Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

October 2018

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Revision History

Version No.	Version Details	Document Status	Date
1.0	**Environmental Advisor**	**Final**	**21/12/2018**

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 October to 31 October 2018.

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

2018	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
October	17.4	175

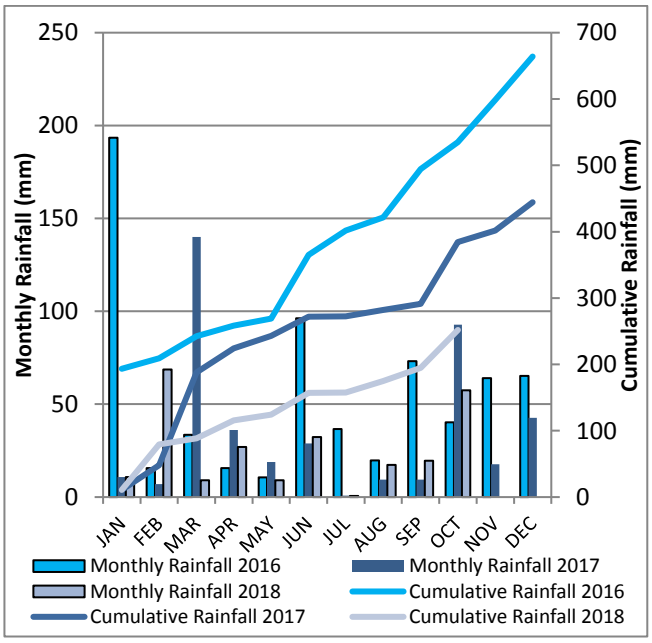

Figure 1: Rainfall Trend YTD

2.1.2 Wind Speed and Direction

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

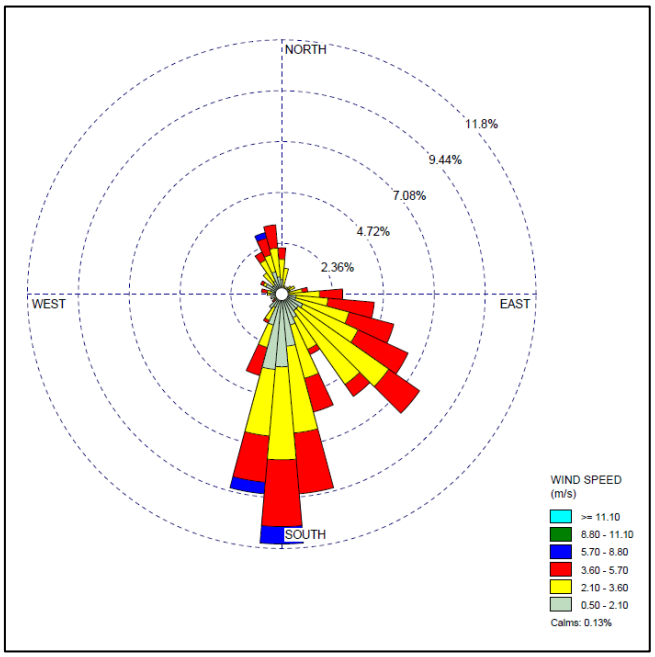

Figure 2: Charlton Ridge Wind Rose – October 2018

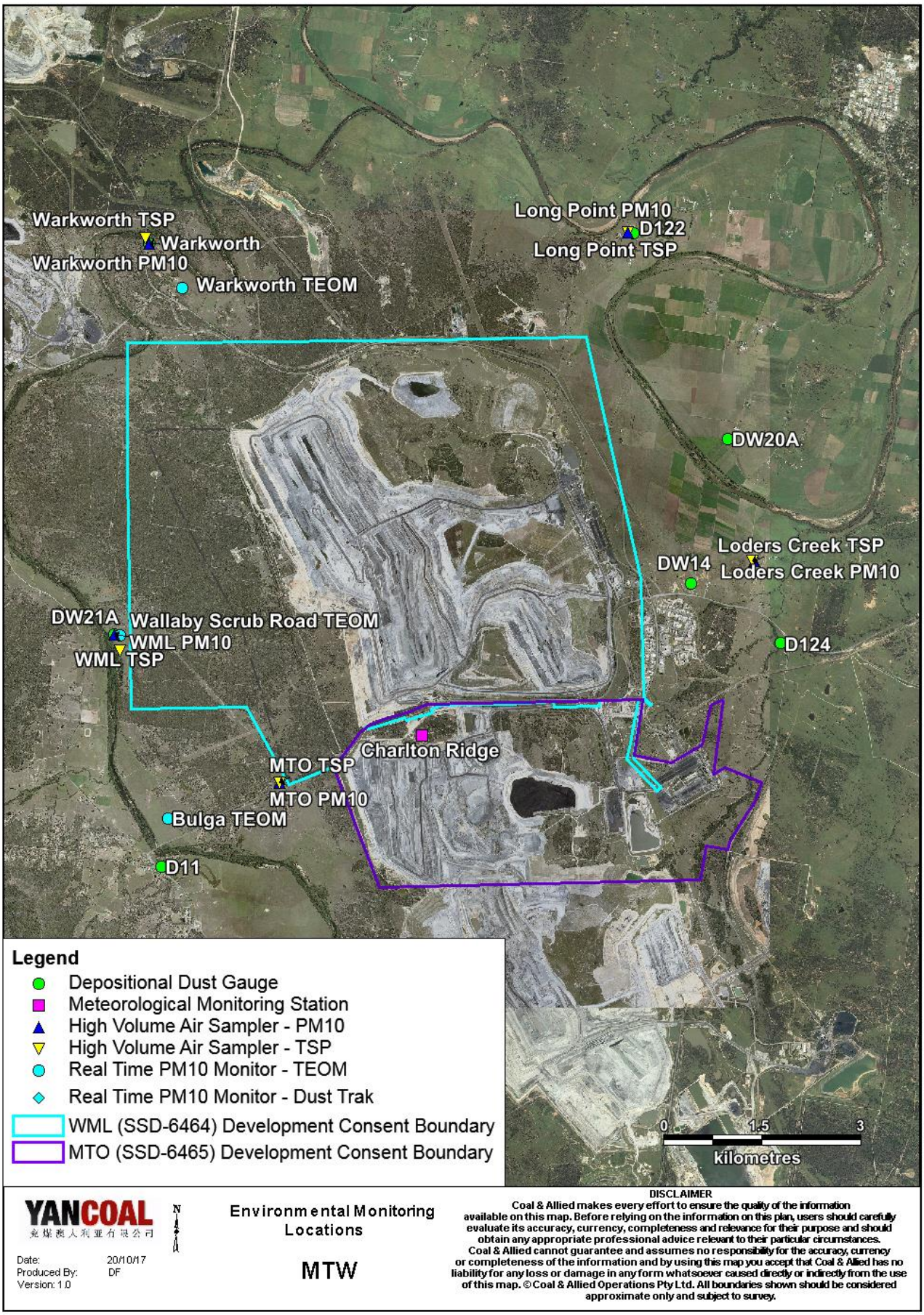

Figure 3: Air Quality Monitoring Locations

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 D122, D124 and Warkworth monitors recorded monthly results above the long term impact assessment criteria of 4.0 g/m^2 per month. Field notes associated with D122 and D124 confirm the presence of vegetation and insects. 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 result is contaminated. Accordingly, the result 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 2018 Annual Review Report.

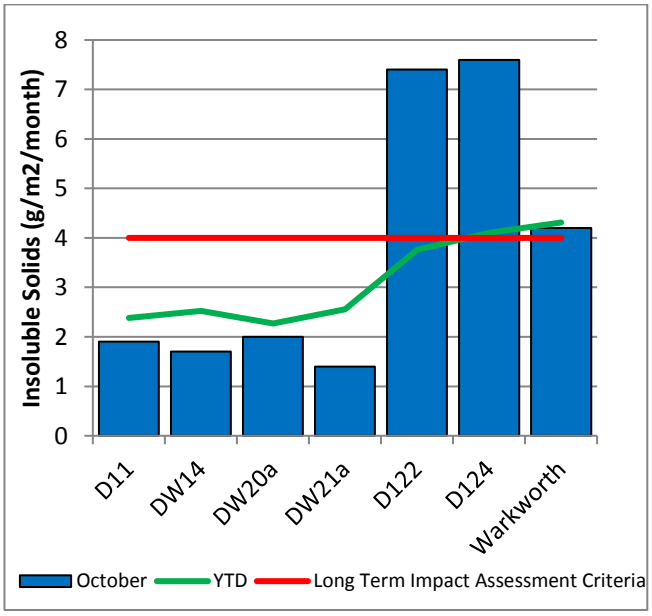

Figure 4: Depositional Dust – October 2018

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/m^3.

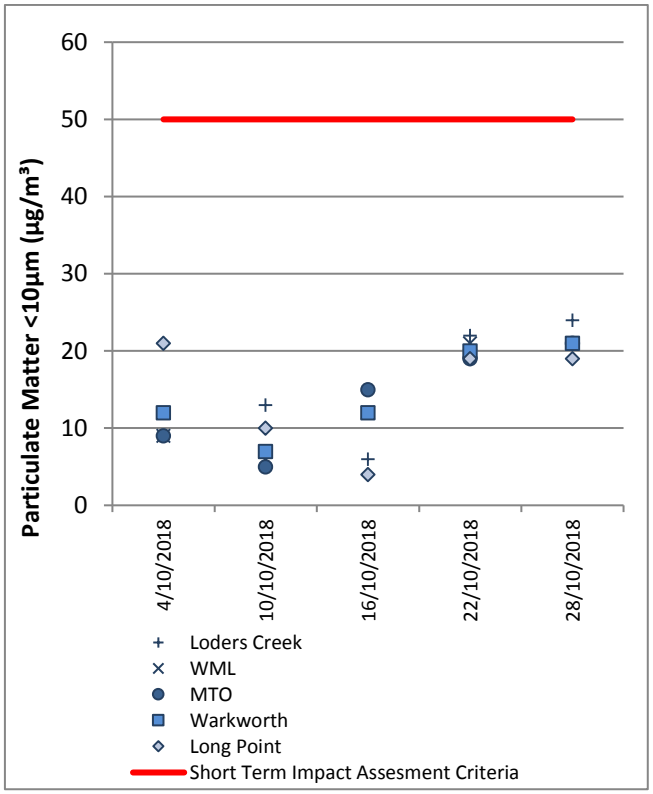

Figure 5: Individual PM10 Results – October 2018

Figure 6 shows the annual average PM10 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 2018 Annual Review Report.

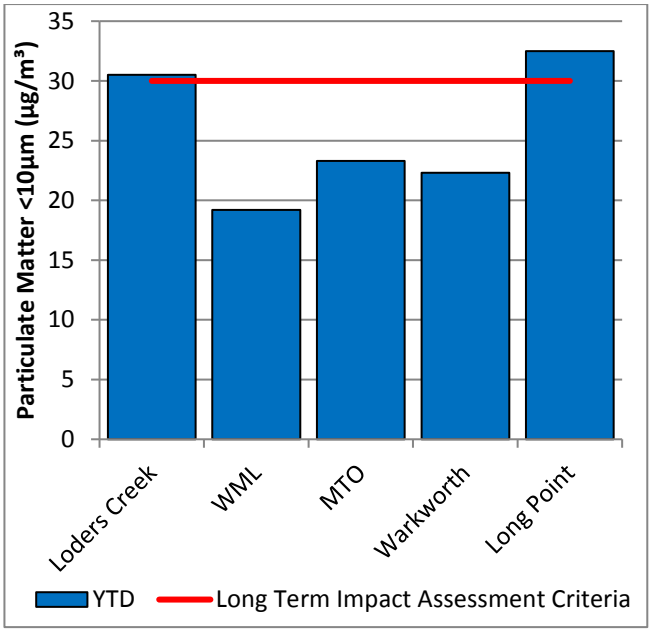

Figure 6: Annual Average PM_{10} – October 2018

2.3.2 TSP Results

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

An assessment of MTW's contribution to the long-term assessment criteria will be reported in the 2018 Annual Review Report.

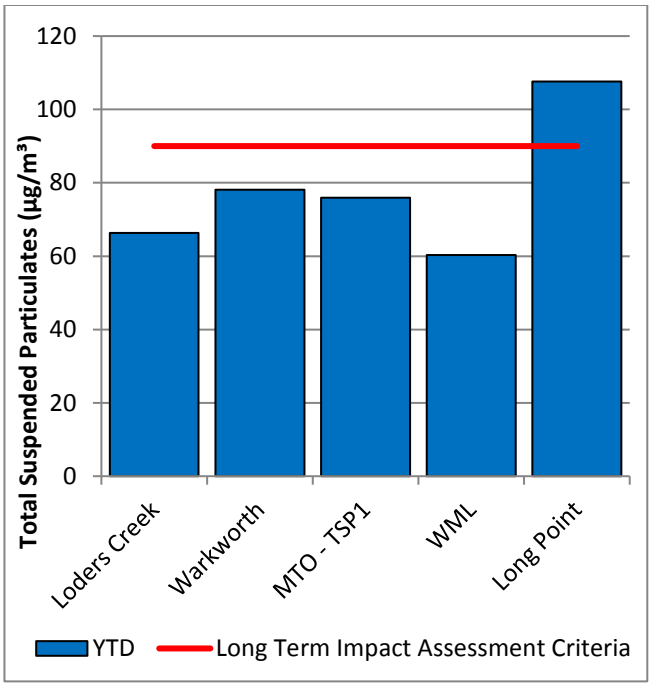

Figure 7: Annual Average Total Suspended Particulates – October 2018

2.3.3 Real Time PM_{10} Results

MTW 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 23 October from the Warkworth monitor due to equipment issues.

2.3.4 Real Time Alarms for Air Quality

During October, the real time monitoring system generated 20 automated air quality related alerts, including 3 alerts for adverse meteorological conditions and 17 alerts for elevated PM_{10} levels.

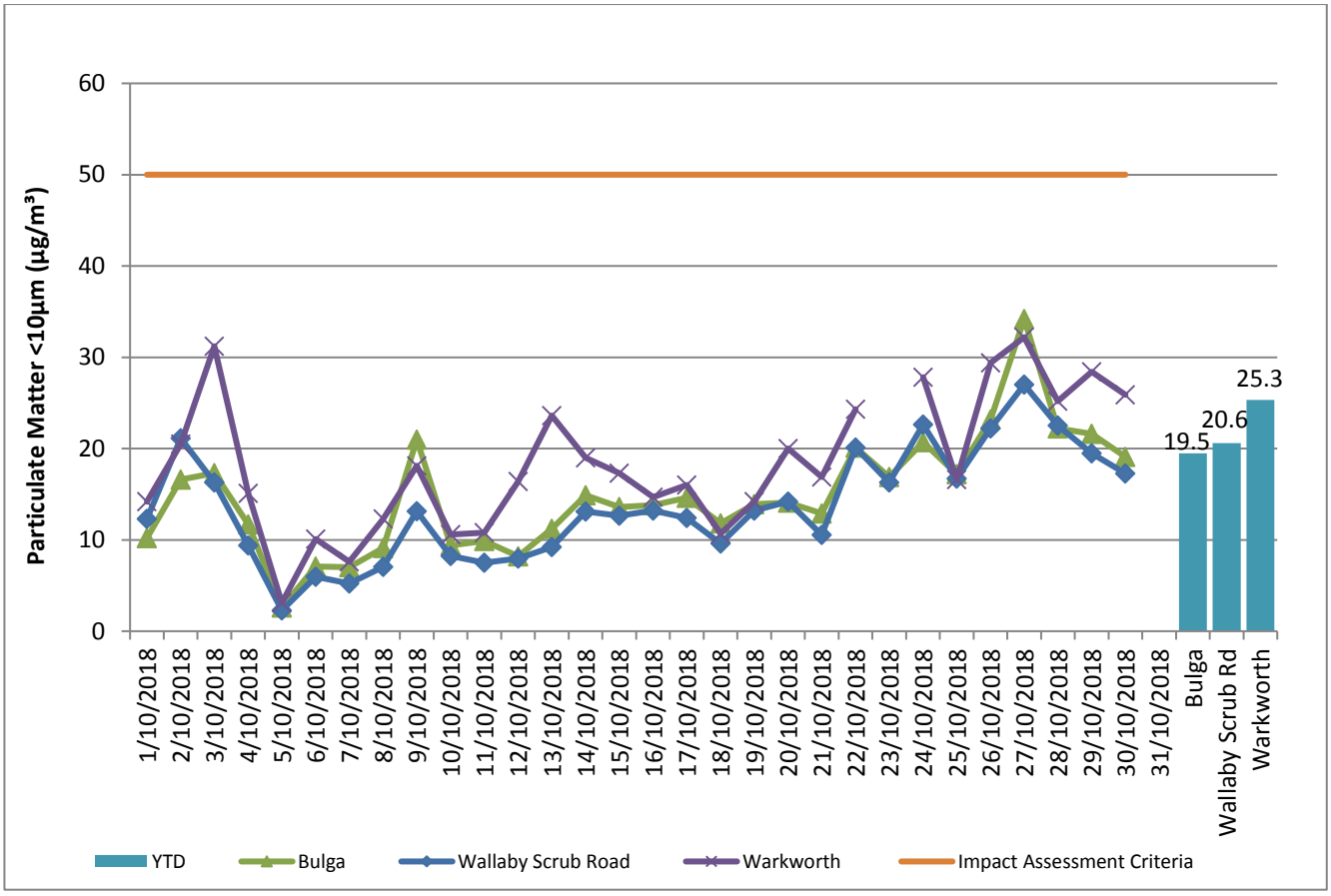

Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – October 2018

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 December 2018 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 2018 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 October 2018, 28 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.

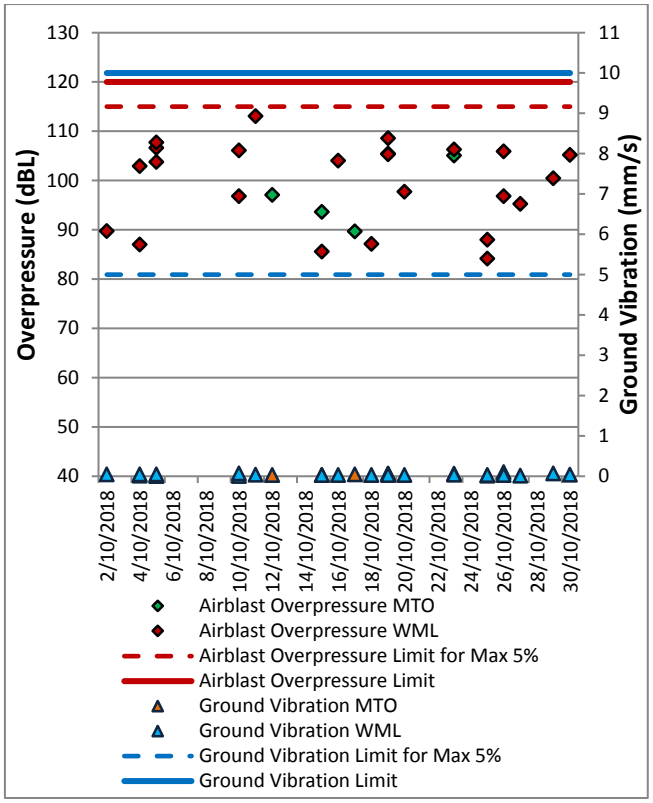

Figure 9: Abbey Green Blast Monitoring Results – October 2018

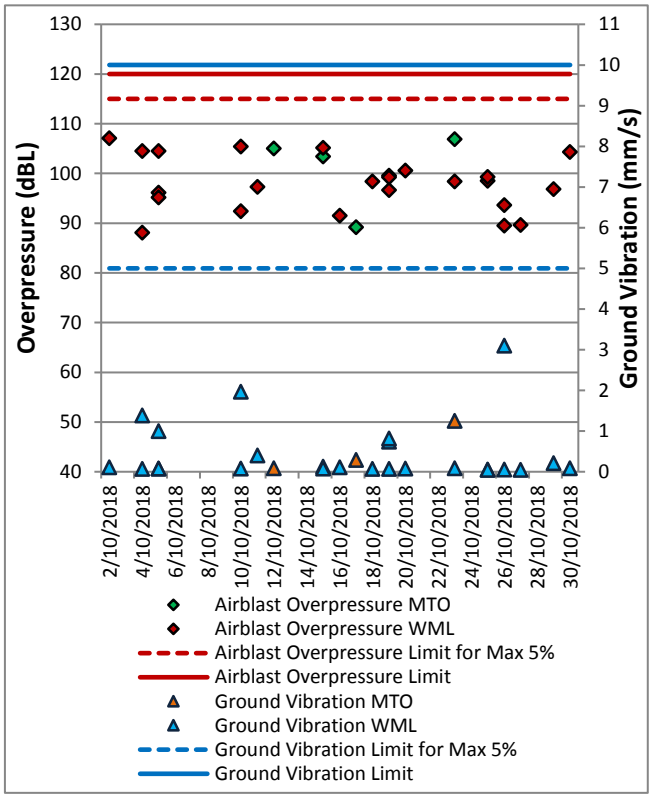

Figure 10: Bulga Village Blast Monitoring Results – October 2018

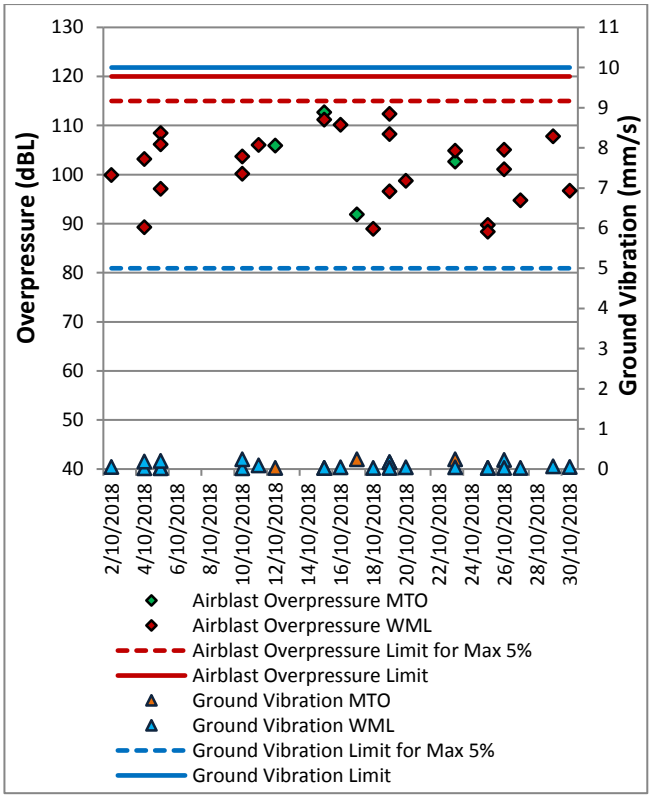

Figure 11: MTIE Blast Monitoring Results – October 2018

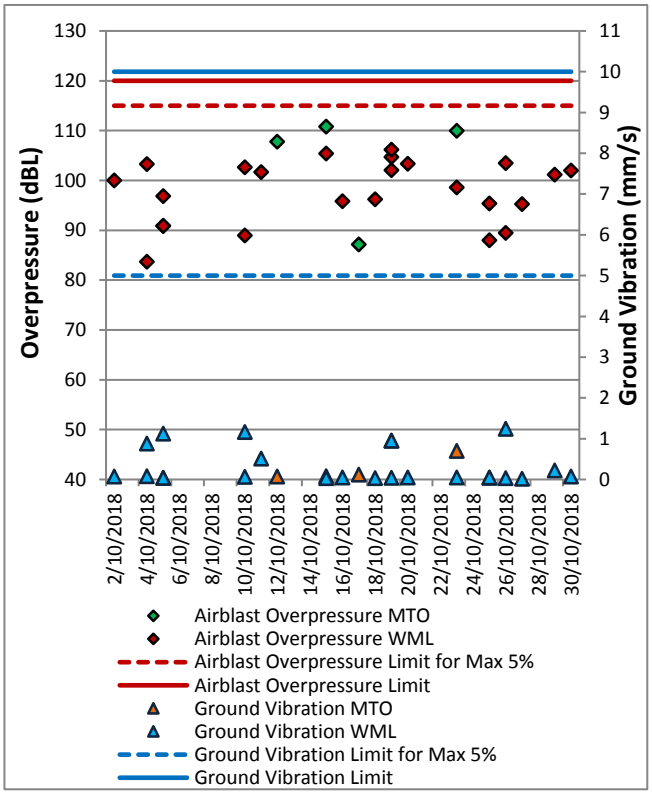

Figure 12: Wollemi Peak Road Blast Monitoring Results – October 2018

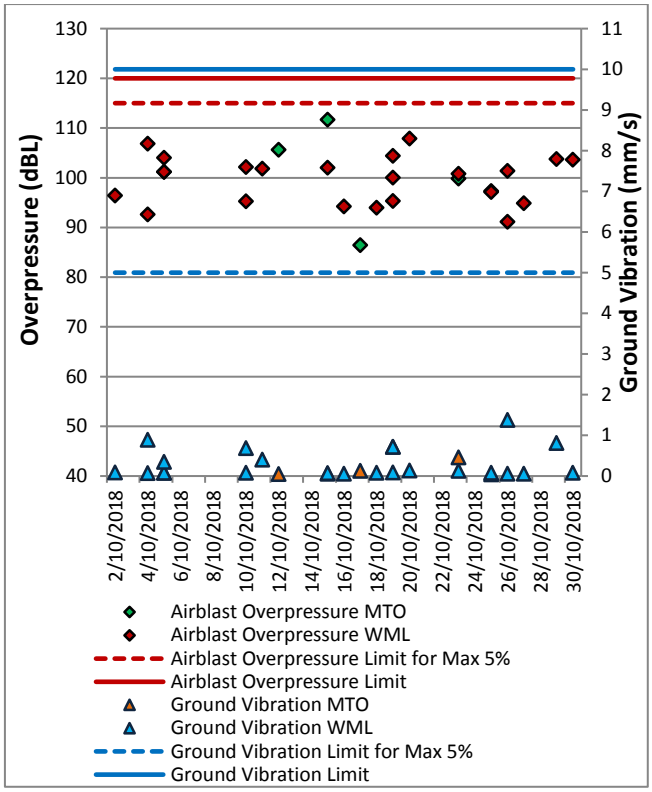

Figure 13: Wambo Road Blast Monitoring Results – October

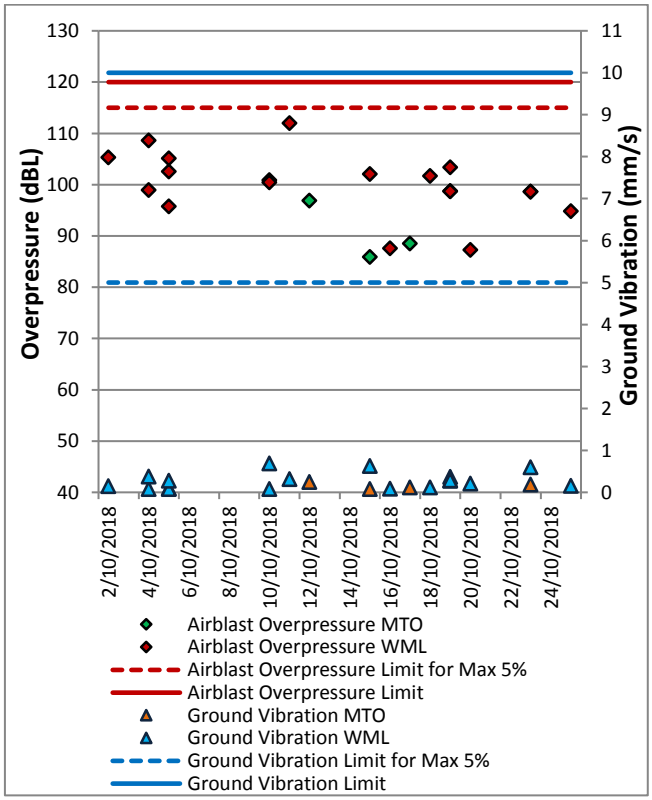

Figure 14: Warkworth Blast Monitoring Results – October 2018

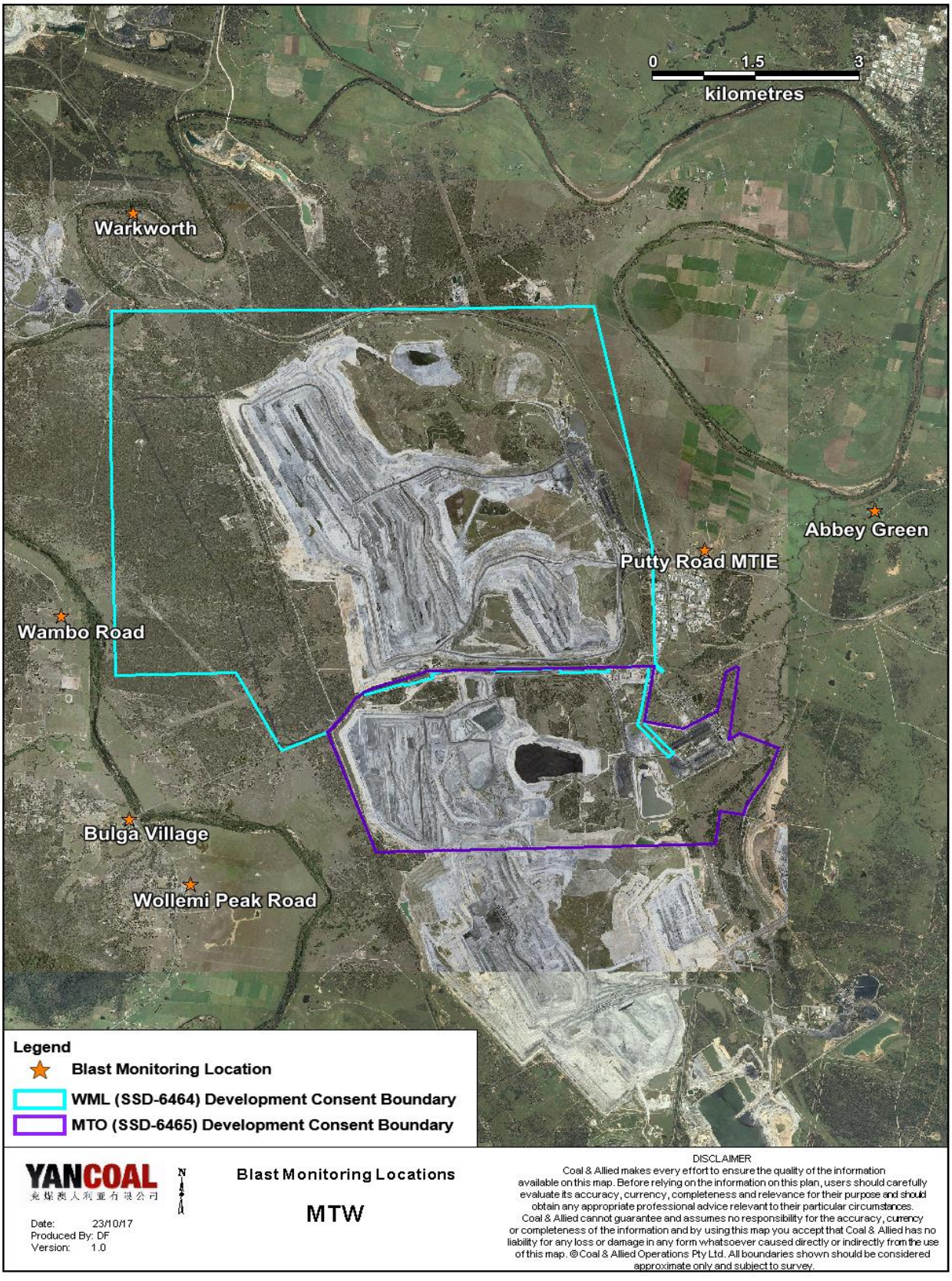

Figure 15: MTW Blast Monitoring Location Plan

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 Report. 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**.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 11 December 2018. 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 – October 2018

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML L_{Aeq} dB[2,3]	Exceedance[3,4]
Bulga RFS	11/10/2018 21:00	2.4	F	37	No	34	NA
Bulga Village	11/10/2018 21:59	2.0	F	38	Yes	27	Nil
Gouldsville	11/10/2018 23:24	1.9	F	38	Yes	<25	Nil
Inlet Rd	11/10/2018 21:32	2.2	F	37	No	32	NA
Inlet Rd West	11/10/2018 21:04	2.4	F	35	No	29	NA
Long Point	11/10/2018 22:59	2.3	F	35	No	IA	NA
South Bulga	11/10/2018 21:26	2.2	F	35	No	29	NA
Wambo Road	11/10/2018 22:22	2.3	E	38	Yes	31	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 LAeq,15minute attributed to WML;
3. Bold results in red are possible exceedances of relevant criteria; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 4: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria – October 2018

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML $L_{A1,\ 1min}$ dB[2,3]	Exceedance[3,4]
Bulga RFS	11/10/2018 21:00	2.4	F	47	No	45	NA
Bulga Village	11/10/2018 21:59	2.0	F	48	Yes	32	Nil
Gouldsville	11/10/2018 23:24	1.9	F	48	Yes	<25	Nil
Inlet Rd	11/10/2018 21:32	2.2	F	47	No	37	NA
Inlet Rd West	11/10/2018 21:04	2.4	F	45	No	33	NA
Long Point	11/10/2018 22:59	2.3	F	45	No	IA	NA
South Bulga	11/10/2018 21:26	2.2	F	45	No	35	NA
Wambo Road	11/10/2018 22:22	2.3	E	48	Yes	35	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 LA1,1minute attributed to WML;
3. Bold results in red are possible exceedances of relevant criteria; and
4. 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: $L_{Aeq, 15minute}$ Mount Thorley - Impact Assessment Criteria – October 2018

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO L_{Aeq} dB[2,3]	Exceedance[3,4]
Bulga RFS	11/10/2018 21:00	2.4	F	37	No	IA	NA
Bulga Village	11/10/2018 21:59	2	F	38	Yes	IA	Nil
Gouldsville	11/10/2018 23:24	1.9	F	35	Yes	IA	Nil
Inlet Rd	11/10/2018 21:32	2.2	F	37	No	IA	NA
Inlet Rd West	11/10/2018 21:04	2.4	F	35	No	IA	NA
Long Point	11/10/2018 22:59	2.3	F	35	No	IA	NA
South Bulga	11/10/2018 21:26	2.2	F	36	No	IA	NA
Wambo Road	11/10/2018 22:22	2.3	E	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 LAeq,15minute 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: $L_{A1, 1Minute}$ Mount Thorley - Impact Assessment Criteria – October 2018

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO $L_{A1, 1min}$ dB[2,3]	Exceedance[3,4]
Bulga RFS	11/10/2018 21:00	2.4	F	47	No	IA	NA
Bulga Village	11/10/2018 21:59	2	F	48	Yes	IA	Nil
Gouldsville	11/10/2018 23:24	1.9	F	45	Yes	IA	Nil
Inlet Rd	11/10/2018 21:32	2.2	F	47	No	IA	NA
Inlet Rd West	11/10/2018 21:04	2.4	F	45	No	IA	NA
Long Point	11/10/2018 22:59	2.3	F	45	No	IA	NA
South Bulga	11/10/2018 21:26	2.2	F	46	No	IA	NA
Wambo Road	11/10/2018 22:22	2.3	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. Criterion may or may not apply due to rounding of meteorological data values;
2. Estimated or measured LA1,1minute 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 – October2018

Location	Date and Time	Measured Site Only LA_{eq} dB (WML/MTO)	Site Only L_{Ceq} dB[1] (WML/MTO)	Site Only LCeq – LAeq dB[1,2] (WML/MTO)	Result Max exceedance of ref spectrum dB (WML/MTO) [1,3]	Penalty dB(A)[1]	Exceedance
Bulga RFS	11/10/2018 21:00	34/IA	51/NA	17/NA	Nil/NA	Nil/NA	NA
Bulga Village	11/10/2018 21:59	27/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Gouldsville	11/10/2018 23:24	<25/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd	11/10/2018 21:32	32/IA	51/NA	19/NA	Nil/NA	Nil/NA	NA
Inlet Rd West	11/10/2018 21:04	29/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Long Point	11/10/2018 22:59	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
South Bulga	11/10/2018 21:26	29/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Wambo Road	11/10/2018 22:22	31/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 LCeq – LAeq ≥ 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.

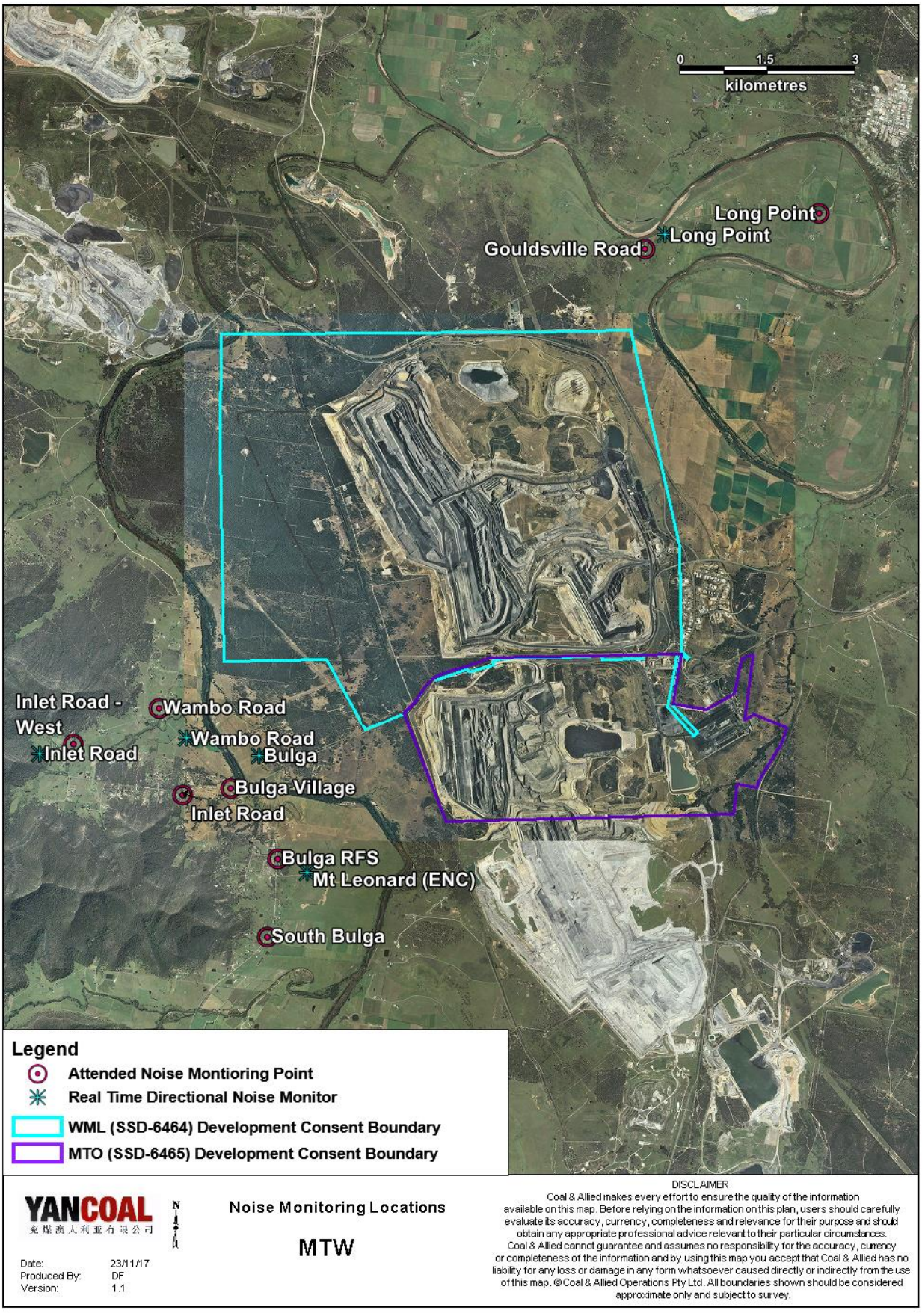

Figure 16: Noise Monitoring Location Plan

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 October are provided in **Table 8**.

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Table 8: Supplementary Attended Noise Monitoring Data – October 2018

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
692	4	2	0.6

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 83 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**.

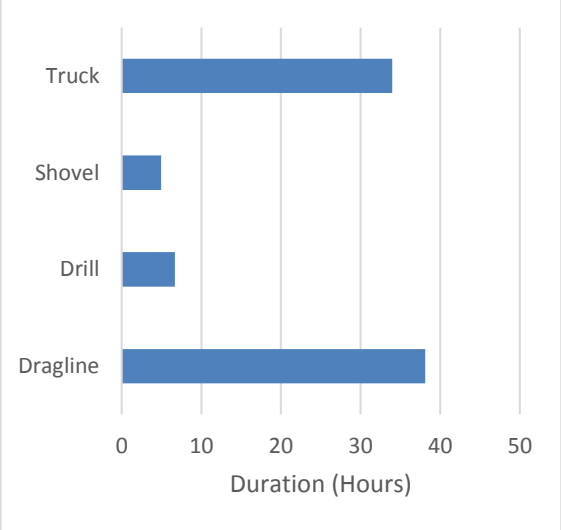

Figure 17: Operational Downtime by Equipment Type – October 2018

7.0 REHABILITATION

During October 2018, 37.4 Ha of land was released for rehabilitation.

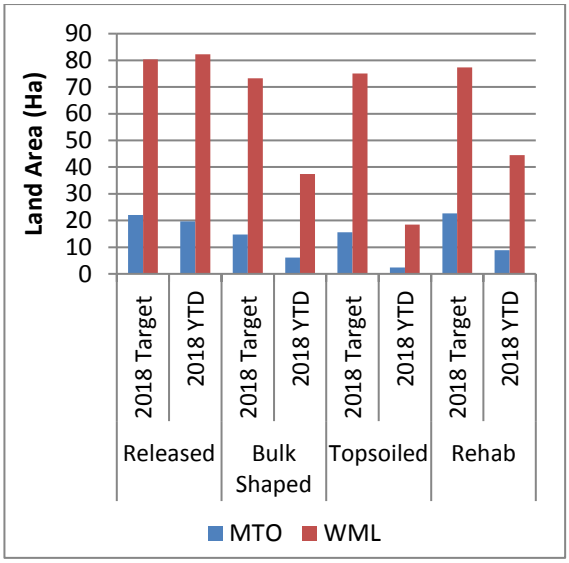

Figure 18: Rehabilitation YTD – October 2018

8.0 ENVIRONMENTAL INCIDENTS

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

9.0 COMPLAINTS

During the reporting period 25 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	9	6	15	1	0	31
February	7	4	3	3	0	17
March	24	0	0	3	0	27
April	8	3	9	3	2	25
May	13	11	3	3	0	30
June	14	2	8	0	0	24
July	9	12	8	0	0	29
August	22	13	5	3	0	43
September	22	9	3	5	1	40
October	16	4	0	5	0	25
November						
December						
Total	144	64	54	26	3	291

Note: The method of capturing complaints was amended in July 2018 and backdated to the start of the year. As a result, the monthly complaint data and YTD figures have been adjusted when compared to previous reports.

Appendix A: Meteorological Data

Table 10: Meteorological Data – Charlton Ridge Meteorological Station – October 2018

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)
1/10/2018	23	7	89	27	1184	140	2.5	0.0
2/10/2018	27	7	87	14	984	159	2.0	0.0
3/10/2018	28	10	84	17	1131	231	2.5	0.0
4/10/2018	20	13	97	45	372	175	2.9	12.2
5/10/2018	15	11	95	78	517	182	5.3	2.4
6/10/2018	19	10	85	58	1401	176	4.3	0.0
7/10/2018	21	10	90	45	1251	217	2.6	1.8
8/10/2018	26	11	92	29	1251	200	2.3	0.0
9/10/2018	28	10	93	22	1194	185	1.9	0.0
10/10/2018	18	10	96	70	299	180	3.7	16.2
11/10/2018	15	9	97	61	496	142	3.0	2.2
12/10/2018	19	9	97	50	1533	140	3.0	1.4
13/10/2018	23	10	91	43	1463	143	3.4	0.0
14/10/2018	24	12	96	37	1292	123	3.7	1.2
15/10/2018	23	11	93	51	1496	127	3.4	0.0
16/10/2018	26	13	92	44	1424	116	3.2	0.0
17/10/2018	24	13	91	51	1055	151	2.1	0.8
18/10/2018	28	14	97	42	1297	177	2.0	15.0
19/10/2018	30	15	98	28	1083	208	2.4	0.2
20/10/2018	32	15	93	30	1222	195	2.3	3.4
21/10/2018	19	14	96	71	603	146	2.0	0.6
22/10/2018	27	15	85	40	923	115	2.8	0.0
23/10/2018	32	13	95	14	1071	215	2.7	0.0
24/10/2018	23	14	86	37	1408	155	3.6	0.0
25/10/2018	24	12	84	44	1426	145	2.5	0.0
26/10/2018	28	12	93	24	1098	180	2.7	0.0
27/10/2018	30	13	81	19	1064	161	2.2	0.0
28/10/2018	20	12	89	57	455	139	3.2	0.0
29/10/2018	24	11	82	37	1453	136	2.9	0.0
30/10/2018	31	10	81	19	1065	189	2.5	0.0
31/10/2018	34	14	72	15	1156	177	2.7	0.0

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