



# Monthly Environmental Monitoring Report

Yancoal Mt Thorley Warkworth

October 2017

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## Revision History

Version No.	Person Responsible	Document Status	Date
<b>1.0</b>	<b>Environmental Advisor</b>	<b>Draft</b>	<b>04/12/2017</b>
<b>1.1</b>	<b>Environmental Specialist</b>	<b>Final</b>	<b>08/12/2017</b>

## 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 1<sup>st</sup> October to 31<sup>st</sup> October 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)
October	92.8	384.2

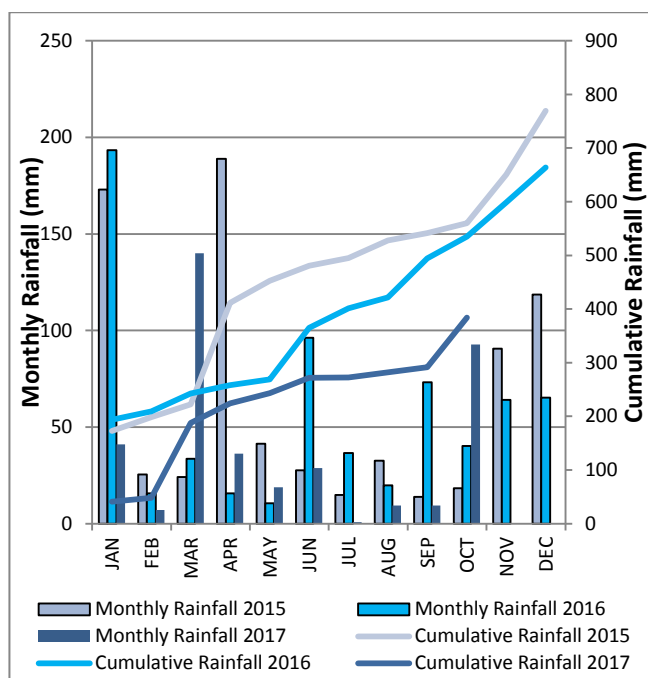


Figure 1: Rainfall Trend YTD

### 2.1.2 Wind Speed and Direction

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

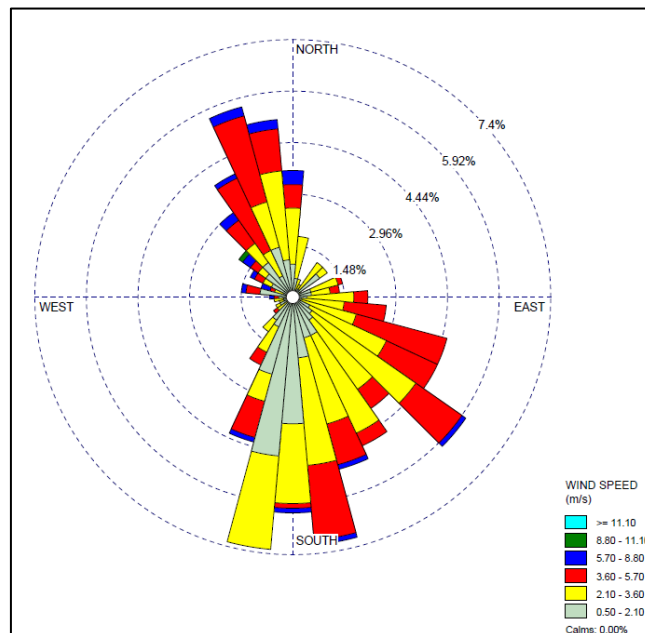


Figure 2: Charlton Ridge Wind Rose – October 2017



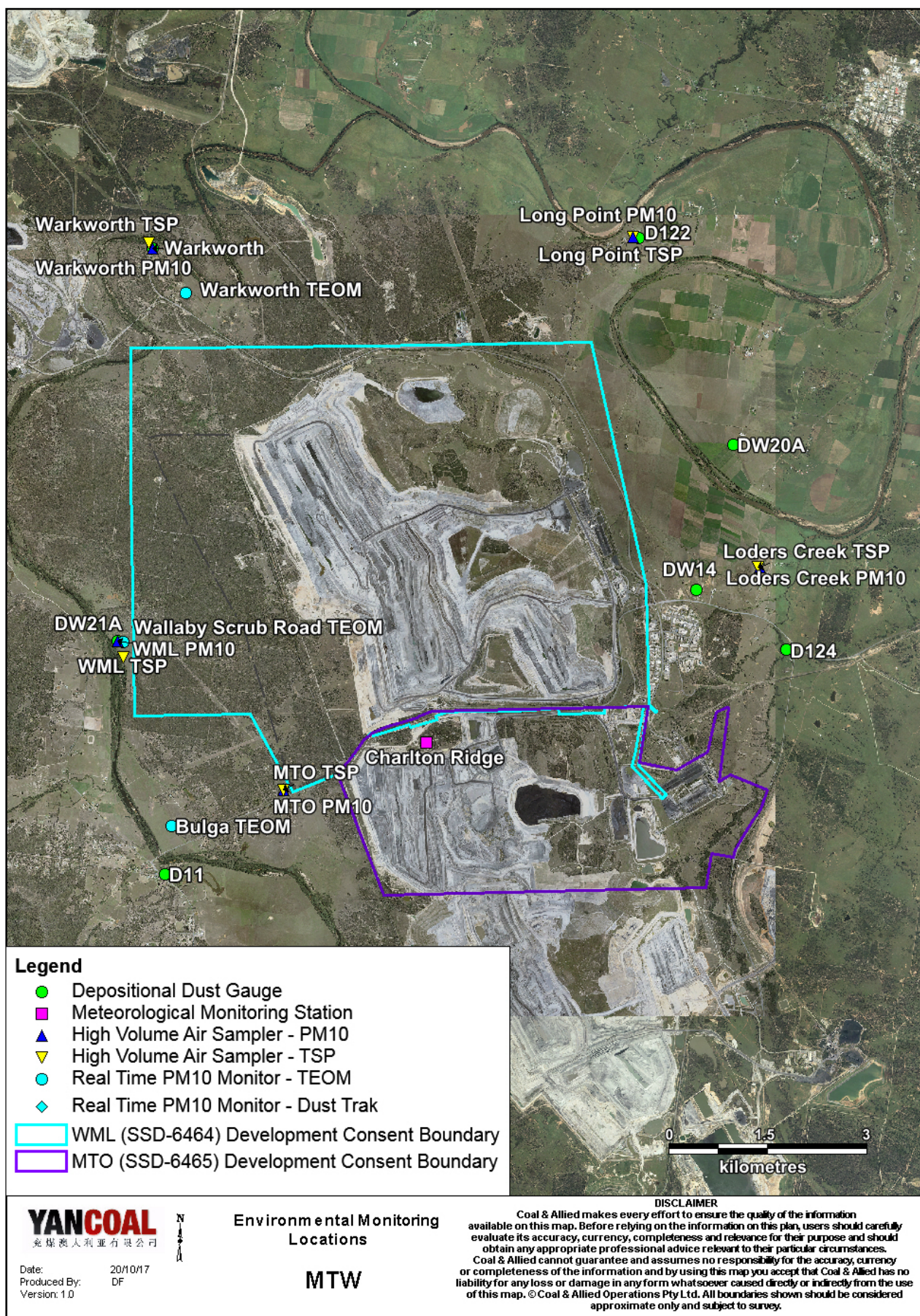


Figure 3: Air Quality Monitoring Locations



## 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.

During the reporting period the D124 and Warkworth monitors recorded a monthly result above the long term impact assessment criteria of 4.0 g/m<sup>2</sup> per month. Field notes associated with D124 confirm the presence of insects and bird droppings. As such the result is considered contaminated and will be excluded from calculation of the annual average. There is no evidence to suggest that the Warkworth result is contaminated. Accordingly, the result will be included in the annual average calculation.

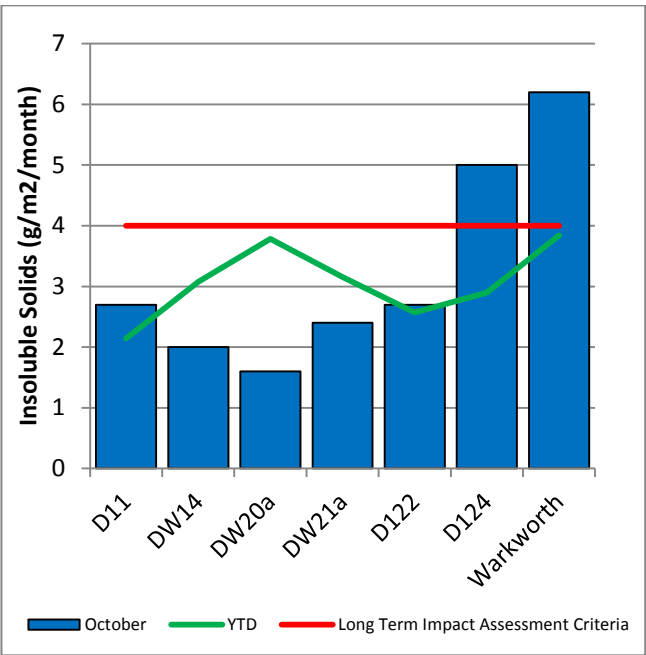


Figure 4: Depositional Dust – October 2017

## 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<sub>10</sub>). 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<sub>10</sub> Results

Figure 5 shows the individual PM<sub>10</sub> results at each monitoring station against the short term impact assessment criteria of 50µg/m<sup>3</sup>.

On 09/10/2017 the Long Point HVAS PM<sub>10</sub> unit recorded a result of 106µg/m<sup>3</sup>, which is greater than the short term (24hr) PM<sub>10</sub> impact assessment criteria.

Investigation determined that the wind direction was generally not from MTW's angle of influence at Long Point on the 9<sup>th</sup> of October. Accordingly, no further action is required.

Data was not available on 21/10/2017 at Long Point due to a power outage and on 27/10/2017 at Long Point or MTO HVAS due to collection of an invalid sample and a power outage, respectively.

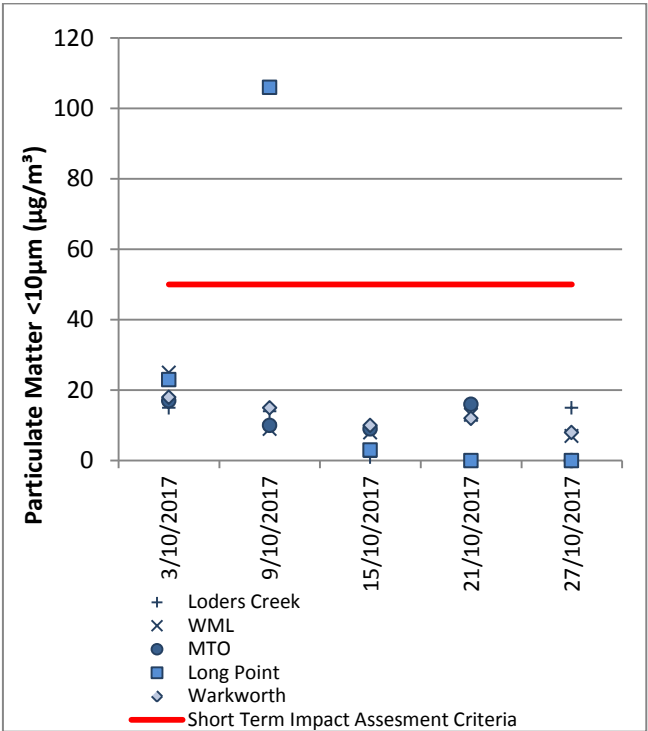


Figure 5: Individual PM<sub>10</sub> Results – October 2017

Figure 6 shows the annual average PM<sub>10</sub> results against the long term impact assessment criteria.

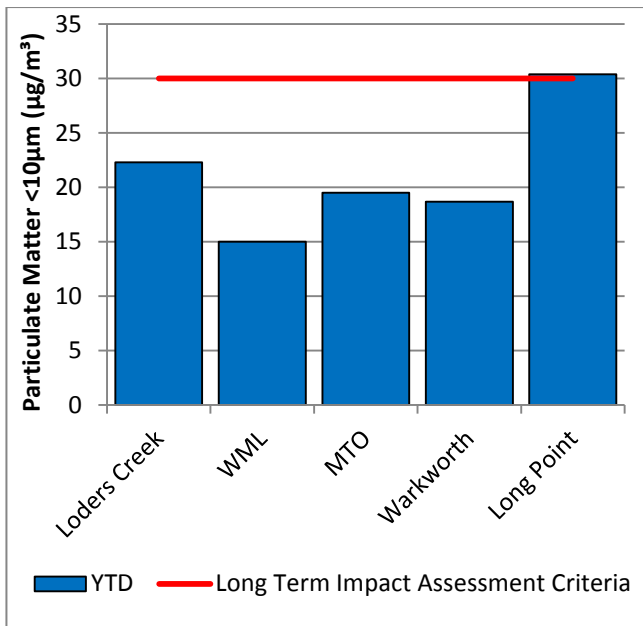


Figure 6: Annual Average PM<sub>10</sub> – October 2017

### 2.3.2 TSP Results

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

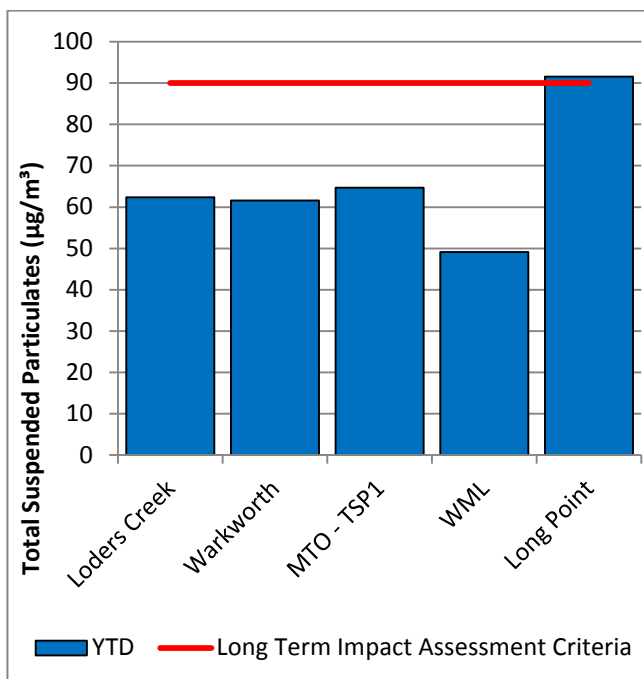


Figure 7: Annual Average Total Suspended Particulates – October 2017

### 2.3.3 Real Time PM<sub>10</sub> Results

Mt Thorley Warkworth maintains a network of real time PM<sub>10</sub> 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<sub>10</sub> result and the annual PM<sub>10</sub> average.

### 2.3.4 Real Time Alarms for Air Quality

During October, the real time monitoring system generated 143 automated air quality related alerts, including 11 alerts for adverse meteorological conditions and 132 alerts for elevated PM<sub>10</sub> levels.

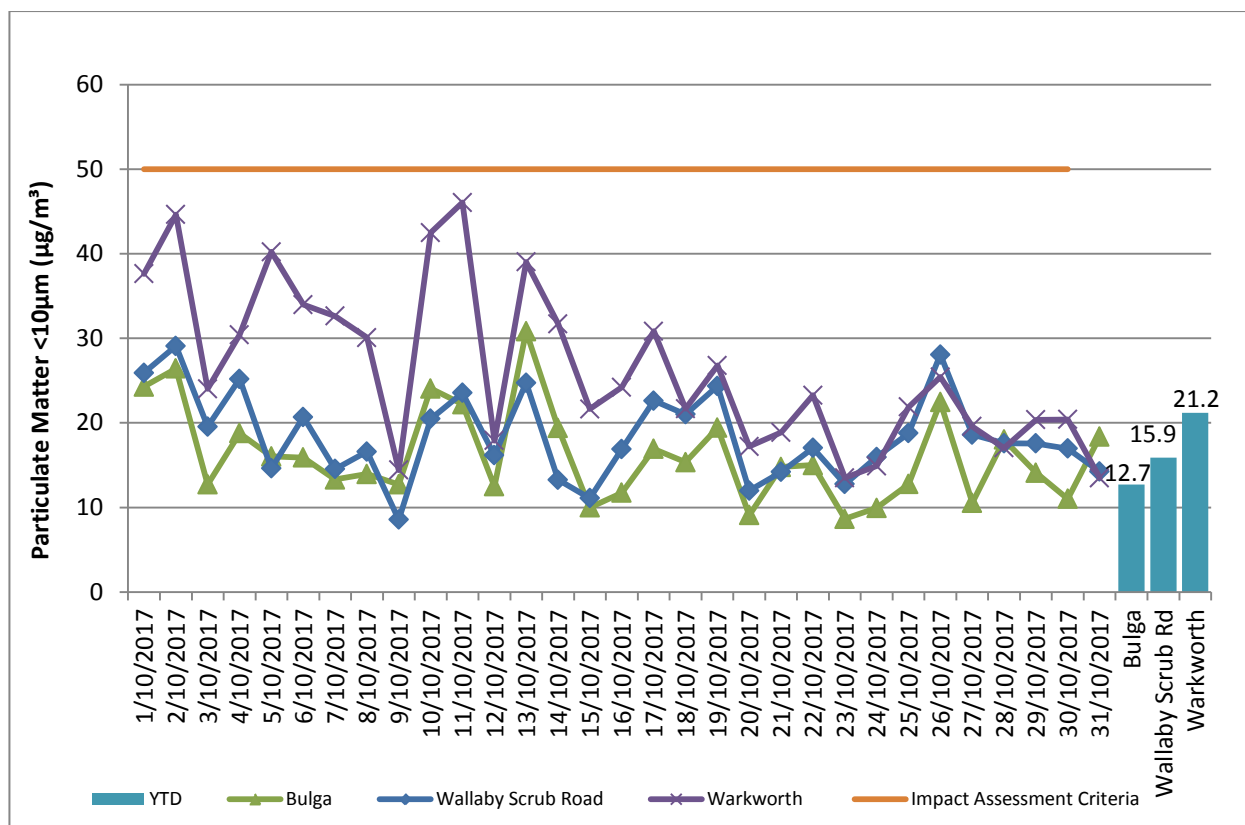


Figure 8: Real Time PM<sub>10</sub> daily 24hr average and annual average – October 2017

### 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.

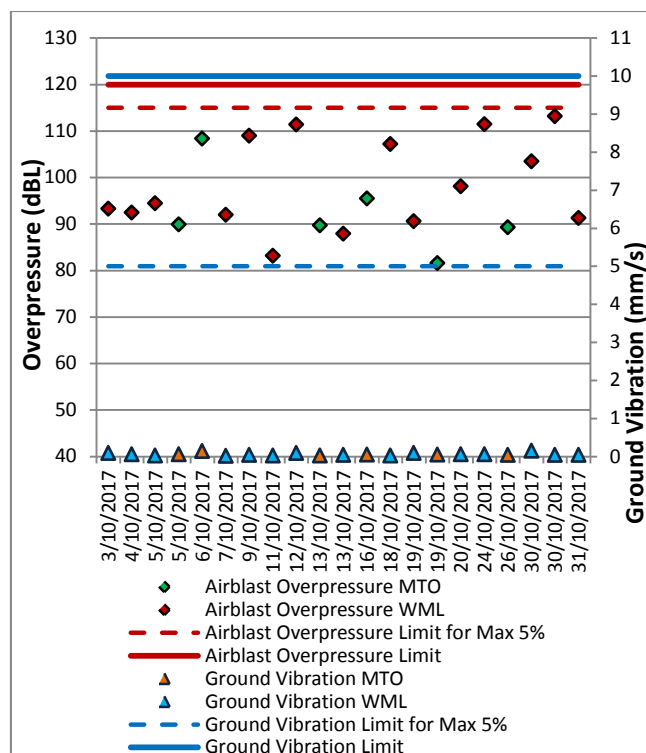
### 4.1 Blast Monitoring Results

During October 2017, 21 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.

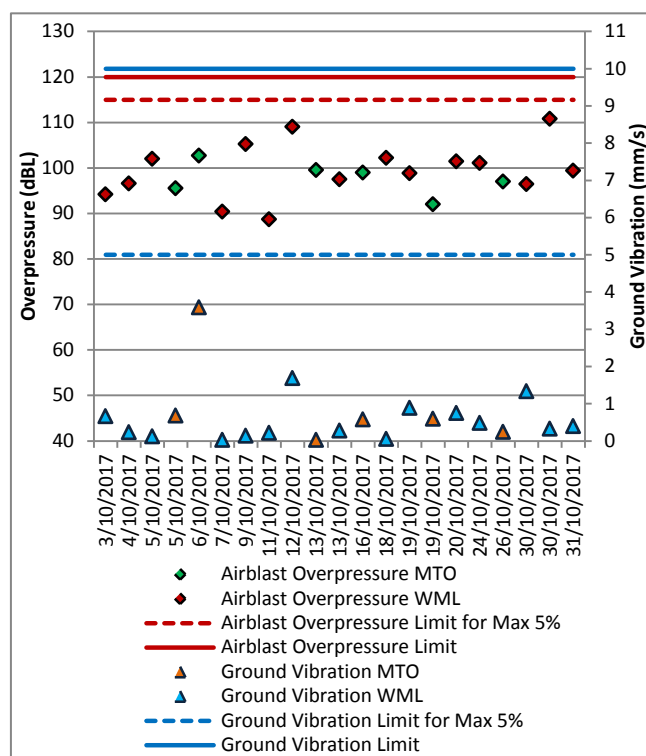
**Table 2: Blasting Limits**

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 – October 2017**



**Figure 10: Bulga Village Blast Monitoring Results – October 2017**

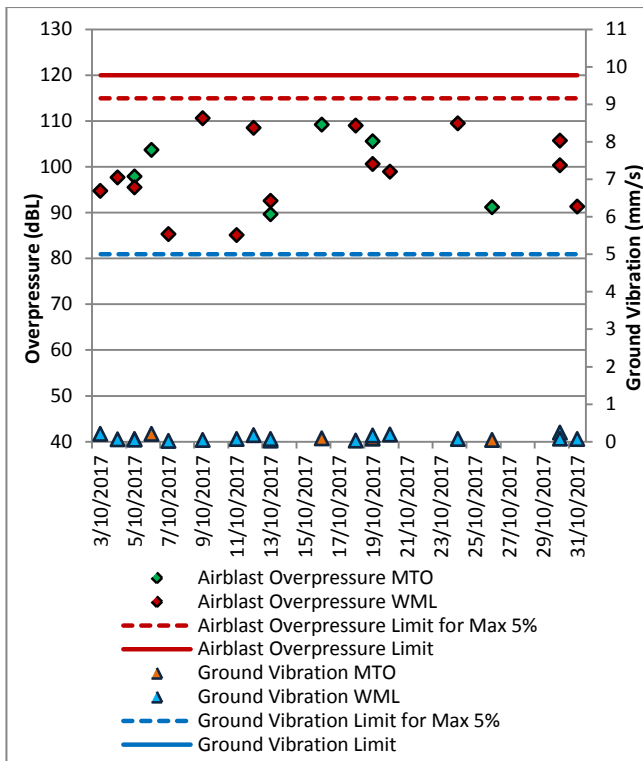


Figure 11: MTIE Blast Monitoring Results – October 2017

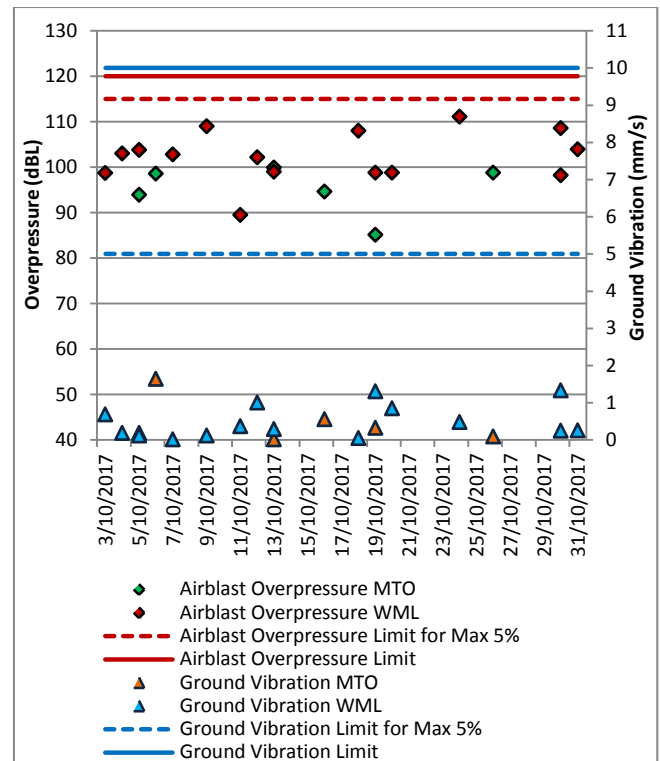


Figure 13: Wambo Road Blast Monitoring Results – October 2017

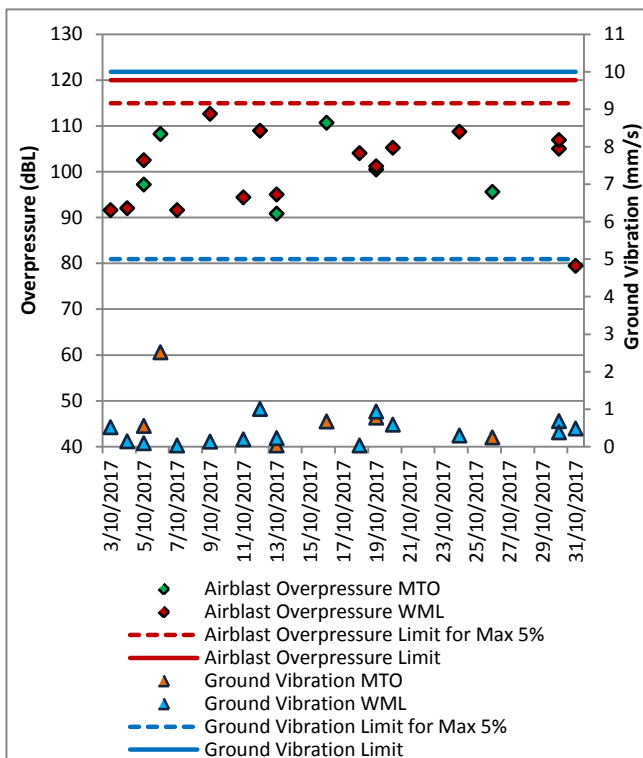


Figure 12: Wollemi Peak Road Blast Monitoring Results - October 2017

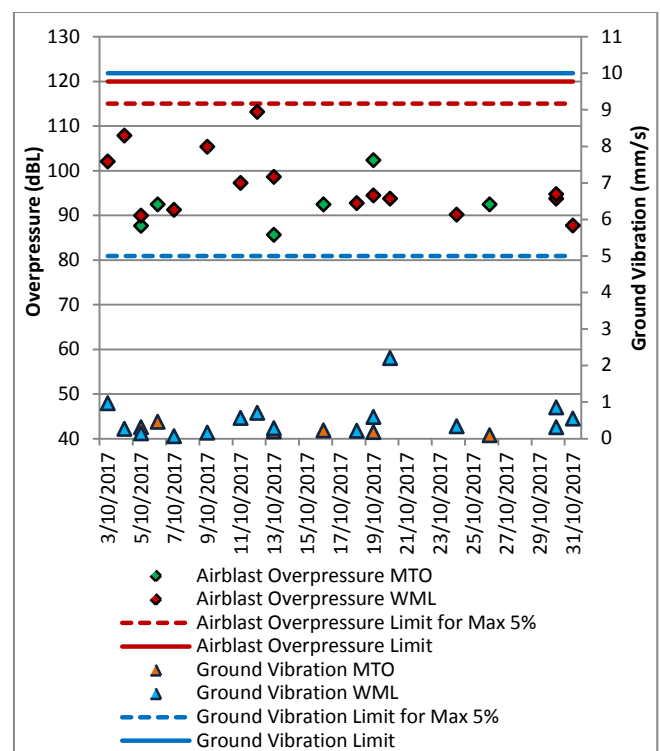


Figure 14: Warkworth Blast Monitoring Results - October 2017



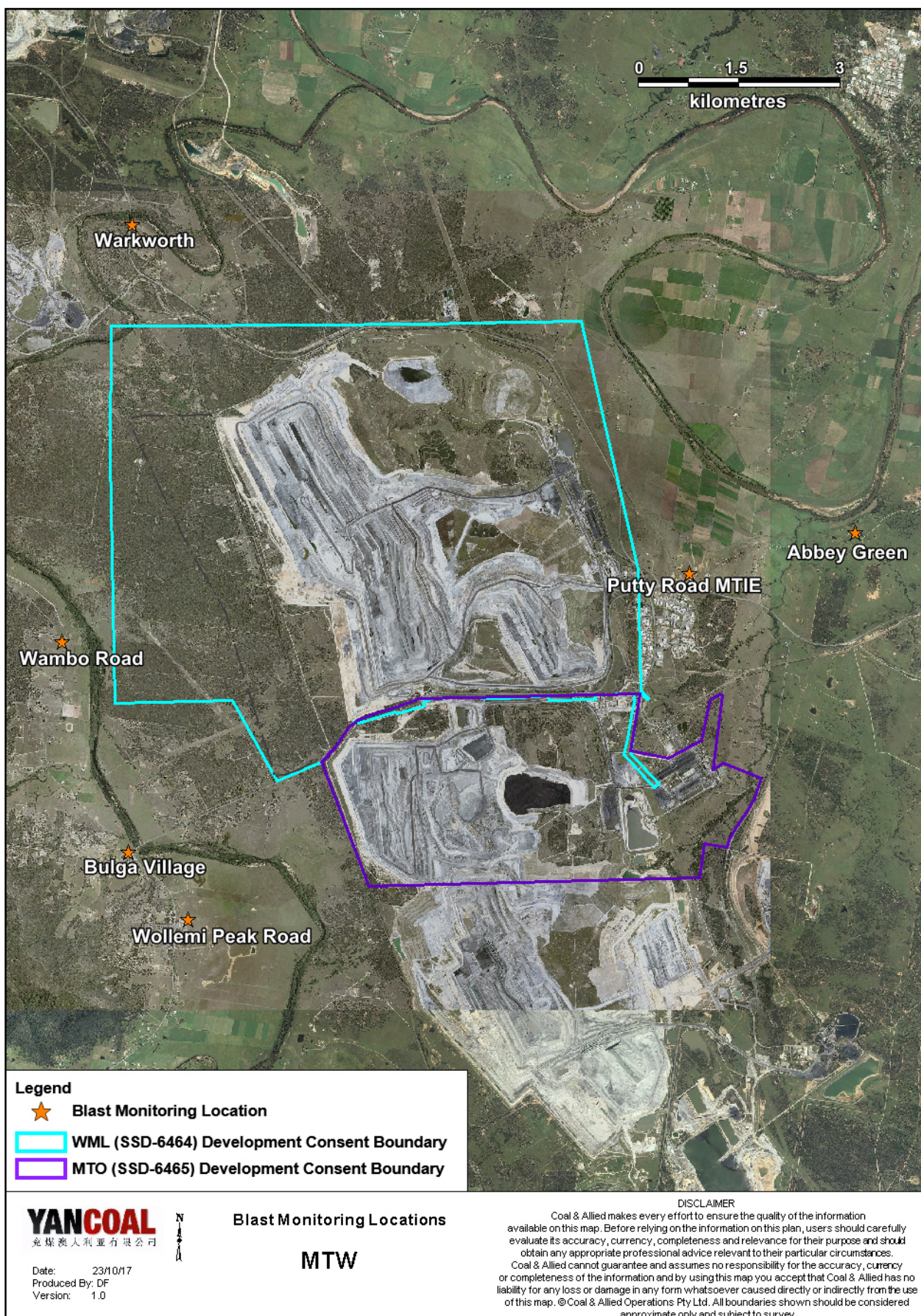


Figure 15: MTW Blast Monitoring Location Plan



## 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 16<sup>th</sup>-17<sup>th</sup> October 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<sub>Aeq, 15 minute</sub> Warkworth Impact Assessment Criteria –October 2017**

Location	Date and Time	Wind Speed (m/s) <sup>5</sup>	Stability Class	Criterion (dB(A))	Criterion Applies? <sup>1,5</sup>	WML L <sub>Aeq</sub> dB <sup>2,4</sup>	Exceedance <sup>3</sup>	Total L <sub>Ceq</sub> – L <sub>Aeq</sub>	Revised WML L <sub>Aeq</sub> <sup>5,6</sup>
Bulga RFS	17/10/2017 1:09	3.1	D	37	No	31	NA	13	31
Bulga Village	16/10/2017 21:53	3.2	D	38	No	38	NA	19	NA
Gouldsville	16/10/2017 22:30	2.9	E	38	Yes	IA	Nil	21	IA
Inlet Rd	16/10/2017 21:02	3.3	D	37	No	35	NA	17	NA
Inlet Rd West	16/10/2017 21:26	3	D	35	Yes	<30	Nil	19	<35
Long Point	16/10/2017 22:01	3.1	D	35	No	IA	NA	21	IA
South Bulga	16/10/2017 23:32	2.6	D	35	Yes	IA	Nil	20	IA
Wambo Road	16/10/2017 22:33	2.9	E	38	Yes	34	Nil	15	39

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 L<sub>Aeq,15minute</sub> 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 L<sub>Aeq, 15minute</sub> level following application of low frequency noise penalty as per the INP where applicable.

**Table 4: L<sub>A1, 1 minute</sub> Warkworth - Impact Assessment Criteria – October 2017**

Location	Date and Time	Wind Speed (m/s) <sup>5</sup>	Stability Class	Criterion dB	Criterion Applies? <sup>1,5</sup>	WML L <sub>A1, 1min</sub> dB <sup>2,4</sup>	Exceedance <sup>3</sup>
Bulga RFS	17/10/2017 1:09	3.1	D	47	No	NM	NA
Bulga Village	16/10/2017 21:53	3.2	D	48	No	45	NA
Gouldsville	16/10/2017 22:30	2.9	E	48	Yes	IA	Nil
Inlet Rd	16/10/2017 21:02	3.3	D	47	No	43	NA
Inlet Rd West	16/10/2017 21:26	3	D	45	Yes	35	Nil
Long Point	16/10/2017 22:01	3.1	D	45	No	IA	NA
South Bulga	16/10/2017 23:32	2.6	D	45	Yes	IA	Nil
Wambo Road	16/10/2017 22:33	2.9	E	48	Yes	48	Nil

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<sub>Aeq, 15minute</sub> Mount Thorley - Impact Assessment Criteria – October 2017**

Location	Date and Time	Wind Speed (m/s) <sup>5</sup>	Stability Class	Criterion dB	Criterion Applies? <sup>1,5</sup>	MTO L <sub>Aeq</sub> dB <sup>2,4</sup>	Exceedance <sup>3</sup>	Total L <sub>Ceq</sub> – L <sub>Aeq</sub> <sup>7</sup>	Revised MTO L <sub>Aeq</sub> <sup>5,6</sup>
Bulga RFS	17/10/2017 1:09	3.1	D	37	No	34	NA	13	34
Bulga Village	16/10/2017 21:53	3.2	D	38	No	NM	NA	19	NM
Gouldsville	16/10/2017 22:30	2.9	E	35	Yes	IA	Nil	21	IA
Inlet Rd	16/10/2017 21:02	3.3	D	37	No	IA	NA	17	IA
Inlet Rd West	16/10/2017 21:26	3	D	35	Yes	IA	Nil	19	IA
Long Point	16/10/2017 22:01	3.1	D	35	No	IA	NA	21	IA
South Bulga	16/10/2017 23:32	2.6	D	36	Yes	31	Nil	20	36
Wambo Road	16/10/2017 22:33	2.9	E	38	Yes	IA	Nil	15	IA

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<sub>A1, 1Minute</sub> Mount Thorley - Impact Assessment Criteria – October 2017**

Location	Date and Time	Wind Speed (m/s) <sup>5</sup>	Stability Class	Criterion dB	Criterion Applies? <sup>1,5</sup>	MTO L <sub>A1, 1min</sub> dB <sup>2,4</sup>	Exceedance <sup>3</sup>
Bulga RFS	17/10/2017 1:09	3.1	D	47	No	43	NA
Bulga Village	16/10/2017 21:53	3.2	D	48	No	NM	NA
Gouldsville	16/10/2017 22:30	2.9	E	45	Yes	IA	Nil
Inlet Rd	16/10/2017 21:02	3.3	D	47	No	IA	NA
Inlet Rd West	16/10/2017 21:26	3	D	45	Yes	IA	Nil
Long Point	16/10/2017 22:01	3.1	D	45	No	IA	NA
South Bulga	16/10/2017 23:32	2.6	D	46	Yes	35	Nil
Wambo Road	16/10/2017 22:33	2.9	E	48	Yes	IA	Nil

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 INP Low Frequency

In accordance with the requirements of the NSW Industrial Noise Policy (INP), the low frequency modification factor has been applied where appropriate. It should be noted that the Industrial Noise Policy does not give guidance on the application of the penalty where more than one target noise source is audible. The  $L_{Ceq}$  levels reported above are “Total”, or “Total mine noise” at best, and cannot be attributed accurately to a single mine. Accordingly, where the INP criteria for the application of the Low Frequency modification factor is triggered, the penalty has been applied to the dominant mine noise source (either of WML or MTO), as such resulting in the application of a 5 dB penalty to the site only  $L_{Aeq}$  for the measurements taken at Bulga Village, Inlet Road and Inlet Road West, South Bulga and Wambo Road.

Resulting  $L_{Aeq}$  noise levels exceed the WML impact assessment criteria at Wambo Road by 1 dB to the application of a 5 dB penalty to the site only  $L_{Aeq}$ .

MTW reports these measurements so as to ensure full disclosure, however it remains MTW’s position that the prescribed methodology is unsuitable when applied to receptors at large distances from mine noise sources due to the nature of noise attenuation. Excess attenuation of noise with distance is greater for high frequency noise than it is for low frequency noise. At significant distance from a noise source (such as private residences from the MTW complex) this often results in large differentials between  $L_{Aeq}$  and  $L_{Ceq}$ . The NSW Industrial Noise Policy requires the penalty to be applied in these instances, irrespective of actual low frequency affectation. As such, MTW does not consider these instances to constitute non-compliance with the conditions of approval.

The result has been reported to the Department of Planning and Environment.

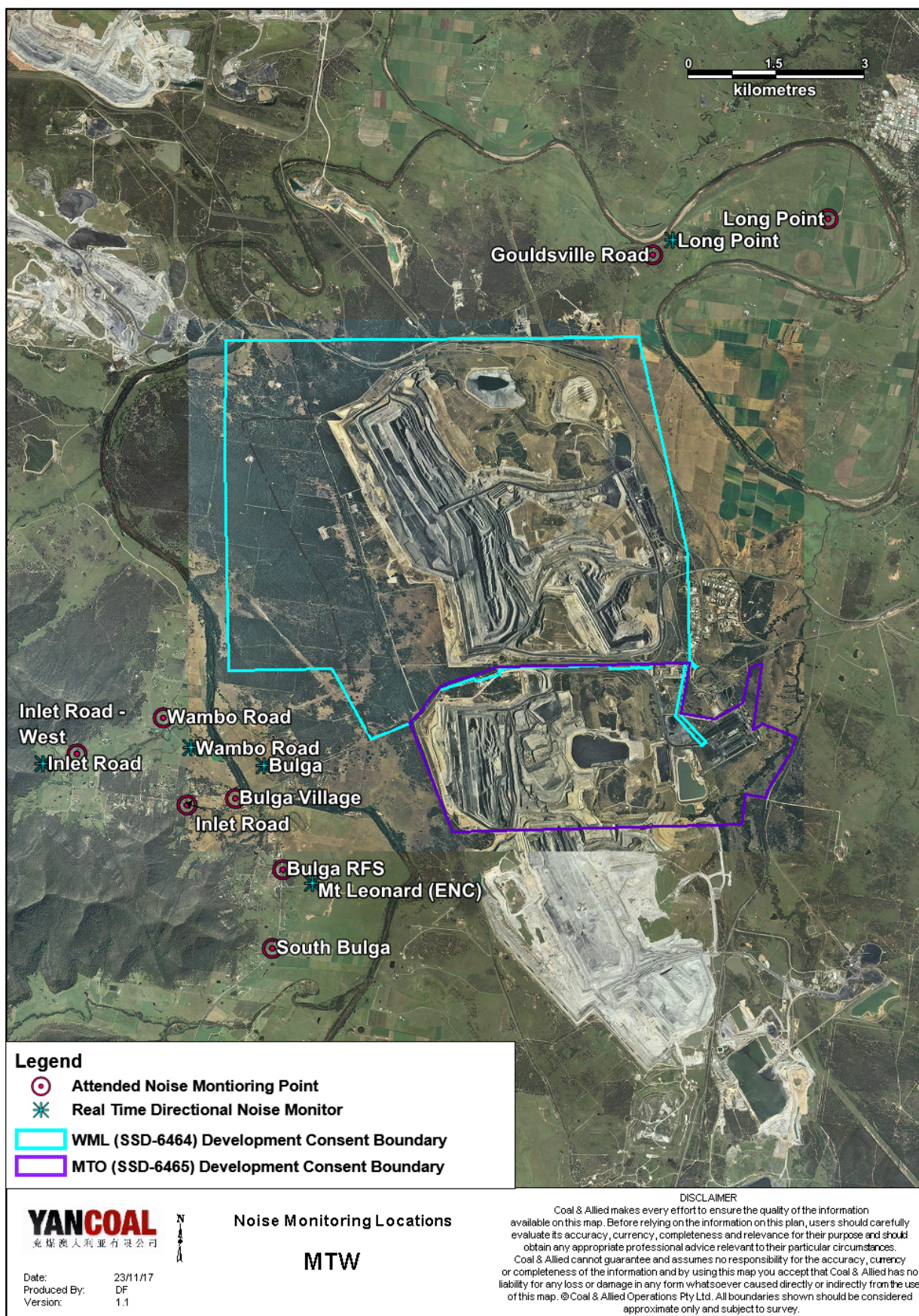


Figure 16: Noise Monitoring Location Plan



## 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 October are provided in Table 7.

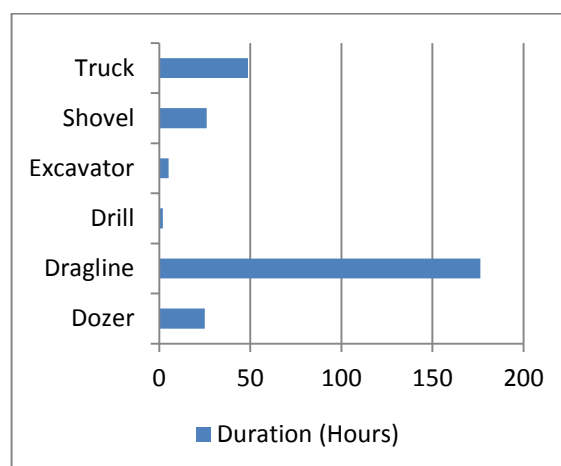
**Table 7: Supplementary Attended Noise Monitoring Data – October 2017**

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
324	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 October, a total of 283.3 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 – October 2017**

## 7.0 REHABILITATION

During October, 11.08 Ha of land was released, 11.75 Ha of land was bulk shaped, 6.57 Ha of land was topsoiled, 24.81 Ha of land was composted and 1.72 Ha of land was rehabilitated.

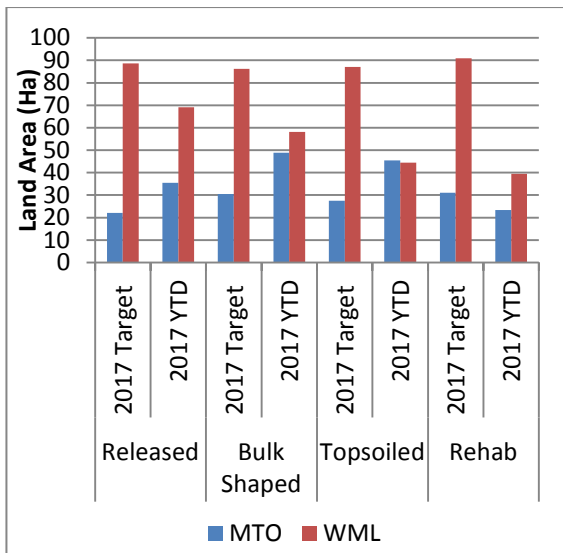


Figure 18: Rehabilitation YTD - October 2017

## 8.0 ENVIRONMENTAL INCIDENTS

During the reporting period there were no reportable environmental incidents.

## 9.0 COMPLAINTS

During the reporting period 39 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	-	-	-	-	-	-
December	-	-	-	-	-	-
Total	159	69	57	29	11	325

**Figure 19: Complaints Summary – YTD October 2017**



## **Appendix A: Meteorological Data**

**Table 8: Meteorological Data – Charlton Ridge Meteorological Station – October 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)
1/10/2017	25.7	7.3	77.0	8.7	959	154.0	2.2	0.0
2/10/2017	22.5	9.5	78.2	27.4	932	159.1	2.3	0.0
3/10/2017	27.0	12.4	89.6	28.9	1201	163.5	1.9	0.2
4/10/2017	28.3	11.8	89.7	31.3	1057	164.0	2.2	0.0
5/10/2017	31.9	14.8	84.0	16.1	1114	208.2	2.5	0.0
6/10/2017	24.7	13.1	74.6	18.7	843	177.0	2.5	0.0
7/10/2017	22.7	11.1	77.6	32.6	1420	145.1	2.6	0.0
8/10/2017	20.5	10.1	89.9	51.8	568	213.0	1.8	1.2
9/10/2017	32.1	14.4	91.5	24.8	1058	254.5	3.6	0.2
10/10/2017	21.8	13.8	88.3	57.8	720	138.9	2.9	0.0
11/10/2017	32.1	15.2	83.5	24.6	1011	164.4	2.3	0.0
12/10/2017	31.0	15.3	86.6	10.7	1221	254.7	4.7	0.0
13/10/2017	29.8	12.3	81.1	16.2	1048	159.2	2.6	0.0
14/10/2017	20.0	13.3	94.6	56.3	968	157.8	4.1	4.0
15/10/2017	24.2	12.9	96.9	45.0	1364	136.9	3.1	6.8
16/10/2017	24.4	10.8	90.8	31.3	1291	143.7	3.2	0.0
17/10/2017	26.4	12.3	82.3	32.9	1364	126.0	3.8	0.0
18/10/2017	27.3	13.4	88.0	30.4	1327	113.8	3.4	0.0
19/10/2017	-	-	27.7	-	1039	132.8	2.2	0.0
20/10/2017	18.6	-	95.1	-	316	223.1	2.9	23.2
21/10/2017	21.1	9.4	86.0	34.9	1428	145.0	3.1	0.0
22/10/2017	22.6	7.6	92.0	30.5	1152	165.0	2.4	8.8
23/10/2017	21.9	9.0	96.4	44.5	1464	145.7	2.1	19.8
24/10/2017	28.9	8.9	94.9	20.3	1076	259.1	2.9	0.0
25/10/2017	31.0	15.0	63.0	16.3	1294	259.3	2.9	0.0
26/10/2017	30.5	10.2	95.3	33.3	1035	152.2	2.7	27.8
27/10/2017	24.6	11.0	96.3	47.3	1452	206.1	1.9	0.8
28/10/2017	27.9	13.2	93.7	32.5	1065	197.1	2.3	0.0
29/10/2017	32.8	17.6	67.3	22.7	1297	255.2	3.6	0.0
30/10/2017	36.2	14.6	74.6	7.4	1109	273.1	4.7	0.0
31/10/2017	22.5	11.1	64.9	19.5	1423	186.3	3.0	0.0

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