Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

November 2023

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Revision History

Version No.	Version Details	Date
1.0	**Final**	**16/02/2024**

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 2023.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

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

2.1.1 Rainfall

Rainfall for the reporting period is summarised in **Table 1**. The year-to-date monthly rainfall totals, 2023 monthly rainfall totals and historical average monthly rainfall trend are shown in **Figure 1**.

Table 1: Monthly Rainfall MTW

2023	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
November	66.4	414.6

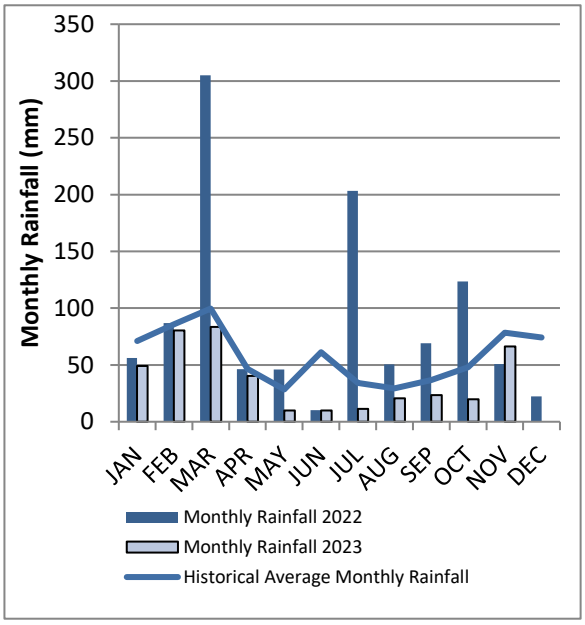


Figure 1: Rainfall Trend YTD

Note: The historical average monthly rainfall is calculated from 2007 to 2022 monthly totals.

2.1.2 Wind Speed and Direction

Winds from the South and Southeast were dominant during the reporting period as shown in **Figure 2.**

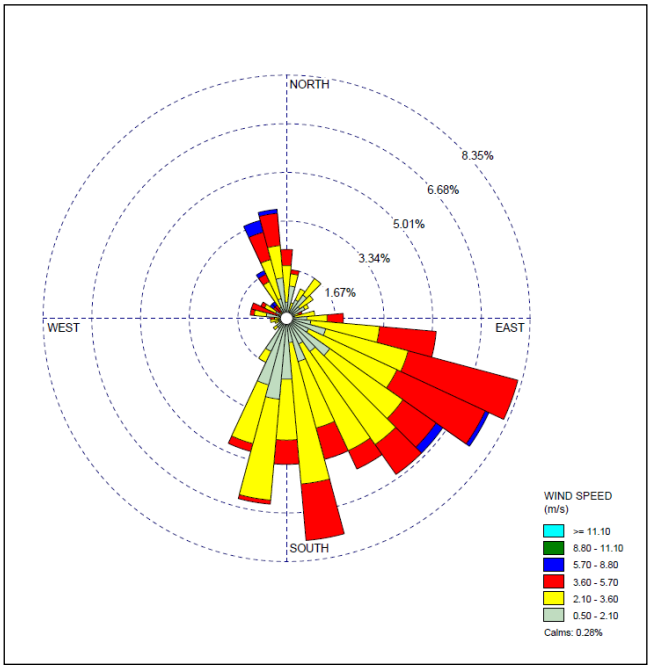


Figure 2: Charlton Ridge Wind Rose – November 2023

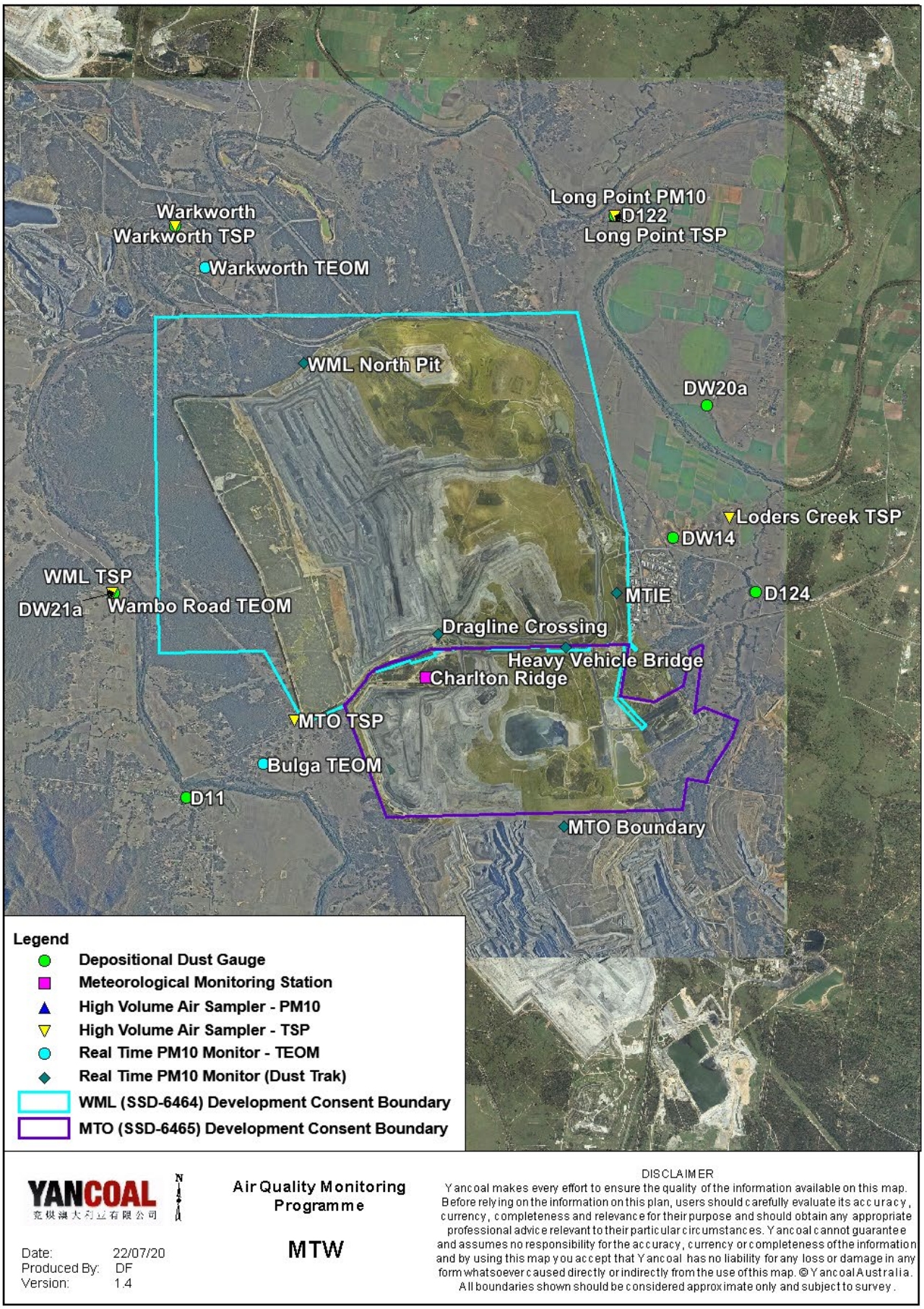


Figure 3: Air Quality Monitoring Locations

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/m2 per month. There is no evidence to suggest that the result is contaminated. Accordingly, the result will be 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 2023 Annual Review Report.

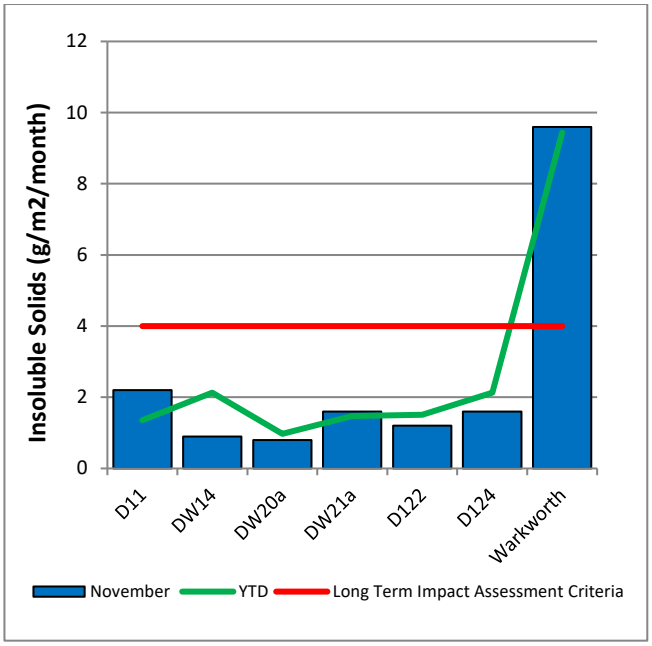


Figure 4: Depositional Dust – November 2023

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/m³.

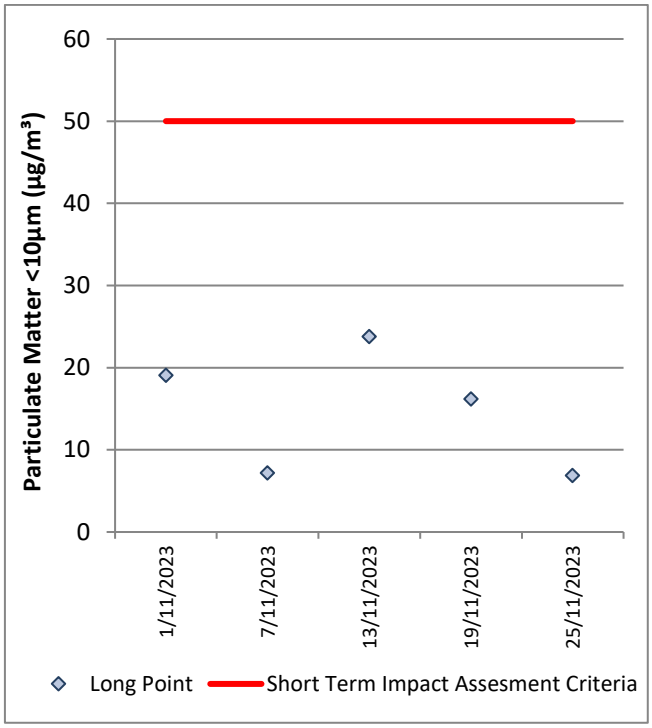


Figure 5: Individual PM10 Results – November 2023

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 2023 Annual Review Report.

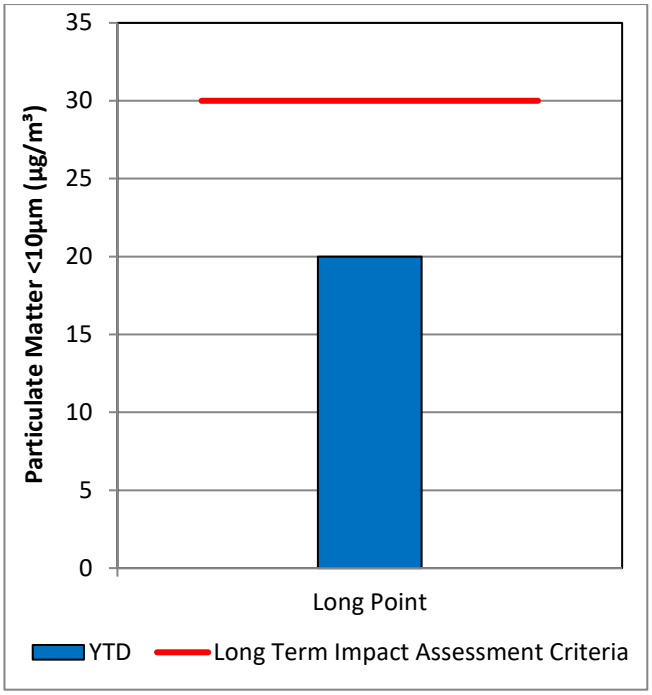


Figure 6: Annual Average PM_{10} – November 2023

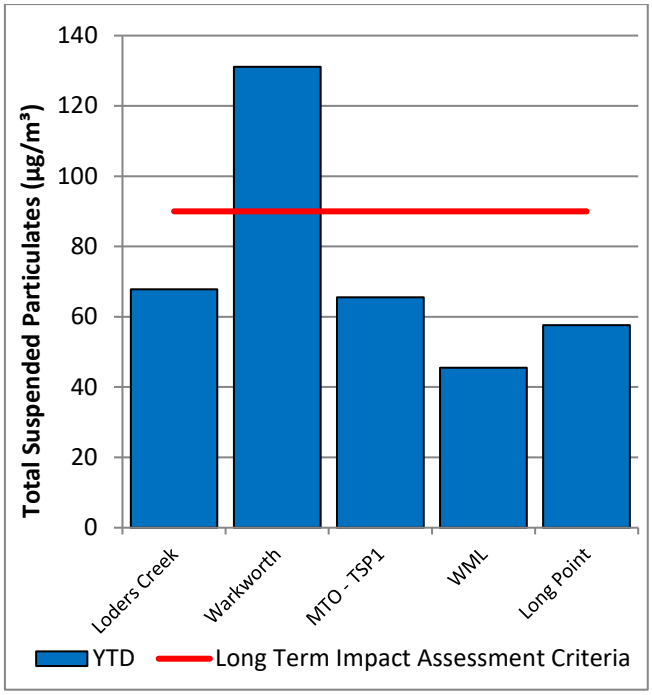


Figure 7: Annual Average Total Suspended Particulates – November 2023

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 2023 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.

On 12 November 2023, the Warkworth TEOM (57.8 µg/m³) exceeded the short term (24hr) criteria. The measurement was assessed for MTW's potential contribution based on meteorological conditions on this day resulting in a maximum estimated contribution of 13 µg/m³, less than a 23.4% contribution to the result. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

On 14 November 2023, the Warkworth TEOM (53.4 µg/m³) exceeded the short term (24hr) criteria. The measurement was assessed for MTW's potential contribution based on meteorological conditions and background PM_{10} levels on this day resulting in a maximum estimated contribution of 20 µg/m³, less than a 37.6% contribution to the result.

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

On 19 November 2023, the Warkworth TEOM (57.4 µg/m³) exceeded the short term (24hr) criteria. The measurement was assessed for MTW's potential contribution based on meteorological conditions and background PM_{10} levels on this day resulting in a maximum estimated contribution of 26.5 µg/m³, less than a 46.3% contribution to the result. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

Data was not available on 22 and 23 November 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 99 automated air quality related alerts, including 15 alerts for adverse meteorological conditions and 84 alerts for elevated PM_{10} levels

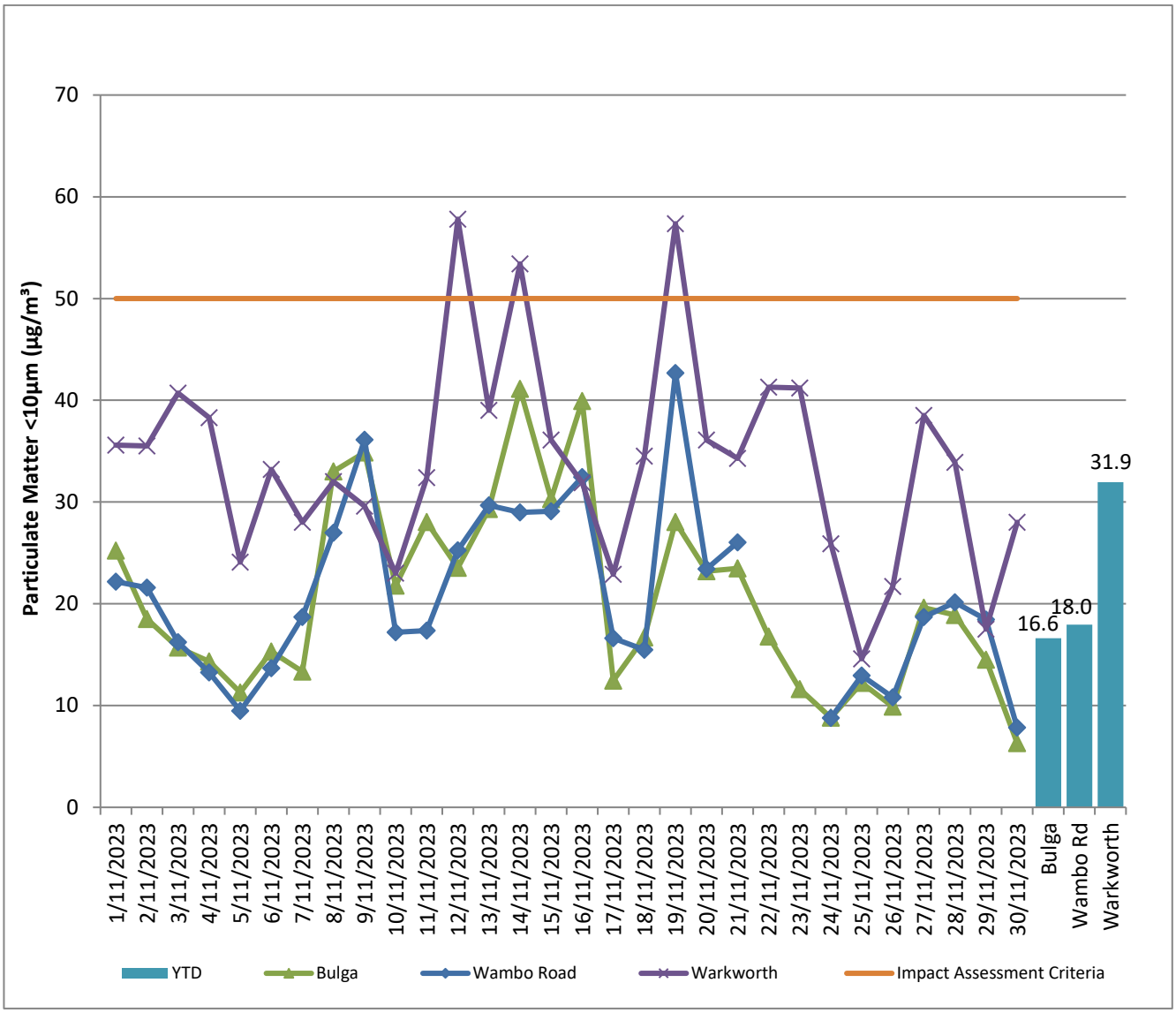


Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – November 2023

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 2023 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.

MTW did not undertake any HRSTS discharges in the reporting period.

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 2023 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 2023, 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 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 115dB(L) threshold for airblast overpressure at the Bulga Village and Wambo Road monitoring locations. No blasts exceeded the 5mm/s criteria for ground vibration.

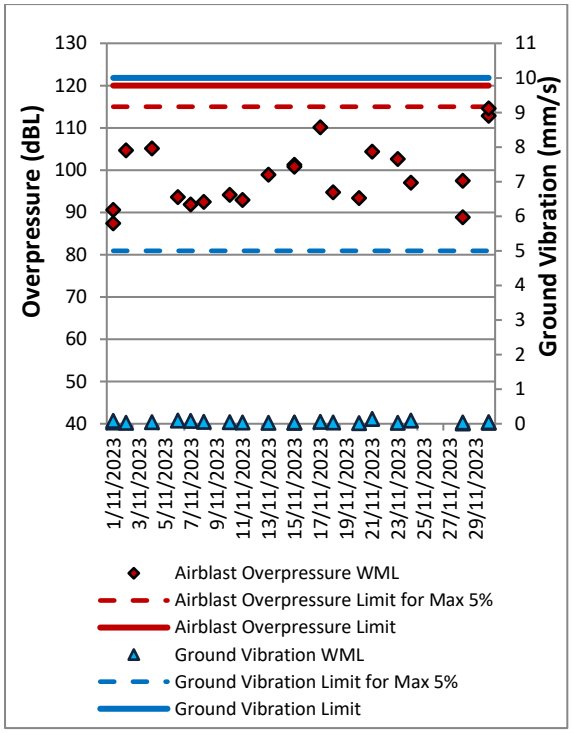


Figure 9: Abbey Green Blast Monitoring Results – November 2023

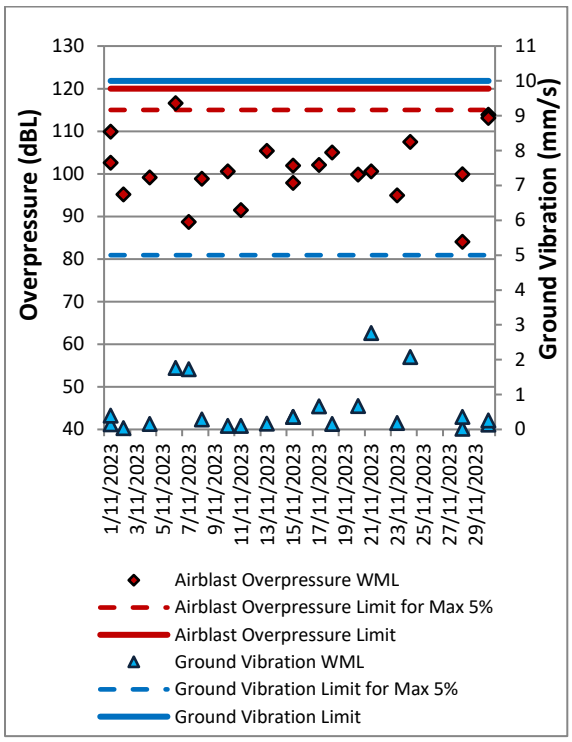


Figure 10: Bulga Village Blast Monitoring Results – November 2023

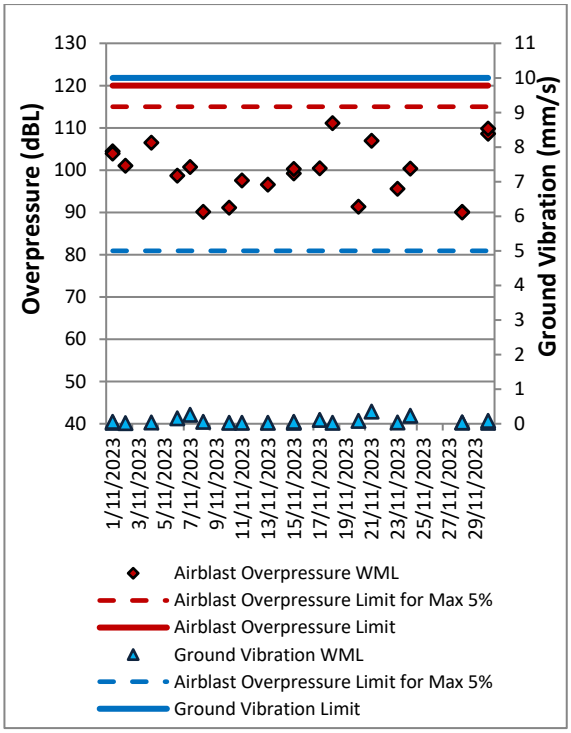


Figure 11: MTIE Blast Monitoring Results – November 2023

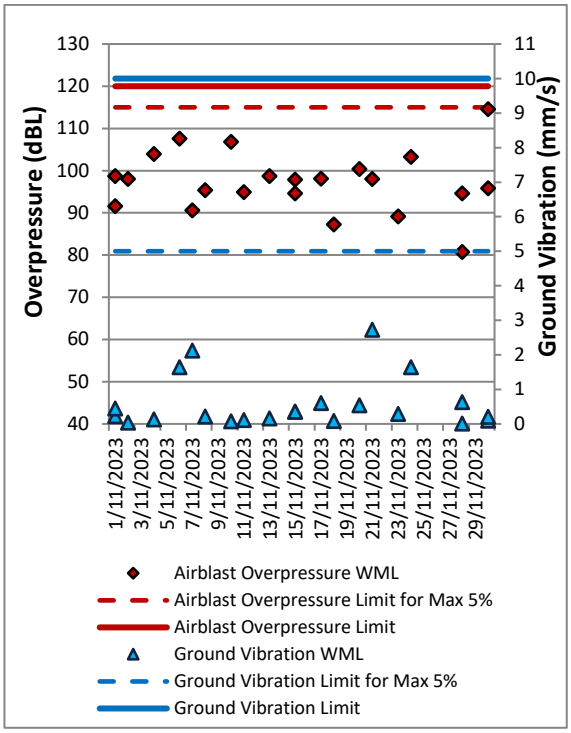


Figure 12: Wollemi Peak Road Blast Monitoring Results – November 2023

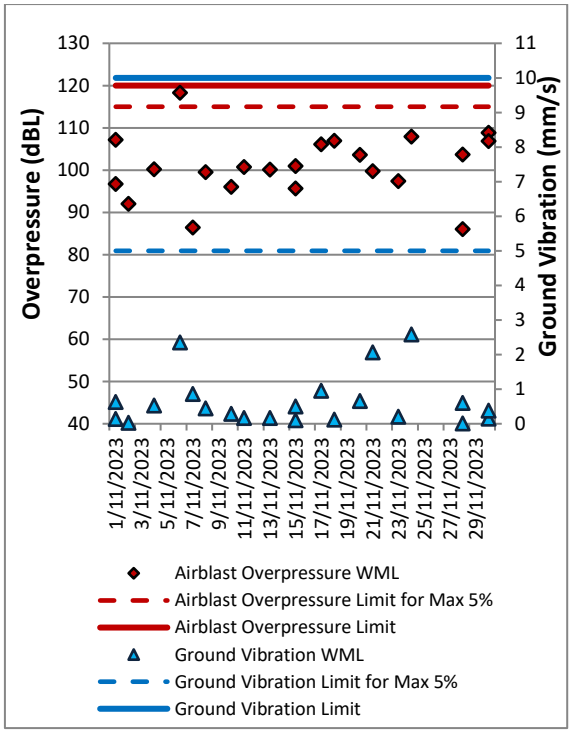


Figure 13: Wambo Road Blast Monitoring Results – November 2023

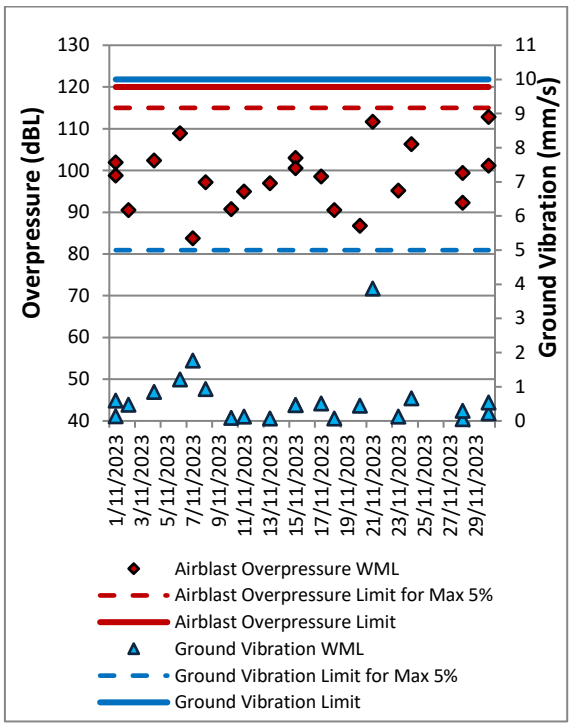


Figure 14: Warkworth Blast Monitoring Results – November 2023

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 6 November 2023. Measurements complied with the relevant criteria.

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 2023

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	6/11/2023 23:02	2.9	E	37	Yes	31	Nil
Bulga Village	6/11/2023 22:14	3.1	D	38	No	36	Nil
Gouldsville	6/11/2023 21:22	3.3	D	38	No	33	Nil
Inlet Rd	6/11/2023 21:24	3.4	D	37	No	35	Nil
Inlet Rd West	6/11/2023 21:00	3.3	D	35	No	32	Nil
Long Point	6/11/2023 21:00	3.3	D	35	No	IA	Nil
South Bulga	6/11/2023 23:53	2.7	D	35	Yes	<30	Nil
Wambo Road	6/11/2023 21:50	3.5	D	38	No	34	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: 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. Site-only LAeq,15minute attributed to WML, including modifying factors if applicable;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

Table 4: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria – November 2023

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	6/11/2023 23:02	2.9	E	47	Yes	40	Nil
Bulga Village	6/11/2023 22:14	3.1	D	48	No	43	Nil
Gouldsville	6/11/2023 21:22	3.3	D	48	No	38	Nil
Inlet Rd	6/11/2023 21:24	3.4	D	47	No	39	Nil
Inlet Rd West	6/11/2023 21:00	3.3	D	45	No	36	Nil
Long Point	6/11/2023 21:00	3.3	D	45	No	IA	Nil
South Bulga	6/11/2023 23:53	2.7	D	45	Yes	32	Nil
Wambo Road	6/11/2023 21:50	3.5	D	48	No	39	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: 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. Site-only LA1,1minute attributed to WML;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

5.1.2 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 2023

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	6/11/2023 23:02	2.9	E	37	Yes	30	Nil
Bulga Village	6/11/2023 22:14	3.1	D	38	No	<30	Nil
Gouldsville	6/11/2023 21:22	3.3	D	35	No	IA	Nil
Inlet Rd	6/11/2023 21:24	3.4	D	37	No	<25	Nil
Inlet Rd West	6/11/2023 21:00	3.3	D	35	No	IA	Nil
Long Point	6/11/2023 21:00	3.3	D	35	No	IA	Nil
South Bulga	6/11/2023 23:53	2.7	D	36	Yes	32	Nil
Wambo Road	6/11/2023 21:50	3.5	D	38	No	IA	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: 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. Site-only LAeq,15minute attributed to MTO, including modifying factors if applicable;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

Table 6: $L_{A1, 1Minute}$ Mount Thorley - Impact Assessment Criteria – November 2023

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	6/11/2023 23:02	2.9	E	47	Yes	32	Nil
Bulga Village	6/11/2023 22:14	3.1	D	48	No	<30	Nil
Gouldsville	6/11/2023 21:22	3.3	D	45	No	IA	Nil
Inlet Rd	6/11/2023 21:24	3.4	D	47	No	30	Nil
Inlet Rd West	6/11/2023 21:00	3.3	D	45	No	IA	Nil
Long Point	6/11/2023 21:00	3.3	D	45	No	IA	Nil
South Bulga	6/11/2023 23:53	2.7	D	46	Yes	34	Nil
Wambo Road	6/11/2023 21:50	3.5	D	48	No	IA	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: 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. Site-only LA1,1minute attributed to MTO;
3. Bold results in red indicate exceedance of relevant criterion; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

5.1.3 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**.

Table 7: Warkworth Low Frequency Noise Assessment – November 2023

Location	Date and Time	Measured WML LAeq dB	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality [1]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [1,2]	Penalty dB [2]
Bulga RFS	6/11/2023 23:02	31	Yes	No	No	NA	No	NA	Nil
Bulga Village	6/11/2023 22:14	36	No	NA	NA	NA	NA	NA	Nil
Gouldsville	6/11/2023 21:22	33	No	NA	NA	NA	NA	NA	Nil
Inlet Rd	6/11/2023 21:24	35	No	NA	NA	NA	NA	NA	Nil
Inlet Rd West	6/11/2023 21:00	32	No	NA	NA	NA	NA	NA	Nil
Long Point	6/11/2023 21:00	IA	No	NA	NA	NA	NA	NA	Nil
South Bulga	6/11/2023 23:53	<30	Yes	No	No	NA	No	NA	Nil
Wambo Road	6/11/2023 21:50	34	No	NA	NA	NA	NA	NA	Nil

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

Table 8: Mount Thorley Operations Low Frequency Noise Assessment – November 2023

Location	Date and Time	Measured MTO LAeq dB	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [1,2]	Penalty dB[2]
Bulga RFS	6/11/2023 23:02	30	Yes	No	No	NA	No	NA	Nil
Bulga Village	6/11/2023 22:14	<30	No	NA	NA	NA	NA	NA	Nil
Gouldsville	6/11/2023 21:22	IA	No	NA	NA	NA	NA	NA	Nil
Inlet Rd	6/11/2023 21:24	<25	No	NA	NA	NA	NA	NA	Nil
Inlet Rd West	6/11/2023 21:00	IA	No	NA	NA	NA	NA	NA	Nil
Long Point	6/11/2023 21:00	IA	No	NA	NA	NA	NA	NA	Nil
South Bulga	6/11/2023 23:53	32	Yes	No	No	NA	No	NA	Nil
Wambo Road	6/11/2023 21:50	IA	No	NA	NA	NA	NA	NA	Nil

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

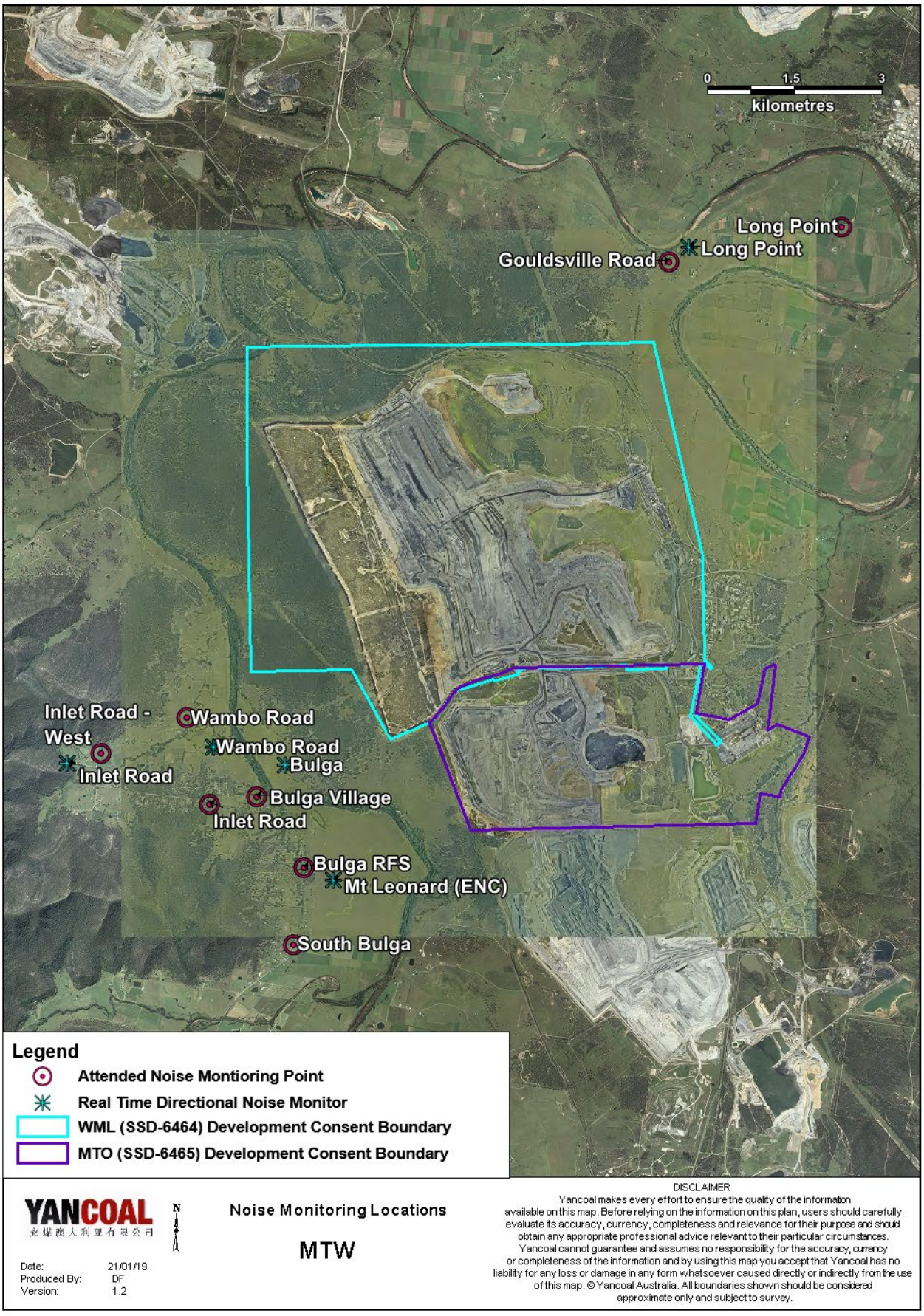


Figure 16: Noise Monitoring Location Plan

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**.

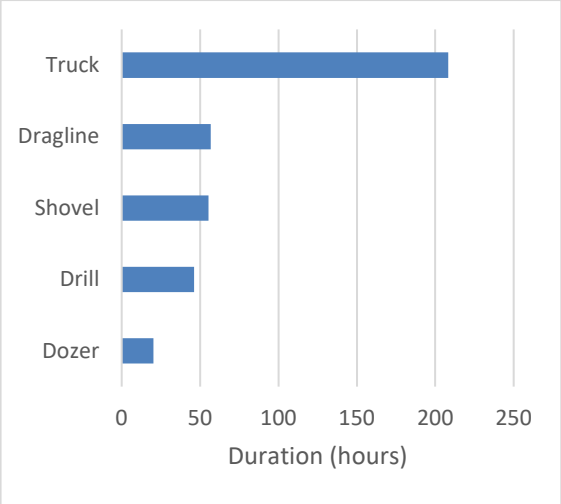
Table 9: Supplementary Attended Noise Monitoring Data – November 2023

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
637	8	4	1.3

6.0 OPERATIONAL DOWNTIME

During November, a total of 386.9 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 2023



7.0 REHABILITATION

During November 2023, 8.27 Ha of land was released, 24.47 Ha was bulk shaped, 20.97 Ha was topsoiled and 22.06 Ha was rehabilitated.

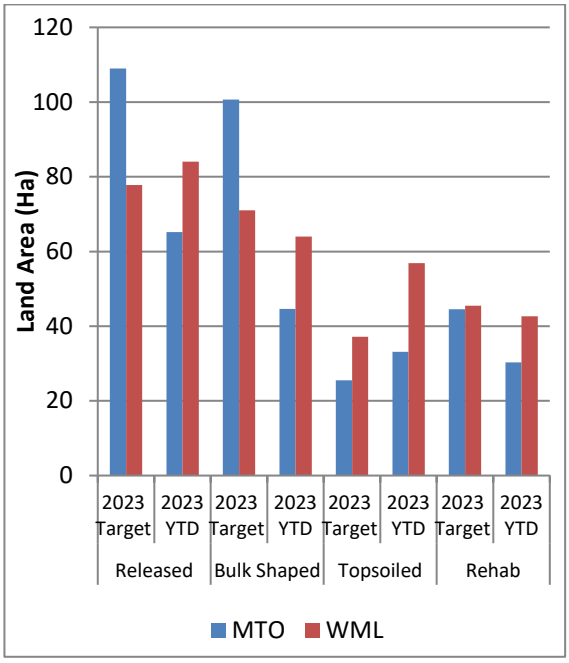


Figure 18: Rehabilitation YTD – November 2023

8.0 ENVIRONMENTAL INCIDENTS

There were no reportable environmental incidents during the reporting period.

9.0 COMPLAINTS

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

Table 10: Complaints Summary YTD

	Noise	Dust	Blast	Lighting	Other	Total
January	1	2	2	3	0	8
February	4	5	4	0	0	13
March	4	6	0	4	0	14
April	2	2	0	0	0	4
May	2	2	1	1	0	6
June	1	1	2	1	1	6
July	1	2	2	1	0	6
August	8	10	4	0	0	22
September	3	26	8	1	1	39
October	4	26	3	3	0	36
November	5	14	5	1	0	25
December						
Total	35	96	31	15	2	178

Appendix A: Meteorological Data

Table 11: Meteorological Data – Charlton Ridge Meteorological Station – November 2023

Date	Air Temperature		Relative Humidity		Wind Direction	Wind Speed	Rainfall
	Maximum (°C)	Minimum (°C)	Maximum (%)	Minimum (%)	Average (°)	Average (m/sec)	total (mm)
1/11/2023	26	12	81	30	127	3.1	0.0
2/11/2023	26	13	87	30	137	3.1	0.0
3/11/2023	28	12	93	37	144	3.1	0.0
4/11/2023	27	15	94	39	153	3.2	0.2
5/11/2023	21	13	100	61	137	3.6	1.2
6/11/2023	23	11	91	41	141	3.0	0.0
7/11/2023	28	10	97	28	151	2.5	0.0
8/11/2023	31	11	99	20	181	2.0	0.0
9/11/2023	31	14	100	33	150	1.9	20.2
10/11/2023	31	13	100	32	167	2.4	0.0
11/11/2023	35	14	99	17	192	2.6	0.0
12/11/2023	38	18	81	22	252	3.6	0.0
13/11/2023	27	15	85	42	124	3.4	0.0
14/11/2023	35	12	91	18	172	3.0	0.0
15/11/2023	35	17	88	18	182	2.9	0.0
16/11/2023	33	17	96	26	147	2.1	1.4
17/11/2023	25	13	100	35	157	3.7	3.2
18/11/2023	27	11	96	32	139	2.9	0.0
19/11/2023	33	11	89	19	146	2.3	0.0
20/11/2023	22	16	97	64	145	1.7	2.6
21/11/2023	28	15	88	44	145	2.2	0.0
22/11/2023	27	16	91	48	143	3.0	0.0
23/11/2023	27	17	89	50	159	3.2	0.0
24/11/2023	26	16	100	55	137	2.5	7.8
25/11/2023	22	16	100	77	145	1.6	7.8
26/11/2023	33	17	90	25	271	3.4	0.2
27/11/2023	30	14	100	41	161	2.7	12.6
28/11/2023	25	17	100	71	136	2.7	3.8
29/11/2023	30	16	100	44	156	2.0	5.4
30/11/2023	30	16	100	25	272	3.4	0.0