Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

November 2018

CONTENTS

Figures

Tables

Revision History

Version No.	Version Details	Document Status	Date
1.0	**Environmental Advisor**	**Final**	**25/01/2019**

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 November to 30 November 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 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

2018	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
November	50.2	302.1

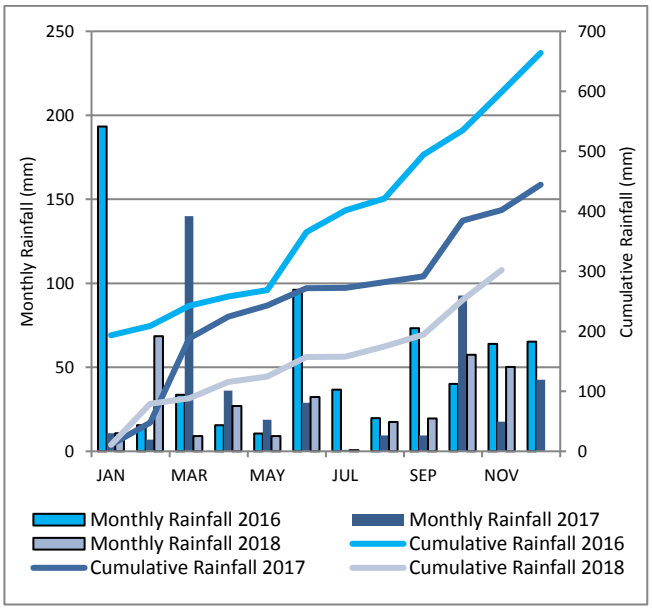

Figure 1: Rainfall Trend YTD

2.1.2 Wind Speed and Direction

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

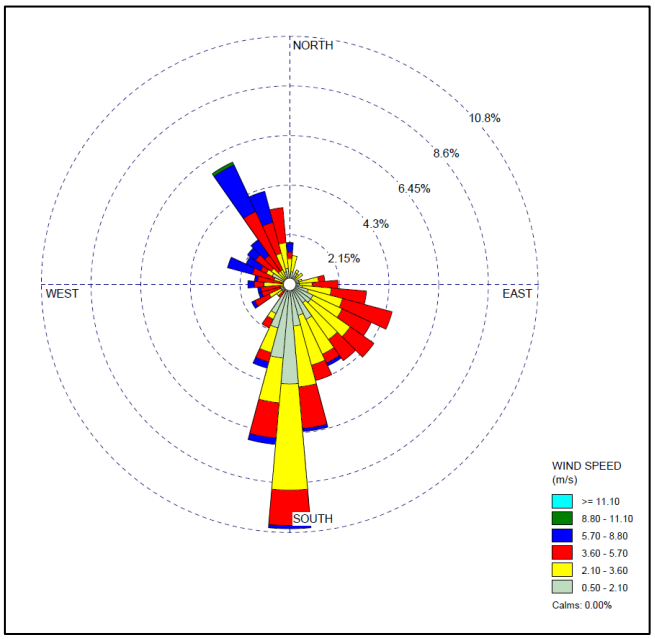

Figure 2: Charlton Ridge Wind Rose – November 2018

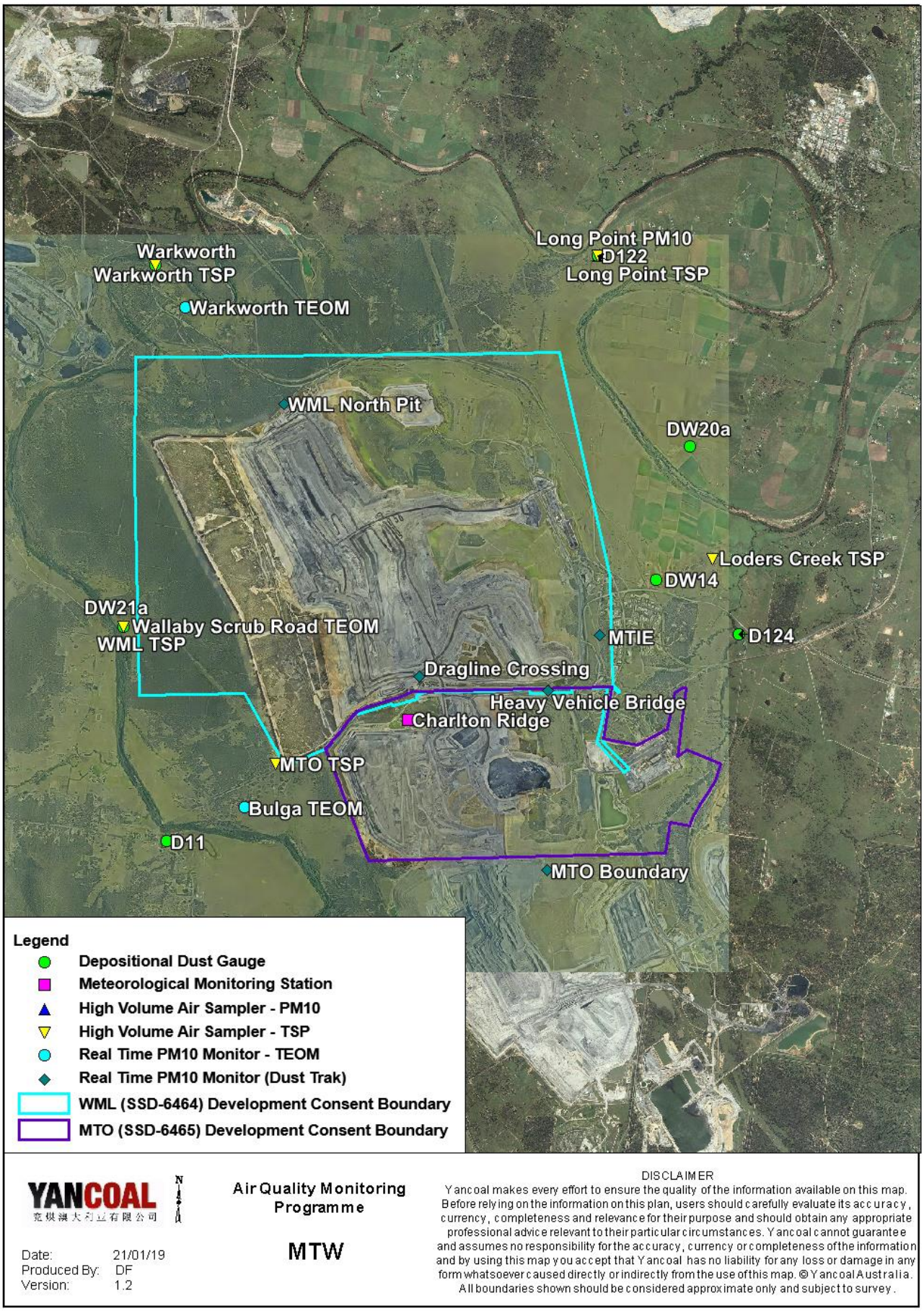

Figure 3: Air Quality Monitoring Locations

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 D11 and DW14 monitors recorded monthly results above the long-term impact assessment criteria of 4.0 g/m^2 per month. Field notes associated with D11 and DW14 confirm the presence of vegetation and insects, although there is not enough evidence to suggest that the 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 2018 Annual Review Report.

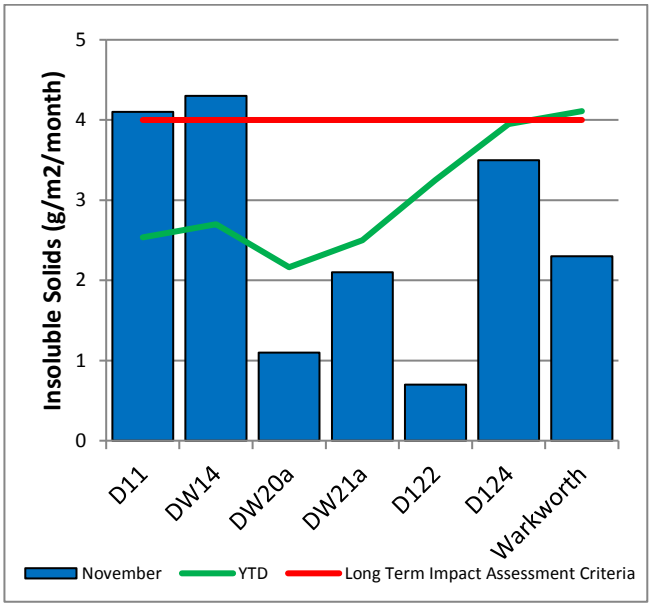

Figure 4: Depositional Dust – November 2018

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.

On 3 November 2018 the Long Point HVAS PM_{10} unit recorded a result of 57 µg/m^3 which is greater than the short term (24hr) PM_{10} impact assessment criteria.

An Investigation determined that the wind direction was generally not from MTW's angle of influence at Long Point on 3 November 2018. Accordingly, no further action is required.

On 21 November 2018 the Long Point, Warkworth, Loders Creek, MTO and WML Long Point HVAS PM_{10} units recorded results in excess of the short term (24hr) PM_{10} impact assessment criteria. There was a regional dust event on 21 November 2018. Investigations determined that the wind direction was generally not from MTW's angle of influence and/or that the likely MTW contribution to the results is less than 75%. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

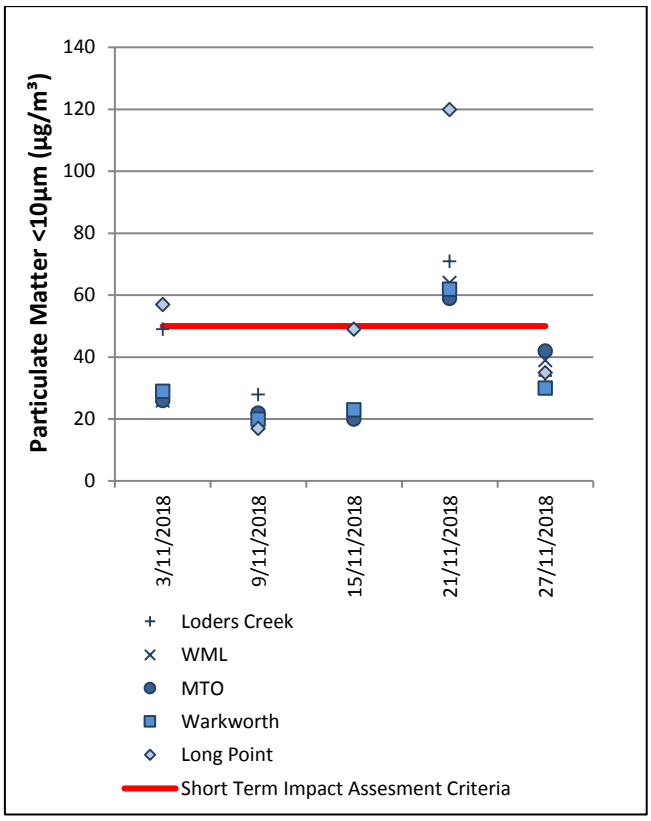

Figure 5: Individual PM10 Results – November 2018

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.

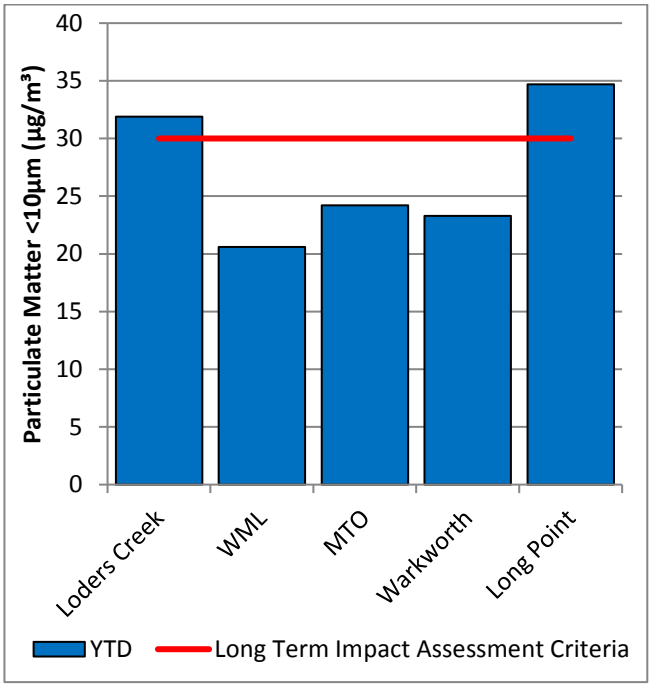

Figure 6: Annual Average PM_{10} – November 2018

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.

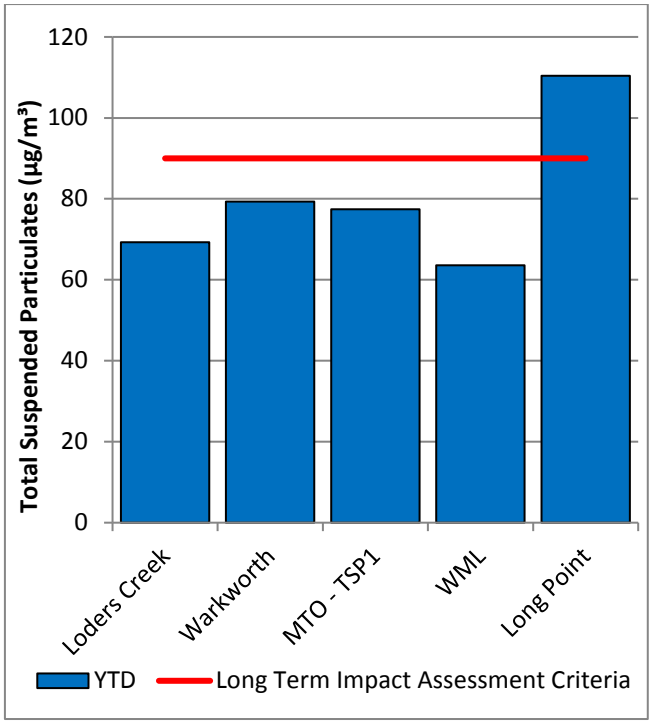

Figure 7: Annual Average Total Suspended Particulates – November 2018

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.

On 20 November 2018, the Warkworth OEH TEOM (52.5 µg/m³) 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 36.4 µg/m³ (less than 70% contribution to the result) from the direction of MTW. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

From 21 to 23 November 2018, the Bulga OEH, Wallaby Scrub Road and Warkworth TEOM's all exceeded the short term (24hr) criteria. There was a regional dust storm on these days. Investigations determined that the wind direction was generally not from MTW's angle of influence and/or that the likely MTW contribution to the results is less than 75%.

Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

2.3.4 Real Time Alarms for Air Quality

During November, the real time monitoring system generated 180 automated air quality related alerts, including 23 alerts for adverse meteorological conditions and 157 alerts for elevated PM_{10} levels.

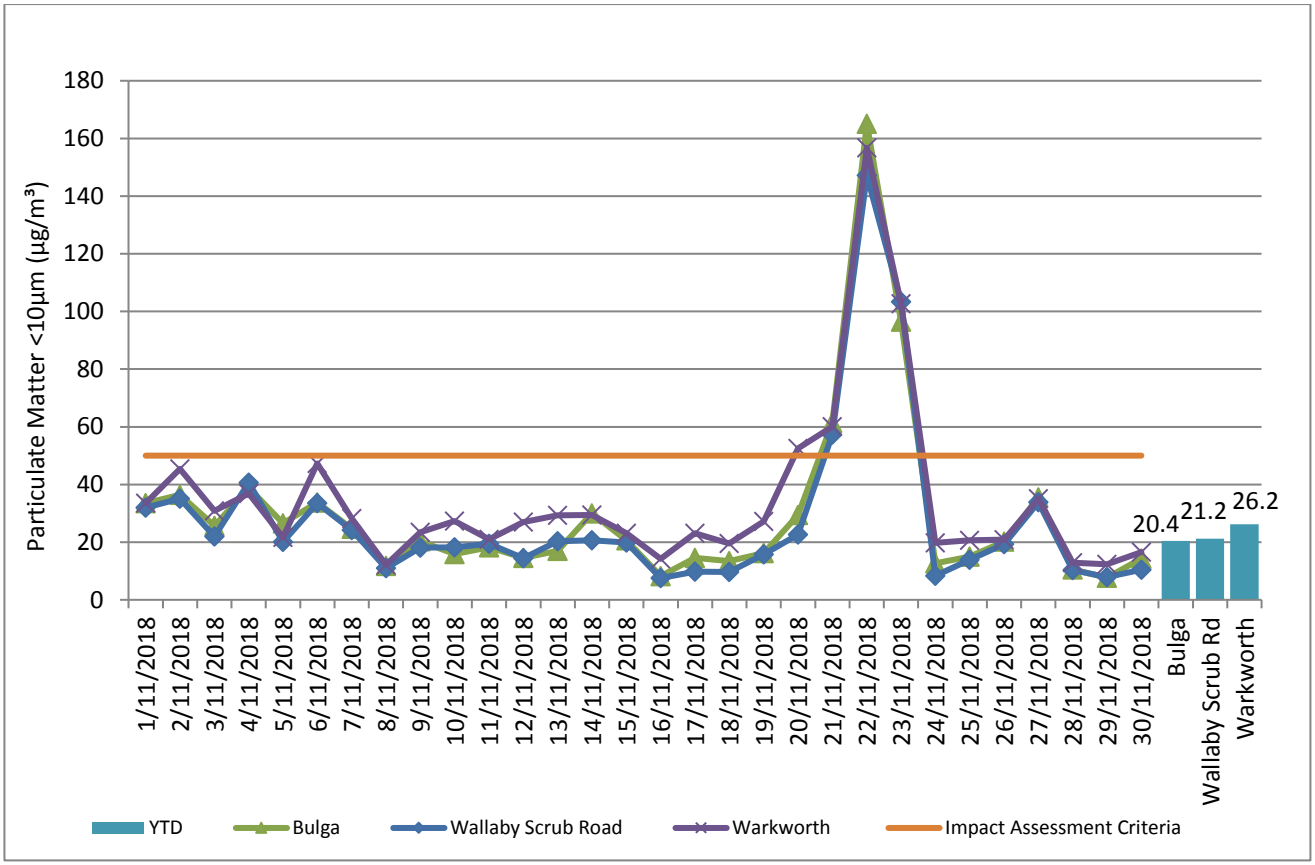

Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – November 2018

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 November 2018, 22 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.

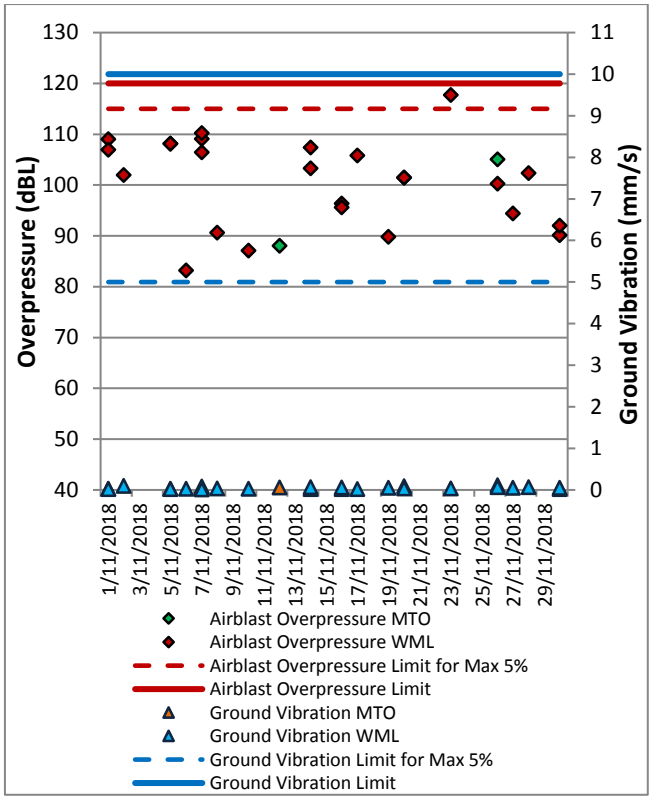

Figure 9: Abbey Green Blast Monitoring Results – November 2018

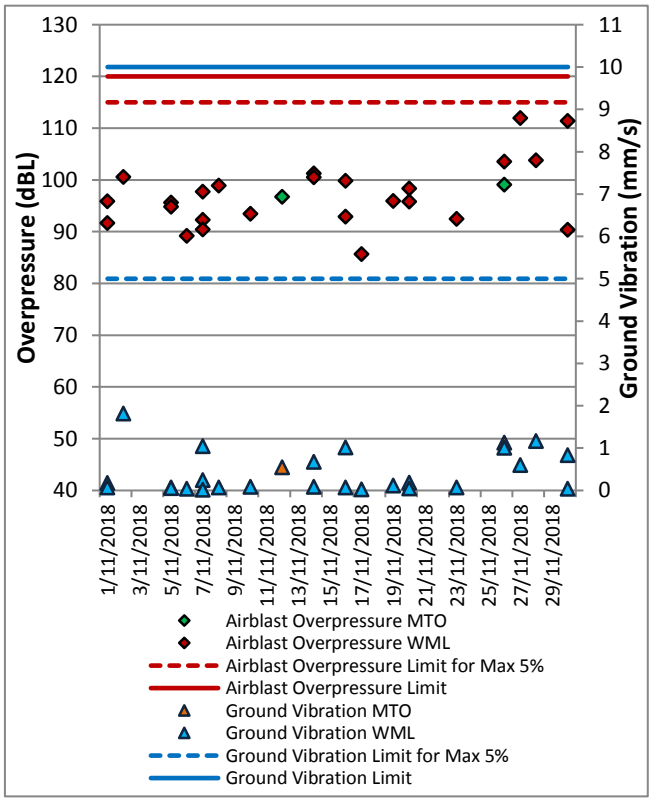

Figure 10: Bulga Village Blast Monitoring Results – November 2018

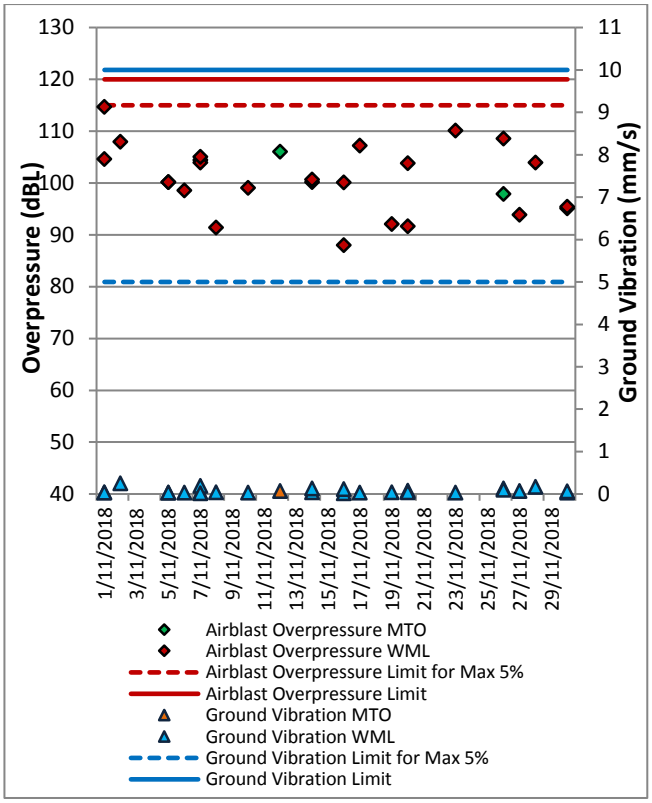

Figure 11: MTIE Blast Monitoring Results – November 2018

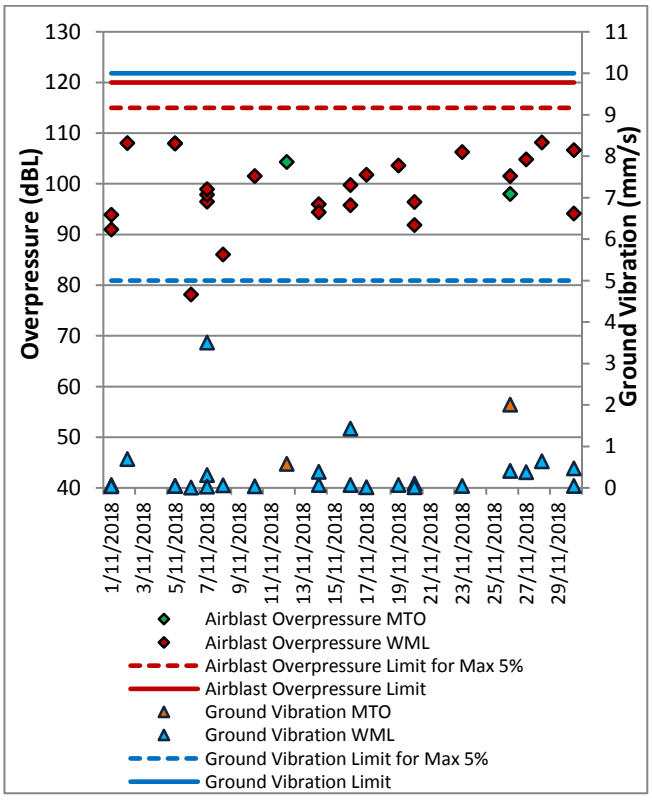

Figure 12: Wollemi Peak Road Blast Monitoring Results – November 2018

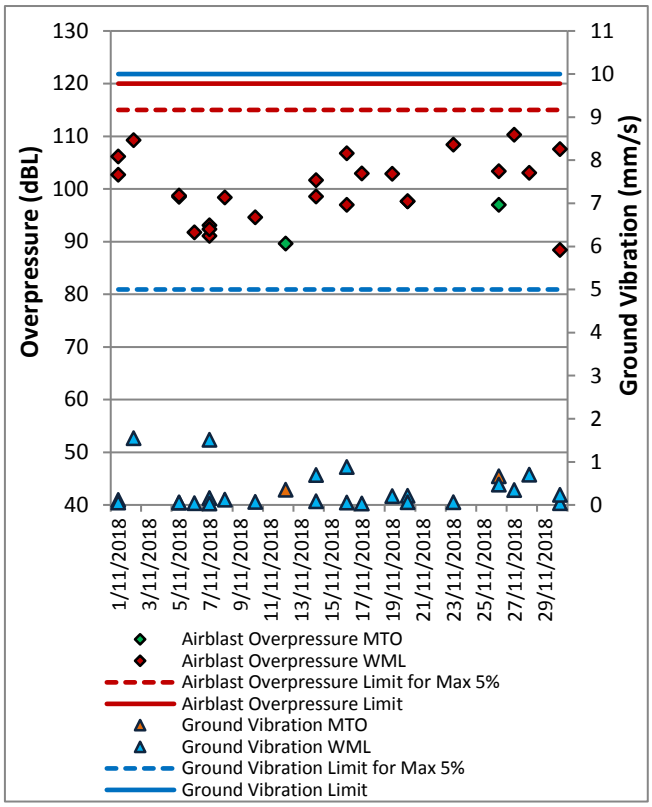

Figure 13: Wambo Road Blast Monitoring Results – November

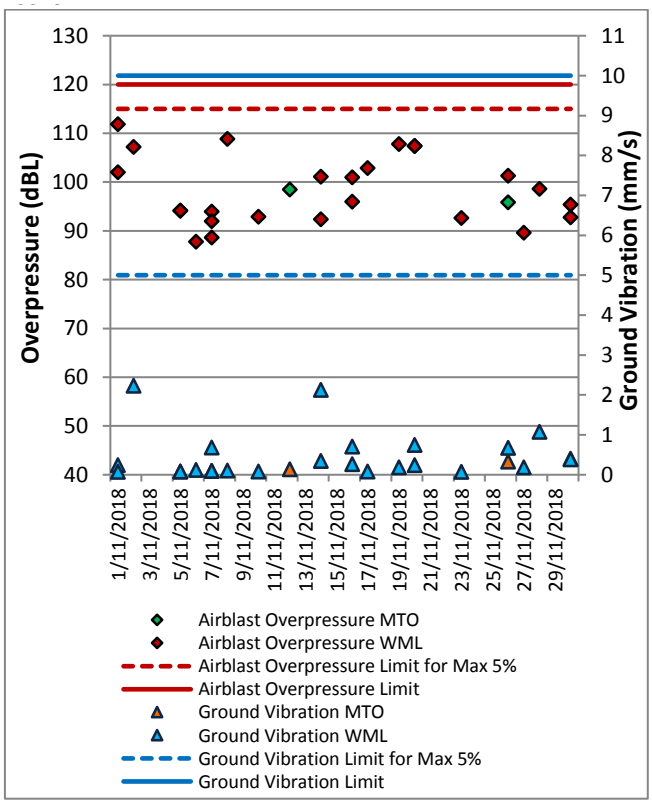

Figure 14: Warkworth Blast Monitoring Results – November 2018

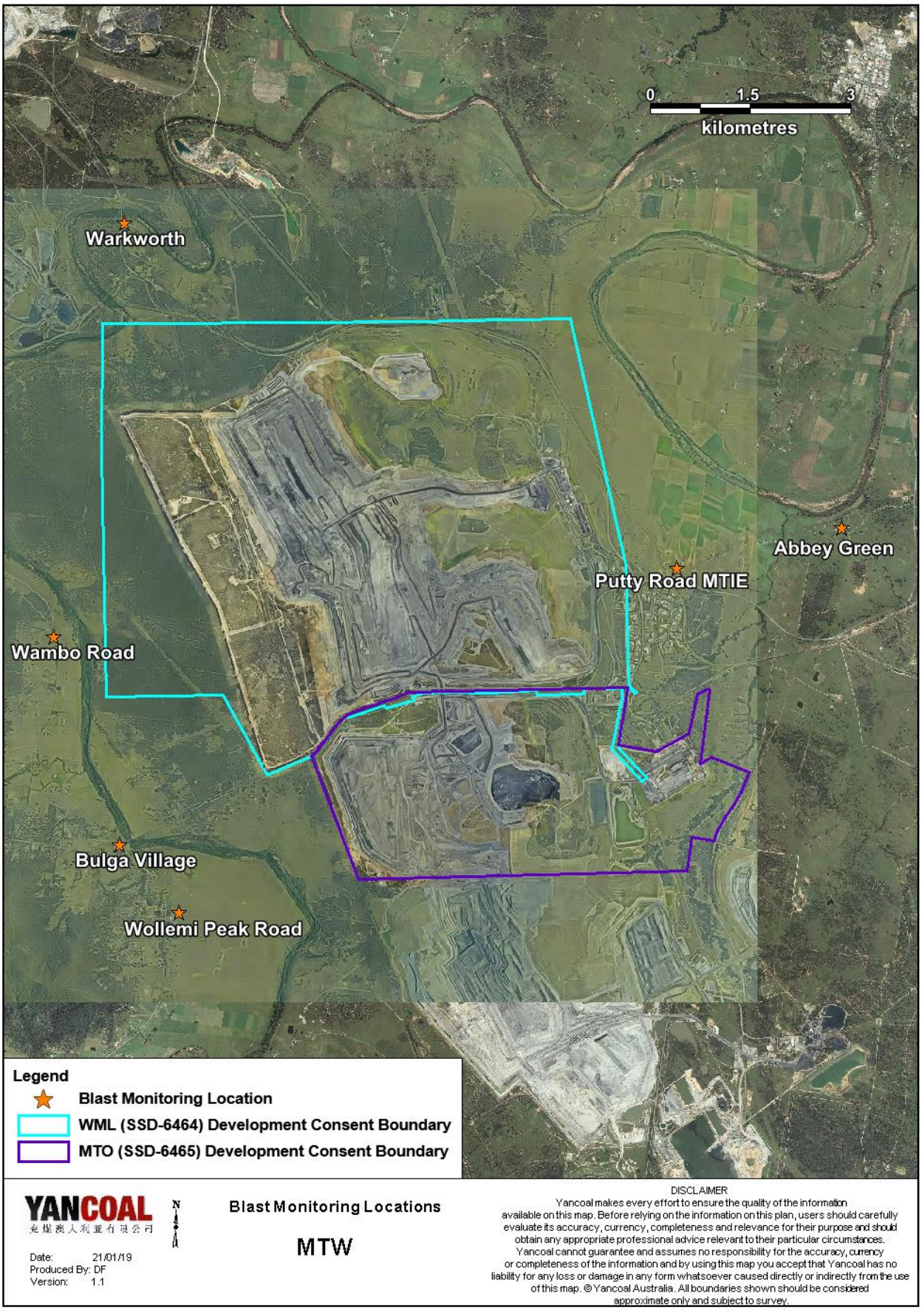

Figure 15: MTW Blast Monitoring Location Plan

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. 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 1 November 2018. All measurements complied with the relevant criteria. Results are detailed in **Table 3 to Table 6.**

5.1 Attended Noise Monitoring Results

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 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	1/11/2018 21:00	1.4	F	37	Yes	30	Nil
Bulga Village	1/11/2018 22:15	1.7	E	38	Yes	<30	Nil
Gouldsville	1/11/2018 23:31	0.9	F	38	Yes	IA	Nil
Inlet Rd	1/11/2018 21:51	1.2	F	37	Yes	31	Nil
Inlet Rd West	1/11/2018 21:00	1.4	F	35	Yes	<30	Nil
Long Point	1/11/2018 23:07	2.0	E	35	Yes	IA	Nil
South Bulga	1/11/2018 21:24	1.3	E	35	Yes	<30	Nil
Wambo Road	1/11/2018 21:27	1.3	E	38	Yes	<30	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 – November 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	1/11/2018 21:00	1.4	F	47	Yes	37	Nil
Bulga Village	1/11/2018 22:15	1.7	E	48	Yes	32	Nil
Gouldsville	1/11/2018 23:31	0.9	F	48	Yes	IA	Nil
Inlet Rd	1/11/2018 21:51	1.2	F	47	Yes	32	Nil
Inlet Rd West	1/11/2018 21:00	1.4	F	45	Yes	<30	Nil
Long Point	1/11/2018 23:07	2.0	E	45	Yes	IA	Nil
South Bulga	1/11/2018 21:24	1.3	E	45	Yes	32	Nil
Wambo Road	1/11/2018 21:27	1.3	E	48	Yes	<30	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 – November 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	1/11/2018 21:00	1.4	F	37	Yes	NM	Nil
Bulga Village	1/11/2018 22:15	1.7	E	38	Yes	IA	Nil
Gouldsville	1/11/2018 23:31	0.9	F	35	Yes	IA	Nil
Inlet Rd	1/11/2018 21:51	1.2	F	37	Yes	IA	Nil
Inlet Rd West	1/11/2018 21:00	1.4	F	35	Yes	IA	Nil
Long Point	1/11/2018 23:07	2	E	35	Yes	IA	Nil
South Bulga	1/11/2018 21:24	1.3	E	36	Yes	IA	Nil
Wambo Road	1/11/2018 21:27	1.3	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 – November 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	1/11/2018 21:00	1.4	F	47	Yes	NM	Nil
Bulga Village	1/11/2018 22:15	1.7	E	48	Yes	IA	Nil
Gouldsville	1/11/2018 23:31	0.9	F	45	Yes	IA	Nil
Inlet Rd	1/11/2018 21:51	1.2	F	47	Yes	IA	Nil
Inlet Rd West	1/11/2018 21:00	1.4	F	45	Yes	IA	Nil
Long Point	1/11/2018 23:07	2	E	45	Yes	IA	Nil
South Bulga	1/11/2018 21:24	1.3	E	46	Yes	IA	Nil
Wambo Road	1/11/2018 21:27	1.3	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 – November2018

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	1/11/2018	30/NM	NA/NA	NA/NA	NA/NA	NA/NA	NA
Bulga Village	1/11/2018	<30/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Gouldsville	1/11/2018	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd	1/11/2018	31/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd West	1/11/2018	<30/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Long Point	1/11/2018	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
South Bulga	1/11/2018	<30/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Wambo Road	1/11/2018	<30/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.

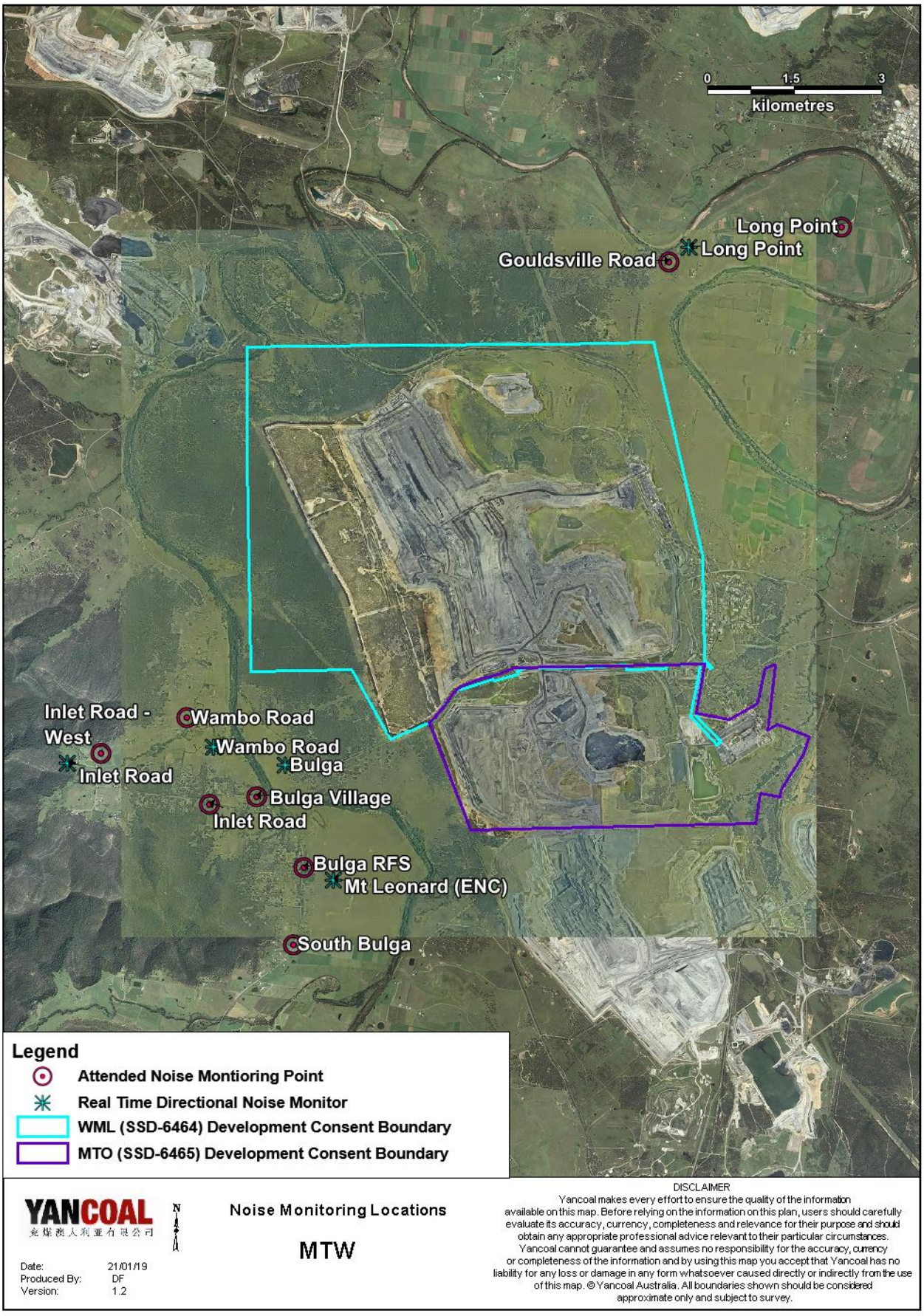

Figure 16: Noise Monitoring Location Plan

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 November are provided in **Table 8**.

.

Table 8: Supplementary Attended Noise Monitoring Data – November 2018

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
636	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 1,585 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**.

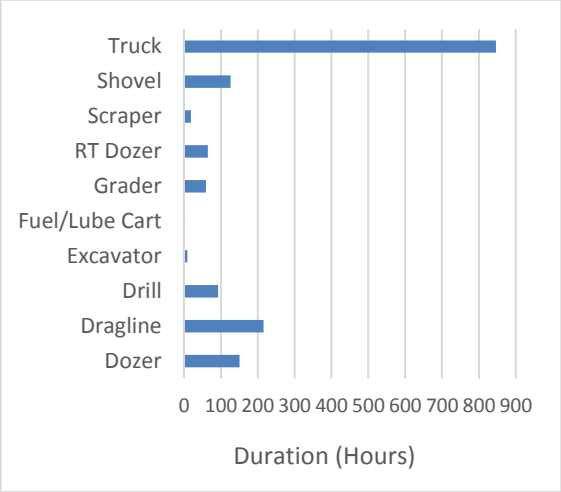

Figure 17: Operational Downtime by Equipment Type – November 2018

7.0 REHABILITATION

During November 2018, 3.5 Ha of land was bulk shaped, 0.7 Ha of land was topsoiled, 0.2 Ha of land was composted and 4.2 Ha of land was rehabilitated.

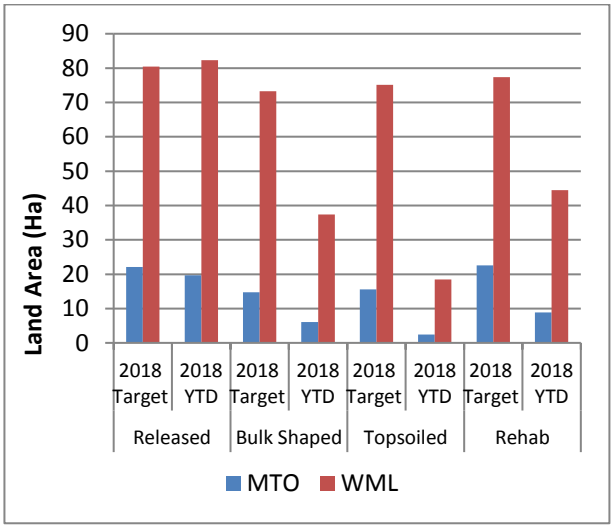

Figure 18: Rehabilitation YTD – November 2018

8.0 ENVIRONMENTAL INCIDENTS

There was one environmental incident recorded during the reporting period. On 20 November 2018, an exploration drill rig was observed drilling a borehole within an area of cleared land within MTW's mining lease, but outside of MTW's land access authorisation area, due to an error during a Ground Disturbance Permit amendment. The borehole was completed after confirming land access authorisations at the borehole location with the landholder.

9.0 COMPLAINTS

During the reporting period 24 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	5	8	9	2	0	24
December						
Total	149	72	63	28	3	315

Appendix A: Meteorological Data

Table 10: Meteorological Data – Charlton Ridge Meteorological Station – November 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)
1/11/2018	35	17	78	15	1056	173	2.9	0.0
2/11/2018	36	22	64	11	1445	288	5.4	0.2
3/11/2018	36	19	72	13	1112	268	5.3	0.4
4/11/2018	30	16	90	33	1265	124	2.0	0.2
5/11/2018	32	14	94	15	1189	205	2.4	0.0
6/11/2018	39	19	62	11	1323	232	2.8	0.0
7/11/2018	28	14	94	32	458	259	3.1	6.8
8/11/2018	23	10	94	21	1359	177	3.0	9.8
9/11/2018	24	9	81	25	1303	146	2.4	0.0
10/11/2018	27	11	78	14	1335	151	2.5	0.0
11/11/2018	28	10	87	19	1118	142	2.7	0.0
12/11/2018	28	13	79	28	1239	139	3.2	0.0
13/11/2018	30	13	82	15	1318	142	2.2	0.0
14/11/2018	27	16	82	36	869	190	1.7	0.0
15/11/2018	31	15	91	24	1375	185	2.7	2.0
16/11/2018	20	13	87	63	906	164	3.3	0.0
17/11/2018	25	15	83	38	1465	160	3.1	0.0
18/11/2018	24	13	84	37	1570	142	3.9	0.0
19/11/2018	28	12	77	26	1352	137	2.9	0.0
20/11/2018	33	14	75	22	1233	160	2.2	0.0
21/11/2018	29	19	80	41	885	283	4.7	0.0
22/11/2018	26	17	71	3	1197	291	5.9	0.0
23/11/2018	24	14	40	18	1273	288	6.2	0.0
24/11/2018	29	12	43	12	1306	263	3.8	0.0
25/11/2018	30	15	66	11	1643	232	3.4	0.0
26/11/2018	29	11	78	19	1470	156	2.5	0.0
27/11/2018	31	13	84	18	1344	143	2.1	0.6
28/11/2018	24	13	95	57	1378	174	3.4	29.8
29/11/2018	25	14	80	38	1544	172	4.2	0.0
30/11/2018	28	13	89	28	1409	178	1.6	0.4

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