Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

January 2022

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Revision History

Version No.	Version Details	Document Status	Date
1.0	**Environment and Community Advisor**	**Final**	**20/05/2022**

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 January to 31 January 2022.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

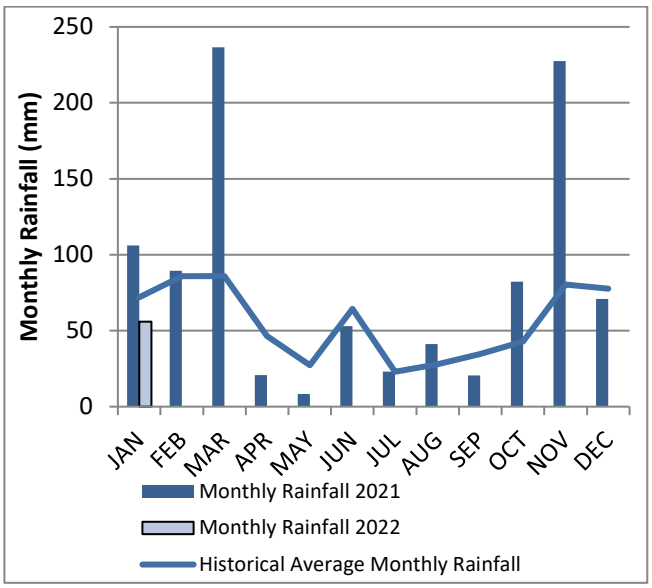
Meteorological data is collected at MTW's 'Charlton Ridge' meteorological station (refer to **Figure 3**: Air Quality Monitoring Locations).

2.1.1 Rainfall

Rainfall for the reporting period is summarised in **Table 1**. The year-to-date monthly rainfall totals, 2022 monthly rainfall totals and historical average monthly rainfall trend are shown in **Figure 1**.

Table 1: Monthly Rainfall MTW

2022	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
January	56	56



Note: The historical average monthly rainfall is calculated from 2007 to 2021 monthly totals

Figure 1: Rainfall Trend YTD

2.1.2 Wind Speed and Direction

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

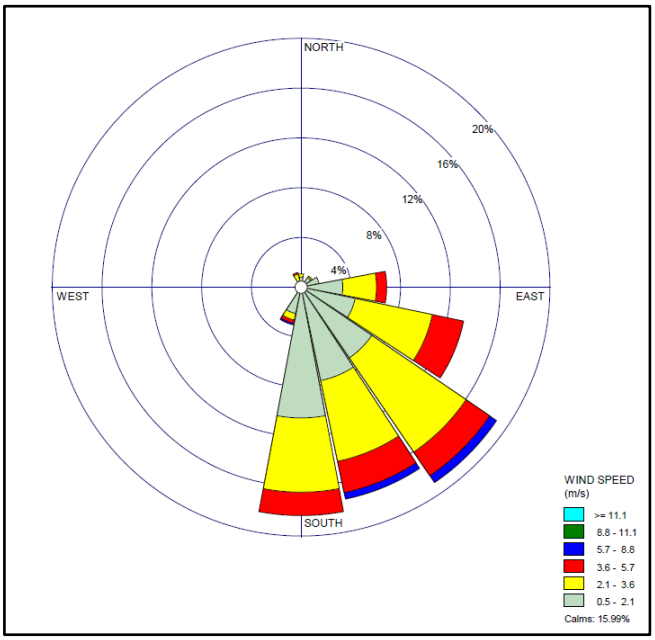


Figure 2: Charlton Ridge Wind Rose – January 2022

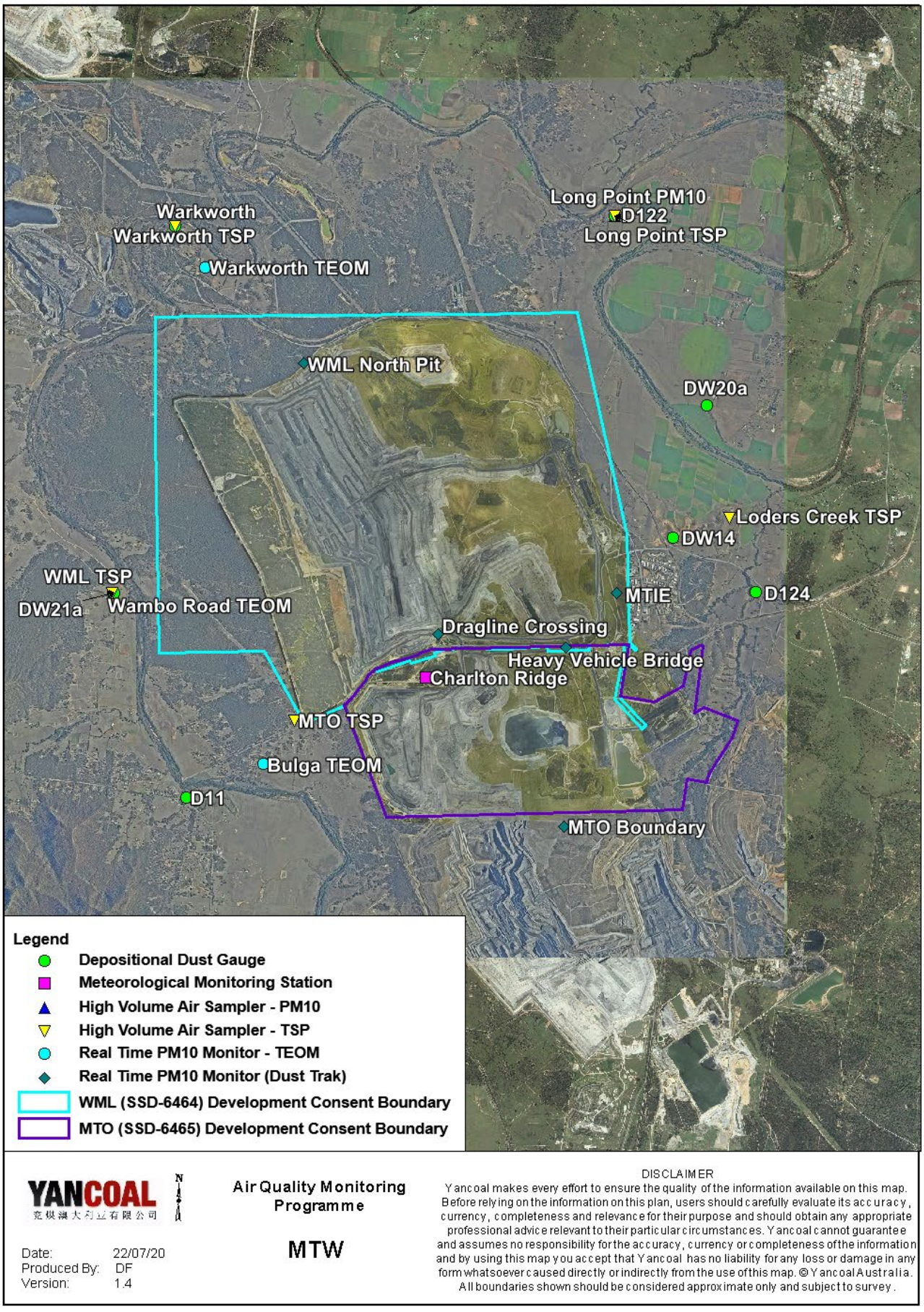


Figure 3: Air Quality Monitoring Locations

2.2 Depositional Dust

To monitor air quality, MTW operates and maintains a network of seven depositional dust gauges, situated on private and mine owned land surrounding MTW.

Figure 4 displays insoluble solids results from depositional dust gauges during the reporting period compared against the year-to-date average and the annual impact assessment criteria.

An annual assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2022 Annual Review Report.

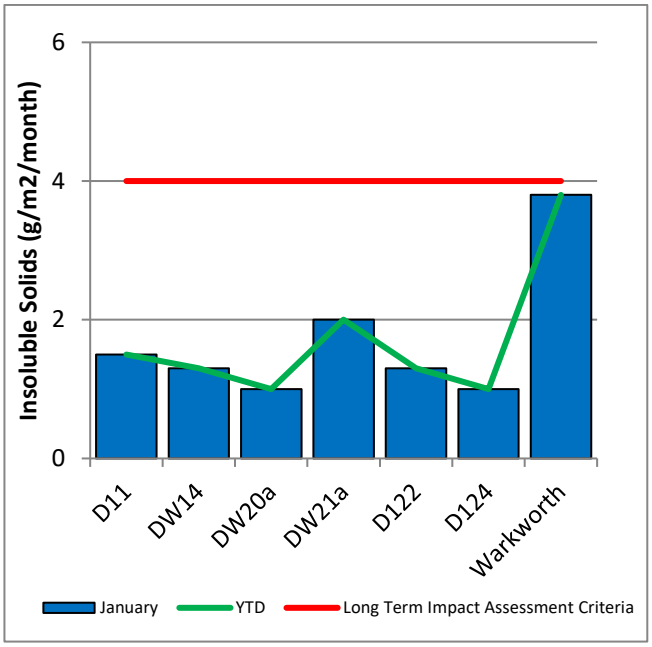


Figure 4: Depositional Dust – January 2022

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.

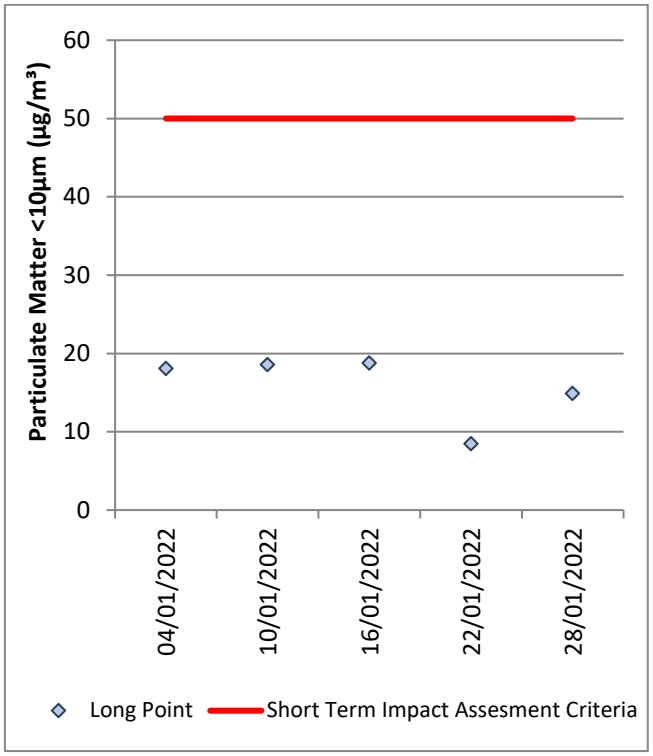


Figure 5: Individual PM10 Results – January 2022

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 2022 Annual Review Report.

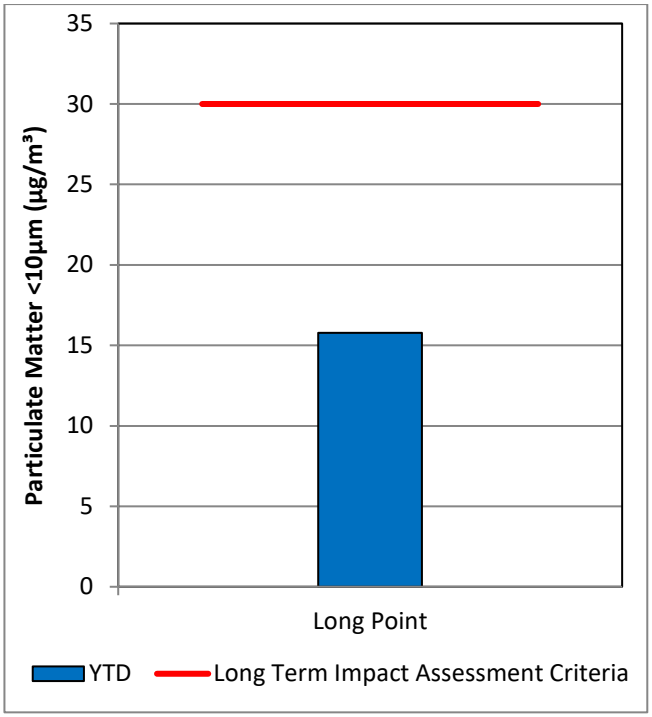


Figure 6: Annual Average PM_{10} – January 2022

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 2022 Annual Review Report.

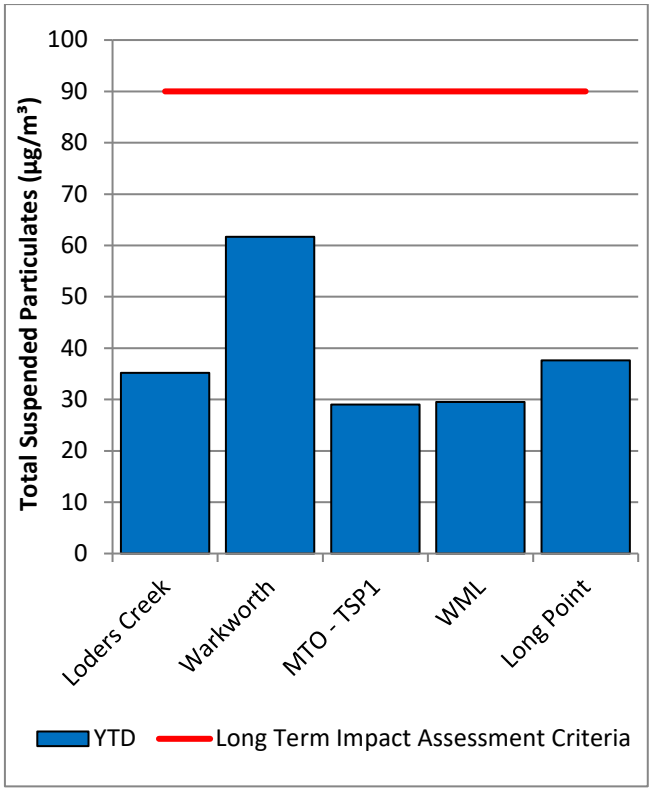


Figure 7: Annual Average Total Suspended Particulates – January 2022

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 on 10 and 11 January 2022 from the Bulga monitor, 17 January from the Wambo Road Monitor and 9 and 10 and 27 and 28 January from the Warkworth Monitor due to equipment issues.

2.3.4 Real Time Alarms for Air Quality

During January, the real time monitoring system generated 18 automated air quality related alerts, including 6 alerts for adverse meteorological conditions and 12 alerts for elevated PM_{10} levels.

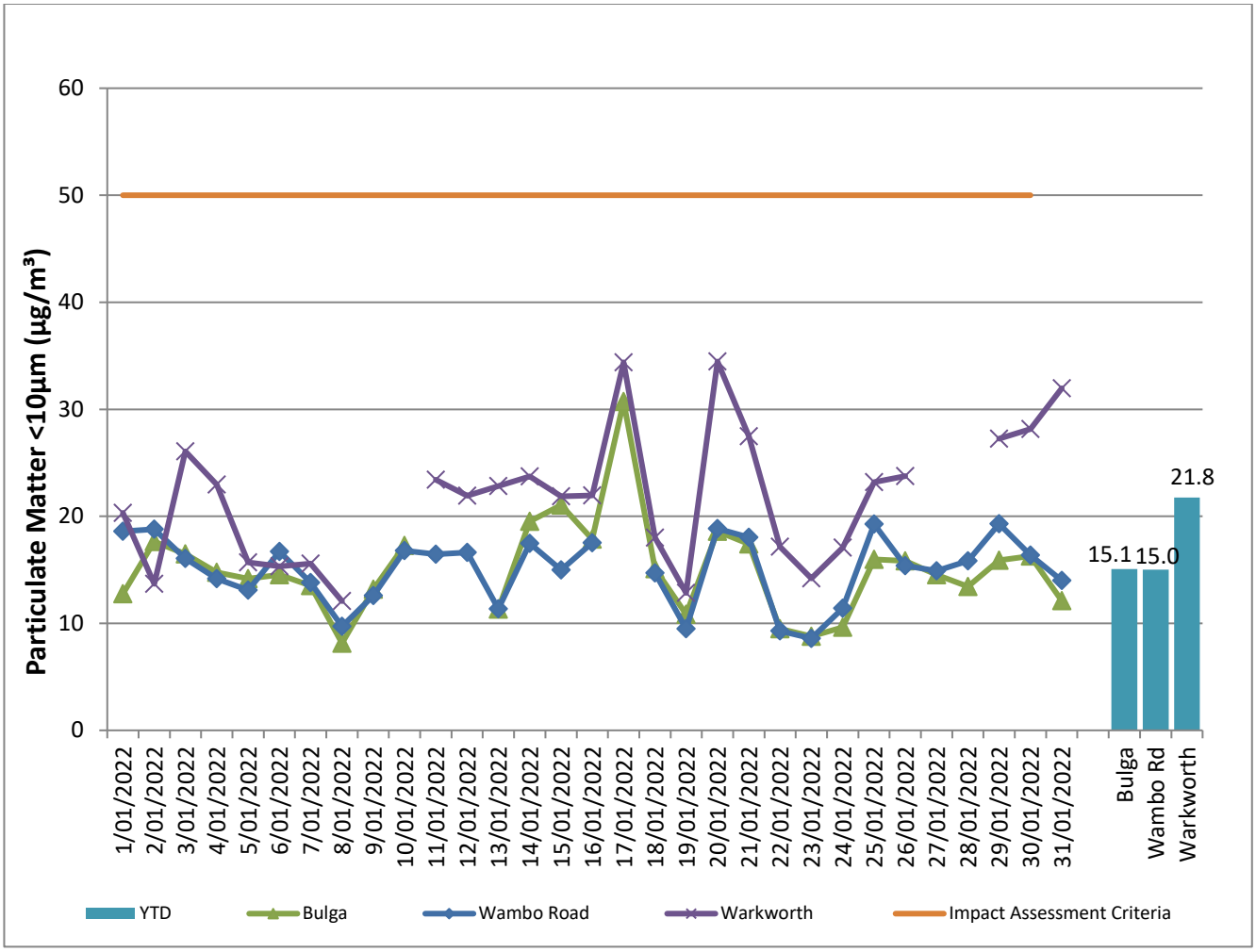


Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – January

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 March 2022 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 12 January to 21 January and on 25 and 27 January 2022 discharging a total of 179.2ML.

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 March 2022 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 January 2022, 17 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 the Bulga Village monitoring location. No blast exceeded the 5mm/s 5% criteria for ground vibration.

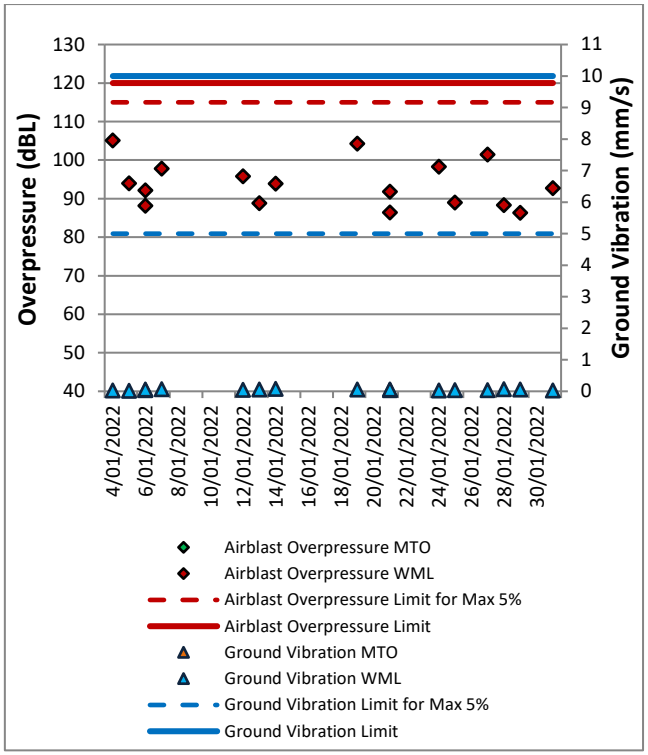


Figure 9: Abbey Green Blast Monitoring Results – January 2022

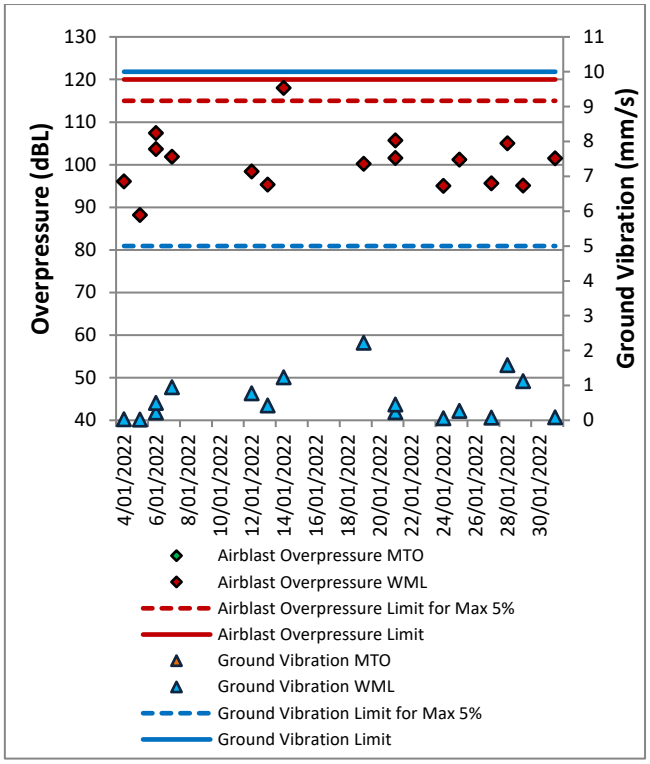


Figure 10: Bulga Village Blast Monitoring Results – January 2022

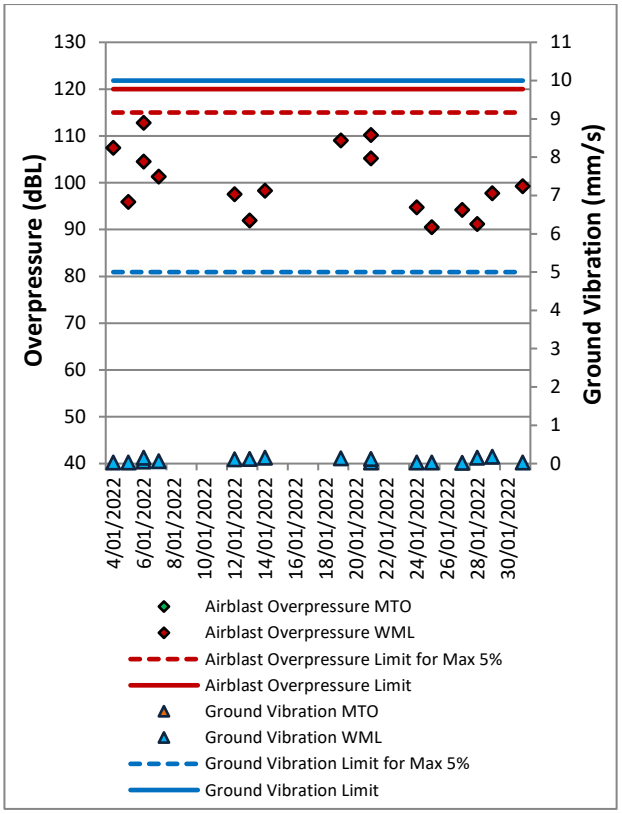


Figure 11: MTIE Blast Monitoring Results – January 2022

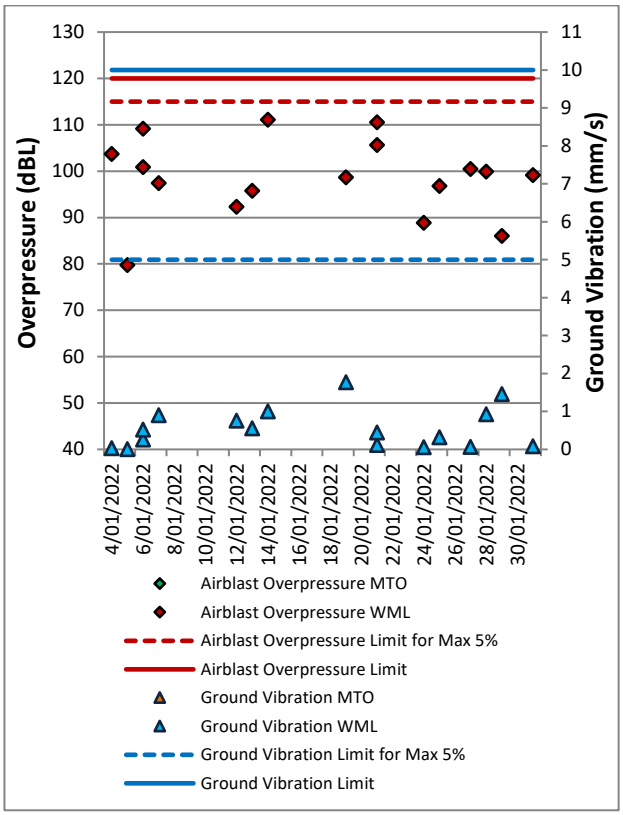


Figure 12: Wollemi Peak Road Blast Monitoring Results – January 2022

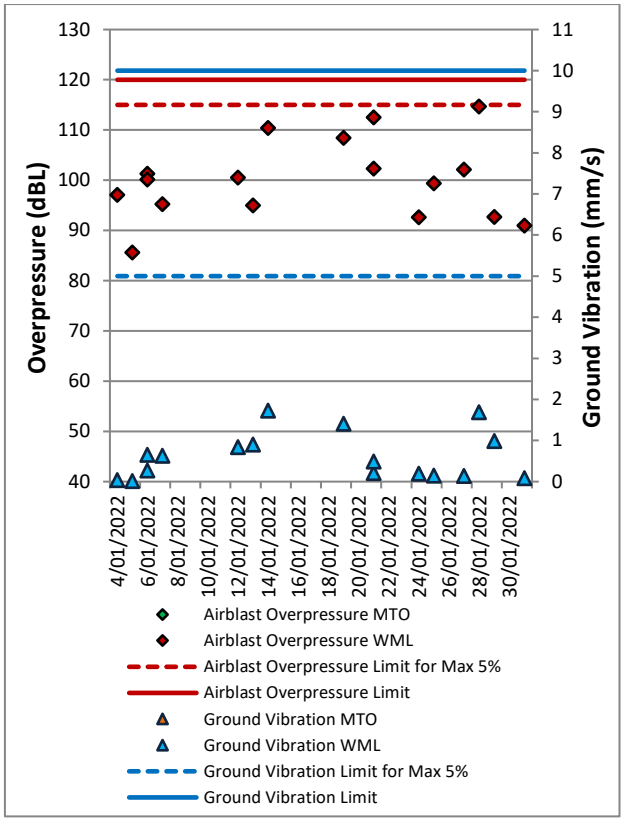


Figure 13: Wambo Road Blast Monitoring Results – January 2022

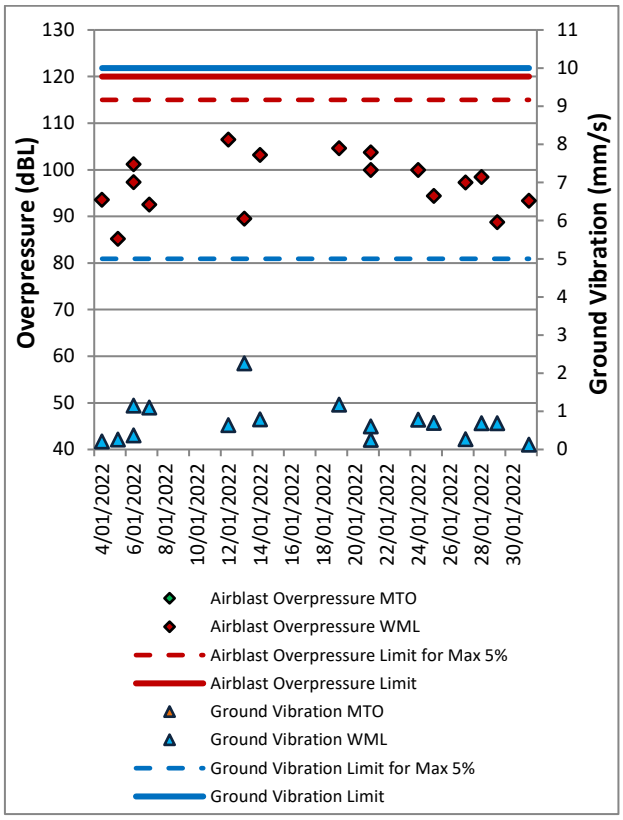


Figure 14: Warkworth Blast Monitoring Results – January 2022

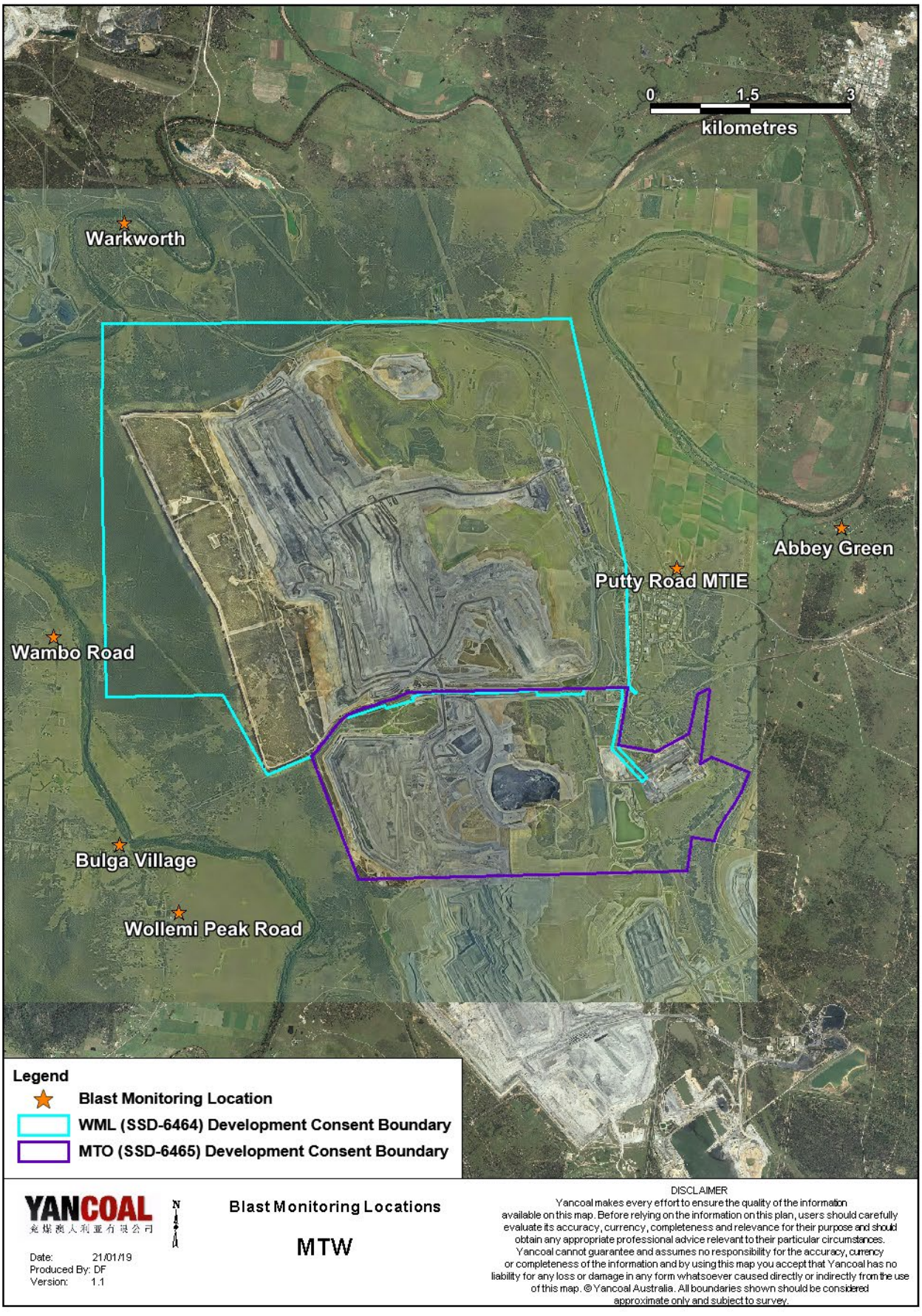


Figure 15: MTW Blast Monitoring Location Plan

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 17 January 2022. 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 – January 2022

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	17/01/2022 21:44	0.2	E	37	Yes	IA	NA
Bulga Village	17/01/2022 23:50	2.6	D	38	Yes	IA	NA
Gouldsville	17/01/2022 21:59	0.2	F	38	Yes	<25	NA
Inlet Rd	17/01/2022 22:54	2.5	D	37	Yes	<25	NA
Inlet Rd West	17/01/2022 23:20	2.3	D	35	Yes	<25	NA
Long Point	17/01/2022 21:00	1.6	E	35	Yes	IA	NA
South Bulga	17/01/2022 22:08	0.3	F	35	Yes	IA	NA
Wambo Road	18/01/2022 0:14	1.8	E	38	Yes	IA	NA

Notes:
1. Noise criteria 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. 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 – January 2022

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	17/01/2022 21:44	0.2	E	47	Yes	IA	NA
Bulga Village	17/01/2022 23:50	2.6	D	48	Yes	IA	NA
Gouldsville	17/01/2022 21:59	0.2	F	48	Yes	<25	NA
Inlet Rd	17/01/2022 22:54	2.5	D	47	Yes	<25	NA
Inlet Rd West	17/01/2022 23:20	2.3	D	45	Yes	<25	NA
Long Point	17/01/2022 21:00	1.6	E	45	Yes	IA	NA
South Bulga	17/01/2022 22:08	0.3	F	45	Yes	IA	NA
Wambo Road	18/01/2022 0:14	1.8	E	48	Yes	IA	NA

Notes:
1. Noise criteria 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. 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. 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 – January 2022

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	17/01/2022 21:44	0.2	E	37	Yes	<25	NA
Bulga Village	17/01/2022 23:50	2.6	D	38	Yes	IA	NA
Gouldsville	17/01/2022 21:59	0.2	F	35	Yes	IA	NA
Inlet Rd	17/01/2022 22:54	2.5	D	37	Yes	27	NA
Inlet Rd West	17/01/2022 23:20	2.3	D	35	Yes	<25	NA
Long Point	17/01/2022 21:00	1.6	E	35	Yes	IA	NA
South Bulga	17/01/2022 22:08	0.3	F	36	Yes	IA	NA
Wambo Road	18/01/2022 0:14	1.8	E	38	Yes	IA	NA

Notes:
1. Noise criteria 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. 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 – January 2022

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	17/01/2022 21:44	0.2	E	47	Yes	<25	NA
Bulga Village	17/01/2022 23:50	2.6	D	48	Yes	IA	NA
Gouldsville	17/01/2022 21:59	0.2	F	45	Yes	IA	NA
Inlet Rd	17/01/2022 22:54	2.5	D	47	Yes	34	NA
Inlet Rd West	17/01/2022 23:20	2.3	D	45	Yes	26	NA
Long Point	17/01/2022 21:00	1.6	E	45	Yes	IA	NA
South Bulga	17/01/2022 22:08	0.3	F	46	Yes	IA	NA
Wambo Road	18/01/2022 0:14	1.8	E	48	Yes	IA	NA

Notes:
1. Noise criteria 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. 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.

5.1.4 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 – January 2022

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	17/01/2022 21:44	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	17/01/2022 23:50	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	17/01/2022 21:59	<25	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	17/01/2022 22:54	<25	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	17/01/2022 23:20	<25	Yes	No	No	NA	No	NA	Nil	NA
Long Point	17/01/2022 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	17/01/2022 22:08	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	18/01/2022 0:14	IA	Yes	No	No	NA	No	NA	Nil	NA

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 – January 2022

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	17/01/2022 21:44	<25	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	17/01/2022 23:50	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	17/01/2022 21:59	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	17/01/2022 22:54	27	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	17/01/2022 23:20	<25	Yes	No	No	NA	No	NA	Nil	NA
Long Point	17/01/2022 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	17/01/2022 22:08	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	18/01/2022 0:14	IA	Yes	No	No	NA	No	NA	Nil	NA

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

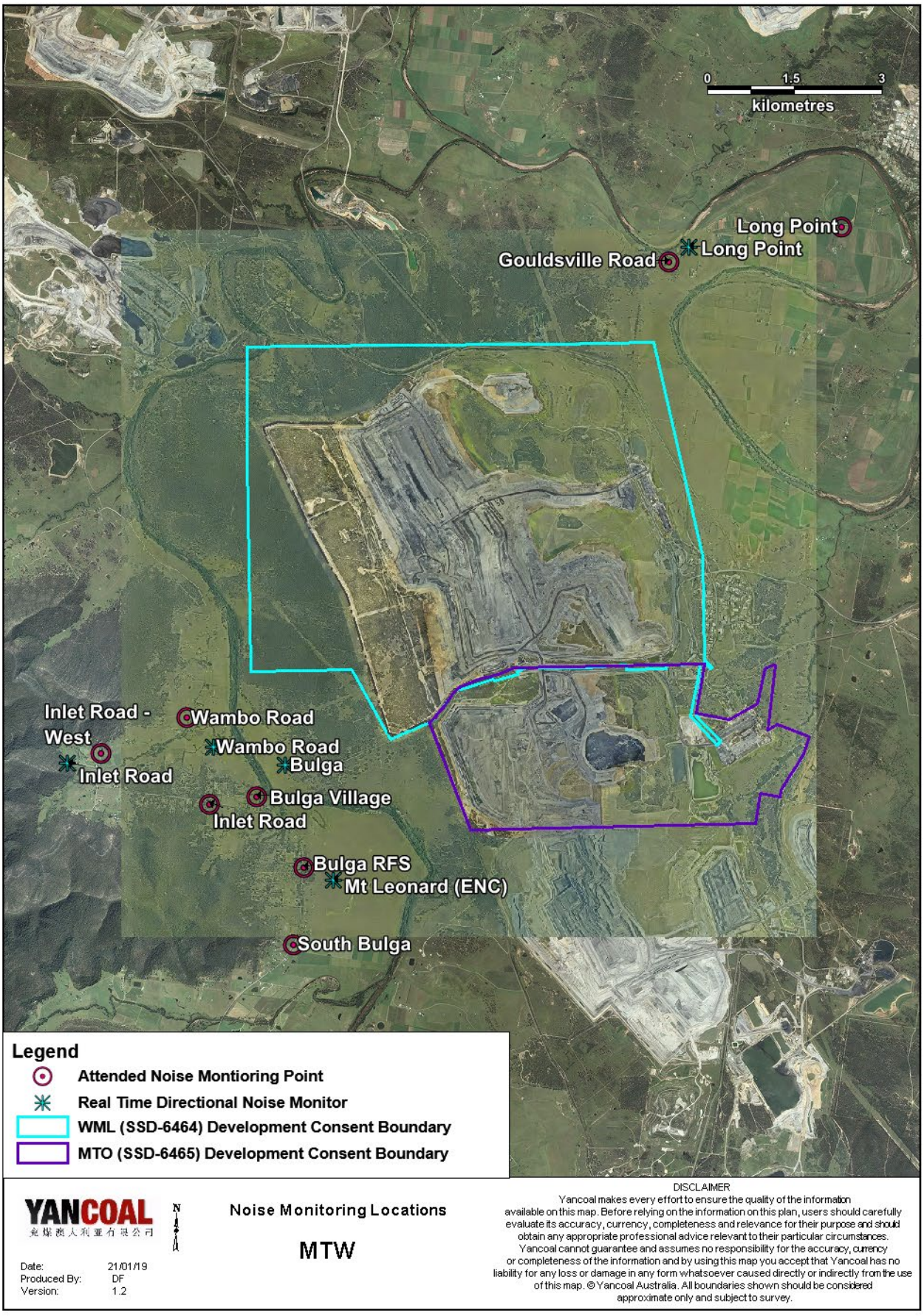


Figure 16: Noise Monitoring Location Plan

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 January are provided in **Table 9**.

Table 9: Supplementary Attended Noise Monitoring Data – January 2022

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
520	1	1	0.2

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

6.0 OPERATIONAL DOWNTIME

During January, a total of 88 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**.

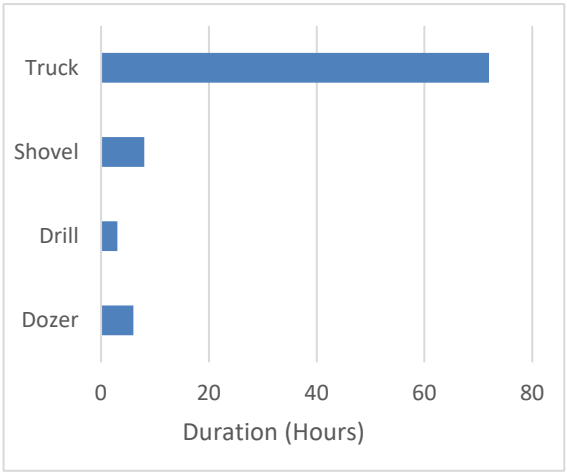


Figure 17: Operational Downtime by Equipment Type – January 2022

7.0 REHABILITATION

During January 2022 2.54 Ha of land was released and 2.54 Ha was bulk shaped, no land was topsoiled, composted or rehabilitated.

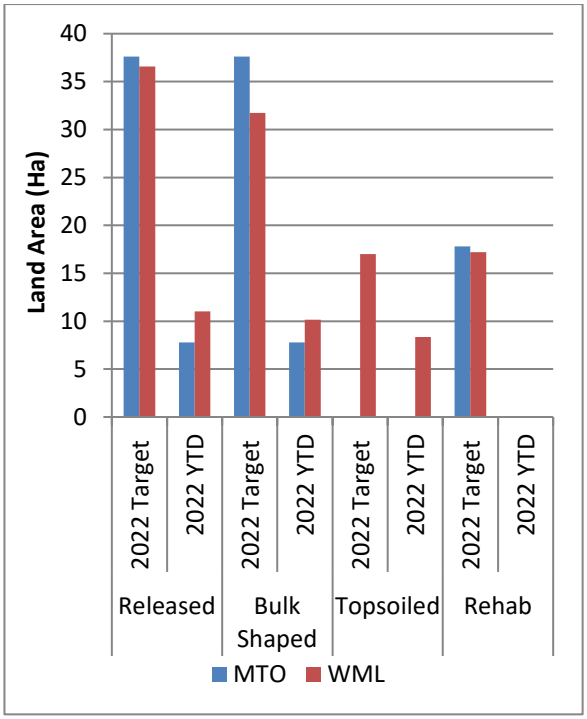


Figure 18: Rehabilitation YTD - January 2022

8.0 ENVIRONMENTAL INCIDENTS

There were no environmental incidents recorded during the reporting period.

9.0 COMPLAINTS

7 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	2	1	4	0	0	7
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						
Total	2	1	4	0	0	7

Appendix A: Meteorological Data

Table 11: Meteorological Data – Charlton Ridge Meteorological Station – January 2022

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)
1/01/2022	30	12	91	41	132	1.1	0.0
2/01/2022	33	13	98	30	137	1.3	0.0
3/01/2022	30	16	86	36	143	2.6	0.0
4/01/2022	30	14	86	41	149	3.0	0.0
5/01/2022	26	16	98	67	156	2.8	11.8
6/01/2022	29	16	95	56	117	3.3	0.2
7/01/2022	32	17	93	48	123	2.2	0.0
8/01/2022	32	15	99	45	175	2.0	8.6
9/01/2022	29	15	98	58	165	2.7	8.6
10/01/2022	29	18	92	60	168	0.9	0.4
11/01/2022	30	17	95	54	171	1.4	1.0
12/01/2022	28	16	96	54	143	1.9	0.0
13/01/2022	30	15	90	39	144	2.5	0.0
14/01/2022	30	15	90	47	144	1.0	0.0
15/01/2022	34	16	97	36	199	1.1	7.8
16/01/2022	32	14	99	49	187	1.5	0.2
17/01/2022	35	16	94	36	170	0.8	1.4
18/01/2022	26	16	96	66	173	1.1	1.4
19/01/2022	21	14	99	68	166	3.9	14.4
20/01/2022	26	13	87	41	159	4.9	0.0
21/01/2022	27	11	89	38	144	3.0	0.0
22/01/2022	28	12	93	36	156	2.3	0.2
23/01/2022	27	13	89	46	155	1.4	0.0
24/01/2022	27	13	94	49	145	1.2	0.0
25/01/2022	29	12	94	46	138	1.2	0.0
26/01/2022	27	14	79	48	127	2.0	0.0
27/01/2022	30	12	86	39	137	2.2	0.0
28/01/2022	33	14	89	41	152	1.3	0.0
29/01/2022	34	15	92	33	148	1.4	0.0
30/01/2022	32	17	89	39	129	2.0	0.0
31/01/2022	35	15	91	34	160	1.0	0.0

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