YANCOAL
兖煤澳大利亚有限公司
MT THORLEY WARKWORTH

Mount Thorley Warkworth

2021 Annual Review

Name of Operations	Mount Thorley Warkworth
Name of Operator	Coal & Allied (NSW) Pty Ltd (wholly owned subsidiary of Yancoal Australia Ltd)
Development consent /project approval	SSD-6464 & SSD-6465
Name of holder of development consent/project approval	Warkworth Mining Ltd Mt Thorley Operations Pty Ltd
Mining Lease #	Contained within Section 3.1 of this report
Name of holder of mining lease	Warkworth Mining Ltd Mount Thorley Operations Pty Ltd
Water Licence #	Contained within Section 3.1 of this report
Name of holder of water licence	Contained within Section 3.1 of this report
MOP/RMP start date	30/11/2021
MOP/RMP end date	02/07/2022
Annual Review Start Date	01/01/2021
Annual Review End Date	31/12/2021

I, Gary Mulhearn, certify that this audit report is a true and accurate record of the compliance status of Mount Thorley Warkworth for the period 1 January 2021 to 31 December 2021 and that I am authorised to make this statement on behalf of Coal & Allied (NSW) Pty Ltd.

Note.

a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

b) The Crimes Act 1900 contains other offences relating to the false and misleading information: section 192G (Intention to defraud by false or misleading statement- maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents – maximum penalty 2 years imprisonment or $22,000, or both).

Name of Authorised Reporting Officer	Mr Gary Mulhearn
Title of Authorised Reporting Officer	Environment and Community Manager
Signature of Authorised Reporting Officer	
Date	2 September 2022

Executive Summary

Mount Thorley Warkworth (MTW) is an integrated operation of two open cut coal mines, Warkworth Mining Limited (WML) and Mount Thorley Operations (MTO). This Annual Review reports on the environmental performance of MTW for the period 1 January 2021 to 31 December 2021.

This report has been prepared in accordance with conditions of the development consents and Mining Leases (ML) held by MTW which require a report of the operation's environmental performance to be provided on an annual basis. The structure of the 2021 Annual Review aligns with the NSW Department of Planning and Environment (DPE) *Post-approval requirements for State significant mining developments – Annual Review Guideline* (October 2015).

MTW produced 16.51 million tonnes of run-of-mine (ROM) coal during 2021, and 11.212 million tonnes of saleable coal, against an approved ROM coal production rate of 28 million tonnes per annum (mtpa).

Noise

There were no non-compliances recorded against MTW's consented noise limits. There was an increase (from 72 to 106) in the number of supplementary attended noise measurements which exceeded the internal trigger levels for corrective action compared to 2020. A total of up to 907 hours of mine stoppages were recorded due to proactive and reactive measures to minimise noise and ensure compliance with noise criteria.

Blasting

During the reporting period 224 blast events were initiated at MTW. There were no non compliances against blasting conditions in MTWs development consents and licence conditions.

Air Quality

During 2021, MTW complied with all short term and annual average air quality criteria. A total of 1,459 hours of mine stoppage was recorded following implementation of proactive and reactive measures to minimise dust and ensure compliance with air quality criteria.

Heritage

Aboriginal and historic heritage matters continued to be managed in accordance with the MTW Aboriginal Heritage Management Plan (AHMP) and Historic Heritage Management Plan (HHMP). No aboriginal heritage assessments or salvage programs were conducted at MTW in 2021.

Annual AHMP and HHMP compliance inspections were conducted during the 2021 reporting period by a consultant archaeologist assisted by internal mine site personnel, representatives of the Aboriginal community and representatives from the sites Community Heritage Advisory Group (CHAG).

There were no incidents or any unauthorised disturbance to any heritage sites at MTW during the reporting period.

Surface Water

2021 was a wetter than average year with a total of 979.6 mm rainfall recorded at MTW's Charlton Ridge Meteorological station. The average annual rainfall at Charlton Ridge is 668mm, as calculated from 2007 to 2021 annual totals.

Construction of sediment water management structures for the western advancing pre-strip at Warkworth was completed in quarter one 2021. These structures were designed in accordance with the NSW Blue Book, *Managing Urban Stormwater: Soils and Construction, Volume 2E Mines and Quarries*. Remote boundary monitoring systems were installed on the additional new pre strip sediment dams (54N and 55N). Construction of the Warkworth North Pit North drainage upgrade works was completed during the reporting period to improve water management and mitigate the risk of unauthorised water releases from site.

There were four reportable water related incidents during the reporting period that occurred on 4 January, 19 March, 12 November and 26 November 2021. Further details on the incidents and the actions taken by MTW are provided in **Section 6.7.1 and Section 10**.

Groundwater

Groundwater monitoring activities were undertaken in 2021 in accordance with the MTW Water Management Plan and groundwater monitoring programme. The monitoring results are used to establish and monitor trends in physical and geochemical parameters of surrounding groundwater potentially influenced by mining.

Groundwater monitoring data is reviewed on a quarterly basis and is included in the March, June, September and December Monthly Environmental Monitoring Reports, available at https://www.mtwcoal.com.au/page/environment/environmental-monitoring/

Visual Amenity

Shade cloth was attached to the existing fence along Putty Road in July 2021 as a visual amenity mitigation measure. This visual screen fencing is an interim measure prior to the establishment of vegetation. Vegetation plantings were undertaken in 2020 to infill between existing trees/shrubs. Slashing works were also undertaken in 2021 along Putty Road and the Golden Highway, improving visual amenity.

Rehabilitation and Land Management

A total of 44.6ha of new rehabilitation was completed during 2021 against a Mining Operations Plan (MOP) target of 35.0ha. A further 59.1ha of Stage 2 rehabilitation was seeded with the target vegetation community seed mixes in 2021. Total disturbance undertaken was 53.6ha, which was higher than the 2021 MOP projection of 40.6ha.

The net rehabilitation progress (i.e. rehabilitation minus rehabilitation disturbance) for the current MOP period (2015 to 2021) is 442.3ha, which is 20.4ha higher than the MOP target of 421.9ha. The net rehabilitation exceeds the MOP forecast following completion of the Stage 2 rehabilitation

undertaken in 2021. Cumulative new disturbance over the MOP period is 471.7ha which is slightly above the MOP forecast of 465.7ha for the same period.

Biodiversity and Offset Management

Restoration of the Warkworth Sands Woodland vegetation community continued in the Northern Biodiversity Area, with 1,500 tube stock planted. Restoration activities for the Central Hunter Grey Box – Ironbark Woodland and River Oak Forest continued in the Southern Biodiversity Area, with 15,000 tube stock planted. Planting at the Goulburn River Biodiversity area to increase the suitability of habitat for the Regent Honeyeater continued with 12,000 infill tube stock planted into the cleared areas of Yellow Box – Grey Box – Red Gum Grassy Woodland and riparian woodland areas. The annual Rapid Condition Assessments were undertaken across all Biodiversity Areas in 2021.

Weed control, vertebrate pest management activities, seed collection, track maintenance, waste removal and fence repairs were conducted during 2021 across all Biodiversity Areas in accordance with the Offset Management Plans.

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1 STATEMENT OF COMPLIANCE

A Statement of Compliance against the relevant approvals is provided in **Table 1.1**. **Table 1.2** provides a brief summary of the non-compliances and a reference to where these are addressed within this Annual Review.

TABLE 1.1 STATEMENT OF COMPLIANCE

Approval	Were all conditions complied with?
DA SSD-6465 (MTO)	No
DA SSD-6464 (WML)	Yes

TABLE 1.2 NON COMPLIANCES

Relevant approval	Condition number	Condition description (summary)	Compliance status	Section in this Annual Review it is addressed.
SSD-6465 (MTO)	Schedule 3 Condition 25	Water Discharge	Non-compliant	10

TABLE 1.3 COMPLIANCE STATUS KEY FOR TABLE 1.2

Risk level	Colour Code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with : Potential for serious environmental consequences, but is unlikely to occur; or Potential for moderate environmental consequences, but is unlikely to occur
Low	Non-compliant	Non-compliance with : Potential for moderate environmental consequences, but is unlikely to occur; or Potential for low environmental consequences, but is unlikely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

Source: NSW Government Post-approval requirements for State significant mining developments – Annual Review Guideline (October 2015).

2 INTRODUCTION

Mount Thorley Warkworth Coal Mine (MTW), is an integrated operation consisting of Warkworth Mining Limited (WML) and Mount Thorley Operations (MTO) (**Figure 1**) situated 14 km southwest of Singleton, in the Upper Hunter Valley region of NSW. MTW is managed and operated by Coal & Allied (NSW) Pty Ltd, a wholly owned subsidiary of Yancoal Australia Limited (YAL). A summary of MTW tenements is shown in **Figure 2.**

2.1 Scope

This Annual Review (AR) covers the twelve-month reporting period from **1 January 2021 to 31 December 2021.**

This report summarises the environmental performance of MTW in accordance with conditions of the development consents and Mining Leases (ML) held by site. The structure of this 2021 Annual Review aligns with the *DPE Post-approval requirements for State significant mining developments – Annual Review Guideline* (October 2015).

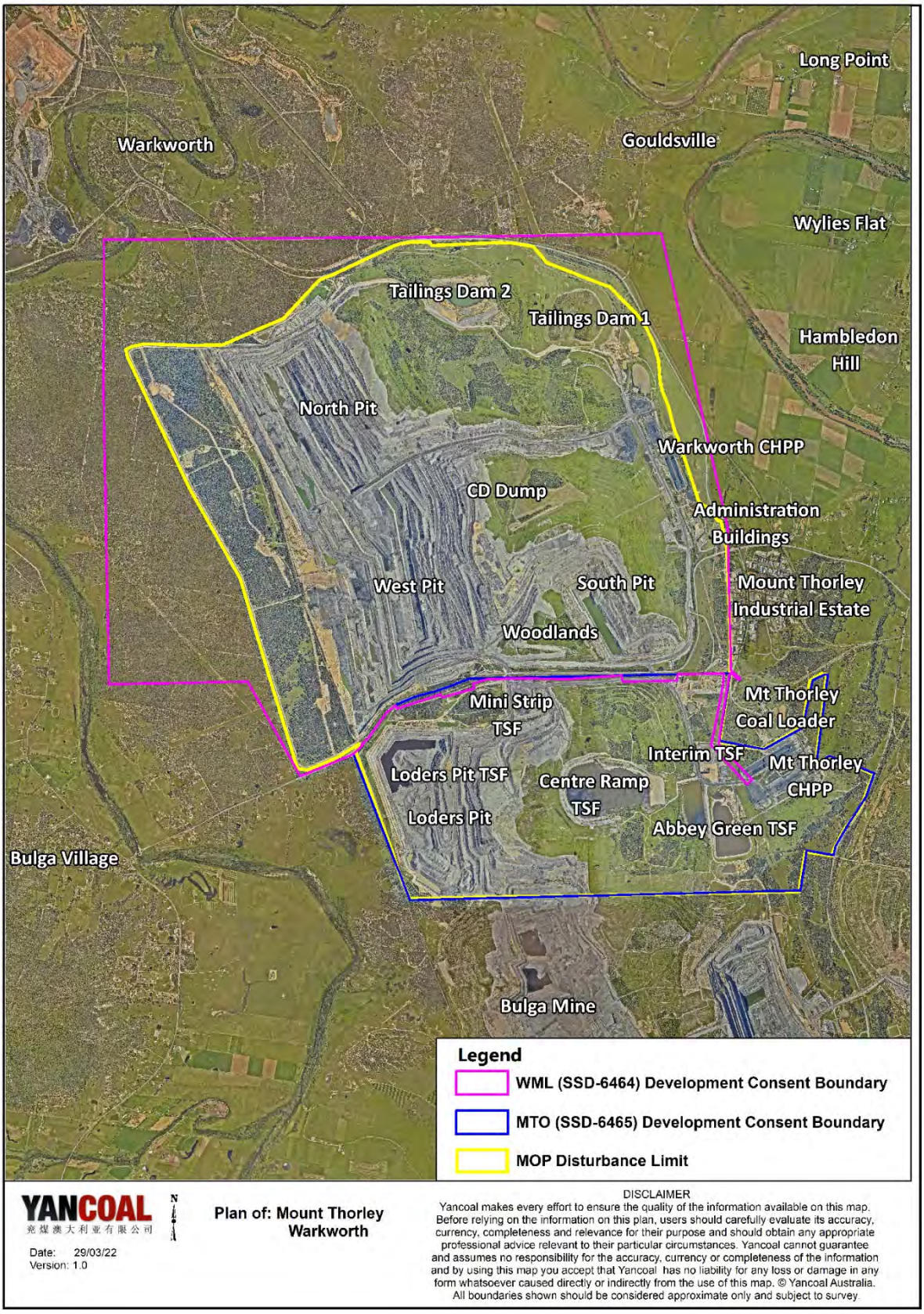


FIGURE 1: MTW SITE LAYOUT AND LOCALITY PLAN

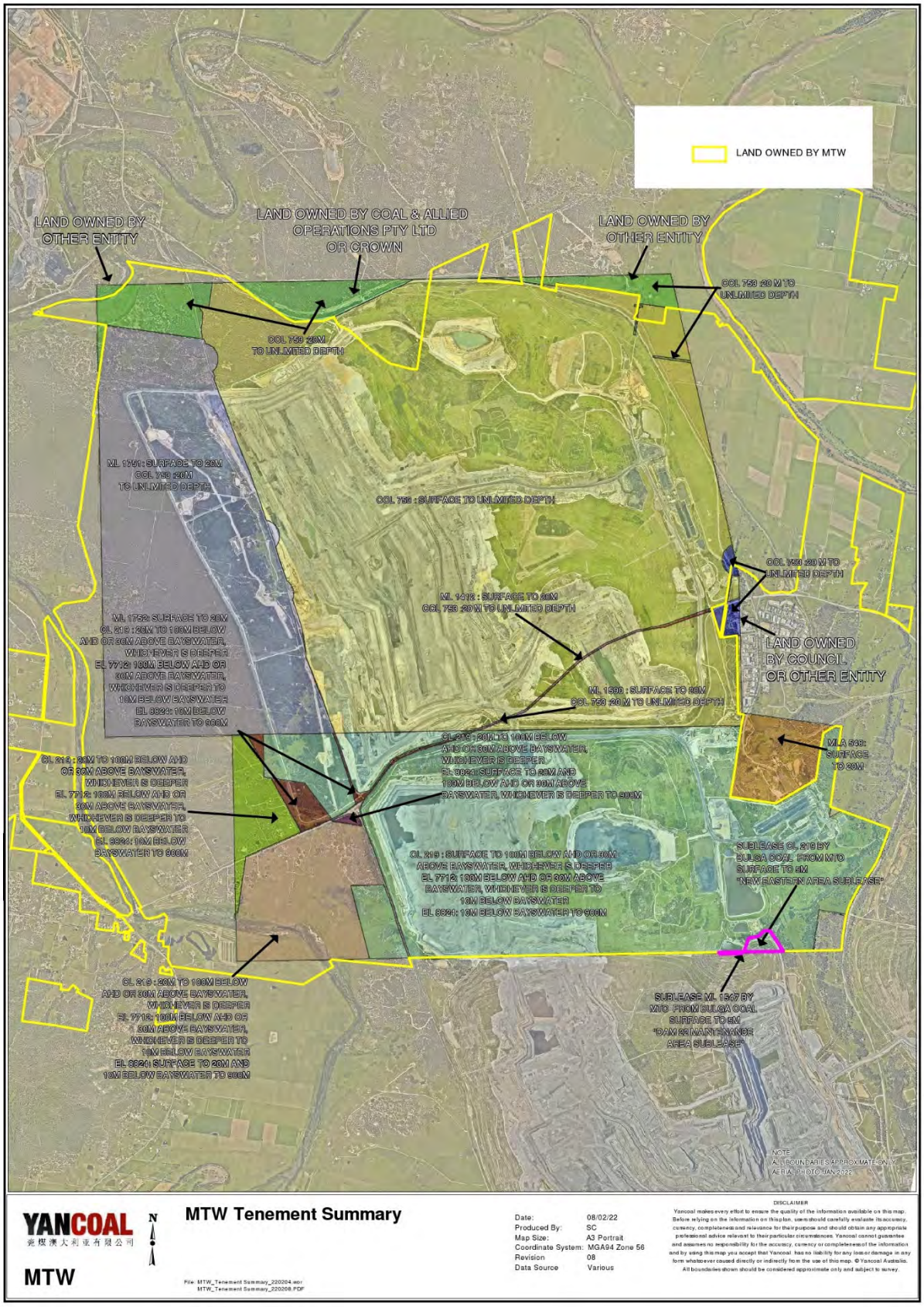


FIGURE 2: MTW TENEMENT SUMMARY

2.2 Mine Contacts

Table 2.1 outlines the contact details for site personnel responsible at Mount Thorley Warkworth.

TABLE 2.1 SITE PERSONNEL

Position	Name	Contact Number
General Manager – MTW	David Bennett	(02) 6570 1500
Environment & Community Manager - MTW	Gary Mulhearn	(02) 6570 1734

3 APPROVALS

3.1 Approvals, Leases and Licences

3.1.1 Current Approvals

The status of MTO and WML development consents, licenses and relevant approvals at 31 December 2021 are summarised in **Table 3.1** to **Table 3.6**.

TABLE 3.1 OPERATIONS APPROVALS- WARKWORTH

Approval Number	Description	Authority	Date of Approval / Variations
SSD-6464	Warkworth Continuation Project development consent	DPE	26/11/2015
EPBC 2009/5081	Approval under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) to extend the existing Warkworth Coal Mine over an additional 705 hectares of land at Warkworth NSW including associated modifications to existing mine infrastructure	Department of Agriculture, Water and the Environment (DAWE)	9/8/2012 – 31/3/2033 (varied on 14/10/2018)
EPBC 2002/629	Approval under the EPBC Act to construct and operate an open cut coal mine extension at the Warkworth Coal Mine	DAWE	18/2/2004 – 25/02/2039 (varied on 6/4/2004, 24/5/2004, 19/11/2004, 13/7/2012, 14/10/2018)

TABLE 3.2 OPERATIONS APPROVALS - MOUNT THORLEY

Approval Number	Description	Authority	Date of Approval / Variations
SSD-6465	Mount Thorley Continuation Project development consent	DPE	26/11/2015

TABLE 3.3 LICENCES AND PERMITS

Licence No	Description	Authority	Date of Approval / Variations
Warkworth			
EPL 1376	Environment Protection Licence	EPA	25/10/2021
5061122	Radiation Licence	EPA	29/06/2021
XSTR100160	Licence to Store – Explosives Act	WorkCover NSW	18/08/2019
Mount Thorley			
EPL 24	Environment Protection Licence	EPA	24/11/2016
EPL 1976	Environment Protection Licence	EPA	25/10/2021
5061110	Radiation Licence	EPA	11/08/2021

Note: Environment Protection Licences remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

TABLE 3.4 MINING TENEMENTS

Mining tenement	Type	Purpose	Status	Grant Date	Expiry Date
Warkworth Mining Ltd					
CCL 753	Consolidated Coal Lease	Prospecting and Mining Coal	Granted	23/05/1990	17/02/2023
ML 1412	Mining Lease	Prospecting and Mining Coal	Renewal Pending	11/01/1997	10/01/2018
ML 1590	Mining Lease	Prospecting and Mining Coal	Granted	27/02/2007	26/02/2028
ML 1751	Mining Lease	Prospecting, Mining Coal and Purposes	Granted	17/03/2017	17/03/2038

Mining tenement	Type	Purpose	Status	Grant Date	Expiry Date
Mount Thorley Operations Pty Ltd					
CL 219	Coal Lease	Prospecting and Mining Coal	Granted	23/09/1981	23/09/2023
(Part) ML 1547	Sub-Lease	Mining Purposes	Registered	The part sublease area known as the "Dam 22 Long Term Mining Sublease" was registered on 10th January 2018 for a term until 3 April 2025.	03/04/2025
ML 1752	Mining Lease	Prospecting, Mining Coal and Purposes	Granted	17/03/2017	17/03/2038
EL 7712	Exploration Licence	Prospecting Coal	Renewal Pending	23/2/2011	23/02/2026
EL 8824	Exploration Licence	Prospecting Coal	Granted	15/02/2019	15/02/2025
Mount Thorley Coal Loading Ltd					
ML 1828	Mining Lease	Mining Purposes	Granted	25/02/2022	25/02/2043

TABLE 3.5 WATER LICENCES

Licence Number	Type	Purpose	Legislation	Description	Renewal Date
20BL168821	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: MTAGP1, MTAGP2, ABGOH07, ABGOH43, ABGOH44, ABGOH45	Perpetuity
20BL171729	Bore	Monitoring Bore	Part 5 Water Act 1912	G3	Perpetuity
20BL171841	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1126	Perpetuity
20BL171842	Bore	Monitoring Bore	Part 5 Water Act 1912	OH944	Perpetuity
20BL171843	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1137	Perpetuity
20BL171844	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: OH1123 (E), OH1123 (W)	Perpetuity

Licence Number	Type	Purpose	Legislation	Description	Renewal Date
20BL171845	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1124	Perpetuity
20BL171846	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: OH786, OH942	Perpetuity
20BL171847	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: OH1127, OH787	Perpetuity
20BL171848	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1125	Perpetuity
20BL171849	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1122	Perpetuity
20BL171850	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1138	Perpetuity
20BL171891	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: OH1121, OH788, OH943	Perpetuity
20BL171892	Bore	Monitoring Bore	Part 5 Water Act 1914	Bores: WOH2153 (PZ2), WOH2154 (PZ1), WOH2155 (PZ4), WOH2156 (PZ3)	Perpetuity
20BL171893	Bore	Monitoring Bore	Part 5 Water Act 1918	Bores: WOH2141 (PZ6), Ground Water Alluvial Modelling	Perpetuity
20BL171894	Bore	Monitoring Bore	Part 5 Water Act 1913	WOH2139 (PZ5)	Perpetuity
20BL172272	Bore	Monitoring Bore	Part 5 Water Act 1912	PZ9S, PZ9D	Perpetuity
20BL172273	Bore	Monitoring Bore	Part 5 Water Act 1912	PZ8S, PZ8D	Perpetuity
20BL172439	Bore	Monitoring Bore	Part 5 Water Act 1912	Windermere	Perpetuity
20BL172518	Bore	Monitoring Bore	Part 5 Water Act 1912	Windermere: MBW01, MBW02, MBW03, MBW04	Perpetuity
20BL173276	Bore	Monitoring Bore	Part 5 Water Act 1912	Windermere	Perpetuity
20BL173065	Bore	Monitoring Bore	Part 5 Water Act 1912	SR012	Perpetuity
20FW213276 (formerly 20CW802601)	Flood Work Approval	Block Dam	Water Management Act 2000	Charlton Rd Levee	Expired
20WA209905 (Formerly 20SL051292)	Stream Diversion	Bywash Dams	Water Management Act 2000	Doctors Creek Bywash	31 July 2022
20CA209904 WAL - 19022	Stream Diversion	Bywash Dams	Water Management Act 2000	Sandy Hollow Creek	25 February 2023

TABLE 3.6 WATER ACCESS LICENCES

Licence Number	Description	Water Source	Water Sharing Plan	Water Source – Management Zone	Licence Allocation (ML)*	2021 Take (ML) Total
WAL963	Warkworth Mining Limited Hunter River Pump (General Security)	Hunter River	Hunter Regulated River WSP	Zone 2b (Hunter River from Wollombi Brook Junction to Oakhampton Rail Bridge)	243	0
WAL10543	Mount Thorley Joint Venture (MTJV) water supply scheme, held by Singleton Shire Council	Hunter River	Hunter Regulated River WSP	Zone 2b (Hunter River from Wollombi Brook Junction to Oakhampton Rail Bridge)	1,907 (MTW share is 1,009)	248.3
WAL43056	Warkworth Mining Limited (High Security)	Hunter River	Hunter Regulated River WSP	Zone 2b (Hunter River from Wollombi Brook Junction to Oakhampton Rail Bridge)	2,000	0
WAL43057	Warkworth Mining Limited (High Security)	Hunter River	Hunter Regulated River WSP	Zone 2b (Hunter River from Wollombi Brook Junction to Oakhampton Rail Bridge)	1,400	0
WAL10544	(Hunter Regulated River – Domestic and Stock)	Hunter River	Hunter Regulated River WSP	Zone 2b (Hunter River from Wollombi Brook Junction to Oakhampton Rail Bridge)	5	0
WAL18233	Old Farm	Hunter River Alluvium	Hunter Unregulated and Alluvial Water Sources WSP	Hunter Regulated River Alluvial Water Source – Downstream Glennies Creek Management Zone	5	0
WAL18558	Hawkes	Wollombi Brook	Hunter Unregulated and Alluvial Water Sources WSP	Lower Wollombi Brook Water Source	50	0
WAL19022	Sandy Hollow Creek	Unregulated River	Hunter Unregulated and Alluvial Water Sources WSP	Singleton Water Source	60	0

Licence Number	Description	Water Source	Water Sharing Plan	Water Source – Management Zone	Licence Allocation (ML)*	2021 Take (ML) Total
WAL40464 / WAL40465	Mt Thorley and Warkworth Pit Excavations	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP	Sydney Basin – North Coast Groundwater Source	180 / 750	428

** Licence allocations are for 1 July to 30 June reporting year. Actual usage can exceed licence allocation in the table above if carryover provisions are available and have been applied during the water year.*

3.1.2 Management Plans, Programmes and Strategies

Table 3.7 details the management plans and strategies which are required under the Warkworth (SSD-6464) and Mount Thorley (SSD-6465) Development Consent instruments.

A Mining Operations Plan (MOP) was developed to replace the previous MOP and cover the existing MTW operations, as well as the approved operations outlined in the Environmental Impact Statements for the Warkworth Continuation 2014 and Mt Thorley Operations 2014. The MOP outlines the proposed operational and applicable environmental management activities planned for MTW. Details regarding the submission and approval dates for the current MOP are shown in **Table 3.8**.

TABLE 3.7 STATUS OF MANAGEMENT PLANS REQUIRED UNDER WARKWORTH CONTINUATION (SSD-6464) AND MOUNT THORLEY OPERATIONS (SSD-6465) DEVELOPMENT CONSENTS

Plan / Program / Strategy	Status (approval date)
Air Quality Management Plan	20/07/2021
Noise Management Plan	21/01/2022
Blast Management Plan	20/07/2021
Water Management Plan	15/11/2021
WML Biodiversity Management Plan	20/09/2018
Rehabilitation Management Plan (addressed in MOP)	30/11/2021 (MOP Extension to 2 July 2022)
Environmental Management Strategy	20/07/2021
MTW Historic Heritage Management Plan	11/10/2017
MTW Aboriginal Heritage Management Plan	28/08/2019
Wollombi Brook Aboriginal Cultural Heritage Conservation Area Plan of Management	11/10/2017
Loder Creek Aboriginal Cultural Heritage Conservation Area Plan of Management	19/03/2019
Management Plan for Goulburn River Biodiversity Area	30/04/2018 (DPE)
Management Plan for Bowditch Biodiversity Area	30/04/2018 (DPE)
Management Plan for Southern Biodiversity Area	20/07/2021 (DPE)

Plan / Program / Strategy	Status (approval date)
Management Plan for Northern Biodiversity Area	20/07/2021 (DPE)
Management Plan for North Rothbury Biodiversity Area	30/04/2018 (DPE)
Warkworth Sands Woodland Integrated Management Plan	Pending (Submitted to OEH 15/02/2017)
Warkworth Sands Woodland Performance Criteria	Pending (Submitted to OEH 15/02/2017)

TABLE 3.8 MOP APPROVAL STATUS FOR MOUNT THORLEY WARKWORTH

Mining Operations Plan	Date Submitted	Date Approved
Mount Thorley Warkworth MOP Amendment A 2018 - 2021	11/10/2018	14/12/2018
Mount Thorley Warkworth MOP Amendment B 2018 - 2021	23/5/2019	11/6/2019
Mount Thorley Warkworth MOP Amendment C 2020 - 2021	31/3/2020	24/11/2020
Mount Thorley Warkworth MOP Extension to 02 July 2022	19/11/2021	30/11/2021

4 OPERATIONS DURING THE REPORTING PERIOD

4.1 Summary of Mining Activities

Areas to be mined are geologically modelled, a mine plan is formed and the relevant mining locations are surveyed prior to mining. **Figure 3** illustrates the mining process.

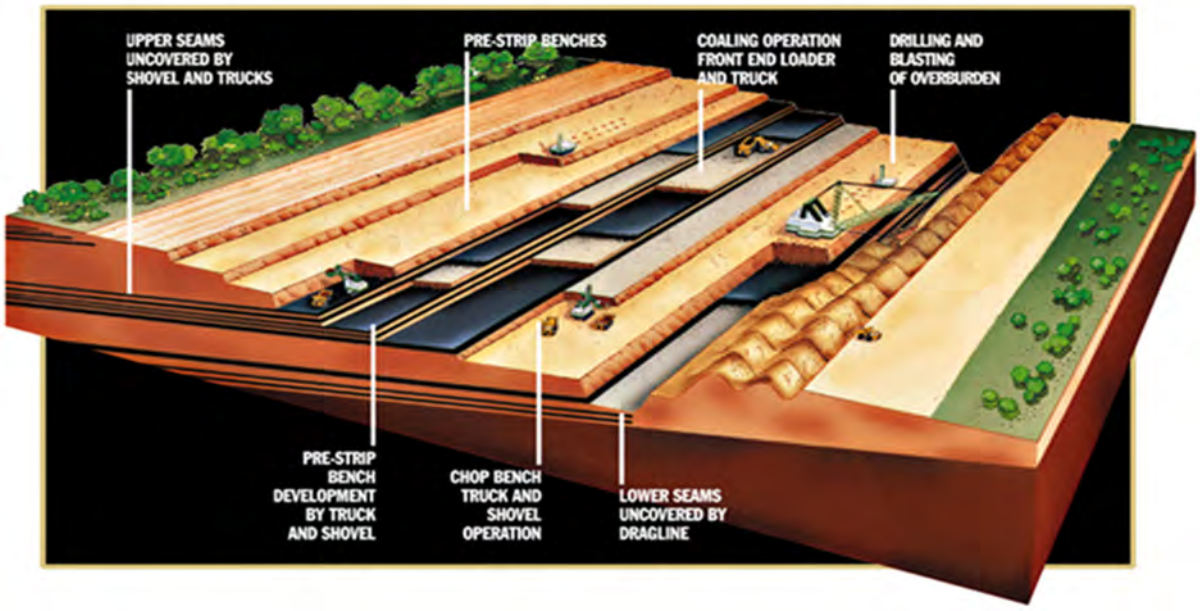


FIGURE 3: MINING PROCESS

Within Warkworth, mining activities will continue to advance in a westerly direction in both North and West Pits. North, West and South Pit voids are used for dumping overburden & coarse rejects from the North & South CHPP. Mount Thorley operations continues to be utilised for fine tailings and overburden emplacement. Exploration drilling was conducted within the relevant mining leases ahead of mining and within the pit to gain further information on the resource. All mining related activity is in line with the current MOP.

The planned 2022 production and waste schedule for MTW is summarised below:

- 17.75 Mt ROM coal;
- 12.19 Mt Product coal;
- 117.8 Mbcm overburden (including rehandle)
- 5.4 Mt Tailings and reject

The forecasted ROM coal production represents approximately 63% of the approved maximum ROM coal production for MTW. Coal will continue to be transported via conveyer to the Mount Thorley Coal Loader and railed to the port.

4.2 Mineral Processing

All processing and rejects/tailings disposal activities undertaken in 2021 were consistent with the approved MOP and no changes were made to the processing and rejects/tailings disposal methods.

The Loders Pit Tailings Storage Facility was developed during 2020 and tailings deposition commenced and continued throughout 2021. The Centre Ramp & Abbey Green Tailings Storage Facilities were also used as alternative locations when required to control water in Loders pit. Waste capping of Tailings Dam 2 continued throughout 2021 in limited quantities.

4.3 Production Statistics

MTW is permitted to extract up to 28 Mtpa of ROM coal, comprising up to 18 million tonnes of ROM coal from the Warkworth Mine and 10 million tonnes from the Mount Thorley Mine. MTW Production Statistics for the previous, current and future reporting period are summarised in **Table 4.1**. Error! Not a valid bookmark self-reference..

TABLE 4.1 SUMMARY OF PRODUCTION AT MTW IN 2021

Material	Approved Limits	Reporting Period 2020	Reporting Period 2021	Forecast for 2022
Prime Overburden Waste (kbcm)	N/A	98,217	87,472	104,621
MTO ROM Coal (Mtpa)	10 (SSD-6465)	0.88	0.43	0.73
WML ROM Coal (Mtpa)	18 (SSD-6464)	16.60	16.08	17.02
ROM Coal (Mtpa)	28 (Combined)	17.49	16.51	17.75
Coarse Reject (kt)	N/A	5,063	4,769	5,063
Fine Reject – Tailings (kt)	N/A	1,116	529.9	563
Product (kt)	N/A	11,929	11,212	12.19

All product coal was transported by rail. MTW transported 11,259 kt of product coal via rail during the 2021 reporting period.

4.4 Summary of Changes (Developments and Equipment Upgrades)

- A new Liebherr 9800 excavator was commissioned in July 2021
- 102 dragline ceased operation in March 2021 in Loders pit

5 ACTION(S) REQUIRED FROM PREVIOUS ENVIRONMENTAL MANAGEMENT REVIEW

There were no actions required by DPE to be addressed in the 2021 AR from the 2020 AR.

6 ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

6.1 Meteorological Data

Meteorological data is collected to assist in day to day operational decisions, planning, and environmental management and to meet development consent requirements. MTW operates a real time meteorological (weather) station located on Charlton Ridge. The meteorological station measures wind speed, wind direction, temperature, humidity, solar radiation, rainfall, and sigma theta. Instruments are installed, calibrated, and maintained according to the relevant Australian Standard AS 3580.14 (2011). Meteorological data is available to site personnel and provides mining operations with trend assessment details to inform operational decisions aimed at minimising impacts. Daily Meteorological data summaries are presented in the Monthly Environmental Monitoring reports, available via the MTW website: https://www.mtwcoal.com.au/.

6.2 Noise

6.2.1 Noise Management

MTW manages noise to ensure compliance with permissible noise limits at nearby private residences. A combination of both proactive and reactive control mechanisms is employed on a continuous basis to ensure effective management of noise emissions is maintained. Noise management strategies and processes employed at MTW are detailed in the MTW Noise Management Plan available for viewing via the MTW website: https://www.mtwcoal.com.au/.

MTW's 2021 noise performance metrics are shown below:

- Community noise complaints received – reduced by 50% from 2020
- Number of Community Response Officer (CRO) (supplementary) noise measurements which exceed the internal trigger level for action – increased to 106 from 72 in 2021; and
- Number of equipment downtime hours logged in response to noise management triggers – decreased by ~ 17% from 2020.

A range of noise management processes were undertaken during 2021. These are described herein.

6.2.2 Sound Power Control

The new Liebherr 9800 excavator was commissioned in July 2021 with noise attenuation fitted, as is required by development consent conditions. For existing fleet, in addition to visual inspections, MTW implements a Sound Power Level screening program to assess the sound power outputs of individual pieces of equipment.

Forty-One sound power level assessments were undertaken by an external consultant, across 24 trucks, 2 water carts, 2 service carts, 1 loader, 2 graders, 6 dozers, 2 excavators, 1 shovel and 1 dragline. Of the assessments undertaken, 4 pieces of equipment exceeded MTW In-Service targets. Recommendations have been made for further treatment to address these items of equipment and maintenance has been scheduled to rectify defects.

6.2.2.1 Real Time Noise Management

MTW's Real-Time noise management framework provides an effective tool for managing instances of elevated noise, ensuring compliance is maintained, and responding to community concerns.

MTW utilise CROs to provide an interface between the mine and community. They are effective in implementing the management framework, validating real-time alerts through supplementary handheld noise measurements and audible observations, driving operational change as required, and responding to community complaints. A summary of supplementary handheld noise measurements conducted by the CROs in 2021 is presented in **Table 6.1**.

MTW's Insite website allows members of the general public to access noise, meteorological, air quality data as well as any operational changes made during shift via MTW's interactive website. Insite viewer access: http://insite.yancoal.com.au

TABLE 6.1 SUMMARY OF SUPPLEMENTARY ATTENDED NOISE MONITORING CONDUCTED BY COMMUNITY RESPONSE OFFICERS 2021

Monitoring Location	Number of Assessments	Number of measurements >WML trigger^	Number of measurements > MTO trigger^	Average WML noise level ($L_{Aeq\ 5min}$ dB(A))*	Average MTO noise level ($L_{Aeq\ 5min}$ dB(A))*
Wollemi Peak Road (Bulga RFS)	1314	66	13	34.1	33.2
Bulga Village	623	4	1	33.0	32.6
Inlet Road	493	13	1	33.1	31.9
Inlet Road West	365	1	0	30.3	29.3
Long Point	1029	3	0	31.3	35.0[1]
South Bulga	0	-	-	-	-
Wambo Road	47	4	-	35.7	33.0
Total	3871	91	15	-	-

^Triggers are internally set thresholds for operational response and are specified in the MTW Noise Management Plan. The number of measurements greater than the trigger cannot be used as an assessment or interpretation of compliance. A compliance assessment is provided in Sections 6.2.3 and 6.2.3.1.

**Average noise levels do not take account of measurements taken where the noise source of interest was recorded as inaudible.*

[1] Only one noise measurement taken where MTO was assigned a noise level

In response to the events listed in **Table 6.1** which were greater than the trigger, up to 907 hours of equipment downtime were recorded to manage noise during 2021.

6.2.3 Noise Performance

A total of 96 compliance measurements were undertaken by an independent acoustic specialist in accordance with the MTW Noise Monitoring Programme during the reporting period. Each measurement involves an assessment of mine noise against the various LAeq, 15 minute and LA1, 1min noise criteria. Noise monitoring results are shown in **Appendix 1** and are also presented in the Monthly Environmental Monitoring Reports, available via the MTW website https://www.mtwcoal.com.au/page/environment/environmental-monitoring/

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 four noise measurements taken during the reporting period which required the penalty to be applied. There were no noise measurements taken during the reporting period which exceeded consent conditions following application of NPfI low frequency modifying factor.

TABLE 6.2 ATTENDED NOISE MEASUREMENTS EXCEEDING CONSENT CONDITIONS FOLLOWING APPLICATION OF NPFI LOW FREQUENCY MODIFYING FACTOR

Location	Date/Time	Relevant Criteria	Criterion (dB)*	L_{Aeq}(dB)	Revised L_{Aeq} (dB)	Exceeds by (dB)
N/A	-	-	-	-	-	-

6.2.3.1 Comparison against Last Years' Results

A comparison of non-compliances and exceedances between years is used as a measure of the effectiveness of noise management measures employed on site.

Details of this comparison are provided in **Table 6.3** which demonstrates a continuation of the effective management delivered in 2021.

TABLE 6.3 COMPARISON OF 2021 NOISE MONITORING RESULTS AGAINST PREVIOUS YEARS'

Year	Number of assessments	Number of exceedances	Number of non-compliances
2021	576	0	0
2020	576	0	0
2019	588	1	0
2018	594	1	0
2017	576	0	0
2016	576	0	0
2015	665	0	0
2014	700	0	0
2013	456	11	7
2012	562	13	3
2011	572	11	4
2010	561	3	3
2009	569	10	4

A comparison of supplementary noise measurements undertaken during the previous and current reporting period is provided in **Table 6.4**. This data shows the considerable effort in undertaking supplementary noise measurements has continued in 2021, and average noise readings have been comparable.

TABLE 6.4 COMPARISON OF CRO (SUPPLEMENTARY) NOISE MEASUREMENT PERFORMANCE

Monitoring Location	Number of Assessments		Number of Measurements >WML Trigger^		Number of Measurements > MTO Trigger^		Average WML Noise Level ($L_{Aeq\ 5min}$ dB(A))*		Average MTO Noise Level ($L_{Aeq\ 5min}$ dB(A))*	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Wollemi Peak Road (Bulga RFS)	1307	1314	42	66	12	13	33.3	34.1	32.6	33.2
Bulga Village	622	623	4	4	0	1	32.5	33.0	32.0	32.6
Inlet Road	521	493	10	13	0	1	32.7	33.1	31.9	31.9
Inlet Road West	374	365	0	1	0	0	29.9	30.3	29.4	29.3
Long Point	998	1029	0	3	0	0	31.0	31.3	-	35.0
South Bulga	0	0	-	-	-	-	-	-	-	-
Wambo Road	120	47	4	4	-	-	34.9	35.7	32.7	33.0
Total	3943	3871	60	91	12	15	-	-	-	-

^Triggers are internally set thresholds for operational response and are specified in the MTW Noise Management Plan. The number of measurements greater than the trigger cannot be used an assessment or interpretation of compliance. Compliance assessment is provided in 6.2.3 and 6.2.4.

**Average noise levels do not take account of measurements taken where the noise source of interest was recorded as inaudible.*

6.2.3.2 Validation of Real Time Monitoring Results

A comparison of real time and independent attended noise monitoring results was undertaken for 2021. The comparison identified that the majority of attended noise monitoring results were lower than the corresponding real time noise monitoring results i.e. real time noise monitor trigger is largely conservative for the most closely located real time noise monitors and for the mostly closely aligned 15-minute monitoring periods. There were exceptions to this, including;

- WML LAeq 15 minute attended monitoring measured noise levels were higher than the real time monitoring measured noise levels for one of eight attended monitoring locations in January, for two of eight attended monitoring locations in February, for four of eight monitoring locations in March and April, for 3 of eight monitoring locations in May, for 4 of eight monitoring locations in June and July, for 3 of eight monitoring locations in August and October, for one of eight monitoring locations in November and for 6 of eight monitoring locations in December.
- MTO LAeq, 15 minute attended monitoring measured noise levels were higher than the real time monitoring measured noise levels for four of eight attended monitoring locations in February, for one of eight monitoring locations in August, October and November and for 2 of eight monitoring locations in December.

On the occasions where the WML and MTO attended monitoring measured noise levels were higher, the recorded noise levels were generally well below noise limits specified in MTW's Noise Management Plan. The exceptions to this were measurements taken at the Wambo Road monitoring location in March and December, which were at or one dB less than the compliance limits respectively. The noise monitors can have difficulty assigning WML and MTO directional noise levels at times, such as where there is more than one noise source and where MTW is not the primary noise source. MTW's noise management process is that routine supplementary noise monitoring is also undertaken by the Community Response Officer each night and provides additional assessment of directional noise levels, allowing for swift targeted operational modifications where noise levels from MTW presents a risk of exceeding the specified noise limit(s).

The Wambo Road noise monitor is scheduled to be replaced by an Environmental Noise Compass (ENC) in 2022 and will be the second MTW owned monitor of this type installed in Bulga. Developed by Acoustic Research Labs, the ENC utilises a 26 microphone array and conventional beamforming techniques (borrowed from military / submarine applications) to resolve the source direction of measured noise in real time.

6.2.3.3 Comparison against EA Predictions

Table 6.5 provides a comparison of 2021 attended monitoring data and the predicted noise levels modelled in the 2014 Warkworth Continuation EIS. Comparison has been made against the modelled worst-case noise levels for Year 9 of the development (nominally 2023). The comparison data has been sourced from the modelled noise levels at the nearest residential receivers to the current monitoring locations. Reported 2021 data is the calculated quarterly average of WML contribution to measured LAeq (15 minute) results and the maximum monthly measured noise level obtained through

compliance assessment (irrespective of applicability of noise criteria due to meteorological conditions).

Where a monitoring event has been assessed as being "inaudible" or "not measurable", a conservative value of 25dB has been used to calculate the LAeq average for the quarter. The comparison shows that measured noise is within the predicted noise level range.

TABLE 6.5 PREDICTED NIGHT TIME WML (EIS 2014) LAEQ (15 MINUTE) NOISE LEVELS AND AVERAGED AND MAXIMUM 2021 MONITORING RESULTS

Monitoring Location	Year 9 Modelled Noise	Quarter 1 2021 average & maximum		Quarter 2 2021 average & maximum		Quarter 3 2021 average & maximum		Quarter 4 2021 average & maximum	
	$L_{Aeq\ (15\ minute)}$ (dB)	$L_{Aeq\ (15\ minute)}$ (dB)		$L_{Aeq\ (15\ minute)}$ (dB)		$L_{Aeq\ (15\ minute)}$ (dB)		$L_{Aeq\ (15\ minute)}$ (dB)	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max
Wollemi Peak Road*/Bulga RFS	≤38	25.0	25	30.3	36	32.0	36	26.7	30
Bulga Village	≤38	29.0	33	30.0	33	31.0	37	27.3	29
Gouldsville Road	≤35	28.0	30	25.0	25	26.3	29	25.0	30
Inlet Road	≤37	27.7	33	32.0	33	28.3	35	30.0	35
Inlet Road West*	≤35	28.0	30	28.3	32	24.3	28	27.3	32
Long Point*	≤35	25.0	25	25.0	25	25.7	27	25.0	25
South Bulga	≤38	25.0	25	27.7	30	27.3	32	25.0	25
Wambo Road	≤38	32.0	38	32.3	34	29.3	38	31.0	37

**Denotes – No nearby receiver location modelled*

6.3 Blasting

6.3.1 Blast Management

During the reporting period, the MTW blast monitoring network operated in accordance with AS2187.2-2006 to measure ground vibration and air blast overpressure of each event at a high sampling frequency. Monitors function as regulatory compliance instruments in accordance with the MTW Blast Monitoring Programme (appended to Blast Management Plan) and are located on (or in locations representative of) privately owned land. During 2021 monitors were located at:

- Abbey Green (Abbey Green Station, Putty Road, Glenridding);
- Bulga Village (Wambo Road, Bulga);
- Putty Road, Mount Thorley (known as MTIE)
- Wambo Road (Wambo Road, Bulga);
- Warkworth Village (former Warkworth Public School, Warkworth); and
- Wollemi Peak Road (intersection of Putty & Wollemi Peak Roads, Bulga).

These locations are shown on **Figure 4** below.

FIGURE 4: BLAST MONITORING LOCATIONS

6.3.2 Blast Performance

During the reporting period 224 blast events were initiated at MTW. Results of ground vibration and airblast overpressure recorded during 2021 are presented in **Figure 5** to **Figure 10**. All blasts returned results below the relevant airblast overpressure / ground vibration criteria for all monitoring locations.

Road closures occurred for all blasts within 500 metres of a public road. Public roads were also closed on occasions to mitigate potential impact upon road users from post blast emissions.

In accordance with Schedule 3, Conditions 9 and 10 of SSD-6464, Warkworth Mining Limited carried out blasting on site between 7am and 5pm Monday to Saturday inclusive. No blasts occurred on Sundays or on public holidays. Warkworth Mining Limited carried out not more than 3 blasts per day and not more than 12 blasts per week (averaged over a calendar year).

Note: No blasts were carried out at Mt Thorley Operations Limited in 2021.

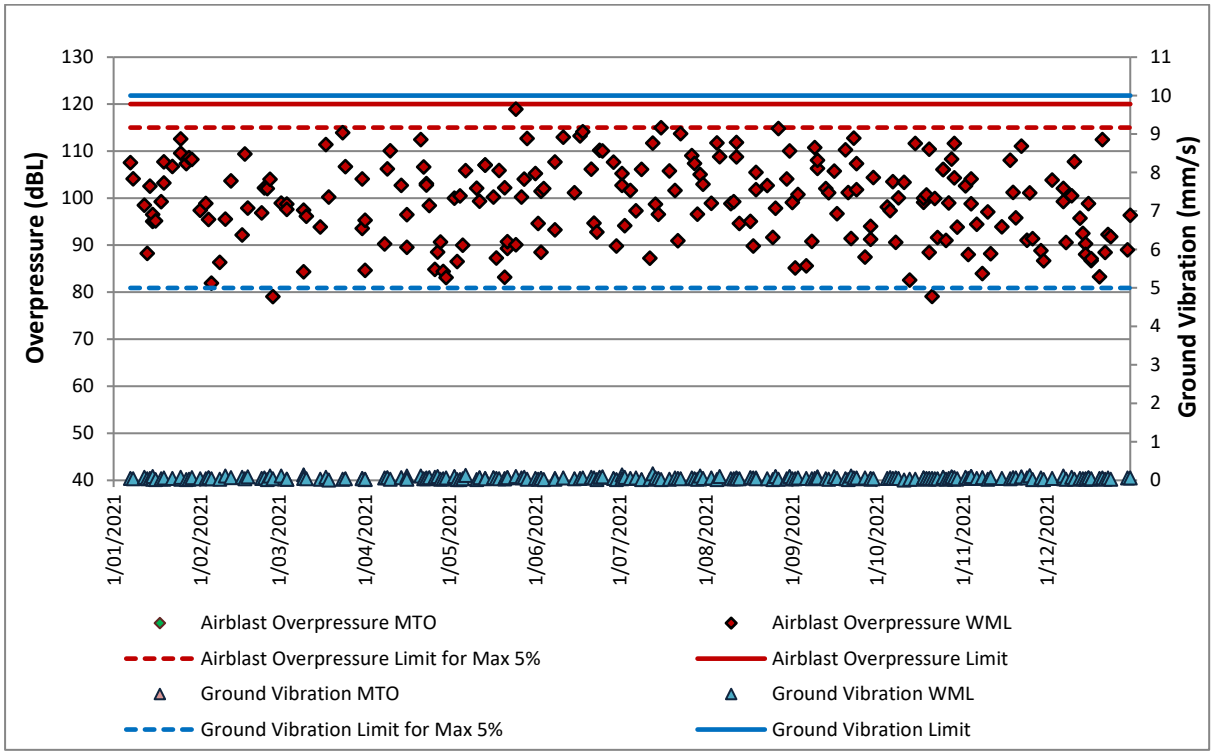


FIGURE 5: ABBEY GREEN BLAST RESULTS

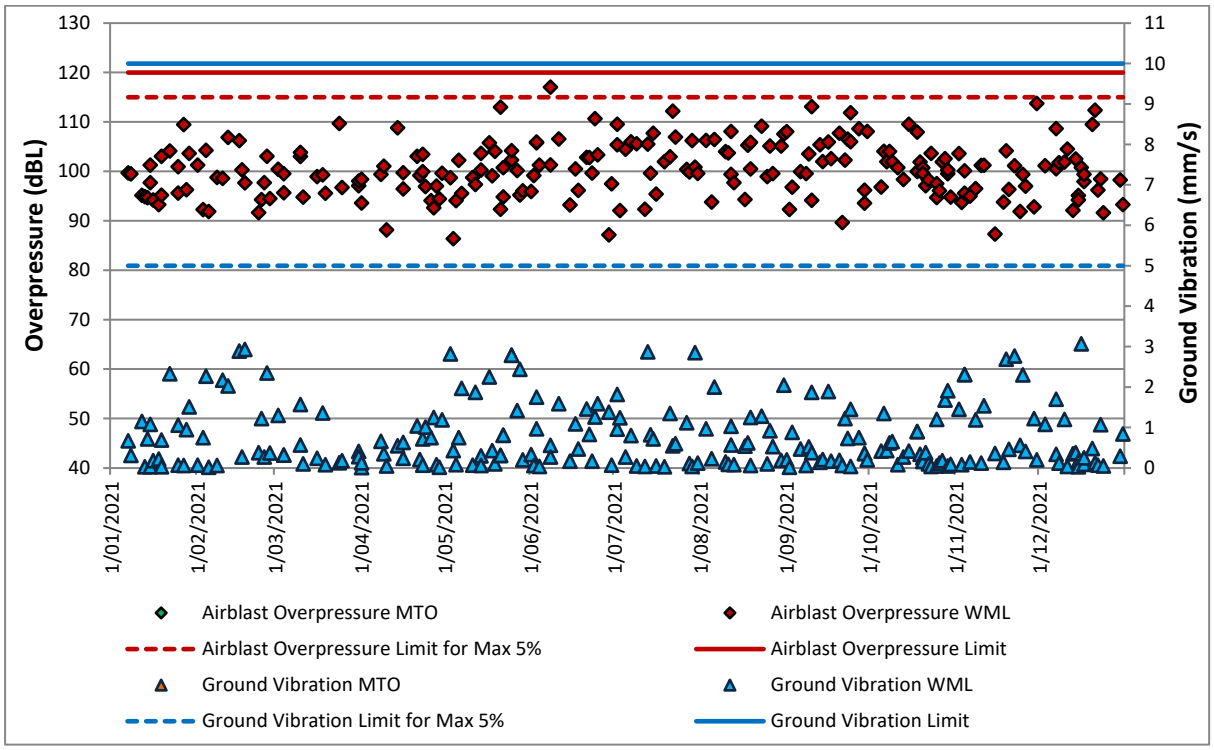


FIGURE 6: BULGA VILLAGE BLAST RESULTS

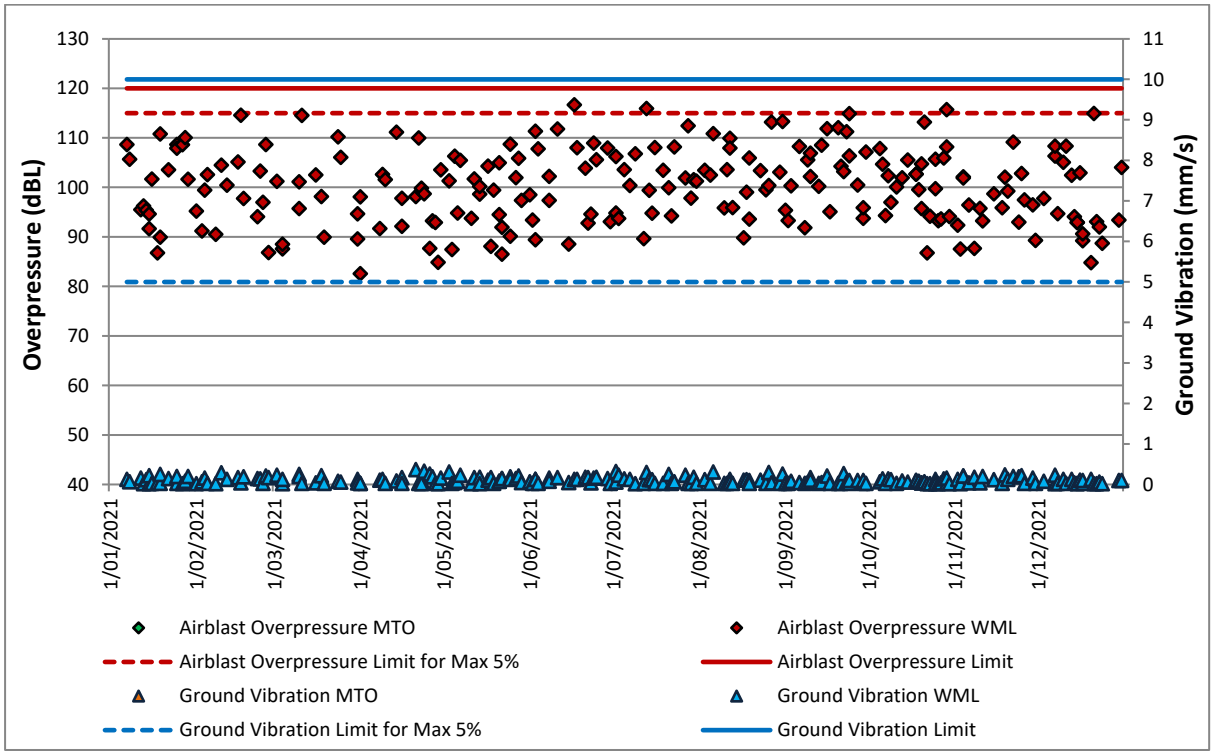


FIGURE 7: MTIE BLAST RESULTS

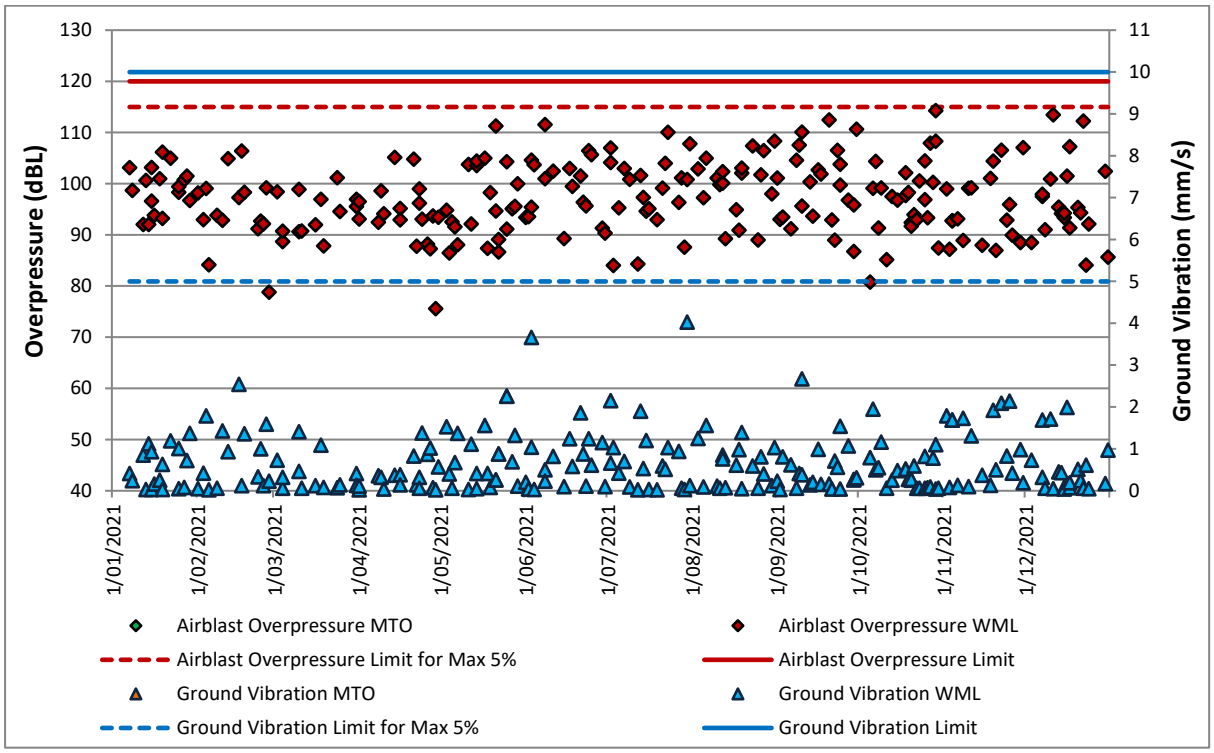


FIGURE 8: WOLLEMI PEAK ROAD BULGA BLAST RESULTS

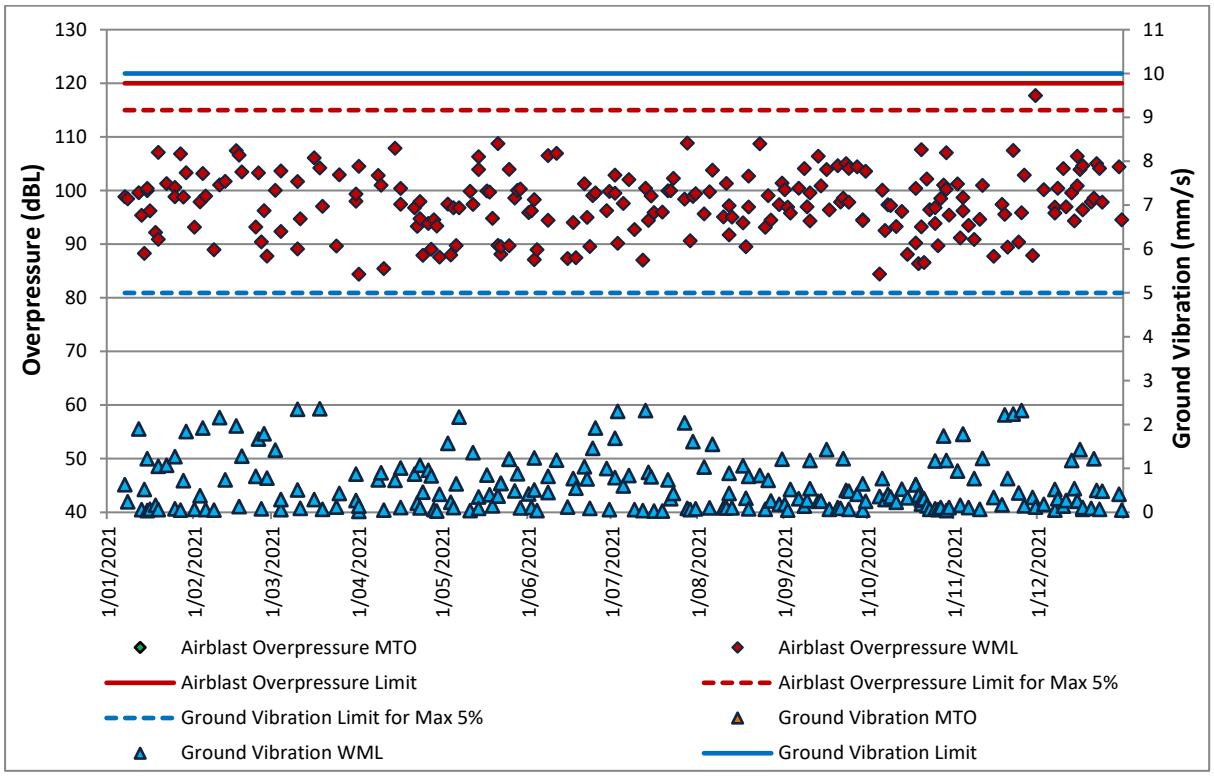


FIGURE 9: WAMBO ROAD BLAST RESULTS

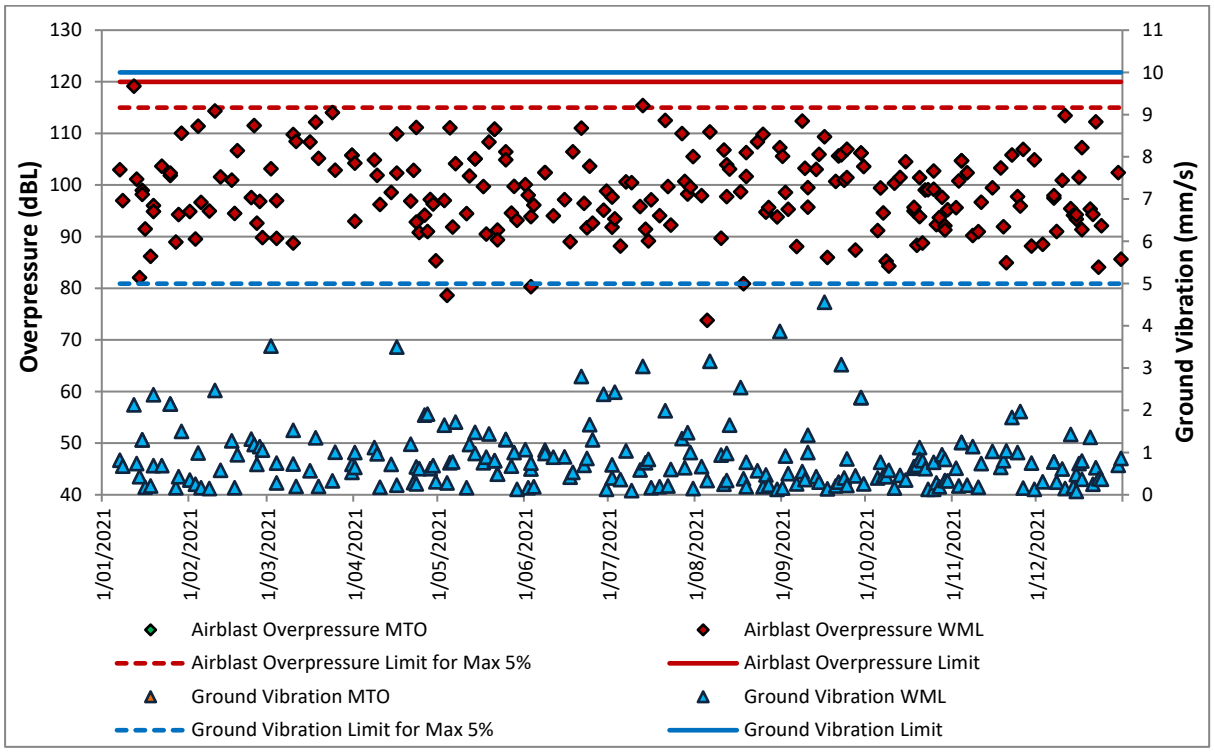


FIGURE 10: WARKWORTH BLAST RESULTS

6.3.2.1 Blast Fume Management

MTW operates a Post Blast Fume Generation Mitigation and Management Plan. This document outlines the practices to be utilised to reduce generation of post blast fume and reduce potential offsite impact from any fume which may be produced. This includes risk assessment of the likelihood of fume production, specialised blasting design, appropriate product selection, on-bench water management, implementation of fume management zones and use of blasting permissions to identify likely path of any fume which may be produced.

All blasts are observed for fume and any fume produced is ranked according to the Australian Explosive Industry & Safety Group (AEISG) Scale. During 2021, no blasts produced visible post-blast fume with a post-blast ranking Level 4 or higher according to the AEISG Scale.

Rankings for visible blast fume according to the AEISG scale for shots fired during 2021 and comparison to rankings distribution during previous years is provided in **Table 6.6.**

TABLE 6.6 VISIBLE BLAST FUME RANKINGS ACCORDING TO THE AEISG COLOUR SCALE

AEISG Ranking	2021	2020	2019
0	230	243	269
1	13	13	16
2	9	9	7
3	4	0	1
4	0	0	0
5	0	0	0
Total*	256	265	293

** Where a number of individual blasts were fired as a blast event, fume was assessed for each individual blast pattern rather than for the event as a whole.*

6.3.2.2 Comparison of Monitoring Results Against Previous Years' Performance and EA Predictions

Blasting results recorded in 2021 are similar to results recorded in previous years and are generally consistent with EA predictions.

6.4 Air Quality

6.4.1 Air Quality Management

Air quality management at MTW is prescribed by the Air Quality Management Plan (available at https://www.mtwcoal.com.au/page/environment/environmental-management-plans/), the management plan:

- Describes procedures required to ensure compliance with the approval conditions relating to air quality including the measures that MTW will use to manage air quality;
- Details the management framework and mitigation actions to be taken while operating; and
- Provides a mechanism for assessing air quality monitoring results against the relevant impact assessment criteria.

6.4.1.1 Real-Time Air Quality Management

MTW's 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. Following an alarm, an inspection is undertaken, and operations and equipment usage are modified as required to manage air quality in accordance with MTW's Air Quality Management Plan.

838 real-time alarms for air quality and wind conditions were received and acknowledged during 2021. In response, **1,459** hours of equipment downtime was recorded due to air quality management. A detailed breakdown of air quality related equipment stoppages (per month, per equipment type) is presented in **Figure 11**.

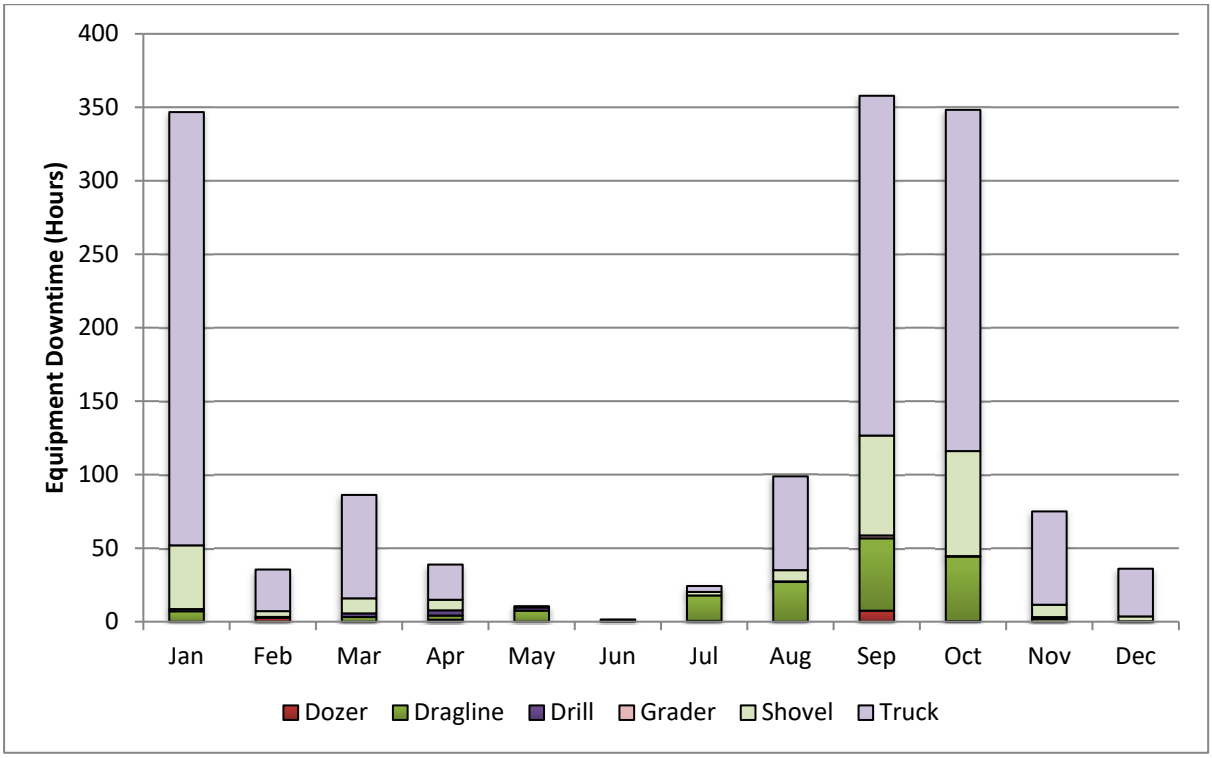


FIGURE 11: EQUIPMENT DOWNTIME FOR DUST MANAGEMENT BY MONTH (2021)

6.4.1.2 Temporary Stabilisation

An aerial seeding programme was undertaken in 2021, which aims to reduce airborne dust from inactive waste dumps and ahead of mining areas. 184 hectares of area was seeded (see **Figure 12**) using an exotic pasture grass and legume mix suitable for summer sowing. Fertiliser was mixed with the seed prior to loading to provide sufficient nutrients for plant growth.

FIGURE 12: AERIAL SEEDING AREAS

6.4.2 Air Quality Performance

6.4.2.1 Air Quality Monitoring

Air quality monitoring at MTW is undertaken in accordance with the MTW Air Quality Monitoring Programme and protocol for evaluating non-compliances. The monitoring network comprises an extensive array of monitoring equipment which is utilised to assess performance against the relevant conditions of MTW's approvals and EPL's. Air quality monitoring locations are shown in **Figure 13**. During 2021, MTW complied with all short term and annual average air quality criteria.

Air quality compliance criteria are shown in **Table 6.7,** along with a summary of MTW's performance against the criteria. Whilst MTW operates under two separate planning approvals the following compliance assessment has been undertaken on a 'whole of MTW site' basis, rather than individually assessing the contribution of each approval area to the measured results.

Air quality monitoring data is made publicly available through the MTW Monthly Environmental Monitoring Report available on the MTW website https://www.mtwcoal.com.au/page/environment/environmental-monitoring/, and daily data can be accessed on the MTW Insite website: https://insite.yancoal.com.au/mount-thorley-warkworth/data

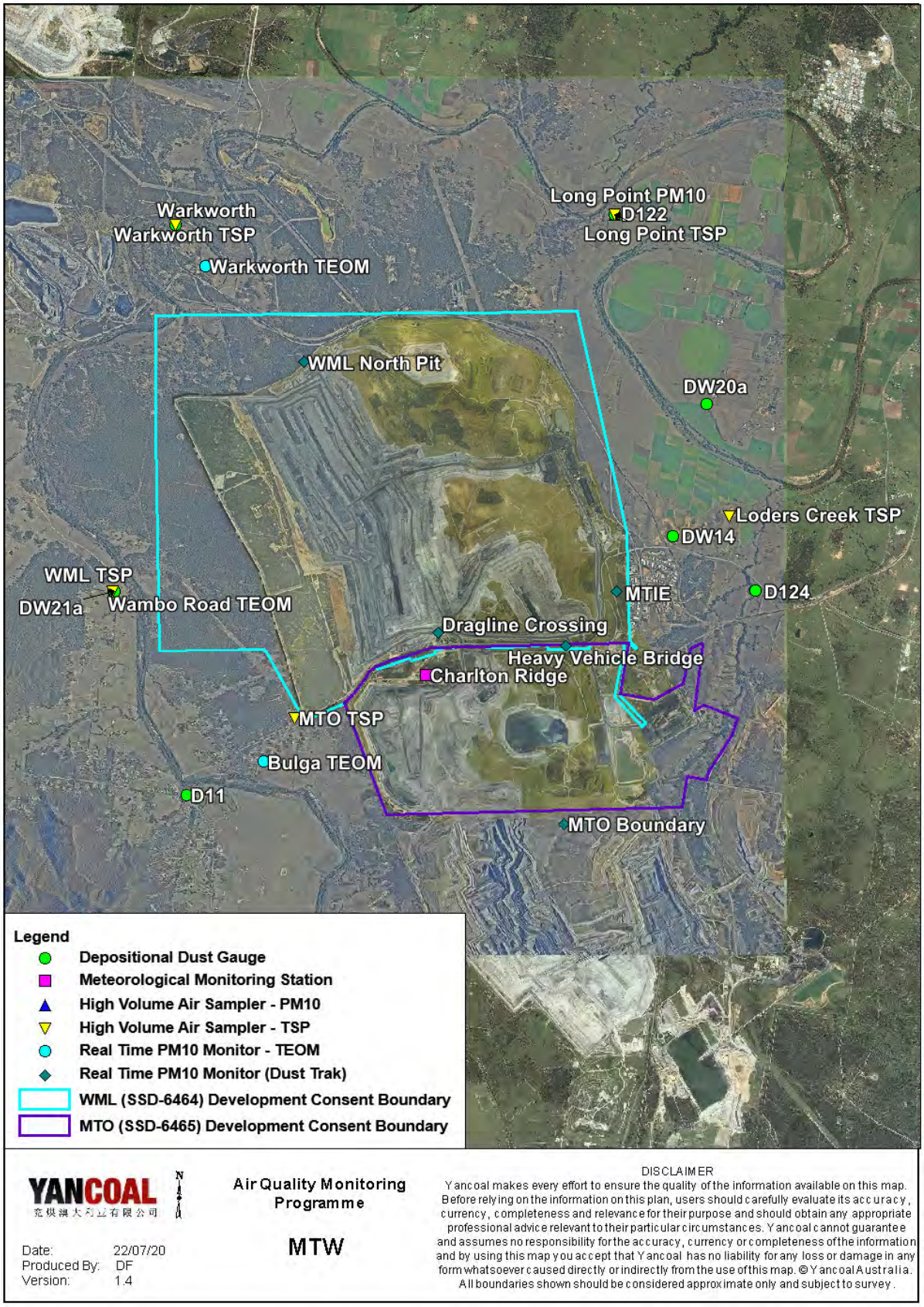


FIGURE 13: AIR AND METEOROLOGICAL MONITORING LOCATIONS MTW 2021

TABLE 6.7 AIR QUALITY IMPACT ASSESSMENT CRITERIA AND 2021 COMPLIANCE ASSESSMENT

Pollutant	Criterion	Averaging Period	Compliance
Deposited Dust	4 g/m^2/month	Maximum total deposited dust level	100%
	2 g/m^2/month	Maximum increase in deposited dust level	100%
Total Suspended Particulate matter (TSP)	90 µg/m^3	Long Term (Annual)	100%
Particulate matter <10µm (PM_{10})	30 µg/m^3	Long Term (Annual)	100%
	50 µg/m^3	Short Term (24 hour)	100%

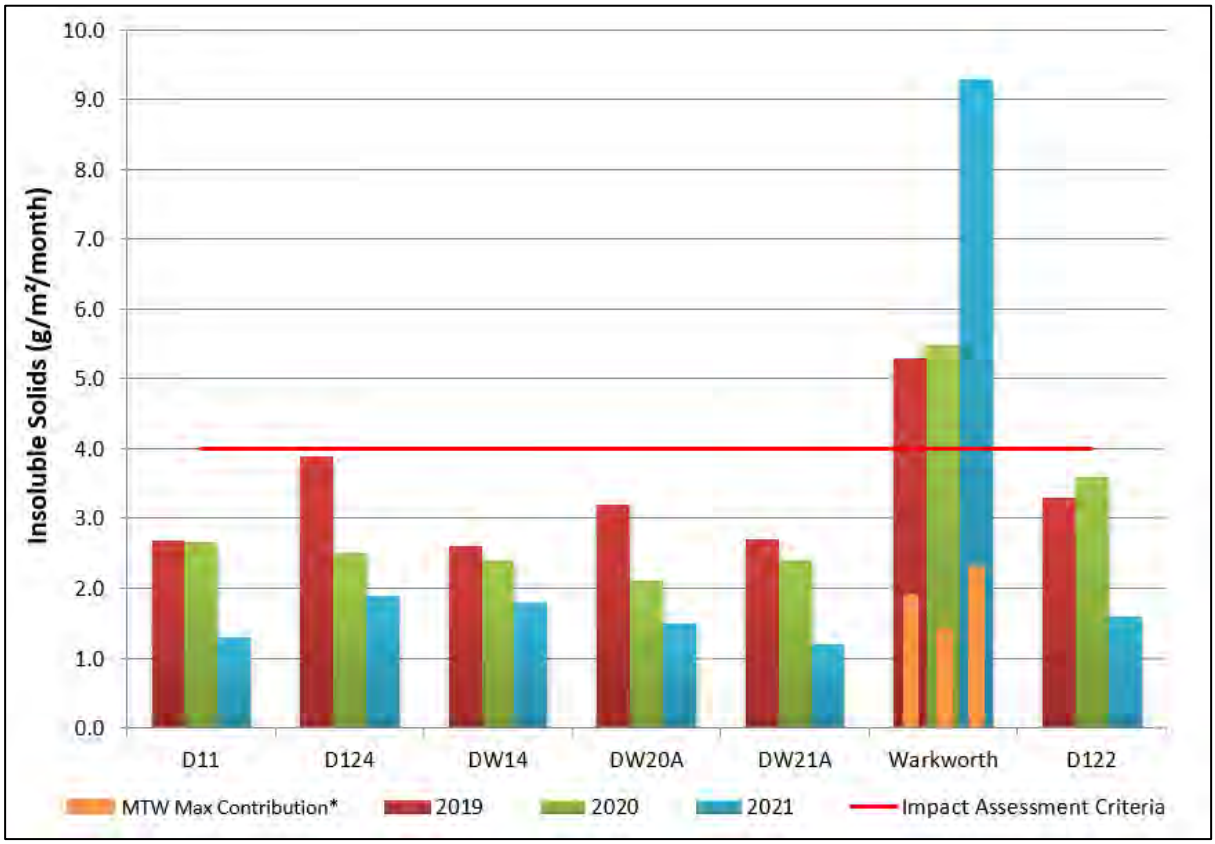
6.4.2.2 Deposited Dust

Deposited dust is monitored at six (6) locations situated on, or representative of privately-owned land generally in accordance with AS3580.10.1 (2003) and also at a 7th location (Warkworth). The Warkworth deposited dust gauge is not representative of privately-owned land as there are no longer privately owned properties in Warkworth. The annual average insoluble matter deposition rates in 2021 compared with the impact assessment criterion and previous years' data is shown in **Figure 14.**

There was one exceedance of the 4 g/m^2/month long-term impact assessment criteria, for maximum total deposited dust level, recorded at the Warkworth monitoring location. An external consultant was engaged to conduct an investigation which determined maximum MTW contribution to be less than or equal to 2.3g/m2/month, or ~25% of the total level of 9.3g/m2/month at Warkworth. Whilst the result exceeds the 2 g/m^2/month maximum allowable increase in deposited dust criterion, there are no privately-owned residences in Warkworth and as such, this does not constitute non-compliance, as per Schedule 3, Condition 17 of Warkworth Mining Limited Development Consent (SSD-6464) and Schedule 3, Condition 15 of Mount Thorley Operations Development Consent (SSD-6465). The results after investigation is shown on **Figure 14**.

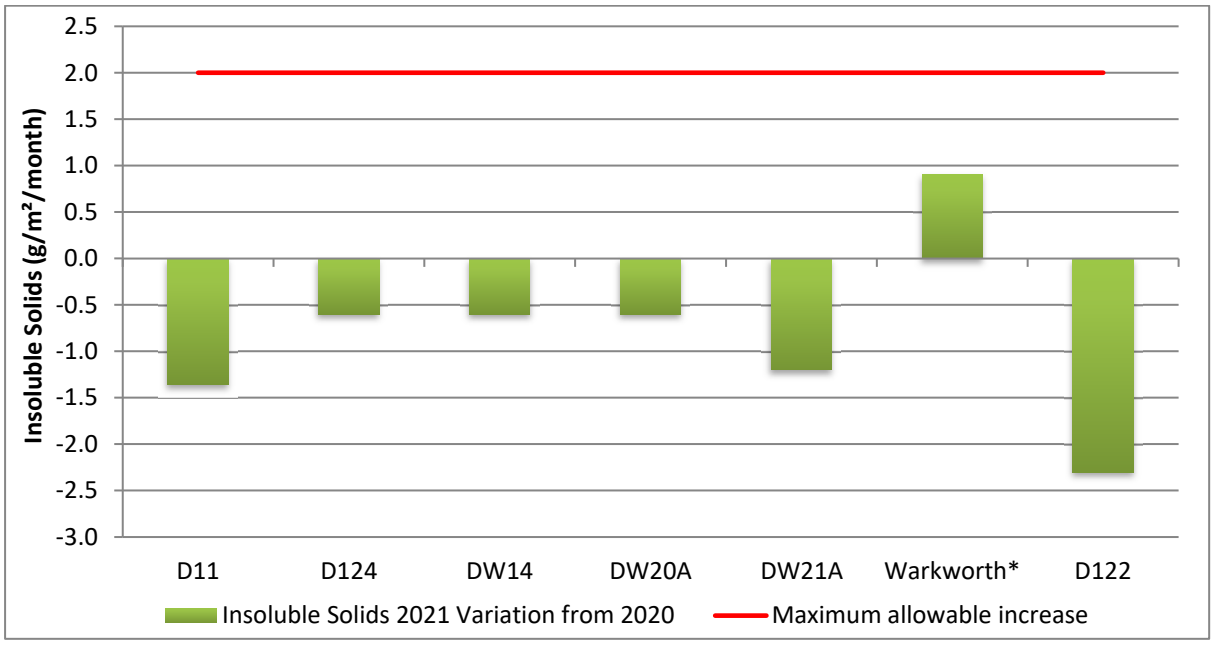
After analysis of the single exceedance, all annual average insoluble matter deposition rates recorded on or representing privately owned land were compliant with the long-term impact assessment criteria of 4g/m2/month. All monitoring locations representing privately owned residences also demonstrated compliance with the maximum allowable insoluble solids increase criteria of 2g/m2/month (**Figure 15**). MTW propose to amend its Air Quality Monitoring Programme to remove the Warkworth depositional dust gauge from its monitoring network, considering that there are no longer any privately-owned residences in Warkworth.

Note: During the July reporting period the Warkworth monitor recorded a monthly result above the long-term impact assessment criteria of 4.0 g/m^2 per month. An external consultant was engaged to conduct an investigation which determined the result to be anomalous and that MTW was not the primary contributor. Accordingly, the result was excluded from the annual average calculation.



** MTW's estimated maximum contribution to annual average deposited dust level (determined by external air quality consultant).*

FIGURE 14: 2021 DEPOSITIONAL DUST RESULTS COMPARED AGAINST THE IMPACT ASSESSMENT CRITERIA AND PREVIOUS YEARS' RESULTS



** Variation calculated from MTW's estimated maximum contribution to annual average deposited dust level (determined by external air quality consultant).*

FIGURE 15: VARIATION IN INSOLUBLE SOLIDS DEPOSITION RATE FROM 2020 TO 2021 COMPARED AGAINST THE IMPACT ASSESSMENT CRITERIA

6.4.2.3 Total Suspended Particulates (TSP)

Total Suspended Particulates (TSP) are measured at four (4) locations situated on or representative of privately-owned land in accordance with AS3580.9.3 (2003) and also at a 5th location (Warkworth HVAS). The Warkworth HVAS is not representative of privately-owned land as there are no longer privately owned properties in Warkworth.

Annual average TSP concentrations recorded in 2021 compared against the long-term impact assessment criterion and previous years' data, are shown **Figure 16**.

One high volume air sampler exceeded the annual TSP impact assessment criteria during the reporting period. This was investigated to determine the level of contribution from MTW activities in accordance with the compliance protocol outlined in the approved MTW Air Quality Management Plan. The recorded exceedance was determined to be compliant with the relevant criteria, as the measured result is not primarily attributable to MTW. The result after investigation is shown in **Figure 16.**

After analysis of the single exceedance, all annual average results were compliant with the impact assessment and land acquisition criteria.

A summary of the investigation undertaken for the annual TSP exceedance is provided in

Table 6.8.

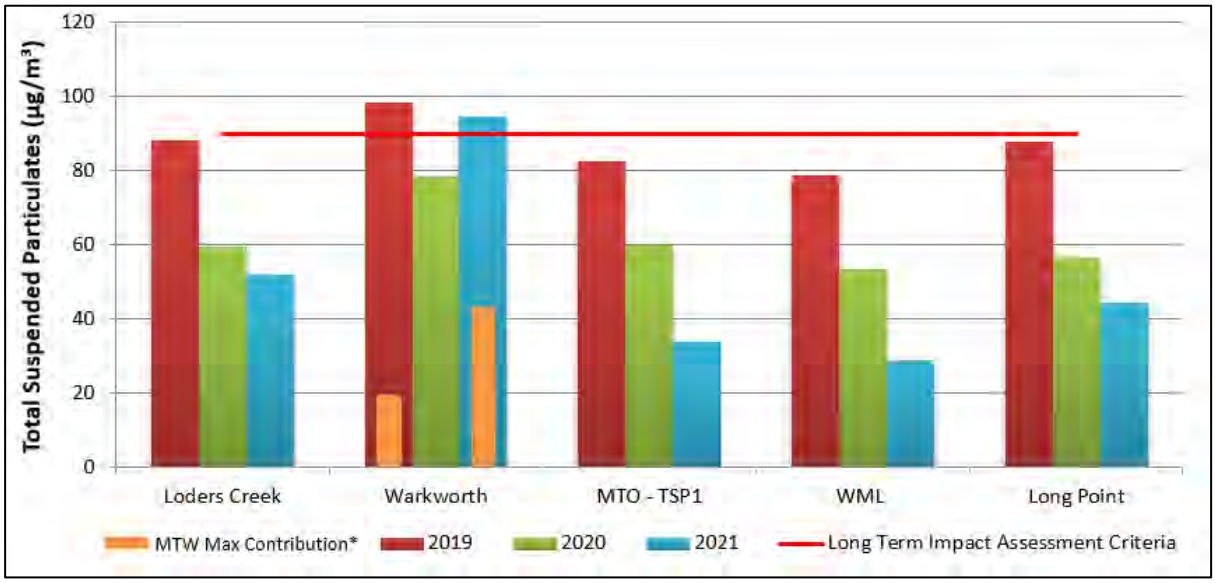
TABLE 6.8 ANNUAL TSP INVESTIGATION - 2021

Date	Site	Annual Average PM_{10} result ($\mu g/m^3$)	Calculated Annual TSP ($\mu g/m3$)	Discussion
2021	Warkworth HVAS TSP	94.6	≤42.8*	An external consultant was engaged to investigate the exceedance. The investigation determined that the maximum potential contribution from MTW at the Warkworth monitor during the review period was 42.8 µg/m3. This was based on an analysis of meteorological data, background TSP levels and position of the site in relation to MTW. As the measured result is not primarily attributable to MTW, it does not constitute non-compliance, as per MTW's approved Air Quality Management Plan. No further action is required.

* *MTW's estimated contribution to annual average TSP level ($\mu g/m^3$).*

During the reporting period, five (5) out of the 305 TSP measurements were not able to be fully collected on the scheduled sampling date (based on a sampling frequency of every six days) likely due to power failures and programming errors.

The annual average TSP concentrations recorded in 2021 are generally lower than those recorded in previous years, which is likely related to above average rainfall in 2020 and 2021.



** MTW's estimated maximum contribution to annual average TSP level (determined by external air quality consultant).*

FIGURE 16: 2021 TSP ANNUAL AVERAGE COMPARED AGAINST THE IMPACT ASSESSMENT CRITERIA AND PREVIOUS YEARS' RESULTS

6.4.2.4 Particulate Matter <10µm (PM10)

Compliance assessment for Particulate Matter <10µm (PM_{10}) is measured at four (4) locations on privately owned land in accordance with AS3580.9.6 (2003). During 2021, all short term and annual average results were compliant with the impact assessment criteria, as per MTW's approved Air Quality Management Plan.

6.4.2.5 Short term PM10 impact assessment criteria

Monitoring results for PM_{10} (24 hour) collected through High-Volume Air Sampler monitoring are compared against the short-term impact assessment criteria (**Figure 17**). All 24hr average results recorded by MTW's surrounding network of TEOM monitors are presented on a quarterly basis in **Figure 18** to **Figure 21.**

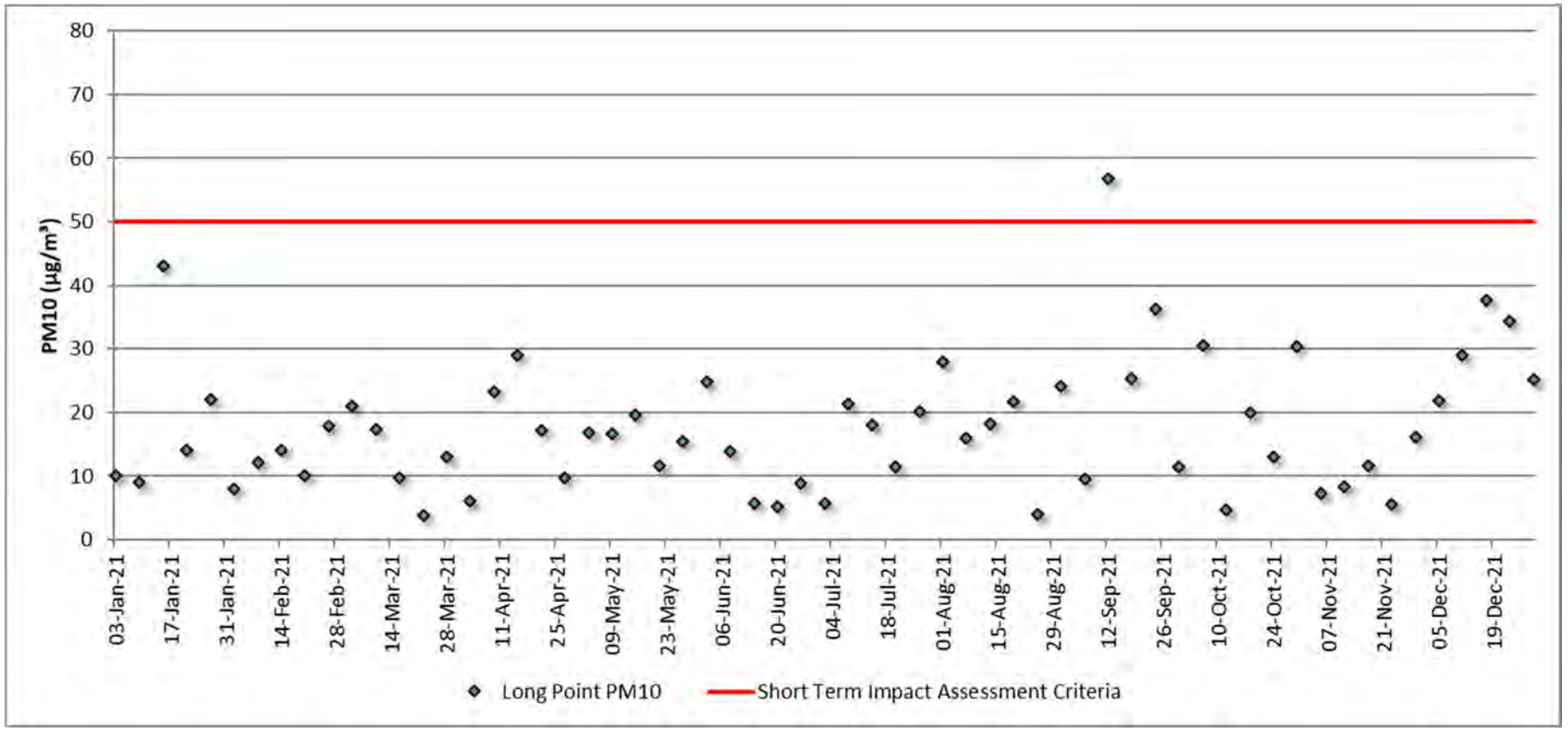


FIGURE 17: PM10 24HR MONITORING RESULTS (MEASURED BY MTW PM10 HVAS MONITOR)

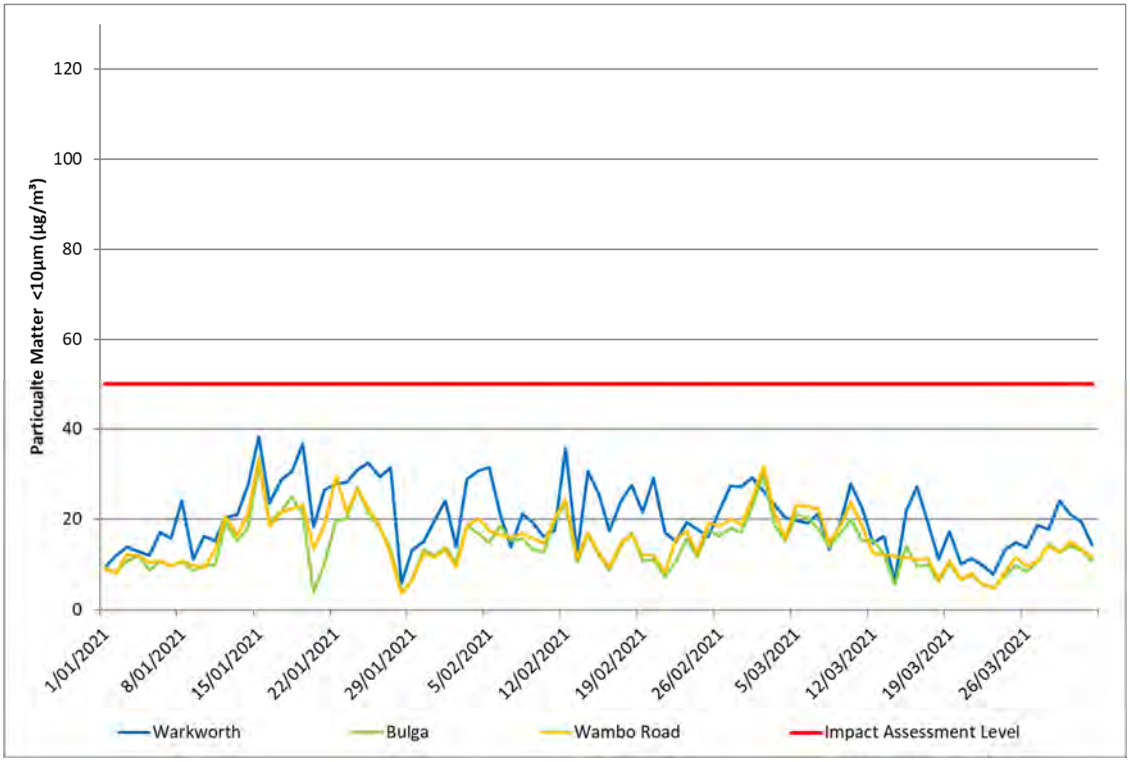


FIGURE 18: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER ONE 2021

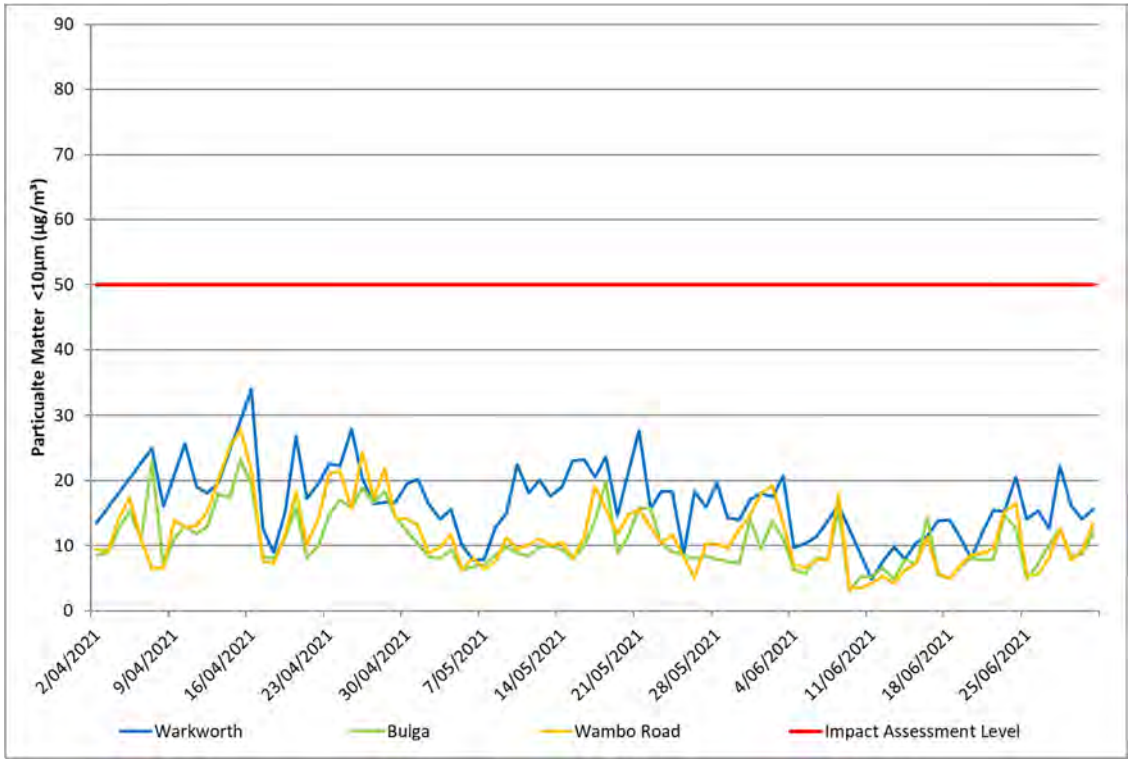


FIGURE 19: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER TWO 2021

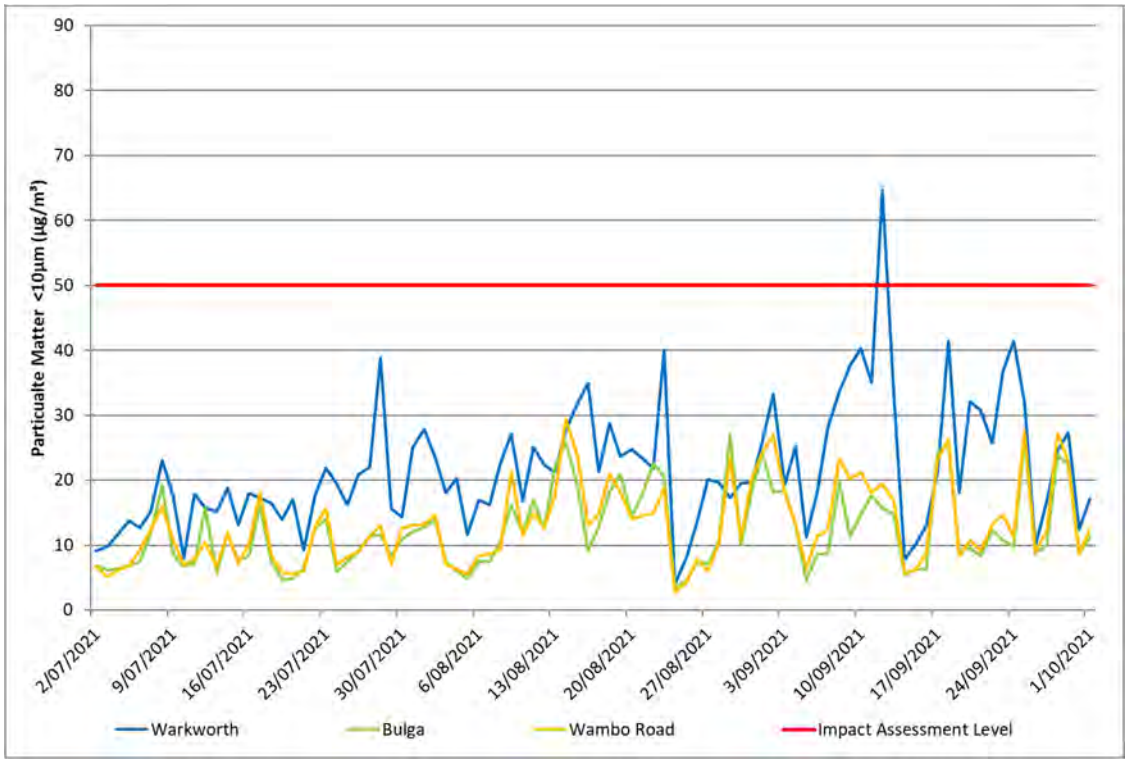


FIGURE 20: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER THREE 2021

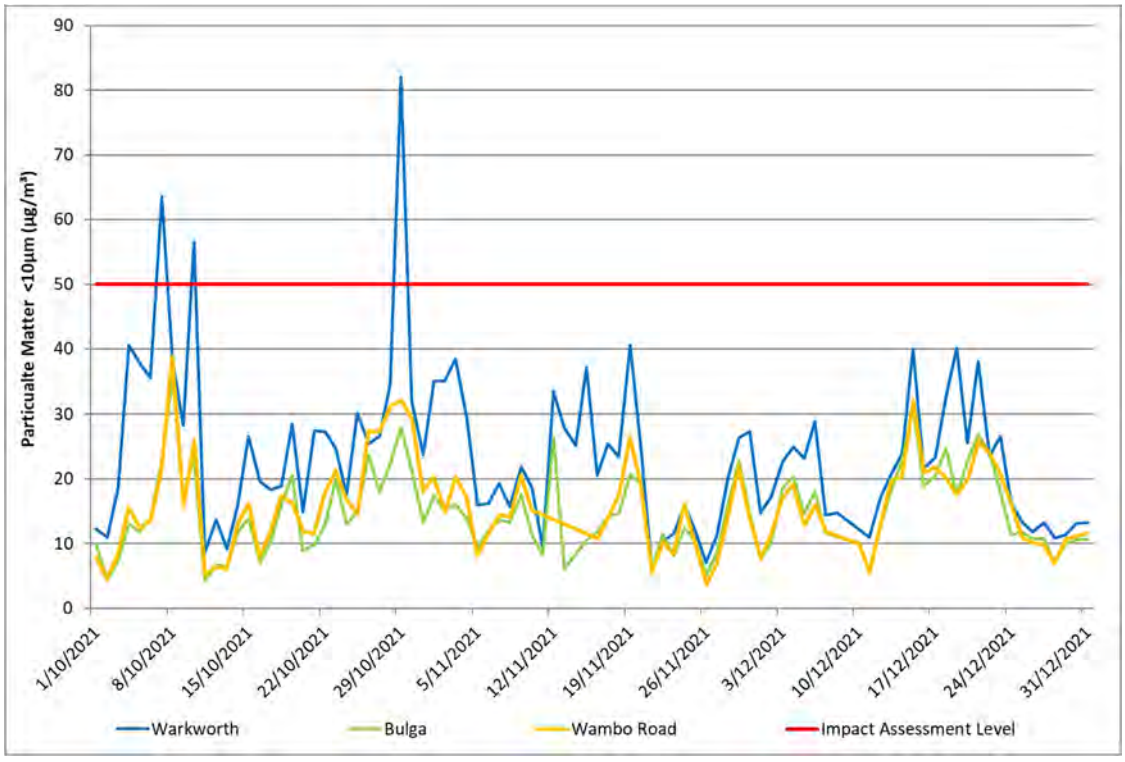


FIGURE 21: 24HR AVERAGE PM_{10} MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER FOUR 2021

One high volume air sample and four TEOM PM_{10} measurement results potentially exceeded the 24 hour short term impact assessment criteria during the reporting period. The exceedances were investigated to determine the level of contribution from MTW activities in accordance with the compliance protocol outlined in the MTW Air Quality Management Plan. MTW was not a significant contributor to the exceedances and therefore no non-compliances were recorded.

A summary of the investigations undertaken for each short term PM10 exceedance are provided in **Table 6.9**

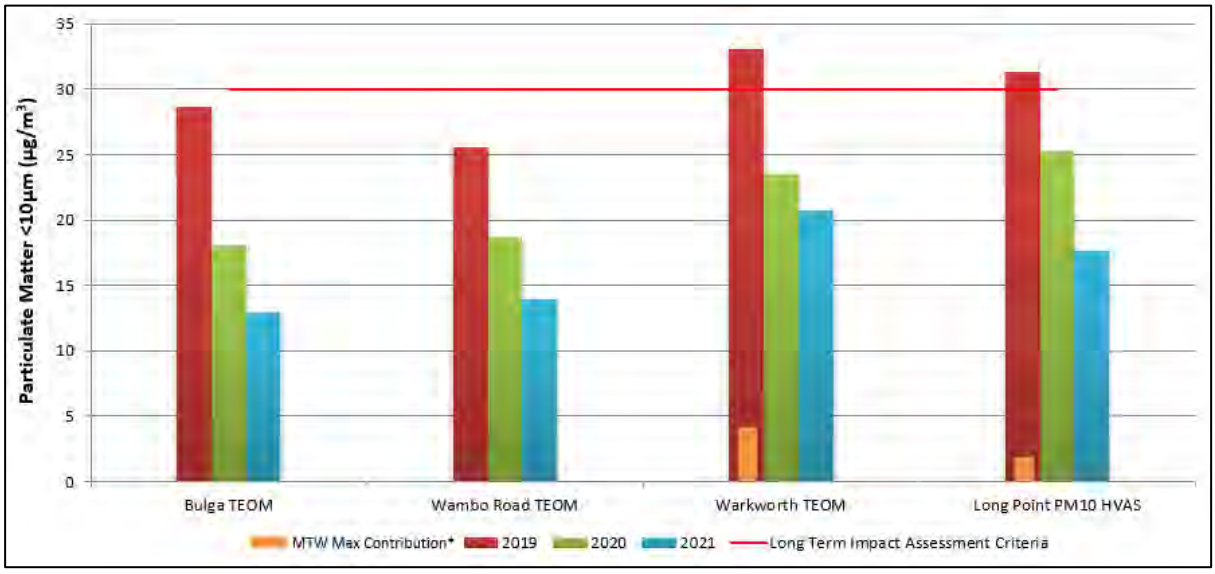
TABLE 6.9 24 HOUR PM_{10} INVESTIGATIONS - 2021

Date	Site	24hr PM_{10} result ($\mu g/m^3$)	Estimated contribution from MTW ($\mu g/m^3$)	Discussion
12/09/2021	Warkworth TEOM	64.6	0.8	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 0.8µg/m3 or <2% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
12/09/2021	Long Point HVAS PM_{10}	56.7	41.0	An analysis of meteorological data and background PM10 levels has determined the maximum potential MTW contribution to the result to be in the order of 41.0µg/m3 or ~72% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
07/10/2021	Warkworth TEOM	63.6	15.5	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 15.5µg/m3 or ~24% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.

Date	Site	24hr PM_{10} result ($\mu g/m^3$)	Estimated contribution from MTW ($\mu g/m^3$)	Discussion
10/10/2021	Warkworth TEOM	56.5	7.5	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 7.5µg/m3 or ~13% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
29/10/2021	Warkworth TEOM	82.0	11.6	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 11.6µg/m3 or ~16% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.

6.4.2.6 Long term PM_{10} impact assessment criteria

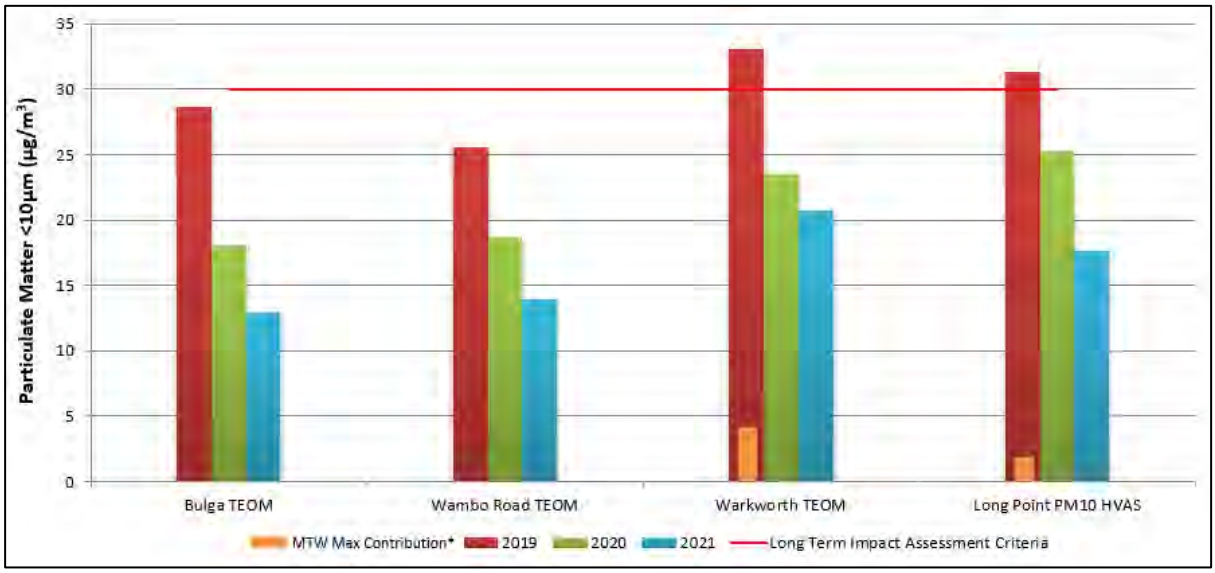
Annual average PM_{10} concentrations have been compared with the long term PM_{10} impact assessment criterion and previous years' data (



** MTW's estimated maximum contribution to annual average PM10 level (determined by external air quality consultant).*

Figure 22). All annual average PM_{10} concentrations recorded on privately owned land (or representative of the nearest privately-owned property) were compliant with the assessment criterion.

The Bulga, Wambo Road, Warkworth and Long Point monitoring locations recorded decreases in annual average PM_{10} concentrations compared to 2020 and 2019. This decrease is considered largely attributable to above average rainfall.



** MTW's estimated maximum contribution to annual average PM10 level (determined by external air quality consultant).*

FIGURE 22: ANNUAL AVERAGE PM10 RESULTS 2019 TO 2021

6.4.2.7 Comparison of 2021 Air Quality data against EA predictions

Annual average PM_{10} results were close to or below the modelled range for Year 9 of the development (nominally 2023) which is the mine plan year in the EA which provides the most appropriate comparison year. Refer to **Table 6.10**

TSP annual averages at three of five monitoring locations were higher than modelled predictions for the Year 9 scenario. Refer to **Table 6.11.**

The difference between modelled predictions and the measured results can be explained as a function of model inputs which do not account for PM_{10} or TSP contribution from regional particulate events such as bushfires, stock movement, dust from local roads and driveways and agricultural activity.

TABLE 6.10 2021 PM10 ANNUAL AVERAGE RESULTS COMPARED AGAINST CUMULATIVE PREDICTIONS FOR YEAR 9 - WARKWORTH CONTINUATION EIS (2014).

Monitoring Location	Long Term (annual average) PM_{10} criteria	
	Year 9 EIS Prediction (µg/m³)	2021 Annual Average (µg/m³)
Bulga OEH TEOM	22	12.9
Wambo Road TEOM	14	13.9
Warkworth OEH TEOM	32	20.7
Long Point PM_{10}	16	17.6

TABLE 6.11 2021 TSP ANNUAL AVERAGE RESULTS COMPARED AGAINST CUMULATIVE PREDICTIONS FOR YEAR 9 – WARKWORTH CONTINUATION EIS (2014).

Monitoring Location	Long Term (annual average) TSP criteria	
	Year 9 EIS Prediction (µg/m³)	2021 Annual Average (µg/m³)
MTO TSP1	50	33.9
Loders Creek TSP	41	52.0
WML- HV2a	35	29.0
Warkworth	68	94.6
Long Point	38	44.6

6.5 Heritage Summary

6.5.1 Heritage Management

During the reporting period, Aboriginal Cultural Heritage and Historic Heritage was managed in accordance with the site's approved Aboriginal Heritage and Historic Heritage Management Plans. A summary of the performance in each of these areas is outlined below.

6.5.2 Heritage Performance

6.5.2.1 Aboriginal Heritage

6.5.2.1.1 Aboriginal Heritage Activities

No Aboriginal cultural heritage assessments or salvage programs were required at MTW during the reporting period. Aboriginal cultural heritage was managed in accordance with the MTW Aboriginal Heritage Management Plan (AHMP) and the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (the Due Diligence Code).

MTW was issued Care Agreement C0003708 on 26 April 2019 by the Office of Environment and Heritage (now Heritage NSW), which approved the transfer and safekeeping of Aboriginal objects and

was a replacement of Care Agreement C0001841. On 19 October 2020, the Aboriginal objects specified in Care Agreement C003708 were transferred to the updated location for safekeeping. Heritage NSW was advised of the transfer on 29 October 2020.

There were no additional Aboriginal cultural heritage sites identified during the reporting period.

An AHMP compliance inspection covering the 2021 reporting period was undertaken on 2-3 November 2021. This inspection was conducted by representatives of the Aboriginal community, internal MTW personnel and a consultant archaeologist. A total of 53 Aboriginal cultural heritage sites were reviewed during this program, with no adverse findings identified. The Aboriginal Heritage Management Plan Inspection report is shown in **Appendix 2**.

The Upper Hunter Valley Aboriginal Cultural Heritage Working Group (CHWG) is the primary forum for Aboriginal community consultation on matters pertaining to cultural heritage. The CHWG is comprised of representatives from MTW and Registered Aboriginal Parties (RAPs) from Upper Hunter Valley Aboriginal community groups, corporations and individuals. There were no meetings of the CHWG during the reporting period. Further consultation with the CHWG is planned for the next reporting period to discuss upcoming salvage programs and general cultural heritage management processes.

6.5.2.1.2 Audits and Incidents

During the reporting period there were 35 Ground Disturbance Permits (GDP's) assessed for cultural heritage management considerations at MTW. Ground disturbance works were conducted based on an Aboriginal cultural heritage sites avoidance policy so that no un-salvaged sites were impacted by these activities. There were no known incidents, nor any unauthorised disturbance caused to Aboriginal cultural heritage sites at MTW during 2021.

6.5.2.2 Historic Heritage

6.5.2.2.1 Historic Heritage Activities

An Historic Heritage Management Plan (HHMP) compliance inspection covering the 2021 reporting period was conducted on 2-3 November 2021. This inspection was conducted by a consultant archaeologist, assisted by representatives of the Community Heritage Advisory Group (CHAG) and internal MTW personnel. A total of 3 historic heritage sites were inspected during this program. The Historic Heritage Management Plan Inspection Report is shown in **Appendix 3**.

In 2012 the CHAG was established as a community consultation forum for matters pertaining to management of historic (non-Indigenous) heritage located on MTW lands. The CHAG is comprised of community representatives with particular knowledge and interests in the historic heritage of the region such as historical groups, individuals and local government.

The MTW Historic Heritage Conservation Fund (HHCF) was launched by Singleton Council in December 2018, in accordance with Schedule 17 of the HHMP. Including the 2021 reporting period, MTW has made $409,333 of contributions to the HHCF since its launch. Singleton Council advised

correspondence received September 2020, that a total of 3 applications were made in 2020. There were no applications received for HHCF funding in 2021. MTW will continue to consult with Council during 2022 on the HHCF processes, including methods to promote/advertise the fund, to ensure the positive outcomes that the funding is intended to achieve can be realised in the Singleton area.

There were no incidents or any unauthorised disturbance caused to historic heritage sites at MTW during 2021.

6.6 Visual Amenity and Lighting

6.6.1 Visual Amenity and Lighting Management

MTW aims to minimise visual amenity impacts from its operations. Two of the main controls used are lighting management and visual screening.

6.6.2 Visual Amenity and Lighting Performance

6.6.2.1 Lighting

MTW aims to provide sufficient lighting for work to be undertaken safely, whilst minimising disturbance to neighbouring residents and public road users, particularly nearby residents in Bulga Village, Mount Thorley, Warkworth Village, Long Point, Milbrodale and motorists on the Putty Road and Golden Highway.

Actions undertaken in 2021 to manage lighting impacts at MTW included:

- Routine night shift inspections conducted by Community Response Officers to observe operating practices and to ensure lights are not shining towards nearby residential areas or affecting public roads;
- Yellow lights are used in preference to white lights in areas based on risk and external exposure;
- Alternate sheltered dumps are operated, or work areas are shut down if lighting or visual amenity issues arise and cannot be sufficiently managed.

6.6.2.2 Visual Screening

Visual screening of MTW's operations incorporates various methods to best suit the terrain and infrastructure constraints around the boundary of the mine.

Visual bunding has an immediate screening effect, providing complete screening in areas where vegetation would be inadequate to filter views or where additional height is required. Bunds may be vegetated where practicable and feasible for visual amenity and to mitigate erosion.

Built screens (i.e. solid fences or walls), may be used as an alternative when bunds and tree screens are not practicable. Temporary screens (i.e. fencing and shade mesh) may also be used as required for interim screening.

Shade cloth was attached to the existing fence along Putty Road in July 2021. This visual screen fencing is an interim measure prior to the establishment of vegetation. Vegetation plantings were undertaken in 2020 to infill between existing trees/shrubs. Slashing works were also undertaken in 2021 along Putty Road and the Golden Highway, improving visual amenity.

6.7 Water

6.7.1 Water Management

An adaptive management approach is implemented at MTW to achieve the following objectives for water management:

- Fresh water usage is minimised;
- Impacts on the environment and MTW neighbours are minimised; and
- Interference to mining production is minimal.

This is achieved by:

- Preferentially using mine water for coal preparation and dust suppression where feasible;
- An emphasis on control of water quality and quantity at the source;
- Segregating waters of different quality where practical;
- Recycling on-site water;
- Ongoing maintenance and review of the water management system; and
- Releasing water to the environment in accordance with statutory requirements.

Plans showing the layout of all water management structures and key pipelines are shown in **Figure 23**. During the reporting period an updated Water Management Plan was approved in November 2021.
The MTW Water Management Plan contains further detail on management practices and is available on the MTW website https://www.mtwcoal.com.au/.

Improvements to water management in 2021 included;

- Construction of sediment water management structures for the western advancing pre-strip at Warkworth completed in quarter one 2021. These structures were designed in accordance with the NSW Blue Book, Managing Urban Stormwater: Soils and Construction, Volume 2E Mines and Quarries.

- Remote boundary monitoring system installed on the additional new dams (54N and 55N).

- Upgrade and install of additional pumping infrastructure to manage Dams 1S, 2S and 3S to reduce risk during high intensity rainfall events.

- Construction of the Warkworth North Pit North drainage upgrade works was completed during the reporting period to improve water management and mitigate the risk of unauthorised water releases from site.

- Develop concept sediment dam sizing for the rehabilitation areas catchment that reports to Dam 3S in accordance with the key principles outlined within the 'Blue Book' (Managing Urban Stormwater: Soils and Construction Vol. 1, 4th edition and Vol. 2E Mines and Quarries (Landcom, 2004 and DECC, 2008)) to mitigate the risk of unauthorised water releases from site from Dam 1S. The Water Management Plan was updated with this concept in 2021, and further design works / geotechnical assessments progressing to construction are planned to occur in 2022.

There were four reportable water related incidents during the reporting period that occurred on 4 January, 19 March, 12 November and 26 November 2021 per below summary. Further details on these incidents and the actions taken by MTW are provided in **Section 10**.

- The incident on 4 January 2021 involved the overtopping of four boundary dams at Warkworth (Dam 46N, Dam 52N, Dam 53N, Dam SSD09) and a mine water dam at Mount Thorley Operations (Dam 1S) as a result of a greater than design rainfall event (79.4 mm). Two penalty notices were received from the EPA in July 2021, and one penalty notice was received from DPE in August 2021.
- The incident on 19 March 2021 involved the overtopping of three boundary dams at Warkworth (Dam 53N, 54N and 55N) and a mine water dam at Mount Thorley Operations (Dam 1S) as a result of a greater than design rainfall event (175.2 mm). MTW received notification on 4 November 2021 from DPE stating no comments on the incident reports. There has been no response from the EPA.
- The incident on 12 November 2021 involved the overtopping of two boundary dams at Warkworth (Dam 54N and Dam 53N) as a result of a greater than design rainfall event (110.6 mm). WML received notification on 20 January 2021 from the EPA stating they would not be taking regulatory action.
- The incident on 26 November 2021 involved the overtopping of a boundary dam at Warkworth (Dam 53N) as a result of a greater than design rainfall event (84 mm). WML received notification on 20 January 2022 from the EPA stating they would not be taking regulatory action.

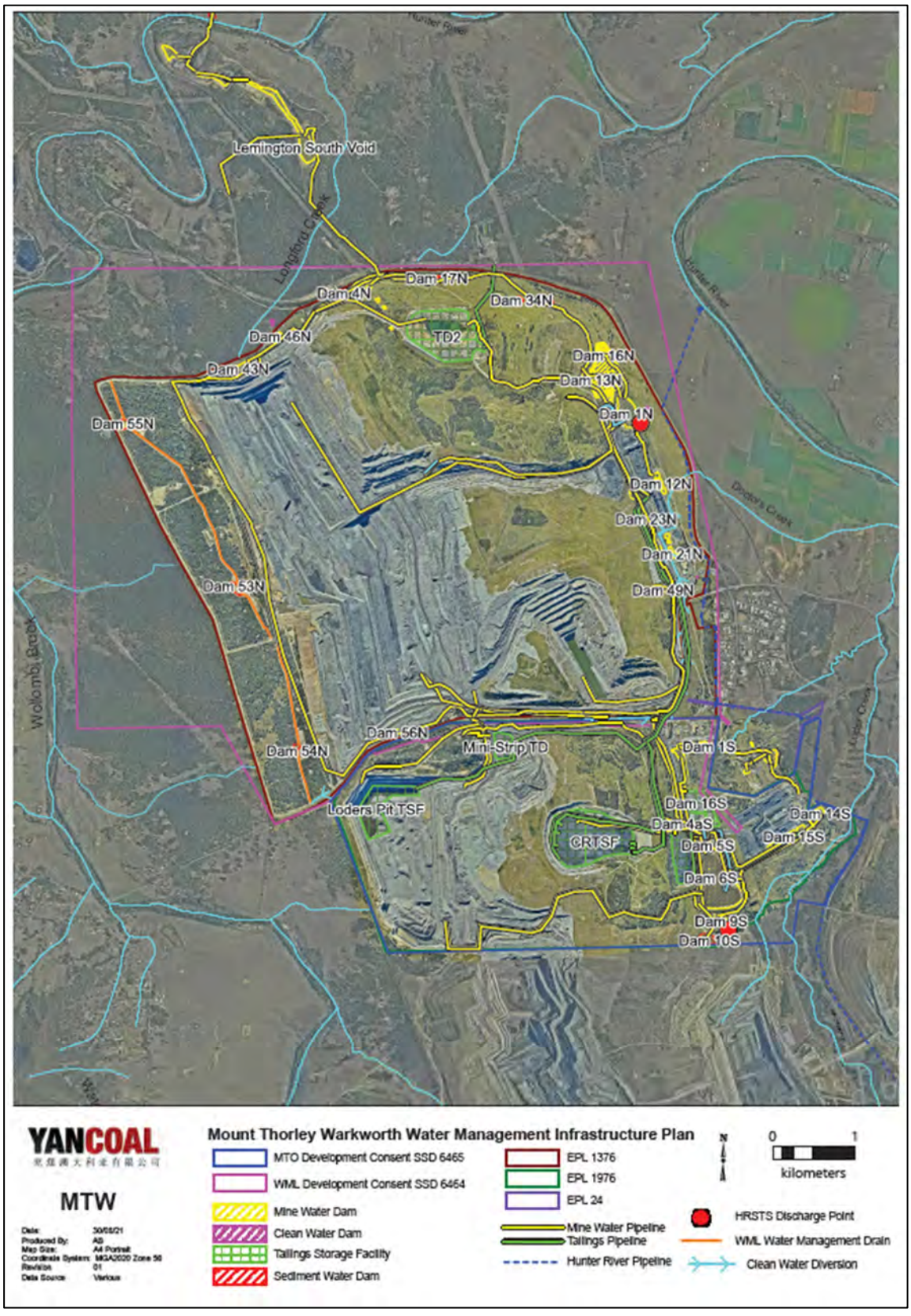


FIGURE 23: WATER MANAGEMENT INFRASTRUCTURE PLAN

6.7.2 Water Balance Performance

MTW uses a water balance to record and assess water flux, but also to forecast and plan water management needs. These annual site water balances are then compared to previous results. A 2021 static water balance for MTW is presented in **Table 6.12** and a simplified schematic of this balance is included in **Figure 24**. A salt flux schematic is shown **in Figure 25**.

TABLE 6.12 STATIC MODEL RESULTS, ANNUAL WATER BALANCE

Water Stream	Volume (ML) (% Total)
Inputs	
Rainfall Runoff	10,014 (84%)
Hunter River (MTJV supply scheme)	259 (2%)
Potable (Singleton Shire Council / trucked)	48 (<1%)
Groundwater	428 (4%)
Recycled to CHPP from tailings (not included in total)	5,529
Imported (LUG bore)	41 (<1%)
Imported (Hunter Valley Operations)	0 (0%)
Water from ROM Coal	1,138 (10%)
Total Inputs	**11,928**
Outputs	
Dust Suppression	3,030 (27%)
Evaporation – mine water dams	2,074 (19%)
Entrained in process waste	2,451 (22%)
Sharing with other mines	0 (0%)
Discharged (HRSTS)	1,688 (15%)
Water in coarse reject	640 (6%)
Water in product coal	1,160 (10%)
Miscellaneous use (wash-down etc.)	110 (1%)
Total Outputs	**11,153**
Change in storage	**775**

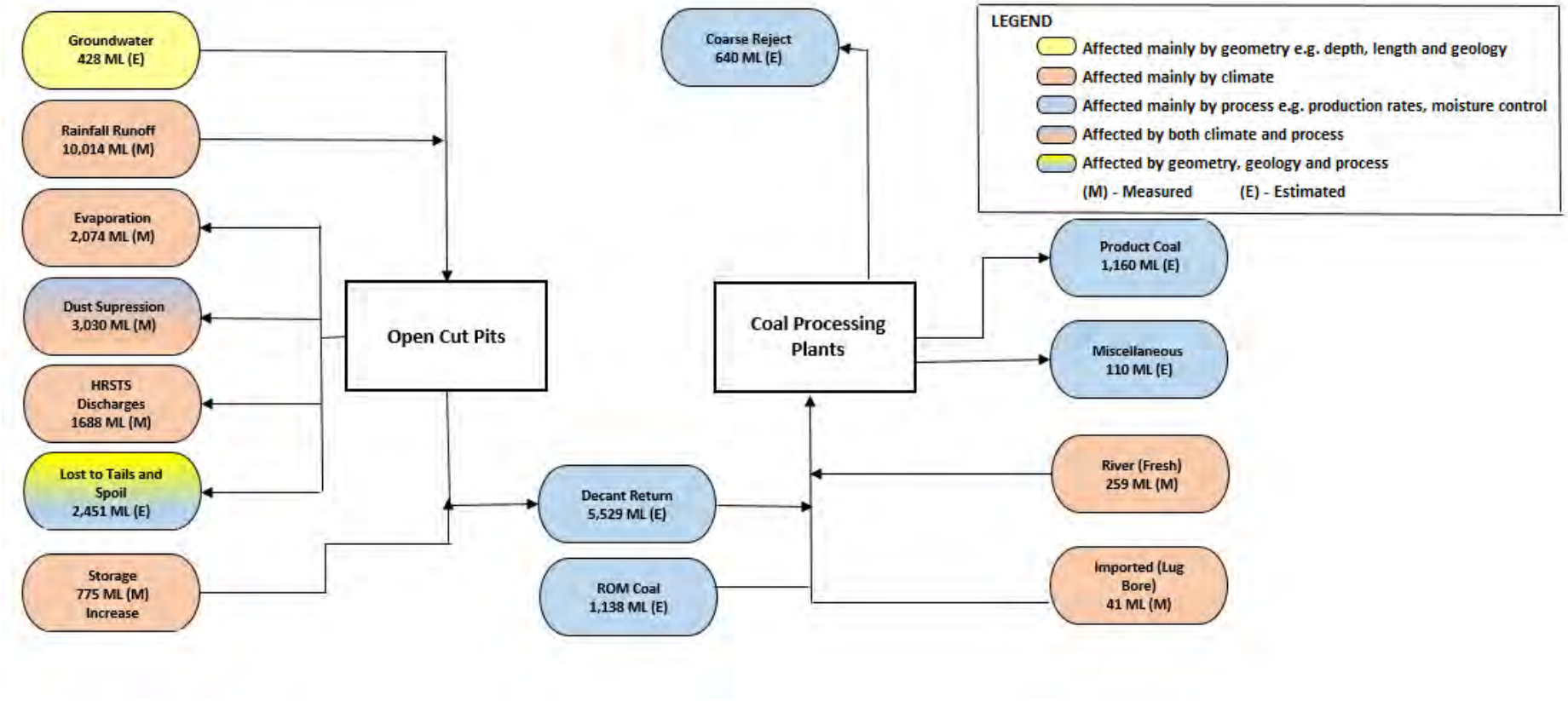


FIGURE 24: SCHEMATIC DIAGRAM MTW WATER FLUX

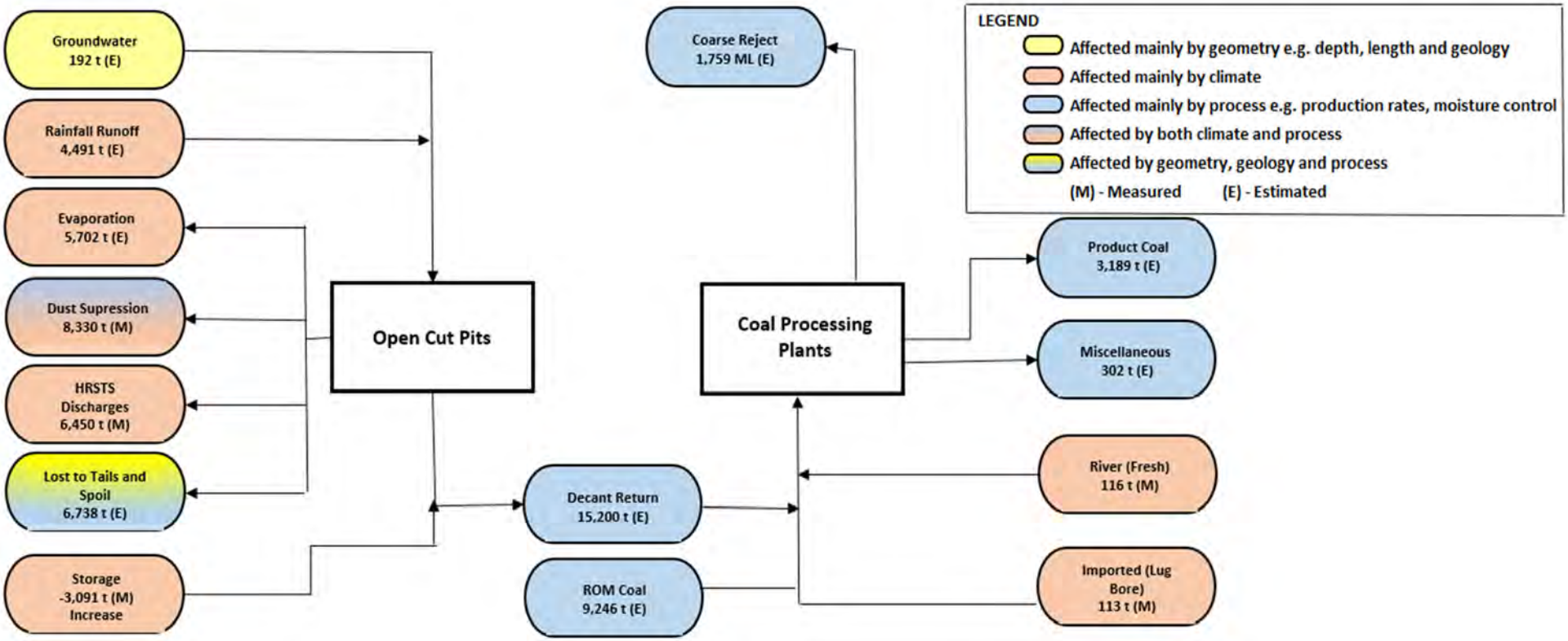


FIGURE 25: SCHEMATIC DIAGRAM MTW SALT FLUX

6.7.2.1 Water Inputs

A total of 979.6mm of rainfall was recorded at MTW in 2021 producing a calculated 10,014 ML of runoff from developed, disturbed and mining catchments. Water falling on clean water catchments is diverted off site into natural systems where possible. Rainfall runoff was the largest input to the site mine water balance in 2021.

With high rainfall during the year, minimal water was required to be imported to meet site demand. During the reporting period 41 ML was imported from the LUG bore by MTW. This volume was a significant decrease on the previous reporting period (565ML extracted), due to on site water availability.

MTW also sources water from the Hunter River via the Mount Thorley Joint Venture (MTJV) water supply scheme. Singleton Shire Council holds the high security water licence on behalf of the scheme members. Singleton Shire Council maintains and operates the scheme to supply raw water to MTW, Glencore's Bulga Coal complex, and to meet Council's own needs. MTW's share of the MTJV allocation is 1,009 ML per water reporting year.

A total of 259 ML of water was abstracted from the Hunter River during the reporting period for MTW operations which was significantly less than the volume of water extracted in the previous reporting period. (1,455 ML extracted in 2020).

Groundwater Licences under Part 5 of the Water Act 1912 are held for each mining excavation area, to account for passive take via seepage inflows. Water Licences held by MTW are detailed in **Table 3.5** and **Table 3.6..**

Licence conditions require the volume and quality of water taken by the works to be measured and reported on an annual water calendar year basis (i.e. financial year). Groundwater inflows via pit wall seepage are at low rates, with a significant proportion evaporating at the coal face. The remainder reports to the pit floor, where it may accumulate along with direct rainfall, rainfall runoff and leakage from spoils. As a result, it is not possible to physically measure the volume of water taken by these groundwater licences, nor the quality of waters extracted via seepage to the pits. Ground water inflows volumes are estimated based on modelling from Australasian Groundwater and Environmental Consultants Pty Ltd (2015), *Mount Thorley and Warkworth Mines Long Term Approvals Model Update* (Project No G1468G, February 2015).

6.7.2.2 Water Outputs

Significant water uses at MTW in 2021 were for dust suppression on haul roads, mining areas and coal stockpiles (3,030 ML), evaporation from Dams (2,074 ML) and water entrained in process waste (2,451 ML). Water usage for dust suppression on haul roads was comparable to the 2020 reporting period with similar climatic conditions during the reporting period.

MTW participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing discharge from licensed discharge points during declared discharge events associated with increased flow in the Hunter River. During high flows, each HRSTS participant is entitled to discharge a share of the total allowable discharge into a block of water passing down the Hunter River according to the number of HRSTS salt credits that they hold. Credits may be traded between participants to ensure that saline water is being managed in the most cost-effective way.

There are 1000 credits, each entitling the holder to discharge 1/1000 of each high flow day's total allowable discharge. The credits may be traded between participants so that those holders who do not need to discharge can trade their entitlement to others with the greatest need HRSTS discharge opportunity. HRSTS discharges are undertaken in accordance with HRSTS regulations (including the need to hold HRSTS credits for the discharges undertaken), and the licence conditions of EPL 1376 and EPL 1976.

MTW maintains two licensed HRSTS discharge monitoring locations:

- Dam 1N, located at WML North, which discharges to Doctor's Creek; and
- Dam 9S, located at MTO South, which discharges to Loders Creek.

During the reporting period, no discharge occurred from Dam 1N (WML) under the HRSTS. A total of 1,688 ML was discharged from Dam 9S (MTO) during the reporting period.

6.7.3 Surface Water Management

Surface water monitoring activities continued in 2021 in accordance with the MTW Water Management Plan and MTW Surface Water Monitoring Programme. MTW maintains a network of surface water monitoring sites located at selected site dams and surrounding natural watercourses as shown in **Figure 26**. Water quality monitoring is undertaken to verify the effectiveness of the water management system onsite, and to identify the emergence of potentially adverse effects on surrounding watercourses. Primary water storage dams are monitored routinely to verify the quality of mine water, used in coal processing, dust suppression, and other day to day activities around the mine.

Surface water monitoring data review involves a comparison of measured pH, EC and TSS results against internal trigger values which have been derived from the historical data set. The response to measured samples outside the trigger limits is detailed in the MTW Water Management Plan.

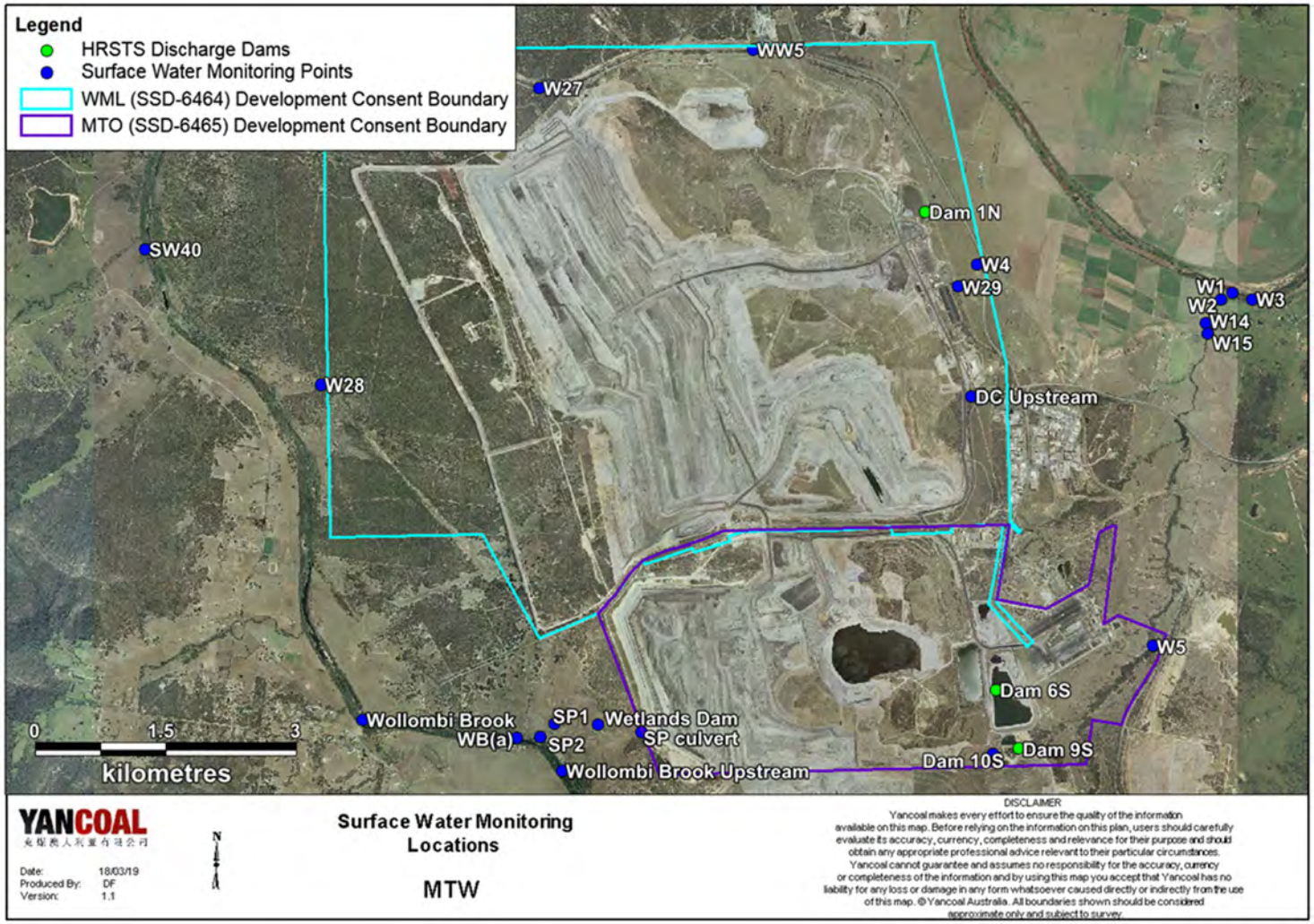


FIGURE 26: SURFACE WATER MONITORING POINTS

6.7.4 Surface Water Performance

Routine surface water monitoring was undertaken from twelve (12) sites and rain event sampling was undertaken from thirteen (13) sites. Sampling of surface waters was carried out in accordance with AS/NZS 5667.6 (1998). Analysis of surface water was carried out in accordance with approved methods by a NATA accredited laboratory.

Water quality is evaluated through the assessment of pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS). All surface water sites were also sampled for comprehensive analysis annually. The sampling frequency for ephemeral water sites was modified in 2016, from quarterly to a rain-event trigger system in an effort to ensure samples taken were more representative of typical water quality for those streams (up to eight sampling events per annum can now be taken under the revised sampling protocol). Due to above average rainfall during the reporting period, three rain event sampling runs were completed in 2021. All required sampling and analysis was undertaken, except as detailed in **Table 6.13**. Trigger tracking results are described in **Table 6.14**.

TABLE 6.13 MTW WATER MONITORING DATA RECOVERY FOR 2021 (BY EXCEPTION)

Location	Data Recovery (%)	Comment
W27	67%	Insufficient water for sampling in March.
W1	50%	No safe access to site in March and June
W3	25%	No safe access to site in March, June and December
Dam 6S	92%	Insufficient water for sampling in June.

Note: Missing data indicates that there was insufficient water to take a sample, or that there was no safe access.

A summary of all surface water monitoring results is provided in the MTW Monthly Environmental Monitoring Reports and can be viewed via MTW's website (https://www.mtwcoal.com.au/).

Figure 27 to **Figure 32** show long term water quality trends for the Hunter River, Wollombi Brook, other surrounding tributaries and site dams.

Measurements of EC were generally stable during the reporting period across the majority of sites and consistent with historical seasonal trends. A single elevated EC level was recorded at the WW5 (unnamed creek) monitoring site during the reporting period. This site will continue to be monitored for future elevated levels and investigated as required.

Measurements of pH were generally stable during the reporting period across the majority of sites and consistent with historical seasonal trends. A few sites triggered 5th percentile/lowers limits during the first month of the reporting period and returned to within trigger limits the remainder of the year. One site triggered the 95th percentile/upper limit in the last month of the reporting period and will be monitored for future elevated levels. Refer to **Table 6.14** for trigger results.

A number of TSS limits were triggered in the reporting period, which were generally associated with rainfall events or sampling from pooled section of watercourses; these are outlined below in **Table 6.16**. MTW undertook investigations into the elevated TSS readings at W2 (Loders Creek), W4 (Doctors Creek), W5 (Loders Creek), W14 (Loders Creek), W15 (Loders Creek), W27 (Longford Creek) and W28 (Unname Creek) during the reporting period. The investigations concluded that the elevated results were most likely attributed to the rainfall event received prior to sampling. Monitoring results will continue to be watched. These results are also provided in the Monthly reports provided on the MTW Insite website (https://www.mtwcoal.com.au/).

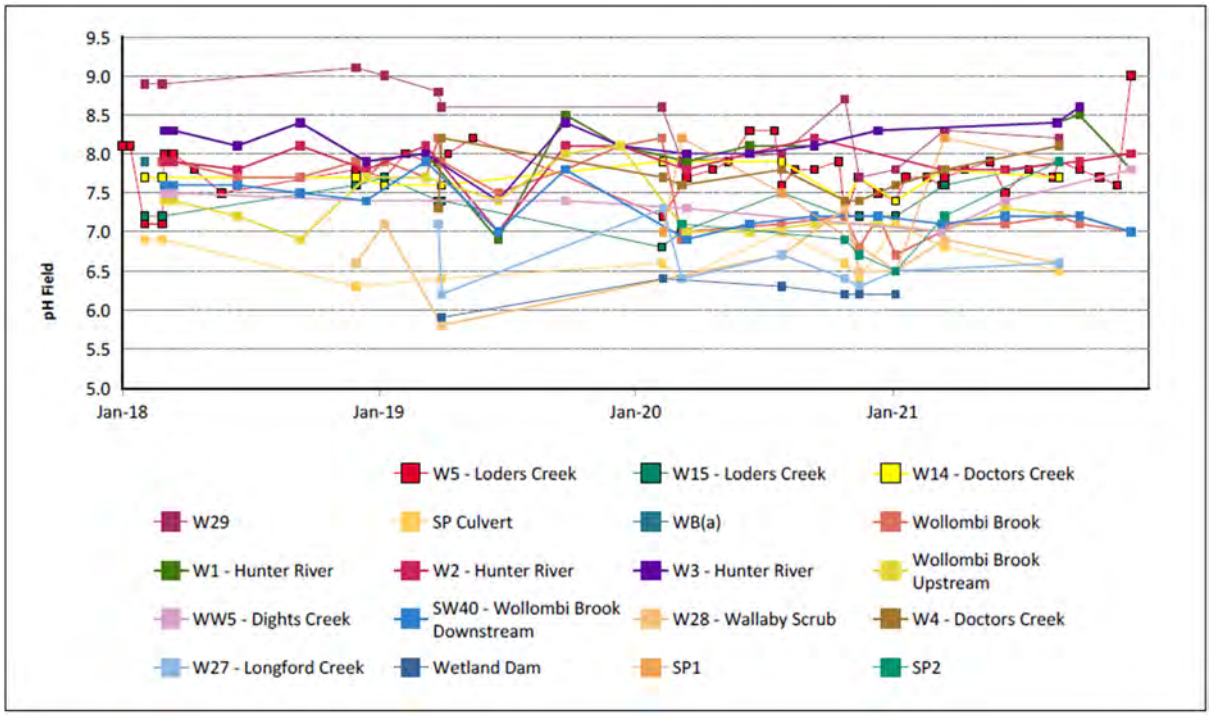
TABLE 6.14 SURFACE WATER MONITORING - TRIGGER TRACKING RESULTS

Site	Date	Trigger Limit Breached	Action Taken in Response
SP1	05/01/2021	pH –5th Percentile	Monitoring results back within trigger limits for March and August 2021 sample rounds. No follow up required.
W5	05/01/2021	pH –5th Percentile	Monitoring results back within trigger limits for February 2021 and all subsequent sample rounds. No follow up required.
W5	6/12/2021	pH –95th Percentile	Watching Brief*
W15	05/01/2021	pH –5th Percentile	Cyclical lower-pH measurements are consistently seen in the historical trend for this Loders Creek monitoring location. Monitoring results back within trigger limits for March 2021 sample round. No follow up required.
W29	05/01/2021	pH –5th Percentile	Monitoring results back within trigger limits for March and August 2021 sample rounds. No follow up required.
W3	23/09/2021	pH –5th Percentile	Watching Brief*
WW5	6/12/2021	EC – 95th Percentile	Watching Brief*
W1	6/12/2021	TSS – 50mg/L (ANZECC criteria)	Watching Brief* Note: Unlikely to be associated with MTW mining related impacts.
W2	11/03/2021	TSS – 50mg/L (ANZECC criteria)	Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to sampling from water with no flow. Note: Result is not considered to be a valid representation given that there was no flow at the time of sampling. Monitoring results back within trigger limits for June and December 2021 sample rounds. No follow up required.
W4	05/01/2021	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS associated with high runoff due to rainfall event (79.4mm on 4 January). Consistent with and higher than upstream sample W29 (which is closer to MTW); no mine site sources of sediment identified (no dam overtopping and/or site discharges recorded during the event).
W4	15/03/2021	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS associated with rainfall event (36.2mm on 14 March) and is considered related to sampling from slow flowing water. Consistent with and higher than upstream sample W29 (which is closer to MTW); no mine site sources of sediment identified. Monitoring results back within trigger limits for August 2021 sample round. No follow up required.
W5	05/01/2021	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (79.4mm on 4 January), resulting in mobilisation of sediment in Loders Creek. No

Site	Date	Trigger Limit Breached	Action Taken in Response
			MTW site sources of sediment identified. No follow up required.
W5	15/03/2021	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with rainfall event (36.2mm on 14 March), resulting in mobilisation of sediment in Loders Creek. No MTW site sources of sediment identified. Monitoring results back within trigger limits for August 2021 sample round. No follow up required.
W14	05/01/2021	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (79.4mm on 4 January). No mine site sources of sediment identified. Upstream sample W29 (which is closer to MTW) indicates source of sediment may be partially attributable to runoff from downstream farming properties. No follow up required.
W14	15/03/2021	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with rainfall event (36.2mm on 14 March), resulting in mobilisation of sediment in Doctors Creek. No mine site sources of sediment identified. Upstream sample W29 (which is closer to MTW) indicates source of sediment may be partially attributable to runoff from downstream farming properties. No follow up required.
W14	25/08/2021	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with rainfall event (31.4mm on 24 August), resulting in mobilisation of sediment in Doctors Creek. No mine site sources of sediment identified. Upstream sample W29 (which is closer to MTW) indicates source of sediment may be partially attributable to runoff from downstream farming properties. No follow up required.
W15	05/01/2021	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS results most likely attributable to high runoff due to rainfall event (79.4mm on 4 January), resulting in mobilisation of sediment in Loders Creek. In addition, TSS results were potentially affected by turbid water associated with the overtopping of one mine water dam at MTO and several MTCL dams/catchment basins which were reported to EPA and DPE.
W15	15/03/2021	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with rainfall event (36.2mm on 14 March), resulting in mobilisation of sediment in Loders Creek. No mine site sources of sediment identified. Monitoring results back within trigger limits for August 2021 sample round. No follow up required.
W27	05/01/2021	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS results most likely attributable to high runoff due to rainfall event (79.4mm on 4 January). In addition, TSS results were potentially affected by turbid water associated with the overtopping of an MTW mine water dam as a result of the rainfall event which was reported to EPA and DPE.
W27	25/08/2021	TSS – 50mg/L (ANZECC criteria)	Watching Brief* Elevated TSS results most likely attributable to high runoff due to rainfall event (31.4mm on 24 August). Note: location was too shallow to sample in March 2021 sample round.
W28	05/01/2021	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS results most likely attributable to high runoff due to rainfall event (79.4mm on 4 January). In addition, TSS results were potentially affected by turbid water associated with the overtopping of MTW

Site	Date	Trigger Limit Breached	Action Taken in Response
			sediment dams as a result of greater than design rainfall, which were reported to EPA and DPE.
W28	15/03/2021	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with rainfall event (36.2mm on 14 March). No mine site sources of sediment identified. No follow up required.
W28	25/08/2021	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with rainfall event (31.4mm on 24 August). No mine site sources of sediment identified.

* = Watching brief established pending outcomes of subsequent monitoring events.



Note: Missing data indicates that there was insufficient water to take a sample, or that there was no safe access.

FIGURE 27: WATERCOURSE PH TRENDS 2018 TO 2021

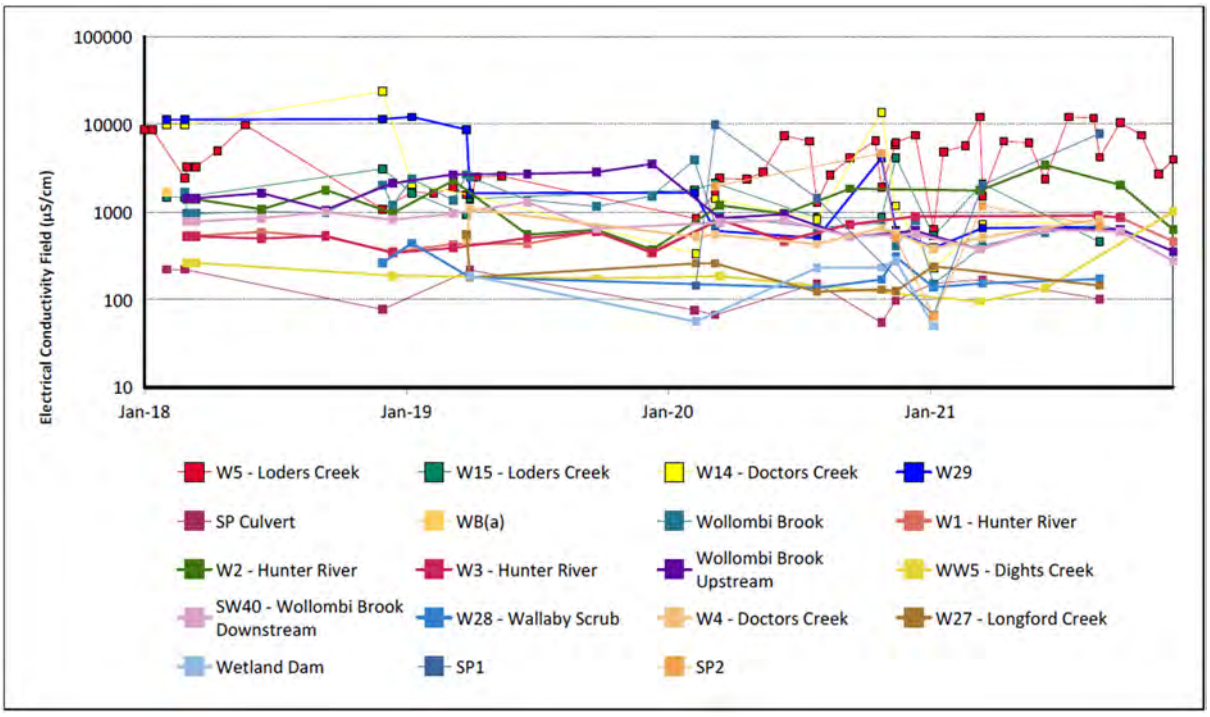


FIGURE 28: WATERCOURSE EC TRENDS 2018 TO 2021

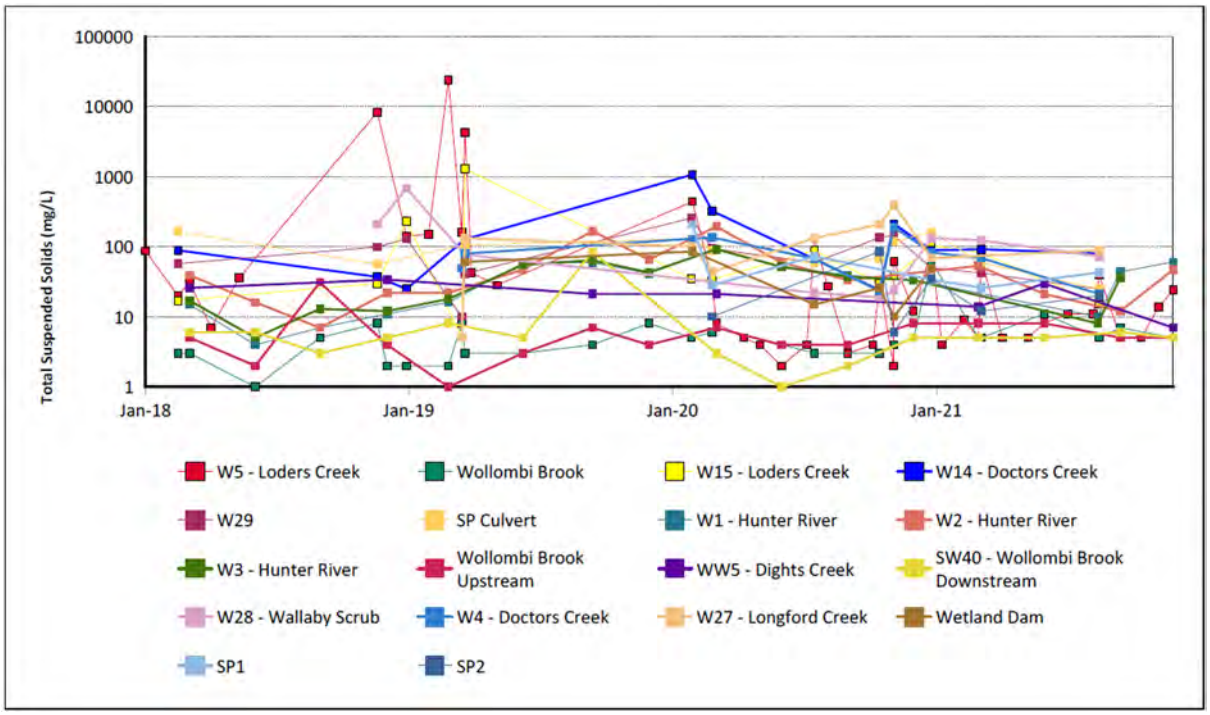


FIGURE 29: WATERCOURSE TSS TRENDS 2018 TO 2021

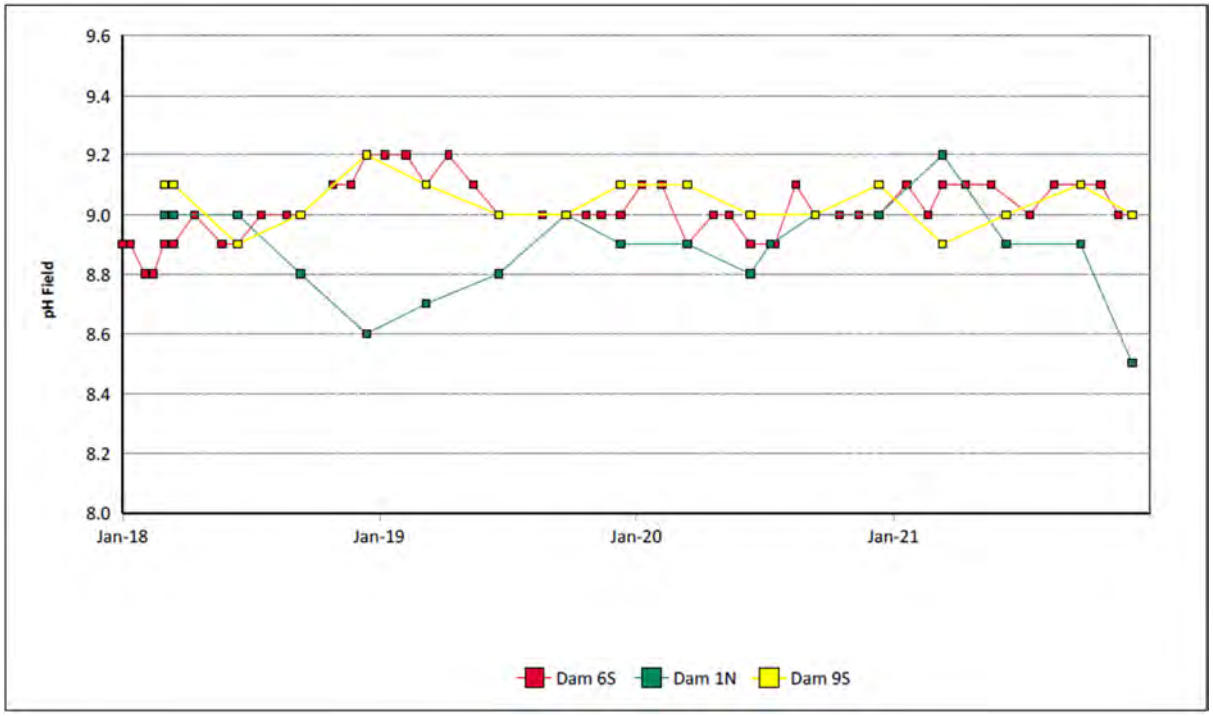


FIGURE 30: SITE DAMS PH TRENDS 2018 TO 2021

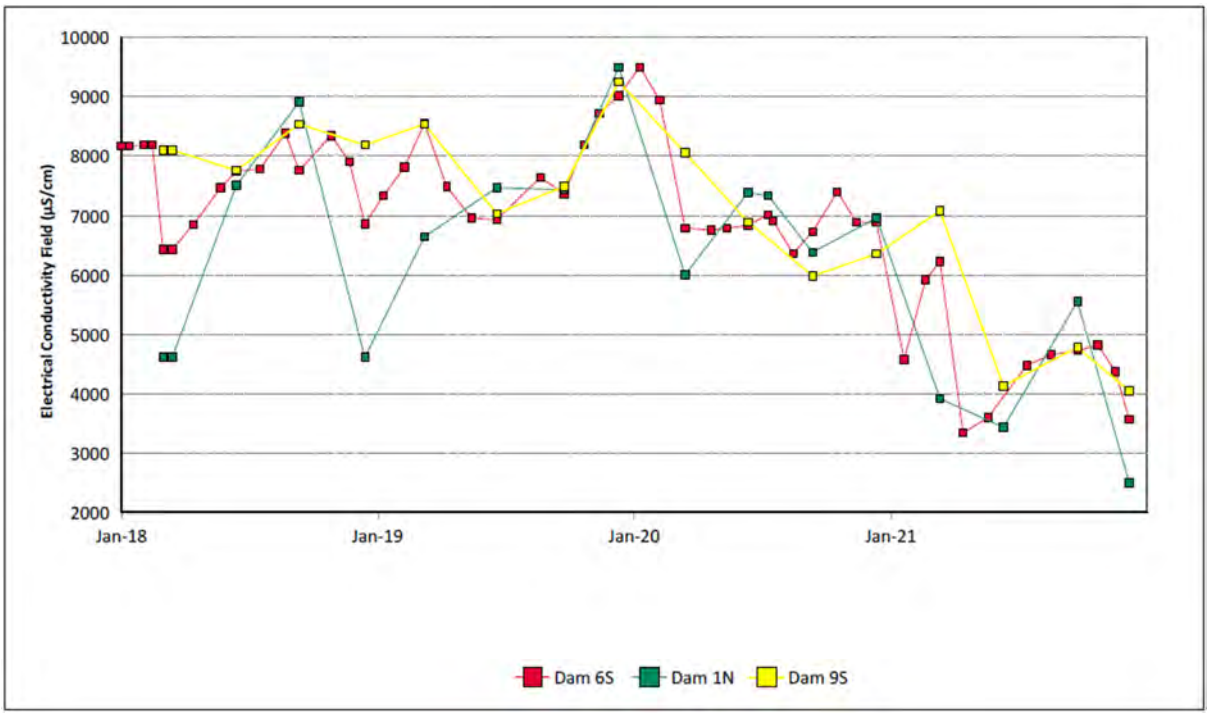


FIGURE 31: SITE DAMS EC TRENDS 2018 TO 2021

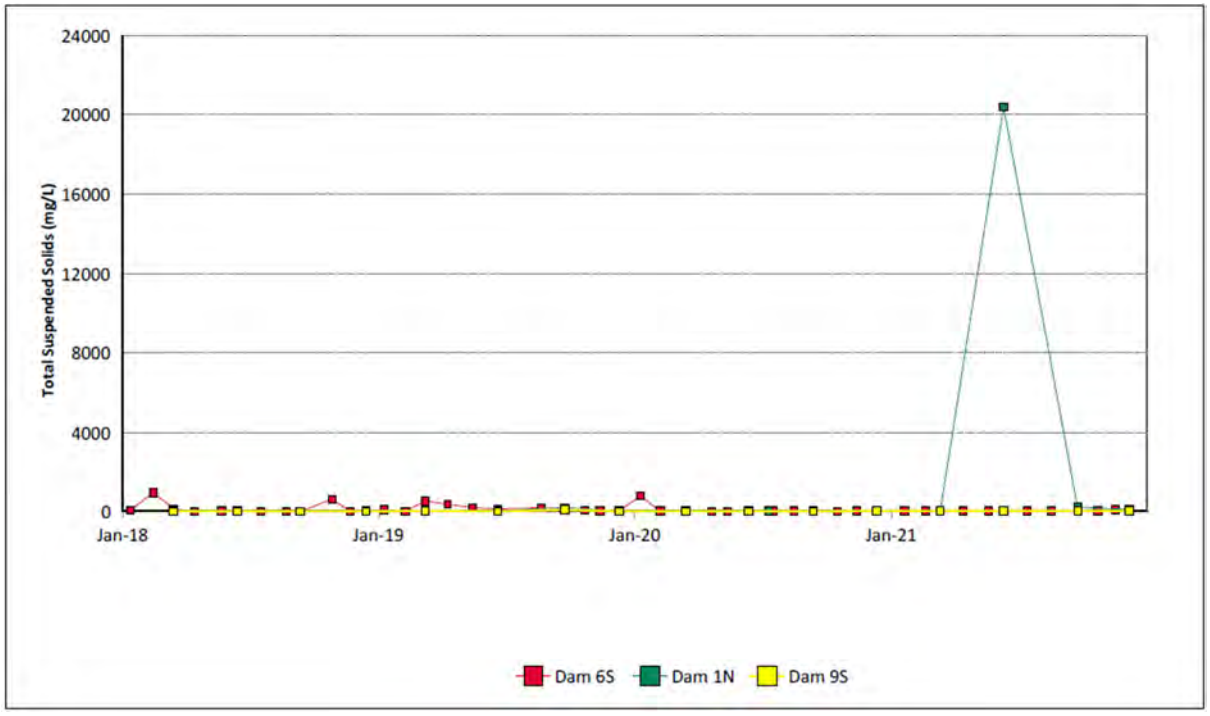


FIGURE 32: SITE DAMS TSS TRENDS 2018 TO 2021

6.7.4.1 Stream Health and Channel Stability

A programme to monitor and report on the stream and riparian vegetation health in Loders Creek and Wollombi Brook which may be potentially affected by the development commenced in 2016. The monitoring programme has previously been conducted in conjunction with a similar programme managed by Bulga Surface Operations.

The annual monitoring program includes the following:

- Documenting locations and dimensions of significant erosive or depositional features;
- Photographs upstream, downstream, at both the left and right banks;
- Rating the site with the Ephemeral Stream Assessment protocol developed by the CSIRO to assess the erosional state of the creek at the monitoring location (a measure of channel stability);
- Rating the site with the Rapid Appraisal of Riparian Condition (RARC) protocol developed by Land & Water Australia. This assesses the ecological condition of riparian habitats using indicators that reflect functional aspects of the physical, community and landscape features of the riparian zone (a measure of stream health); and
- Taking measurements of the channel cross-sections (transects) for comparison purposes for any future monitoring.

A copy of the annual stream health and stability monitoring report is provided as **Appendix 4**. This round of monitoring was subjected to a wetter year than the previous rounds of monitoring and that was reflected by an increase in vegetation growth. MTW advised that there has been 703.43ML discharged from the MTW discharge point between January and November 2021. There has been 736 mm of rainfall recorded within the on-site rainfall gauge for the period January to Mid-November 2021. In comparison, the Bureau of Meteorology shows 843 mm of rainfall recorded at Singleton (Singleton Defence AWS 61430) for the same period.

The results of this monitoring survey indicate that both stream health and channel stability fluctuate over different sections of Loders Creek. The survey identified that some sections of Loders Creek are currently eroding and are vulnerable to further erosion with areas of significant erosion observed. These areas are generally associated with exposed dispersive sub-soils, which hamper vegetation establishment by the development of a hard surface crust when the soil is dry, and the 'melting' nature of the soil when wet.

The survey identified that the majority of Loders Creek displayed stable environments. Generally, the monitoring identified that the creeks have not significantly changed from what was observed during the 2020 survey. Many sections of the creek experience active erosion as a result of natural influences as well as the increased rainfall experienced in the region since 2020. An additional erosion point LC14 was identified during the 2021 survey. This erosion was most likely caused by cattle grazing in the area.

As outlined in the report, stream health and channel stability monitoring results in 2021 indicated that channel stability in Wollombi Brook had remained generally the same as the previous year's

monitoring cycle conditions and that the majority of Loders Creek displayed stable environments. Generally, the monitoring identified that both creeks have not significantly changed from what was observed during the previous survey.

6.7.5 Groundwater Management

Groundwater monitoring activities were undertaken in 2021 in accordance with the MTW Water Management Plan and groundwater monitoring program. The monitoring results are used to establish and monitor trends in physical and geochemical parameters of surrounding groundwater potentially influenced by mining.

The groundwater monitoring program at MTW measures the quality of groundwater against background data, EIS predictions and historical trends. Groundwater quality is evaluated through the parameters of pH, EC, and standing water level. A comprehensive suite of analytes are measured on an annual basis, including major anions, cations and metals. MTW modified its groundwater sampling methodology during the reporting period following a recommendation in the 2018 annual groundwater review undertaken by an independent groundwater consultant. Accordingly bore purging is undertaken across the monitoring network for routine samples (where infrastructure allows) to ensure a representative sample is collected in accordance with industry standards.

Groundwater monitoring data is reviewed on a quarterly basis. The review involves a comparison of measured pH and EC results against internal trigger values (5th and 95th percentile) which have been derived from the historical data set. The response to results outside the trigger limits is detailed in the MTW Water Management Plan.

The monitoring locations are shown in **Figure 33** and the annual Ground Water Review report can be found in **Appendix 5.**

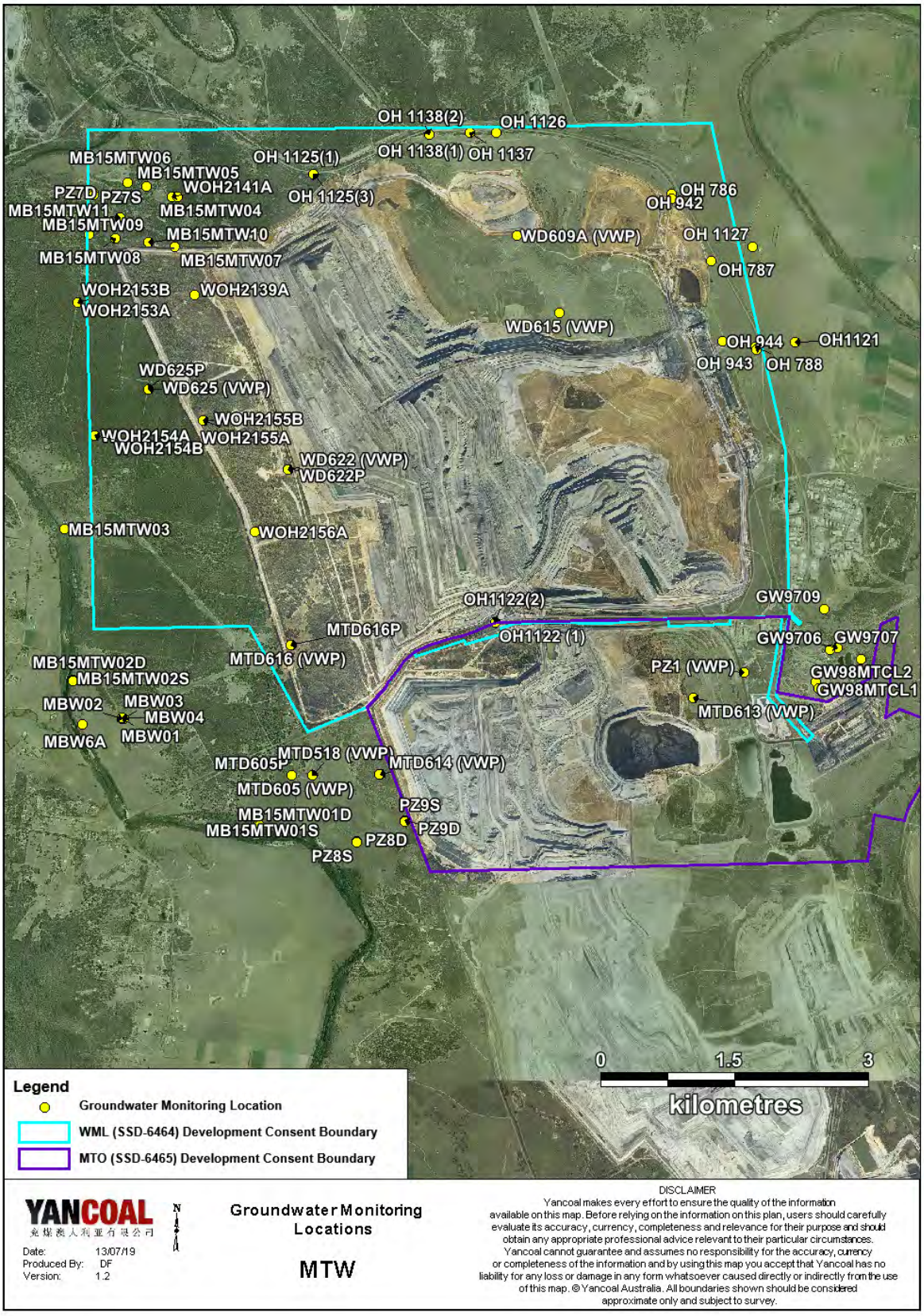


FIGURE 33: GROUNDWATER MONITORING NETWORK AT MTW IN 2021

6.7.6 Groundwater Performance

Sampling of ground waters was carried out on 271 occasions from 61 bores across MTW in accordance with AS/NZS 5667.6 (1998). Where laboratory analysis was undertaken, this was performed by a NATA accredited laboratory. Groundwater sampling and analysis was undertaken as required with the following exceptions detailed in **Table 6.15**.

TABLE 6.15 MTW WATER MONITORING DATA RECOVERY FOR 2021 (BY EXCEPTION)

Location	Data Recovery (%)	Comment
PZ7S	75%	No safe access in February.
PZ9S	25%	Insufficient water for sampling in February, May and September.
GW98MTCL2	75%	Sampling unable to be completed in April due to blocked bore.
OH1121	50%	No safe access in April and December.
OH1125 (3)	75%	Insufficient water for sampling in November and December.
OH1137	50%	Insufficient water for sampling in April and June.
WOH2156B	0%	Insufficient water for sampling in 2021
OH943	50%	Insufficient water for sampling in April and June.

6.7.7 Annual Ground Water Review

Groundwater monitoring results are reviewed against the approved trigger limits within MTW's approved Water Management Plan on a quarterly basis by MTW. A comparison of the water quality information across MTW's monitoring bore network is provided graphically in **Appendix 5.** The approved trigger limits are based on the historical water quality data as shown in the relevant site Environmental Impact Assessments. These trigger limits are updated annually based on collected site data as described in the MTW Water Management Plan. A summary of the management actions taken in response to any exceedances of the trigger limits during the period is provided in the Monthly Environmental Monitoring Reports, available via MTW's website (https://www.mtwcoal.com.au/).

An annual groundwater review was undertaken by an independent groundwater consultant. The scope of the review included an assessment of the water quality and groundwater levels recorded

during the 2021 reporting period as well as a review of the historical results against the predictions in the site groundwater model. A copy of the full report is included in **Appendix 5.**
Key findings from the independent groundwater consultant's report were:

- Groundwater level in coal seams in the western down-dip depressurised zone generally declined or remained stable during the 2021 monitoring period. The exception being OH1125(3) in the Bowfield coal seam which increased until-mid 2021 before declining rapidly in September.
- Excepting PZ9D which was stable, groundwater level in shallow overburden monitoring bores underlying the Wollombi Brook alluvium and Warkworth Sands increased gradually during the 2021 monitoring period. Minimal interaction between the Wollombi Brook alluvium and the shallow overburden is evident.
- Groundwater level in coal seams eastward and up-dip of mining recorded variable results during 2021. Bayswater monitoring bores were stable, whilst groundwater levels in Vaux seam bores increased during the monitoring period.
- Groundwater level in Hunter River alluvial bores were stable during 2021. The exception being OH786 which recorded fluctuating groundwater levels. Monitoring bore OH944 was dry throughout the 2021 monitoring period.
- Groundwater level in Wollombi Brook Alluvium monitoring bores increased or remained stable during the year. Groundwater level in PZ8S increased throughout the 2021 monitoring period, correlating strongly with the CRD, indicating no mining related impacts. Excepting a decrease in June, groundwater level in PZ9S has been relatively stable since June 2020.
- Groundwater level in Warkworth Sands monitoring bore PZ7S increased during the 2021 monitoring period, this is likely due to increased rainfall in the region in 2020 and 2021, indicated by an increasing CRD.
- Various pH trigger exceedances were recorded in bores in the Western depressurized zone; Wambo seam bores WOH2154B (in February and May) and WD622P (in February); Blakefield seam bore WOH2139A (in February, May, October and November) and Woodlands Hill seam bore WD625P (in August).
- Multiple pH trigger exceedances were recorded in shallow overburden monitoring bores underlying Wollombi Brook Alluvium and Warkworth Sands. These include three consecutive trigger exceedances in PZ7D (in May, August and November), four consecutive exceedances in MB15MTW01D (February, May, August and November), PZ9D (in April) and MB15MTW03 (in November).
- Three pH trigger exceedances were recorded in shallow overburden monitoring bore MTD616P (in February, May and November). Two groundwater EC exceedances were recorded in shallow overburden monitoring bore MTD605P (in May and November).
- Two bores eastward and up-dip of mining at MTW recorded pH trigger exceedances during the 2021 monitoring period. These were Bayswater coal seam bore GW98MTCL2 (in June) and Warkworth seam bore OH1138(1) (in January, February, March, April, June and August).
- One pH exceedance was recorded in Hunter River Alluvium bore OH788 (in September) during 2021. Several EC trigger exceedances were also record in Hunter River alluvial bores, OH787 (in April, June and September), OH788 (in June and September) and OH943 (September and December).
- Wollombi Brook Alluvium bore PZ7S recorded a single EC trigger exceedance (in August) during the 2021 monitoring period. No investigation was undertaken as consecutive exceedances were not recorded.

- VWP sensors installed into the Bayswater coal seam recorded varied results during the 2021 monitoring period. Sensor in WD625, MTD616 and MTD605 recorded decreasing pressure heads throughout the year; pressure heads in WD615 and MTD613 increased. Pressure head in the Bayswater seam at WD622 was stable during 2021.
- VWP pressure head in sensors installed into the Mt Arthur coal seam decreased during the 2021 monitoring period. The exception being sensors in WD625 and WD622 in which pressure head was stable throughout 2021. Data in MTD614 Mt Arthur sensor is erroneous and should be inspected.
- Sensors installed into Woodlands Hill coal seam recorded decreasing or stable pressure heads during the 2021 monitoring period.
- Excepting the sensor in MTD518 in which pressure head increased, Wambo coal seam VWP sensor pressure heads decreased throughout the year.
- VWP pressure heads recorded in Vaux coal seam VWP sensors varied in 2021. Sensors installed in WD625 and WD622 were stable, whilst, sensors installed in MTD616 and MTD605 decreased during the monitoring period. The sensor in MTD614 has recorded erroneous data and should be inspected.
- Whybrow coal seam VWP sensor pressure heads increased during the 2021 monitoring period. The exception being the sensor at MTD614 which recorded stable pressure head during the year.
- VWP pressure heads in the Glen Munro seam (at MTD614) and Piercefield seam (at WD615) were stable during the 2021 monitoring period. Blakefield seam sensor at MTD605 recorded decreasing pressure head throughout the year. MTD614 sensor in Bowfield seam recorded erroneous data and should be inspected.
- Observed groundwater level trends generally correlate with modelled predictions. The exceptions being Blakefield seam bore OH1122(1) in which observed groundwater levels are >35m higher than model predictions, a weak correlation between modelled and observed level data in Bowfield seam monitoring bores and GW98MTCL2 with differences between observed data and modelled data >10 m. There is no modelled data for bores constructed after 2015.

Key recommendations from the independent groundwater consultant's report include:

- Calibration factors for VWP PZ1 should be determined so that pressure head trends can be discussed in future annual reviews;
- Cable/wire connections to VWP logger boxes should be inspected at VWP MTD616 (sensor at 383 m) and MTD605 (sensor at 429 m) to determine if erroneous data is due to a poor connection;
- Mount Arthur and Vaux seam VWP sensor cables should be inspected in MTD614 for damage to determine if erroneous data is due to a poor connection to the logger;
- pH trigger exceedance investigations should be undertaken for WOH2139A, PZ7D, OH1138(1) and OH787 as they recorded three consecutive pH exceedances in 2021; and
- The groundwater model should be updated to incorporate newly constructed monitoring installations and to better model existing monitoring installations.

MTW will assess and progress the recommendations of the groundwater consultant for the 2021 reporting period including completion of investigation into instances of trigger exceedances, as per MTW's Water Management Plan.

6.7.8 Compensatory Water Supply

Under the *Water Management Act 2000*, there are three types of basic landholder rights in NSW:

- **Domestic and stock rights** - Owners or occupiers of land overlaying an aquifer or with river, estuary or lake frontage can take water without a licence for domestic (household) purposes or for stock watering.
- **Harvestable rights** - Harvestable rights allows landholders to capture and store a proportion of the rainfall runoff from their landholding in one or more harvestable rights dams without requiring a water access licence, water supply work approval, or water use approval.
- **Native title** - Anyone who holds native title with respect to water, as determined under the Commonwealth Native Title Act 1993, can take and use water for a range of personal, domestic and non-commercial purposes.

MTW is required by development consent conditions to provide compensatory water supply to the owner of any privately owned land whose basic landholder water rights (as defined in the *Water Management Act 2000*) are adversely and directly impacted as a result of the development.

During the 2021 reporting period there was no need for compensatory water supply to be provided to others as a result of the development.

6.8 Waste

6.8.1 Management

The management of waste generated on the MTW site is undertaken in accordance with the site MTW non-mineral waste management strategy which is designed to;

- track and record all wastes leaving the site to meet all regulatory requirements; and
- implement appropriate segregation, collection, handling, transport and disposal of waste in a way which minimises the impacts on the environment.

All waste not suitable for reuse on site is removed by a licensed waste contractor and disposed of or recycled accordingly at licensed waste management facilities within the local Hunter region. Appropriate segregation is implemented across various waste streams at MTW to maximise diversion from landfill and minimise the impact to the environment by recycling or reuse. Some waste categories are processed and disposed of on the MTW site, as per NSW EPA exemption approvals, set out in the MTW Environment Protection Licenses. The effluent treatment and disposal facilities at MTW consist of sewage treatment plants which treat, disinfect and dispose, or re-use the treated effluent on site. All waste management contractors engaged for waste collection, handling and transportation at MTW are licensed by the NSW EPA.

6.8.2 Performance

During the reporting period MTW continued to undertake regular inspections of areas where wastes are generated and stored, to reinforce the principles of a considerate waste management approach including waste stream segregation to increase material recycling and promote diversion from landfill. In 2021 76% of all non-mineral waste generated and removed from MTW was diverted from landfill and processed at licensed recycling and secondary use facilities. The remaining 24% was disposed of as end-of-life waste at a local licensed landfill facility. There were no community complaints or regulatory non-compliance notices receiving in 2021, in relation to waste management during the reporting period.

7 REHABILITATION

7.1 Summary of Rehabilitation

A total of 44.6ha of new rehabilitation was undertaken during 2021 against a Mining Operations Plan (MOP) target of 35.0ha. A further 59.1ha of Stage 2 rehabilitation was seeded to the target vegetation community seed mixes in 2021 to further reduce the legacy rehabilitation areas that are in the Growth Medium Development phase.

Total disturbance undertaken during 2021 was 53.7ha, which was higher than the MOP projection of 40.6ha. The disturbance during 2021 was made up of 47.2ha of new disturbance and 6.5ha of disturbance of previously rehabilitated area.

TABLE 7.1 KEY REHABILITATION PERFORMANCE INDICATORS

Mine Area Type	Previous Reporting Period (Actual) Year 2020 (ha)	This Reporting Period (Actual) Year 2021 (ha)	Next Reporting Period (Forecast) Year 2022 (ha)
A. Total mine footprint[1]	3,934.1	3,982.9	4,025.4
B. Total Active Disturbance[2]	2,601.3	2,601.5	2,684.0
C. Land being prepared for rehabilitation[3]	104.9	57.0	20.0
D. Land under active rehabilitation[4]	1,227.9	1,324.4	1,321.4
E. Completed rehabilitation[5]	0	0	0

[1] ***Total mine footprint*** *includes all areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities. As such it is the sum of total active disturbance, decommissioning, landform establishment, growth medium development, ecosystem establishment, ecosystem development and relinquished lands (as defined in DRE MOP/RMP Guidelines). Please note that subsidence remediation areas are excluded.*

[2] ***Total active disturbance*** *includes all areas ultimately requiring rehabilitation such as: on-lease exploration areas, stripped areas ahead of mining, infrastructure areas, water management infrastructure, sewage treatment facilities, topsoil stockpiles areas, access tracks and haul road, active mining areas, waste emplacements (active/unshaped/in or out-of-pit), and tailings dams (active/unshaped/uncapped).*

[3] ***Land being prepared for rehabilitation*** *– includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development (as defined in DRE MOP/RMP Guidelines).*

[4] ***Land under active rehabilitation*** *– includes areas under rehabilitation and being managed to achieve relinquishment – includes the following rehabilitation phases as described in the DRE MOP/RMP Guidelines – "ecosystem and land use establishment" and "ecosystem and land use sustainability" (revegetation assessed as showing signs of trending towards relinquishment OR infrastructure development).*

[5] ***Completed rehabilitation*** *– requires formal sign off by DRE that the area has successfully met the rehabilitation land use objectives and completion criteria.*

7.1.1 Management of Rehabilitation

Performance criteria for each rehabilitation phase is provided in detail in the MOP for MTW. The criteria have been developed so that the rehabilitation success can be quantitatively tracked as it progresses through the phases outlined below:

- Stage 1 – Decommissioning
- Stage 2 – Landform Establishment
- Stage 3 – Growth Medium Development
- Stage 4 – Ecosystem and Land use Establishment
- Stage 5 – Ecosystem and Land use Sustainability
- Stage 6 – Rehabilitation Complete

The performance criteria are objective target levels or values that can be measured to quantitatively demonstrate the progress and ultimate success of a biophysical process. A monitoring methodology has been developed to measure the performance criteria outlined in the MOPs utilising a combination of tools that provide quantitative data to assess changes occurring over time.

The target levels or values have been based on monitoring results from reference sites and were detailed in the MOP Amendment A approved by Resources Regulator in December 2018. The results of the rehabilitation monitoring programme for native vegetation areas are compared against the target levels to determine if rehabilitation has been successful or if additional intervention is needed.

Monitoring of rehabilitated land returned to native vegetation commenced in 2015. The results of this monitoring and monitoring programs conducted in 2017 and 2019 have been presented in previous MTW Annual Reviews (AR's). Monitoring has been conducted across 12 reference sites within two vegetation communities Central Hunter Grey Box-Ironbark Woodland EEC, and Ironbark-Spotted Gum-Grey Box Forest EEC. Previous monitoring programs have established 50 permanent monitoring transects across MTW rehabilitation areas with the majority of these sites having been revisited in successive years to provide information on the progression of sites over time. Sites have been selected to include rehabilitation of varying ages and different rehabilitation methods.

Monitoring of rehabilitated land was undertaken in 2021 and the results are presented in **Appendix 6**. During the 2021 monitoring program, monitoring of the six Central Hunter Ironbark-Spotted Gum-Grey Box Forest EEC reference sites has been discontinued as the target vegetation community for the rehabilitated mined land is the Central Hunter Grey Box-Ironbark Woodland EEC. The six Central Hunter Grey Box-Ironbark Woodland EEC reference sites continue to be monitored to allow comparisons to be made with the rehabilitation sites.

The 2021 monitoring program targeted 69 sites, including:

- Six Central Hunter Grey Box-Ironbark Woodland reference sites;
- 32 previously established Woodland – EEC rehabilitation sites;

- 26 newly established Woodland – EEC rehabilitation sites; and
- Five previously established Woodland – Other rehabilitation sites.

The key issues affecting successful rehabilitation at MTW and the control measures implemented to address these issues are listed below:

Issue 1 – Weed competition affecting native vegetation establishment.

Control Measures.

Use of mine spoil as growth medium to avoid use of weedy topsoils in rehabilitation. This technique has proven successful in establishing diverse native vegetation when combined with the use of composts and other ameliorants to improve the physical, chemical and nutritional quality of the mine spoil. Suitable alternative compost products have been sourced and used since 2019 in place of the Mixed Waste Compost, which was banned from use by the EPA in 2018.

Weed control on topsoil stockpiles.

Topsoil stockpiles established prior to 2011 were seeded with exotic pasture species to provide a suitable cover for erosion protection. These competitive exotic species are causing weed problems in rehabilitation areas when the soil from these stockpiles is used on areas being returned to native vegetation. MTW has a topsoil stockpile maintenance program in place to spray out the exotic pasture species and sow native species on these old stockpiles. Stockpiles may require a number of weed control passes to adequately reduce weed levels before sowing to native species. New topsoil stockpiles are being treated in much the same way as new rehabilitation areas, in terms of weed control and soil amelioration, before being sown to native species. Establishment of native species on topsoil stockpiles will reduce the presence of weeds and provide a soil seed bank in rehabilitation areas that contains seeds from desirable native species.

Pre- and post-sowing weed control in rehabilitation.

MTW has implemented an extensive weed control program in rehabilitation areas to reduce the amount of weeds and assist the establishment of native vegetation. This program involves the use of boom sprays for both pre-sowing and pre-emergent spray passes to control weeds volunteering from the topsoil. After the native species have germinated, a weed-wiper can be used to control weeds that are taller than the native species. Herbicide can be wiped onto the taller weeds without affecting the emerging native species. Crews using backpack sprays and Quikspray units are also used to selectively control weeds that are growing amongst desirable native species.

Issue 2 – **Topsoil/spoils prone to dispersion leading to surface crusting, erosion and poor vegetation establishment.**

Control Measures.
Addition of ameliorants to topsoil/spoil. MTW conducts soil testing on the topsoil/spoil material that is used in rehabilitation areas. Based on the results of the soil testing, ameliorants such as compost, gypsum, lime and fertilisers are then used to address the physical, chemical and nutritional deficiencies of the topsoil/spoil. Subsequent applications of ameliorants are undertaken as required to address poor performing rehabilitation areas with continuing soil quality issues.

Issue 3 – Lack of native seed in topsoil seed bank leading to poor vegetation establishment.

Control Measures.
Sourcing of diverse native seed mixes. MTW has generally found that the soil seed bank in topsoils from both stripping areas and topsoil stockpiles cannot be relied on to contain sufficient native seed propagules for successful native vegetation establishment in rehabilitation. MTW has established medium term contracts with seed suppliers to provide some security of supply to suppliers who are then able to collect and store sufficient quantities of seed to meet MTW's future demands. The seed supply contracts include quality assurance controls to ensure the seed being purchased is of suitable quality i.e. satisfactory provenance, correct species, high seed count and viability.

7.2 Decommissioning

Capping of the Interim Tailings Storage Facility continued during 2021 using breaker rock from the South CHPP. A capping of inert spoil will be placed over the breaker rock before rehabilitating the area.

During 2017, capping of Tailings Dam 2 commenced using small contractor-owned equipment to place selected mine spoil in layers across the tailings dam surface. Capping work was suspended during 2017 due to settlement cracking occurring in an area where the tailings surface had low strength. Stage 1 capping work was recommenced during 2020 in areas where geotechnical studies identified that the tailings strength was sufficient to support the capping process. The focus of activity during 2021 has been on pumping activities to keep the surface of the tailings storage facility dry. The aim of this work is to increase the strength of the top layer of the tailings to allow the Stage 1 capping work to continue.

7.3 Rehabilitation Performance

Error! Not a valid bookmark self-reference.**Table 7.2** summarises actual rehabilitation and disturbance completed compared with the rehabilitation commitments in the MTW MOP. **Appendix 7** provides the Annual Rehabilitation Report Form, including rehabilitation progress for each domain through the rehabilitation phases.

The area of new and Stage 2 rehabilitation that was sown during the reporting period was 68.7ha above the MOP target for MTW. The area of rehabilitation disturbance was 5ha higher than the MOP target for MTW, leading to a net rehabilitation result for 2021 that was 63.7ha above the MOP commitment. The net rehabilitation result over the MOP period (2015 to 2021) is 442.3ha versus a MOP commitment of 421.9ha, ahead by 20.4ha.

The amount of new disturbance undertaken in 2021 was 8.1ha higher than the MOP projections. The cumulative new disturbance over the period of the current MOP is also 6.1ha higher than the projected disturbance.

The 2021 rehabilitation areas for MTW are shown in **Appendix 8.**

TABLE 7.2 REHABILITATION AND DISTURBANCE COMPLETED IN 2021

MOP	Pit Area	2021 Totals (ha)		Cumulative Totals During MOP Period* (ha)	
		Actual	MOP Commitment	Actual	MOP Commitment
Rehabilitation					
MTW	Mt Thorley	32.2[1]	18.2	183.3	192.8
	Warkworth	71.5[2]	16.8	391.0	355.3
	MTW Total	**103.7**	**35.0**	**574.3**	**548.1**
Rehabilitation Disturbance					
MTW	Mt Thorley	0.3	0.0	53.2	52.8
	Warkworth	6.2	1.5	78.8	73.4
	MTW Total	**6.5**	**1.5**	**132.0**	**126.2**
New Disturbance					
MTW	Mt Thorley	8.3	4.6	43.8	71.9
	Warkworth	38.9	34.5	428.0	393.8
	MTW Total	**47.2**	**39.1**	**471.8**	**465.7**
Net Rehabilitation (Rehabilitation minus Rehabilitation Disturbance)					
MTW	Mt Thorley	31.9	18.2	130.1	140.0
	Warkworth	65.3	15.3	312.2	281.9
	MTW Total	**97.2**	**33.5**	**442.3**	**421.9**

Note: Rehabilitation areas relate to areas at or past the phase of Ecosystem and Landuse Establishment.

** MOP Period is 2015 – 2021*

[1] Includes 10.3ha of Stage 2 Seeding

[2] Includes 48.8ha of Stage 2 Seeding

Progressive rehabilitation commitments are outlined in the Warkworth Continuation 2014 and Mt Thorley Operations 2014 Environmental Impact Statements. These documents modelled a total of 1,103 ha of rehabilitation to be completed by the end of 2017, and a further 505.8ha to be completed by the end of 2023. At the end of the reporting period there had been 1,324.4 hectares of rehabilitation completed across MTW, 221.4ha ahead of the EIS forecast for the end of 2017. At the end of 2021 the cumulative rehabilitation total is 284.4ha behind the EIS forecast for the end of 2023. It is considered unlikely that there will be this amount of rehabilitation available to be completed in the period 2022 to 2023 so the completed rehabilitation at the end of 2023 is expected to be approximately 190ha (12%) less than the EIS forecast.

7.4 Rehabilitation Programme Variations

A MOP extension was submitted during the reporting period which will allow the current approved MOP to cover the transition period to 02 July 2022 for the submission of the Rehabilitation Management Plans required under the new standard conditions for mining leases. The MOP extension included the following changes:

- MOP Plan 3H to provide rehabilitation and mining progression to the end of 2022;
- updated MOP Plan 4 and Plan 5 which included a change to the final landform on Tailings Dam 1 to provide a dump location for material excavated out of the North Out-of-Pit (NOOP) Dam;
- inclusion of Appendix E Seeding Program for Growth Medium Areas; and
- revised Rehabilitation Cost Estimates for Mount Thorley and Warkworth.

7.5 Rehabilitation Trials

Trials were conducted in 2020 to investigate the effect of not adding compost to topsoils. These trials are of particular interest for rehabilitation where topsoil has been used that has a high weed seed load. It is thought that not adding compost to “weedy” topsoils could reduce the growth of competitive weed species and hence result in better establishment of native species. Rehabilitation areas within the trials have received identical treatments apart from the addition of compost to some areas to allow for a comparison of results on composted versus un-composted areas.

The early results indicate that the germination of native species was indeed improved in the areas that didn’t receive compost application. There is a marked increase in the amount in the amount of exotic grass cover in the areas that did received compost application and this is likely to be holding back the germination of native species. These trials will continue to be monitored to determine if the growth rates of the native species is satisfactory in the areas that didn’t receive compost application.

A compost that is produced by Remondis from source-segregated green waste and food waste, without the addition of Biosolids, was used on rehabilitation areas in 2021. This product has also been passed over a 15mm screen at the completion of the composting process, with the +15mm portion being what was spread on rehabilitation areas. This type of compost is lower in nutrients than the

MWOO products and composts that have had Biosolids added during the composting process. It was thought that a lower nutrient compost may be better where there is a risk of a high weed seed load. To date, the Remondis compost has only been used on a spoil/compost area where the native germination results don't appear to be as good as previous spoil/compost areas that had used a compost made with the addition of Biosolids.

Trials will be conducted during 2022 to compare the performance of high and low nutrient composts on both mine spoil and topsoil growth mediums.

7.1 Rehabilitation Maintenance

Management of rehabilitated areas is undertaken as required or when issues are identified through monitoring, auditing or inspections. Rehabilitation maintenance activities are described further in the sections below.

Post rehabilitation broadacre weed control

Broadacre weed treatment within rehabilitation areas is undertaken using agricultural methods comprising boom sprays and wick wipers. In existing rehabilitation areas boom spraying is primarily used to manage cover crop and fallow areas prior to sowing to final native seed mixes. Pre-emergent application of herbicide is occasionally necessary to control emerging weeds in the period between sowing and germination of the desired plants. Wick wiping targets rapidly growing exotic grasses and other erect growing weeds in the period following native germination but while desirable species remain below the wiper target zone. During 2021 areas totalling 117.4ha of existing rehabilitation received boom spray and/or wick wiper treatment.

Hand spraying and manual removal of weeds is also undertaken in rehabilitation areas with establishing native vegetation. During 2021 areas totalling 138.5ha were treated using selective weed control methods (i.e. backpack spray, Quikspray, cut and paint, manual removal). Selective weed control is being used more extensively due to a change in rehabilitation methodology to move more quickly to sowing rehabilitation areas with the diverse native seed mixes.

Rehabilitation areas receiving weed control during 2021 are shown in **FIGURE** 34 below. Note some areas may have received a combination of treatments during the reporting period.

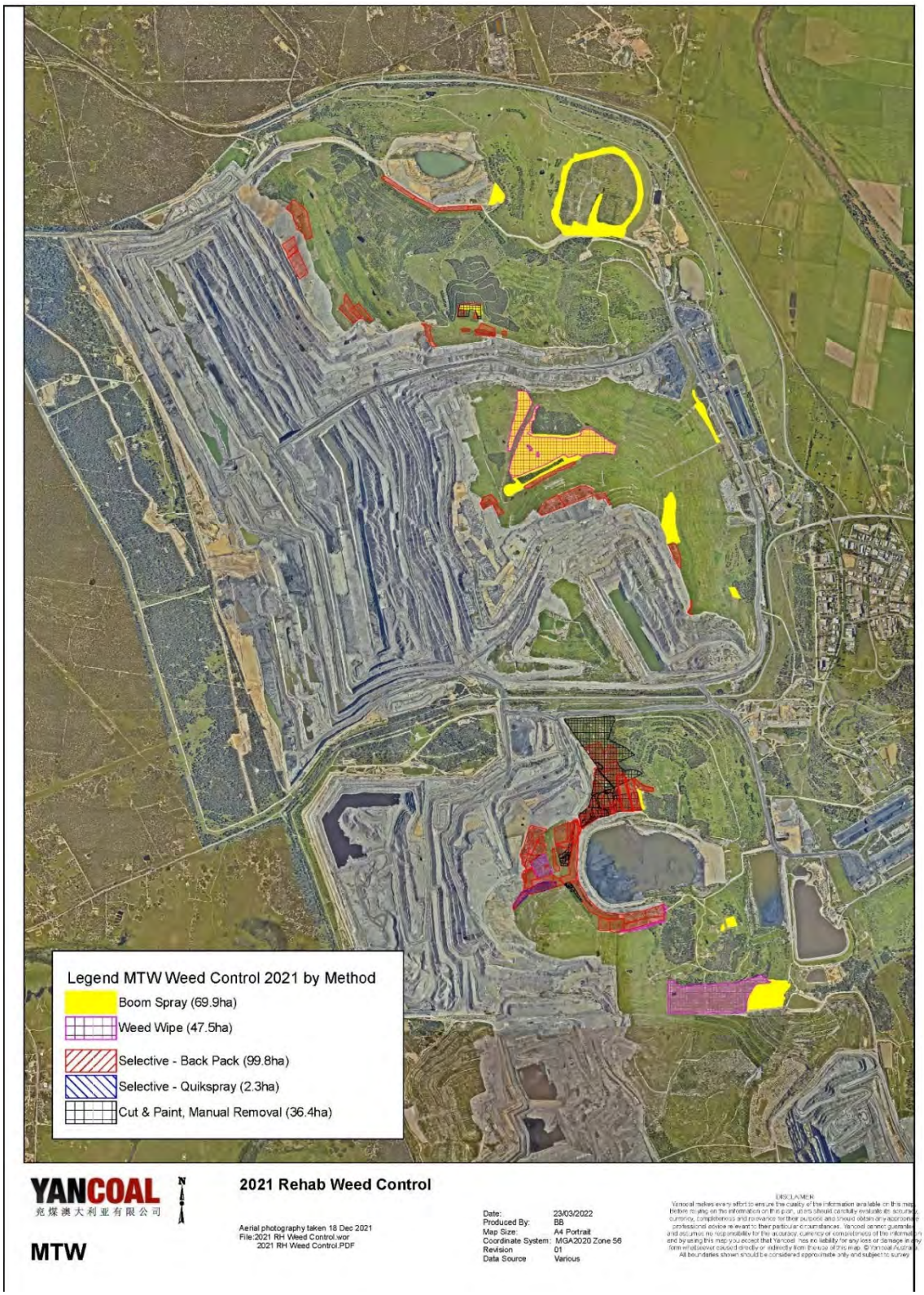


FIGURE 34: 2021 REHABILITATION WEED CONTROL LOCATIONS

7.2 Topsoil Management

Topsoil is managed according to MTW's Disturbance and Rehabilitation procedures. **Table 7.4**outlines the topsoil used and stockpiled during 2021. There was 8.6 ha of rehabilitation top soiled during 2021, using stockpiled and pre-stripped soil resources. The topsoil stockpile inventory updated at the end of 2021 wrote off 37,615m3 of stockpiled topsoil due to poor quality.

TABLE 7.3 SOIL MANAGEMENT

Soil Used this Period (m^3)	Soil Prestripped this Period (m^3)	Stockpile Inventory to Date (m^3)	Stockpile Inventory Last Report (m^3)
8,600	50,207	670,921	666,929

7.3 Tailings Management

Detail of capping activities on tailings storage facilities at MTW is covered in **Appendix 7**. Minimising the amount of standing water on tailings storage facilities, by managing the decant water, is important during and post tailings deposition to assist with closure of these facilities. Effective removal of decant water enables better consolidation of the tailings material, which in turn facilitates earlier capping and rehabilitation of the storage facility. **Table 7.4** outlines the current state of decant water pumping infrastructure across the active and inactive TSF's at MTW.

TABLE 7.4 TAILINGS MANAGEMENT

Facility	Status	Decant System
Centre Ramp TSF	Active	Decant pumps in place, regular pumping
Abbey Green South	Active	Decant pumps installed as required due to infrequent filling regime.
TD2	Inactive (Capping in progress)	Diesel pump in place
Interim TSF	Inactive (Capping in progress)	Floating solar pump installed
Ministrip TSF	Active	Diesel Pump in place, pumping as required
Loders Pit TSF	Active	Tailings deposition commenced in January 2021, decant pumps in place, regular pumping

7.4 Weed Control

7.4.1 Weed Treatment

The weeds identified at MTW occur primarily in areas that have been disturbed such as post mining rehabilitation areas, previous civil works areas, soil stockpiles, water management structure surrounds, and general areas of minor ground disturbance. A total of 97 days of weed management work was undertaken on site at MTW during 2021, with 640 ha of land treated, including maintenance of access tracks and 56 environmental monitoring points. The weeds targeted during the 2021 weed management programme were based on the results of the 2020 weed survey. **Figure 35** illustrates the target species and weed treatment areas across MTW. Weed treatment areas are assessed following the completion of periods of work to determine the effectiveness of control works.

The species focussed on during treatment included:

- African boxthorn *(Lycium ferocissimum)*
- African lovegrass (Eragrostis curvula)
- African olive (Olea europaea)
- Blue heliotrope (Heliotropium amplexicaule)
- Galenia (Galenia pubescens)
- Golden dodder (Cuscuta campestris)
- Inkweed (Phytolacca octandra)
- Lantana (Lantana Camara)
- Mother of millions (Bryophyllum delagoense)
- Narrow leaf cotton bush (Gomphocarpus fructicosus)
- Opuntia (Pear) species (Tiger, Prickly and Creeping Pear)
- Saligna (Acacia saligna)
- St Johns Wort (Hypericum perforatum)
- Various grasses (Various spp)

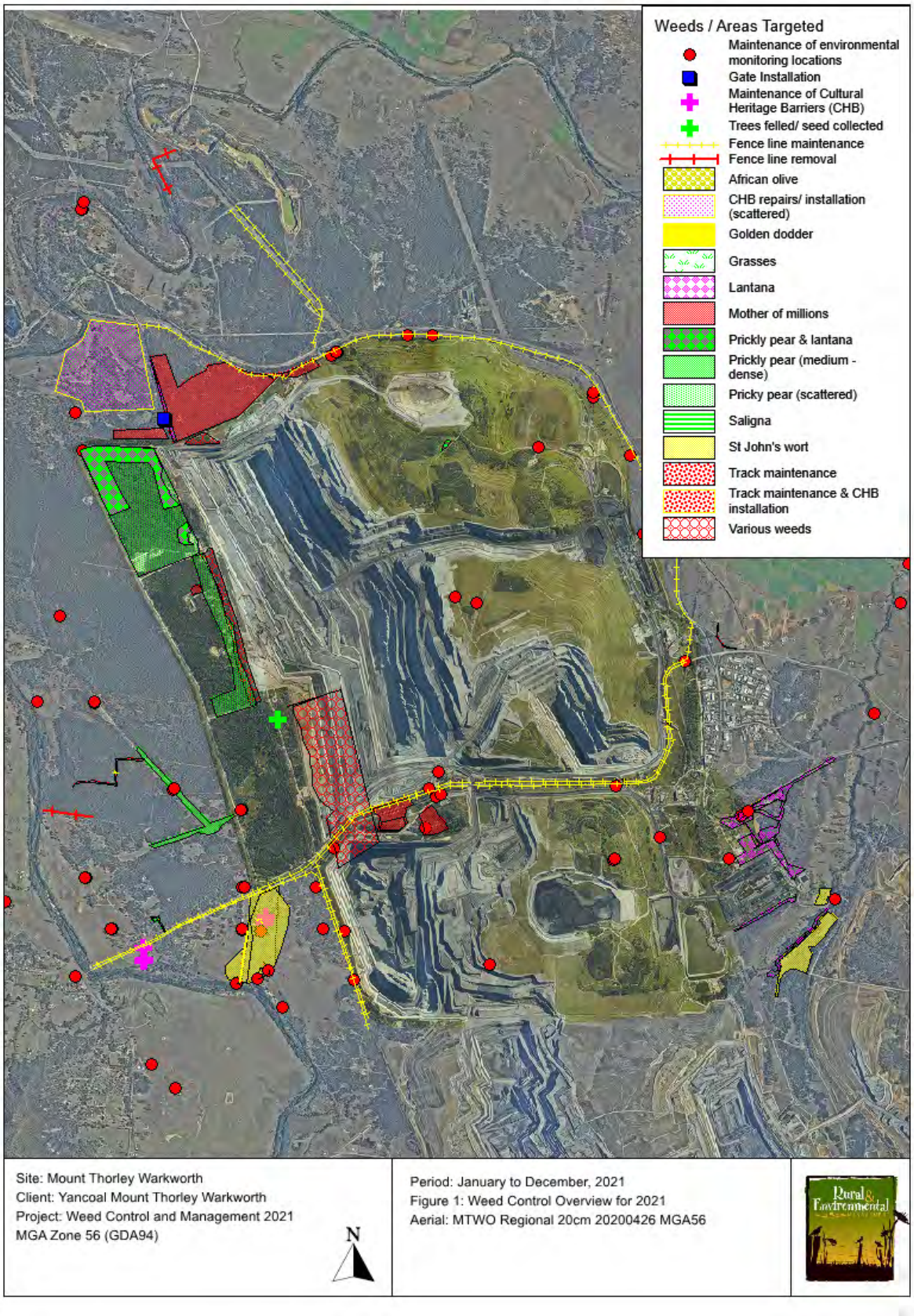


FIGURE 35: ANNUAL WEED CONTROL OVERVIEW FOR 2021

7.4.2 Annual Weed Survey

The management and control of weeds at MTW is governed by the Annual Weed Survey (AWS). The AWS lists Weeds of National Significance (WONS), noxious, environmental and other non-declared weed species identified across MTW and provides a framework to allow for structured weed management and control across operational and non-operational areas of MTW.

The following summarises the results of the weed survey undertaken during December 2021 and is based upon the NSW Biosecurity Act 2015 which came into force from 1 July 2017 and repealed 14 Acts including the Noxious Weeds Act 1993. The new legislation has resulted in the development of the Hunter Regional Strategic Weed Management Plan 2017-2022 which covers the area occupied by MTW.

Six WONS were identified during the survey, they included:

- African boxthorn *(Lycium ferocissimum)* State – Asset protection
- Fireweed *(Scenecio madagascariensis)* State – Asset protection/ Regional – additional species of concern
- Lantana *(Lantana camara)* State – Asset protection

Pear Species:

- Creeping pear *(Opuntia humifusa)* State – Asset protection
- Prickly pear *(Opuntia stricta)* State – Asset protection/ Additional species of concern
- Tiger pear *(Optunia aurantiaca)* State – Asset protection

Fourteen other priority weeds were identified at MTW during the survey, including:

- African olive *(Olea europea subspecies cuspidae)* Regional – Asset protection
- African lovegrass *(Eragrostis curvulva)* Regional – Additional species of concern
- Balloon vine *(Cardiospermum grandiflorum)* Regional – Additional species of concern
- Blue heliotrope *(Heliotropium amplexicaule)* Regional – Additional species of concern
- Castor oil plant *(Ricinus communis)* General biosecurity duty
- Fleabane *(Conyza bonariensis)* General biosecurity duty
- Galenia *(Galenia pubescens)* Regional – Additional species of concern
- Golden dodder (Cuscuta campestris) General biosecurity duty
- Green cestrum *(Cestrum parqui)* Regional - Asset protection
- Mother of millions *(Bryophyllum delagonese)* Regional - Asset protection
- Patersons curse (Echium plantagineum), Regional – Asset protection
- Saffron thistle *(Cartharmus lanatus)* General biosecurity duty
- Scotch thistle (Onopordum acanthium), General biosecurity duty
- St Johns Wort *(Hypericum perforatum)* Regional – Additional species of concern

Thirteen weeds that are not officially declared or listed were also recorded at MTW including:

- Blackberry nightshade *(Solanum nigram)*
- Century plant *(Agave americana)*

- Golden wreath wattle or Saligna *(Acacia saligna)*
- Inkweed *(Phytolacca octandra)*
- Lambs tongue *(Verbascum Thapsus)*
- Mustard weed *(Sisymbrium sp)*
- Narrow leaved cotton bush *(Gomphocarpus fructicosus)*
- Paddy's lucerne (Sida rhombifolia)
- Purpletop / Purple verbena (Verbena bonariensis)
- Rhodes grass *(Chloris gayana Kunth)*
- Stinking Rodger *(Tangetes minuta)*
- Spiny Rush (Juncas acutus)
- Tree Tobacco (Nicotiana glauca)

Species identified during the 2021 survey will form the basis of ongoing weed management works during 2022.

7.5 Vertebrate Pest Management

As part of MTW's Vertebrate Pest Action Plan a baiting programme is carried out on a seasonal basis. Three 1080 ground baiting programmes consisting of approximately 60 bait sites utilising meat baits and ejector baits were undertaken during autumn, winter and spring to target wild dogs and foxes. Baits were checked over a three-week period and replaced each week when taken. The programmes were undertaken in conjunction with neighbouring landholders where possible.

Table 7.5 summarises the results from the programmes carried out at MTW during 2021 with baiting locations and results for the programmes are illustrated in **Figure 37, 37** and **38**.

TABLE 7.5 VERTEBRATE PEST CONTROL SUMMARY

Season	1080 Baiting			
	Total Lethal Baits Laid	Takes by Wild Dog	Takes by Fox	Takes by Feral Pigs
Autumn	129	60	6	1
Winter	116	49	11	2
Spring	119	42	17	11
Total	**364**	**151**	**34**	**14**

Additional pest management programmes included:

- Feral pig 1080 baiting programme carried out across MTW in winter resulted in 4 feral pigs poisoned.

MTW will continue to carry out quarterly vertebrate pest control programmes during 2022 to limit feral pest impacts on landholdings and surrounding neighbours.

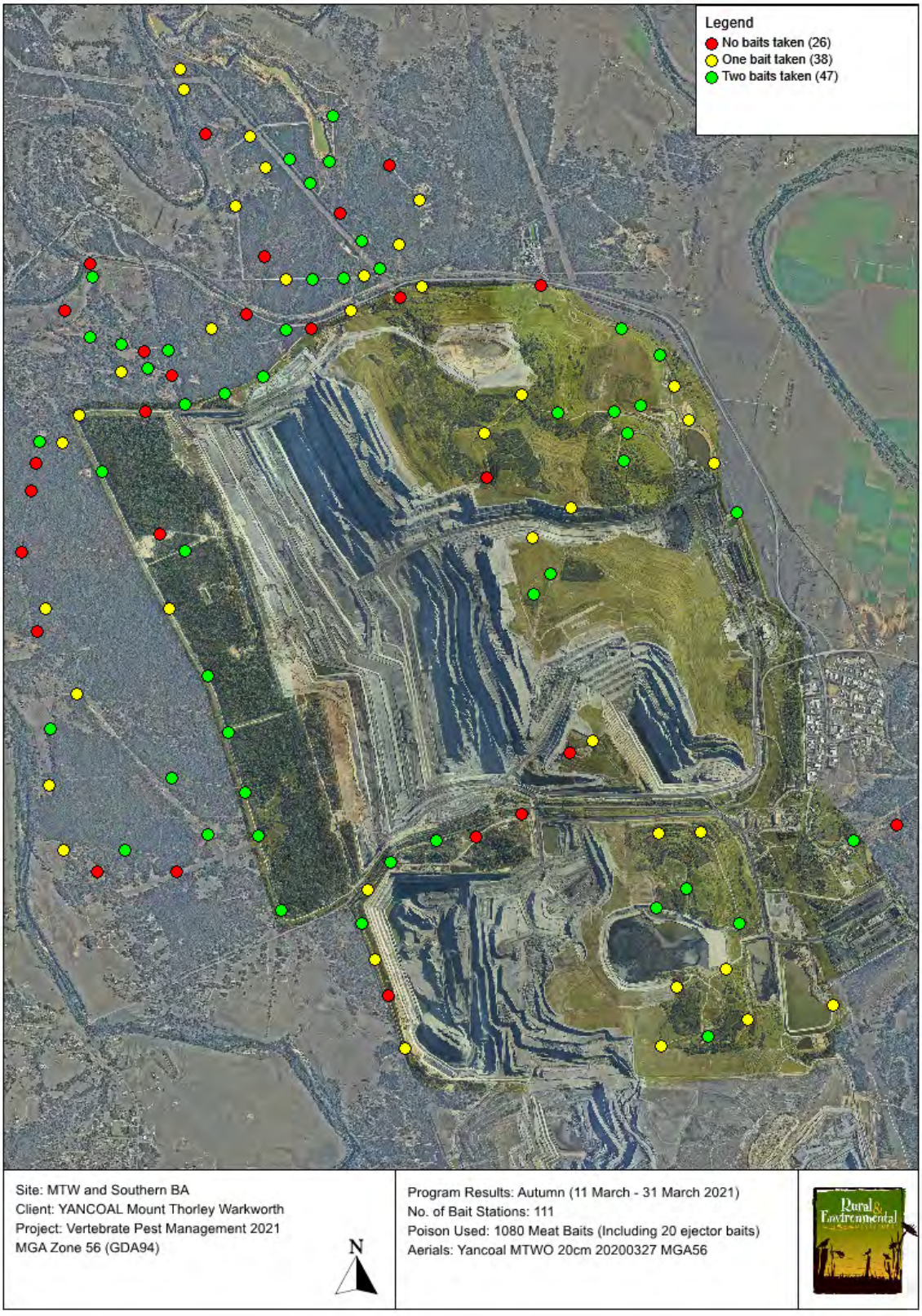


FIGURE 36: BAITING STATION LOCATIONS AND RESULTS AT MTW DURING AUTUMN 2021 VERTEBRATE PEST MANAGEMENT PROGRAMME

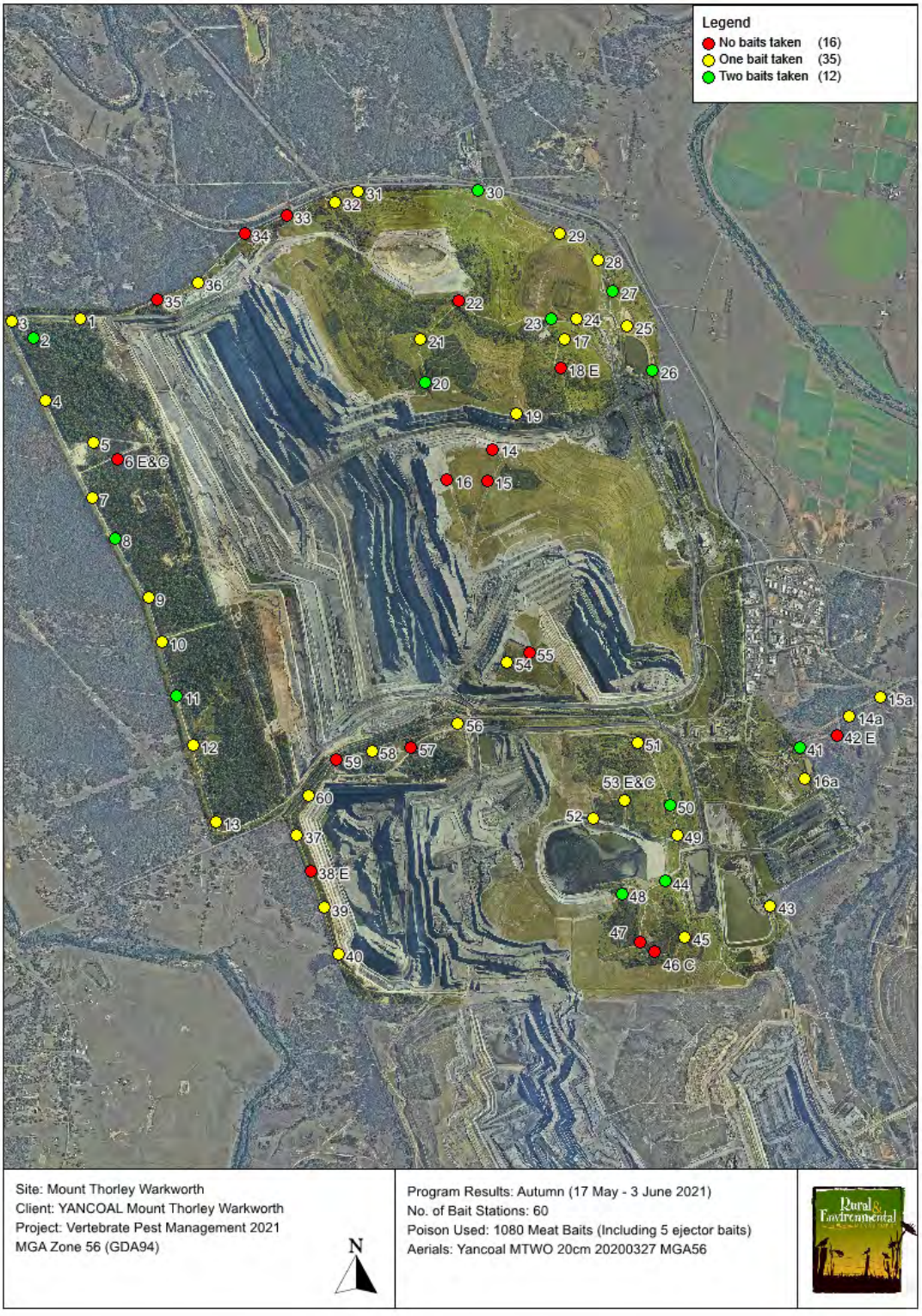


FIGURE 37: BAITING STATION LOCATIONS AND RESULTS AT MTW DURING AUTUMN/WINTER 2021 VERTEBRATE PEST MANAGEMENT PROGRAMME

FIGURE 38: BAITING STATION LOCATIONS AND RESULTS AT MTW DURING SPRING 2021 VERTEBRATE PEST MANAGEMENT PROGRAMME

7.6 Biodiversity Offsets

7.6.1 Management

MTW's impacts on biodiversity values are offset through the protection and management of Biodiversity Areas (BAs). The BA's that are related to MTW illustrated in **Figure 39** and also listed in **Table 7.7** below:

TABLE 7.6 MTW BIODIVERSITY AREAS

Biodiversity Areas	Area (ha)	Environmental Approvals				Offset Feature/s
		State		Federal		
		NSW 2014	NSW 2015	EPBC 2002/629	EPBC 2009/5081	
Southern	986	211	775		94	Warkworth Sands Woodland; Central Hunter Grey Box – Ironbark Woodland; Habitat for Swift Parrot, Regent Honeyeater, Southern Myotis and Large-eared Pied Bat.
Northern	341	39	302		341	Warkworth Sands Woodland; Central Hunter Grey Box – Ironbark Woodland; Habitat for Swift Parrot, Regent Honeyeater, Southern Myotis and Large-eared Pied Bat.
North Rothbury	41		41		41	North Rothbury Persoonia
Goulburn River (MTW Portion)	1,066		1,066	1,066		Central Hunter Valley Eucalypt Forest (CHVEF); Ironbark/Stringybark Communities; Box shrubby/grassy Woodlands; Habitat for Swift Parrot and Regent Honeyeater
Bowditch	602		602	520	82	CHVEF; Ironbark/Stringybark Communities; Habitat for Swift Parrot and Regent Honeyeater
Putty	383				383	CHVEF; Habitat for Swift Parrot and Regent Honeyeater
Seven oaks	519				519	CHVEF; Habitat for Swift Parrot and Regent Honeyeater
Condon View (MTW Portion)	345				345	CHVEF; Habitat for Swift Parrot and Regent Honeyeater

The MTW BA's are managed in accordance with site specific Offset Management Plans (OMPs). All of the OMPs are available on MTW's website.

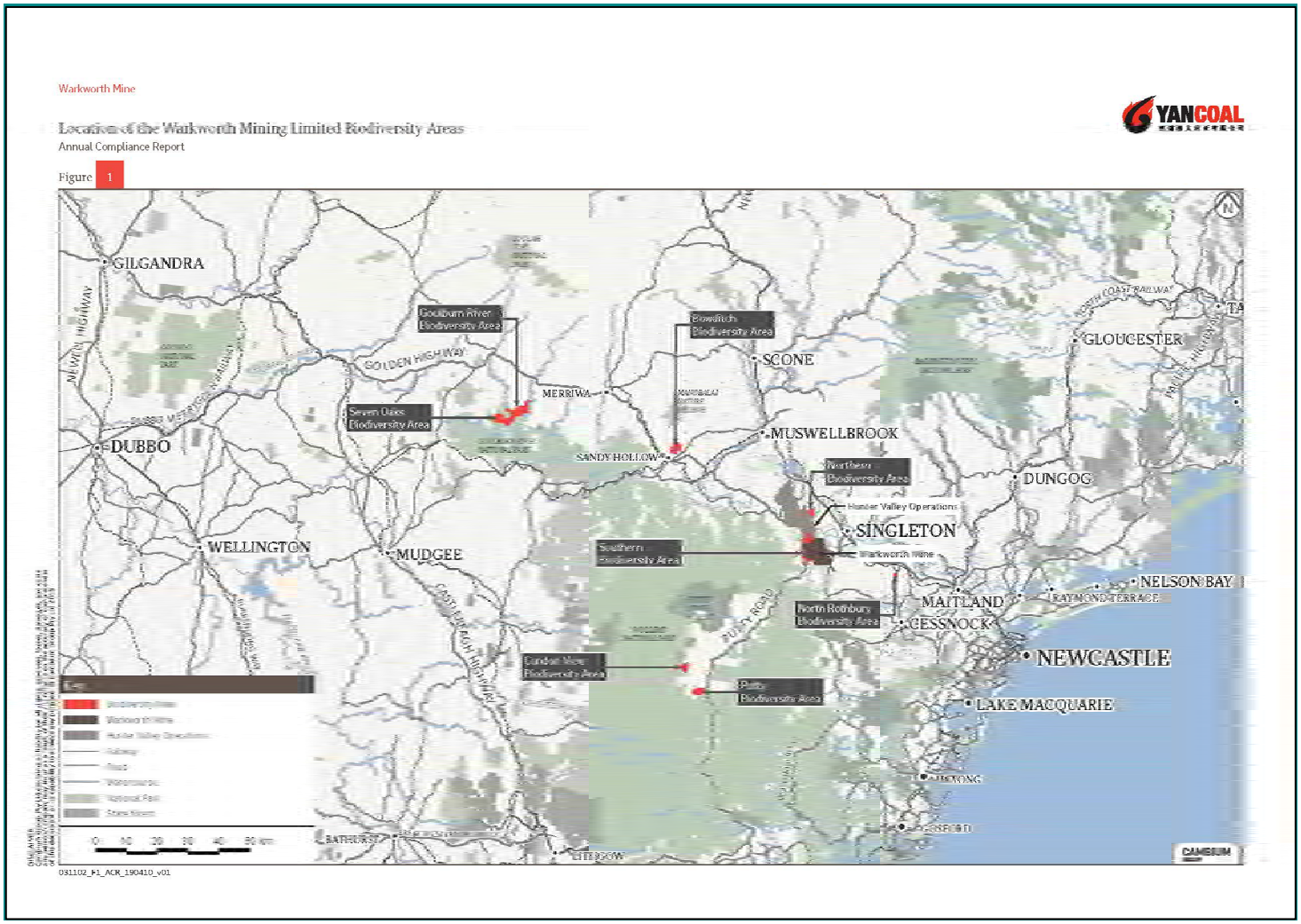


FIGURE 39: MTW BIODIVERSITY OFFSET LOCALITY MAP

7.6.2 Biodiversity Area Management Activities

The OMPs describe the Conservation Management Strategies. The following are the key actions completed throughout 2021 across all the BAs:

7.6.2.1 Weed Control

Weed control at the Local BAs targeted the following species:

- African boxthorn *(Lycium ferocissimum)*
- African lovegrass *(Eragrostis curvulva)*
- Blue heliotrope *(Heliotropium amplexicaule)*
- Coolatai grass *(Hyparrhenia hirta)*
- Farmers friends *(Biden pilosa)*
- Galenia *(Galenia pubescens)*
- Green cestrum *(Cestrum parqui)*
- Lantana *(Lantana camara)*
- Mother of millions *(Bryophyllum delagonese)*
- Paterson's curse *(Echium plantagineum)*
- Prickly pear *(Opuntia stricta)*
- Stinking roger *(Tagetes minuta)*
- Telegraph weed *(Heterotheca grandiflora)*
- Tiger pear *(Optunia aurantiaca)*
- Whisky grass (Andropogon virginicus)
- St Johns Wort (Hypericum perforatum)

Weed control at the Regional BAs targeted the following species:

- Bathurst Burr (Xanthium spinosum)
- Blackberry *(Rubus fruticosus)*
- Blue heliotrope *(Heliotropium amplexicaule)*
- Bridal creeper *(Asparagus asparagoides)*
- Common Thornapple *(Datura stramonium)*
- *Cotton Bush (Gomphocarpus fructicosus)*
- Farmers friends *(Bidens pilosa)*
- Fireweed *(Scenecio madagascariensis)*
- Fleabane *(Erigeron bonariensis)*
- *Giant Parramatta grass (Sporobolus fertilis)*
- *Great Mullien (Verbascum Thapsus)*
- Green cestrum *(Cestrum parqui)*
- Lantana *(Lantana camara)*
- Mallow *(Malva parviflora)*
- Mexican Poppy *(Argemone ochroleuca)*
- Mothvine (Araujia sericifera)

- Narrow leaf cotton bush *(Gomphocarpus fructicosus)*
- Paddy's lucene *(Sida rhombifolia)*
- Prickly pear *(Opuntia stricta)*
- *Purple top (Verbena bonariensis)*
- *Rhodes Grass (Chloris gayana)*
- Scotch thistle *(Onopordum acanthium)*
- *St Barnabys thistle (Centaurea solstitialis)*
- St John's wort *(Hypericum perforatum)*
- Stinking Roger *(Tangetes minuta)*
- Tiger Pear *(Optunia aurantiaca)*
- Tree of heaven *(Ailanthus altissima)*
- Variegated thistle *(Silybum marianum)*

7.6.2.2 Infrastructure Management and Improvement

In 2021 fence repairs were undertaken at the Southern, North Rothbury, Putty and Bowditch BAs. A new 470m section of boundary fence was installed at the Putty BA. Internal fences were removed from the Southern, Northern and Condon View BAs. Track repairs were undertaken in the Southern BA and all tracks were maintained to reduce encroaching vegetation and improve access. Regular property inspections were undertaken on all BAs.

7.6.2.3 Fire Management

Slashing of fire breaks was undertaken on the Southern, Northern and Goulburn River BAs. A Hazard Reduction Burn for North Rothbury BA was approved however weather conditions were outside the prescribed limits, so the burn has been rescheduled for 2022. Overall fuel load assessments were not undertaken in 2021 and have been rescheduled for early 2022.

7.6.2.4 Strategic Grazing

No strategic grazing was undertaken in the BAs in 2021.

7.6.2.5 Vertebrate Pest Management

Three 1080 ground baiting programmes targeting wild dogs and foxes were undertaken across the Local Biodiversity Areas and two 1080 ground baiting programmes were undertaken across the Regional Biodiversity Areas. Baits were checked over a three-week period and replaced each week when taken. Baiting was carried out in autumn, winter and spring and was undertaken in conjunction with neighbouring landholders where possible. **Table 7.7** summarises the results from the programmes during 2021.

TABLE 7.7 SUMMARY OF VERTEBRATE PEST MANAGEMENT 2021

Season	1080 Baiting				
	Total Lethal Baits Laid	Takes by Wild Dog	Takes by Fox	Takes by Feral Pigs	Takes by other/unknown
Autumn (Local BAs)	114	82	16	8	26
Winter (Local BAs)	116	95	19	3	10
Spring (Local BAs)	119	88	28	14	36
Autumn (Regional BAs)	205	55	27	17	9
Spring (Regional BAs)	184	69	39	24	27
Total	**738**	**389**	**129**	**66**	**108**

Additional pest management programmes included:

- A feral pig 1080 baiting and ground shooting program controlled 87 at the Goulburn River BA in March.
- Noisy Miner ground shoot at the Goulburn River BA in August to assist the survivability of the Regent Honeyeater: 230 Noisy Miners controlled over a seven-day programme under Licence to Harm Protected Animals (Biodiversity Conservation Act 2016). This is the fifth consecutive year of this programme making this the longest running and most successful noisy miner management programme in the country. The 2021 programme included the whole BA and monitoring results conclude that ongoing noisy miner management is successfully suppressing noisy miner numbers at the Goulburn River Biodiversity Area.
- A ground shooting program controlled 26 feral pigs in August.
- Opportunistic shooting of other vertebrate pests included two deer, three foxes and one feral cat.
- Aerial shoot conducted by NPWS at the Goulburn River BA in April and October.
- Aerial shoot conducted by HLLS controlled 49 feral pigs at the Goulburn River BA in October.
- The Professional Wild Dog Controller Programme has trapped and euthanised more than 438 problem wild dogs in the four years it has been running. This is a four-year programme with the primary goal to reduce the impacts of wild dog predation on livestock production, the social wellbeing of livestock producers, and native fauna, through professional and targeted control of problem dogs in the Upper Hunter district. A total of 19 wild dogs have been controlled on Yancoal land since July 2017.

Vertebrate pest management programmes will continue to be carried out during 2022 to limit feral pest impacts on landholdings and surrounding neighbours.

7.6.2.6 Seed Collection

Seed collection was undertaken by contractors in the Northern and Southern BA's during 2021, focussing on the WSW, River Oak Forest and Ironbark vegetation community. Seed collection was also undertaken on the Goulburn River BA for Yellow Box – Grey Box – Red Gum grassy woodland and River Oak riparian woodland. Tube stock for 2022 plantings is currently being propagated from the seed collected.

7.6.2.7 Revegetation

MTW has committed to restoring the Endangered Ecological Communities of Warkworth Sands Woodland and Central Hunter Grey Box – Ironbark Woodland in the Southern and Northern Biodiversity Areas. Work commenced in 2014 and overall there is more than 500 hectares of grassland area to be planted and managed over 15 years to restore these Endangered Ecological Communities.

In 2021, restoration work included infill planting Central Hunter Grey Box – Ironbark Woodland and River Oak Forest in the Southern BA with 9,000 tube stock planted into rip lines. Warkworth Sands Woodland planting progressed at the Northern BA with 3,632m³ of WSW sand from ahead of mining at MTW spread into strips and seeded with native grasses to increase the groundcover diversity then planted with 1,500 tubestock.

Infill planting at the Goulburn River Biodiversity area to increase the suitability of habitat for the Regent Honeyeater continued with 12,000 tube stock planted into the cleared areas of Yellow Box – Grey Box – Red Gum Grassy Woodland and riparian woodland areas. Access to the site was restricted again during 2021 due to high river levels, which meant that not all areas could be accessed for infill planting. Supplementary infill planting will continue in 2022.

The next round of planting is planned for spring 2022 and will include 6,000 Warkworth Sands Woodland tubestock in the Northern BA and 4,000 in the Southern BA. Additional infill of the Central Hunter Grey Box – Ironbark Woodland and River Oak Forest planting areas at the Southern BA will continue as required.

FIGURE 40: DRONE IMAGE OF NORTHERN BIODIVERSITY PLANTING AREA

FIGURE 41: IRON BARK WOODLANDS PLANTING STRIP SOUTHERN BIODIVERSITY AREA

7.7 Monitoring Activities

The Local and Regional Biodiversity Areas Annual Compliance Reports respectively (provided in **Appendix 9**) provide a summary of the monitoring activities undertaken, which are consistent with

the requirements of the relevant Biodiversity Management Plans. The sections below provide a summary. Monitoring results for 2021 are also provided in **Appendix 9**.

7.7.1.1 Bird Assemblages Monitoring

Bird assemblage monitoring was not required to be undertaken during 2021. The results from the 2020 bird assemblage monitoring were presented in the 2020 Annual Report for Local Offsets. The next bird assemblage monitoring will occur in 2022.

7.7.1.2 Habitat Restoration Monitoring

The habitat restoration monitoring programme assesses the changes in key attributes within the BA through time as grassland communities are restored to woodland.

Habitat restoration monitoring was not required to be undertaken during 2021. The results from the last round of habitat restoration monitoring conducted in 2020 were presented in the 2020 Annual Report for Local Offsets. A separate monitoring program was undertaken across the Northern BA in Spring 2021 and included an additional eight transitional plots to capture the WSW planting activities undertaken between 2014 - 2021. The monitoring demonstrated that the woodland areas were near benchmark condition however the cleared grasslands still require substantial effort to decrease weed density and increase native species diversity and cover. A combination of weed control, planting, seeding and soil translocation will all be required to improve vegetation condition. The next habitat restoration monitoring will occur in 2022.

7.7.1.3 Rapid Condition Assessments

The Rapid Condition Assessment technique is used as a preliminary assessment of woodland condition within the BA. Each year the sites in mature and regrowth vegetation are revisited to record the presence or absence of key habitat components and threatening processes. The results of the Rapid Condition Assessment, together with property inspection and plot reference points will be used to monitor woodland condition and identify emerging threats. The 2021 monitoring results showed an improvement in woodland conditions across all BAs and supports the continued implementation of the conservation management strategies. Refer to **Appendix 9** for monitoring results.

7.8 Audits and Reviews

The NSW Resources Regulator undertook a Targeted Assessment Program (TAP) at MTW on 18 May 2021 which focused on landform establishment in relation to rehabilitation activities. The recommendations identified in the TAP report will be included in a Rehabilitation Management Plan that will be prepared in accordance with the requirements under the new standard conditions for mining leases and implemented during 2022.

8 COMMUNITY

8.1 Complaints

A total of 177 complaints were recorded during the reporting period, with a decrease of approximately 25% compared to 2020. The 177 complaints were registered by approximately 44 people (some complainants remained anonymous), with just over 66% of complaints received from 9 individuals. Most complaints were received from residents in the Bulga area. A breakdown of complaints by type is shown in **Table 8.1**.

Blasting has emerged as a key concern for near neighbours. Whilst there has been a decrease in complaints regarding blasting by ~15% in comparison to 2020, the highest number of complaints recorded in 2021 were for blasting. Just over 50% of blasting complaints were received from 1 individual.

There has been a trending decrease (overall 56%) in noise complaints from 2019, with a 50% decrease from 2020. The decrease experienced from 2019 is considered partially attributed to routine noise measurements undertaken by the Community Response Officers from 2019 to 2021 and corresponding mitigating actions taken where required.

Dust concern has remained quite consistent for the community since 2020. 2021 showed a slight increase of complaints regarding dust by ~7% in comparison to 2020, although a decrease of 78% in comparison to 2019. The decrease from 2019 may be attributed to the above average rainfall conditions in 2021 (980 mm) and 2020 (828mm) in comparison to the below average rainfall in 2019 (304 mm).

The average annual rainfall recorded at MTW's Charlton Ridge Meteorological station is 668mm, as calculated from 2007 to 2021 annual totals.

Lighting has remained a key concern for the community. 2021 showed a slight reduction of complaints regarding lighting by 5% in comparison to 2020, although an increase of 26% in comparison to 2019. This increase from 2019 may be partially attributed to the progression of mining in the Warkworth Pit, which is progressively removing natural topographical shielding, as well as normal dumping activity on elevated dumps.

In summary:

- 15% reduction in blasting complaints;
- 50% decrease in noise complaints;
- Dust, Lighting, Water and Other related complaint numbers have remained fairly consistent since 2020.

TABLE 8.1 SUMMARY OF COMPLAINTS BY TYPE FOR 2019 TO 2021

Complaint type	2021	2020	2019
Noise	49	98	112
Blasting	58	68	94
Dust	32	30	146
Lighting	34	36	27
Water	0	0	0
Other	4	3	6
Total	177	235	385

8.2 Review of Community Engagement

8.2.1 Communication

Members of the community are encouraged to contact MTW and engage in a way that suits them. Communication avenues in place to support MTW include:

- MTW free call Community Information Line (1800 727 745), which is advertised regularly in local newspapers and community newsletters;
- Online, via MTW's website (www.mtwcoal.com.au) with information about MTW including approvals documents, public reports, environmental monitoring results, blasting and road closures, and information about the MTW Community Consultative Committee (CCC) including the minutes of CCC meetings;
- MTW maintains a 24 hour freecall environmental hotline (1800 656 892), which allows community members to register a concern or complaint at any time of the day or night, 365 days a year. The hotline is advertised in telephone directories, on the MTW website, regularly in local newspapers, and in MTW publications;
- MTW maintains a Blast Information Line (1800 099 669) which provides information on blasts and road closures;
- Near neighbour engagement, including proactive visits to neighbours surrounding MTW; and
- MTW also issues correspondence to specific community members who may be affected by certain changes, to inform of upcoming consultation activities and as a feedback mechanism.

A range of consultation and engagement activities have continued in 2021, which included:

- The MTW Social Impact Management Plan was implemented. This plan collates together all commitments that were part of the Environmental Assessment for MTW's Continuation Project process and identifies where the company will undertake actions to mitigate some of the potential impacts in the area. The main topics include:-
    - Voluntary Planning Agreement;

- Property Agreements Strategy, around acquisition and mitigation rights in the area.
- Management of properties in and around Bulga that MTW has had to acquire.
- Conservation funds and how MTW operate these.
- Support for local Schools
- Scholarships and Apprenticeships;
- Acquisition of Commercial Facilities, for example the Bulga Tavern where MTW has worked to upgrade this facility to support the business sustainability;
- Ongoing Community Support Program; and
- the MTW CCC, which is identified as one of the primary communication areas where the company reports back through the CCC on how their business is performing.

- Engagement and consultation with near neighbours to provide project updates at key project milestones and activities, and in response to concerns/queries raised by individual near neighbours;
- MTW are supportive of the Upper Hunter Mining Dialogue School Tours program.

8.2.2 Community Consultation Committee

The MTW CCC met on a quarterly basis to discuss our operations. The Committee is comprised of MTW representatives, community members and other key external stakeholders, including Singleton Council. The MTW CCC minutes were made available on the MTW website (www.mtwcoal.com.au). The community is invited to visit the MTW website to learn more about the MTW CCC, as well as other aspects of MTW operations and projects.

During the reporting period the CCC members were:

- Dr Col Gellatly - Independent Chair
- Cr Hollee Jenkins - Singleton Council Representative
- Mr Adrian Gallagher – Community Representative (resigned 16/11/2021)
- Mr Ian Hedley – Community Representative
- Mr Stewart Mitchell – Community Representative
- Ms Antoinette Silk – Community Representative
- Mrs Barb Brown – Community Representative
- Mr Neville Hodkinson – Stakeholder Representative - Singleton Shire Healthy Environment Group
- Mr Denis Maizey – Community Representative (DPE endorsed 2/7/2021)
- Mr Graeme O'Brien – Community Representative (Alternate)

Company representatives attending the CCC included:

- Mr David Bennett - MTW General Manager
- Mr Gary Mulhearn – MTW Environment & Community Manager
- Mr Chris Collier – MTW Technical Services Manager
- Ms Olivia Lane – MTW Environment & Community Advisor

- Mr Joshua van Bezouwen – MTW Environment & Community Advisor
- Ms Aleisha Tindall – MTW Community Response Officer

8.2.3 Community Support and Development

In 2021, MTW continued its focus on ensuring the long-term sustainability of the communities in which it operates, through the facilitation of community development programmes such as:

- Voluntary Planning Agreement
- Mount Thorley Warkworth Community Support Program

8.2.3.1 Voluntary Planning Agreement

In 2021, MTW continued contributions to the voluntary planning agreement funds required by development consents SSD-6464 and SSD-6465, and as agreed with Singleton Council. During 2021, MTW contributed a further $800,000 excluding GST, bringing total VPA contributions at end of 2021 to $6.4M of the total commitment value of $11M.

Singleton Council operates the Mount Thorley Warkworth VPA Community Committee which discusses the Bulga Community Project Fund component of the VPA funds. During 2021, the committee was chaired by Mayor Sue Moore and includes senior staff from Council, community representatives, and a Yancoal representative. Pleasingly, there has been good progress with projects in the Bulga / Milbrodale area from the Bulga Community Project Fund. Council published a newsletter in December 2021 with progress to date, a summary of which is reproduced in **Table 8.2.**

TABLE 8.2 MTW VPA PROJECTS STATUS

Approved Project	Project Lead	Project Update	Allocated Funding
Lockable noticeboard	Singleton Council	completed 2020	$2,000.00
Outdoor Exercise equipment	Singleton Council	completed 2019	$30,000.00
Recreation area improvements project	Singleton Council	completed 2019	$50,000.00
Electronic message board	Singleton Council	Sign installed December 2021	$27,014.00
Bulga Stock Reserve Plan of Management & Masterplan	Singleton Council	Documents adopted by Council February 2021	$60,000.00
Bulga Stock Reserve Stage 1 maintenance works	Singleton Council	Maintenance works completed September 2021	$46,811.82
Bulga Stock Reserve Stage 2 detailed survey	Singleton Council	Survey in progress	$15,000.00
Bulga Stock Reserve Stage 3 Aboriginal cultural study	Singleton Council	Project planning in progress	$10,000.00
Bulga Stock Reserve Stage 4 detailed design plans	Singleton Council	Project planning in progress	$25,000.00

Approved Project	Project Lead	Project Update	Allocated Funding
Wollombi Brook Walking Trail Masterplan and land purchase exploration	Singleton Council	Final draft masterplan completed. Community engagement to be finalised	$20,000.00
Milbrodale Public School - Welsh's Road sealing 600m	Singleton Council	Works to commence February 2022	$517,259.68
Bulga Hall media system and verandah	Bulga Hall Committee	Works to commence in 2022	$100,000.00
Bulga Hall additional funding – replacement of hall ceiling	Bulga Hall Committee	works in conjunction with the project above	$53,000.00
Old Bulga School restoration	Bulga Milbrodale Progress Association	Building plans in progress	$430,000.00
Milbrodale Public School Yarning Circle	Milbrodale Public School	Project in progress	$3,000.00
Milbrodale public School storage room renovations	Milbrodale Public School	Project planning in progress	$22,000.00
Bulga Recreation Ground RV dump point	Singleton Council	Project planning and design in progress	$60,000.00
Friends of St Mark's Cemetery - replacement fence	Friends of St Marks Cemetery	Project planning in progress	$19,349.48
Project management incidentals	Singleton Council	Project planning in progress	$24,000.00
Project Officer resource – 3 year contract	Singleton Council	Year 1 - completed	$390,000.00
		TOTAL ALLOCATED FUNDING	**$1,904,434.98**

8.2.3.2 MTW Community Support Program

In 2021 MTW continued implementation of the Yancoal Community Support Program (CSP). The CSP intends to make a genuine positive difference to the communities in which Yancoal operates. Applications for CSP partnerships are formally received once per funding year. MTW considers and supports applications for local donations and sponsorships that have a clear community benefit and are aligned with the CSP guidelines.

The COVID-19 pandemic caused disruption to many events. Some MTW Community Support Program (CSP) events being supported in 2020 postponed their timing into 2021 due to COVID-19. The following organizations are those which postponed their timing into 2021 due to COVID-19:

- Westpac Rescue Helicopter Service – Hunter Valley Mining Charity Rugby League Competition 2020 (COVID-19 – Support held for event in March 2021 – but cancelled due to inclement weather).
- Newcastle & Hunter Combined Schools ANZAC Service – 2020 Singleton ANZAC Service (COVID-19 –April 2021)
- Singleton Business Chamber – 2020 Hunter Coal Festival (COVID19 – Support held for event – planned for October 2022)
- Rotary Club of Singleton on Hunter – 2020 Singleton Art Prize (COVID19 – July 2021)

- Singleton Theatrical Society – 2020 Annual Musical (COVID19 – June 2021)
- University of Newcastle – Upper Hunter Science and Engineering Challenge (COVID19 – June 2021)

The 2021 round of applications were advertised in September-October 2020 and closed 6 November 2020. There were 14 applications received. The following 7 organizations were supported in 2021 through the CSP:

- Branxton Tennis Club – Tennis court resurfacing and new nets
- PCYC Singleton – Electronic scoreboard
- Singleton Council – Christmas on John Street 2021
- Singleton Fire Brigade Social Club – Santa's lolly run
- Singleton Neighbourhood Centre – Garden Project
- St Catherine's Catholic College – Bush tucker garden
- Westpac Rescue Helicopter Service – Hunter Valley Mining Charity Rugby League Day 2021 (COVID – postponed to September 2022.

The 2022 round of applications were advertised in September-October 2021 and closed 5 November 2021. There were 15 applications received. The following organisations are being supported in 2022 through the CSP.

- University of Newcastle – Upper Hunter Science and Engineering Challenge
- Life Education NSW - Covid Recovery – Health & Wellbeing program for children in the Singleton LGA.
- Samaritans Foundation – Diocese of Newcastle - Christmas lunch in Singleton 2022.
- Singleton Business Chamber - 2022 Singleton Business Excellence Awards
- Singleton Council - 2022 Singleton Business Excellence Awards
- Singleton Council - Christmas on John Street 2022
- Singleton Golf Club Lady Members – Christmas on John Street 2022
- Singleton Fire Brigade Social Club – Singleton Lolly Run 2022
- Singleton Rugby Club Ltd - First Aid Kit Equipment Upgrade
- Northern Agriculture Association Inc (NAA) – Singleton Show & Camp Draft 2022
- Singleton Theatrical Society - 2022 Musical – Mamma Mia
- Rotary Club of Singleton on Hunter – 2022 Singleton Art Prize

For information on the Yancoal Community Support Program please visit our website at www.mtwcoal.com.au or email mtw.csp@yancoal.com.au.

9 INDEPENDENT ENVIRONMENTAL AUDIT

There was no Independent Environmental Audit completed during the reporting period. An update of progress against the Action Plan developed in response to the 2020 Independent Environmental Audit is included in **Appendix 10**. The next MTW Independent Environmental Audit is due in 2023.

The environmental audit report and MTW's response to recommendations are available in full on the company website (https://www.mtwcoal.com.au/page/environment/environmental-reports-studies-and-audits/).

10 INCIDENTS AND NON-COMPLIANCE

A summary of the environmental incidents reported during 2021 are provided in **Table 10.1** below

TABLE 10.1 ENVIRONMENTAL INCIDENT SUMMARY 2021

Date	Incident Details	Follow up Actions
4 January 2021	Discharge from four boundary dams at Warkworth (Dam 46N, Dam 52N, Dam 53N, Dam SSD09) and a mine water dam at Mount Thorley Operations (Dam 1S) as a result of a greater than design rainfall event. A total of 79.4mm of rainfall was recorded during the incident period from 18 March to 23 March 2021. Notifications to the relevant regulatory authorities was undertaken, in accordance with the MTW Pollution Incident Response Management Plan (PIRMP).	Investigation undertaken by MTW into both discharges. MTW submitted an incident report to EPA and DPE associated with the discharge event. Dewatering of Dam 46N, 52N, 53N and 1S continued throughout the duration and post the rainfall event to the sites mine water management system to dewater both dams to their lowest operating levels. Water management improvements completed: • Pumping infrastructure upgrade from Dam 1S. • Water diversion analysis to reduce rehabilitation catchment water reporting to Dams 3S, 2S, 1S. Sediment dam concept at MTO to be progressed. WMP updated to reflect this. • Drainage improvement works to eliminate mine water entering dam 46N.
19 March 2021	Discharge from three boundary dams at Warkworth (Dam 53N, 54N and 55N) and a mine water dam at Mount Thorley Operations (Dam 1S) as a result of a greater than design rainfall event. A total of 175.2mm of rainfall was recorded during the incident period from 18 March to 23 March 2021. Notifications to the relevant regulatory authorities was undertaken, in accordance with the MTW Pollution Incident Response Management Plan (PIRMP).	Investigation undertaken by MTW into both discharges. MTW submitted an incident report to EPA and DPE associated with the discharge event. Dewatering of Dam 54N, 53N, 55N and 1S continued throughout the duration and post the rainfall event to the sites mine water management system to dewater both dams to their lowest operating levels. Water management improvements completed as part of the January discharge incident for Dam 1S: • Pumping infrastructure upgrade from Dam 1S. • Water diversion analysis to reduce rehabilitation catchment water reporting to Dams 3S, 2S, 1S. Sediment dam concept at MTO to be

Date	Incident Details	Follow up Actions
		progressed. WMP updated to reflect this.
12 November 2021	Discharge from two boundary dams at Warkworth (Dam 54N and Dam 53N) as a result of a greater than design rainfall event. A total of 110.6mm of rainfall was recorded during the incident period from 10 November to 12 November 2021. Notifications to the relevant regulatory authorities was undertaken, in accordance with the MTW Pollution Incident Response Management Plan (PIRMP).	Investigation undertaken by MTW into discharges. MTW submitted an incident report to EPA and DPE associated with the discharge event. Dewatering of Dam 54N and Dam 53N continued throughout the duration and post the rainfall event to the sites mine water management system to dewater both dams to their lowest operating levels. Water samples were collected from monitoring sites during the event and analysis results obtained.
26 November 2021	Discharge from a boundary dams at Warkworth (Dam 53N) as a result of a greater than design rainfall event. A total of 84mm of rainfall was recorded during the incident period from 20 November to 26 November 2021. Notifications to the relevant regulatory authorities was undertaken, in accordance with the MTW Pollution Incident Response Management Plan (PIRMP).	Investigation undertaken by MTW into discharge. MTW submitted an incident report to EPA and DPE associated with the discharge event. Dewatering of Dam 53N continued throughout the duration and post the rainfall event to the sites mine water management system to dewater both dams to their lowest operating levels. Water samples were collected from monitoring sites during the event and analysis results obtained.

11 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Yancoal will endeavour to carry out the following activities during the 2021 reporting period at Mount Thorley Warkworth, as outlined in **Table 11.1**.

TABLE 11.1 PROPOSED ACTIVITIES FOR 2022 REPORTING PERIOD

ID	Performance Area	Activities Proposed
1	Noise	• Maintain and continue sound power level testing of attenuated fleet; • Continue undertaking noise management and monitoring actions in accordance with the MTW Noise Management Plan • Undertake quarterly comparison of real time and external noise monitoring to validate real time monitoring results. • Integrate an additional Environmental Noise Compass (ENC) into MTW's real time noise monitoring network. Note: the additional ENC will replace the existing noise monitor at that location
2	Blasting	• Review and revise the MTW Blast Management Plan for operational changes at MTW. • Implementation of a real time model, which will use real time meteorological data from weather stations throughout the Hunter Valley to better determine the effect of possible overpressure enhancement (real time model in development)
3	Air Quality	• Continue undertaking air quality management and monitoring actions in accordance with the MTW Air Quality Management Plan

ID	Performance Area	Activities Proposed
4	Aboriginal Cultural Heritage	• Ongoing Aboriginal archaeological and cultural heritage management activities will occur in 2022 in accordance with current management plans, to inform ongoing land management and development planning. This will include planning for the relocation of the Site M grinding grooves from the Putty Road Storage facility to the WBACHCA & the salvage of those Aboriginal artefact sites located within the AHMP Area in areas required for mine development. Condition monitoring of those sites peripheral to authorised disturbance areas will be conducted annually to ensure operational compliance with the AHMP. • Conservation Agreements for the Wollombi Brook and Loders Creek Aboriginal Cultural Heritage Conservation Areas will be progressed in 2022. • Relocation of the three cultural scar trees from the active mining area will be undertaken in consultation with the relevant stakeholders. • The WBACHCA PMIG meetings are planned to continue where required during the 2022 reporting period to begin actioning the WBACHCA plan of implementation.
5	Historic Heritage	• Implementing the MTW complex-wide HHMP developed in accordance with the conditions of the Warkworth & Mount Thorley Development Consents, which will guide the management of historic heritage. • MTW has engaged a contractor to undertake quarterly grounds maintenance at Springwood and Red Brick historic heritage houses. • Treatment of the cat claw creeper vine will be continue during the 2022 reporting period at Springwood followed by a structural building inspection. • Replacing window and door sheeting and any loose roofing is planned for completion at the Red Brick house during the 2022 reporting period. • Track maintenance into the RAAF Mess Hall is planned for completion during the 2022 reporting period to allow access for future works. During the 2022 reporting period tree lopping, asbestos removal and a structural building inspection are targeted for completion.

ID	Performance Area	Activities Proposed
6	Water	• Improving the general capacity of the site's water resources via construction and/or upgrades of approved tailings storage and water storage facilities (NOOP and Loders Pit TSF). • Implementation of actions/recommendations from the annual groundwater review. • Develop an action plan to address the findings of the annual stream health assessment for Loders Creek. • Construct rehab diversion and sediment basin as shown in the WMP to reduce catchment area reporting to dam 3S, 2S, 1S. • Install additional boundary dam monitoring equipment on the Mount Thorley mine water dams. • Update the operational site water balance and model.
7	Rehabilitation	• The rehabilitation monitoring programme will continue in 2022 for native vegetation rehabilitation areas. The monitoring program will be varied to align with changes to MOP performance criteria in the new format Rehabilitation Management Plan. • Weed spraying (boom and spot spraying), cut and paint and weed wiping will be conducted in establishing rehabilitation areas as required to control both noxious and environmental weeds that are likely to impact on successful rehabilitation being achieved. It is planned that 35ha of new rehabilitation will be undertaken at MTW during 2022. • Habitat augmentation measures, such as the construction of habitat ponds and the placement of salvaged logs in rehabilitation areas. • Surface water will be managed on Tailings Dam 2 with the aim to increase the strength of the tailings surface. Capping activities will continue on areas of the Tailings Dam 2 surface that allow for the safe placement of material, following ongoing geotechnical investigations. • Capping of the Interim TSF will continue during 2022 using breaker rock from the South CHPP as the initial capping layer.

ID	Performance Area	Activities Proposed
8	Biodiversity Management	• Planting works will continue to restore Warkworth Sands Woodland and Central Hunter Grey Box – Ironbark Woodland in the Northern and Southern BAs. Supplementary planting to re-establish the cleared land in the Yellow Box – Grey Box – Red Gum Grassy Woodland to a Box Gum Grassy Woodland community and increase the suitability of habitat for the Regent Honeyeater in the River Oak riparian woodland will continue at the Goulburn River Biodiversity Area. • Conservation management actions will be undertaken across the BAs in 2022 in accordance with the Offset Management Plans, these will include weed management in autumn and spring. Vertebrate pest management including 1080 ground baiting program to target wild dogs and foxes scheduled for autumn and spring across all BAs. 1080 baiting targeting feral pigs at the Goulburn River BA and a noisy miner control in the regent honeyeater breeding area at the Goulburn River BA. Thermal ground shooting programs at Putty, Condon View, Bowditch and Goulburn River. Habitat Restoration Monitoring and Bird Assemblage Monitoring will be undertaken in 2022. Rapid Condition Assessments, Overall Fuel Load Assessments and property inspections will be undertaken across all BAs. The hazard reduction burn for North Rothbury will be undertaken if conditions are within the parameters of the approved burn plan. Waste removal will be undertaken at the Seven Oaks BAs. Infrastructure improvement including fence repairs and track maintenance will be undertaken as required. • Progress the securing of biodiversity offset areas using the methods detailed in the relevant state and federal biodiversity approvals.
9	Community Engagement	• Continued operation of the Community Consultation Committee. • Implementation of the MTW Social Impact Management Plan (which outlines specific and general stakeholder engagement and consultation requirements).
10	Community Development	• Implementation of the Yancoal Community Support Program (CSP) during 2022. The CSP program provides an opportunity for multiple site or group-wide investment in larger, long-term, capacity building projects that make a positive difference. Focus areas include health, social and community, environment, education and training. • Continued funding and participation as a committee representative for the MTW Voluntary Planning Agreement to progress sustainable community projects in the local area.

Appendix 1:

Compliance Noise Monitoring Data

Compliance Noise Monitoring Data

Yancoal Mt Thorley Warkworth

2021

1.0 Noise

Routine attended noise monitoring is carried out in accordance with the MTW Noise Management Plan. The purpose of the noise surveys is to quantify and describe the acoustic environment around the site and compare results with specified limits. Attended noise monitoring locations are displayed in **Figure 1**.

1.1 Attended Noise Monitoring Results

Monthly attended monitoring was conducted at receiver locations surrounding MTW in 2021. All measurements complied with the relevant criteria. Results are detailed in **Table 1** to **Table 4.**

1.1.1 WML Noise Assessment

Compliance assessments undertaken against the WML noise criteria are presented in **Tables 1** and **2**.

Table 1: $L_{Aeq,\ 15\ minute}$ Warkworth Impact Assessment Criteria – 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	14/01/2021 22:59	4.2	D	37	No	<25	NA
Bulga Village	14/01/2021 22:14	3.1	E	38	No	29	NA
Gouldsville	14/01/2021 21:23	1.7	F	38	Yes	IA	Nil
Inlet Rd	14/01/2021 21:26	1.7	F	37	Yes	IA	Nil
Inlet Rd West	14/01/2021 21:01	1.2	F	35	Yes	IA	Nil
Long Point	14/01/2021 21:00	1.2	F	35	Yes	IA	Nil
South Bulga	14/01/2021 23:22	5.7	D	35	No	IA	NA
Wambo Road	14/01/2021 21:50	2.1	F	38	No	IA	NA
Bulga RFS	17/02/2021 22:47	3.5	D	37	No	IA	NA
Bulga Village	17/02/2021 22:08	4.1	D	38	No	<25	NA
Gouldsville	17/02/2021 21:33	3.5	D	38	No	29	NA
Inlet Rd	17/02/2021 21:21	3.6	D	37	No	25	NA
Inlet Rd West	17/02/2021 21:00	3.6	D	35	No	29	NA
Long Point	17/02/2021 21:07	3.6	D	35	No	IA	NA
South Bulga	17/02/2021 23:35	3.8	D	35	No	IA	NA
Wambo Road	17/02/2021 21:45	3.5	D	38	No	33	NA
Bulga RFS	16/03/2021 0:19	2.0	E	37	Yes	IA	Nil
Bulga Village	15/03/2021 23:34	2.2	D	38	Yes	33	Nil
Gouldsville	15/03/2021 21:29	1.8	E	38	Yes	<30	Nil
Inlet Rd	15/03/2021 21:42	2	E	37	Yes	33	Nil
Inlet Rd West	15/03/2021 21:12	1.7	F	35	Yes	30	Nil
Long Point	15/03/2021 21:05	2.1	F	35	No	IA	NA
South Bulga	16/03/2021 1:05	2.4	D	35	Yes	IA	Nil
Wambo Road	15/03/2021 22:11	1.9	F	38	Yes	38	Nil
Bulga RFS	21/04/2021 23:11	2.1	D	37	Yes	36	Nil
Bulga Village	21/04/2021 22:27	2.3	D	38	Yes	33	Nil
Gouldsville	21/04/2021 21:25	1.4	E	38	Yes	IA	Nil

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]
Inlet Rd	21/04/2021 21:31	1.4	E	37	Yes	31	Nil
Inlet Rd West	21/04/2021 21:00	0.7	F	35	Yes	28	Nil
Long Point	21/04/2021 21:03	0.7	F	35	Yes	IA	Nil
South Bulga	21/04/2021 23:36	1.9	F	35	Yes	30	Nil
Wambo Road	21/04/2021 22:02	1.6	E	38	Yes	33	Nil
Bulga RFS	18/05/2021 0:04	2.3	D	37	Yes	NM	Nil
Bulga Village	17/05/2021 23:18	1.9	D	38	Yes	IA	Nil
Gouldsville	17/05/2021 21:25	0.4	F	38	Yes	IA	Nil
Inlet Rd	17/05/2021 21:29	0.4	F	37	Yes	33	Nil
Inlet Rd West	17/05/2021 21:00	1.2	E	35	Yes	32	Nil
Long Point	17/05/2021 21:03	1.2	E	35	Yes	IA	Nil
South Bulga	18/05/2021 0:26	2.6	E	35	Yes	IA	Nil
Wambo Road	17/05/2021 21:57	1.1	F	38	Yes	34	Nil
Bulga RFS	1/06/2021 23:10	0.8	F	37	Yes	<30	Nil
Bulga Village	1/06/2021 22:25	1.8	D	38	Yes	32	Nil
Gouldsville	1/06/2021 21:38	2	E	38	Yes	IA	Nil
Inlet Rd	1/06/2021 21:36	2	E	37	Yes	32	Nil
Inlet Rd West	1/06/2021 21:15	1.8	E	35	Yes	25	Nil
Long Point	1/06/2021 21:13	1.8	E	35	Yes	IA	Nil
South Bulga	1/06/2021 23:50	1	F	35	Yes	28	Nil
Wambo Road	1/06/2021 22:02	2.4	D	38	Yes	30	Nil
Bulga RFS	23/07/2021 1:19	0.9	E	37	Yes	36	Nil
Bulga Village	23/07/2021 0:19	1.1	D	38	Yes	37	Nil
Gouldsville	22/07/2021 21:22	2.1	E	38	Yes	IA	Nil
Inlet Rd	22/07/2021 21:40	2.1	D	37	Yes	35	Nil
Inlet Rd West	22/07/2021 21:10	2.2	D	35	Yes	28	Nil
Long Point	22/07/2021 21:00	2	E	35	Yes	IA	Nil
South Bulga	23/07/2021 0:53	1	F	35	Yes	IA	Nil
Wambo Road	22/07/2021 22:08	1.5	F	38	Yes	38	Nil
Bulga RFS	11/08/2021 0:00	1.4	E	37	Yes	35	Nil
Bulga Village	10/08/2021 23:16	1	D	38	Yes	31	Nil
Gouldsville	10/08/2021 21:24	0.5	F	38	Yes	IA	Nil
Inlet Rd	10/08/2021 21:23	0.5	F	37	Yes	25	Nil
Inlet Rd West	10/08/2021 21:00	1.5	E	35	Yes	<20	Nil
Long Point	10/08/2021 21:00	1.5	E	35	Yes	IA	Nil
South Bulga	11/08/2021 0:18	1.7	D	35	Yes	32	Nil
Wambo Road	10/08/2021 21:48	0.4	F	38	Yes	<25	Nil
Bulga RFS	7/09/2021 22:51	1.7	F	37	Yes	IA	Nil
Bulga Village	7/09/2021 22:11	1.3	F	38	Yes	IA	Nil
Gouldsville	7/09/2021 21:27	3	D	38	Yes	29	Nil
Inlet Rd	7/09/2021 21:22	2.5	D	37	Yes	NM	Nil

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]
Inlet Rd West	7/09/2021 21:00	2.9	E	35	Yes	IA	Nil
Long Point	7/09/2021 21:01	2.9	E	35	Yes	27	Nil
South Bulga	7/09/2021 23:38	1.7	E	35	Yes	IA	Nil
Wambo Road	7/09/2021 21:49	2.7	D	38	Yes	IA	Nil
Bulga RFS	21/10/2021 22:55	2.8	D	37	Yes	<25	Nil
Bulga Village	21/10/2021 21:48	2.9	D	38	Yes	29	Nil
Gouldsville	21/10/2021 21:22	3.1	D	38	Yes	<20	NA
Inlet Rd	21/10/2021 21:24	3.1	D	38	Yes	30	NA
Inlet Rd West	21/10/2021 21:00	3	D	35	Yes	25	Nil
Long Point	21/10/2021 21:00	3	D	35	Yes	IA	Nil
South Bulga	21/10/2021 23:18	3.2	D	35	Yes	IA	NA
Wambo Road	21/10/2021 22:10	3.2	D	38	Yes	31	NA
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	38	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
Bulga RFS	20/12/2021 22:53	0.2	F	37	Yes	30	Nil
Bulga Village	20/12/2021 22:14	1	F	38	Yes	28	Nil
Gouldsville	20/12/2021 21:28	2.3	F	38	No	<25	NA
Inlet Rd	20/12/2021 21:23	2.3	F	37	No	35	NA
Inlet Rd West	20/12/2021 21:00	1.1	F	35	Yes	32	Nil
Long Point	20/12/2021 21:05	1.1	F	35	Yes	IA	Nil
South Bulga	20/12/2021 23:33	0.2	D	35	Yes	IA	Nil
Wambo Road	20/12/2021 21:50	2.4	D	38	Yes	37	Nil

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 exceedances of relevant criteria;

4. IA denotes 'Inaudible'; and

5. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 2: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria – 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	14/01/2021 22:59	4.2	D	47	No	<25	NA
Bulga Village	14/01/2021 22:14	3.1	E	48	No	33	NA
Gouldsville	14/01/2021 21:23	1.7	F	48	Yes	IA	Nil
Inlet Rd	14/01/2021 21:26	1.7	F	47	Yes	IA	Nil
Inlet Rd West	14/01/2021 21:01	1.2	F	45	Yes	IA	Nil
Long Point	14/01/2021 21:00	1.2	F	45	Yes	IA	Nil
South Bulga	14/01/2021 23:22	5.7	D	45	No	IA	NA
Wambo Road	14/01/2021 21:50	2.1	F	48	No	IA	NA
Bulga RFS	17/02/2021 22:47	3.5	D	47	No	IA	NA
Bulga Village	17/02/2021 22:08	4.1	D	48	No	<25	NA
Gouldsville	17/02/2021 21:33	3.5	D	48	No	33	NA
Inlet Rd	17/02/2021 21:21	3.6	D	47	No	30	NA
Inlet Rd West	17/02/2021 21:00	3.6	D	45	No	37	NA
Long Point	17/02/2021 21:07	3.6	D	45	No	IA	NA
South Bulga	17/02/2021 23:35	3.8	D	45	No	IA	NA
Wambo Road	17/02/2021 21:45	3.5	D	48	No	39	NA
Bulga RFS	16/03/2021 0:19	2	E	47	Yes	IA	Nil
Bulga Village	15/03/2021 23:34	2.2	D	48	Yes	45	Nil
Gouldsville	15/03/2021 21:29	1.8	E	48	Yes	<30	Nil
Inlet Rd	15/03/2021 21:42	2	E	47	Yes	39	Nil
Inlet Rd West	15/03/2021 21:12	1.7	F	45	Yes	34	Nil
Long Point	15/03/2021 21:05	2.1	F	45	No	IA	NA
South Bulga	16/03/2021 1:05	2.4	D	45	Yes	IA	Nil
Wambo Road	15/03/2021 22:11	1.9	F	48	Yes	42	Nil
Bulga RFS	21/04/2021 23:11	2.1	D	47	Yes	40	Nil
Bulga Village	21/04/2021 22:27	2.3	D	48	Yes	37	Nil
Gouldsville	21/04/2021 21:25	1.4	E	48	Yes	IA	Nil
Inlet Rd	21/04/2021 21:31	1.4	E	47	Yes	39	Nil
Inlet Rd West	21/04/2021 21:00	0.7	F	45	Yes	36	Nil
Long Point	21/04/2021 21:03	0.7	F	45	Yes	IA	Nil
South Bulga	21/04/2021 23:36	1.9	F	45	Yes	40	Nil
Wambo Road	21/04/2021 22:02	1.6	E	48	Yes	35	Nil
Bulga RFS	18/05/2021 0:04	2.3	D	47	Yes	NM	Nil
Bulga Village	17/05/2021 23:18	1.9	D	48	Yes	IA	Nil
Gouldsville	17/05/2021 21:25	0.4	F	48	Yes	IA	Nil
Inlet Rd	17/05/2021 21:29	0.4	F	47	Yes	38	Nil

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]
Inlet Rd West	17/05/2021 21:00	1.2	E	45	Yes	39	Nil
Long Point	17/05/2021 21:03	1.2	E	45	Yes	IA	Nil
South Bulga	18/05/2021 0:26	2.6	E	45	Yes	IA	Nil
Wambo Road	17/05/2021 21:57	1.1	F	48	Yes	37	Nil
Bulga RFS	1/06/2021 23:10	0.8	F	47	Yes	<30	Nil
Bulga Village	1/06/2021 22:25	1.8	D	48	Yes	35	Nil
Gouldsville	1/06/2021 21:38	2	E	48	Yes	IA	Nil
Inlet Rd	1/06/2021 21:36	2	E	47	Yes	34	Nil
Inlet Rd West	1/06/2021 21:15	1.8	E	45	Yes	30	Nil
Long Point	1/06/2021 21:13	1.8	E	45	Yes	IA	Nil
South Bulga	1/06/2021 23:50	1	F	45	Yes	30	Nil
Wambo Road	1/06/2021 22:02	2.4	D	48	Yes	32	Nil
Bulga RFS	23/07/2021 1:19	0.9	E	47	Yes	40	Nil
Bulga Village	23/07/2021 0:19	1.1	D	48	Yes	40	Nil
Gouldsville	22/07/2021 21:22	2.1	E	48	Yes	IA	Nil
Inlet Rd	22/07/2021 21:40	2.1	D	47	Yes	38	Nil
Inlet Rd West	22/07/2021 21:10	2.2	D	45	Yes	<30	Nil
Long Point	22/07/2021 21:00	2	E	45	Yes	IA	Nil
South Bulga	23/07/2021 0:53	1	F	45	Yes	IA	Nil
Wambo Road	22/07/2021 22:08	1.5	F	48	Yes	42	Nil
Bulga RFS	11/08/2021 0:00	1.4	E	47	Yes	45	Nil
Bulga Village	10/08/2021 23:16	1	D	48	Yes	35	Nil
Gouldsville	10/08/2021 21:24	0.5	F	48	Yes	IA	Nil
Inlet Rd	10/08/2021 21:23	0.5	F	47	Yes	30	Nil
Inlet Rd West	10/08/2021 21:00	1.5	E	45	Yes	<20	Nil
Long Point	10/08/2021 21:00	1.5	E	45	Yes	IA	Nil
South Bulga	11/08/2021 0:18	1.7	D	45	Yes	40	Nil
Wambo Road	10/08/2021 21:48	0.4	F	48	Yes	35	Nil
Bulga RFS	7/09/2021 22:51	1.7	F	47	Yes	IA	Nil
Bulga Village	7/09/2021 22:11	1.3	F	48	Yes	IA	Nil
Gouldsville	7/09/2021 21:27	3	D	48	Yes	32	Nil
Inlet Rd	7/09/2021 21:22	2.5	D	47	Yes	NM	Nil
Inlet Rd West	7/09/2021 21:00	2.9	E	45	Yes	IA	Nil
Long Point	7/09/2021 21:01	2.9	E	45	Yes	28	Nil
South Bulga	7/09/2021 23:38	1.7	E	45	Yes	IA	Nil
Wambo Road	7/09/2021 21:49	2.7	D	48	Yes	IA	Nil
Bulga RFS	21/10/2021 22:55	2.8	D	47	Yes	<30	Nil

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 Village	21/10/2021 21:48	2.9	D	48	Yes	35	Nil
Gouldsville	21/10/2021 21:22	3.1	D	48	Yes	<20	NA
Inlet Rd	21/10/2021 21:24	3.1	D	47	Yes	33	NA
Inlet Rd West	21/10/2021 21:00	3	D	45	Yes	28	Nil
Long Point	21/10/2021 21:00	3	D	45	Yes	IA	Nil
South Bulga	21/10/2021 23:18	3.2	D	45	Yes	IA	NA
Wambo Road	21/10/2021 22:10	3.1	D	48	Yes	34	NA
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
Bulga RFS	20/12/2021 22:53	0.2	F	47	Yes	35	Nil
Bulga Village	20/12/2021 22:14	1	F	48	Yes	30	Nil
Gouldsville	20/12/2021 21:28	2.3	F	48	No	<25	NA
Inlet Rd	20/12/2021 21:23	2.3	F	47	No	39	NA
Inlet Rd West	20/12/2021 21:00	1.1	F	45	Yes	37	Nil
Long Point	20/12/2021 21:05	1.1	F	45	Yes	IA	Nil
South Bulga	20/12/2021 23:33	0.2	D	45	Yes	IA	Nil
Wambo Road	20/12/2021 21:50	2.4	D	48	Yes	39	Nil

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 exceedances of relevant criteria;

4. IA denotes 'Inaudible'; and

5. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable

1.1.2 MTO Noise Assessment

Compliance assessments undertaken against the MTO noise criteria are presented in **Table 3** and **4**.

Table 3: $L_{Aeq,\ 15minute}$ Mount Thorley - Impact Assessment Criteria – 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	14/01/2021 22:59	4.2	D	37	No	IA	NA
Bulga Village	14/01/2021 22:14	3.1	E	38	No	IA	NA
Gouldsville	14/01/2021 21:23	1.7	F	35	Yes	IA	Nil
Inlet Rd	14/01/2021 21:26	1.7	F	37	Yes	IA	Nil
Inlet Rd West	14/01/2021 21:01	1.2	F	35	Yes	IA	Nil
Long Point	14/01/2021 21:00	1.2	F	35	Yes	IA	Nil
South Bulga	14/01/2021 23:22	5.7	D	36	No	IA	NA
Wambo Road	14/01/2021 21:50	2.1	F	38	No	IA	NA
Bulga RFS	17/02/2021 22:47	3.5	D	37	No	<30	NA
Bulga Village	17/02/2021 22:08	4.1	D	38	No	30	NA
Gouldsville	17/02/2021 21:33	3.5	D	35	No	IA	NA
Inlet Rd	17/02/2021 21:21	3.6	D	37	No	29	NA
Inlet Rd West	17/02/2021 21:00	3.6	D	35	No	25	NA
Long Point	17/02/2021 21:07	3.6	D	35	No	IA	NA
South Bulga	17/02/2021 23:35	3.8	D	36	No	IA	NA
Wambo Road	17/02/2021 21:45	3.5	D	38	No	33	NA
Bulga RFS	16/03/2021 0:19	2.0	E	37	Yes	IA	Nil
Bulga Village	15/03/2021 23:34	2.2	D	38	Yes	IA	Nil
Gouldsville	15/03/2021 21:29	1.8	E	35	Yes	IA	Nil
Inlet Rd	15/03/2021 21:42	2	E	37	Yes	IA	Nil
Inlet Rd West	15/03/2021 21:12	1.7	F	35	Yes	IA	Nil
Long Point	15/03/2021 21:05	2.1	F	35	No	IA	NA
South Bulga	16/03/2021 1:05	2.4	D	36	Yes	IA	Nil
Wambo Road	15/03/2021 22:11	1.9	F	38	Yes	IA	Nil
Bulga RFS	21/04/2021 23:11	2.1	D	37	Yes	<30	Nil
Bulga Village	21/04/2021 22:27	2.3	D	38	Yes	IA	Nil
Gouldsville	21/04/2021 21:25	1.4	E	35	Yes	IA	Nil
Inlet Rd	21/04/2021 21:31	1.4	E	37	Yes	IA	Nil
Inlet Rd West	21/04/2021 21:00	0.7	F	35	Yes	IA	Nil
Long Point	21/04/2021 21:03	0.7	F	35	Yes	IA	Nil

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]
South Bulga	21/04/2021 23:36	1.9	F	36	Yes	IA	Nil
Wambo Road	21/04/2021 22:02	1.6	E	38	Yes	IA	Nil
Bulga RFS	18/05/2021 0:04	2.3	D	37	Yes	IA	Nil
Bulga Village	17/05/2021 23:18	1.9	D	38	Yes	IA	Nil
Gouldsville	17/05/2021 21:25	0.4	F	35	Yes	IA	Nil
Inlet Rd	17/05/2021 21:29	0.4	F	37	Yes	IA	Nil
Inlet Rd West	17/05/2021 21:00	1.2	E	35	Yes	IA	Nil
Long Point	17/05/2021 21:03	1.2	E	35	Yes	IA	Nil
South Bulga	18/05/2021 0:26	2.6	E	36	Yes	IA	Nil
Wambo Road	17/05/2021 21:57	1.1	F	38	Yes	IA	Nil
Bulga RFS	1/06/2021 23:10	0.8	F	37	Yes	<30	Nil
Bulga Village	1/06/2021 22:25	1.8	D	38	Yes	IA	Nil
Gouldsville	1/06/2021 21:38	2	E	35	Yes	IA	Nil
Inlet Rd	1/06/2021 21:36	2	E	37	Yes	IA	Nil
Inlet Rd West	1/06/2021 21:15	1.8	E	35	Yes	IA	Nil
Long Point	1/06/2021 21:13	1.8	E	35	Yes	IA	Nil
South Bulga	1/06/2021 23:50	1	F	36	Yes	IA	Nil
Wambo Road	1/06/2021 22:02	2.4	D	38	Yes	IA	Nil
Bulga RFS	23/07/2021 1:19	0.9	E	37	Yes	NM	Nil
Bulga Village	23/07/2021 0:19	1.1	D	38	Yes	IA	Nil
Gouldsville	22/07/2021 21:22	2.1	E	35	Yes	IA	Nil
Inlet Rd	22/07/2021 21:40	2.1	D	37	Yes	IA	Nil
Inlet Rd West	22/07/2021 21:10	2.2	D	35	Yes	IA	Nil
Long Point	22/07/2021 21:00	2	E	35	Yes	IA	Nil
South Bulga	23/07/2021 0:53	1	F	36	Yes	35	Nil
Wambo Road	22/07/2021 22:08	1.5	F	38	Yes	IA	Nil
Bulga RFS	11/08/2021 0:00	1.4	E	37	Yes	IA	Nil
Bulga Village	10/08/2021 23:16	1	D	38	Yes	IA	Nil
Gouldsville	10/08/2021 21:24	0.5	F	35	Yes	IA	Nil
Inlet Rd	10/08/2021 21:23	0.5	F	37	Yes	IA	Nil
Inlet Rd West	10/08/2021 21:00	1.5	E	35	Yes	<20	Nil
Long Point	10/08/2021 21:00	1.5	E	35	Yes	IA	Nil
South Bulga	11/08/2021 0:18	1.7	D	36	Yes	IA	Nil
Wambo Road	10/08/2021 21:48	0.4	F	38	Yes	IA	Nil
Bulga RFS	7/09/2021 22:51	1.7	F	37	Yes	NM	Nil
Bulga Village	7/09/2021 22:11	1.3	F	38	Yes	IA	Nil

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]
Gouldsville	7/09/2021 21:27	3	D	35	Yes	IA	Nil
Inlet Rd	7/09/2021 21:22	2.5	D	37	Yes	IA	Nil
Inlet Rd West	7/09/2021 21:00	2.9	E	35	Yes	IA	Nil
Long Point	7/09/2021 21:01	2.9	E	35	Yes	IA	Nil
South Bulga	7/09/2021 23:38	1.7	E	36	Yes	32	Nil
Wambo Road	7/09/2021 21:49	2.7	D	38	Yes	NM	Nil
Bulga RFS	21/10/2021 22:55	2.8	D	37	Yes	32	Nil
Bulga Village	21/10/2021 21:48	2.9	D	38	Yes	<25	Nil
Gouldsville	21/10/2021 21:22	3.1	D	35	Yes	IA	NA
Inlet Rd	21/10/2021 21:24	3.1	D	37	Yes	IA	NA
Inlet Rd West	21/10/2021 21:00	3	D	35	Yes	IA	Nil
Long Point	21/10/2021 21:00	3	D	35	Yes	IA	Nil
South Bulga	21/10/2021 23:18	3.2	D	36	Yes	31	NA
Wambo Road	21/10/2021 22:10	3.2	D	38	Yes	IA	NA
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
Bulga RFS	20/12/2021 22:53	0.2	F	37	Yes	NM	Nil
Bulga Village	20/12/2021 22:14	1	F	38	Yes	28	Nil
Gouldsville	20/12/2021 21:28	2.3	F	35	No	IA	NA
Inlet Rd	20/12/2021 21:23	2.3	F	37	No	30	NA
Inlet Rd West	20/12/2021 21:00	1.1	F	35	Yes	IA	Nil
Long Point	20/12/2021 21:05	1.1	F	35	Yes	IA	Nil
South Bulga	20/12/2021 23:33	0.2	D	36	Yes	25	Nil
Wambo Road	20/12/2021 21:50	2.4	D	38	Yes	IA	Nil

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 exceedances of relevant criteria;

4. IA denotes 'Inaudible'; and

5. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 4: $L_{A1, 1Minute}$ Mount Thorley - Impact Assessment Criteria – 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	14/01/2021 22:59	4.2	D	47	No	IA	NA
Bulga Village	14/01/2021 22:14	3.1	E	48	No	IA	NA
Gouldsville	14/01/2021 21:23	1.7	F	45	Yes	IA	Nil
Inlet Rd	14/01/2021 21:26	1.7	F	47	Yes	IA	Nil
Inlet Rd West	14/01/2021 21:01	1.2	F	45	Yes	IA	Nil
Long Point	14/01/2021 21:00	1.2	F	45	Yes	IA	Nil
South Bulga	14/01/2021 23:22	5.7	D	46	No	IA	NA
Wambo Road	14/01/2021 21:50	2.1	F	48	No	IA	NA
Bulga RFS	17/02/2021 22:47	3.5	D	47	No	<30	NA
Bulga Village	17/02/2021 22:08	4.1	D	48	No	33	NA
Gouldsville	17/02/2021 21:33	3.5	D	45	No	IA	NA
Inlet Rd	17/02/2021 21:21	3.6	D	47	No	36	NA
Inlet Rd West	17/02/2021 21:00	3.6	D	45	No	<30	NA
Long Point	17/02/2021 21:07	3.6	D	45	No	IA	NA
South Bulga	17/02/2021 23:35	3.8	D	46	No	IA	NA
Wambo Road	17/02/2021 21:45	3.5	D	48	No	35	NA
Bulga RFS	16/03/2021 0:19	2.0	E	47	Yes	IA	Nil
Bulga Village	15/03/2021 23:34	2.2	D	48	Yes	IA	Nil
Gouldsville	15/03/2021 21:29	1.8	E	45	Yes	IA	Nil
Inlet Rd	15/03/2021 21:42	2	E	47	Yes	IA	Nil
Inlet Rd West	15/03/2021 21:12	1.7	F	45	Yes	IA	Nil
Long Point	15/03/2021 21:05	2.1	F	45	No	IA	NA
South Bulga	16/03/2021 1:05	2.4	D	46	Yes	IA	Nil
Wambo Road	15/03/2021 22:11	1.9	F	48	Yes	IA	Nil
Bulga RFS	21/04/2021 23:11	2.1	D	47	Yes	33	Nil
Bulga Village	21/04/2021 22:27	2.3	D	48	Yes	IA	Nil
Gouldsville	21/04/2021 21:25	1.4	E	45	Yes	IA	Nil
Inlet Rd	21/04/2021 21:31	1.4	E	47	Yes	IA	Nil
Inlet Rd West	21/04/2021 21:00	0.7	F	45	Yes	IA	Nil
Long Point	21/04/2021 21:03	0.7	F	45	Yes	IA	Nil
South Bulga	21/04/2021 23:36	1.9	F	46	Yes	IA	Nil
Wambo Road	21/04/2021 22:02	1.6	E	48	Yes	IA	Nil
Bulga RFS	18/05/2021 0:04	2.3	D	47	Yes	IA	Nil
Bulga Village	17/05/2021 23:18	1.9	D	48	Yes	IA	Nil

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]
Gouldsville	17/05/2021 21:25	0.4	F	45	Yes	IA	Nil
Inlet Rd	17/05/2021 21:29	0.4	F	47	Yes	IA	Nil
Inlet Rd West	17/05/2021 21:00	1.2	E	45	Yes	IA	Nil
Long Point	17/05/2021 21:03	1.2	E	45	Yes	IA	Nil
South Bulga	18/05/2021 0:26	2.6	E	46	Yes	IA	Nil
Wambo Road	17/05/2021 21:57	1.1	F	48	Yes	IA	Nil
Bulga RFS	1/06/2021 23:10	0.8	F	47	Yes	<30	Nil
Bulga Village	1/06/2021 22:25	1.8	D	48	Yes	IA	Nil
Gouldsville	1/06/2021 21:38	2	E	45	Yes	IA	Nil
Inlet Rd	1/06/2021 21:36	2	E	47	Yes	IA	Nil
Inlet Rd West	1/06/2021 21:15	1.8	E	45	Yes	IA	Nil
Long Point	1/06/2021 21:13	1.8	E	45	Yes	IA	Nil
South Bulga	1/06/2021 23:50	1	F	46	Yes	IA	Nil
Wambo Road	1/06/2021 22:02	2.4	D	48	Yes	IA	Nil
Bulga RFS	23/07/2021 1:19	0.9	E	47	Yes	NM	Nil
Bulga Village	23/07/2021 0:19	1.1	D	48	Yes	IA	Nil
Gouldsville	22/07/2021 21:22	2.1	E	45	Yes	IA	Nil
Inlet Rd	22/07/2021 21:40	2.1	D	47	Yes	IA	Nil
Inlet Rd West	22/07/2021 21:10	2.2	D	45	Yes	IA	Nil
Long Point	22/07/2021 21:00	2	E	45	Yes	IA	Nil
South Bulga	23/07/2021 0:53	1	F	46	Yes	37	Nil
Wambo Road	22/07/2021 22:08	1.5	F	48	Yes	IA	Nil
Bulga RFS	11/08/2021 0:00	1.4	E	47	Yes	IA	Nil
Bulga Village	10/08/2021 23:16	1	D	48	Yes	IA	Nil
Gouldsville	10/08/2021 21:24	0.5	F	45	Yes	IA	Nil
Inlet Rd	10/08/2021 21:23	0.5	F	47	Yes	IA	Nil
Inlet Rd West	10/08/2021 21:00	1.5	E	45	Yes	25	Nil
Long Point	10/08/2021 21:00	1.5	E	45	Yes	IA	Nil
South Bulga	11/08/2021 0:18	1.7	D	46	Yes	IA	Nil
Wambo Road	10/08/2021 21:48	0.4	F	48	Yes	IA	Nil
Bulga RFS	7/09/2021 22:51	1.7	F	47	Yes	NM	Nil
Bulga Village	7/09/2021 22:11	1.3	F	48	Yes	IA	Nil
Gouldsville	7/09/2021 21:27	3	D	45	Yes	IA	Nil
Inlet Rd	7/09/2021 21:22	2.5	D	47	Yes	IA	Nil
Inlet Rd West	7/09/2021 21:00	2.9	E	45	Yes	IA	Nil
Long Point	7/09/2021 21:01	2.9	E	45	Yes	IA	Nil

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]
South Bulga	7/09/2021 23:38	1.7	E	46	Yes	42	Nil
Wambo Road	7/09/2021 21:49	2.7	D	48	Yes	NM	Nil
Bulga RFS	21/10/2021 22:55	2.8	D	47	Yes	36	Nil
Bulga Village	21/10/2021 21:48	2.9	D	48	Yes	<30	Nil
Gouldsville	21/10/2021 21:22	3.1	D	45	Yes	IA	NA
Inlet Rd	21/10/2021 21:24	3.1	D	47	Yes	IA	NA
Inlet Rd West	21/10/2021 21:00	3	D	45	Yes	IA	Nil
Long Point	21/10/2021 21:00	3	D	45	Yes	IA	Nil
South Bulga	21/10/2021 23:18	3.1	D	46	Yes	36	Nil
Wambo Road	21/10/2021 22:10	3.2	D	48	Yes	IA	NA
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
Bulga RFS	20/12/2021 22:53	0.2	F	47	Yes	NM	Nil
Bulga Village	20/12/2021 22:14	1	F	48	Yes	31	Nil
Gouldsville	20/12/2021 21:28	2.3	F	45	No	IA	NA
Inlet Rd	20/12/2021 21:23	2.3	F	47	No	30	NA
Inlet Rd West	20/12/2021 21:00	1.1	F	45	Yes	IA	Nil
Long Point	20/12/2021 21:05	1.1	F	45	Yes	IA	Nil
South Bulga	20/12/2021 23:33	0.2	D	46	Yes	30	Nil
Wambo Road	20/12/2021 21:50	2.4	D	48	Yes	IA	Nil

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 exceedances of relevant criteria;

4. IA denotes 'Inaudible'; and

5. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

1.1.3 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 5** and the MTO assessment for low frequency noise is shown in **Table 6**.

Table 5: Warkworth Low Frequency Noise Assessment –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
Bulga RFS	14/01/2021 22:59	<25	NA	No	No	NA	No	NA	Nil	NA
Bulga Village	14/01/2021 22:14	29	NA	No	No	NA	No	NA	Nil	NA
Gouldsville	14/01/2021 21:23	IA	Nil	No	No	NA	No	NA	Nil	NA
Inlet Rd	14/01/2021 21:26	IA	Nil	No	No	NA	No	NA	Nil	NA
Inlet Rd West	14/01/2021 21:01	IA	Nil	No	No	NA	No	NA	Nil	NA
Long Point	14/01/2021 21:00	IA	Nil	No	No	NA	No	NA	Nil	NA
South Bulga	14/01/2021 23:22	IA	NA	No	No	NA	No	NA	Nil	NA
Wambo Road	14/01/2021 21:50	IA	NA	No	No	NA	No	NA	Nil	NA
Bulga RFS	17/02/2021 22:47	IA	No	No	No	NA	No	NA	Nil	NA
Bulga Village	17/02/2021 22:08	<25	No	No	No	NA	No	NA	Nil	NA
Gouldsville	17/02/2021 21:33	29	No	No	No	NA	No	NA	Nil	NA
Inlet Rd	17/02/2021 21:21	25	No	No	No	NA	No	NA	Nil	NA
Inlet Rd West	17/02/2021 21:00	29	No	No	No	NA	No	NA	Nil	NA
Long Point	17/02/2021 21:07	IA	No	No	No	NA	No	NA	Nil	NA
South Bulga	17/02/2021 23:35	IA	No	No	No	NA	No	NA	Nil	NA
Wambo Road	17/02/2021 21:45	33	No	No	No	NA	No	NA	Nil	NA

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
Bulga RFS	16/03/2021 0:19	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	15/03/2021 23:34	31	Yes	No	No	NA	Yes	**2 dB @ 80 Hz**	**2**	NA
Gouldsville	15/03/2021 21:29	<30	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	15/03/2021 21:42	33	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	15/03/2021 21:12	30	Yes	No	No	NA	No	NA	Nil	NA
Long Point	15/03/2021 21:05	IA	No	No	No	NA	No	NA	Nil	NA
South Bulga	16/03/2021 1:05	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	15/03/2021 22:11	36	Yes	No	No	NA	Yes	**2 dB @ 80 Hz**	**2**	NA
Bulga RFS	21/04/2021 23:11	36	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	21/04/2021 22:27	33	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	21/04/2021 21:25	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	21/04/2021 21:31	31	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	21/04/2021 21:00	28	Yes	No	No	NA	No	NA	Nil	NA
Long Point	21/04/2021 21:03	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	21/04/2021 23:36	30	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	21/04/2021 22:02	33	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	18/05/2021 0:04	NM	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	17/05/2021 23:18	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	17/05/2021 21:25	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	17/05/2021 21:29	33	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	17/05/2021 21:00	32	Yes	No	No	NA	No	NA	Nil	NA
Long Point	17/05/2021 21:03	IA	Yes	No	No	NA	No	NA	Nil	NA

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
South Bulga	18/05/2021 0:26	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	17/05/2021 21:57	34	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	1/06/2021 23:10	<30	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	1/06/2021 22:25	32	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	1/06/2021 21:38	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	1/06/2021 21:36	32	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	1/06/2021 21:15	25	Yes	No	No	NA	No	NA	Nil	NA
Long Point	1/06/2021 21:13	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	1/06/2021 23:50	28	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	1/06/2021 22:02	30	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	23/07/2021 1:19	36	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	23/07/2021 0:19	35	Yes	No	No	NA	Yes	**1dB @ 80Hz**	**2**	NA
Gouldsville	22/07/2021 21:22	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	22/07/2021 21:40	35	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	22/07/2021 21:10	28	Yes	No	No	NA	No	NA	Nil	NA
Long Point	22/07/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	23/07/2021 0:53	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	22/07/2021 22:08	38	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	11/08/2021 0:00	35	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	10/08/2021 23:16	31	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	10/08/2021 21:24	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	10/08/2021 21:23	25	Yes	No	No	NA	No	NA	Nil	NA

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
Inlet Rd West	10/08/2021 21:00	<20	Yes	No	No	NA	No	NA	Nil	NA
Long Point	10/08/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	11/08/2021 0:18	32	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	10/08/2021 21:48	<25	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	7/09/2021 22:51	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	7/09/2021 22:11	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	7/09/2021 21:27	29	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	7/09/2021 21:22	NM	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	7/09/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	7/09/2021 21:01	27	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	7/09/2021 23:38	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	7/09/2021 21:49	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	21/10/2021 22:55	<25	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	21/10/2021 21:48	29	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	21/10/2021 21:22	<20	No	No	No	NA	No	NA	Nil	NA
Inlet Rd	21/10/2021 21:24	30	No	No	No	NA	No	NA	Nil	NA
Inlet Rd West	21/10/2021 21:00	25	Yes	No	No	NA	No	NA	Nil	NA
Long Point	21/10/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	21/10/2021 23:18	IA	No	No	No	NA	No	NA	Nil	NA
Wambo Road	21/10/2021 22:10	31	No	No	No	NA	No	NA	Nil	NA
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

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
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
Bulga RFS	20/12/2021 22:53	30	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	20/12/2021 22:14	28	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	20/12/2021 21:28	<25	No	No	No	NA	No	NA	Nil	NA
Inlet Rd	20/12/2021 21:23	35	No	No	No	NA	No	NA	Nil	NA
Inlet Rd West	20/12/2021 21:00	32	Yes	No	No	NA	No	NA	Nil	NA
Long Point	20/12/2021 21:05	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	20/12/2021 23:33	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	20/12/2021 21:50	35	Yes	No	No	NA	Yes	**1dB @ 80Hz**	**2**	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 6: Mount Thorley Operations Low Frequency Noise Assessment – 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
Bulga RFS	14/01/2021 22:59	IA	NA	No	No	NA	No	NA	Nil	NA
Bulga Village	14/01/2021 22:14	IA	NA	No	No	NA	No	NA	Nil	NA

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
Gouldsville	14/01/2021 21:23	IA	Nil	No	No	NA	No	NA	Nil	NA
Inlet Rd	14/01/2021 21:26	IA	Nil	No	No	NA	No	NA	Nil	NA
Inlet Rd West	14/01/2021 21:01	IA	Nil	No	No	NA	No	NA	Nil	NA
Long Point	14/01/2021 21:00	IA	Nil	No	No	NA	No	NA	Nil	NA
South Bulga	14/01/2021 23:22	IA	NA	No	No	NA	No	NA	Nil	NA
Wambo Road	14/01/2021 21:50	IA	NA	No	No	NA	No	NA	Nil	NA
Bulga RFS	17/02/2021 22:47	<30	No	No	No	NA	No	NA	Nil	NA
Bulga Village	17/02/2021 22:08	30	No	No	No	NA	No	NA	Nil	NA
Gouldsville	17/02/2021 21:33	IA	No	No	No	NA	No	NA	Nil	NA
Inlet Rd	17/02/2021 21:21	29	No	No	No	NA	No	NA	Nil	NA
Inlet Rd West	17/02/2021 21:00	25	No	No	No	NA	No	NA	Nil	NA
Long Point	17/02/2021 21:07	IA	No	No	No	NA	No	NA	Nil	NA
South Bulga	17/02/2021 23:35	IA	No	No	No	NA	No	NA	Nil	NA
Wambo Road	17/02/2021 21:45	33	No	No	No	NA	No	NA	Nil	NA
Bulga RFS	16/03/2021 0:19	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	15/03/2021 23:34	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	15/03/2021 21:29	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	15/03/2021 21:42	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	15/03/2021 21:12	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	15/03/2021 21:05	IA	No	No	No	NA	No	NA	Nil	NA
South Bulga	16/03/2021 1:05	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	15/03/2021 22:11	IA	Yes	No	No	NA	No	NA	Nil	NA

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
Bulga RFS	21/04/2021 23:11	<30	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	21/04/2021 22:27	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	21/04/2021 21:25	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	21/04/2021 21:31	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	21/04/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	21/04/2021 21:03	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	21/04/2021 23:36	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	21/04/2021 22:02	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	18/05/2021 0:04	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	17/05/2021 23:18	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	17/05/2021 21:25	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	17/05/2021 21:29	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	17/05/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	17/05/2021 21:03	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	18/05/2021 0:26	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	17/05/2021 21:57	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	1/06/2021 23:10	<30	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	1/06/2021 22:25	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	1/06/2021 21:38	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	1/06/2021 21:36	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	1/06/2021 21:15	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	1/06/2021 21:13	IA	Yes	No	No	NA	No	NA	Nil	NA

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
South Bulga	1/06/2021 23:50	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	1/06/2021 22:02	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	23/07/2021 1:19	NM	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	23/07/2021 0:19	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	22/07/2021 21:22	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	22/07/2021 21:40	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	22/07/2021 21:10	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	22/07/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	23/07/2021 0:53	35	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	22/07/2021 22:08	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	11/08/2021 0:00	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	10/08/2021 23:16	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	10/08/2021 21:24	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	10/08/2021 21:23	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	10/08/2021 21:00	<20	Yes	No	No	NA	No	NA	Nil	NA
Long Point	10/08/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	11/08/2021 0:18	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	10/08/2021 21:48	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	7/09/2021 22:51	NM	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	7/09/2021 22:11	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	7/09/2021 21:27	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	7/09/2021 21:22	IA	Yes	No	No	NA	No	NA	Nil	NA

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
Inlet Rd West	7/09/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	7/09/2021 21:01	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	7/09/2021 23:38	32	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	7/09/2021 21:49	NM	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	21/10/2021 22:55	32	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	21/10/2021 21:48	<25	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	21/10/2021 21:22	IA	No	No	No	NA	No	NA	Nil	NA
Inlet Rd	21/10/2021 21:24	IA	No	No	No	NA	No	NA	Nil	NA
Inlet Rd West	21/10/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	21/10/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	21/10/2021 23:18	31	No	No	No	NA	No	NA	Nil	NA
Wambo Road	21/10/2021 22:10	IA	No	No	No	NA	No	NA	Nil	NA
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
Bulga RFS	20/12/2021 22:53	NM	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	20/12/2021 22:14	28	Yes	No	No	NA	No	NA	Nil	NA

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
Gouldsville	20/12/2021 21:28	IA	No	No	No	NA	No	NA	Nil	NA
Inlet Rd	20/12/2021 21:23	30	No	No	No	NA	No	NA	Nil	NA
Inlet Rd West	20/12/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	20/12/2021 21:05	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	20/12/2021 23:33	25	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	20/12/2021 21:50	IA	Yes	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.

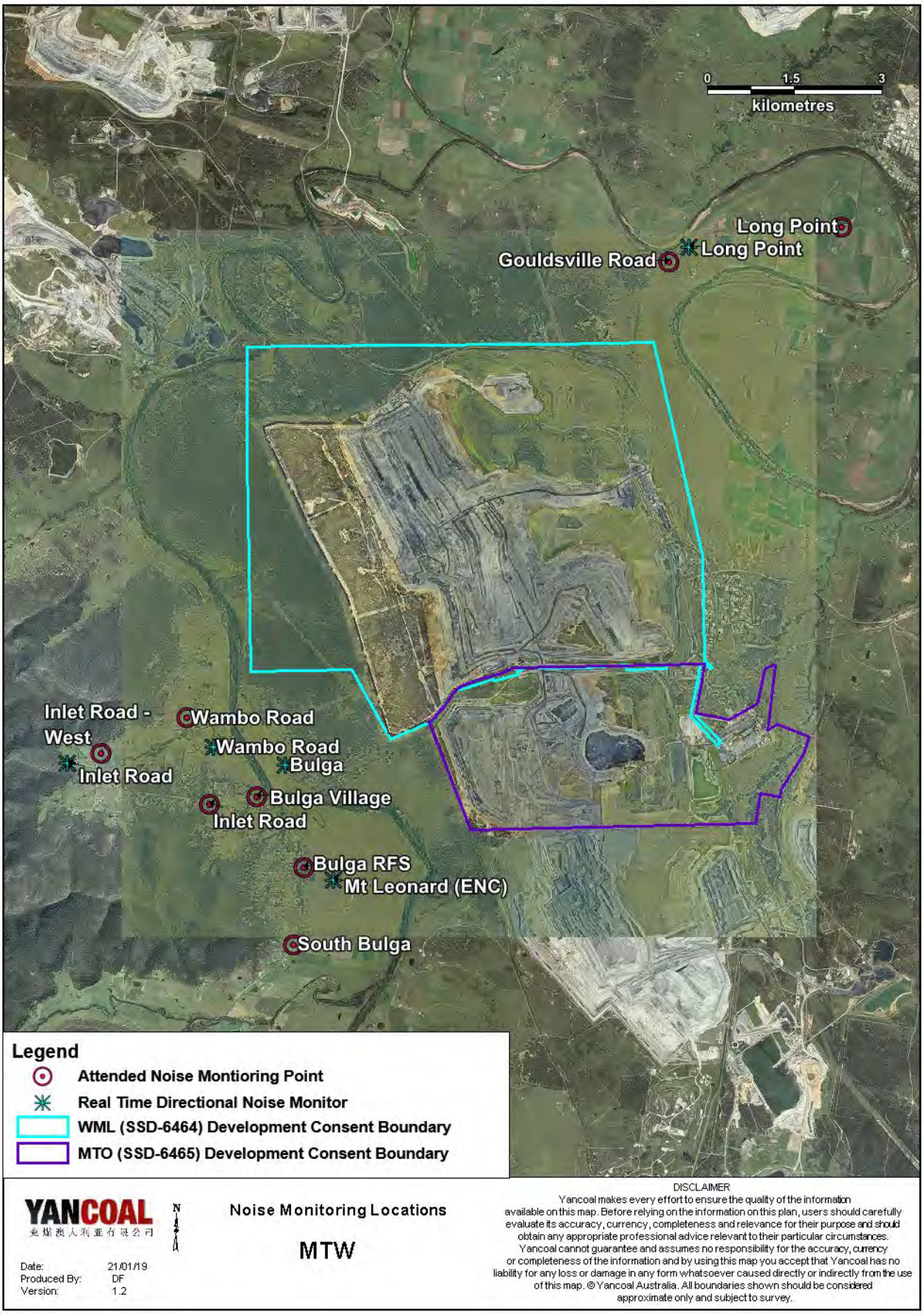


Figure 1: Noise Monitoring Location Plan

Appendix 2:

Aboriginal Heritage Management Plan Compliance Inspection Report

Mount Thorley Warkworth

Aboriginal Heritage Management Plan 2021 Compliance Audit Inspection

Report prepared for

Yancoal Australia, Mount Thorley Warkworth

November 2021

Joel Deacon

ARROW HERITAGE SOLUTIONS

Introduction

Yancoal Australia (Yancoal) manage the Mount Thorley Warkworth (MTW) mining complex located in the Hunter Valley, approximately 8km south-west of Singleton. Approval for the continuation & expansion of the mine was granted on 26th November 2015 under two separate project approvals: the Warkworth Continuation Project Approval (SSD-6464) & the Mount Thorley Operations Project Approval (SSD-6465).

Pursuant to Condition 43 of the Warkworth Continuation Project Approval, & Condition 28 of the Mount Thorley Operations Project Approval, Yancoal developed a MTW Aboriginal Heritage Management Plan (AHMP) to cover both mining operations, which was approved by the Department of Planning & Environment on 29th May 2017. This AHMP sets out the principles, processes & measures through which Aboriginal cultural heritage (ACH) will be managed within the AHMP Area. This includes a commitment (Provision 24) to conduct annual AHMP compliance inspections with members of the Aboriginal community, through the auspices of the MTW Aboriginal Cultural Heritage Working Group (CHWG), throughout the life of operations. The purpose of the compliance inspections is to afford the Aboriginal stakeholders & MTW:

- the opportunity to visit mine operations and mine areas to inspect the operational compliance with AHMP provisions & Ground Disturbance Permit procedures;
- to inspect and monitor the condition and management of various sites over time; and
- to review the effectiveness and performance of AHMP provisions in the management of cultural heritage at the mine.

These compliance inspections are conducted at least annually. Due to the number of ACH sites within the AHMP area & the time required to inspect all sites, it is not feasible to inspect every site during the same field trip. Therefore, a regular, rolling program of compliance inspections has been implemented that will visit all sites at each location periodically. A record will be kept of each compliance inspection so that it can be ensured that each site is inspected regularly.

Proposed Activity and Project Brief

The compliance inspections involved the following elements:

- Fifty-three (53) ACH site locations were visited and AHMP compliance inspection proformas were completed for each noting evidence of compliance and non-compliance with AHMP provisions, recommendations on modifications and improvements to management provisions, and recommendations on corrective actions; and
- A photographic record was completed for the inspected ACH sites.

Timing & Personnel

The 2021 MTW AHMP compliance inspection program was conducted on Tuesday and Wednesday 2/3 November 2021. The personnel involved in these inspections were:

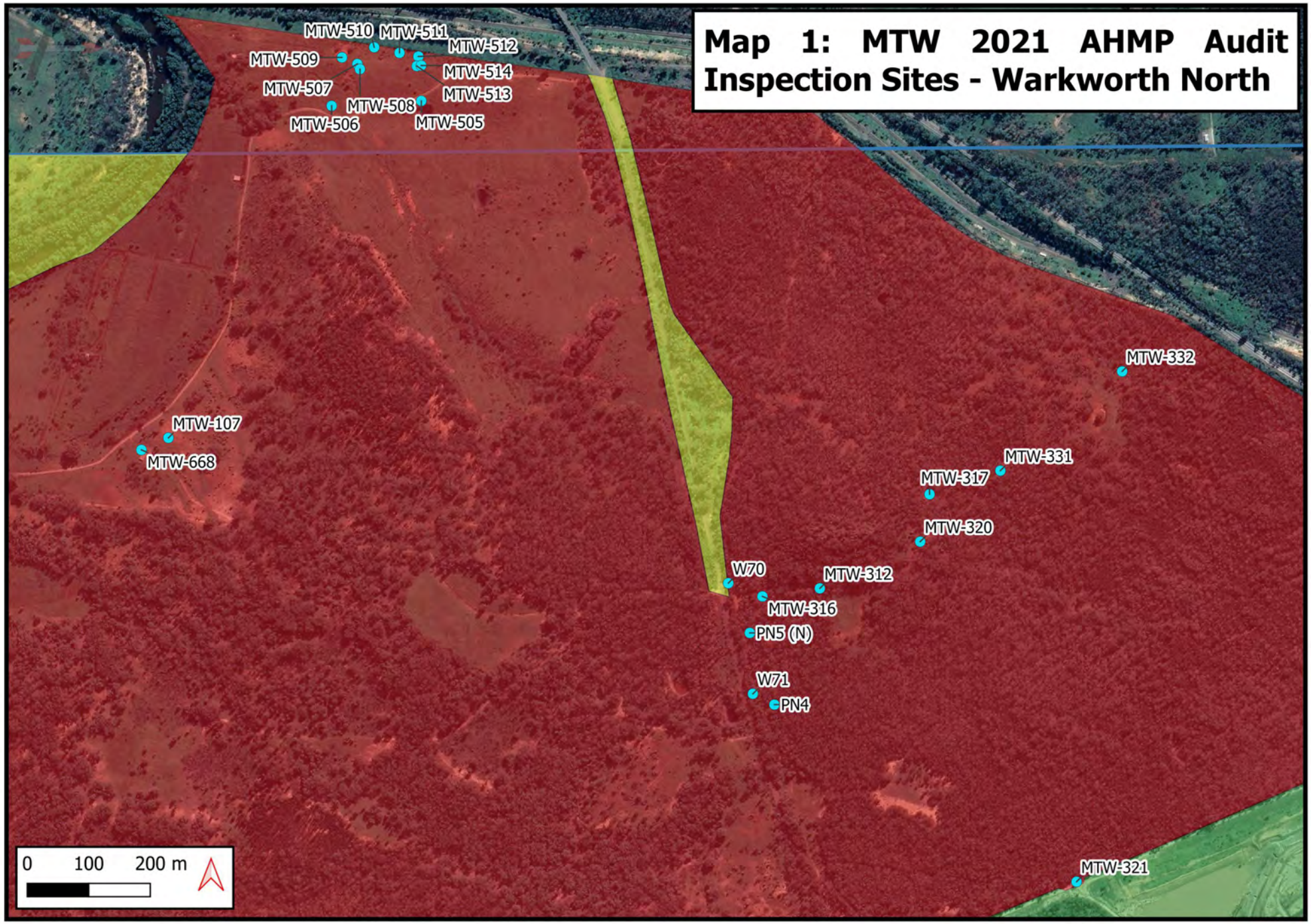
Name	Position/Organisation
Joel Deacon	Archaeologist, Arrow Heritage Solutions
Joshua van Bezouwen	Environment and Community Coordinator, MTW
Christine Paul	CHWG representative
Arthur Fletcher	CHWG representative

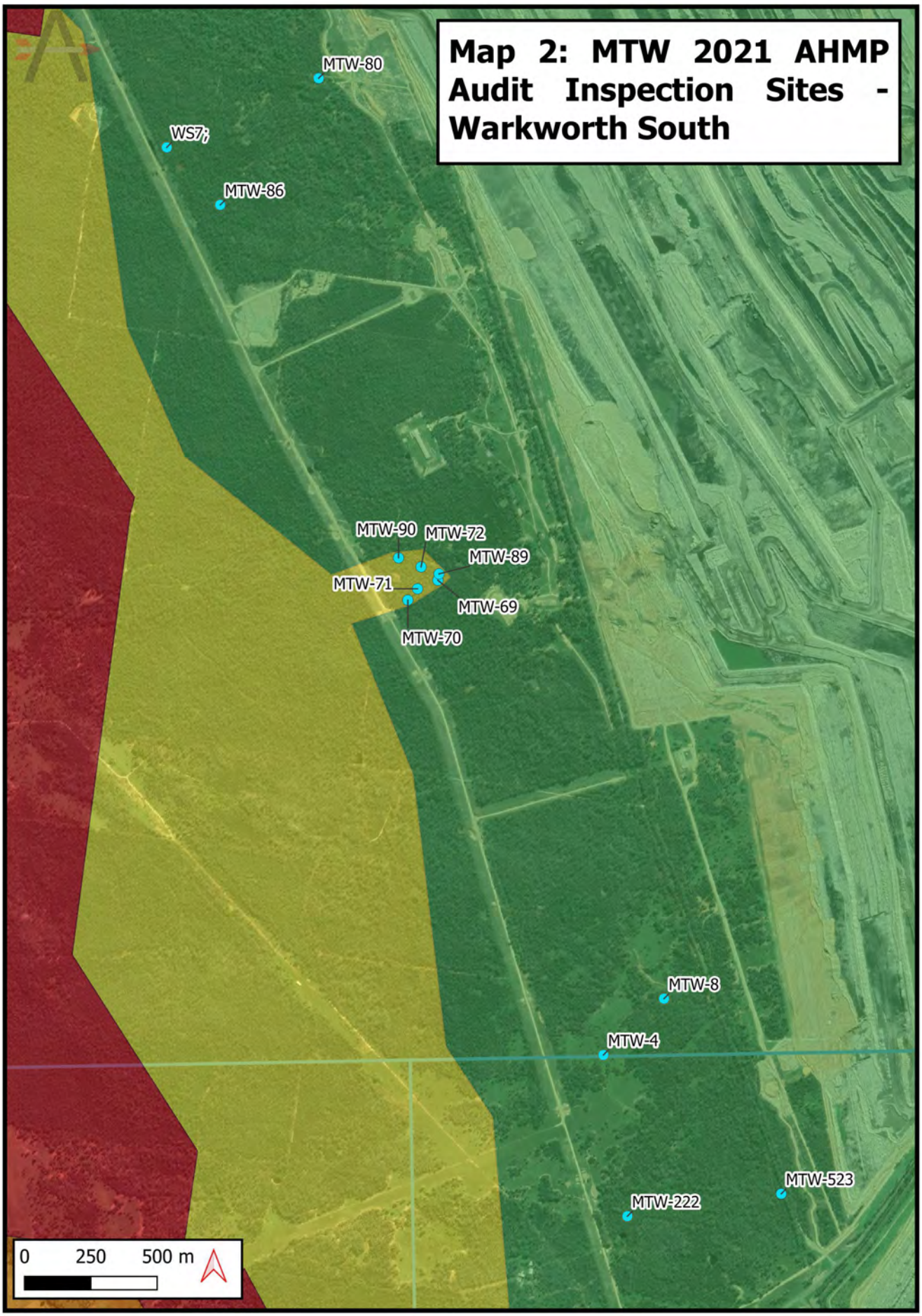
Arrow Heritage Solutions were engaged as independent heritage consultants to conduct the AHMP compliance inspections, and Joel Deacon acted as technical advisor and author of this report. MTW's Environment and Communities Co-ordinator Joshua van Bezouwen arranged the compliance inspection programs and escorted the field team. CHWG representatives from Aboriginal Native Title Consultants and Wonn1 participated in the field work program.

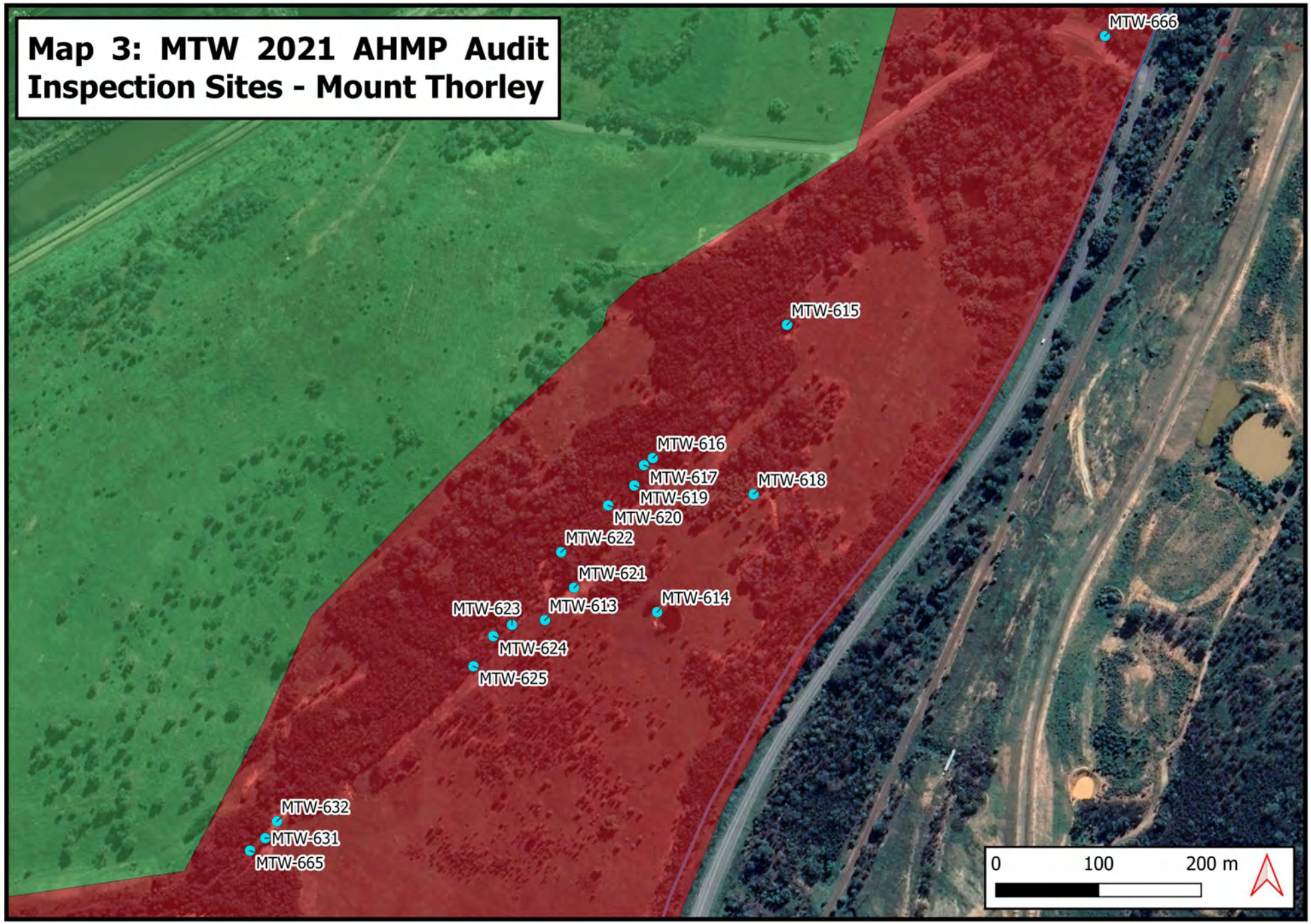
MTW AHMP Compliance Inspection

A total of 53 ACH sites were inspected across both the Warkworth and the Mount Thorley operations (see Maps 1, 2 and 3). The areas at Warkworth were selected for inspection as they were either located adjacent to current development areas or alongside regular tracks that are being frequently accessed. A sample of sites from within the Wollombi Brook ACH Conservation Area (WBACHCA) were also inspected to ensure they were being managed effectively and not subject to any natural disturbance, such as erosion. At Mount Thorley, ACH sites were inspected within the Loder Creek Aboriginal Cultural Heritage Conservation Area (LCACHCA) to ensure they were also being managed effectively.

In addition, a recent project area at Mt Thorley was also inspected to ensure that ACH site protection requirements were fully considered and completed in the course of ground disturbing works.


Map 1: MTW 2021 AHMP Audit Inspection Sites - Warkworth North
MTW-510
MTW-511
MTW-512
MTW-509
MTW-514
MTW-507
MTW-513
MTW-508
MTW-506
MTW-505
MTW-332
MTW-107
MTW-668
MTW-331
MTW-317
MTW-320
W70
MTW-312
MTW-316
PN5 (N)
W71
PN4
MTW-321
0
100
200 m


Map 2: MTW 2021 AHMP Audit Inspection Sites - Warkworth South
MTW-80
WS7;
MTW-86
MTW-90
MTW-72
MTW-89
MTW-71
MTW-69
MTW-70
MTW-8
MTW-4
MTW-523
MTW-222
0
250
500 m


Map 3: MTW 2021 AHMP Audit
Inspection Sites - Mount Thorley
MTW-666
MTW-615
MTW-616
MTW-617
MTW-618
MTW-619
MTW-620
MTW-622
MTW-621
MTW-623
MTW-613
MTW-614
MTW-624
MTW-625
MTW-632
MTW-631
MTW-665
0
100
200 m

Results

Table 1 shows the results of the 2021 MTW compliance inspection and summarises the information recorded on the individual proforma inspection sheets. Using a mobile mapper pre-loaded with the GIS co-ordinates for each ACH site, the field team travelled to each location and attempted to re-locate each site. Sometimes this was not possible due to poor ground surface visibility, a result which in itself was not overly significant as long as it was determined that the vicinity had not been disturbed. The presence and condition of barricading or fencing was noted, as well as the presence and nature of various potential site disturbing factors (e.g. erosion, animal, human). Pertinent observations of each site were made if necessary, and, based on information provided for all the above factors, management recommendations were discussed and agreed by the field team for each site.

Site Name	Date	Mine	Site re-identified?	Site intact?	Site fenced/ barricaded?	Fencing/ barricading intact?	Natural erosion	Livestock damage	Human disturbance	Animal disturbance	Pests & weeds	General observations	Management recommendations
MTW-107	2/11/21	WML	No	Yes	Yes	No	Some	No	Old track	No	No	Track edges formerly barricaded	Rebarricade sites to keep people on track
MTW-222	2/11/21	MTO	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-312	2/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No	Track has been re-routed to avoid site	
MTW-316	2/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-317	2/11/21	WML	No	Yes	No	-	No	No	No	No	Prickly pear		
MTW-320	2/11/21	WML	No	Yes	Yes	No	No	No	No	No	No	Is on old track	Close track and barricade at this point
MTW-321	2/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No	In good condition	
MTW-331	2/11/21	WML	No	Yes	No	-	No	No	No	No	No		-
MTW-332	2/11/21	WML	No	Yes	Yes	No	No	No	No	No	No	Track edges formerly barricaded	Rebarricade sites to keep people on track
MTW-4	2/11/21	WML	No	Yes	Yes	Yes	No	No	No	No	No	Track has been diverted to avoid site	
MTW-505	3/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-506	3/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No	Artefacts noted outside of fence	Rebarricade along track edge
MTW-507	3/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No	Artefacts noted outside of fence	Extend barricading to tree planting area
MTW-508	3/11/21	WML	Yes	Yes	No	-	No	No	No	No	No		
MTW-509	3/11/21	WML	Yes	Yes	Yes	Yes	Yes	No	No	No	No		Extend barricading along track
MTW-510	3/11/21	WML	No	Yes	Yes	Yes	No	No	No	No	No	Artefacts noted outside of fence	Rebarricade along track edge
MTW-511	3/11/21	WML	No	Yes	No	-	No	No	No	No	No		Barricade nearby track edge
MTW-512	3/11/21	WML	Yes	Yes	No	-	No	No	No	No	No		
MTW-513	3/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-514	3/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-523	3/11/21	MTO	Yes	Yes	Yes	Yes	No	No	No	No	No		Tree to be salvaged as per current ToR
MTW-613	3/11/21	MTO	No	Yes	Yes	Yes	No	No	No	No	No		
MTW-614	3/11/21	MTO	Yes	Yes	No	-	No	No	Dam construction	No	No		
MTW-615	3/11/21	MTO	Yes	Yes	No	-	No	No	No	No	No	More extensive than first recorded	
MTW-616	3/11/21	MTO	No	Yes	No	-	No	No	No	No	No		
MTW-617	3/11/21	MTO	Yes	Yes	No	-	No	No	No	No	No		
MTW-618	2/11/21	MTO	No	Yes	Yes	Yes	Severe near track	No	Old track	No	No		Investigate erosion control measures
MTW-619	3/11/21	MTO	Yes	Yes	No	-	No	No	No	No	No		

Site Name	Date	Mine	Site re-identified?	Site intact?	Site fenced/ barricaded?	Fencing/ barricading intact?	Natural erosion	Livestock damage	Human disturbance	Animal disturbance	Pests & weeds	General observations	Management recommendations
MTW-620	3/11/21	MTO	Yes	Yes	No	-	No	No	No	No	No		
MTW-621	3/11/21	MTO	Yes	Yes	Yes	Yes	No	No	Old track	No	No		
MTW-622	3/11/21	MTO	Yes	Yes	No	-	No	No	No	No	No		
MTW-623	3/11/21	MTO	Yes	Yes	No	-	No	No	No	No	No		
MTW-624	3/11/21	MTO	Yes	Yes	No	-	No	No	No	No	No		
MTW-625	3/11/21	MTO	Yes	Yes	No	-	No	No	No	No	No		
MTW-631	3/11/21	MTO	Yes	Yes	No	-	severe	No	No	No	No		Investigate erosion control measures
MTW-632	3/11/21	MTO	Yes	Yes	No	-	severe	No	No	No	No		Investigate erosion control measures
MTW-665	3/11/21	MTO	Yes	Yes	No	-	severe	No	No	No	No		Investigate erosion control measures
MTW-6*6	3/11/21	MTO	Yes	Yes	No	-	No	No	On fence-line	No	No	Located just behind MTO CHPP road fence	
MTW-668	3/11/21	MTO	No	Yes	Yes	Yes	No	No	Under collapsed shed	No	No		Rebarricade when shed is removed – monitor removal
MTW-69	2/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-70	2/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	termites	Tree has been burnt and has termites	
MTW-71	2/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-72	2/11/21	WML	No	Yes	Yes	Yes	No	No	No	No	No		
MTW-8	2/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No		Tree to be salvaged as per current ToR
MTW-80	2/11/21	WML	Yes	Yes	Yes	Yes	No	No	No	No	No		Tree to be salvaged as per current ToR
MTW-86	2/11/21	WML	No	Yes	Yes	Yes	No	No	No	No	No		
MTW-89	3/11/21	WML	Yes	Yes	Yes	Yes	Some wash	No	No	No	No		
MTW-90	2/11/21	WML	No	Yes	Yes	Yes	No	No	Old track	No	No		
PN4	2/11/21	WML	No	Yes	Yes	No	No	No	No	No	No		Rebarricade
PN5 (N)	2/11/21	WML	No	Yes	Yes	No	No	No	No	No	No		Rebarricade site to keep people on track
W70	2/11/21	WML	Yes	No	Yes	No	Yes	No	On track	No	No	Artefacts washing onto track	Rebarricade site to keep people on track
W71	2/11/21	WML	No	Yes	Yes	No	Yes	No	No	No	No		Rebarricade site to keep people on track
WS7	2/11/21	WML	No	Yes	Yes	Yes	No	No	No	No	No		

Table 1: Results of 2021 MTW AHMP Compliance Inspection

Aboriginal Site Management Recommendations

All ACH site locations visited during the AHMP compliance inspection were found to be intact with no recent damage or unauthorised disturbance noted, however, natural erosion processes were noted at some sites. Not all ACH sites were able to be re-identified, but this was due to thick vegetation cover obscuring the ground surface rather than due to inadvertent destruction. Management recommendations were provided for the majority of the ACH sites visited during the 2021 compliance inspection. These recommendations are described below.

Install or reinstall/repair barricade, wire and/or signage

Sites: MTW-107, 320, 332, 506, 507, 509, 510, 511, PN4, PN5 (N), W70 and W71

Example of dilapidated barricading (at MTW-320)

Most of the barricading at these ACH sites, although visible to some extent, was generally in a state of disrepair. The barricading for these sites is recommended around the site itself or along the edges of tracks in order to keep vehicles on these tracks where the actual extent of the site is large or unclear. In some cases, barricading is recommended to be extended due to additional artefacts being found outside of existing barricading. The specific recommendations for each site is noted in Table 1 above. Barricading should consist of hi-vis string line and signage delineating the area as an ACH site to be avoided.

Monitor shed removal and re-barricade

Sites: MTW-668

This site consists of a broken jar of artefacts that were discovered in a dilapidated farm shed that has since collapsed. The artefacts were likely collected by a former land-owner and deposited in the jar many years ago. Nearby structures have been removed, however, this particular shed was not touched because of the presence of the artefacts.

In order to complete the clean up of this area, it is recommended that the shed be removed, by hand where possible (especially in the vicinity of the artefacts), and the process monitored by a representative of the CHWG. Once the shed is removed and the artefacts reidentified, barricading can be erected around the site, which is located within the WBACHCA and cannot, therefore, be salvaged under the terms of the current management plans.

Star pickets indicate location of artefacts at MTW-668 underneath collapsed shed

Investigate erosion control measures

Sites: MTW-618, 631, 632, 665

These four ACH sites are located within the LCACHCA and are currently being affected by erosion. MTW-618 is located adjacent to a vehicle crossing on the banks of an eroding gully, the effects of which have been exacerbated by traffic. As this crossing is now to steep for continued use, the closing of this track should allow vegetation to regenerate and stabilise the bank. The remaining three sites are located on the bank of Loder Creek, where deeply incised erosion channelling is occurring, which is having the effect of washing artefacts away or covering them with sediment.

Severe erosion at MTW-632

As more sites further upstream have been identified during past audits as suffering the same erosion effects, rather than a site by site approach, it is suggested that a holistic environmental remediation plan be developed and implemented for the LCACHCA, with input from the CHWG and their assistance sought in its implementation. As no disturbance approval is currently in place for ACH sites within the LCACHCA, approval should be sought from Heritage NSW to allow the temporary removal of artefacts from remediation areas and their replacement once revegetation has been established and erosion has ceased.

Remove and relocate scarred trees

Sites: MTW-8; 80; 523

These three scarred trees are located within the approved future mining area at MTW and have been assessed by an arborist regarding the best method of removal and relocation. These scarred trees have also been visited by RAPs during this compliance inspection and during other inspections and assessments. A removal and relocation plan has been developed by MTW and the salvage of these trees is planned for 2022, with representatives of the CHWG to be involved.

Scarred tree MTW-8

Scarred tree MTW-523

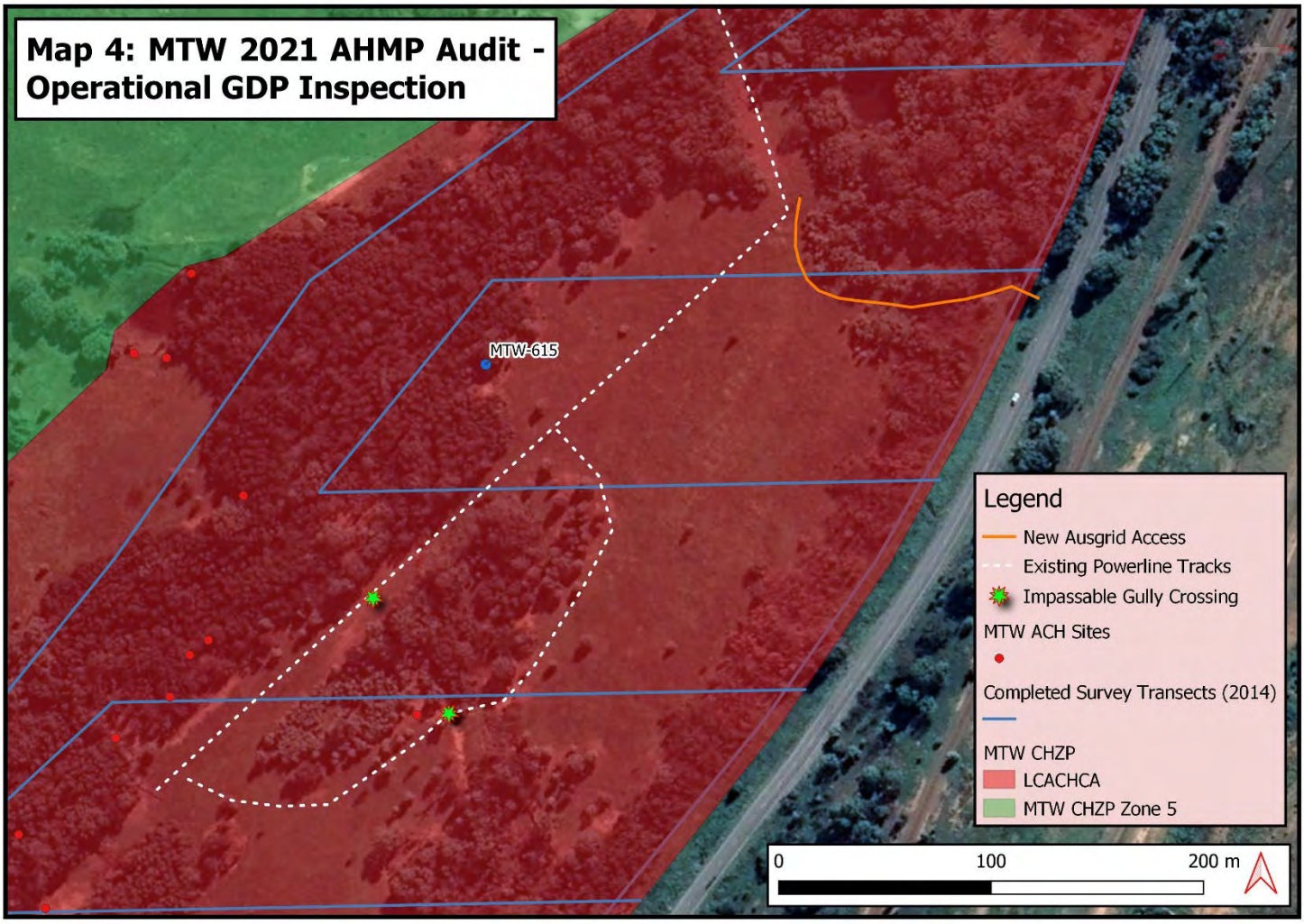
Scarred tree MTW-80

Ground Disturbance Audit Check

Aside from affording CHWG representatives with an opportunity to visit mining operations and monitor the condition of ACH sites, another intention of the compliance inspections is to provide the opportunity to inspect the operational compliance with AHMP provisions and GDP procedures. To this end, an inspection was made of a new route required by Ausgrid to access an existing powerline, that had been processed through the GDP procedure.

This access route measured c.150m in length and was designed to minimise vegetation disturbance and avoid impacts on any ACH sites. It runs west from Broke Rd to link up with an existing powerline track (see map below). This new access is required by Ausgrid as the former access to this part of the powerline has been closed due to erosion in a drainage gully, with remediation earthworks to the former access likely to cause impacts to previously recorded ACH sites.

The entire area has been subject to previous ACH assessments, most recently in September 2014 when comprehensive pedestrian transects were conducted by archaeologists and representatives of the CHWG. The nearest recorded ACH site (MTW-615 – an isolated mudstone flake) is located 150m to the south-west of the new access route.



Results of Audit Inspection

The field team inspected the new access route and confirmed the results of the 2014 ACH assessment. No ACH objects or sites were located on the new access route. The nearest ACH site – MTW-615 – was inspected and successfully relocated. In terms of the overall management of ACH in this area, it was agreed that the installation of this new track, which does not disturb any ACH sites, would be preferable to the potential remediation of the existing powerline track and the subsequent disturbance of previously recorded cultural material.

Conclusions and Recommendations

The 2021 AHMP compliance inspection has been conducted as per the procedures outlined in the AHMP. No unauthorised site disturbances or AHMP non-compliances were observed during the inspection, and no issues were raised by the CHWG representatives present. A number of recommendations have been made to enhance or assist with the management of ACH at MTW:

1. **Install or reinstall/repair barricading at, or in the vicinity of, ACH sites MTW-107, 320, 332, 506, 507, 509, 510, 511, PN4, PN5 (N), W70 and W71;**
2. **Representative/s of the CHWG to monitor the removal of the shed, if required, on top of ACH site MTW-668 and rebarricade;**
3. **Explore erosion remediation measures within the LCACHCA, especially in the vicinity of ACH sites MTW-618, 631, 632, 665; and**
4. **With the participation of representatives of the CHWG, an archaeologist and an arborist team, remove and relocate scarred trees MTW-8, 80 and 523, considering the Wollombi Brook ACH Conservation Area as a relocation destination.**

Appendix 3:

Historic Heritage Management Plan Compliance Inspection Report

Mount Thorley Warkworth Historic Heritage Management Plan 2021 Compliance Audit Inspection

Report prepared for

Yancoal Australia, Mount Thorley Warkworth

March 2022

Joel Deacon

ARROW HERITAGE SOLUTIONS

Introduction

Yancoal Australia (Yancoal) manage the Mount Thorley Warkworth (MTW) mining complex located in the Hunter Valley, approximately 8km south-west of Singleton. Approval for the continuation & expansion of the mine was granted on 26 November 2015 under two separate project approvals: the Warkworth Continuation Project Approval (SSD-6464) & the Mount Thorley Operations Project Approval (SSD-6465).

Pursuant to Condition 46 of the Warkworth Continuation Project Approval, Yancoal have developed an MTW Historic Heritage Management Plan (HHMP) that covers the whole MTW mining complex. The MTW HHMP was approved by the Department of Planning & Environment on 11 October 2017 and sets out the principles, processes & measures through which historic heritage will be managed within the HHMP Area. This includes the commitment (Provision 19) to conduct annual HHMP compliance inspections with members of the community through the auspices of the Community Heritage Advisory Group (CHAG). The purpose of the HHMP compliance inspections is to:

a. inspect areas and sites to assess compliance with the provisions of the HHMP;
b. inspect and monitor the condition and management of various sites; and
c. review the effectiveness and performance of the HHMP provisions in the management of historic heritage at MTW.

Proposed Activity and Project Brief

The following historic sites within the MTW HHMP area (shown on the map below) are to be inspected to assess compliance with actions listed in the HHMP and specific Conservation Management Plans (CMP). A detailed photographic record for each site was also collated to add to the previous photographic data:

- Former RAAF Base Bulga Mess Hall
- Springwood Homestead
- Mount Thorley Brick Farm House


Historic Heritage Sites Inspected
2021 MTW HHMP Compliance Audit
Springwood Homestead
Mount Thorley Red Brick House
Former RAAF Base Bulga Mess Hall
1 0 1 2 3 4 km
Legend
HHMP Audit Sites
Warkworth Continuation DC Boundary
MTW Mining Leases

Timing & Personnel

The 2021 MTW HHMP compliance inspection was conducted on Thursday 18 November 2021. The personnel involved in this inspection were:

Name	Position/Organisation
Joel Deacon	Archaeologist, Arrow Heritage Solutions
Drew Williams	Environment and Community Coordinator, MTW
Lyn MacBain	CHAG representative

Arrow Heritage Solutions were engaged as independent heritage consultants to conduct the HHMP compliance inspection, and Joel Deacon acted as technical advisor and author of this report. MTW's Environment and Community Coordinator arranged the compliance inspection program and escorted the field team. Lyn MacBain participated in the inspection as a representative of the CHAG forum.

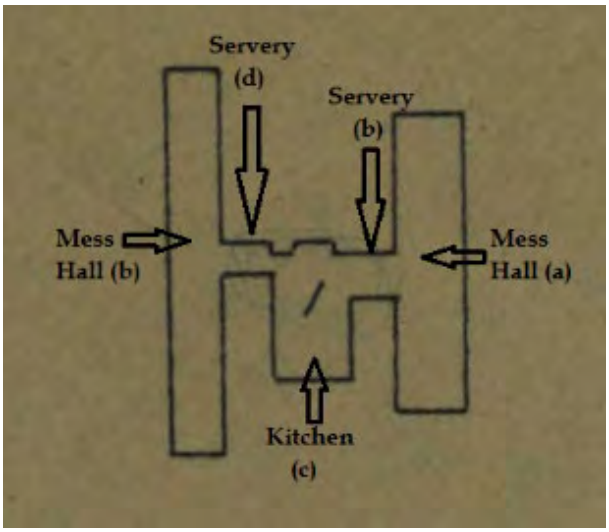
Former RAAF Base Bulga Mess Hall

Following the Japanese attack on Pearl Harbour in December 1941, plans were approved to expand existing RAAF bases and establish new ones, including a number of sites in the Hunter Valley. Bulga was identified as a potential site for an operational base and the area was officially taken over by the RAAF on 12 June 1942 for use as a relief landing strip. By July 1943 the site was completed, including the kitchen and mess hall, however, by January 1944 the use of the site was limited due to the decreasing threat of attack. A 1946 condition report noted this building as deteriorating. In January 1953, the building was noted as missing a few sheets of iron and windows.

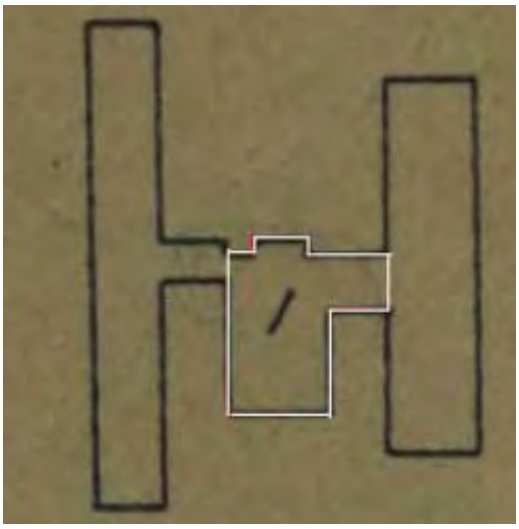
The building sits in the former camp area west of the north-south runway. It was originally irregular in plan comprising a central kitchen area measuring 13.4 x 8.8m, with long rectangular mess halls to the east and west, connected by a servery on either side. The remnant structure today comprises the kitchen building and the foundation of one of the serveries (see below).

The remnant building is "L" shaped in plan with brick and concrete footings. During the original assessment conducted by ERM in November 2012 (which informed the CMP) the building was noted as being in poor condition with trees physically impacting on the building fabric, and some minor settlement issues resulting in cracking and failing brickwork. The western section

of the building was the most intact part, retaining the original timber frame, corrugated asbestos cement roof sheeting and walls clad with corrugated iron sheeting.



Original layout of building



Remaining structure

The building is currently structurally unsound, with a number of timber elements either missing or in a deteriorated state. Corrugated asbestos roof sheeting is also missing in some places, and damaged and in poor condition where it remains. Much of the corrugated iron sheeting is corroded. Brickwork is also cracking in a number of locations resulting in significant movement outward, loss of mortar and loss of bricks along the southern and eastern elevations.

View to mess from south-east (2012)

Remnant kitchen area (2012)

As a result, a number of structural recommendations were outlined by ERM in the CMP developed for the site in 2012. These recommendations were not intended to return the building to a serviceable state, rather they sought to do the minimum required to allow safe access to the building to prevent significant damage, and also allow safe access for asbestos removal and internal inspection of the building in the short to medium term.

CMP Requirements

Short to medium term structural recommendations included:

a) **Remove fallen tree branch.** The tree branch impacting on the roof of the building should be removed, using an external mobile elevated platform or boom lift;
b) **Temporary propping.** The building should be temporarily propped and supported as per Bligh Tanner plans SK 1.0 A and SK 2.0 A (contained within the CMP) to allow for safe access into the building and more detailed inspection of the structure.
c) **Asbestos Removal.** Asbestos removal should be completed by a licensed asbestos removal specialist, include the roof sheeting, all asbestos dust and fibres, and loose fragments that are known to exist in the remaining area.
d) **Stabilise framework and replace roof.** Any structural roof members that are destabilized once the roof sheeting is removed are to be secured as required. Side walls which lose stiffness once the roof sheeting has been removed are to be propped temporarily until the new roof has been replaced.
e) **Archaeological clean-up.** Asbestos removal and clean-up should be supervised by a historical archaeologist to ensure any identified items of significance are retained.
f) **Further building inspection.** A structural engineer should complete a building inspection to identify structural repairs and stability requirements with four weeks of the building being cleaned up and decontaminated from asbestos.

Following the internal inspection of the building noted in (f) above, further advice may be provided regarding further recommendations, which, due to the lack of integrity of the building, are unlikely to be directed at restoration, but more towards retaining the remnant structure in a safe environment and reducing further deterioration. Repair drawings have been provided in the CMP to remedy any major cracking in the brickwork or where sections of brickwork have either partially collapsed or broken away from the wall.

Photographic Comparison 2012; 2018; 2020 (Mar); 2020 (Dec); 2021

During the inspection of the Former RAAF Base Bulga Mess Hall for this report, a number of photographs were taken from the same angles and of the same features as were taken during the ERM 2012 assessment and archival recording as well as during the 2018, March 2020 and December 2020 HHMP compliance inspections. These photographs provide a visual baseline condition assessment of the building, and also allow a comparative analysis of the deterioration, or maintenance, levels over the last six to nine years. These photographs are set out below, along with comments pertinent to management recommendations.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**East elevation** **2012-18:** no discernible change – note fallen branch from tree on western side. **2018-20 (Mar):** no discernible change – fallen branch has moved. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020 – 2021:** no discernible change.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**South-east elevation** **2012-18:** evidence of increased bow to southern wall. **2018-20 (Mar):** bow in wall appears to have increased. **Mar 2020 – Dec 2020:** bow in wall continues to increase. **Dec 2020 – 2021:** gap in bowing has increased.
	

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**South elevation** **2012-18:** evidence of increased bow to southern wall and missing panel above entry. **2018-20 (Mar):** increased bow to southern wall. **Mar 2020 – Dec 2020:** increased bowing on southern wall. **Dec 2020-2021:** gap in bowing has increased.
	

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>West elevation</u>** **2012-18:** shows deterioration of roofing members above open kitchen area and leaning north wall, and further collapse of asbestos roof due to fallen dead tree. **2018-20 (Mar):** top of north wall now collapsed, further damage to roof with branch now fallen to ground. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020-2021:** northern wall on near side of chimney has detached from exposed western beam.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**North elevation** **2012-18:** no discernible change. **2018-20 (Mar):** top of north wall now collapsed. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020-2021:** no discernible change.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**Concrete and brick foundation at east side of building** **2012-18:** difficult to discern change. **2018-20 (Mar):** no discernible change. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020-2021:** difficult to discern change.
	

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**Grease trap at south end of building** **2012-18:** shows bow to south wall. **2018-20 (Mar):** shows increased bow to south wall. **Mar 2020 – Dec 2020:** shows increasing bowing of south wall, and example of new termite monitoring system in bottom right of picture. **Dec 2020-2021:** shows increasing bowing of south wall.
	

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**Storage area at south end of building** **2012-18:** further slight collapse of storage area. **2018-20 (Mar):** shows loosening of corrugated iron wall sheeting due to bowing in wall. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020-2021:** no discernible change.
	

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>Windows and entry at west elevation</u>** **2012-18:** shows large trunk/branch portions of tree collapsed on roof, which has destroyed roof ventilator. **2018-20 (Mar):** shows majority of branches fallen from roof, leaving increased damage to sheeting. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020-2021:** no discernible change.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**Timber window detail, west elevation** **2012-18:** no discernible change. **2018-20 (Mar):** no discernible change. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020-2021:** no discernible change.
	

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>Showing cylindrical ventilator and damage to roof, view from west</u>** **2012-18:** shows significant roof damage from fallen dead tree, including to ventilator. **2018-20 (Mar):** shows increased damage to roof edge sheeting from fallen branch. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020-2021:** deterioration of left window frame.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**Detail of north-west elevation** **2012-18:** shows increased collapse over open kitchen area, as well as new damage to brick foundation at north-west corner. **2018-20 (Mar):** shows fallen top of north wall plus increased (animal?) damage to brick foundation at north-western corner. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020 – 2021**: detachment of north wall from western beam

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>Showing interior damage at kitchen at north end of building</u>** **2012-18:** shows increased collapse over and accumulation of debris within open kitchen area. Note also severe lean to north wall. Stove doors have become unhinged. **2018-20 (Mar):** shows collapsed top of north wall and collapse of remaining full cross-beam. Stove now obscured by collapsed north wall. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020 – 2021:** no discernible change.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>View to interior of south end of building, view from east</u>** **2012-18:** shows increased collapse over open kitchen area. **2018-20 (Mar):** shows further minor deterioration of asbestos panelling. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020 – 2021:** no discernible change.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**Showing west interior space** **2012-18:** no discernible change. **2018-20 (Mar):** no discernible change. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020 – 2021**: no discernible change.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>Damaged brick foundation at south-east corner (south view)</u>** **2012-18:** no discernible increase to cracked brick foundation. **2018-20 (Mar):** further cracking of foundation (to left of shot) and some slumping of corner bricks. **Mar 2020 – Dec 2020:** some slight potential further movement in cracked section (also note termite management system in bottom right hand corner of photograph. **Dec 2020 – 2021**: no discernible change.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**Detail of damaged brick foundation (east view)**
	**2012-18:** some further collapse of concrete/cement above brick foundation. **2018-20 (Mar):** some slumping outwards of corner brick foundation. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020 – 2021**: movement and setting of internal concrete piece.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>View to interior of building, looking north from south entry</u>** **2012-18:** no discernible change. **2018-20 (Mar):** no discernible interior change, but shows collapsed north wall. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020 – 2021**: no discernible change.

2012	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**Showing interior of building, viewed from north-west corner** **2012-18:** shows collapsed roofing members above open kitchen area and accumulation of debris. **2018-20 (Mar):** shows additional collapsed roofing member. **Mar 2020 – Dec 2020:** no discernible change. **Dec 2020 – 2021**: no discernible change.
	

The comparative photographs above show the changes at the building over the past nine years. Although no substantial changes were noted between the current and the last inspection, no structural maintenance has occurred either. During this time it can be expected that the underlying causes of deterioration, such as the degeneration of wooden framework and metal panelling, and animal burrowing underneath the structure has continued. Therefore, the more significant changes and priority actions identified during the last inspection remain of importance and, if anything, their need of remediation has increased in urgency. Previous recommendations remain valid and the key issues remain:

- Damaged roof sheeting and roofing members, as well as increasing structural instability of bowing southern wall;
- Due to the complete collapse of remaining roofing members over the open kitchen area the top portion of the northern wall has now failed and fallen inside the building footprint. This northern wall has now detached from remnant roofing and west wall members;
- Deterioration of window panelling; and
- Increased damage to brick foundation in north-west corner, and new slumping of south-east foundation corner.

A termite management regime was implemented around the site prior to the 2020 annual inspection. The inspection points remain intact and these should continue to be monitored and any evidence of termite activity treated as soon as possible.

Recommendations

High Priority Actions

1. If not already conducted, have an asbestos expert assess and develop a clean up and disposal plan to deal with both the broken fragments and intact asbestos sheeting;
2. Remove any remaining tree branches from the roof. In addition, to prevent similar damage in the future, serious consideration should be given to removing or lopping those trees that are located close enough to the building that they may cause damage if they fall or drop large branches;

High Priority Actions to Follow Actions 1 & 2

3. Pending the results of the asbestos assessment, the building and surrounds should be thoroughly cleaned of asbestos and other rubbish material. An archaeologist should be present to collect any items of historic importance or that relate to the original fabric of the building. This should also include the removal, repair and curation of items such

as window frames and panels before their total deterioration. All such items can can be stored inside the building and potentially re-used during further stabilization programs;

4. Pending the results of the asbestos assessment, any parts of the building framework, such as roofing members of walls should be stabilized and propped, using the CMP Bligh Tanner plans as a guide;
5. A structural engineer should then inspect the building before any further works are commenced to make further recommendations on stability requirements and structural repairs. These further works should aim to reduce the likelihood and extent of any further deterioration at the site rather than seek to rebuild or renovate as it is unlikely that there would be any valid or appropriate option to re-use the site; and

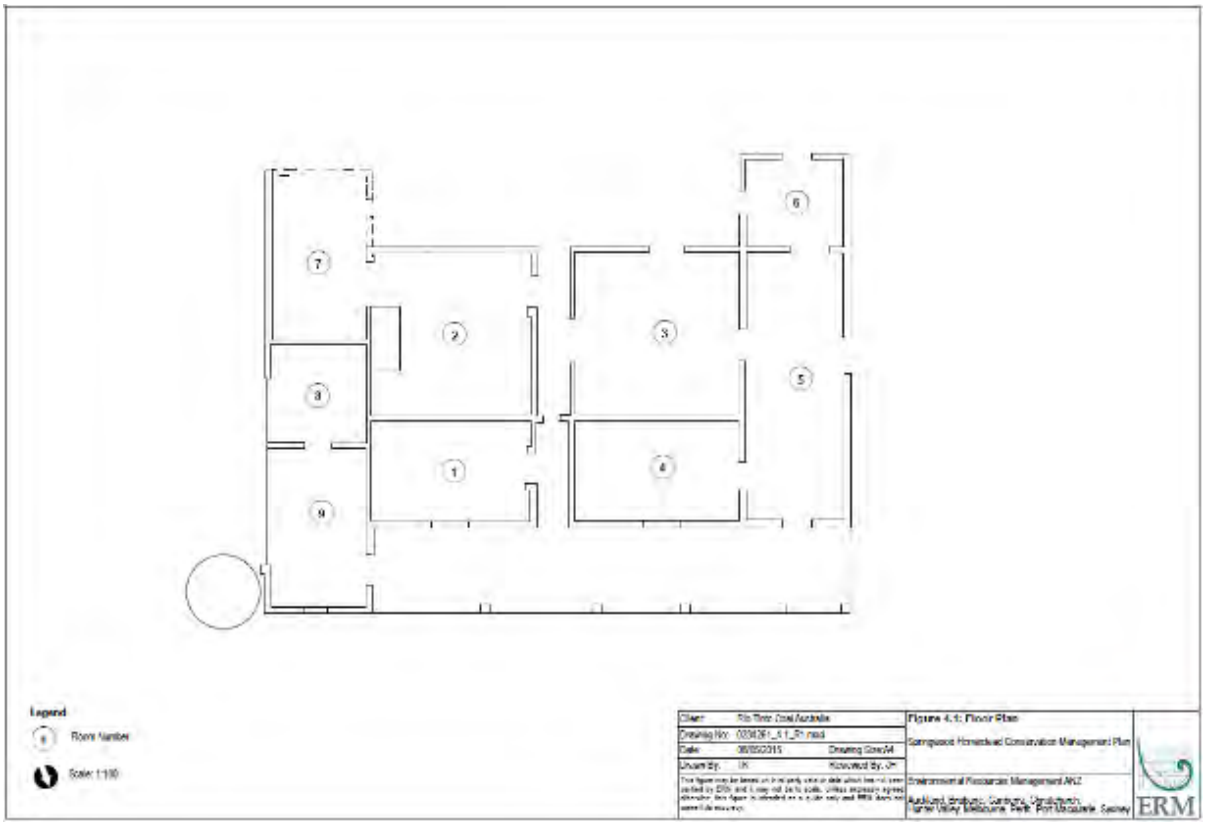
Ongoing

6. Continue with the recently implemented termite monitoring regime.

Springwood Homestead

Based on historical research, Springwood Homestead is likely to have been constructed c.1860 and displays many characteristics of late Old Colonial Georgian and Victorian Georgian architecture, including an original shingle broken-backed roof, fanlights or transom lights, panelled doors and under-roof verandahs. The homestead is low-set, constructed in vertical timber slabs and built around a four room square core, as shown in the plan below (taken from ERM's 2015 CMP).

Given that Springwood Homestead is timber framed and in direct contact with the ground, it is remarkable that it is still standing and in a generally stable condition, with most roof rafters appearing to be still in place. Although the building fabric is generally intact there are a number of areas where the level of structural damage to the roof, wall and flooring members is high. The majority of the damage has occurred from termites and fungal decay, resulting in localised collapse of outer external walls and roof structures. Recently, vandalism has also been an issue, with many vertical timber slabs having been pilfered. Within the CMP developed for the site by ERM in 2015, a number of stabilisation measures have been recommended that will assist to reduce the extent of damage, however a return to a habitable state is not planned.



Springwood Homestead plan

Springwood Homestead in 2012

CMP Recommendations

Although many recommendations are made within the CMP, the more important management measures have been incorporated within a conservation works schedule that covers the following issues:

- Drainage and weatherproofing;
- Vegetation;
- Termites and vermin;
- Building fabric; and
- Structural capacity and wind loads.

The works schedule prioritises the required conservation works and are presented with technical specifications from a structural engineer. Those measures that attend to the buildings structural integrity are the focus of the schedule.

High Priority

a) Remove debris from roof using a cherry picker or similar;
b) Remove tree from eastern elevation and stabilize building in this location;
c) Remove vine from eastern wall using combination of pruning and herbicide;
d) Remove tree from south-west corner and stabilize building in this location;
e) Prune all overhanging branches and maintain regular maintenance program; and
f) Reinstate southern verandah and roof to match northern elevation.

Moderate to Low Priority

g) Place treated plywood sheeting over door openings;
h) Prune trees, spray weeds and slash grass;
i) Clean up of site surrounds, overseen by archaeologist;
j) Clean up of building interior, overseen by archaeologist;
k) Refix loose ceiling boards, retaining evidence of fabric if unable to fix;
l) Refix loose and dislodged slabs and plates; and
m) Place treated plywood sheeting over openings and undertake repairs to windows.

Photographic Comparison 2012; 2018; 2020 (Mar); 2020 (Dec); 2021

During the inspection of Springwood Homestead for this report, a number of photographs were taken from the same angles and of the same features as were taken during the 2018 and March 2020 HHMP compliance inspections, and the ERM 2014 assessment that informed the 2015 CMP. These photographs provide a visual baseline condition assessment of the building, and also allow a comparative analysis of the changes over the last six to eight years. These photographs are set out below, along with comments pertinent to management recommendations.

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**Eastern elevation** **2014-8:** no discernible change. **2018-20 (Mar):** roof slumping appears to have increased. **Mar 2020-Dec 2020:** heavy leaf litter on roof persists. Positively, vegetation clearing surrounding the house is occurring regularly. **Dec 2020 – 2021:** tree growth and associated leaf litter/structural impacts increasing.
	

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**Southern elevation** **2014-8:** vertical timber slabs have been removed from southern wall. **2018-20 (Mar):** possible deterioration of shingles at roof edge, and missing panels from above back door. **Mar 2020-Dec 2020:** no discernible change. **Dec 2020 – 2021:** no discernible change.
	

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**Southern elevation doorway** **2014-8:** door has been removed. **2018-20 (Mar):** no discernible change. **Mar 2020-Dec 2020:** no discernible change. **Dec 2020 – 2021:** no discernible change.
	

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**South-eastern corner** **2014-8:** vertical slabs have been removed causing further collapse of roof. **2018-20 (Mar):** further deterioration of eastern wall. **Mar 2020-Dec 2020:** heavy leaf litter on roof persists. **Dec 2020 – 2021:** heavy leaf litter on roof persists.
	

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**Eastern side** **2014-8:** debris has been cleaned and stored and a weed removal program conducted. The house area has also been fenced. **2018-20 (Mar):** further deterioration of eastern wall and regrowth of weeds. **Mar 2020-Dec 2020:** no discernible change. **Dec 2020 – 2021:** no discernible change.
	

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**Room 2 interior** **2014-8:** increased debris caused by removal of southern wall. **2018-20 (Mar):** no discernible change. **Mar 2020-Dec 2020:** no discernible change. **Dec 2020 – 2021:** no discernible change.

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**South-west corner** **2014-8:** shows removal of vertical slabs from southern wall. **2018-20 (Mar):** no discernible change. **Mar 2020-Dec 2020:** no discernible change. **Dec 2020 – 2021:** furniture in far room collapsed.
	

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**Northern elevation** **2014-8:** further deterioration of weatherboard panelling. **2018-20 (Mar):** no discernible change, though termite activity present. **Mar 2020-Dec 2020:** grass/weed growth encroaching over verandah floor. **Dec 2020 – 2021:** increased grass encroachment.

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>South-east corner</u>** **2014-8:** shows removal of vertical slabs from southern wall, and some from eastern wall, and further collapse of roof. **2018-20 (Mar):** further roof slumping and deterioration of eastern wall. **Mar 2020-Dec 2020:** no discernible change. **Dec 2020 – 2021:** further deterioration of eastern wall.

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**Eastern elevation** **2014-8:** possible further collapse of crossbeam and guttering. **2018-20 (Mar):** tree continues to impact eastern roof line. **Mar 2020-Dec 2020:** increased impact on roofline by tree branches. **Dec 2020 – 2021:** tree continues to impact eastern side.
	

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**Northern elevation** **2014-8:** slumping of verandah along edge beam. **2018-20 (Mar):** no discernible change. **Mar 2020-Dec 2020:** grass/weed growth encroaching over verandah floor. **Dec 2020 – 2021:** no discernible change.

2014	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**View of south-west corner from south** **2014-8:** shows removal of vertical slabs from southern wall as well as some increase in vegetation growth. **2018-20 (Mar):** no discernible change but continuing vegetation impacts. **Mar 2020-Dec 2020:** Apparent increased vine growth. **Dec 2020 – 2021:** continued impacts on south-west corner.
	

The comparative photographs above show the changes at the building over the past eight years. Although no great change was noted between the current and the last inspection, no structural maintenance has occurred either. During this time it can be expected that the underlying causes of deterioration, such as the degeneration of wooden framework, impacts caused by adjacent trees and the effects of weather entering the unsealed building has continued. Therefore, the more significant changes and priority actions identified during the last inspection remain of importance and, if anything, their need of remediation has increased in urgency. Previous recommendations remain valid and the key issues remain:

- The removal of all of the vertical timber slabs from the southern wall continue to have a negative impact on the structural integrity of this side of the building, allowing weather and the associated adverse impacts into the building; and
- The continued growth of trees and vines are also having impacts on structural stability in the south-western corner and along the eastern roof line;

It should be noted, however, that a termite management regime has been implemented around the site, which is a positive action and will assist in the arrest of the deterioration of the wooden aspects of the building. Also, a vegetation management regime is in place that sees regular maintenance within the fenced compound.

Recommendations

Management recommendations have been prioritised as high or moderate importance, and high priority recommendations should be actioned as soon as possible, after which the conservation works schedule within the CMP can be re-evaluated and amended by a structural engineer prior to further works being commenced.

High Priority

1. Remove the trees and vines currently impacting the building at the eastern elevation and south-west corner and treat to prevent regrowth. Coincident with this removal, acrow props should be installed where appropriate, i.e. where the trees themselves have been supporting the building structure, and as per the structural engineer's instructions at Annex B of the CMP;
2. Once vegetation has been removed, clean all debris from the roof and prune (or consider the removal of) all other trees in close vicinity of the building with potential to drop leaf/branch litter on roof;

3. Clear the surroundings of the building of rubbish, overgrowth and weeds in the accompaniment of an archaeologist to ensure any items of historical relevance are salvaged and stored within the homestead; and
4. Due to the damage caused by the removal of the vertical slabs, once the items above are complete, a structural engineer should then re-inspect the building before any further works are commenced to make further recommendations on stability requirements and structural repairs.

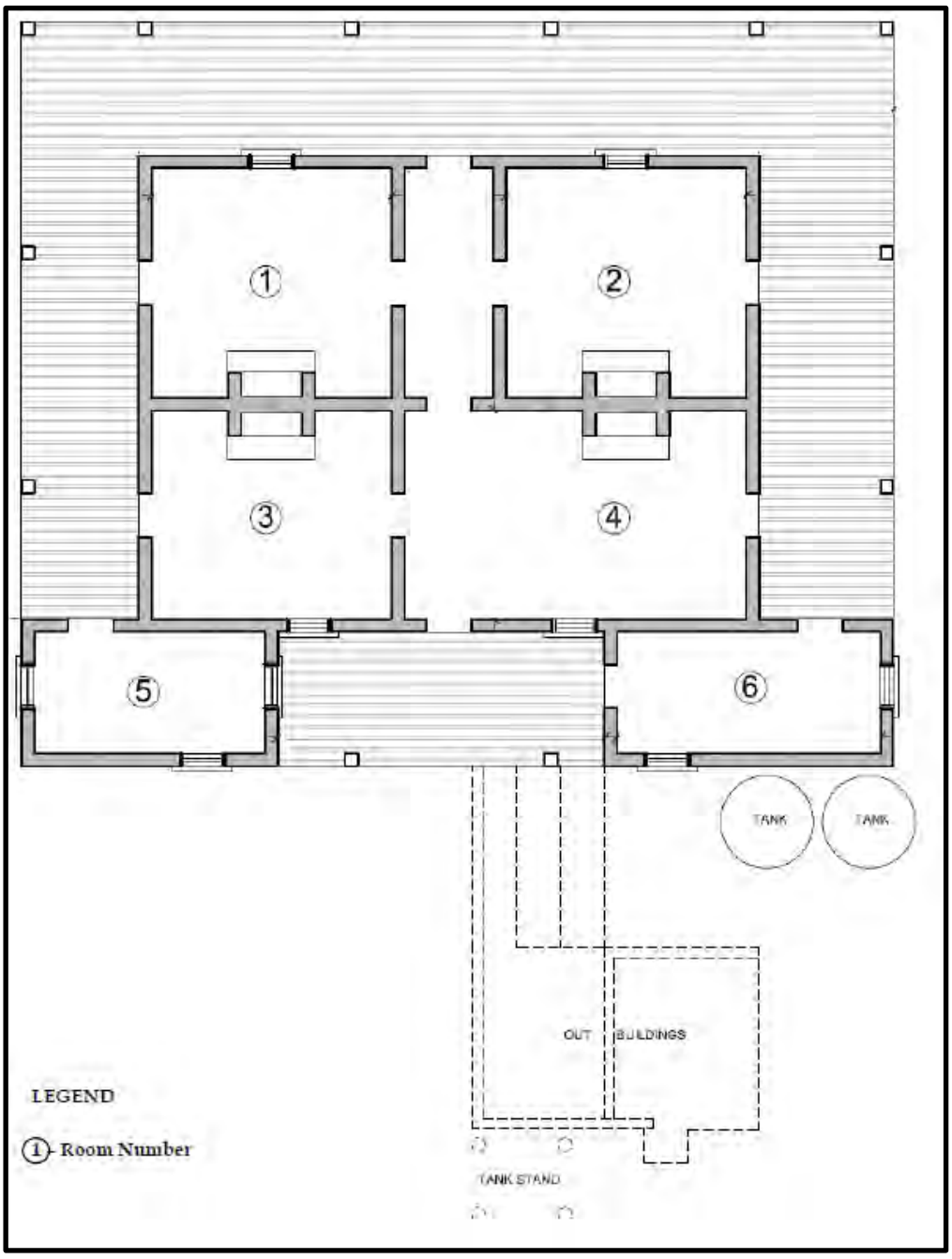
Moderate Priority

Once the high priority recommendations have been attended to, the structural engineer may recommend different or additional measures than originally put forward. Notwithstanding these, the following moderate priority measures are recommended to attain compliance with the CMP and enhance the condition of the homestead:

1. Due to their propensity to harbour termites and transfer infestation to the building, remove all peppercorn trees from around the building;
2. Future condition inspections should photograph the building using the photograph views and locations presented above so that any changes to the building can be documented in subsequent inspections;
3. Maintain the regular vegetation maintenance program;
4. Pending structural engineer's advice, reinstate southern wall, verandah and roof to match northern elevation.
5. Pending reconstruction of southern wall, place treated plywood sheeting over door and window openings;
6. Clean up of building interior, overseen by archaeologist;
7. Pending structural engineer's advice, refix loose ceiling boards and loose and dislodged wall slabs and plates, retaining evidence of fabric if unable to fix;
8. Ensure the minor recommendations and 'policies' listed throughout Section 7 of the CMP are considered in the future management of the homestead;
9. Give consideration to an archaeological excavation and research program at the site, with possible community involvement, to explore the areas of archaeological potential identified in the CMP; and
10. Maintain the termite and pest control regime at the building.

Mount Thorley Brick Farm House

The Mount Thorley Brick Farm House is located off the Golden Highway opposite the MTW coal handling and preparation plant, c.10km south-west of Singleton. The portion of land on which the house sits was purchased by Eliza Glass in 1870 and the physical attributes of the house, which display characteristics of Victorian Georgian architecture, suggest that it was constructed during the following decade. The building is roughly square in plan, with four principal rooms flanking a central hallway.



Floor plan of Mount Thorley Brick Farm House, north up (from ERM 2015 CMP)

The masonry structure of the building is sound, however, it was noted as being in poor physical condition in 2015 (when a CMP was developed for the site by ERM), with a collapsed verandah roof, missing or loose roof sheeting, missing or collapsed verandah posts, and floorboards and areas affected by termites. The conservation works schedule within the CMP considered the following issues at Mount Thorley Brick Farm House:

- Drainage and weather-proofing;
- Asbestos;
- Vegetation;
- Termites and vermin;
- Building fabric; and
- Structural capacity and wind loads.

Recommendations were made within the CMP's conservation works schedule to address the elements above, a number of which have completed by the proponent. These works included:

- Removal and safe storage of verandah;
- Initial vegetation clearing;
- Sheeting and sealing of all window and door openings;
- Clean up of scattered debris surrounding building; and
- Repair of loose roof sheeting and patching of holes.

Monitoring and maintenance of these repaired items is an ongoing requirement to ensure they provide continual protection to the building.

Mount Thorley Brick Farm House (2012)

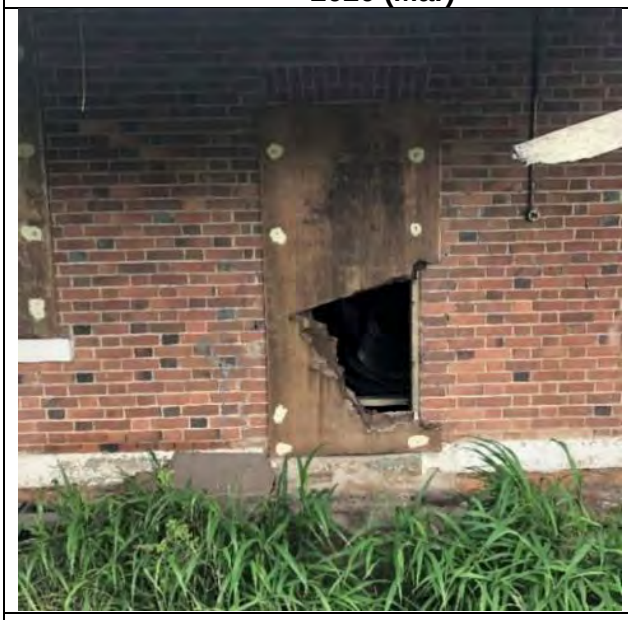
Photographic Comparison 2012; 2018; 2020 (Mar); 2020 (Dec); 2021

During the inspection of the Mount Thorley Brick Farm House for this report, a number of photographs were taken from the same angles and of the same features as were taken during previous HHMP compliance inspections as well as the ERM 2015 assessment that informed the CMP. These photographs provide a visual baseline condition assessment of the building, and also allow a comparative analysis of the changes over the last seven years. These photographs are set out below, along with comments pertinent to management recommendations.

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**View of north-west side** **2015-8:** verandah removed and stored inside building, vegetation has been managed **2018-20 (Mar):** vegetation has regrown around building **Mar 2020-Dec 2020:** vegetation again under control, panel above boarded door requires refixing. **Dec 2020 – 2021:** vegetation requires management and loose boards re-affixing.
	

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**<u>View of north-west roof corner (focus on damaged roof)</u>** **2015-8:** roofing sheets have been replaced and holes patched **2018-20 (Mar):** some minor roof holes and lifted sheeting noted **Mar 2020-Dec 2020:** some verandah flashing fallen, panel above door requires refixing. **Dec 2020 – 2021:** panel above door requires re-affixing and guttering remains in disrepair.
	

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**View of door and window panelling** **2015-8:** sheeting installed on all openings, however some repair required **2018-20 (Mar):** no discernible change **Mar 2020-Dec 2020:** Front door panel requires reinstallation. **Dec 2020 – 2021:** front door panel remains broken.
	

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**View of door and window panelling** **2015-8:** sheeting installed on all openings, however some repair required **2018-20 (Mar):** some repair of panelling required **Mar 2020-Dec 2020:** Broken panel remains unrepaired **Dec 2020 – 2021:** broken panel remains unrepaired.
	

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>View of rear of building (view south)</u>** **2015-8:** debris has been cleared and stacked **2018-20 (Mar):** vegetation has regrown around building and stacked debris **Mar 2020-Dec 2020:** vegetation cleared and debris restacked **Dec 2020 – 2021:** vegetation management required.

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**View of rear of building (view north)** **2015-8:** debris has been cleared and stacked **2018-20 (Mar):** vegetation has regrown around building and stacked debris **Mar 2020-Dec 2020:** vegetation cleared and debris restacked **Dec 2020 – 2021:** vegetation regrown.
	

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>View of eastern verandah (focus on verandah floor)</u>** **2015-8:** posts and sheeting removed, damaged boards remain exposed **2018-20 (Mar):** damaged boards remain and vegetation growth throughout **Mar 2020-Dec 2020:** damaged boards remain and vegetation growth throughout **Dec 2020 – 2021:** verandah floor remains dilapidated and grass growth throughout.

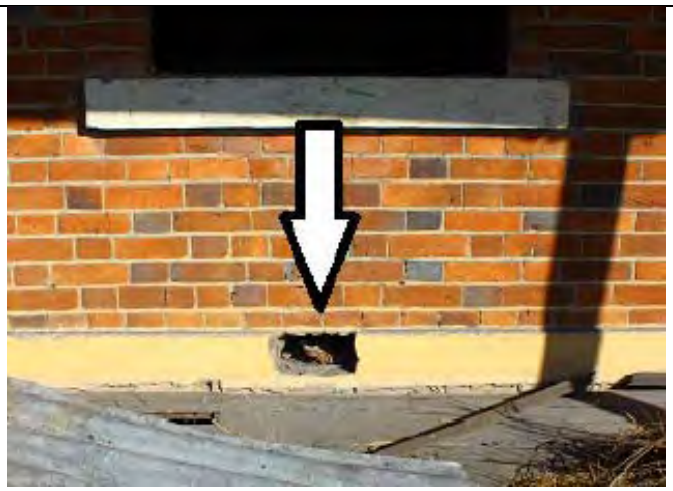
2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**View of rear of building (focus on roof)** **2015-8:** skillion roof, guttering and rafters have collapsed; main roof holes repaired **2018-20 (Mar):** no discernible change **Mar 2020-Dec 2020:** some minor holes in roofing require repair **Dec 2020 – 2021:** minor roofing holes remain.
	

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**View of north-east of building** **2015-8:** wall element has collapsed (bricks stacked under window); roof framing, sheeting and guttering has collapsed **2018-20 (Mar):** no discernible change **Mar 2020-Dec 2020:** no discernible change **Dec 2020 – 2021:** rafter collapse from above window.
	

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**View of north-east corner of building (focus wall below window)** **2015-8:** bricks from roof above stacked in front of required repointing, window sheeting removed **2018-20 (Mar):** no discernible change **Mar 2020-Dec 2020:** repointing requirements remain **Dec 2020 – 2021:** repointing requirements remain.
	

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>View of south-east of building (focus on top of wall)</u>** **2015-8:** no discernible change **2018-20 (Mar):** no discernible change **Mar 2020-Dec 2020:** no discernible change **Dec 2020 – 2021:** repointing requirements remain.

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**View of eastern verandah (focus on dwarf wall wall)**
	**2015-8:** debris cleared from verandah, no change to dwarf wall **2018-20 (Mar):** no discernible change **Mar 2020-Dec 2020:** cracking to wall evident **Dec 2020 – 2021:** remains in disrepair.

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	**View of ventilation grilles** **2015-8:** grilles not replaced **2018-20 (Mar):** no discernible change **Mar 2020-Dec 2020:** grilles remain open **Dec 2020 – 2021:** grilles remain open.
	

2015	2018
	
2020 (Mar)	**2020 (Dec)**
	
2021	
	**<u>View of southern chimney</u>** **2015-8:** no discernible change **2018-20 (Mar):** no discernible change **Mar 2020-Dec 2020:** no discernible change **Dec 2020 – 2021:** repointing requirements remain.

The comparative photographs above show the changes at the building over the past seven years. As with the other two buildings, although no great change was noted between the current and the last inspection, no structural maintenance has occurred either. During this time it can be expected that the underlying causes of deterioration, such as the degeneration of wooden framework and the effects of weather entering through unsealed sections has continued. Therefore, the more significant changes and priority actions identified during the last inspection remain of importance and, if anything, their need of remediation has increased in urgency. Previous recommendations remain valid and the key issues remain:

- Considerable damage and exposure to the rear of the building;
- Loose, damaged and removed window and door sheeting;
- Some new roof holes and loose sheeting; and
- Reinstatement of vegetation management regime.

It should be noted, however, that a termite management regime has been implemented around the site, which is a positive action and will assist in the arrest of the deterioration of the wooden aspects of the building.

Recommendations

While many of the high and moderate priority recommended actions within the CMP conservation works schedule have been completed in the past, the 2020 inspection has identified that some items need renewed attention. The recommendations outlined below are required to minimise the risk of further deterioration in the building structure.

High Priority

1. Replace any damaged plywood door/window coverings and ensure all coverings are tightly attached;
2. Patch fix any new damage to roofing sheets;
3. If any asbestos or fibrous cement sheeting remains at the property, engage an asbestos removalist to remove as required;
4. Reinstate the vegetation management program;

Moderate Priority

5. Check that all debris surrounding the house has been removed. If this has not occurred, remove all debris, ensuring an archaeologist is on hand to identify and catalogue any early architectural fittings or rare pieces of joinery that should be retained for future restoration purposes;

6. Reinstall verandah, including verandah decking and northern brick dwarf wall, re-using original material where possible, as per recommendations M5, M6 and L1 in the CMP conservation works schedule;
7. As the roof above Room 6 has collapsed, salvage any reusable masonry or timber and set aside within room. Engage a structural engineer to advise on feasibility of reconstructing the roof. (NB. Recommendation M9 in the CMP conservation works schedule erroneously refers to Room 5 rather than Room 6 as shown in the photograph);
8. Replace gutters around the house to match existing materials and ogee profile. Install new down-pipes and ensure they are discharging away from the building.
9. Repoint mortar joints with lime based mortar on brickwork below Room 6 eastern elevation window sill, on northern wall of room 5 and all chimneys;
10. Install new ventilation grilles to existing ground level openings; and
11. Maintain the termite and pest control regime at the building.

Conclusion

Up to ten years has now elapsed since the preparation of the CMPs for the three historic heritage buildings reviewed during this inspection. Although some important conservation measures have been implemented over the last decade, other recommended management actions remain incomplete, with the urgency surrounding their attention only increasing year on year. The following actions are considered imperative to prevent irreparable damage to the buildings and, once complete, will provide a solid foundation from which to tackle the remaining issues.

Former RAAF Base Bulga Mess Hall

1. If not already conducted, have an asbestos expert assess and develop a clean up and disposal plan to deal with both the broken fragments and intact asbestos sheeting;
2. Remove any remaining tree branches from the roof and consider removing or lopping those trees that are located close enough to the building that they may cause damage if they fall or drop large branches;

Springwood Homestead

3. Remove the trees and vines currently impacting the building at the eastern elevation and south-west corner and treat to prevent regrowth. Coincident with this removal, acrow props should be installed where appropriate, i.e. where the trees themselves have been supporting the building structure, and as per the structural engineer's instructions at Annex B of the CMP;
4. Once vegetation has been removed, clean all debris from the roof and prune (or consider the removal of) all other trees in close vicinity of the building with potential to drop leaf/branch litter on roof;
5. Due to the damage caused by the removal of the vertical slabs, once the items above are complete, a structural engineer should then re-inspect the building before any further works are commenced to make further recommendations on stability requirements and structural repairs.

Mount Thorley Brick Farm House

6. Replace any damaged plywood door/window coverings and ensure all coverings are tightly attached;
7. Patch fix any new damage to roofing sheets;
8. If any asbestos or fibrous cement sheeting remains at the property, engage an asbestos removalist to remove as required.