



# Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

February 2019

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## Revision History

Version No.	Version Details	Document Status	Date
1.0	Environmental Advisor	Final	17/04/2019

## 1.0 INTRODUCTION

This report has been compiled to provide a monthly summary of environmental monitoring results for Mount Thorley Warkworth (MTW). This report includes all monitoring data collected for the period 1 February to 28 February 2019.

## 2.0 AIR QUALITY

### 2.1 Meteorological Monitoring

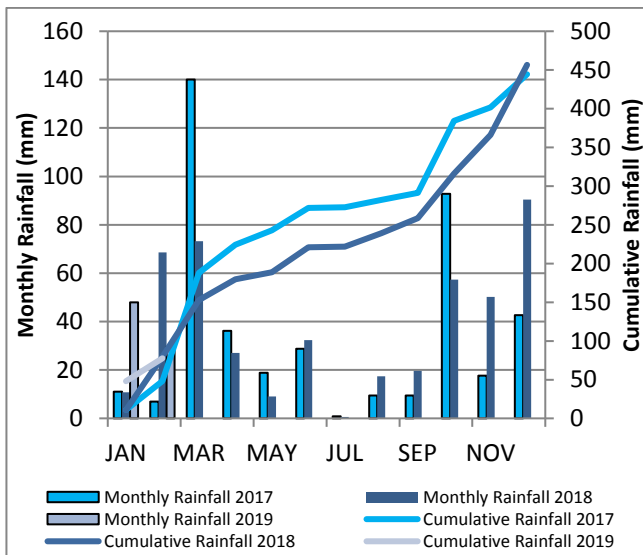
Meteorological data is collected at MTW’s ‘Charlton Ridge’ meteorological station (refer to **Figure 3: Air Quality Monitoring Locations**).

#### 2.1.1 Rainfall

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

**Table 1: Monthly Rainfall MTW**

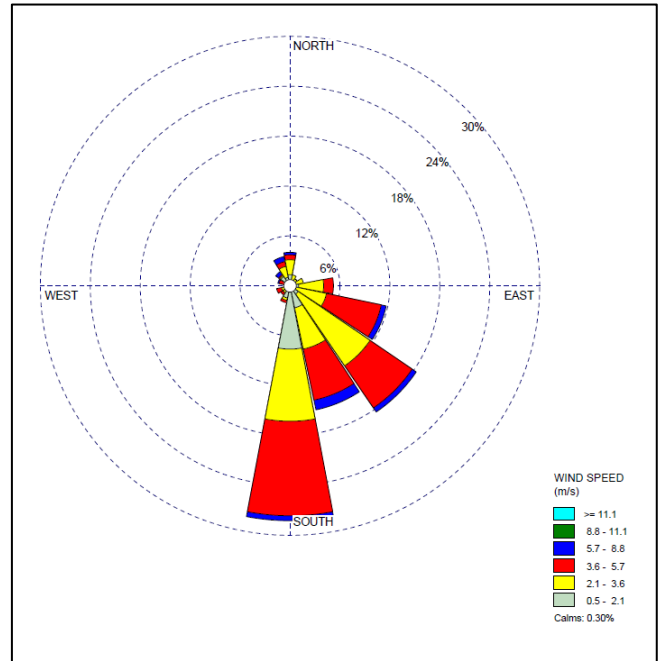
2019	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
February	29.6	77.6



**Figure 1: Rainfall Trend YTD**

### 2.1.2 Wind Speed and Direction

Winds from the south were dominant throughout the reporting period as shown in **Figure 2**.



**Figure 2: Charlton Ridge Wind Rose – February 2019**



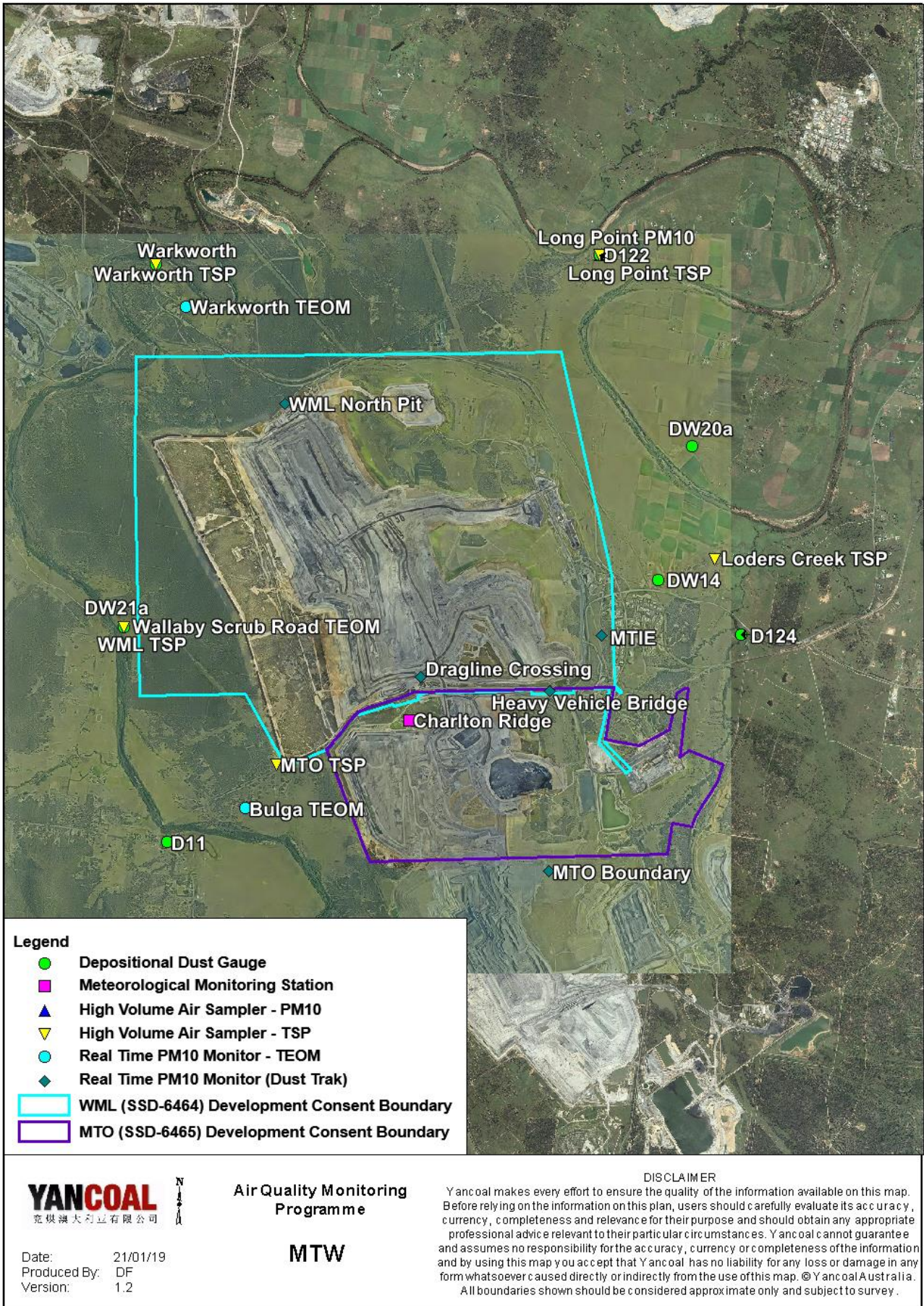


Figure 3: Air Quality Monitoring Locations



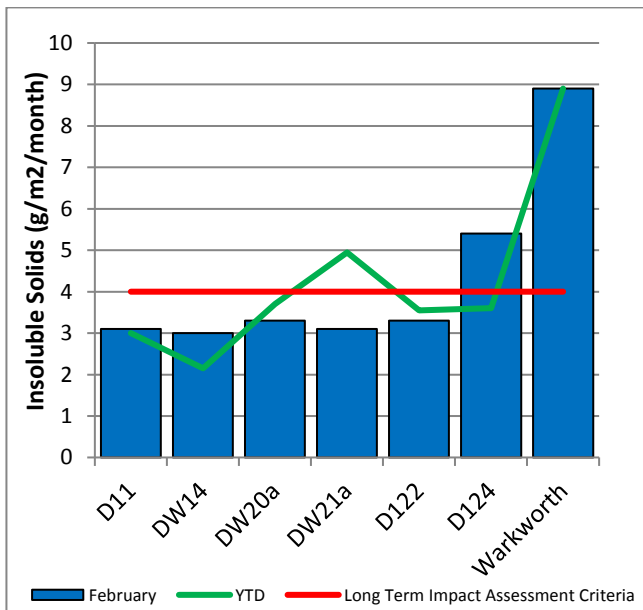
## 2.2 Depositional Dust

To monitor 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 monthly results 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 results are considered contaminated and will be excluded from calculation of the annual average. There is no evidence to suggest that the Warkworth results are contaminated. Accordingly, the results will be included in the annual average calculation.

An annual assessment of MTW’s compliance with the Long-Term Impact Assessment Criteria will be provided in the 2019 Annual Review Report.



**Figure 4: Depositional Dust – February 2019**

## 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

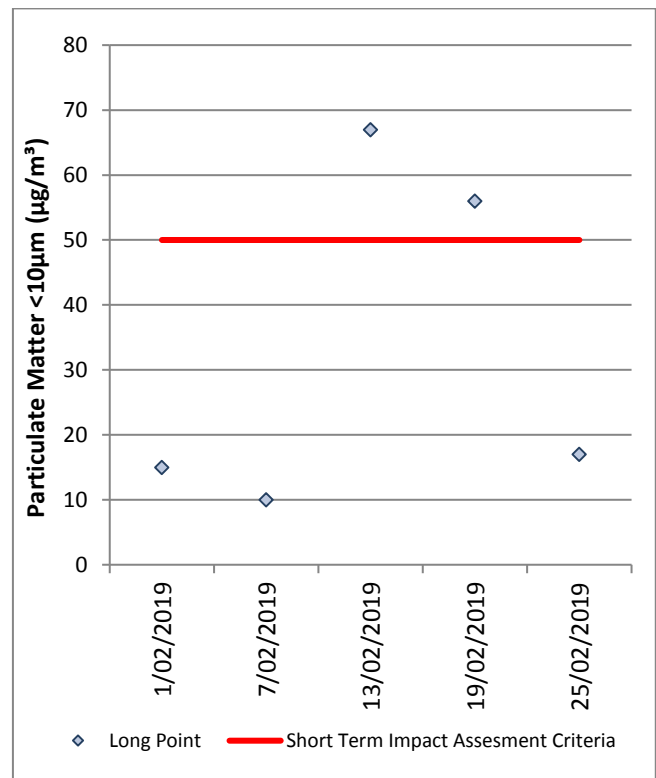
was run for 24 hours on a six-day cycle in accordance with EPA requirements.

### 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 13 and 19 February 2019 the Long Point HVAS PM<sub>10</sub> unit recorded results of 67 µg/m<sup>3</sup> and 56 µg/m<sup>3</sup> respectively, which is greater than the short term (24hr) PM<sub>10</sub> impact assessment criteria.

Investigations indicate that the likely MTW contribution to the results at Long Point on 13 and 19 February is less than 38% and 7% respectively. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).



**Figure 5: Individual PM<sub>10</sub> Results – February 2019**

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

An assessment of MTW’s contribution to the long term assessment criteria will be reported in the 2019 Annual Review Report.

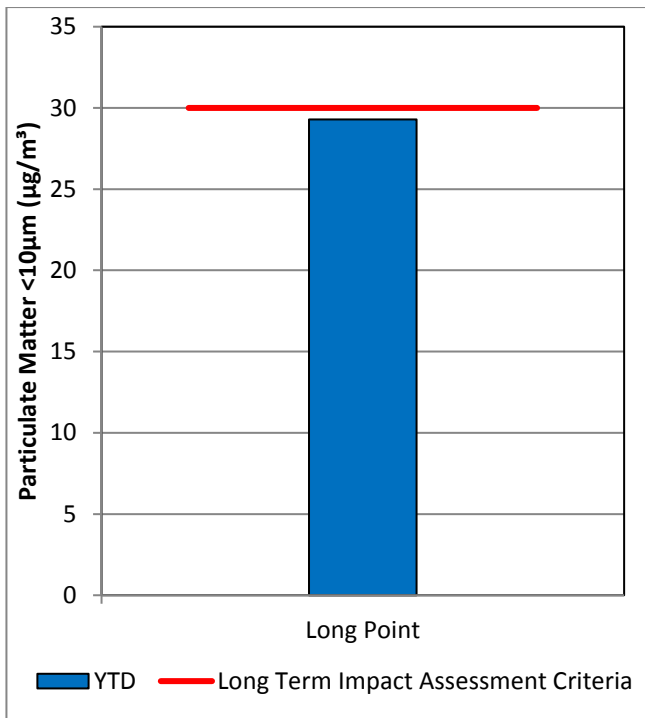


Figure 6: Annual Average PM<sub>10</sub> – February 2019

### 2.3.2 TSP Results

Figure 7 shows the annual average TSP results compared against the long-term impact assessment criteria of 90µg/m<sup>3</sup>.

An assessment of MTW’s contribution to the long-term assessment criteria will be reported in the 2019 Annual Review Report.

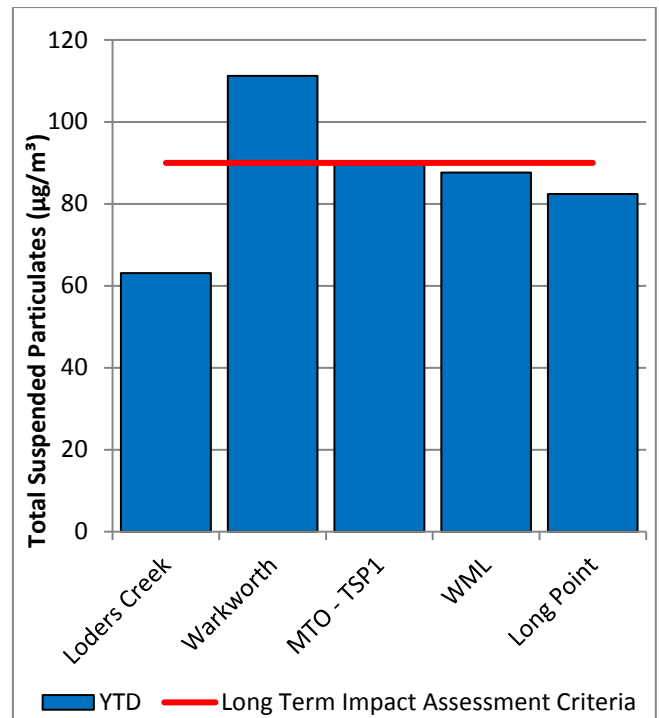


Figure 7: Annual Average Total Suspended Particulates – February 2019

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

MTW 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 internal alerts 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.

On 10 February 2019, the Bulga OEH TEOM (58.0 µg/m<sup>3</sup>) and the Warkworth OEH TEOM (53.9 µg/m<sup>3</sup>) exceeded the short term (24hr) criteria. These measurements were assessed for MTW’s potential contribution based on meteorological conditions on this day resulting in a maximum estimated contribution of 22.2 µg/m<sup>3</sup> and 23.4 µg/m<sup>3</sup> respectively, less than a 75% contribution to the results. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

On 13 February 2019, the Bulga OEH TEOM (58.9 µg/m<sup>3</sup>) and Wallaby Scrub Road TEOM (52.2 µg/m<sup>3</sup>) exceeded the short term (24hr) criteria. These measurements were assessed for MTW’s potential contribution based on meteorological conditions on this day resulting in maximum estimated

contributions of 16.7  $\mu\text{g}/\text{m}^3$  and 28.4  $\mu\text{g}/\text{m}^3$  respectively, less than a 75% contribution to the results. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

On 13 February 2019, the Warkworth OEH TEOM (61.6  $\mu\text{g}/\text{m}^3$ ) exceeded the short term (24hr) criteria. This measurement was assessed for MTW's potential contribution based on background  $\text{PM}_{10}$  levels on this day resulting in a maximum estimated contribution of less than 75% to the result. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

On 19 February 2019, the the Warkworth OEH TEOM (53.9  $\mu\text{g}/\text{m}^3$ ) exceeded the short term (24hr) criteria. This measurement was assessed for MTW's potential contribution based on meteorological conditions on this day resulting in a maximum estimated contribution of 27.1, less than a 75% contribution to the result. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

#### **2.3.4 Real Time Alarms for Air Quality**

During February, the real time monitoring system generated 118 automated air quality related alerts, including 6 alerts for adverse meteorological conditions and 112 alerts for elevated  $\text{PM}_{10}$  levels.



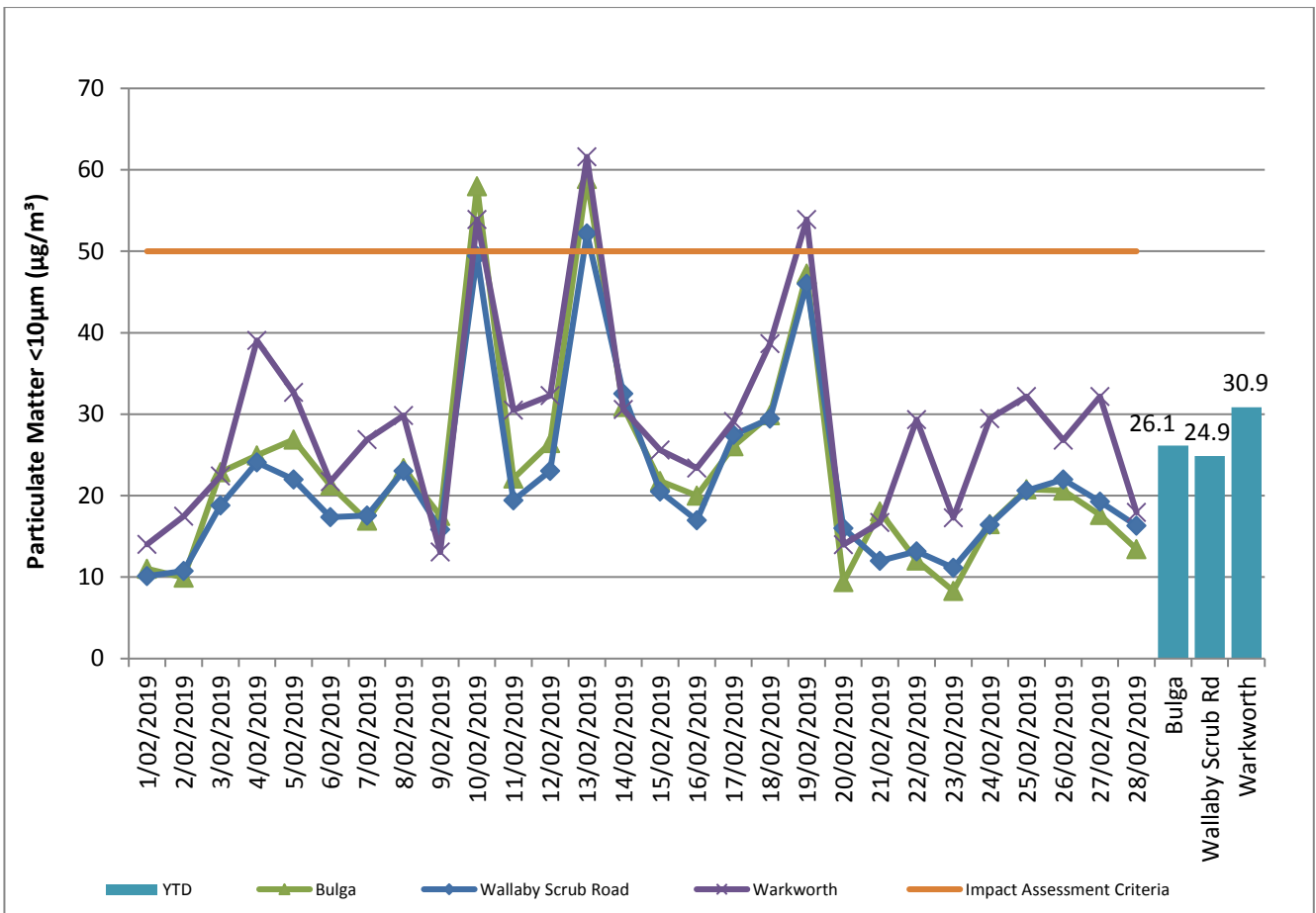


Figure 8: Real Time PM<sub>10</sub> daily 24hr average (line graphs) and YTD annual average (column graphs) – February 2019

### 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 system. Other Hunter River tributaries are also monitored.

Results of monitoring are reported quarterly, next available in the March 2019 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 March 2019 report.

#### 3.3 HRSTS Discharge

MTW participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing discharge from licensed discharge points located at 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**.

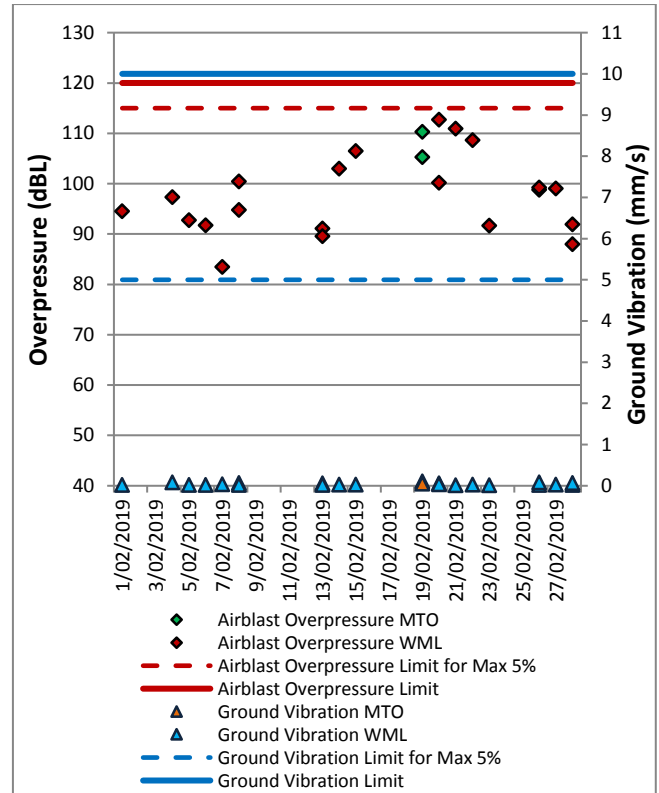
### 4.1 Blast Monitoring Results

During February 2019, 23 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**.

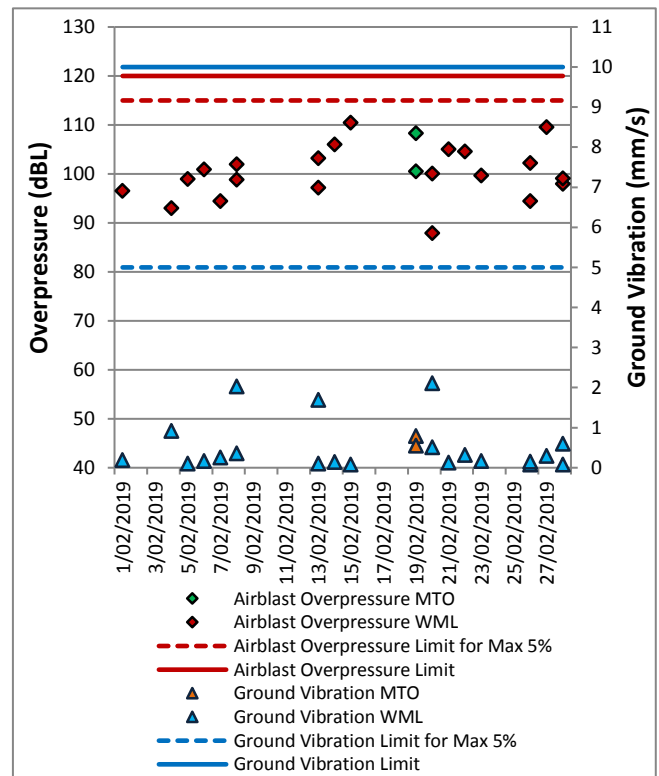
**Table 2: Blasting Limits**

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 one blast exceeded the 115 dB(L) threshold for airblast overpressure at the MTIE blast monitor on 6 February at 14:16. No blast exceeded the 5mm/s criteria for ground vibration.



**Figure 9: Abbey Green Blast Monitoring Results – February 2019**



**Figure 10: Bulga Village Blast Monitoring Results – February 2019**

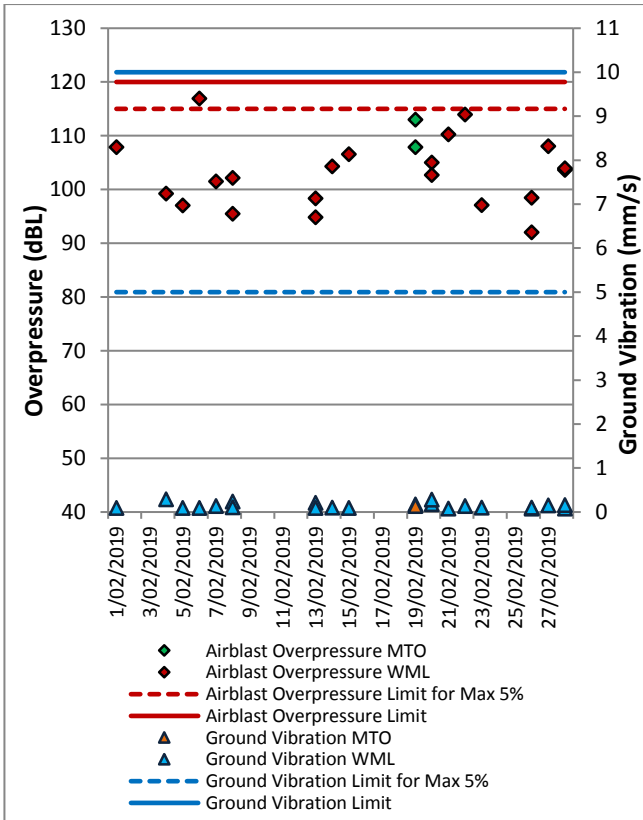


Figure 11: MTIE Blast Monitoring Results – February 2019

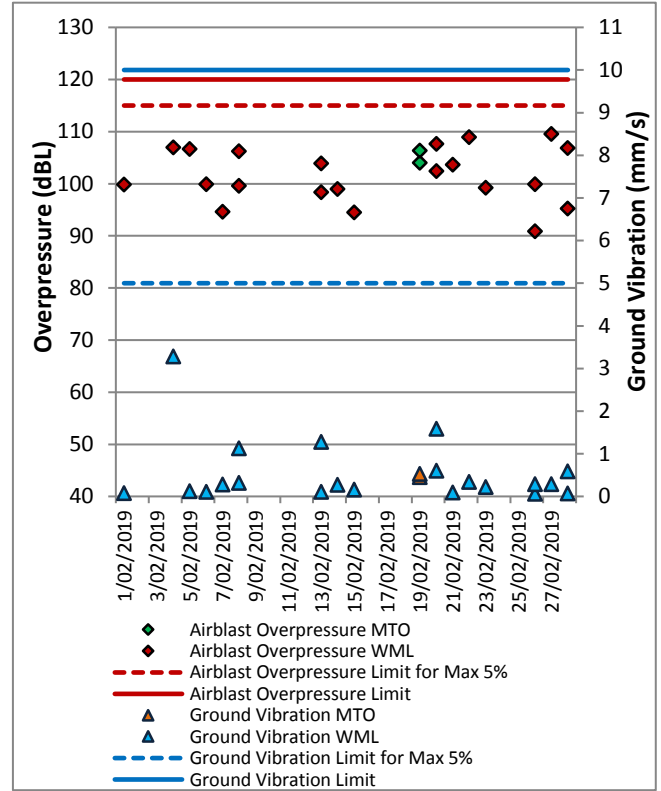


Figure 13: Wambo Road Blast Monitoring Results – February

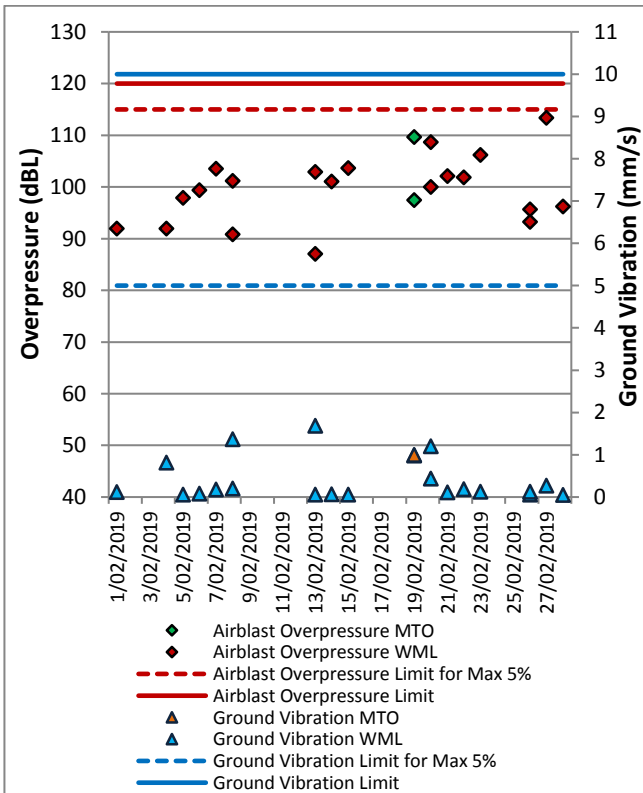


Figure 12: Wollemi Peak Road Blast Monitoring Results – February 2019

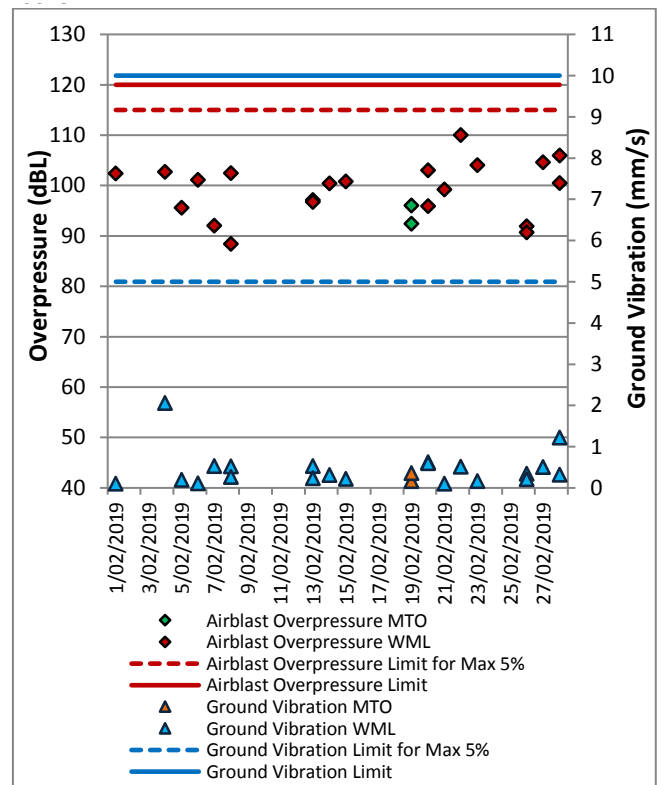


Figure 14: Warkworth Blast Monitoring Results – February 2019



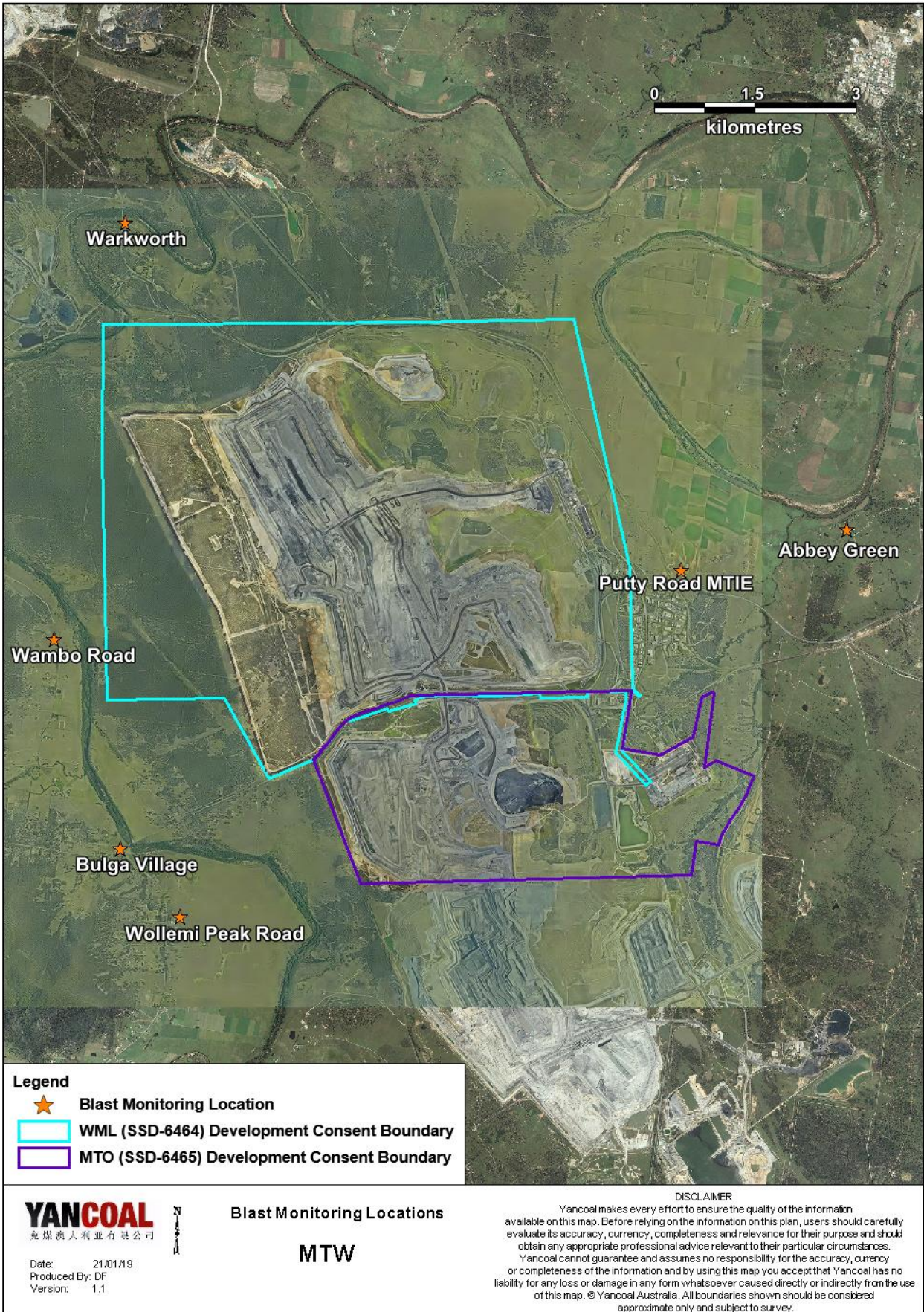


Figure 15: MTW Blast Monitoring Location Plan

## 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 five sites surrounding MTW. Noise monitoring locations are displayed in **Figure 16**.

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 11 February 2019. 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**.

## 5.1 Attended Noise Monitoring Results

**Table 3: L<sub>Aeq, 15 minute</sub> Warkworth Impact Assessment Criteria – February 2019**

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies? <sup>1</sup>	WML L <sub>Aeq</sub> dB <sup>2,3</sup>	Exceedance <sup>3,4</sup>
Bulga RFS	11/02/2019 21:01	1.4	F	37	Yes	IA	Nil
Bulga Village	11/02/2019 23:14	1.8	D	38	Yes	29	Nil
Gouldsville	11/02/2019 23:45	1.9	E	38	Yes	30	Nil
Inlet Rd	11/02/2019 21:25	2.2	F	37	No	IA	NA
Inlet Rd West	11/02/2019 21:02	1.4	F	35	Yes	IA	Nil
Long Point	11/02/2019 23:21	1.8	D	35	Yes	<30	Nil
South Bulga	11/02/2019 21:20	1.7	E	35	Yes	IA	Nil
Wambo Road	11/02/2019 22:51	1.5	F	38	Yes	27	Nil

Notes:

- 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. Criterion may or may not apply due to rounding of meteorological data values;
- Estimated or measured L<sub>Aeq,15minute</sub> attributed to WML;
- Bold results in red are possible exceedances of relevant criteria; and
- NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

**Table 4: L<sub>A1, 1 minute</sub> Warkworth - Impact Assessment Criteria – February 2019**

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies? <sup>1</sup>	WML L <sub>A1, 1min</sub> dB <sup>2,3</sup>	Exceedance <sup>3,4</sup>
Bulga RFS	11/02/2019 21:01	1.4	F	47	Yes	IA	Nil
Bulga Village	11/02/2019 23:14	1.8	D	48	Yes	35	Nil
Gouldsville	11/02/2019 23:45	1.9	E	48	Yes	36	Nil
Inlet Rd	11/02/2019 21:25	2.2	F	47	No	IA	NA
Inlet Rd West	11/02/2019 21:02	1.4	F	45	Yes	IA	Nil
Long Point	11/02/2019 23:21	1.8	D	45	Yes	32	Nil
South Bulga	11/02/2019 21:20	1.7	E	45	Yes	IA	Nil
Wambo Road	11/02/2019 22:51	1.5	F	48	Yes	38	Nil

Notes:

- 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. Criterion may or may not apply due to rounding of meteorological data values;
- Estimated or measured L<sub>A1,1minute</sub> attributed to WML;
- Bold results in red are possible exceedances of relevant criteria; and
- NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.



### 5.1.3 MTO Noise Assessment

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

**Table 5: L<sub>Aeq, 15minute</sub> Mount Thorley - Impact Assessment Criteria – February 2019**

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies? <sup>1</sup>	MTO L <sub>Aeq</sub> dB <sup>2,3</sup>	Exceedance <sup>3,4</sup>
Bulga RFS	11/02/2019 21:01	1.4	F	37	Yes	IA	Nil
Bulga Village	11/02/2019 23:14	1.8	D	38	Yes	IA	Nil
Gouldsville	11/02/2019 23:45	1.9	E	35	Yes	IA	Nil
Inlet Rd	11/02/2019 21:25	2.2	F	37	No	IA	NA
Inlet Rd West	11/02/2019 21:02	1.4	F	35	Yes	IA	Nil
Long Point	11/02/2019 23:21	1.8	D	35	Yes	IA	Nil
South Bulga	11/02/2019 21:20	1.7	E	36	Yes	<25	Nil
Wambo Road	11/02/2019 22:51	1.5	F	38	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. Criterion may or may not apply due to rounding of meteorological data values;

2. Estimated or measured L<sub>Aeq,15minute</sub> attributed to MTO;

3. Bold results in red are possible exceedances of relevant criteria; and

4. NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable.

**Table 6: L<sub>A1, 1Minute</sub> Mount Thorley - Impact Assessment Criteria – February 2019**

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies? <sup>1</sup>	MTO L <sub>A1, 1min</sub> dB <sup>2,3</sup>	Exceedance <sup>3,4</sup>
Bulga RFS	11/02/2019 21:01	1.4	F	47	Yes	IA	Nil
Bulga Village	11/02/2019 23:14	1.8	D	48	Yes	IA	Nil
Gouldsville	11/02/2019 23:45	1.9	E	45	Yes	IA	Nil
Inlet Rd	11/02/2019 21:25	2.2	F	47	No	IA	NA
Inlet Rd West	11/02/2019 21:02	1.4	F	45	Yes	IA	Nil
Long Point	11/02/2019 23:21	1.8	D	45	Yes	IA	Nil
South Bulga	11/02/2019 21:20	1.7	E	46	Yes	25	Nil
Wambo Road	11/02/2019 22:51	1.5	F	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. Criterion may or may not apply due to rounding of meteorological data values;

2. Estimated or measured L<sub>A1,1minute</sub> attributed to MTO;

3. Bold results in red are possible exceedances of relevant criteria; and

4. NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable.

### 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. There were no noise measurements taken during the reporting period which 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 – February 2019**

Location	Date and Time	Measured Site Only LA <sub>eq</sub> dB (WML/MTO)	Site Only L <sub>Ceq</sub> dB <sup>1</sup> (WML/MTO)	Site Only L <sub>Ceq</sub> – LA <sub>eq</sub> dB <sup>1,2</sup> (WML/MTO)	Result Max exceedance of ref spectrum dB (WML/MTO) <sup>1,3</sup>	Penalty dB(A) <sup>1</sup>	Exceedance
Bulga RFS	11/02/2019 21:01	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Bulga Village	11/02/2019 23:14	29/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Gouldsville	11/02/2019 23:45	30/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd	11/02/2019 21:25	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd West	11/02/2019 21:02	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Long Point	11/02/2019 23:21	<30/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
South Bulga	11/02/2019 21:20	IA/<25	NA/NA	NA/NA	NA/NA	NA/NA	NA
Wambo Road	11/02/2019 22:51	27/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA

**Notes:**

1. 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;
2. As per NPfI, if L<sub>Ceq</sub> – LA<sub>eq</sub> ≥ 15 dB further assessment of low-frequency noise required; and
3. 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.

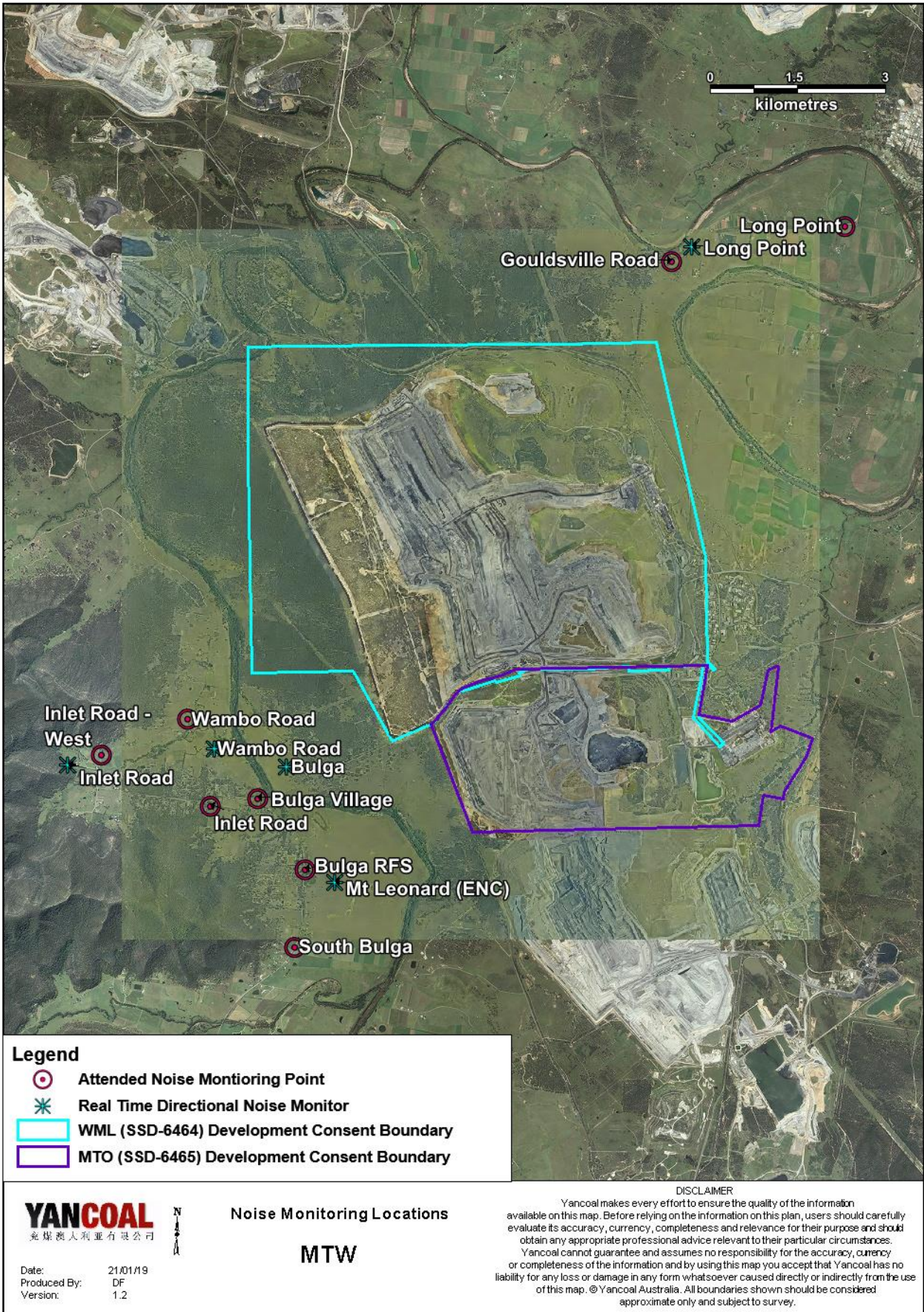


Figure 16: Noise Monitoring Location Plan



## 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 February are provided in **Table 8**.

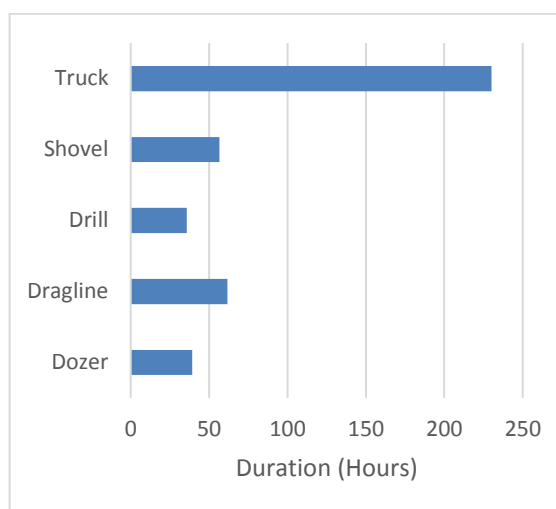
**Table 8: Supplementary Attended Noise Monitoring Data – February 2019**

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
647	5	3	0.8

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

## 6.0 OPERATIONAL DOWNTIME

During February, a total of 423 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 – February 2019**

## 7.0 REHABILITATION

During February 2019, 3.9 Ha of land was released, 1.5 Ha of land was bulk shaped, 7.3 Ha of land was topsoiled and 0.2 Ha of land was rehabilitated.

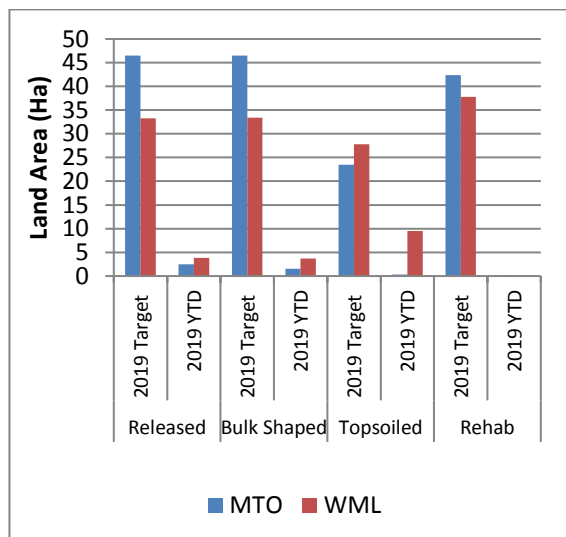


Figure 18: Rehabilitation YTD – February 2019

## 8.0 ENVIRONMENTAL INCIDENTS

There were no reportable environmental incidents recorded during the reporting period.

## 9.0 COMPLAINTS

During the reporting period 43 complaints were received. Details of these complaints are shown in Table 9 below.

Table 9: Complaints Summary YTD

	Noise	Dust	Blast	Lighting	Other	Total
January	7	6	9	3	0	25
February	14	16	11	2	0	43
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						
<b>Total</b>	<b>21</b>	<b>22</b>	<b>20</b>	<b>5</b>	<b>0</b>	<b>68</b>



## **Appendix A: Meteorological Data**

**Table 10: Meteorological Data – Charlton Ridge Meteorological Station – February 2019**

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)
1/02/2019	24	17	88	55	773	173	4.4	0.0
2/02/2019	30	16	95	53	1537	158	3.7	3.0
3/02/2019	36	18	91	21	1091	148	2.4	0.0
4/02/2019	39	19	82	16	1080	169	2.2	0.0
5/02/2019	36	21	74	25	1356	148	3.7	0.0
6/02/2019	33	18	85	29	1387	116	3.9	0.0
7/02/2019	35	18	82	20	1278	130	2.7	0.0
8/02/2019	34	18	92	29	1594	179	2.3	16.0
9/02/2019	34	17	94	27	1306	271	4.4	1.2
10/02/2019	30	14	67	18	1100	166	2.5	0.0
11/02/2019	35	14	74	4	1125	200	2.9	0.0
12/02/2019	38	15	56	4	1115	260	3.4	0.0
13/02/2019	31	19	67	33	997	128	3.6	0.0
14/02/2019	26	17	62	35	1435	118	3.3	0.0
15/02/2019	29	15	70	27	1200	128	3.6	0.0
16/02/2019	30	15	77	27	1312	135	2.8	0.0
17/02/2019	35	14	87	16	1058	146	2.0	0.0
18/02/2019	39	17	74	10	1049	150	2.2	0.0
19/02/2019	41	20	78	8	1316	210	3.5	0.0
20/02/2019	28	18	84	49	1229	177	4.9	0.0
21/02/2019	25	17	94	54	907	159	4.1	4.6
22/02/2019	27	16	88	41	1443	167	4.8	0.6
23/02/2019	27	14	96	37	1458	167	4.2	2.4
24/02/2019	25	15	88	45	1436	161	4.4	1.8
25/02/2019	27	13	86	33	1421	147	3.0	0.0
26/02/2019	30	13	88	23	1039	158	2.0	0.0
27/02/2019	30	15	81	26	1251	146	3.2	0.0
28/02/2019	30	15	86	29	1221	137	2.6	0.0

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