Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

November 2021

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Revision History

Version No.	Version Details	Document Status	Date
1.1	**Environment and Community Advisor**	**Final**	**21/02/2022**

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 2021.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

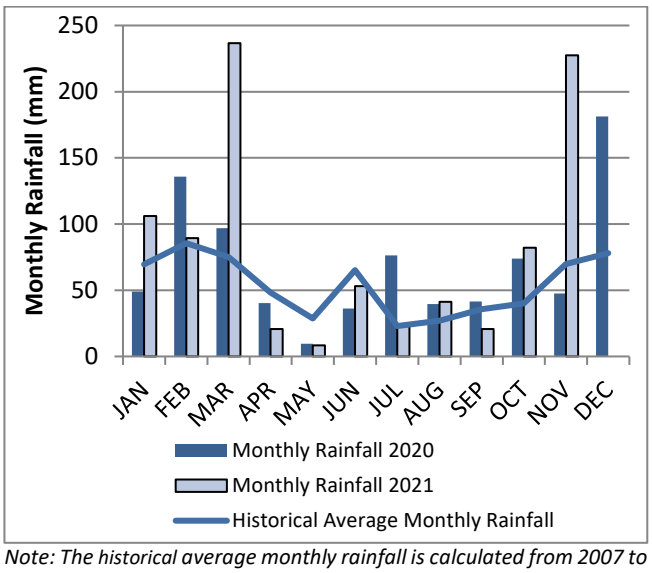
Meteorological data is collected at MTW's 'Charlton Ridge' meteorological station (refer to **Figure 3**: Air Quality Monitoring Locations).

2.1.1 Rainfall

Rainfall for the reporting period is summarised in **Table 1**. The year-to-date monthly rainfall totals, 2021 monthly rainfall totals and historical average monthly rainfall trend are shown in **Figure 1**.

Table 1: Monthly Rainfall MTW

2021	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
November	227.4	908.6



Note: The historical average monthly rainfall is calculated from 2007 to 2020 monthly totals

Figure 1: Rainfall Trend YTD

2.1.2 Wind Speed and Direction

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

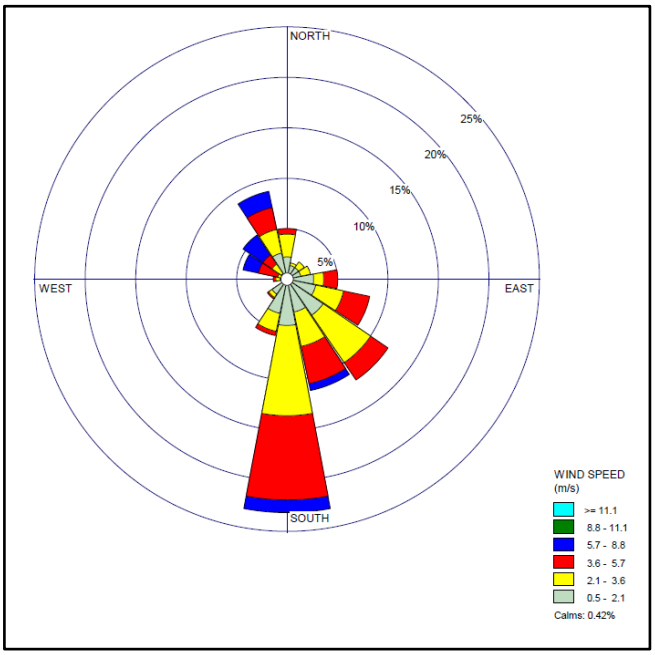


Figure 2: Charlton Ridge Wind Rose – November 2021

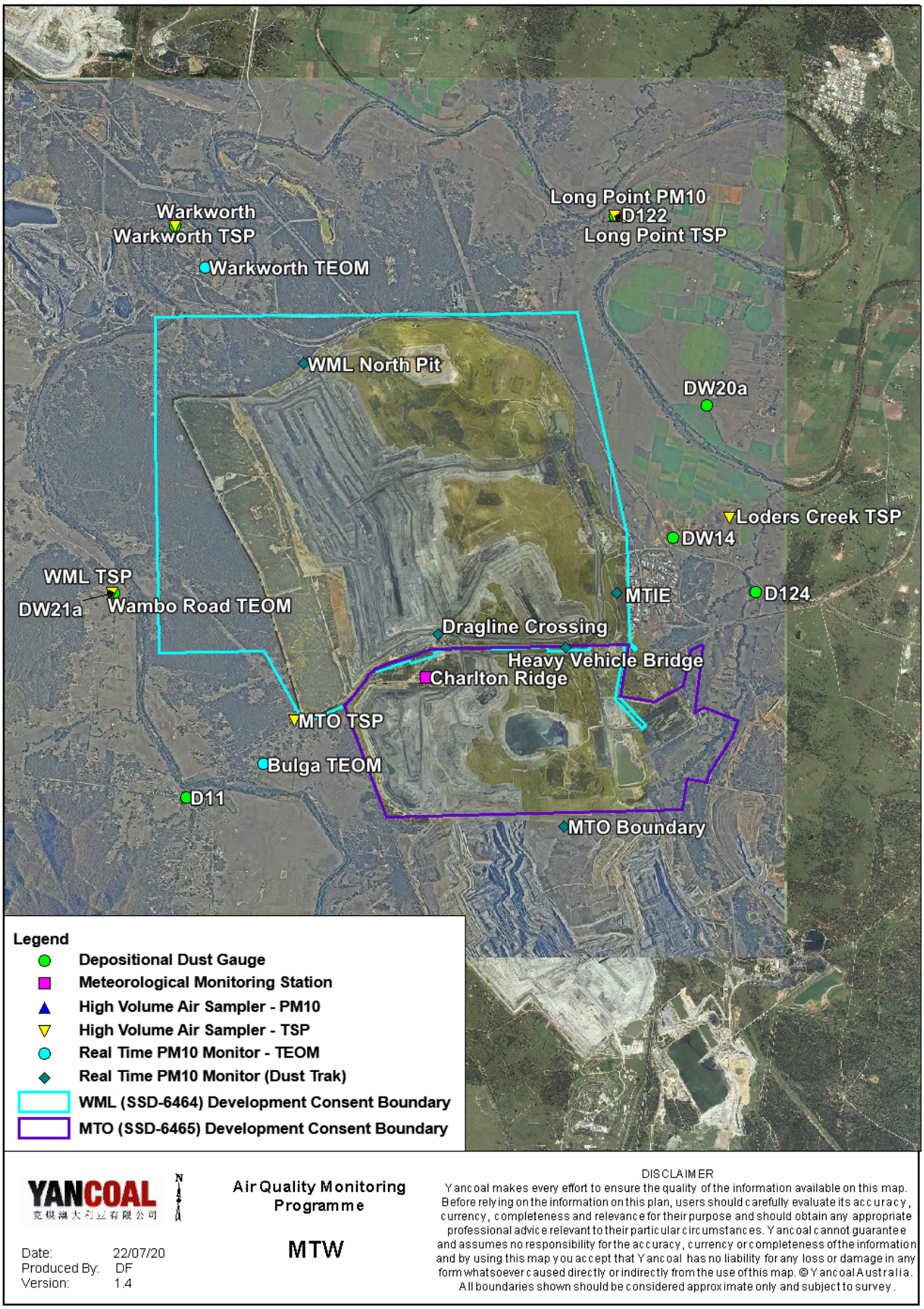


Figure 3: Air Quality Monitoring Locations

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.

During the reporting period the Warkworth monitor recorded a monthly result above the long-term impact assessment criteria of 4.0 g/m^2 per month. There is no evidence to suggest that the Warkworth result is contaminated. An external investigation of an elevated result at this monitor was undertaken for a July 2021 reading, which indicated the July result was anomalous and was then excluded from annual average calculation. Since that time, the August to November results have been elevated compared to other depositional dust results. MTW is progressing further investigation of the potential influence of localised sources to determine possible reasons for the result, as recommended by a specialist Air Quality specialist consultant. Presently, the result is included in the annual average calculation.

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.

An annual assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2021 Annual Review Report.

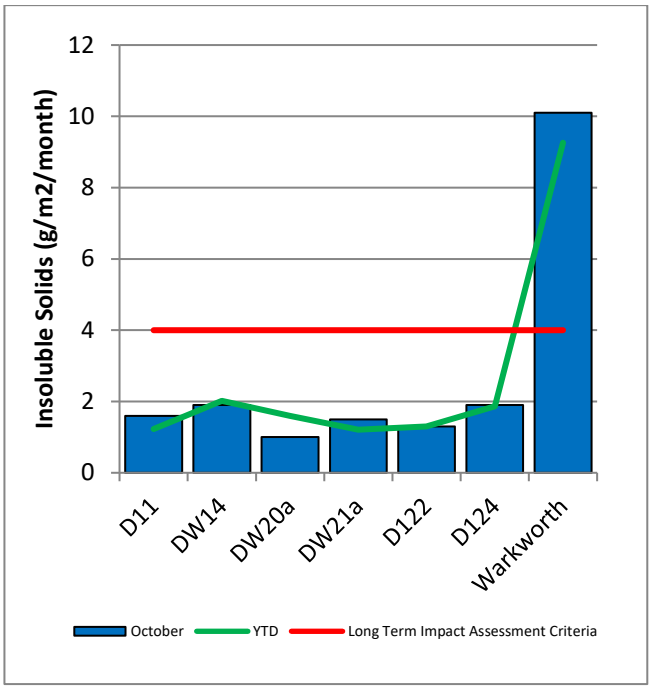


Figure 4: Depositional Dust – November 2021

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.

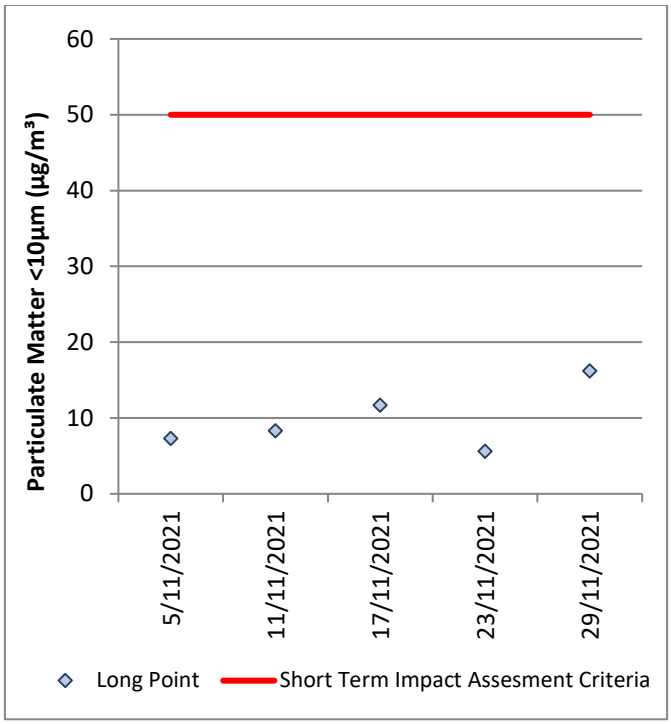


Figure 5: Individual PM10 Results – November 2021

Figure 6 shows the annual average PM10 result against the long term impact assessment criteria.

An assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2021 Annual Review Report.

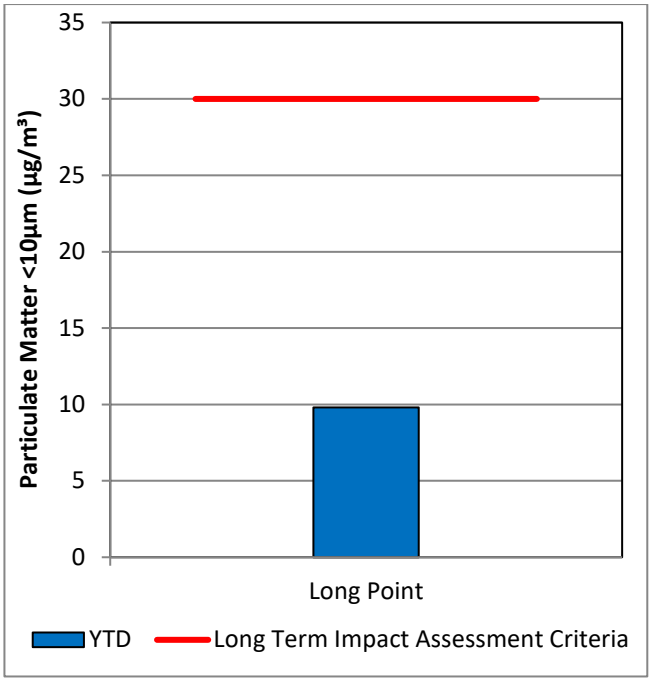


Figure 6: Annual Average PM_{10} – November 2021

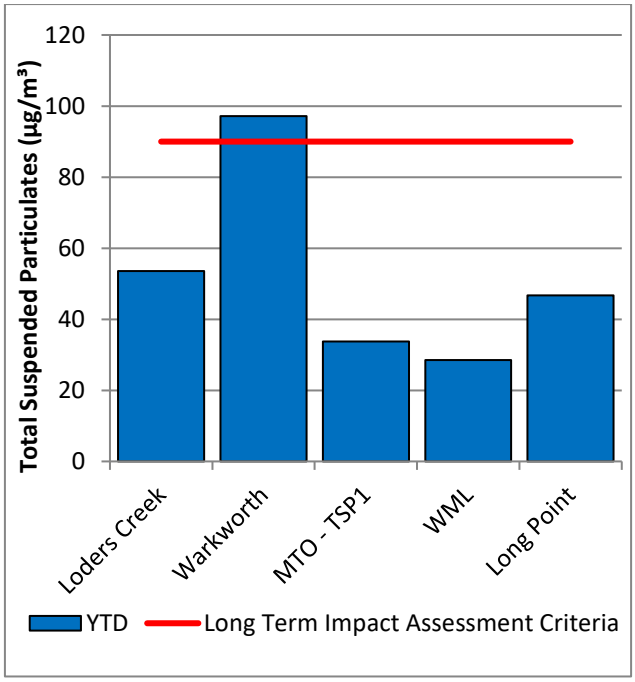


Figure 7: Annual Average Total Suspended Particulates – November 2021

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 compliance with the Long-Term Impact Assessment Criteria will be provided in the 2021 Annual Review Report.

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 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_{10} result and the annual PM_{10} average.

Data was not available from 11 to 15 November 2021 from the Wambo Road monitor due to equipment issues.

2.3.4 Real Time Alarms for Air Quality

During November, the real time monitoring system generated 33 automated air quality related alerts, including 10 alerts for adverse meteorological conditions and 23 alerts for elevated PM_{10} levels.

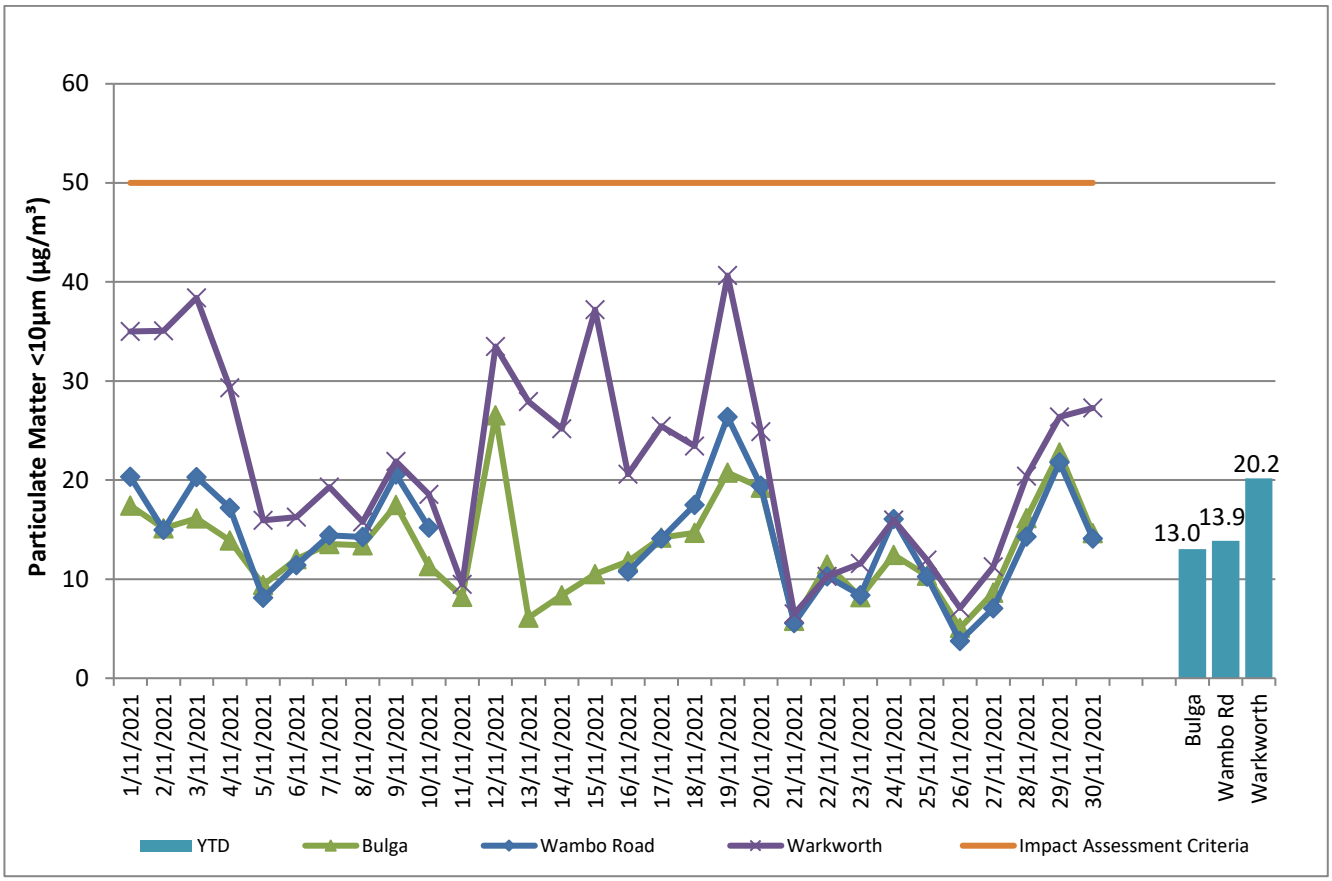


Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – November

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 record background water quality and 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 2021 report.

3.2 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 licenced HRSTS discharge from Dam 9S (EPL 1976 Point 4) occurred from the 24 November to 30 November 2021 discharging a total of 359ML.

3.3 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 2021 report.

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 2021, 18 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 at WML or MTO
120	0%
Ground Vibration (mm/s)	**Comments**
5	5% of the total number of blasts in a 12 month period at WML or MTO
10	0%

During the reporting period one blast exceeded the 115 dB(L) 5% threshold for airblast overpressure at Wambo Road monitoring location. No blast exceeded the 5mm/s 5% criteria for ground vibration.

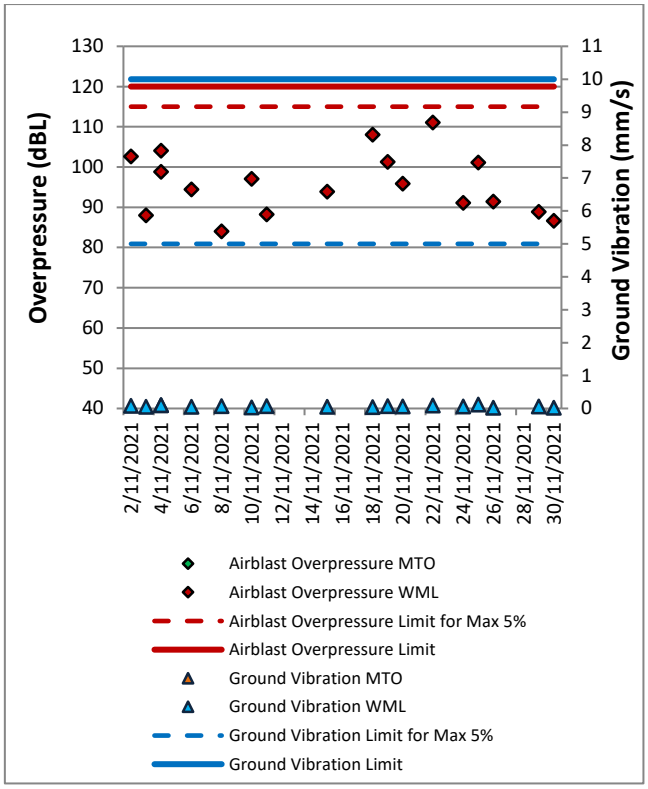


Figure 9: Abbey Green Blast Monitoring Results – November 2021

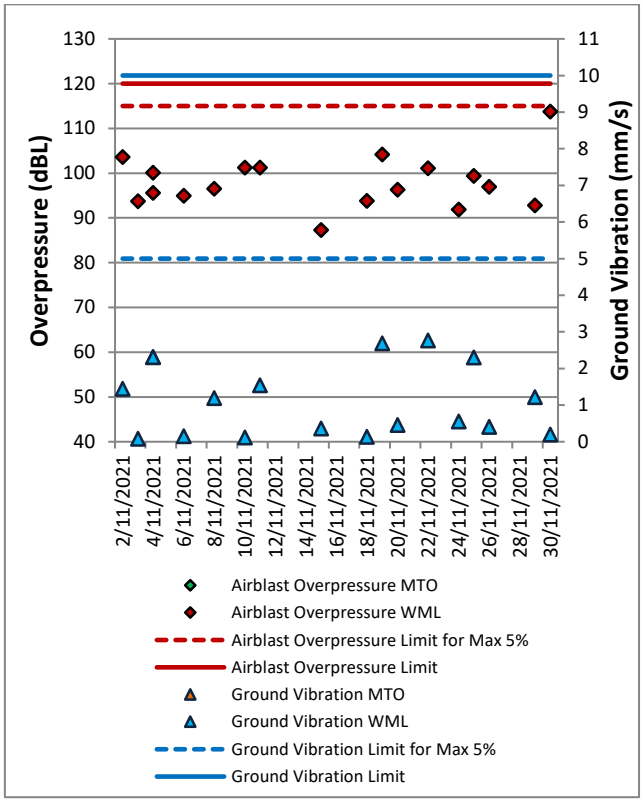


Figure 10: Bulga Village Blast Monitoring Results – November 2021

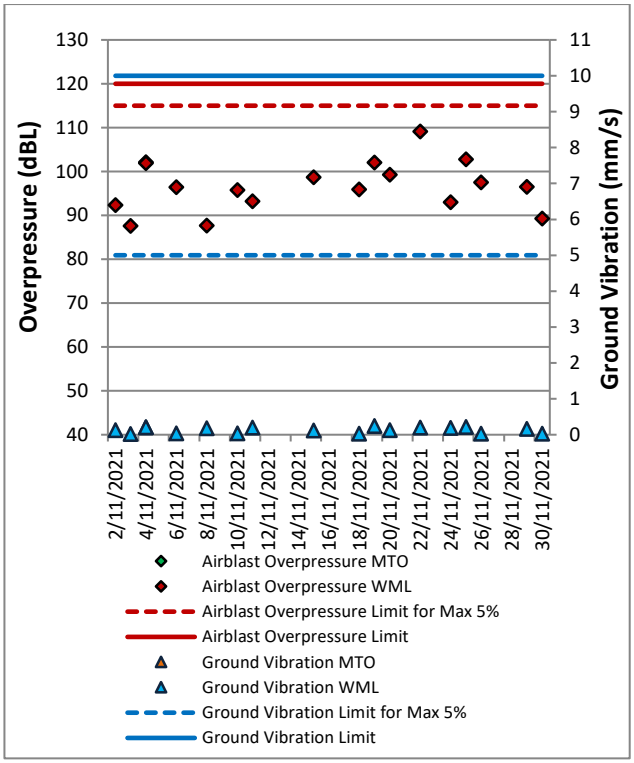


Figure 11: MTIE Blast Monitoring Results – November 2021

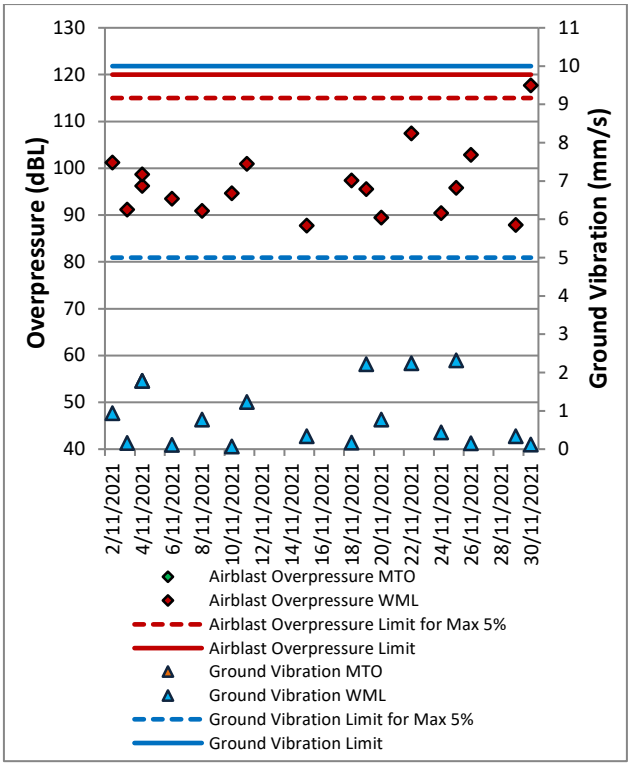


Figure 13: Wambo Road Blast Monitoring Results – November 2021

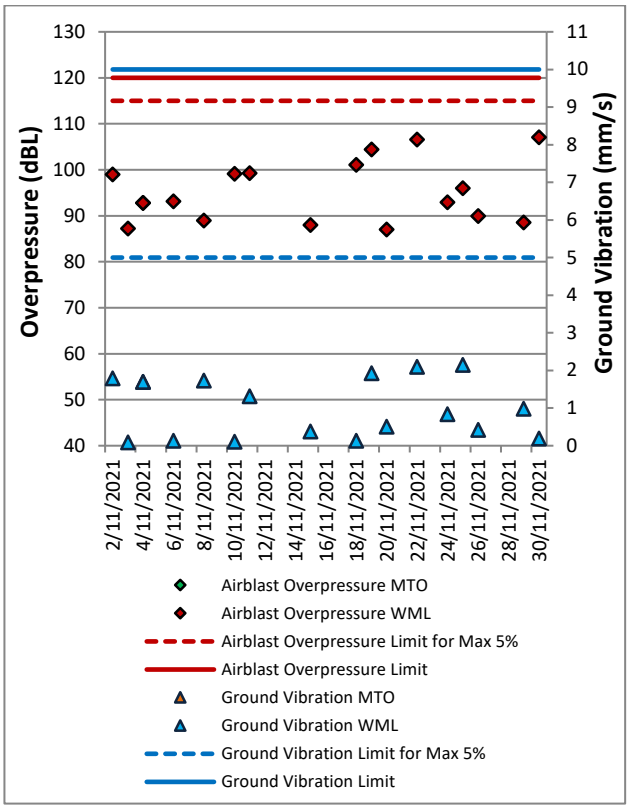


Figure 12: Wollemi Peak Road Blast Monitoring Results – November 2021

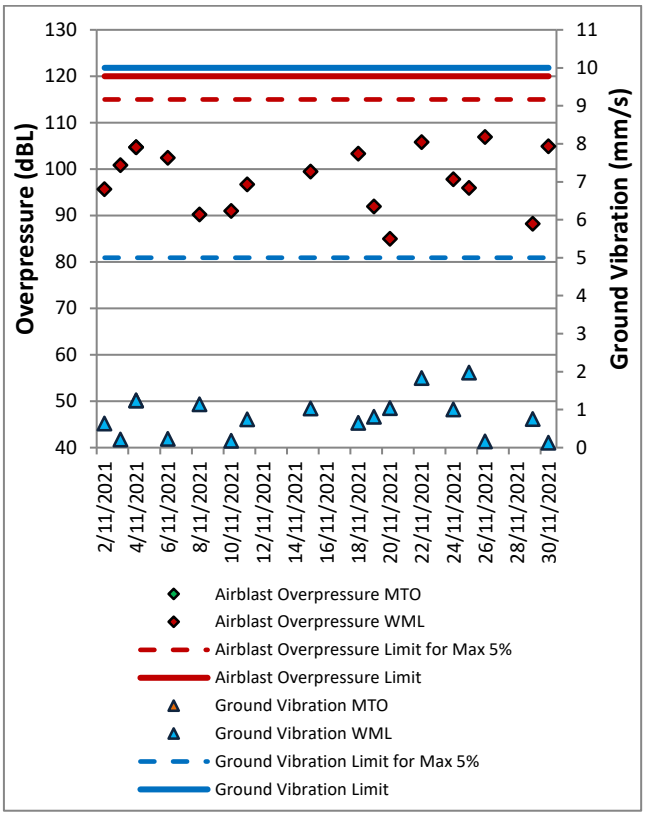


Figure 14: Warkworth Blast Monitoring Results – November 2021

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**.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 23 November 2021. All measurements complied with the relevant criteria. Results are detailed in **Table 3 to Table 6.**

5.1.1 WML Noise Assessment

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

Table 3: $L_{Aeq,\ 15\ minute}$ Warkworth Impact Assessment Criteria – November 2021

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML L_{Aeq} dB[2,3,4]	Exceedance[3,5]
Bulga RFS	23/11/2021 23:03	2.6	F	37	No	IA	NA
Bulga Village	23/11/2021 22:06	3.2	E	38	No	<25	NA
Gouldsville	23/11/2021 21:23	3.5	E	38	No	<30	NA
Inlet Rd	23/11/2021 21:22	3.8	E	37	No	<25	NA
Inlet Rd West	23/11/2021 21:01	3.8	E	35	No	IA	NA
Long Point	23/11/2021 21:00	3.8	E	35	No	IA	NA
South Bulga	23/11/2021 23:23	2.8	F	35	No	IA	NA
Wambo Road	23/11/2021 21:44	3.3	E	38	No	<25	NA

Notes:
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. 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;
4. IA denotes 'Inaudible';
5. 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 2021

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML $L_{A1,\ 1min}$ dB[2,3,4]	Exceedance[3,5]
Bulga RFS	23/11/2021 23:03	2.6	F	47	No	IA	NA
Bulga Village	23/11/2021 22:06	3.2	E	48	No	27	NA
Gouldsville	23/11/2021 21:23	3.5	E	48	No	35	NA
Inlet Rd	23/11/2021 21:22	3.8	E	47	No	<25	NA
Inlet Rd West	23/11/2021 21:01	3.8	E	45	No	IA	NA
Long Point	23/11/2021 21:00	3.8	E	45	No	IA	NA
South Bulga	23/11/2021 23:23	2.8	F	45	No	IA	NA
Wambo Road	23/11/2021 21:44	3.3	E	48	No	29	NA

Notes:
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. 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;
4. IA denotes 'Inaudible';

5. 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 2021

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO L_{Aeq} dB[2,3,4]	Exceedance[3,5]
Bulga RFS	23/11/2021 23:03	2.6	F	37	Yes	33	NA
Bulga Village	23/11/2021 22:06	3.2	E	38	Yes	IA	NA
Gouldsville	23/11/2021 21:23	3.5	E	35	Yes	IA	NA
Inlet Rd	23/11/2021 21:22	3.8	E	37	Yes	<25	NA
Inlet Rd West	23/11/2021 21:01	3.8	E	35	Yes	<20	NA
Long Point	23/11/2021 21:00	3.8	E	35	Yes	IA	NA
South Bulga	23/11/2021 23:23	2.8	F	36	Yes	<25	NA
Wambo Road	23/11/2021 21:44	3.3	E	38	Yes	IA	NA

Notes:
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. 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;
4. IA denotes 'Inaudible';
5. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 6: $L_{A1, 1Minute}$ Mount Thorley - Impact Assessment Criteria – November 2021

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO $L_{A1, 1min}$ dB[2,3,4]	Exceedance[3,5]
Bulga RFS	23/11/2021 23:03	2.6	F	47	Yes	39	NA
Bulga Village	23/11/2021 22:06	3.2	E	48	Yes	IA	NA
Gouldsville	23/11/2021 21:23	3.5	E	45	Yes	IA	NA
Inlet Rd	23/11/2021 21:22	3.8	E	47	Yes	<25	NA
Inlet Rd West	23/11/2021 21:01	3.8	E	45	Yes	<20	NA
Long Point	23/11/2021 21:00	3.8	E	45	Yes	IA	NA
South Bulga	23/11/2021 23:23	2.8	F	46	Yes	27	NA
Wambo Road	23/11/2021 21:44	3.3	E	48	Yes	IA	NA

Notes:
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. 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;
4. IA denotes 'Inaudible';
5. NA in exceedance column means atmospheric conditions outside conditions specified in development consent 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 factor corrections has been assessed. There were no noise measurements taken during the reporting period which required the penalty to be applied. The WML assessment for low frequency noise is shown in **Table 7** and the MTO assessment for low frequency noise is shown in **Table 8**: Mount Thorley Operations Low Frequency Noise Assessment –

Table 7: Warkworth Low Frequency Noise Assessment – November 2021

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[2]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [2,3]	Penalty dB[3]	Exceedance [2]
Bulga RFS	23/11/2021 23:03	IA	No	No	No	NA	No	NA	Nil	NA
Bulga Village	23/11/2021 22:06	<25	No	No	No	NA	No	NA	Nil	NA
Gouldsville	23/11/2021 21:23	<30	No	No	No	NA	No	NA	Nil	NA
Inlet Rd	23/11/2021 21:22	<25	No	No	No	NA	No	NA	Nil	NA
Inlet Rd West	23/11/2021 21:01	IA	No	No	No	NA	No	NA	Nil	NA
Long Point	23/11/2021 21:00	IA	No	No	No	NA	No	NA	Nil	NA
South Bulga	23/11/2021 23:23	IA	No	No	No	NA	No	NA	Nil	NA
Wambo Road	23/11/2021 21:44	<25	No	No	No	NA	No	NA	Nil	NA

Notes:
1. IA denotes 'Inaudible';
2. NA denotes 'not applicable'; and
3. Bold results indicate that application of NPfI modifying factor/s is required.

Table 8: Mount Thorley Operations Low Frequency Noise Assessment – November 2021

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[2]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [2,3]	Penalty dB[3]	Exceedance [2]
Bulga RFS	23/11/2021 23:03	33	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	23/11/2021 22:06	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	23/11/2021 21:23	IA	No	No	No	NA	No	NA	Nil	NA
Inlet Rd	23/11/2021 21:22	<25	No	No	No	NA	No	NA	Nil	NA
Inlet Rd West	23/11/2021 21:01	<20	Yes	No	No	NA	No	NA	Nil	NA
Long Point	23/11/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	23/11/2021 23:23	<25	No	No	No	NA	No	NA	Nil	NA
Wambo Road	23/11/2021 21:44	IA	No	No	No	NA	No	NA	Nil	NA

Notes:
1. IA denotes 'Inaudible';
2. NA denotes 'not applicable'; and
3. Bold results indicate that application of NPfI modifying factor/s is required.

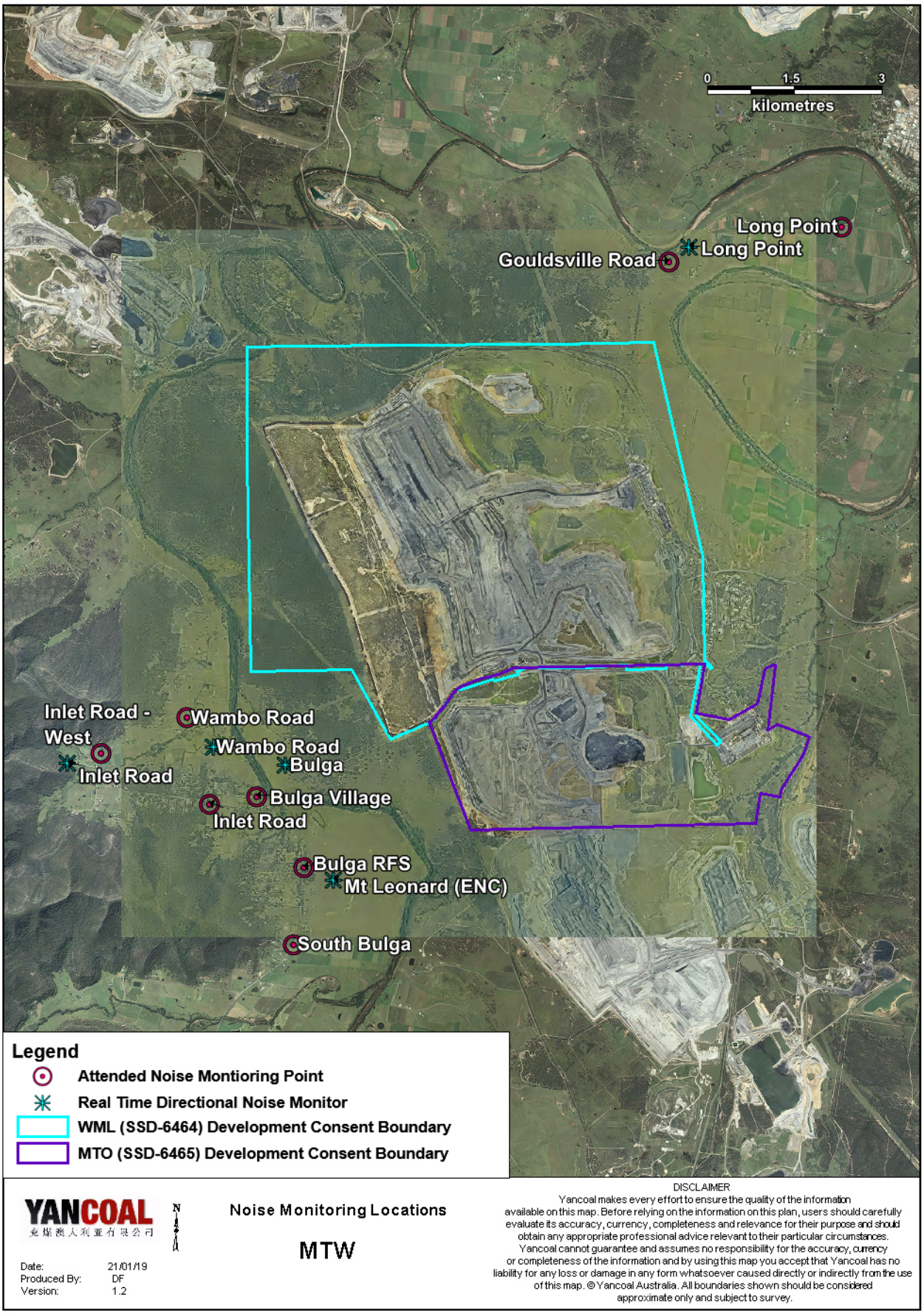


Figure 16: Noise Monitoring Location Plan

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 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 9**.

Table 9: Supplementary Attended Noise Monitoring Data – November 2021

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
497	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 84 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**.

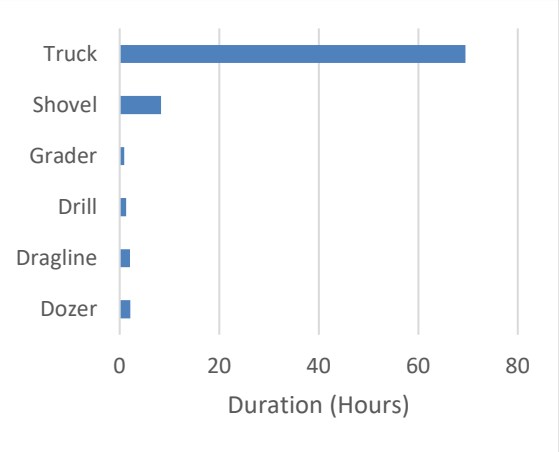


Figure 17: Operational Downtime by Equipment Type – November 2021

7.0 REHABILITATION

During November 2021 0.29 Ha of land was released, 6.12 Ha of land was bulk shaped, 1.41 Ha of land was topsoiled, 9.12 Ha of land was composted and 15.8 Ha of land was rehabilitated.

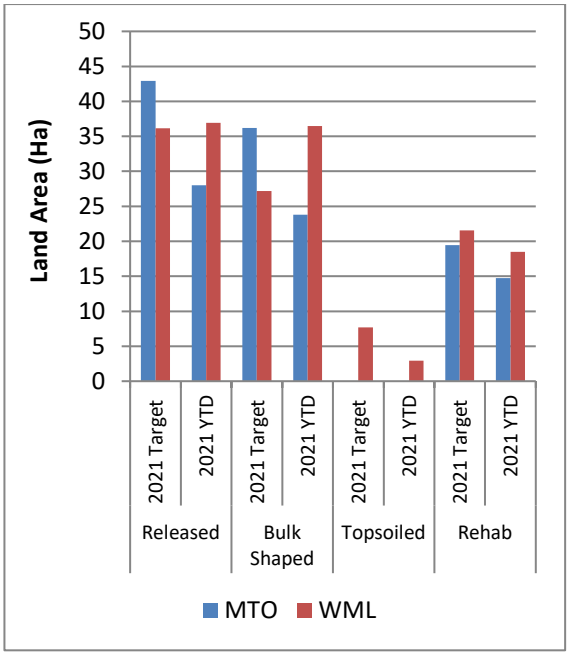


Figure 18: Rehabilitation YTD - November 2021

8.0 ENVIRONMENTAL INCIDENTS

There were two reportable environmental incidents recorded during the reporting period.

On 12 November 2021, two sediment dams overtopped their spillways due to a significant rain event. Rainfall started at approximately 6:30am on Wednesday 10 November 2021 and continued until approximately 7:00am on Friday 12 November 2021. A total of 110.6mm of rainfall was recorded during the period. Notifications to the relevant regulatory authorities was undertaken by the MTW Environment and Community Manager in accordance with the sites Pollution Incident Response Management Plan.

On 26 November 2021, a sediment dam overtopped its spillway due to a significant rain event. Rainfall started at approximately 11:34pm on Saturday 20 November 2021 and continued until approximately 5:20pm on Friday 26 November 2021. A total of 84mm of rainfall was recorded during the period. Notifications to the relevant regulatory authorities was undertaken by the MTW Environment and Community Manager in accordance with the sites Pollution Incident Response Management Plan.

9.0 COMPLAINTS

16 complaints were received during the reporting period. Details of these complaints are shown in **Table 10** below.

Table 10: Complaints Summary YTD

	Noise	Dust	Blast	Lighting	Other	Total
January	1	0	6	4	1	12
February	4	0	3	0	0	7
March	5	0	3	3	1	12
April	6	2	1	10	0	19
May	3	1	10	5	0	19
June	2	0	4	0	0	6
July	1	0	5	3	1	10
August	12	8	5	1	0	26
September	3	11	7	8	1	30
October	4	8	1	0	0	13
November	5	2	9	0	0	16
December						
Total	46	32	54	34	4	170

Appendix A: Meteorological Data

Table 11: Meteorological Data – Charlton Ridge Meteorological Station – November 2021

Date	Air Temperature Maximum (°C)	Air Temperature Minimum (°C)	Relative Humidity Maximum (%)	Relative Humidity Minimum (%)	Wind Direction Average (°)	Wind Speed Average (m/sec)	Rainfall(mm)
1/11/2021	24	7	85	30	162	1.9	0
2/11/2021	27	10	85	32	144	3.3	0
3/11/2021	28	10	86	28	135	2.7	0
4/11/2021	22	-	90	-	144	1.9	0
5/11/2021	19	11	99	76	157	2.0	16.6
6/11/2021	28	9	100	36	180	2.1	0
7/11/2021	25	12	99	60	189	1.3	6
8/11/2021	28	15	99	43	156	2.1	1.8
9/11/2021	28	14	96	36	151	1.9	0
10/11/2021	22	13	100	74	167	2.2	51.4
11/11/2021	23	11	100	72	185	2.7	25.8
12/11/2021	28	9	100	33	246	4.7	33.4
13/11/2021	18	9	74	42	301	5.7	0
14/11/2021	22	6	81	25	299	4.8	2.4
15/11/2021	23	6	75	26	295	5.5	0
16/11/2021	24	6	74	25	219	2.6	0
17/11/2021	25	8	80	35	137	3.1	0
18/11/2021	29	8	91	23	198	2.7	0
19/11/2021	27	13	92	46	237	2.5	1.4
20/11/2021	29	13	97	37	179	2.4	0.6
21/11/2021	17	10	99	88	165	3.6	26.6
22/11/2021	20	10	99	60	157	4.3	3.2
23/11/2021	25	11	99	58	152	3.3	0.8
24/11/2021	29	13	98	44	131	1.6	2
25/11/2021	27	15	99	64	134	1.2	11.6
26/11/2021	21	12	100	82	176	4.0	39.2
27/11/2021	17	10	97	74	169	5.3	2.2
28/11/2021	20	9	95	63	166	3.9	0
29/11/2021	22	10	88	61	142	2.1	0
30/11/2021	21	13	99	75	160	1.9	2.4

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