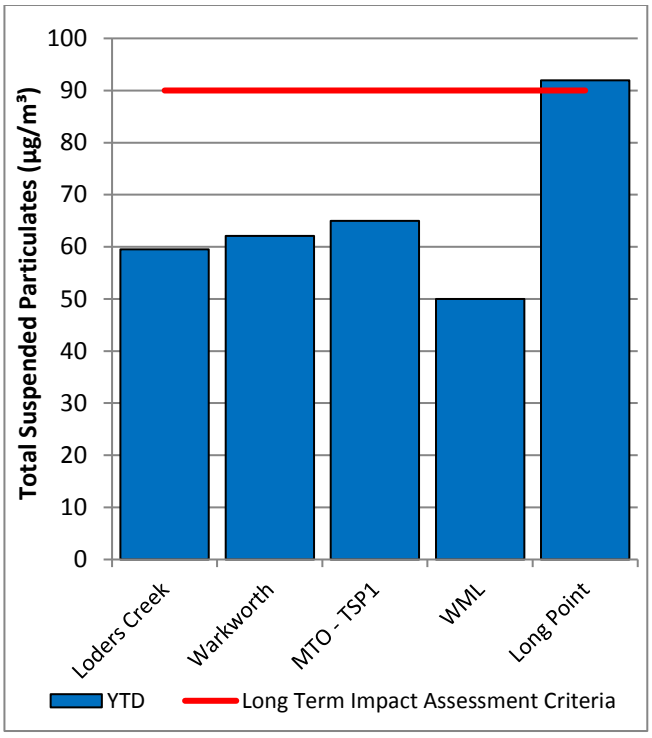

Figure 7: Annual Average Total Suspended Particulates – November 2017

2.3.3 Real Time PM_{10} Results

Mt Thorley Warkworth maintains a network of real time PM_{10} monitors. The real time air quality monitoring stations continuously log information and transmit data to a central database, generating alarms when particulate matter levels exceed internal trigger limits.

Results for real time dust sampling are shown in Figure 8, including the daily 24 hour average PM_{10} result and the annual PM_{10} average.

Data was not available on the 2nd and 6th November 2017 at the Wallaby Scrub Road monitor due to equipment malfunction resulting in erroneous data.

2.3.4 Real Time Alarms for Air Quality

During November, the real time monitoring system generated 47 automated air quality related alerts, including 1 alert for adverse meteorological conditions and 46 alerts for elevated PM_{10} levels.

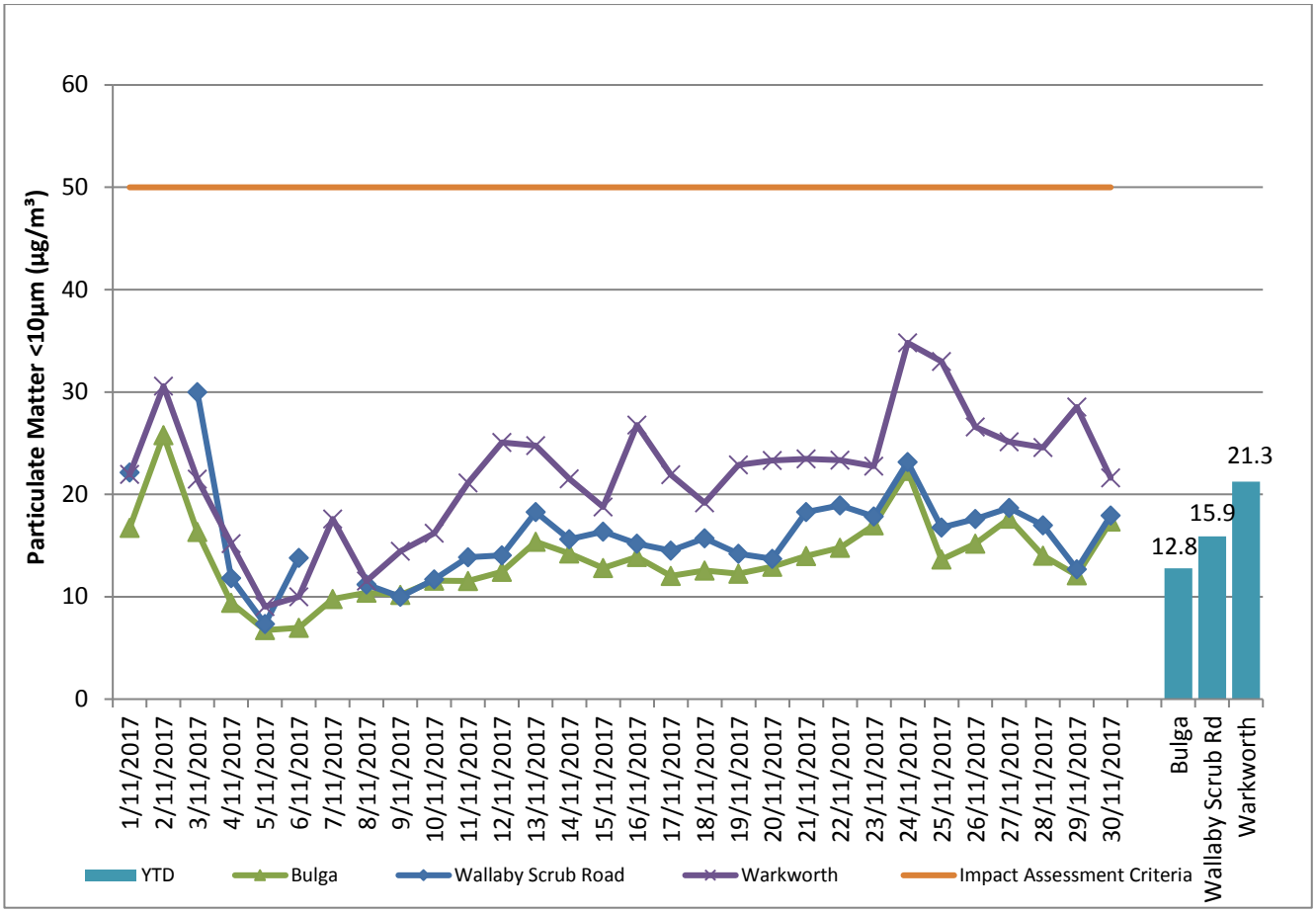

Figure 8: Real Time PM_{10} daily 24hr average and annual average – November 2017

3.0 WATER QUALITY

MTW maintains a network of surface water and groundwater monitoring sites.

3.1 Surface Water

Monitoring is conducted at mine site dams and surrounding natural watercourses.

Surface water courses are sampled on a monthly or quarterly sampling regime. Water quality is evaluated through the parameters of pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS). The Hunter River and the Wollombi Brook are sampled both upstream and downstream of mining operations, to monitor the potential impact of mining on the river. Other Hunter River tributaries are also monitored.

Results of monitoring are reported quarterly, next available in the December 2017 report.

3.2 Groundwater Monitoring

Groundwater monitoring is undertaken on a quarterly basis in accordance with the MTW Groundwater Monitoring Programme.

Groundwater results are reported quarterly, next available in the December 2017 report.

3.3 HRSTS Discharge

MTW participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing discharge from licensed discharge points Dam 1N and Dam 9S. Discharges can only take place subject to HRSTS regulations.

During the reporting period no water was discharged under the HRSTS.

4.0 BLAST MONITORING

MTW have a network of six blast monitoring units. These are located at nearby privately owned residences and function as regulatory compliance monitors.

The location of these monitors can be found in Figure 15.

4.1 Blast Monitoring Results

During November 2017, 20 blasts were initiated at MTW. Figure 9 to Figure 14 show the blast monitoring results for the reporting period against the impact assessment criteria. The criteria are summarised in Table 2.

Table 2: Blasting Limits

Airblast Overpressure (dB(L))	Comments
115	5% of the total number of blasts in a 12 month period
120	0%
Ground Vibration (mm/s)	**Comments**
5	5% of the total number of blasts in a 12 month period
10	0%

During the reporting period no blasts exceeded the 115 dB(L) 5% threshold for airblast overpressure or 5mm/s 5% threshold for ground vibration.

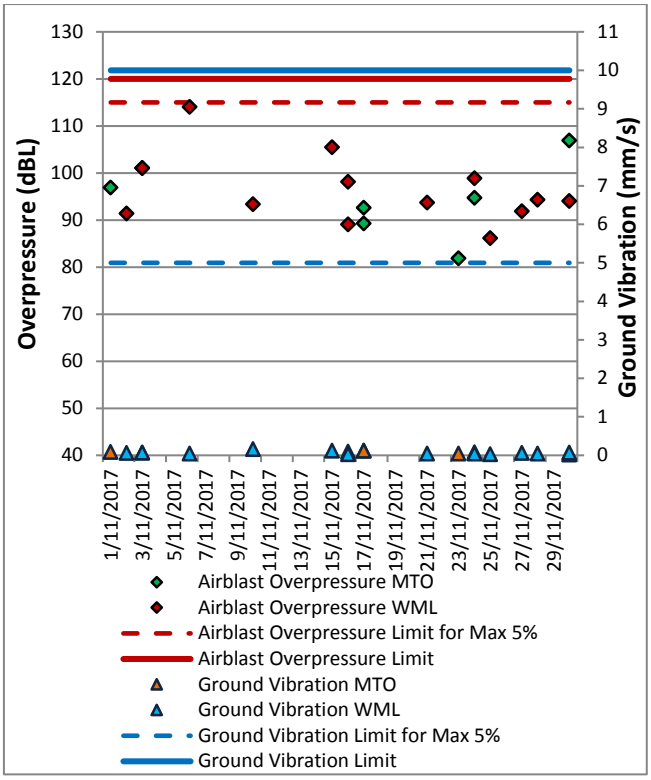

Figure 9: Abbey Green Blast Monitoring Results – November 2017

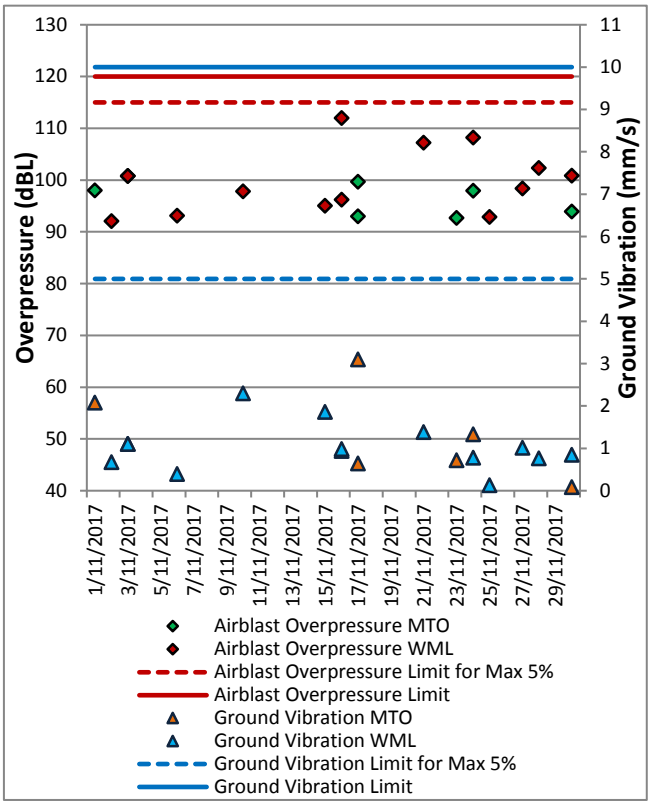

Figure 10: Bulga Village Blast Monitoring Results – November 2017

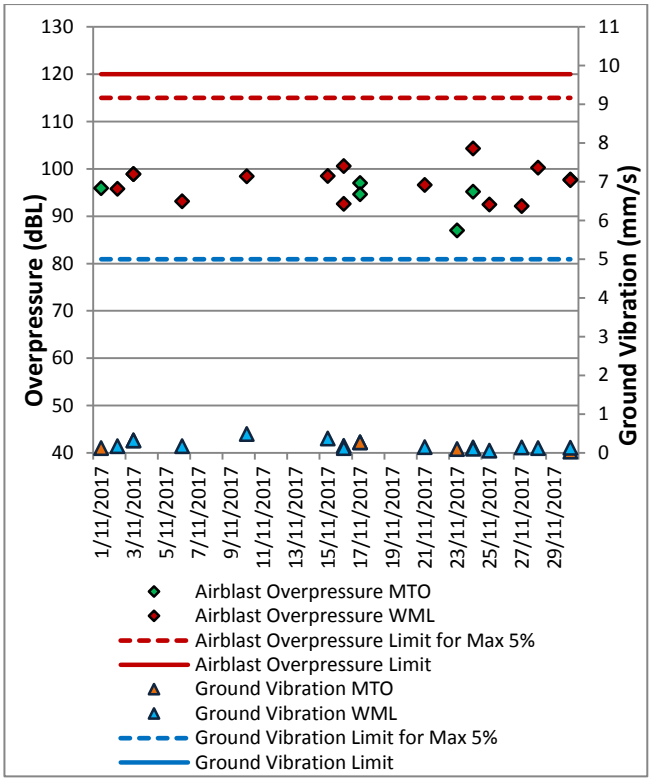

Figure 11: MTIE Blast Monitoring Results – November 2017

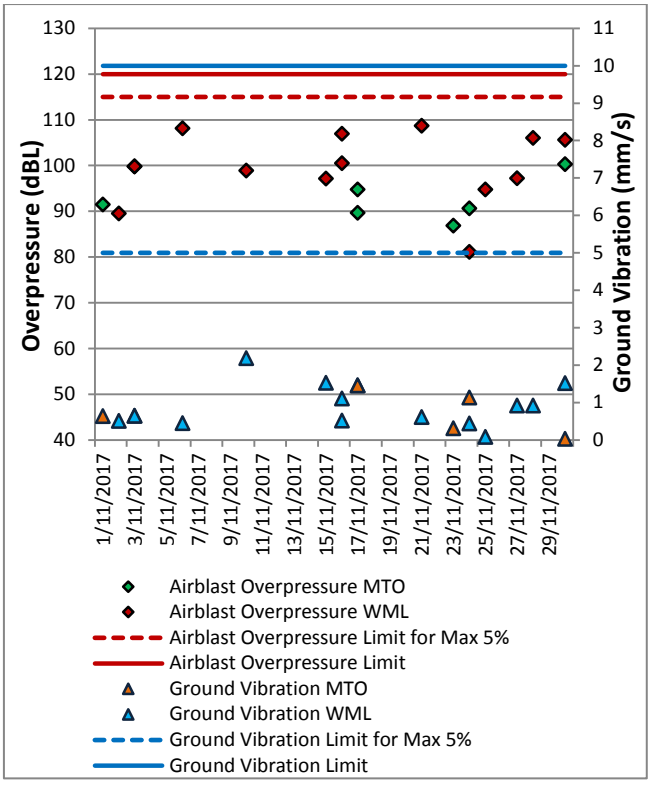

Figure 13: Wambo Road Blast Monitoring Results – November 2017

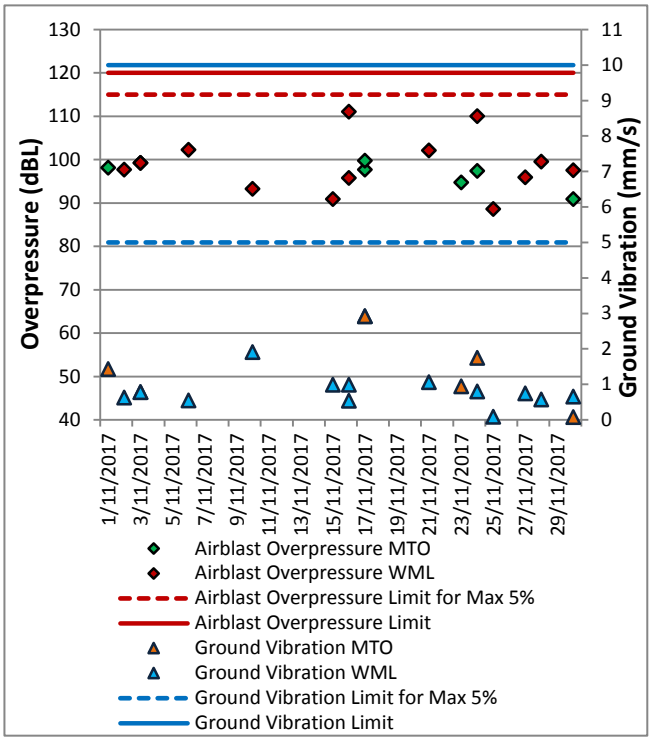

Figure 12: Wollemi Peak Road Blast Monitoring Results - November 2017

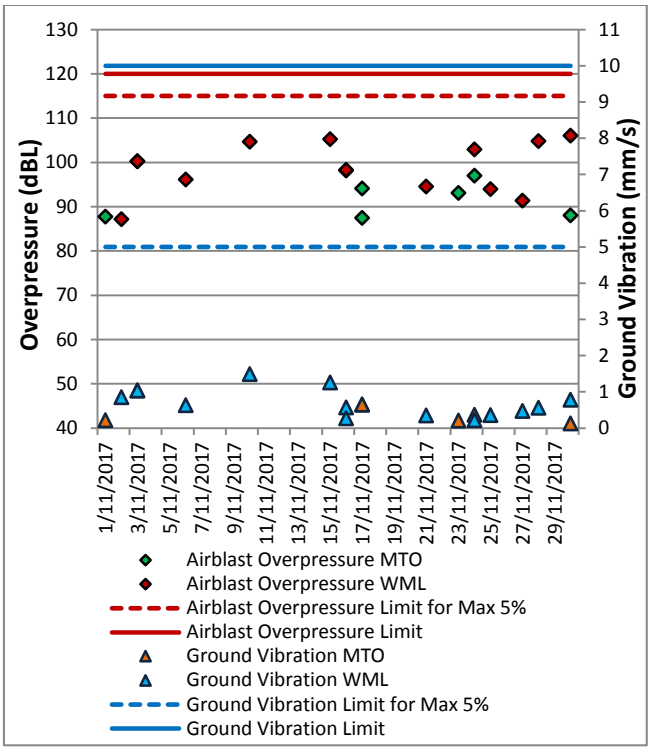

Figure 14: Warkworth Blast Monitoring Results - November 2017

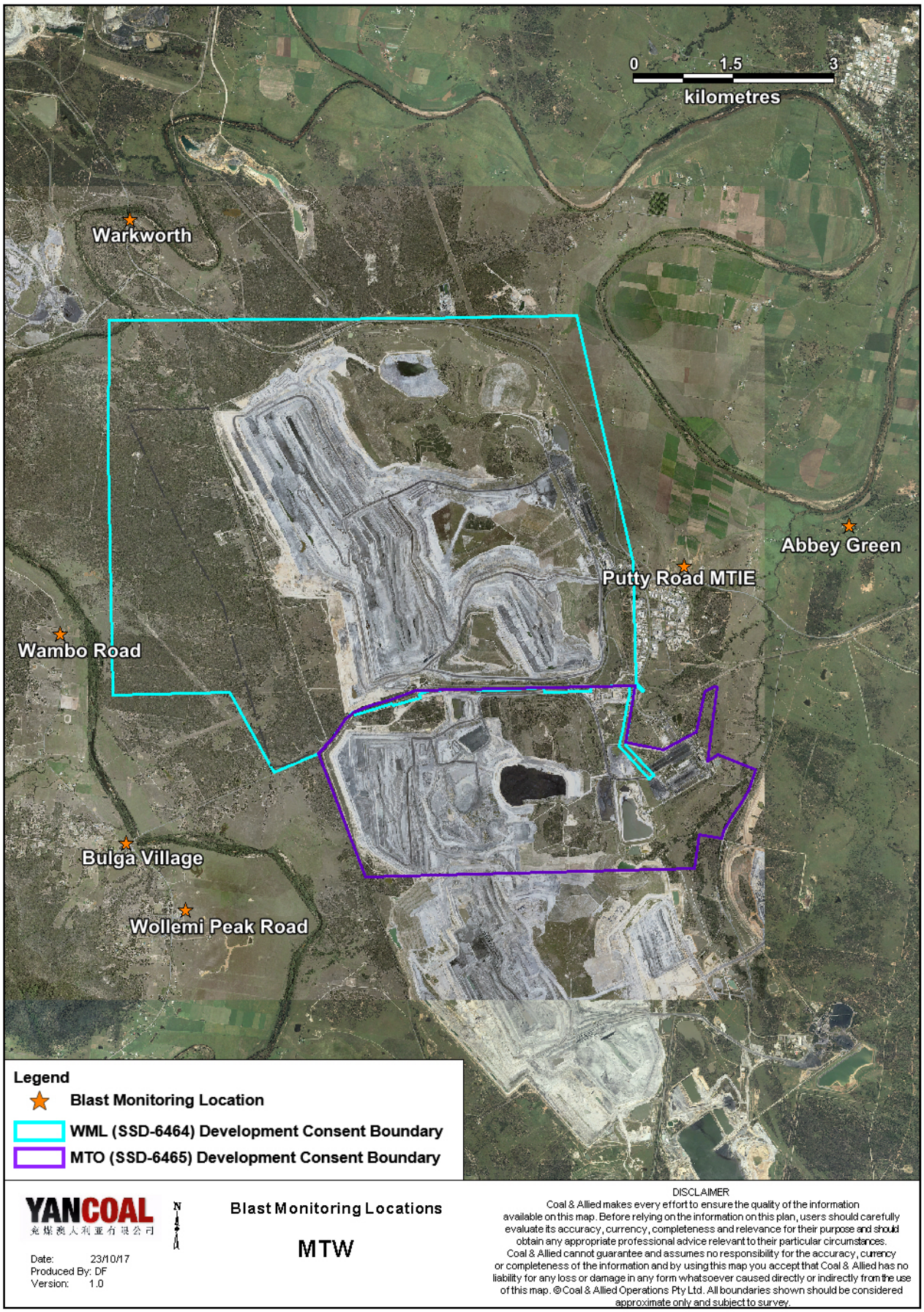

Figure 15: MTW Blast Monitoring Location Plan

5.0 NOISE

Routine attended noise monitoring is carried out in accordance with the MTW Noise Management Plan. A review against EIS predictions will be reported in the Annual Review. The purpose of the noise surveys is to quantify and describe the acoustic environment around the site and compare results with specified limits. Real time noise monitoring also occurs at nine sites surrounding MTW. Noise monitoring locations are displayed in Figure 16.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 13-14 November 2017. All measurements complied with the relevant criteria. Results are detailed in Table 3 to Table 6.

5.1.1 WML Noise Assessment

Compliance assessments undertaken against the WML noise criteria are presented in Tables 3 and 4.

Table 3: $L_{Aeq,\ 15\ minute}$ Warkworth Impact Assessment Criteria – November 2017

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion dB(A)	Criterion Applies?[1,5]	WML L_{Aeq} dB[2,4]	Exceedance[3]
Bulga RFS	13/11/2017 23:27	2.6	E	37	Yes	IA	Nil
Bulga Village	13/11/2017 22:01	2.8	E	38	Yes	IA	Nil
Gouldsville	13/11/2017 21:00	2.4	F	38	No	<30	NA
Inlet Rd	13/11/2017 21:37	3	D	37	Yes	NM	Nil
Inlet Rd West	13/11/2017 21:10	2.6	E	35	Yes	<25	Nil
Long Point	13/11/2017 21:28	3	D	35	Yes	IA	Nil
South Bulga	14/11/2017 0:53	2.5	D	35	Yes	<25	Nil
Wambo Road	13/11/2017 22:30	2.3	F	38	No	29	NA

Notes:
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions;
2. Estimated or measured LAeq,15minute attributed to WML;
3. NA means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable;
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.
6. Revised LAeq, 15minute level following application of low frequency noise penalty as per the INP where applicable.

Table 4: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria – November 2017

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion dB(A)	Criterion Applies?[1,5]	WML $L_{A1,\ 1min}$ dB[2,4]	Exceedance[3]
Bulga RFS	13/11/2017 23:27	2.6	E	47	Yes	IA	Nil
Bulga Village	13/11/2017 22:01	2.8	E	48	Yes	IA	Nil
Gouldsville	13/11/2017 21:00	2.4	F	48	No	30	NA
Inlet Rd	13/11/2017 21:37	3	D	47	Yes	NM	Nil
Inlet Rd West	13/11/2017 21:10	2.6	E	45	Yes	<25	Nil
Long Point	13/11/2017 21:28	3	D	45	Yes	IA	Nil
South Bulga	14/11/2017 0:53	2.5	D	45	Yes	<25	Nil
Wambo Road	13/11/2017 22:30	2.3	F	48	No	39	NA

Notes
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions;
2. Estimated or measured LA1,1minute attributed to Warkworth mine (WML);
3. NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable. NA (not applicable) in criterion column means criterion not specified for this location;
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.

5.1.3 MTO Noise Assessment

Compliance assessments undertaken against the MTO noise criteria are presented in Tables 5 and 6.

Table 5: $L_{Aeq,\ 15minute}$ Mount Thorley - Impact Assessment Criteria – November 2017

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion dB	Criterion Applies?[1,5]	MTO L_{Aeq} dB[2,4]	Exceedance[3]
Bulga RFS	13/11/2017 23:27	2.6	E	37	Yes	28	Nil
Bulga Village	13/11/2017 22:01	2.8	E	38	Yes	30	Nil
Gouldsville	13/11/2017 21:00	2.4	F	35	No	IA	NA
Inlet Rd	13/11/2017 21:37	3	D	37	Yes	32	Nil
Inlet Rd West	13/11/2017 21:10	0.5	E	35	Yes	26	Nil
Long Point	13/11/2017 21:28	3	D	35	Yes	IA	Nil
South Bulga	14/11/2017 0:53	2.5	D	36	Yes	<25	Nil
Wambo Road	13/11/2017 22:30	2.3	F	38	No	27	NA

Notes:
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions;
2. Estimated or measured LAeq,15minute attributed to WML;
3. NA means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable;
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.
6. Revised LAeq, 15minute level following application of low frequency noise penalty as per the INP where applicable.

Table 6: $L_{A1,\ 1Minute}$ Mount Thorley - Impact Assessment Criteria – November 2017

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion dB	Criterion Applies?[1,5]	MTO $L_{A1,\ 1min}$ dB[2,4]	Exceedance[3]
Bulga RFS	13/11/2017 23:27	2.6	E	47	Yes	35	Nil
Bulga Village	13/11/2017 22:01	2.8	E	48	Yes	34	Nil
Gouldsville	13/11/2017 21:00	2.4	F	45	No	IA	NA
Inlet Rd	13/11/2017 21:37	3	D	47	Yes	33	Nil
Inlet Rd West	13/11/2017 21:10	2.6	E	45	Yes	31	Nil
Long Point	13/11/2017 21:28	3	D	45	Yes	IA	Nil
South Bulga	14/11/2017 0:53	2.5	D	46	Yes	<25	Nil
Wambo Road	13/11/2017 22:30	2.3	F	48	No	29	NA

Notes
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions;
2. Estimated or measured LA1,1minute attributed to Mt Thorley Operations (MTO);
3. NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable. NA (not applicable) in criterion column means criterion not specified for this location;
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.

5.1.4 NPfI Low Frequency Assessment

In accordance with the requirements of the EPA's Noise Policy for Industry (NPfI), the applicability of the low frequency modification penalty has been assessed. During November 2017 no measurements required the penalty to be applied. The assessment for low frequency noise is shown in Table 7.

Table 7: Low Frequency Noise Modifying Factor Assessment – November 2017

Location	Date and Time	Measured Site Only LA_{eq} dB (WML/MTO)	Site Only L_{Ceq} dB[4] (WML/MTO)	Site Only LCeq – LAeq dB[1,4] (WML/MTO)	Result Max exceedance of ref spectrum dB (WML/MTO) [2,3,4]	Penalty dB(A)	Exceedance
Bulga RFS	13/11/2017 23:27	IA/28	NA	NA	NA	0	Nil
Bulga Village	13/11/2017 22:01	IA/30	NA/55	NA/25	NA/Nil	0	Nil
Gouldsville	13/11/2017 21:00	<30/IA	NA	NA	NA	0	Nil
Inlet Rd	13/11/2017 21:37	NM/32	NA/55	NA/23	NA/Nil	0	Nil
Inlet Rd West	13/11/2017 21:10	<25/26	NA/52	NA/24	NA/Nil	0	Nil
Long Point	13/11/2017 21:28	IA/IA	NA	NA	NA	0	Nil
South Bulga	14/11/2017 0:53	<25/<25	NA	NA	NA	0	Nil
Wambo Road	13/11/2017 22:30	29/27	51/49	22/22	Nil/Nil	0	Nil

Notes:
1. As per NPfI, if LCeq – LAeq >= 15 dB further assessment of low frequency noise required.
2. As per NPfI, compare measured spectrum against reference spectrum to determine if the low frequency modifying factor is triggered and application of penalty is required;
3. Bold results and penalties in red are where the relevant modifying factor trigger was exceeded; and
4. Where it is not possible to determine the site only result due to the presence of other low frequency noise sources occurring during the measurement, or where criteria were not applicable due to meteorological conditions, this is noted as NA (not available) and no further assessment has been undertaken.

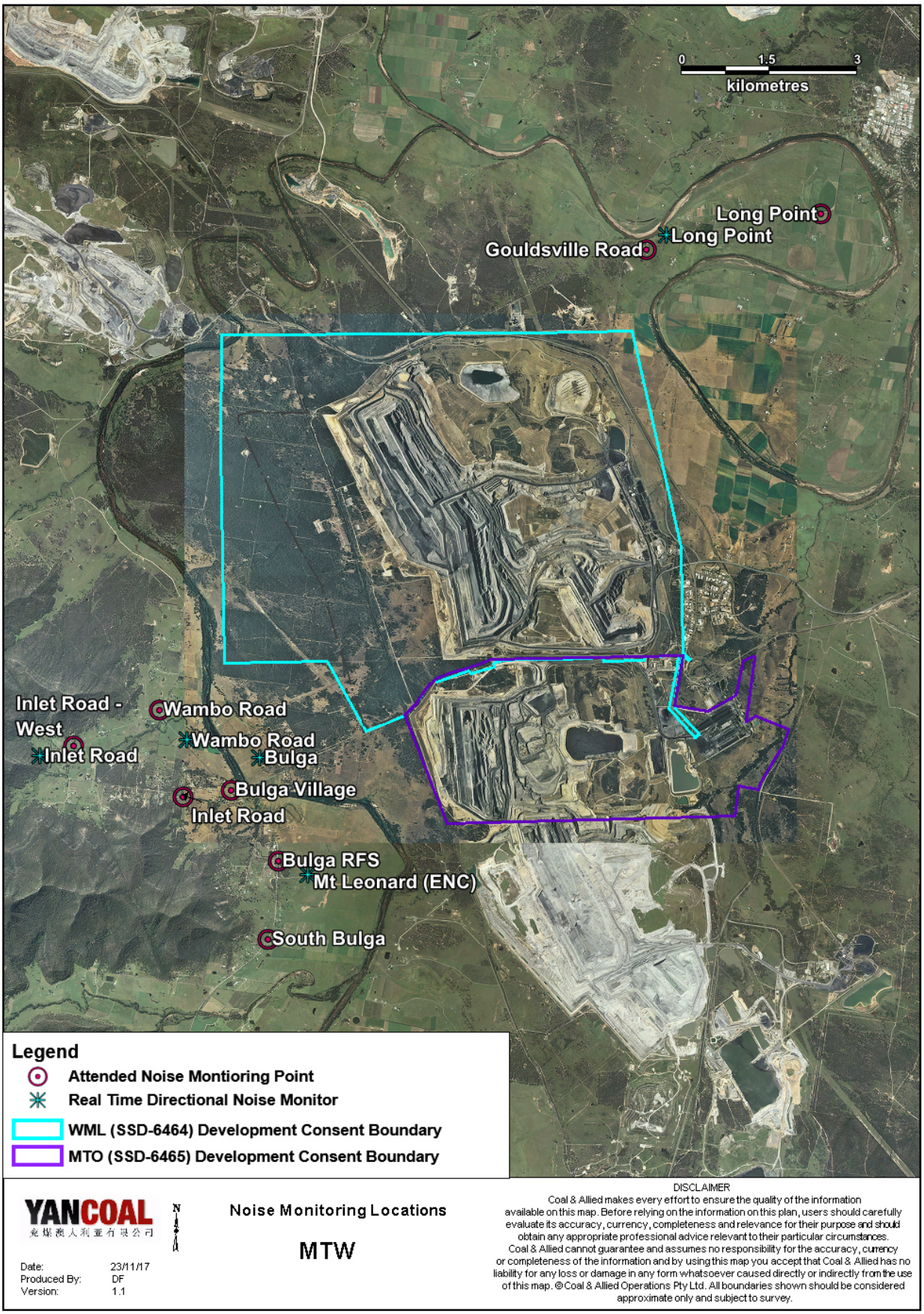

Figure 16: Noise Monitoring Location Plan

5.2 Noise Management Measures

A program of targeted supplementary attended noise monitoring is in place at MTW, supported by the real-time directional monitoring network and ensuring the highest level of noise management is maintained. The supplementary program is undertaken by MTW personnel and involves:

- Routine inspections from both inside and outside the mine boundary;
- Routine and as-required handheld noise assessments (undertaken in response to noise alarm and/or community complaint), comparing measured levels against consent noise limits; and
- Validation monitoring following operational modifications to assess the adequacy of the modifications.

Where a noise assessment identifies noise emissions which are exceeding the relevant noise limit(s) for any particular residence, modifications will be made so as to ensure that the noise event is resolved within 75 minutes of identification. The actions taken are commensurate with the nature and severity of the noise event, but can include:

- Changing the haul route to a less noise sensitive haul;
- Changing dump locations (in-pit or less exposed dump option);
- Reducing equipment numbers;
- Shut down of task; or
- Site shut down.

A summary of these assessments undertaken during November are provided in Table 8.

Table 8: Supplementary Attended Noise Monitoring Data – November 2017

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
516	0	0	0

Note: Measurements are taken under all meteorological conditions, including conditions under which the consent noise criteria do not apply.

6.0 OPERATIONAL DOWNTIME

During November, a total of 617 hours of equipment downtime was logged in response to environmental events such as dust, noise and adverse meteorological conditions. Operational downtime by equipment type is shown in Figure 17.

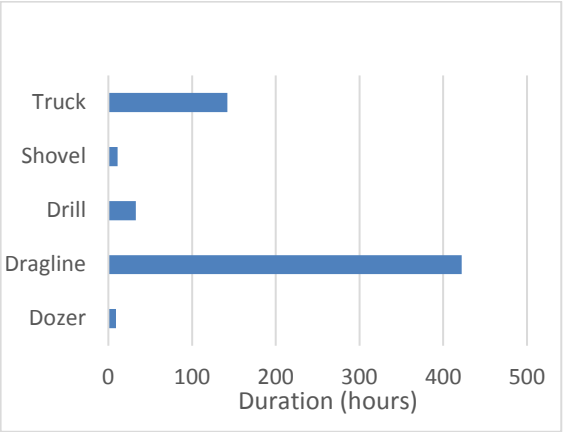

Figure 17: Operational Downtime by Equipment Type – November 2017

7.0 REHABILITATION

During November, 14.8 Ha of land was released, 18.6 Ha of land was bulk shaped, 15.5 Ha of land was topsoiled, 22.6 Ha of land was composted and 55.7 Ha of land was rehabilitated.

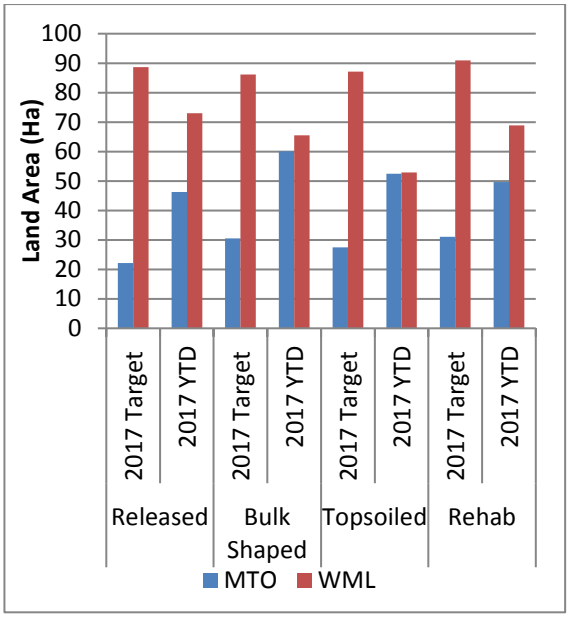

Figure 18: Rehabilitation YTD - November 2017

8.0 ENVIRONMENTAL INCIDENTS

During the reporting period there were no reportable environmental incidents.

9.0 COMPLAINTS

During the reporting period 25 complaints were received. Details of these complaints are shown in Figure 19 below.

	Noise	Dust	Blast	Lighting	Other	Total
January	5	6	3	1	0	15
February	25	3	10	3	0	41
March	14	1	1	2	0	18
April	27	1	7	2	0	37
May	18	4	7	10	3	42
June	10	3	4	3	0	20
July	10	10	8	0	2	30
August	8	18	5	4	1	36
September	21	15	6	2	3	47
October	21	8	6	2	2	39
November	12	5	5	2	1	25
December	-	-	-	-	-	-
Total	171	74	62	31	12	350

Figure 19: Complaints Summary – YTD November 2017

Appendix A: Meteorological Data

Table 9: Meteorological Data – Charlton Ridge Meteorological Station – November 2017

Date	Air Temperature Maximum (°C)	Air Temperature Minimum (°C)	Relative Humidity Maximum (%)	Relative Humidity Minimum (%)	Solar Radiation Maximum (W/Sq. M)	Wind Direction Average (°)	Wind Speed Average (m/sec)	Rainfall(mm)
1/11/2017	24.6	10.6	70.0	20.1	1364	167.3	2.3	0.0
2/11/2017	25.9	9.6	78.7	25.4	1099	156.8	2.5	0.0
3/11/2017	31.5	12.0	85.7	13.5	1119	244.3	3.0	0.6
4/11/2017	20.0	12.2	94.6	66.4	1162	152.4	2.5	7.8
5/11/2017	16.5	11.6	98.0	74.2	358	141.6	3.1	6.4
6/11/2017	27.7	13.0	96.1	36.1	1361	215.1	3.3	6.8
7/11/2017	22.9	9.9	87.9	33.6	1415	156.3	2.5	0.0
8/11/2017	20.0	10.6	94.1	47.2	1600	130.0	2.4	2.4
9/11/2017	22.9	8.6	91.4	37.7	1437	139.1	2.7	0.0
10/11/2017	24.6	9.3	87.9	33.6	1311	134.6	2.9	0.0
11/11/2017	24.7	10.6	88.1	33.2	1413	132.3	2.9	0.0
12/11/2017	25.2	10.4	88.0	31.5	1345	138.6	3.0	0.0
13/11/2017	24.5	13.1	79.4	36.5	1489	140.6	2.9	0.0
14/11/2017	25.4	10.6	84.1	35.6	1383	137.7	2.7	0.0
15/11/2017	28.5	12.2	86.2	24.5	1117	142.6	2.6	0.0
16/11/2017	24.8	13.0	87.3	41.6	1196	174.1	1.9	0.0
17/11/2017	27.9	14.2	91.6	43.4	1435	124.1	2.7	0.0
18/11/2017	24.4	15.2	78.9	38.8	941	107.0	2.6	0.0
19/11/2017	24.7	14.2	87.1	37.6	1063	128.7	3.3	0.0
20/11/2017	26.6	12.2	89.2	33.3	1430	135.5	3.3	0.0
21/11/2017	26.5	13.6	84.4	27.5	1249	133.6	3.2	0.0
22/11/2017	26.3	14.6	82.2	35.4	1446	123.6	2.9	0.0
23/11/2017	29.2	13.4	88.0	27.1	1217	140.6	2.0	0.0
24/11/2017	32.9	17.2	77.8	20.4	1063	151.6	2.9	0.0
25/11/2017	31.3	13.8	87.2	19.0	1118	143.0	3.3	0.0
26/11/2017	32.5	16.8	84.1	22.3	1157	126.5	2.9	0.0
27/11/2017	26.0	17.6	87.4	55.0	864	157.1	2.2	0.0
28/11/2017	30.7	15.9	92.5	36.6	1314	141.2	2.9	0.0
29/11/2017	30.0	17.7	86.6	40.9	1364	137.5	3.1	0.0
30/11/2017	32.3	18.2	88.2	30.5	1323	130.8	2.5	0.0

"-" Indicates that data was not available due to technical issues.