MALABAR

MAXWELL UNDERGROUND MINE PROJECT

MINING OPTIMISATION MODIFICATION

MODIFICATION REPORT

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1 INTRODUCTION

This document is a Modification Report for a proposed modification to the Maxwell Underground Mine Project (the Project), an approved underground coal mining operation owned by Maxwell Ventures (Management) Pty Ltd, a wholly owned subsidiary of Malabar Resources Limited (formerly Malabar Coal Limited) (Malabar).

This Modification is sought under section 4.55(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 BACKGROUND

The Project is in the Upper Hunter Valley of New South Wales (NSW), east-southeast of Denman and south-southwest of Muswellbrook (Figure 1).

Development Consent State Significant Development (SSD) 9526 for the Project was granted by the Independent Planning Commission (IPC) on 22 December 2020. The Project was subsequently approved under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in March 2021 (EPBC 2018/8287).

Malabar previously sought to modify Development Consent SSD 9526 under section 4.55(1A) of the EP&A Act for a minor extension to the mine entry area (MEA) (Modification 1) (Malabar, 2021a). Modification 1 was subsequently approved on 19 November 2021 and EPBC 2018/8287 was varied on 14 December 2021.

The Project is an underground mining operation that is approved to operate for 26 years (until 2047).

The Project involves extraction of run-of-mine (ROM) coal from four seams within the Wittingham Coal Measures, using the following underground mining methods:

- underground bord and pillar mining with partial pillar extraction in the Whynot Seam; and
- underground longwall extraction in the Woodlands Hill Seam, Arrowfield Seam and Bowfield Seam.

At least 75 percent (%) of coal produced by the Project would be capable of being used in the making of steel (coking coals). The balance would be export thermal coals suitable for the new-generation High Efficiency, Low Emissions power generators.

The substantial existing Maxwell Infrastructure is approved for handling, processing and transportation of coal for the life of the Project. The Maxwell Infrastructure includes existing coal handling and preparation plant (CHPP), train load-out facilities and other infrastructure and services (including water management infrastructure, administration buildings, workshops and services).

The Project area comprises the following:

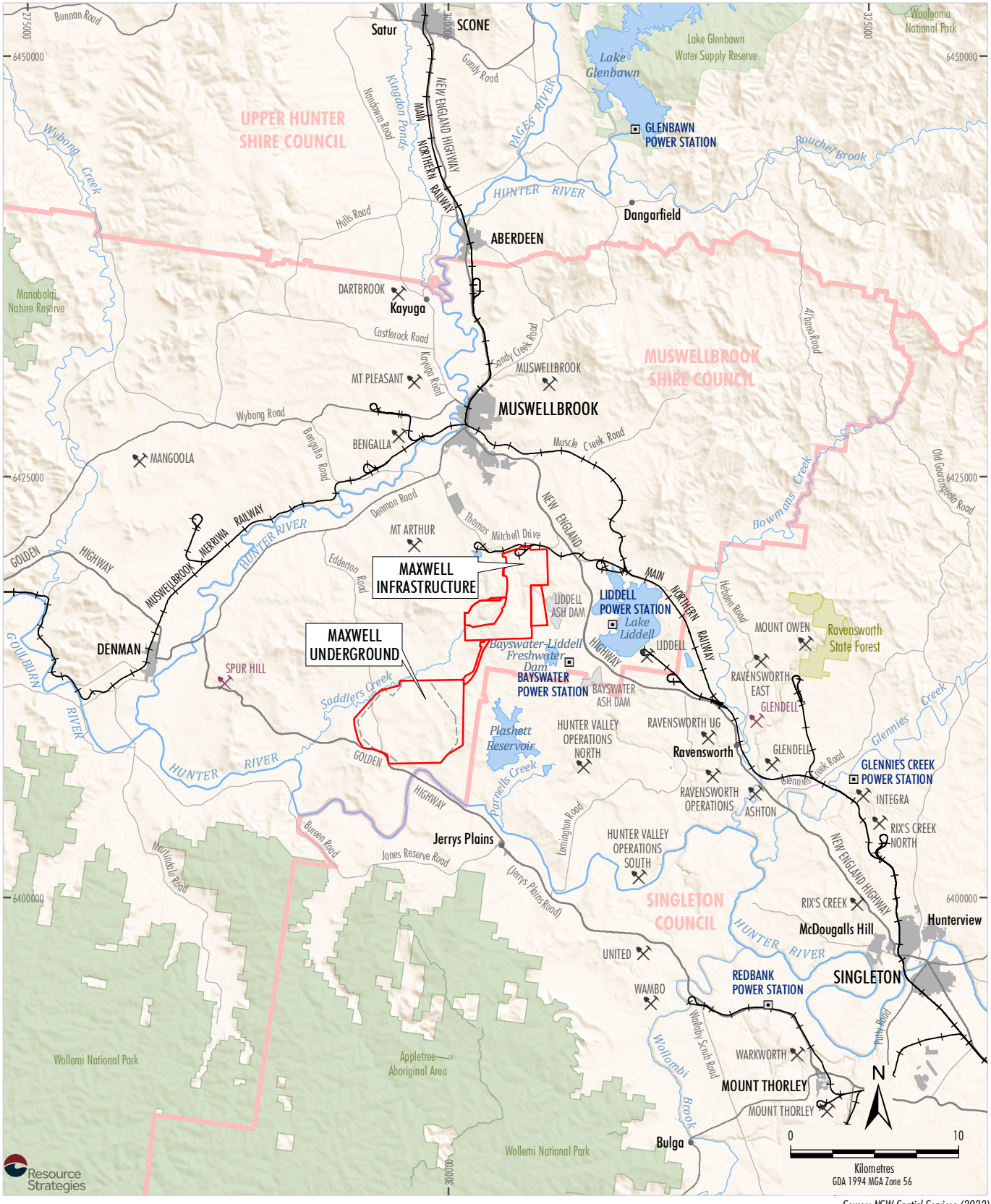
- Maxwell Underground – comprising the approved area of underground mining operations and the MEA within Mining Lease (ML) 1822.
- Maxwell Infrastructure – the area within Coal Lease (CL) 229, ML 1531 and CL 395 comprising the substantial existing infrastructure (including the CHPP) and previous mining areas.
- The transport and services corridor between the Maxwell Underground and Maxwell Infrastructure – the area within CL 229, ML 1820 and ML 1822 comprising the planned site access road, covered overland conveyor, power supply and other ancillary infrastructure and services.
- The realignment of Edderton Road, a local road, prior to undertaking secondary extraction in the Arrowfield Seam.

An indicative general arrangement showing the key components of the approved Project is provided in Figure 2.

The approved underground mining layout is shown on Figure 3.

The approved MEA is located in a natural valley and will support underground mining and coal handling activities and provide for personnel and materials access.

ROM coal brought to the surface at the MEA will be transported to the Maxwell Infrastructure area. Early ROM coal will be transported via internal roads during the construction and commissioning of a covered, overland conveyor system in accordance with Condition A8 of Development Consent SSD 9526. Subsequently, ROM coal will be transported via the covered, overland conveyor.



Source: NSW Spatial Services (2022)

LEGEND

- Mining Operation
- Proposed Mining Operation
- Railway
- Local Government Boundary
- State Forest
- National Parks and Wildlife Service Estate
- Mining and Coal Lease Boundary
- Indicative Extent of Underground Development

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MAXWELL UNDERGROUND MINE PROJECT

Regional Location

Figure 1

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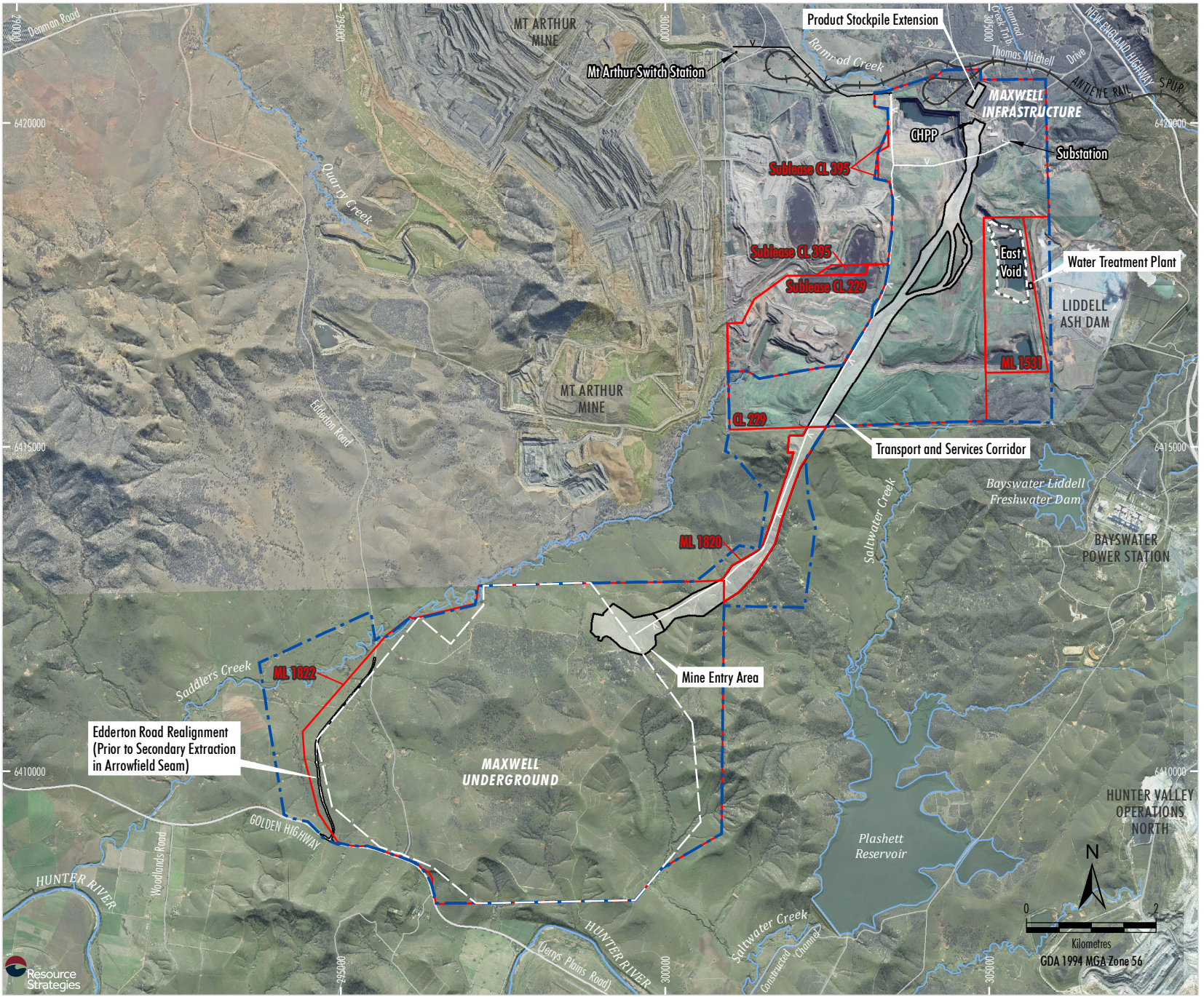

LEGEND

- Railway
- Mining and Coal Lease Boundary
- Proposed Ausgrid 66 kV Power Supply Extension #
- Approved Maxwell Underground Mine
- Development Application Area
- Indicative Extent of Underground Development
- Indicative Surface Development Area
- CHPP Reject Emplacement Area
- 66 kV Power Supply

Subject to separate assessment and approval.

Source: NSW Spatial Services (2022); Arkhill (2021); Orthophoto Mosaic: 2020, 2019

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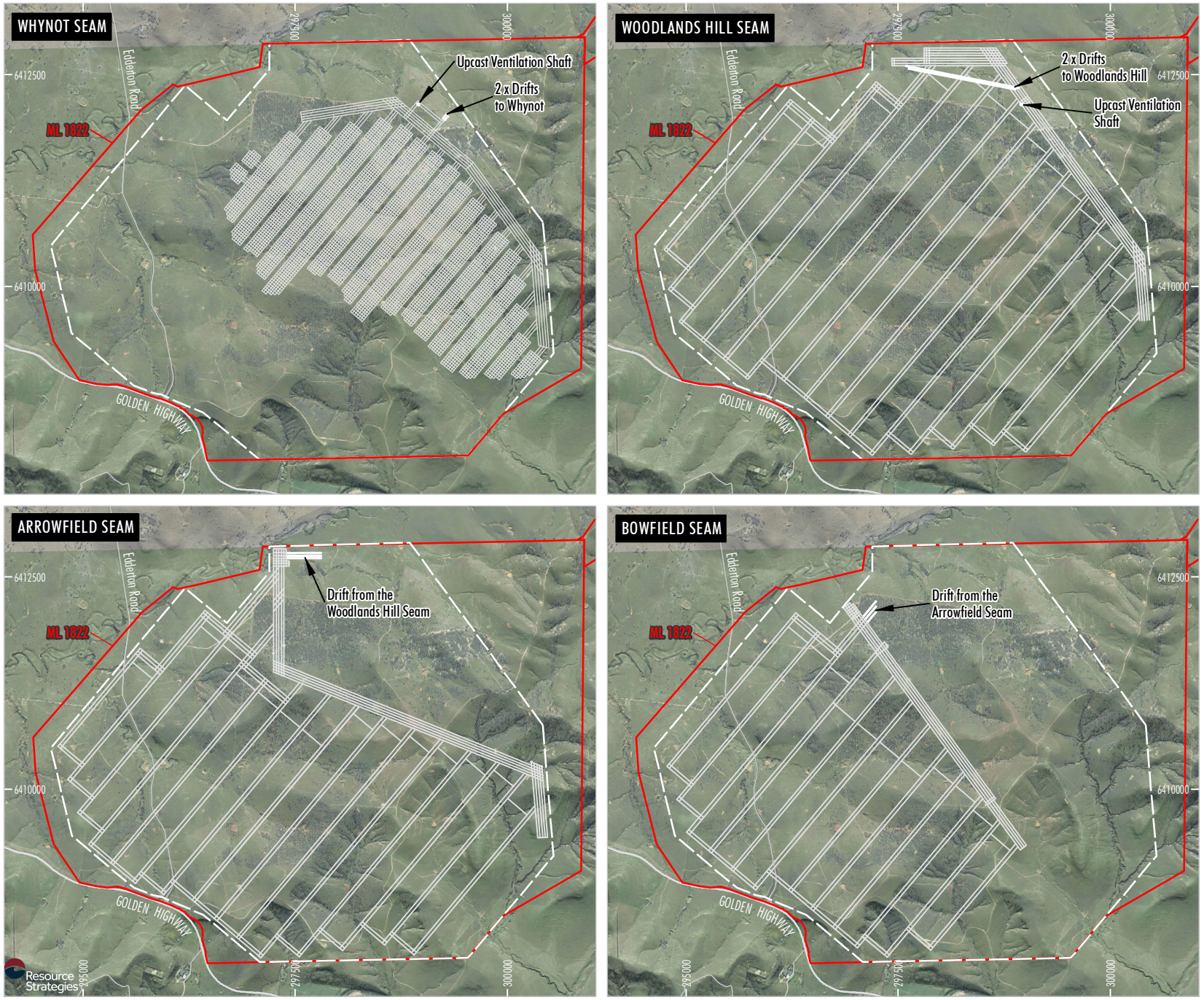
MAXWELL UNDERGROUND MINE PROJECT

Approved General Arrangement

Figure 2

SHM-20-04 MOD LW_Report_MT_202A



LEGEND

Mining and Coal Lease Boundary

Indicative Extent of Underground Mining

Indicative Underground Mining Layout

Source: NSW Spatial Services (2022)
Orthophoto Mosaic: 2019

N

0 2

Kilometres

GDA1994 MGA Zone 56

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MAXWELL UNDERGROUND MINE PROJECT

Approved Indicative Underground Mining Layout

Figure 3

The NSW Division of Resources and Geoscience (DRG, 2019) estimated that the Project would generate approximately $955 million in royalties (undiscounted) based on coal price forecasts of approximately US$140 per tonne for coking coal and US$70 per tonne for thermal coal. Coal prices are currently much higher than these forecasts and, if higher coal prices are sustained, the Project is expected to generate more royalties than the previous estimate.

Malabar commenced initial construction of the Project in May 2022 (Plate 1). Malabar is currently targeting commencement of bord and pillar mining in 2023 and longwall extraction in 2024.

Plate 1: Construction of Initial Access Road

1.2 MODIFICATION OVERVIEW

The Modification is located wholly within the approved Development Application Area and would comprise the following components:

- re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams resulting in a minor increase in the approved underground mining extent;
- reduction in the width of some of the longwall panels in the Woodlands Hill Seam;
- repositioning of the upcast ventilation shaft site and associated infrastructure; and
- other minor works and ancillary infrastructure components (e.g. access road and ancillary water management infrastructure for the repositioned ventilation shaft site).

All freehold land associated with the Modification is owned by Malabar (Figure 4).

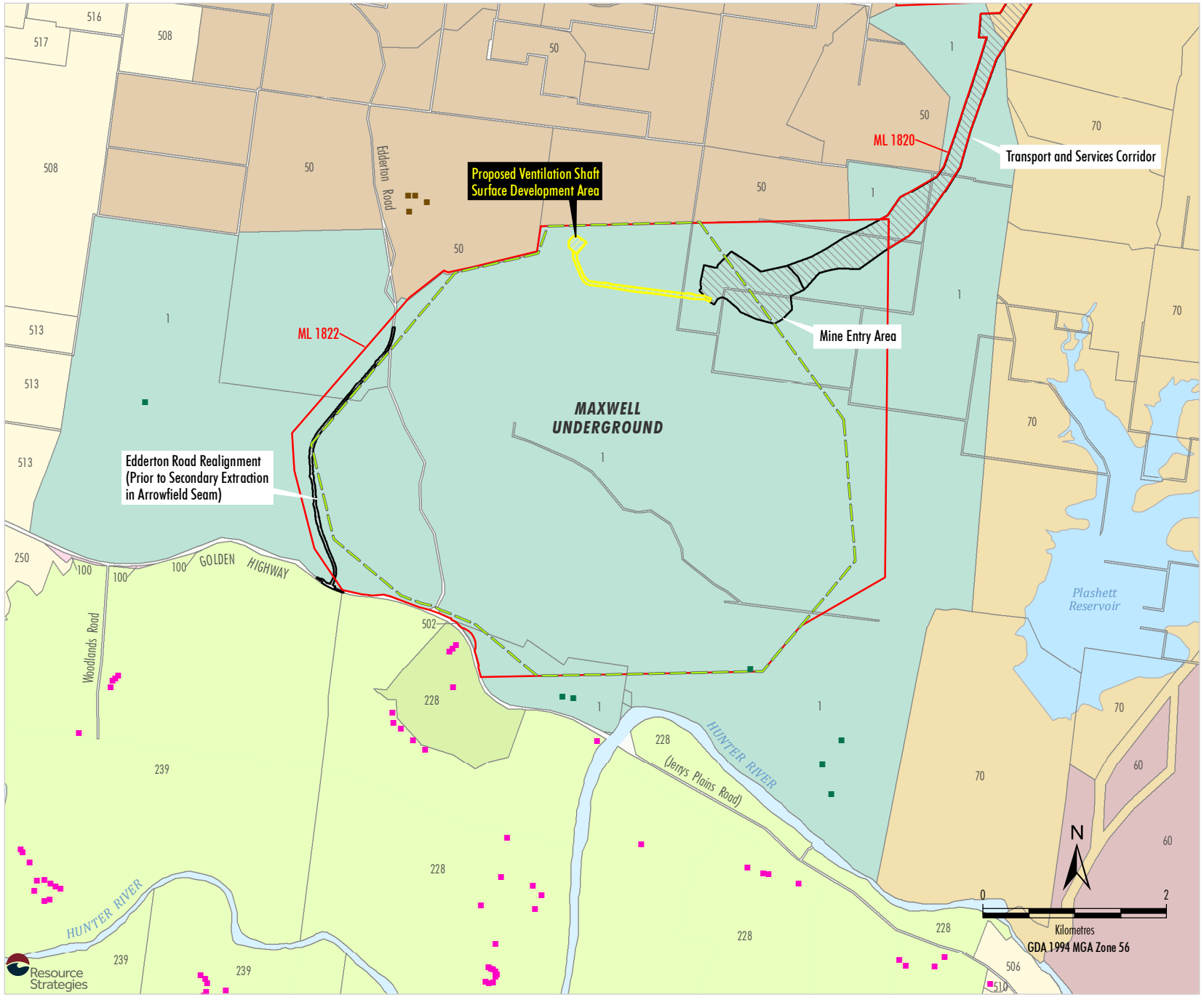
Figure 5 shows the modified general arrangement for the Project, including extensions to the surface development areas. Figure 6 shows the modified underground mining layout.

The re-orientation of the longwall panels provides for benefits to the efficiency and safety of the mine, including; commencing longwall extraction in an area with a lower gas content, which provides additional time to refine gas management strategies. The re-orientation also defers the undermining of Edderton Road allowing additional subsidence monitoring data to be collected from the initial longwall panels, which would improve the efficacy of the subsidence monitoring and management program for Edderton Road when it is undermined.

1.3 STRUCTURE OF THIS MODIFICATION REPORT

An overview of the main text of this Modification Report is presented below:

Section 1	Provides a background description of the Project and overview of the Modification.
Section 2	Outlines the strategic planning context relevant to the Modification.
Section 3	Provides a detailed description of the Modification.
Section 4	Outlines the statutory provisions relevant to the Modification.
Section 5	Describes the consultation and engagement undertaken in relation to the Modification and ongoing community involvement.
Section 6	Details the environmental assessment of the Modification and describes the existing environmental management systems and measures that would be available to manage and monitor any potential impacts.
Section 7	Provides a justification of the modified Project and provides a conclusion.
Section 8	Lists the documents referenced in the main text of the Modification Report.



LEGEND

Mining and Coal Lease Boundary

Approved Maxwell Underground Mine

Indicative Surface Development Area

Proposed Modification

Modified Indicative Extent of Underground Development

Indicative Modification Surface Development Area

Land Ownership

Malabar Coal

Mt Arthur Mine (BHP)

Hunter Valley Operations (Yancoal/Glencore)

AGL

RMS

Crown

Equine Enterprise

Viticulture Enterprise

Other Privately-owned Land

100 Landholder Reference Number

Malabar-owned Receiver

Other mine-owned Receiver

Privately-owned Receiver

Source: NSW Spatial Services (2022)

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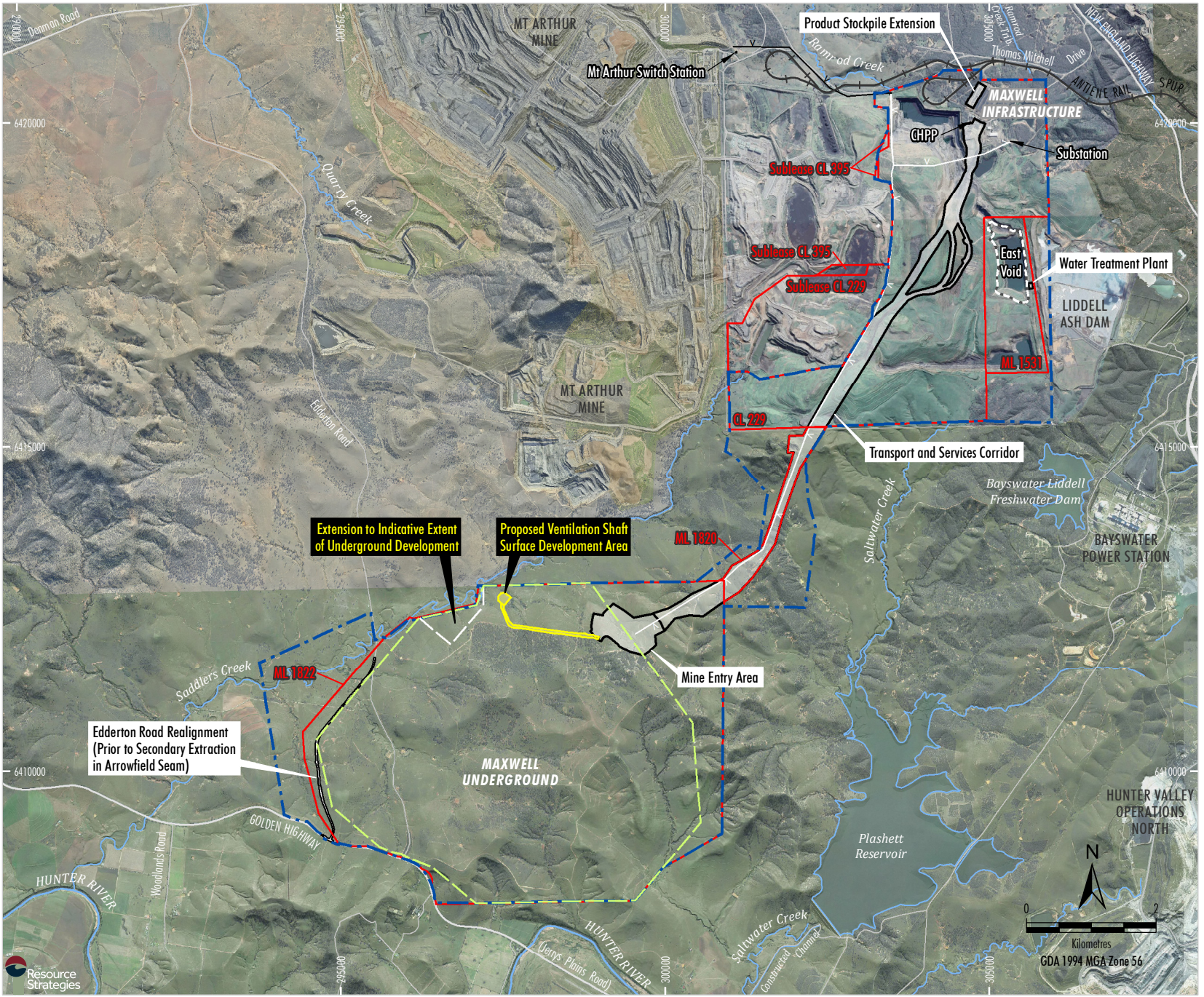
MAXWELL UNDERGROUND MINE PROJECT

Relevant Land Ownership Plan

Figure 4



LEGEND

- Railway
- Mining and Coal Lease Boundary
- Proposed Ausgrid 66 kV Power Supply Extension #

Approved Maxwell Underground Mine

- Development Application Area
- Indicative Extent of Underground Development
- Indicative Surface Development Area
- CHPP Reject Emplacement Area
- 66 kV Power Supply

Proposed Modification

- Modified Indicative Extent of Underground Development
- Indicative Modification Surface Development Area

Subject to separate assessment and approval.

Source: NSW Spatial Services (2022); MSEC (2021)
Orthophoto Mosaic: 2020, 2019

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MAXWELL UNDERGROUND MINE PROJECT

Modified General Arrangement

Figure 5

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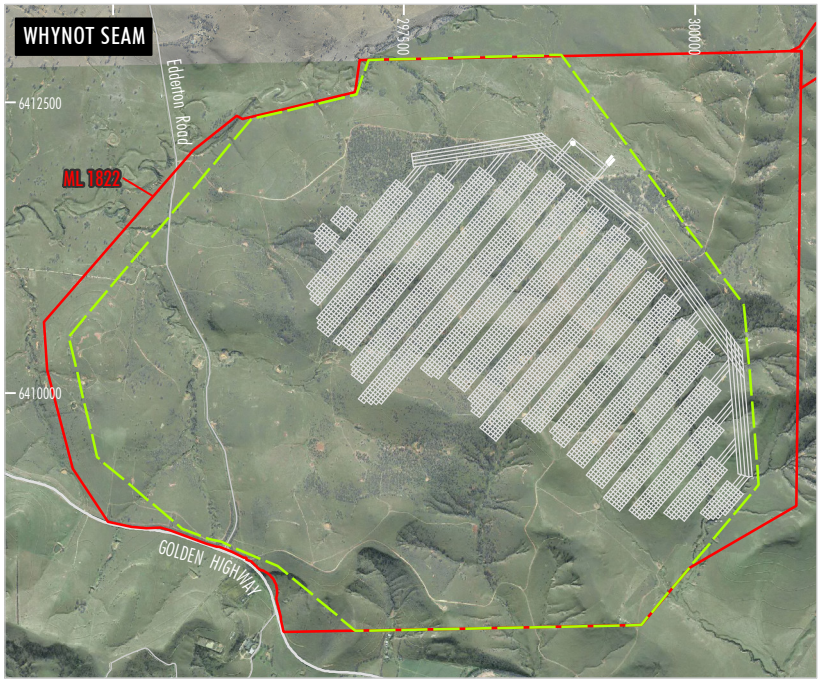

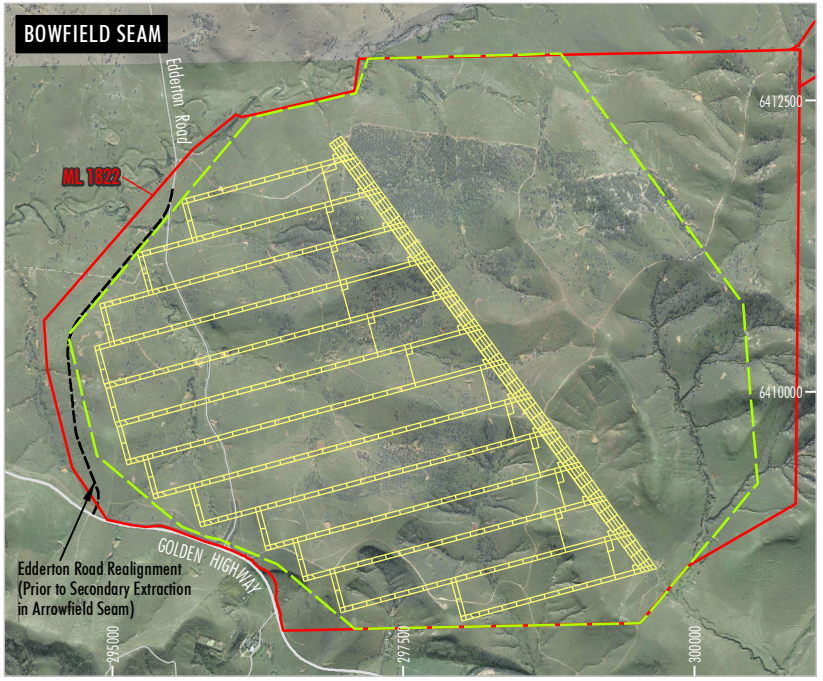

LEGEND
- Mining and Coal Lease Boundary
- Approved Indicative Underground Mining Layout
- Modified Indicative Underground Mining Layout
- Modified Indicative Exent of Underground Development

Source: NSW Spatial Services (2022); Arkhill (2021)
Orthophoto Mosaic: 2019

N

0 2

Kilometres

GDA1994 MGA Zone 56

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MAXWELL UNDERGROUND MINE PROJECT

Modified Indicative Underground Mining Layout

Figure 6

SHM-20-04 MOD LW_Report_MT_206C

Attachments 1 and 3 and Appendices A to H provide supporting information as follows:

Attachment 1	Modified Project Description
Attachment 2	Detailed Statutory Compliance Reconciliation Table
Attachment 3	Summary of Mitigation Measures
Appendix A	Subsidence Assessment
Appendix B	Groundwater Assessment
Appendix C	Surface Water and Flooding Assessment
Appendix D	Biodiversity Development Assessment Report
Appendix E	Aboriginal Cultural Heritage Assessment
Appendix F	Landscape and Visual Assessment
Appendix G	Noise Review
Appendix H	Air Quality Review

2 STRATEGIC CONTEXT

This section outlines the strategic context for the Project and the Modification. This section also summarises the strategic need for the Project and potential benefits of the Modification.

2.1 REGIONAL CONTEXT

The Project is located within the Hunter Coalfield. The Hunter Coalfield and adjacent Newcastle Coalfield in the Sydney-Gunnedah Basin form the target resource of major coal developments in the Hunter region. The region surrounding the Project has been disturbed due to previous open cut mining activity.

The Project area comprises substantial existing Maxwell Infrastructure (a former mining operation) and the approved Maxwell Underground. Prospecting for coal in the Maxwell Underground area and surrounds commenced in the late 1940s, with exploration intensifying during the 1960s and 1970s.

2.2 BENEFITS OF THE MODIFICATION

The Project would generate a significant net benefit to the State of NSW. The *Maxwell Underground Coal Mine Project SSD-9526 Statement of Reasons for Decision* (IPC, 2020) states:

> *In summary, the Commission finds the:*
>
> - *the Project to be a lawful and appropriate use of the land and notes the benefits associated with it being in the Hunter coalfield, close to several other mining operations and power stations, where sharing of infrastructure is possible*
>
> *…*
>
> - *the Project will deliver significant economic benefits for the local area, region and State including 250 construction and 350 operational jobs*

The Modification would increase certainty of the Project being developed to its full capacity and the associated realisation of "significant economic benefits for the local area, region and State".

The revised longwall layout would provide the following benefits:

- improved mine safety due to aligning the underground mine plan more favourably with the geotechnical environment;
- improved management of subsidence impacts on Edderton Road;
- less development drivage required to achieve first longwall coal, resulting in earlier commencement of longwall production (and associated economic and community benefits);
- reduction in initial capital expenditure required to achieve steady-state production and future capital costs associated with modifications to longwall equipment; and
- extraction of initial longwall panels in an area with lower gas content, which provides additional time to refine gas management strategies.

The upcast ventilation shaft is proposed to be repositioned as a result of the changes to the mine layout. The repositioned ventilation shaft would provide the following benefits:

- Minimises development drivage required to complete the shaft ventilation circuit, allowing development drivage to focus on achieving first longwall coal production earlier.
- Reduces life of mine ventilation pressures resulting in improved ventilation efficiency and reducing the risk of spontaneous combustion.

The Modification can be implemented in accordance with the existing environmental limits and performance measures for the off-site impacts of the Project (e.g. the ventilation infrastructure has been designed so that it would not be visible from the Godolphin Woodlands Stud or the Coolmore Stud). On-site impacts, such as native vegetation clearance, would be appropriately offset in accordance with NSW Government policy.

2.3 INTERACTIONS WITH OTHER DEVELOPMENTS

Sections 2.2 and 2.3 of the *Maxwell Project Environmental Impact Statement* (the EIS) (Malabar, 2019a) provided detailed descriptions of other developments in the vicinity of the Project and the potential interactions between these developments and the Project.

There would be no change to the interactions with these developments associated with the Modification as the changes are minimal and are located within Malabar-owned land and existing MLs.

2.4 KEY STRATEGIC PLANNING DOCUMENTS

2.4.1 Strategic Statement on Coal Exploration and Mining in NSW

The *Strategic Statement on Coal Exploration and Mining in NSW* outlines how the NSW Government will continue to support responsible resource development for the benefit of the State (NSW Government, 2020). The *Strategic Statement on Coal Exploration and Mining in NSW* recognises the value of coal production to the NSW economy, including:

- The long history of coal mining in NSW and its close ties with regional communities in the Hunter region.
- The potential for coal production to provide significant benefits to local communities, including jobs and investment.
- Coal production's significant contributions to export earnings as the State's biggest single export earner.

The IPC considered the *Strategic Statement on Coal Exploration and Mining in NSW* in its determination of the Project. The *Maxwell Underground Coal Mine Project SSD-9526 Statement of Reasons for Decision* (IPC, 2020) states:

> *The Commission has considered the objectives of the NSW Strategic Statement and supports DPIE's conclusion that the Project, being an underground coal mine targeting coking coal resources for steel making, aligns with the purpose of the NSW Strategic Statement (ARP 3.4.5).*

The Modification would allow for more efficient and timely access to the State's coal resources. The Modification would not materially change the scale or nature of the Project, and the Project would continue to align with the objectives of the *Strategic Statement on Coal Exploration and Mining in NSW*.

2.4.2 Other Strategic Planning Documents and Policies

Section 4.1 and Attachment 7 of the EIS (Malabar, 2019a) considered the relevant strategic planning documents and policies for the Project.

In approving the Project, the IPC stated (IPC, 2020):

> *In making its determination, the Commission has assessed the application of relevant planning instruments, policies and environmental protections, and the capacity of the Project reasonably and satisfactorily to identify, avoid, mitigate and manage impacts by imposing conditions on the consent.*

The Modification would not materially change the scale or nature of the Project, and the Project would remain consistent with the relevant strategic planning documents and policies for the Project, as described in Section 4.1 and Attachment 7 of the EIS (Malabar, 2019a).

3 DESCRIPTION OF THE MODIFICATION

3.1 OVERVIEW

The Modification would not require a significant alteration to the approved Project. The Modification is located wholly within the approved Development Application Area and would comprise the following components:

- re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams resulting in a minor increase in the approved underground mining extent;
- reduction in the width of some of the longwall panels in the Woodlands Hill Seam;
- repositioning of the upcast ventilation shaft site and associated infrastructure; and
- other minor works and ancillary infrastructure components (e.g. access road and ancillary water management infrastructure for the repositioned ventilation shaft site).

The Modification would not change the following approved Project components:

- total resource extraction and maximum annual production;
- mine life;
- coal handling, processing and stockpiling;
- include management of reject material (i.e. stone-derived material);
- product coal transport;
- workforce; and
- hours of operation.

Table 1 provides a comparative summary of the approved Project under Development Consent SSD 9526 (including Modification 1) and the Project incorporating the Modification.

The actual timing, mining sequence and annual coal production profile may vary to as a result of localised geological features, detailed mine design, mine economics, market volume requirements, and/or adaptive management requirements.

Table 1
Overview of the Approved Maxwell Underground Mine Project and the Modification

Component	Approved Maxwell Underground Mine Project Development Consent SSD 9526	Proposed Modification
Mining Method	Underground extraction using “bord and pillar” and “longwall” mining methods.	No change to the underground extraction methods. No change to the bord and pillar panels in the Whynot Seam. Re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams, resulting in a minor increase in the approved underground mining extent. Reduction in the width of some longwall panels in the Woodlands Hill Seam.
Resource	Coal seams in the Wittingham Coal Measures within ML 1822 (Whynot Seam, Woodlands Hill Seam, Arrowfield Seam and Bowfield Seam).	Unchanged.
Peak Annual Production	Up to 8 million tonnes (Mt) of ROM coal per annum.	Unchanged.
Coal Quality	At least 75% of product coal produced by the Project would be capable of being used in the making of steel (coking coals). The balance would be export thermal coals suitable for the new-generation High Efficiency, Low Emissions power generators.	Unchanged.
Mine Life	Mining operations may be carried out until 30 June 2047	Unchanged.
Total Resource Recovered	Approximately 148 Mt of ROM coal (i.e. an annual average of approximately 5.7 Mt of ROM coal, yielding an annual average of approximately 4.8 Mt of product coal).	No material changes to total resource recovered (148.5 Mt) or annual average production rate.

Table 1 (continued)
Overview of the Approved Maxwell Underground Mine Project and the Modification

Component	Approved Maxwell Underground Mine Project Development Consent SSD 9526	Proposed Modification
Coal Handling and Preparation	Handling and processing of up to 8 Mt of ROM coal per annum. Transport of coal from underground faces to the MEA (mine entry area) via an underground conveyor network. Use of a surge stockpile and coal sizing facilities at the underground MEA prior to transporting ROM coal to the Maxwell Infrastructure CHPP. Transportation of early ROM coal via internal roads to the Maxwell Infrastructure CHPP, while a covered, overland conveyor is constructed and commissioned. Subsequently, ROM coal would be transported via the covered, overland conveyor system. Use of the existing Maxwell Infrastructure CHPP with upgrades to coal handling and processing infrastructure.	Unchanged.
Management of Reject Material (i.e. Stone-derived Material)	Emplacement of coarse rejects and tailings primarily within the existing "East Void" in ML 1531 at the Maxwell Infrastructure precinct.	Unchanged.
General Infrastructure	Use of the existing Maxwell Infrastructure with upgrades. Development of an underground MEA and associated facilities that support the underground mining activities and provide for personnel and materials access to the underground mine. Development of infrastructure for power supply, ventilation and gas management for the underground mine.	Repositioning of the upcast ventilation shaft site and supporting infrastructure (e.g. access roads) outside of the approved surface development area for the MEA.
Product Transport	Transport of product coal to market or to the Port of Newcastle for export via the existing Antiene Rail Spur and Main Northern Railway. Transport of up to 7 Mt of product coal per annum along the rail loop (up to 12 train movements per day).	Unchanged.
Water Management	On-site water management system, including: recycling of water on-site; storage of water on-site (including in voids); water treatment; irrigation; and sharing of water with Mt Arthur Mine and other users. Augmentations and extensions to existing water management infrastructure and development of new water management storages, sumps, pumps, pipelines, sediment control, mine dewatering, water treatment and wastewater treatment infrastructure.	Additional ancillary water management infrastructure would be developed at the repositioned ventilation shaft site (e.g. sediment controls).
Workforce	During operation, the Project would directly employ approximately 350 personnel. Initial construction activities would require an average of approximately 90 personnel, and a maximum of approximately 250 personnel. Additional contractors would also be required during short periods over the life of the Project; for example, during longwall relocations, periods of higher underground development activities, scheduled plant shutdowns or other maintenance programs. These activities may require up to approximately 80 additional personnel.	Unchanged.
Hours of Operation	Operated on a continuous basis, 24 hours per day, seven days per week.	Unchanged.

Based on a review of the proposed changes, Malabar considers that the Project incorporating the Modification would be substantially the same as the approved Project.

The following sub-sections provide a detailed description of the Modification components.

3.2 UNDERGROUND MINING LAYOUT

The Modification would involve the re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams resulting in a minor increase in the approved underground mining extent (Figure 6).

The re-orientated longwall panels would better align with the principal stress orientation (east-west), improving the stability and safety of the underground working area during development advance and longwall retreat.

The Modification would also involve reduction in the width of some longwall panels in the Woodlands Hill Seam (Figure 6). The narrower width of the initial longwall panels would reduce the upfront capital required to commence longwall extraction (i.e. some initial capital expenditure associated with the longwall machine would be deferred until panels are extracted at the full approved width). This would facilitate earlier commencement of longwall mining and bring forward the following associated benefits:

- increased development contributions paid to Muswellbrook Shire Council in accordance with the terms of the existing agreement; and
- employment of workforce required to operate the longwall machine.

The re-orientated longwalls would also be staggered between seams so that the chain pillars would not align, thus minimising the total subsidence at the surface.

As a result of the Modification, the first three longwall panels would not undermine Edderton Road (under the approved Project Edderton Road would be undermined by the first longwall panel). Accordingly, ground subsidence monitoring would be carried out above these earlier longwalls, which would facilitate improved management of subsidence impacts on Edderton Road. The re-orientation of the longwall panels would also reduce the duration of mining beneath Edderton Road for each longwall pass (i.e. reducing the duration for which traffic controls need to be applied to Edderton Road during each longwall pass).

The modified extent of underground development remains wholly within Malabar-owned land and existing MLs (Figure 4).

The Modification would not change the approved maximum amount of ROM coal extracted in any one year (e.g. would remain at 8 Mt). An indicative mining schedule for the modified Project is presented in Table 2.

The actual mining order and layout of the longwalls may vary due to localised geological features, detailed mine design and/or adaptive management requirements. The final mining order and layout would be subject to review and approval as a component of future Extraction Plans developed in consultation with the relevant authorities and to the satisfaction of the Secretary of the NSW Department of Planning and Environment (DPE).

3.3 MINE VENTILIATION SYSTEMS

The upcast ventilation shaft is proposed to be repositioned as a result of the changes to the mine layout. The repositioned ventilation shaft would provide the following benefits:

- Minimises drivage development required to complete the shaft ventilation circuit, allowing development drivage to focus on achieving first longwall coal production earlier.
- Reduces life of mine ventilation pressures resulting in improved ventilation efficiency and reducing the risk of spontaneous combustion.

The proposed ventilation shaft pad has been located to avoid clearance of threatened flora and fauna habitat. The associated access corridor would utilise an existing track to reduce disturbance of native vegetation.

The ventilation fans and associated infrastructure have been designed so that it would not be visible from the Godolphin Woodlands Stud or the Coolmore Stud. They would also be shielded from view from Edderton Road by existing vegetation.

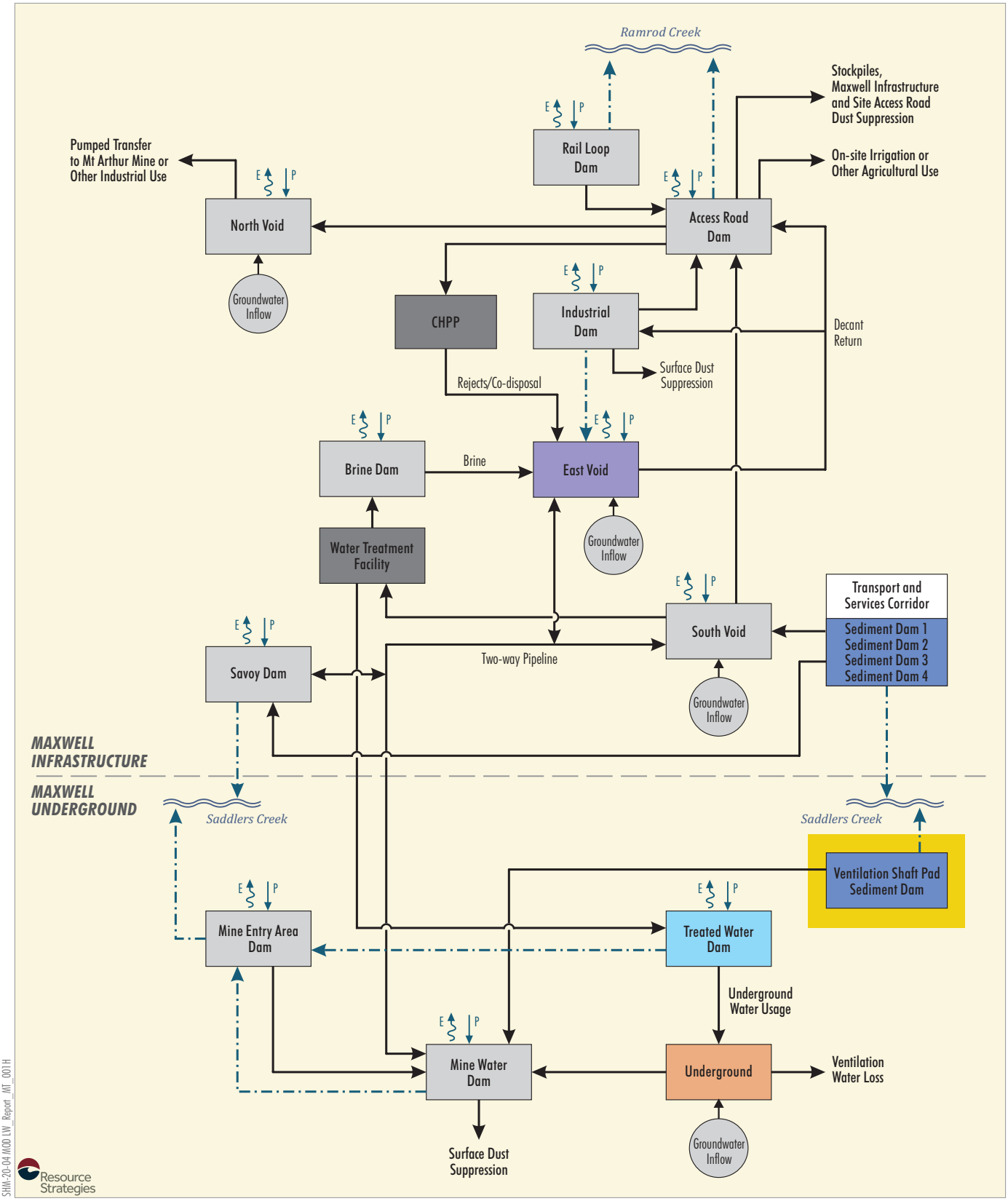
The ventilation shafts would incorporate directional discharge to mitigate the potential for air quality and noise impacts (i.e. ventilation discharge will be directed away from sensitive receivers).

Table 2
Indicative Modified Mining Schedule

Project Year	Project ROM Coal Production (Mt)					CHPP Reject Material (Mt)	Product Coal (Mt)
	Whynot Seam	Woodlands Hill Seam	Arrowfield Seam	Bowfield Seam	Total ROM Coal		
1	-	-			-	-	-
2	0.2	0.3	-	-	0.6	0.3	0.4
3	1.1	2.3	-	-	3.4	1.2	2.4
4	0.8	2.9	-	-	3.8	1.2	2.8
5	1.0	4.8	-	-	5.8	2.0	4.2
6	0.5	7.5	-	-	8.0	2.5	5.9
7	0.8	7.2	-	-	8.0	3.1	5.4
8	0.7	6.5	-	-	7.2	2.7	5.0
9	0.3	7.5	-	-	7.8	2.6	5.7
10	0.3	6.9	0.1	-	7.3	2.1	5.6
11	0.2	6.7	0.3	-	7.1	1.9	5.5
12	0.2	4.7	1.4	-	6.2	1.5	5.0
13	0.4	1.0	3.9	-	5.4	0.9	4.7
14	0.8	-	5.8	-	6.6	1.2	5.6
15	0.8	-	6.6	-	7.4	1.6	6.0
16	0.3	-	7.2	-	7.5	1.3	6.4
17		-	7.4	0.1	7.5	0.9	6.8
18	-	-	7.2	0.3	7.5	0.7	7.0
19	-	-	4.7	1.9	6.6	0.5	6.2
20	-	-	1.3	4.2	5.5	0.5	5.1
21	-	-	-	5.5	5.5	0.8	4.9
22	-	-	-	6.2	6.2	1.0	5.4
23	-	<0.1	-	6.5	6.5	0.9	5.7
24	-	0.2	-	5.8	6.0	0.8	5.3
25	-	1.3	-	2.6	3.9	0.6	3.4
26	-	1.2	-	-	1.2	0.4	0.8
Total	**8.4**	**61.0**	**45.9**	**33.1**	**148.5**	**33.2**	**121.2**

Notes: The combined total of product coal and CHPP reject material is greater than total ROM coal due to changes in moisture content (data are presented on an “as received” moisture basis).

Other totals may not add exactly due to rounding.



SHM-20-04 MOD LW_Report_MT_001H

Source: WRM (2022)

LEGEND

- Approved Water Management System
- Modification to Approved Water Management System
- Evaporation
- Precipitation/Catchment Runoff
- Pumped/Siphoned
- Overflow
- Treated Water Dam
- Underground Mine
- Mine Affected Water Storage
- Sediment Dam
- Rejects/Co-disposal Storage

NOTES

Overflow Direction: Good engineering practice is to include a stabilised spillway as a contingency for dam safety. This arrow does not indicate that these discharges (overflows) will occur. The arrow is to show the direction of water flow (by gravity) should the dam water level exceed the dam spillway level.

Seepage between voids/storages may occur through previously emplaced waste rock, including seepage between voids and native water storages.

Water management system would change if Malabar pursue an alternative management option for excess water (refer excess water management hierarchy in Section 3.10.3 of the EIS).

Dirty water management system storages are not shown.

Portal Dams and Sediment Dam at the Mine Entry Area are not shown as these are located within the catchment of and report to the Mine Entry Area Dam.

Savoy Dam may be used a staging storage to transfer water to the South Void.

Pringles Dam, which is used to supply water for livestock, is not shown as it does not form part of the mine water management system.

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Indicative Water Management Schematic

Figure 7

3.4 WATER MANAGEMENT

Surface water runoff from the ventilation shaft pad would be captured by a new water storage (VSP Sediment Dam). Runoff from the access corridor would be managed in accordance with the approved Erosion and Sediment Control Plan, which would be reviewed and updated for the Modification (if required). An updated water management schematic is shown on Figure 7.

Erosion and sediment controls would be designed and operated in accordance with the requirements of Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Volume 2E – Mines and Quarries (DECC, 2008).

The realigned longwall panels would not change the water management system for the Project. However, it would result in very minor changes to the profile of groundwater inflows over the life of the Project.

WRM Water and Environment Pty Ltd (WRM) (2022) has simulated the performance of the water management system over the life of the Project (incorporating the Modification). Overall, the impact of the Modification on the Project water balance is negligible (Appendix C).

4 STATUTORY CONTEXT

This section outlines the statutory requirements relevant to the assessment of the Modification.

4.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The EP&A Act and *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation) set the framework for planning and environmental assessment in NSW.

4.1.1 Applicability of Section 4.55(2) of the EP&A Act

The Project was approved under Part 4 of the EP&A Act on 22 December 2020 (Development Consent SSD 9526).

Section 4.55(2) of the EP&A Act relevantly provides:

> ***4.55 Modification of consents—generally***
>
> …
>
> *(2)* ***Other modifications*** *A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if--*
>
> *(a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all), and*
>
> *(b) it has consulted with the relevant Minister, public authority or approval body (within the meaning of Division 4.8) in respect of a condition imposed as a requirement of a concurrence to the consent or in accordance with the general terms of an approval proposed to be granted by the approval body and that Minister, authority or body has not, within 21 days after being consulted, objected to the modification of that consent, and*
>
> *(c) it has notified the application in accordance with--*
>
> *(i) the regulations, if the regulations so require, or*
>
> *(ii) a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and*
>
> *(d) it has considered any submissions made concerning the proposed modification within the period prescribed by the regulations or provided by the development control plan, as the case may be.*
>
> …

The modified Project would remain an underground mine with supporting infrastructure. The consent authority can be satisfied that the Project incorporating the Modification would remain "substantially the same development as the development for which consent was originally granted".

As outlined in the *State Significant Development Guidelines* (Department of Planning, Industry and Environment [DPIE], 2021a), Attachment 2 provides a detailed statutory compliance table for the Project incorporating the Modification that identifies all the relevant statutory requirements and the relevant sections in this Modification Report that address these requirements.

4.2 RELEVANT NSW LEGISLATION

In addition to the EP&A Act, the following NSW legislation may be applicable to the Project, incorporating the Modification:

- *Aboriginal Land Rights Act 1983*;
- *Biodiversity Conservation Act 2016* (BC Act);
- *Biosecurity Act 2015*;
- *Coal Mine Subsidence Compensation Act 2017*;
- *Contaminated Land Management Act 1997*;
- *Crown Land Management Act 2016*;
- *Dams Safety Act 1978*;
- *Dams Safety Act 2015*;
- *Dangerous Goods (Road and Rail Transport) Act 2008*;
- *Electricity Supply Act 1995*;
- *Explosives Act 2003*;
- *Fisheries Management Act 1994*;
- *Heritage Act 1977*;
- *Mining Act 1992*;
- *National Parks and Wildlife Act 1974* (NPW Act);
- *Native Title (NSW) Act 1994*;
- *Pipelines Act 1967*;

- PoEO Act;
- *Roads Act 1993*;
- *Water Management Act 2000*;
- *Work Health and Safety Act 2011*; and
- *Work Health and Safety (Mines and Petroleum Sites) Act 2013*.

Relevant licences or approvals required under these Acts would continue to be obtained for the Project incorporating the Modification.

Biodiversity Conservation Act 2016

The BC Act provides the legislative framework for biodiversity conservation in NSW. A Biodiversity Development Assessment Report (BDAR) has been prepared for the Modification in accordance with the BC Act and is provided in Appendix D.

National Parks and Wildlife Act 1974

The NPW Act contains provisions for the protection and management of national parks, historic sites, nature reserves and Aboriginal heritage in NSW.

An Aboriginal Cultural Heritage Assessment (ACHA) for the Modification has been undertaken in consultation with the Registered Aboriginal Parties (Appendix E).

In accordance with section 4.41 of the EP&A Act, Aboriginal Heritage Impact Permits (AHIPs) are not required for projects classified as SSD and approved under Part 4 of the EP&A Act. Impacts to Aboriginal heritage values associated with the Project are managed under the approved Aboriginal Cultural Heritage Management Plan (ACHMP) required under Condition B57 of Development Consent SSD 9526.

Water Management Act 2000

The *Water Management Act 2000* contains provisions for the licensing, allocation, capture and use of water resources.

Under the *Water Management Act 2000*, water sharing plans are being introduced (and many have commenced) for water sources. Water sharing plans establish rules for sharing water between different users and between the various environmental sources (namely rivers or aquifers). Water sharing plans relevant to the Project are:

- *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.*
- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009.*
- *Water Sharing Plan for the Hunter Regulated River Water Source 2016.*

Consideration of the Project against the water management principles and access licence dealing principles of the *Water Management Act 2000*, and a discussion of the access licences required for the Project are provided in Attachment 8 of the EIS. No additional water access licences are required for the Modification.

Aquifer Interference Policy

The Modification is located outside the boundary of the 'highly productive' alluvium mapped along Saddlers Creek (Figure 8). Whilst broad scale regional mapping indicates some alluvium is mapped within the approved MEA, the EIS concluded that site-specific alluvial investigations, including drilling transects, indicates there is no alluvium within the footprint of the MEA.

Consistent with the approved Project, mining in the vicinity of Saddlers Creek would be at minimum depth of cover of approximately 125 metres (m) for the Modification.

Mining Act 1992

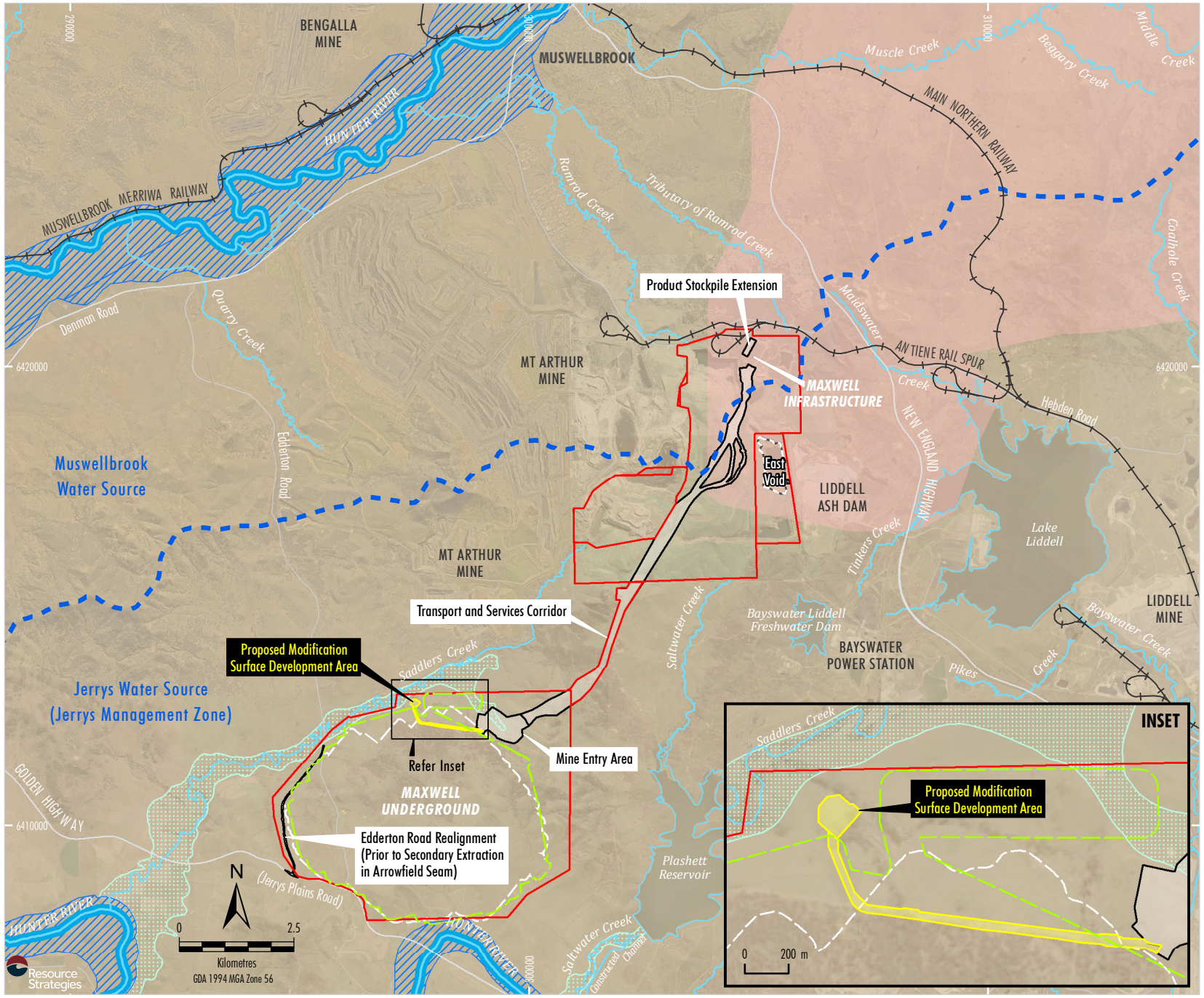
The objects of the *Mining Act 1992* are to encourage and facilitate the discovery and development of mineral resources in NSW, having regard to the need to encourage ecologically sustainable development (ESD).

The Modification would be wholly within existing mining and coal leases (e.g. ML 1820, ML 1822, ML 1531 and CL 229). Therefore, there would be no need for the amendment or variation of the existing authorities or the issue of new authorities under the *Mining Act 1992*.

Malabar would revise the existing approved Mining Operations Plan to incorporate the Modification.

4.3 ENVIRONMENTAL PLANNING INSTRUMENTS

State Environmental Planning Policies (SEPPs) of relevance to the Project were described in the EIS (Malabar, 2019a). Detail on potential Modification requirements under the key environmental planning instruments is included in the statutory compliance table provided in Attachment 2.



LEGEND

- Railway
- Mining and Coal Lease Boundary
- Approved Maxwell Underground Mine
- Subsidence Study Area
- Indicative Surface Development Area
- CHPP Reject Emplacement Area
- Proposed Modification
- Subsidence Study Area
- Indicative Modification Surface Survey Area
- North Coast Fractured and Porous Rock Groundwater Sources
- Sydney Basin - North Coast Groundwater Source
- New England Fold Belt Coast Groundwater Source
- Hunter Unregulated and Alluvial Water Sources
- Management Zone Boundary
- Hunter Regulated River Alluvial Water Source (Upstream Glennies Creek Management Zone)
- Groundwater Sources in Jerrys Water Source#
- Hunter Regulated River Water Source
- Hunter Regulated River Water Source

 # As per Department of Primary Industries (2018) database of groundwater sources (Water Sharing Plan Groundwater Sources) based on mapping of unconsolidated alluvial sediments sourced from geological data created by the Resources and Geoscience Division and Soil Landscape Units from the Department of Planning and Environment. Only water within actual alluvial sediments is covered within this source. Alluvial sediments are absent from the mine entry area.

Source: NSW Spatial Services (2022); NSW Department of Primary Industries - Water (2019); MSEC (2019, 2022)
Orthophoto Mosaic: 2020, 2019

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Water Sharing Plan Boundaries in the Vicinity of the Modification

Figure 8

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4.4 COMMONWEALTH LEGISLATION

4.4.1 Environment Protection and Biodiversity Conservation Act 1999

The proposed action to develop and operate an underground mining operation and utilise the existing Maxwell Infrastructure, was referred to the Commonwealth Minister in September 2018 (EPBC 2018/8287).

The Project was subsequently approved under the EPBC Act in March 2021 (EPBC 2018/8287), including approval under the EPBC Act to potential impacts on the following provisions:

- listed threatened species and communities (sections 18 and 18A); and
- a water resource, in relation to coal seam gas development and large coal mining development (section 24D and 24E).

The potential impacts of the Modification on flora and fauna have been assessed in the BDAR (Appendix D) and summarised in Section 6.4. The Modification would involve minor additional clearing of vegetation, with the BDAR (Appendix D) indicating that there would be no significant impact on threatened species, populations and communities listed under the EPBC Act as a result of the Modification.

The potential impacts of the Modification on groundwater and surface water have been assessed in Appendices B and C and are summarised in Sections 6.2 and 6.3. Appendix C indicates that there would be no significant impact on water resources as a result of the Modification.

Malabar will consult with the Commonwealth Government regarding any potential approval requirements under the EPBC Act.

5 ENGAGEMENT

Consultation conducted during the preparation of this Modification Report is summarised below.

It is anticipated that consultation will continue during the assessment of the Modification by the NSW Government.

5.1 DEPARTMENT OF PLANNING AND ENVIRONMENT

Malabar provided a briefing package and held a Scoping Meeting with DPE on **19 January 2022** to provide an overview of the Modification, proposed approval pathway and the proposed scope of the environmental assessment.

On **3 February 2022**, Malabar provided a letter to DPE regarding the Modification, proposed approval pathway and the proposed scope of the environmental assessment.

DPE subsequently provided a response to Malabar on **10 February 2022**, confirming the proposed approval pathway and outlining the environmental assessment matters to be considered as part of the Modification. These matters have been considered in this Modification Report.

Malabar held a pre-lodgement meeting with DPE on **23 June 2022** to provide an overview of the Modification Report and outcomes of the environmental assessments. DPE requested confirmation regarding the potential implications of the Modification on greenhouse gas emissions from the Project (Section 6.11).

Malabar will continue to consult with DPE throughout the Modification assessment process.

5.2 ABORIGINAL STAKEHOLDERS

Aboriginal stakeholders were consulted throughout the preparation of the ACHA for the Modification (Appendix E). Consultation was conducted with reference to the Heritage NSW guideline *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water [DECCW], 2010a).

Further detail on consultation with Aboriginal stakeholders for the Modification is provided in Section 6.5.

5.3 MUSWELLBROOK SHIRE COUNCIL

Malabar met with Muswellbrook Shire Council on **16 February 2022** to provide an update on the status of the Project and an overview of the Modification.

Feedback received from Muswellbrook Shire Council representatives was focused on issues related to the approved Project, including the importance of local employment and utilising local suppliers.

Malabar is committed to working with local government and the local community to maximise potential opportunities. In particular, Malabar is committed to:

- Encouraging construction contractors and suppliers to hire locally where possible through contractual terms.
- Requiring construction contractors to engage with businesses in the Project region.
- Promoting availability of Project employment and application arrangements in *The Singleton Argus*, *Muswellbrook Chronicle*, *Hunter Valley News*, *Denman News* and/or *The Scone Advocate*.
- Maintaining regular engagement with local employment agencies to advise of opportunities for training and employment.
- Focusing recruitment on hiring residents of the Muswellbrook and Singleton LGAs, including local Indigenous people, young people, and local women.

5.4 OTHER GOVERNMENT AGENCIES

Malabar consulted with the following regulatory agencies to provide an overview description of the Modification and proposed scope of environmental assessment relevant to their respective areas of interest:

- Biodiversity Conservation Division (BCD);
- Department of Planning, Industry and Environment (now DPE) – Water;
- Heritage NSW;
- Resource Regulator;
- NSW Mining, Exploration and Geoscience (MEG); and
- Subsidence Advisory NSW.

Malabar held a meeting with representatives from MEG on **14 June 2022**. MEG requested that the Modification Report include:

- an updated production schedule (Table 2);
- information regarding the implications of the Modification on royalties generated by the Project (Section 6.10); and
- information regarding any changes to the Project Capital Investment Value (Section 6.10).

No comments were received from the remaining regulatory agencies.

5.5 COMMUNITY CONSULTATIVE COMMITTEE

Community Consultative Committees (CCCs) provide a forum for discussion between Maxwell and representatives of the local community, key stakeholder groups and the local council on issues relating directly to the Project.

Malabar provided an overview of the Modification to the Maxwell CCC at the meeting on **17 February 2022**. The meeting was attended by:

- the independent chairperson of the CCC;
- the deputy chairperson of the CCC;
- a councillor from Muswellbrook Shire Council; and
- community representatives.

The Maxwell CCC attendees raised queries regarding the following:

- consequences of the narrower longwall panels on underground mining machinery (Section 3.2); and
- interactions between the modified longwall panels and Edderton Road (Sections 3.2 and 6.1.4).

Meeting minutes for the Maxwell CCC are publicly available on the Malabar website.

5.6 NEAR NEIGHBOURS

Malabar met with representatives from the Coolmore and Godolphin Woodlands Studs on 2 March 2022 to provide an update on the status of the Project and an overview of the Modification.

At the meeting, clarification was requested regarding any potential changes to mining in the Whynot Seam. As described in Table 1, no change to the bord and pillar panels in the Whynot Seam are proposed as part of the Modification.

6 ASSESSMENT OF IMPACTS

Malabar has undertaken a review of the potential environmental impacts of the Modification to identify key potential environmental issues requiring assessment.

The key potential impacts of the Modification are related to the re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams and the repositioning of the upcast ventilation shaft. The potential impacts would be related to the following environmental aspects: subsidence; biodiversity; Aboriginal cultural heritage; water resources; visual amenity; and other environmental considerations.

The key environmental matters are identified and addressed in Sections 6.1 to 6.8 and the Appendices A to H. An updated summary table of the mitigation measures for the Project (as modified) is provided in Attachment 3.

6.1 SUBSIDENCE

6.1.1 Methodology

The EIS Subsidence Assessment (Mine Subsidence Engineering Consultants [MSEC], 2019) assessed the potential subsidence effects and impacts of the Project.

A Subsidence Assessment has been prepared by MSEC (2021) for the Modification and is presented in Appendix A.

The Subsidence Assessment:

- provides updated predicted subsidence effects for the approved panels in the Whynot Seam and the modified longwalls in the Woodlands Hill, Arrowfield and Bowfield Seams;
- compares the revised predicted subsidence effects with those for the approved Maxwell Underground Mine;
- assesses the likely subsidence impacts on natural and built features in the approved and modified longwall mining area; and
- provides recommendations for strategies to manage the potential impacts as a result of mining.

The following sections provide a summary of the key findings of the Subsidence Assessment.

6.1.2 Background

Previous Assessment

The EIS Subsidence Assessment (MSEC, 2019) provided detailed subsidence predictions and impact assessments for natural and built features due to multi-seam mining in the Whynot, Woodlands Hill, Arrowfield and Bowfield Seams.

The EIS Subsidence Assessment (MSEC, 2019) assessed the subsidence impacts of the currently approved Project underground mining layout and concluded that the level of impacts on natural and built features can be managed by the preparation and implementation of appropriate management strategies.

Subsidence Impact Performance Measures

Development Consent SSD 9526 Conditions C1 and C5 outline subsidence impact performance measures for natural, heritage and built features relevant to the Modification. The performance measures pertain to features including water resources, land, biodiversity, Heritage sites, key public infrastructure and other bult features.

6.1.3 Impact Assessment Review

Prediction of Subsidence Effects

Subsidence is the vertical and horizontal movement of overburden and the land surface as a result of the extraction of underlying coal. Land surface movements are generally referred to as subsidence effects.

The type and magnitude of the subsidence effects are dependent on a range of variables, which includes the number of seams mined, mine geometry, mining depth, topography and other geological factors.

The subsidence movements of relevance to the Project, namely, systematic subsidence movements, far-field horizontal movements and sub-strata movements, are described in detail by MSEC (2019).

Prediction Methodology

Predictions of systematic subsidence movement for the approved Project were determined by MSEC (2019) using the Incremental Profile Method (IPM). The same method was adopted for assessment of the Modification. IPM involves the use of subsidence prediction curves derived from empirical data from NSW Coalfields, which is calibrated for local single-seam and multi-seam mining as well as specific geological conditions for the Project (as modified). In relation to the subsidence prediction methodology, the EIS peer reviewer, Professor Bruce Hebblewhite, noted:

> *It is noted that much of the Study Area is agricultural land with relatively few sensitive features that could be adversely impacted by the subsidence effects discussed. To this extent, the application of the MSEC IPM prediction methodology is considered to provide reasonable levels of confidence for subsidence prediction and impact assessment, given that "worst-case" scenarios have been adopted in the cases where greatest uncertainty exists.*

Incremental impacts have been determined by comparing the updated subsidence predictions for the Modification relative to that of the approved Project.

Systematic Subsidence Movements

A summary of the maximum cumulative predicted subsidence, tilt and curvature after mining each seam for the modified Project is provided in Table 3.

The maximum predicted vertical subsidence increases to 6,500 millimetres (mm) due to the Modification (i.e. an increase of approximately 16% relative to the approved Project). This increase occurs in small areas where the where the western extents of the panels in the Whynot Seam are located above the longwalls in all of the Woodlands Hill, Arrowfield and Bowfield Seams. The potential for impacts does not result from absolute vertical subsidence but rather from the differential movements (i.e. tilt, curvature and strain) (Appendix A).

The maximum predicted total tilt, curvatures and strains, based on the modified Project, are the same as the maximum predicted values for the approved Project. While the maximum predicted values do not change, the predicted subsidence effects increase in some locations and decrease in other locations, depending on their positions relative to the panels and longwalls (Appendix A).

Strains for the modified Project are consistent with the approved Project and would typically range between 10 mm/m and 20 mm/m, with localised strains greater than 20 mm/m (Appendix A).

Extent of Predicted Subsidence

The Subsidence Study Area is defined as the surface area that is likely to be affected by the secondary extraction of the panels and longwalls in the Whynot, Woodlands Hill, Arrowfield and Bowfield Seams based on the modified underground mining layouts. The extent of the Subsidence Study Area has been calculated, as a minimum, as the surface area enclosed by the greater of the 26.5° angles of draw from the limits of secondary extraction in each seam and by the predicted total 20 mm subsidence contour (Appendix A).

The surface area located within the Subsidence Study Area is 1,989 ha based on the modified Project and 1,891 ha based on the approved Project. The surface area within the Subsidence Study Area therefore increases by 98 ha, which is a change of approximately 5% (Appendix A).

While the Subsidence Study Area increases slightly due to the Modification, the types of natural and built features located within this area remain the same. The Subsidence Study Area also remains within Malabar-owned land (Appendix A).

Far-Field Horizontal Movements

Far-field horizontal movements are mine-induced, *en masse* horizontal displacement of the surface and generally only have the potential to damage long, linear features such as pipelines, bridges and dam walls.

Far-field horizontal movements are typically small (only detected by precise survey), tend to be movements towards the extracted panel area, and are accompanied by low levels of strain (e.g., < 0.1 mm/m).

Sub-surface Strata Movements

The caving and subsidence development process above a mining panel (longwall or bord and pillar extraction) usually results in sub-surface fracturing and shearing of sedimentary strata in the overburden. The extent of fracturing and shearing is dependent on mining geometry and overburden geology. The effect of sub-surface fracturing on the groundwater regime has been assessed in Appendix B, using the same methodology applied in the EIS groundwater model (HydroSimulations, 2019).

Table 3
Maximum Predicted Cumulative Systematic Subsidence Parameters

After Seam	Cumulative Vertical Subsidence (mm)	Cumulative Tilt (mm/m)	Cumulative Hogging Curvature (km^{-1})	Cumulative Sagging Curvature (km^{-1})
Whynot Seam	350	15	0.5	1.0
Woodlands Hill Seam	3300	35	1.5	1.5
Arrowfield Seam	4700	40	2.0	2.0
Bowfield Seam	6500	50	2.0	2.0

6.1.4 Subsidence Impacts

Subsidence impacts are the physical changes to the ground and its surface caused by the subsidence effects described in Section 6.1.2.

The potential consequences of these impacts are dependent on the size, location and nature of sensitive natural and built features. Potential consequences of subsidence on key natural and built features are described below.

A summary of subsidence impacts as a result of the Project (as modified) is provided below.

Surface Cracking

Panel and longwall mining can result in surface cracking, which occurs when there is a sufficient 'bending' of the ground surface as the subsidence trough develops. This usually occurs as a result of tensile strains; however, it can also occur when compressive strains result in buckling of strata near the surface.

The potential for surface cracking as a result of the Modification, increases in some locations and decreases in other locations, depending on the locations relative to the proposed panels and longwalls.

Consistent with the approved Project, the surface cracking for the Modification is expected to be typically between 50 mm and 100 mm, with widths greater than 300 mm in some locations (Appendix A).

Changes in Drainage Line Gradients

Mining has the potential to increase ponding in locations where mining-induced tilts oppose and are greater than the natural-stream gradients that were present prior to mining (MSEC, 2022).

No "named" drainage lines exist in the Subsidence Study Area. An assessment of the potential impacts of subsidence drainage lines overlying the longwalls in the Subsidence Study Area has been undertaken by MSEC (2022).

Section 6.3 provides further details regarding potential consequences to the geomorphology, hydrology, and water quality of ephemeral and intermittent drainage lines as a result of predicted changes in gradient.

Changes in Topographic Depressions

A depression is a landform element that stands below all, or almost all, points in the adjacent terrain. Examples of depressions include farm dams and pools present in stream channels (Appendix A).

Subsidence can result in an increase in the extent and depth of depressions in channels.

MSEC (2022) conducted an assessment on the potential for increased levels of ponding as a result of the Modification. The surface water and biodiversity implications of these additional ponding areas have been considered in Appendix C and Appendix D, respectively.

Slope Instability

There is potential for slope instability to occur in steeper areas overlying the longwalls as a result of changes in grade or surface cracking.

Curvature and strain may result in increased horizontal movements in the downslope direction of steeper slops, leading to tension cracks appearing at the tops and on the sides of the steeper slopes and compression ridges forming at the bottoms of the steep slopes. It is unlikely that mining-induced tilts would result in an adverse impact on the stability of the steeper slopes in the Subsidence Study Area (Appendix A).

A detailed assessment of the potential for instabilities to occur in steeper slopes is provided in Appendix A.

Increased Erosion Potential

As a result of tension cracks developing along steep slopes, soil erosion can occur if these cracks were left untreated.

The potential for altered flow patterns to occur as a result of slope changes is detailed in Appendix A.

6.1.5 Potential Consequences of Subsidence on Key Natural and Built Features

The major natural and built features within the Subsidence Study Area can be seen on Figure 9.

An assessment of the potential consequences of the subsidence impacts for the built and natural features located within the Subsidence Study Area is detailed in Appendix A. Other significant natural and built features that may be subjected to far-field movements or other movements have also been considered.

The potential consequences of the predicted subsidence impacts for the Modification are summarised in Table 4 and Table 5.

Natural Features

Land Use and Land Resources

The Project is situated on Malabar-owned land previously disturbed by agricultural activities, predominately grazing, and past open cut mining activities.

Land use within the Subsidence Study Area consists primarily of cattle grazing, with small areas of opportunistic fodder cropping.

A more detailed description of the land use and resources of the Subsidence Study Area and surrounds is provided in the EIS.

MSEC (2022) conducted an updated assessment of the subsidence impacts to land use and land resource. The Modification would result in negligible additional risk to cattle grazing within the Subsidence Study Area.

Hunter River and Saddlers Creek

Both the Hunter River and Saddlers Creek are located outside the Subsidence Study Area and would experience negligible vertical subsidence and no measurable conventional tilts, curvatures or strains as a result of the Modification (Appendix A).

In addition, the Hunter River and Saddlers Creek are not anticipated to experience any adverse impacts from valley-related movements (Appendix A).

Cliffs and Steeper Slopes

There are no cliffs within the Subsidence Study Area, as such, the Modification is not predicted to result in any adverse impacts on the stability of steeper slopes in the Subsidence Study Area (Appendix A).

Consistent with the approved Project, potential tension cracks or compression ridges formed along the ridgelines in the south-eastern part of the Subsidence Study Area would be managed in accordance with the recommended measures described in Appendix A.

Historic Heritage

No items listed on local, regional, State or national historic registers are located within the Subsidence Study Area, however there are listed sites within the vicinity of the Modification.

The potential for mining-induced impacts on these historic sites is considered negligible (Appendix A).

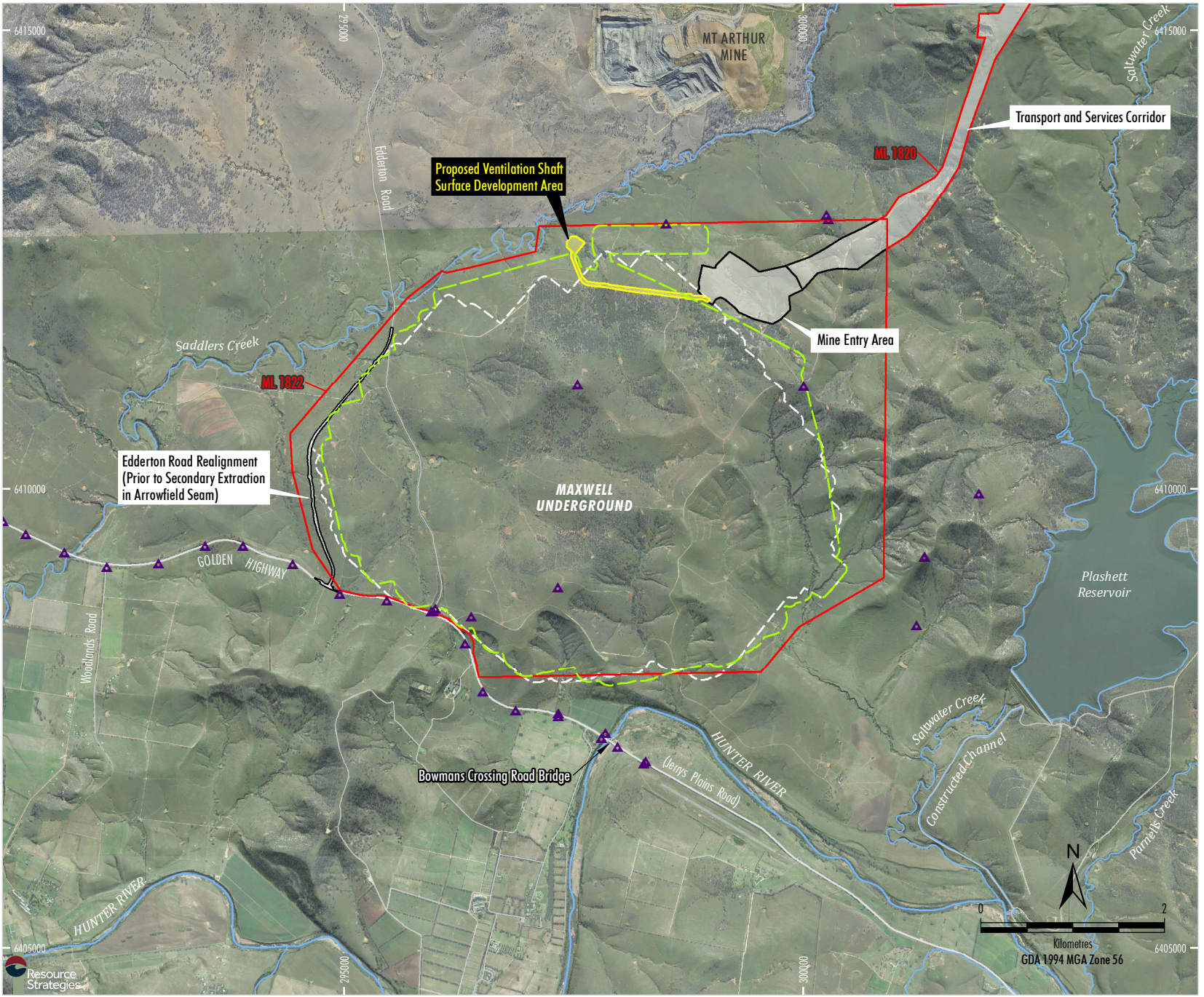
Aboriginal Heritage

Aboriginal Heritage sites are located across the Subsidence Study Area, and therefore are expected to experience some subsidence movements including surface cracking and soil heaving due to the Modification.

The potential for mining induced impacts on the finds, artefacts and deposits themselves is unlikely. However, if remediation is required, these works could potentially impact the Aboriginal heritage sites.

Potential impacts on the Aboriginal heritage sites have been assessed in the Aboriginal Cultural Heritage Assessment (Appendix E). In summary:

- There is one open artefact scatter site of low archaeological significance that would potentially be indirectly impacted by subsidence as a result of the Modification (37-2-4284).
- The remaining sites within Subsidence Study Area were previously approved for indirect impacts under the existing Development Consent (SSD 9526).



LEGEND

- Mining and Coal Lease Boundary
- Survey Control Mark
- Approved Maxwell Underground Mine
- Subsidence Study Area
- Indicative Surface Development Area
- Proposed Modification
- Subsidence Study Area
- Indicative Modification Surface Development Area

Source: NSW Spatial Services (2022); MSEC (2019, 2022)
Orthophoto Mosaic: 2020, 2019

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Modification Extent of Conventional Subsidence

Figure 9

Table 4
Potential Subsidence Consequences – Natural and Heritage Features

Feature	EIS Potential Subsidence Impact	Potential Modification Impact
Hunter River and Saddlers Creek	Negligible subsidence related consequences (i.e. diversion of flows or changes in natural drainage behaviour).	No change due to the Modification.
Drainage Lines	Potential development of topographic depressions resulting in ponding. Ponding is expected to be restricted to existing drainage lines.	Depths and extent of potential ponding areas above longwall mining marginally increased.
Aquifers and Groundwater Resources	Minimal impact to bores in 'highly productive' aquifers.	No change due to the Modification.
Steep Slopes	Minor environmental consequences (e.g., potential tension cracks or compression ridges).	No change due to the Modification.
Land Prone to Flooding or Inundation	No change to the Probable Maximum Flood (PMF) extent due to subsidence impacts. Development of topographic depressions resulting in ponding in the vicinity of farm dams.	No greater consequences than predicted in the EIS.
Swamps, Wetlands or Water Related Ecosystems	There are no swamps or wetlands identified in the Project area. Impacts to water related ecosystems are described in Section 6.2 and in Appendix D of the EIS.	No change due to the Modification.
Threatened or Protected Species	Minor subsidence impacts, such as cracking of the land surface. No significant environmental consequences to threatened species, populations or ecological communities.	No material change due to the Modification.
Aboriginal Heritage Sites	Potential for disturbance of some open artefact sites as a result of surface cracking, surface soil heaving and/ or subsidence remediation.	One additional open artefact scatter site (37-2-4284) would be indirectly impacted.
Historic Heritage Sites	Negligible subsidence impact or ground movements.	No change due to the Modification.

Table 5
Potential Subsidence Consequences – Built Features

Feature	EIS Potential Subsidence Impact	Potential Modification Impact
Public Roads	Edderton Road and Golden Highway would remain safe and serviceable. Subsidence impacts could include low levels of vertical subsidence. Negligible strains, tilts or curvatures. There would be no adverse impacts to the realignment of Edderton Road.	No change due to the Modification. The collection of subsidence data prior to mining of Edderton Road would facilitate improved management of subsidence impacts on Edderton Road.
Drainage Culverts	Negligible vertical subsidence impacts to the causeway where Edderton Road crosses Saddlers Creek. No expected measurable tilts, curvatures or strains on culverts.	No change due to the Modification.
Electrical Infrastructure	Powerlines would remain safe and serviceable. Subsidence impacts could include low levels of vertical subsidence. Negligible strains, tilts or curvatures.	No change due to the Modification.
Telecommunications Infrastructure	There is no telecommunications infrastructure located in the Project area.	No change due to the Modification.
Dams, Reservoirs or Associated Works	There are no public dams, reservoirs or associated works within the Project area. The Plashett Reservoir located outside the Project area would remain safe and serviceable.	No change due to the Modification.
Agricultural Utilisation and Farm Facilities	Negligible risk to cattle and workers from potential surface cracking and deformations. Minor subsidence impacts to rural structures, tanks and fences.	No change due to the Modification.
Permanent Survey Control Marks	Minor subsidence impacts and far-field horizontal movement from the Project.	No change due to the Modification.

Threatened Species

Minor subsidence impacts such as surface cracking will not generate significant environmental consequences for threatened species, threatened populations or threatened ecological communities (TECs) (Appendix A).

Built Features

Public Infrastructure

Public infrastructure located above and in the vicinity of the Maxwell Underground includes the Golden Highway, Edderton Road, Bowmans Crossing Bridge, an Ausgrid 11 kV overhead powerline and survey control marks (Figure 9).

The Golden Highway is located outside the Subsidence Study Area, at a minimum distance of 170 m from the proposed longwalls in the Woodlands Hill, Arrowfield and Bowfield Seams. At this distance, the highway is predicted to experience less than 20 mm vertical subsidence, and no measurable tilts, curvatures or strains.

The Bowmans Crossing bridge where the Golden Highway crosses the Hunter River is located approximately 750 m south of the Subsidence Study Area, and is predicted to experience negligible vertical subsidence, tilt, curvature and strain.

Edderton Road in its current alignment crosses the western part of the Subsidence Study Area and is located above the Woodlands Hill, Arrowfield and Bowfield Seams. As per Condition B90 of Development Consent 9526, Malabar is required to construct Edderton Road realignment prior to commencing secondary extractions. Realignment of the road around the Subsidence Study Area would experience less than 20 mm vertical subsidence and no measurable tilts, curvatures or strains.

The maximum predicted subsidence effects for Edderton Road from mining in the Whynot Seam and Woodlands Hill Seam are less for the Modification than the maximum predicted values for the approved Project. It is unlikely the indicative realignment of Edderton Road would experience adverse impacts due to the proposed mining (Appendix A).

The 11 kV Ausgrid powerline follows the current alignment of Edderton Road and is located directly above the proposed longwalls (Plate 2). The Ausgrid 11 kV, powerline, in its current alignment, would not be directly affected by subsidence as the cables are supported by the power poles above ground level. However, the power poles could experience tilts and strains as a result of mining and, therefore, the power line could be affected by increased cable tensions and lateral loads on the power poles and/or reduced cable clearances (Appendix A).

The maximum predicted total subsidence effects for the powerline for the Modification are similar to the approved Project. The assessed impacts for the powerline, based on the Modification, are the same as those based on the approved Project (Appendix A).

All public infrastructure would remain in a safe and serviceable condition.

Plate 2: 11 kV voltage powerline along Edderton Road
Source: MSEC (2022).

Prescribed Dams

The Plashett Reservoir is a prescribe dam that is managed by NSW Dams Safety Committee and is located at a minimum distance of 2 km outside of the Subsidence Study Area. At this distance, the vertical subsidence at the reservoir is negligible (Appendix A).

The reservoir and dam wall could experience very small far-field horizontal movements due to the mining, typically less than 25 mm, which is in the order of survey tolerance for absolute position. It is unlikely that the differential horizontal movements (i.e. strains) at the dam wall would be measurable. The assessed impacts for the dam wall for the Modification are the same as the approved Project (Appendix A).

Dwellings

No dwellings would be impacted by subsidence from the Project (as modified).

Malabar-owned Infrastructure

All freehold land within the Subsidence Study Area is owned by Malabar (Figures 4 and 9).

6.1.6 Mitigation Measures

Mitigation measures and management for potential consequences on biodiversity, Heritage sites, groundwater and surface water are described in Sections 6.2 to 6.5.

Mitigation and management measures for potential subsidence impacts are detailed below.

Extraction Plans

In accordance with Development Consent SSD 9526 Condition C8, Malabar must prepare an Extraction Plan for all second workings to be approved by the Planning Secretary.

The Extraction Plan prepared for the Project (as modified) are required to:

- demonstrate that subsidence impact performance measures for natural, heritage and built features will be achieved (Table 9 and 10 of Development Consent SSD 9526); and
- outline management and remediation strategies for potential impacts and/or environmental consequences to meet rehabilitation objectives in Development Consent SSD 9526 Condition B76.

Malabar would implement a Subsidence Monitoring Program to manage risks associated with conventional and non-conventional subsidence, validate subsidence predictions and thus inform an adaptive management plan in accordance with Development Consent SSD 9526 Condition E4.

Adaptive management would involve periodic evaluation of predicted and resulting impacts against the performance measures and adjustment (if necessary) of control measures to comply with adopted performance measures.

Public Infrastructure

Public infrastructure located within or immediately adjacent to the extent of conventional subsidence includes the Golden Highway, Edderton Road, an Ausgrid 11 kV overhead power line and survey control marks (Figure 9).

Built Features Management Plans would be developed as part of the relevant Extraction Plan.

Potential subsidence impacts on Edderton Road will be managed through road maintenance along the existing alignment during mining of the Woodlands Hill Seam followed by the realignment of the road around the Subsidence Study Area (prior to secondary extraction in Arrowfield Seam).

Malabar-owned Infrastructure

Malabar will manage potential subsidence consequences for its own infrastructure as a component of the Extraction Plans.

Subsidence Monitoring

Surface subsidence monitoring data will be collected in accordance with the subsidence monitoring programs detailed in the Extraction Plans.

Subsidence monitoring may include transverse and longitudinal subsidence lines and survey lines/pegs around features of interest.

The subsidence monitoring data will be reviewed as part of the Extraction Plan and reporting processes to assist with the management of risks associated with subsidence, validate subsidence predictions and inform the adaptive management process.

6.2 GROUNDWATER

6.2.1 Methodology

The *EIS Groundwater Assessment* (HydroSimulations, 2019) assessed the potential impacts of the Project on groundwater resources and groundwater quality in accordance with relevant guidelines including:

- *Australian Groundwater Modelling Guidelines* (Barnett *et al.*, 2012) and *Murray-Darling Basin Commission (MDBC) Groundwater Flow Modelling Guideline* (Middlemis *et al.*, 2001).
- the *Aquifer Interference Policy – NSW Government Policy for the licensing and assessment of aquifer interference activities* (NSW Government, 2012).
- *Significant Impact Guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources* (Department of the Environment [DotE}, 2013b).
- *Information Guidelines for the Independent Expert Scientific Committee advice on coal seam gas and large coal mining development proposals* (Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development, 2018) and associated explanatory notes.
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, 2000).
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Governments and Australian state and territory governments [ANZG], 2018).

The EIS Groundwater Assessment (HydroSimulations, 2019) was also peer reviewed by Kalf and Associates (Dr Frans Kalf) and the peer review report is presented in Attachment 6 of the EIS.

A Groundwater Review has been prepared by SLR Consulting Australia Pty Ltd (SLR, 2022) to assess and update groundwater modelling and predictions based on the modified longwalls in the Woodlands Hill, Arrowfield and Bowfield Seams.

6.2.2 Background

Water Management Performance Measures

Malabar must comply with the water performance measures outlined in Condition B40 of Development Consent SSD 9526. The performance measures focus on the protection of key features including alluvial aquifers, water courses and aquatic and riparian ecosystems

Malabar has prepared a Water Management Plan in accordance with Condition B42 of the Development Consent SSD 9526. The Water Management Plan demonstrates how the water management performance measures will be achieved.

Groundwater Regime

The Project lies within the Sydney Basin comprising Late Permian aged sediments forming the Singleton Supergroup of the Hunter Coalfield.

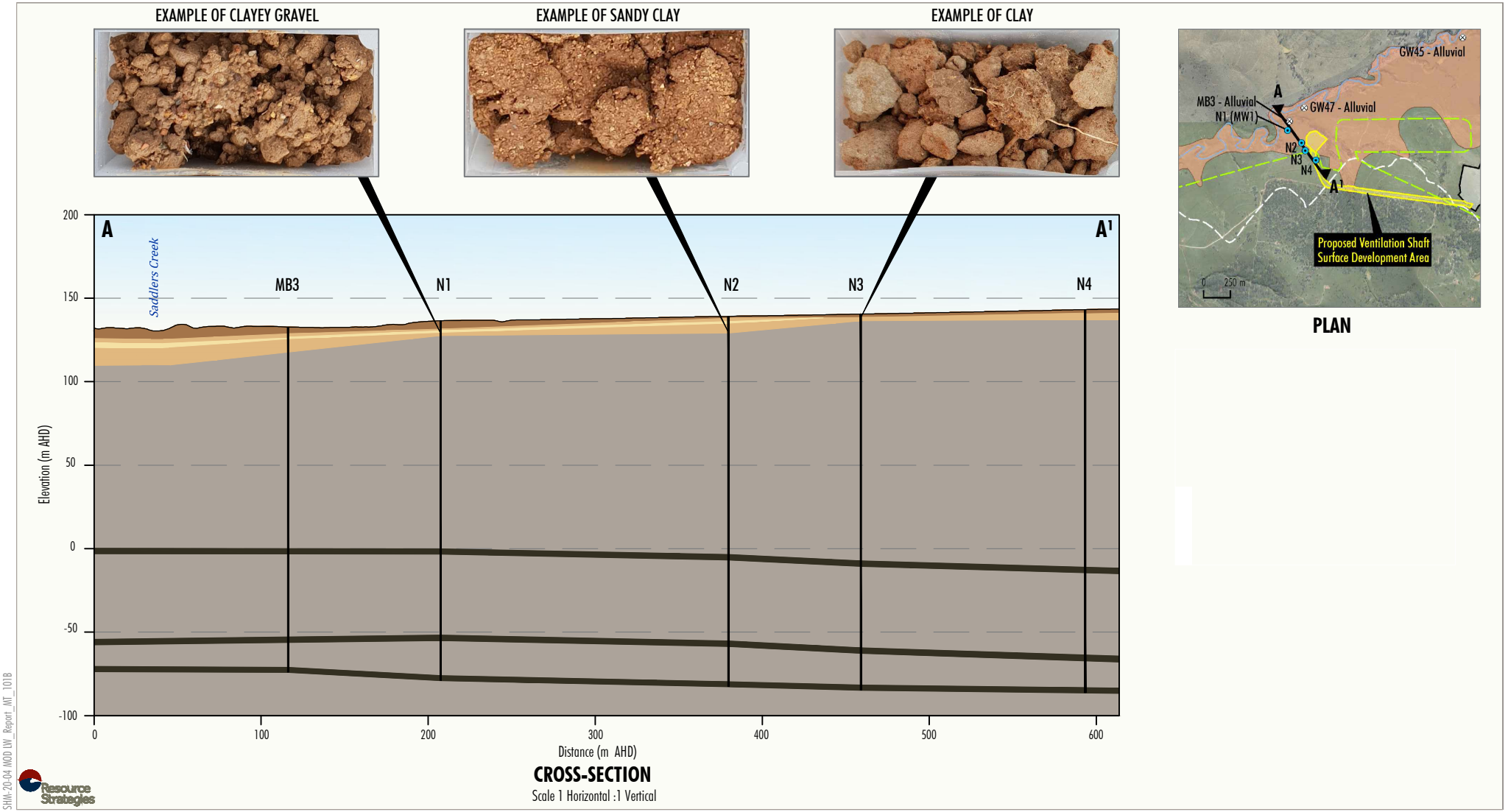
The Project is located in the Hunter River catchment. Geological mapping indicates alluvium present along the Hunter River, Saddlers Creek and Saltwater Creek.

The Hunter River Alluvium comprises surficial silts and clays overlying basal sands and gravels, which are categorised as ‘highly productive’ along its thickest sequences (HydroSimulations, 2019). Groundwater occurs within the Hunter River Alluvium at depths of approximately 5 m to 10 m below the ground surface and generally over 2 m below the base of the Hunter River. This indicates that the Hunter River generally has losing conditions, where surface water from the river seeps into the underlying alluvium (Appendix B).

The Saddlers Creek Alluvium comprises surficial silts and clays overlying heterogenous interbedded clays, slits, sands and gravels. The occurrence of sands and gravels is primarily within the lower reaches of Saddlers Creek, in close proximity to the confluence of the Hunter River. Where groundwater is present, it occurs at approximately 3 m to 10 m below the ground surface (Appendix B).

The Modification is located outside the boundary of the ‘highly productive’ alluvium mapped along Saddlers Creek (Figure 8). Alluvial drilling indicates that alluvium in the vicinity of the ventilation shaft is primarily comprised of clay, with some sand (Figure 10).

The Saltwater Creek Alluvium comprises a sandy creek bed surrounded by steeply incised banks of colluvium and weathered basalt (Appendix B).



SHM-20-04 MOD LW_Report_MT_101B

LEGEND

- Clay
- Sandy Clay
- Clayey Gravel
- Denman Formation/Jerrys Plains Subgroup
- Target Coal Seam

Source: After Hydrosimulations (2019) and ENRS (2019)

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Saddlers Creek Alluvium
Cross-section

Figure 10

Groundwater in the Permian strata occurs in the coal seams and in the sandstone/siltstone units of lower permeability. Recent groundwater levels and trends in the Permian Coal Measures are representative and consistent with those identified in the EIS (Appendix B).

Groundwater Levels

Review of contemporary groundwater levels within monitoring bores found levels remained generally consistent to those reported in the EIS Groundwater Assessment (Appendix B).

Groundwater Quality

SLR (2022) analysed water quality parameters including pH, Electronic Conductivity (EC), Total Dissolved Solids (TDS) and major ions for monitoring bores in the vicinity of the Project.

Water quality results within the hydrostratigraphic units across the Project area are generally consistent with the water quality results presented in the EIS Groundwater Assessment (Appendix B).

Additional observations reported for the Modification include (Appendix B):

- Extremely dry conditions have resulted in some higher recorded salinities due to accumulation of salts.
- Recent water quality measurements show that the “highly productive” Hunter River Alluvium remains generally fresh.
- Since January 2019, metal concentrations appear consistent with concentrations previously reported in the EIS (i.e. typically below laboratory limit of reporting).

6.2.3 Impact Assessment Review

HydroSimulations (2019) developed and calibrated a numerical groundwater model for the EIS Groundwater Assessment. Overall, the calibration of the numerical groundwater model showed generally good agreement to the comprehensive groundwater level/pressure data (HydroSimulations, 2019). Dr Frans Kalf in the peer review of the Groundwater Assessment concluded the calibration of the groundwater model is acceptable (Attachment 6 of the EIS).

The nominal groundwater model calibration was verified using updated groundwater monitoring data collected from 2018 to 2021. The verification indicates the groundwater model continues to calibrate well to the updated data and is fit for purpose.

Mine Inflows

SLR (2022) compared the predicted total groundwater inflows to the Maxwell Underground for the Modification and the approved Project.

The predicted mine inflows to the Maxwell Underground workings for the Modification would be generally consistent with those predicted for the approved Project on an annual basis, with the Modification resulting in an overall reduction of approximately 500 megalitres (ML) in total groundwater inflows over the life of the Project (Appendix B).

Drawdown and Depressurisation

HydroSimulations (2019) found the approved Project would result in depressurisation in the “less productive” fractured and porous rock groundwater sources in the vicinity of the Project.

Groundwater model predictions concluded that the Modification would result in depressurisation of the deeper strata propagating further to the north-west and south-east, however is not expected to cause a material increase in drawdown in the Saddlers Creek and Saltwater Creek Alluvium (Appendix B).

A reduction in the propagation of depressurisation is expected to the north-east and south-west of the Modification, resulting in a lesser impact on deeper strata beneath the Hunter River relative to the approved Project (Appendix B).

Incidental Water Take

The approved Project is predicted to reduce upward leakage from the Permian coal measures to the overlying alluvium in localised areas along Saddlers Creek, Saltwater Creek and the Hunter River.

SLR (2022) has compared predicted alluvial take from the approved Project and the Modification. There is predicted to be a slight decrease in net alluvial groundwater take due to the Modification (less than 1 ML/year) (Appendix B).

Stream Flow Effects

HydroSimulations (2019) predicted there would be no change in baseflow along Saddlers Creek and Saltwater Creek for the approved Project. The Modification would result in no change to this finding (Appendix B).

Predicted drawdown from the approved Project is predicted to extend toward the Hunter River, with the EIS groundwater model predicting increased leakage of up to 0.55 ML/year from the Hunter River to the underlying alluvium (HydroSimulations, 2019). This is considered negligible in comparison to the observed historical flow rates in the Hunter River and the regulation of its flow. For comparison, the median annual flow in the Hunter River at the Liddell Gauging Station (210083) is approximately 87,600 ML/year.

The Modification results in a slight increase in river leakage from the Hunter River to the underlying alluvium, peaking at 0.71 ML/year post mining and with a maximum incremental change estimated at 0.18 ML/year (Appendix B). This remains negligible in comparison to the observed historical flow rates in the Hunter River and the regulation of its flow.

6.2.4 Mitigation Measures

Potential impacts to water resources associated with the Project would continue to be managed under the Water Management Plan required under Condition B42 of Development Consent SSD 9526.

Groundwater monitoring for the Project would continue to be undertaken throughout the life of the mine in accordance with the Groundwater Management Plan (as part of the Water Management Plan) to demonstrate compliance with regulatory requirements.

Groundwater level and groundwater quality monitoring would continue to be conducted consistent with plans stated in the EIS. Yearly reporting of the water level and water quality results would be included in the Annual Review.

Groundwater take for the modified Project would continue to be licensed in accordance with the requirements of the *Water Management Act 2000*.

6.3 SURFACE WATER

6.3.1 Methodology

The *EIS Surface Water Assessment* (WRM, 2019) assessed the potential impacts of the Project on surface water resources and quality.

The Maxwell Underground site water balance model developed as part of the EIS Surface Water Assessment (WRM, 2019) was amended to incorporate minor changes for Modification 1 (WRM, 2021). The Modification 1 site water balance model was used as a base case scenario for comparison with a second model updated to reflect changes due to the Modification (Appendix C).

6.3.2 Background

The Project is located in the Hunter River catchment. The catchment extends some 110 km to the north and 140 km to the west and includes the major tributaries of the Pages River, Dart Brook and the Goulburn River.

Maxwell Infrastructure is located in the upper headwaters of the following tributaries of the Hunter River:

- Ramrod Creek;
- Bayswater Creek;
- Saltwater Creek; and
- Saddlers Creek.

The main drainage feature in the vicinity of the repositioned ventilation shaft pad is Saddlers Creek located to the east. Small tributaries of Saddlers Creek are located immediately north of the proposed ventilation shaft pad.

6.3.3 Impact Assessment Review

Catchment Runoff

There would be a small increase in surface development area due to the re-positioning of the upcast ventilation shaft. This results in a small increase in catchment area excised from Saddlers Creek (Appendix C).

The Modification results in the excision of an additional 2.4 ha, which is approximately 0.02% of the total catchment of Saddlers Creek. Accordingly, the impact of the Modification on flows in Saddlers Creek would be negligible and too small to measure (Appendix C).

Stream Baseflow

The potential impact of the Modification on baseflow in Saddlers Creek and the Hunter River has been assessed by SLR (2022). The assessment concluded the following (Appendix B):

- zero impact on baseflow in Saddlers Creek; and
- a maximum incremental baseflow reduction of 0.18 ML/year in the Hunter River (i.e. a total reduction in baseflow of 0.71 ML/year due to the Project incorporating the Modification).

The median annual flow in the Hunter River at the Liddell Gauging Station (210083) is approximately 87,600 ML/year. In the context of the Hunter River regulated system, a baseflow loss of 0.71 ML/year is negligible. Hence, the Project would not measurably affect baseflow in the downstream waterways (Appendix C).

Potential Subsidence Impacts

The EIS Geomorphology Assessment (Fluvial Systems, 2019) found that subsidence from the approved Project was predicted to increase the surface area of depressions in drainage lines from 8.9 hectares (ha) (existing case) to 12.9 ha (impacted case). A further 2.5 ha of the depressions present under the existing case were predicted to become deeper under the impacted case (Appendix C).

Fluvial Systems (2019) considers these in-channel subsided areas would naturally fill with sediment over time, reducing the maximum increase in surface ponding that would occur at any one time.

Notwithstanding, WRM (2019) determined that the total volume of water retained in the waterways due to the additional surface depressions, conservatively assuming no infilling with sediment, would be approximately 32 ML (Appendix C).

MSEC (2022) has mapped areas that may form topographic depressions as a result of the Modification. Topographical depressions greater than 50 cm in depth that coincide with drainage lines are considered to represent potential ponding areas. The Modification is predicted to result in additional potential ponding areas of approximately 3.5 ha (Appendix C).

The total volume of water that would be retained in ponding areas as a result of the Modification is conservatively estimated to be 18 ML, relative to 32 ML estimated in the EIS. Given that the average annual flows recorded at the Bowfield stream gauge (GS210043) on Saddlers Creek is 1,000 ML, the potential reduction in flows due to subsidence is negligible (Appendix C).

There is no change to the risk of fracturing rock slabs and bedrock beneath draining lines (the same three rock slabs are predicted to be impacted) as a result of the Modification (MSEC, 2022). Accordingly, consistent with the findings for the approved Project, the potential for the Modification to result in diversion of ephemeral flows into the underlying strata during low flow events would remain negligible (Appendix C).

Surface Water Quality

Water balance modelling indicates a very low probability (1% in any one year) that VSP Sediment Dam could overflow to Saddlers Creek. This is expected given its function as a sediment dam (i.e. it is designed to overflow when rainfall events exceed the design criteria) (Appendix C).

The water within VSP Sediment Dam is not mine-affected, and any overflows would only occur during extreme rainfall events and be heavily diluted by background flow in Saddlers Creek.

Accordingly, the Modification would not have an incremental impact on water quality in downstream watercourses (Appendix C).

Flooding

WRM (2022) has undertaken updated modelling of the PMF in Saddlers Creek to determine any interactions with the Modification. The PMF is largest flood that could conceivably be expected to occur in Saddlers Creek.

The updated PMF modelling indicates there would be two minor interactions between the Modification and backwater flood flows in tributaries of Saddlers Creek. These interactions include:

- the northern boundary of the ventilation shaft pad; and
- a small section of subsided land.

The impact of these interactions has been assessed by WRM (2022) and is presented in Appendix C. There would be local flood level increases of up to 0.3 m in the immediate vicinity of the ventilation shaft pad. The increases do not extend into the main Saddlers Creek channel and are considered very minor (Appendix C).

The potential impact of the Modification on Saddlers Creek flood behaviour is negligible and only applies to the PMF flood event (Appendix C).

6.3.4 Mitigation Measures

Potential impacts to water resources associated with the Project would continue to be managed under the Water Management Plan developed in accordance with Condition B42 of Development Consent SSD 9526.

Surface water monitoring for the Project would continue to be undertaken to demonstrate compliance with regulatory requirements, as well as improve the understanding and efficiency of the site water management system.

The site water balance would be periodically reviewed over the life of the Project (incorporating the Modification).

6.4 BIODIVERSITY

6.4.1 Methodology

Previous Biodiversity Development Assessment Reports

The *Maxwell Project Biodiversity Development Assessment Report* (Hunter Eco, 2019a) assessed the potential impacts of the Project on terrestrial ecology.

Hunter Eco (2021) also prepared the *Maxwell Underground Mine Project Mine Entry Area Modification Biodiversity Development Assessment Report*, which assessed the potential impacts of Modification 1.

Modification Biodiversity Development Assessment Report

A Modification BDAR has been prepared by Hunter Eco (2022) for the Modification in accordance with the NSW *Biodiversity Assessment Method* (BAM) (DPIE, 2020a) and is presented in Appendix D.

The Modification Development Footprint is referred to throughout the BDAR (Appendix D) and comprises the Modification surface development area and additional potential subsidence ponding areas associated with the Modification (Figures 11a and 11b).

The BDAR has drawn on the extensive flora and fauna surveys that have been conducted in the vicinity of the Modification for the *Maxwell Project Biodiversity Development Assessment Report* (Hunter Eco, 2019a) in 2017 and 2018, by Hunter Eco (2019b; 2021) and Future Ecology (2019), as well as supplementary surveys undertaken in 2021 and 2022 within the Modification Development Footprint (Appendix D).

6.4.2 Background

Baseline Flora

Hunter Eco (2022) assessed the likely occurrence of the following in the study area, encompassing the Modification Development Footprint and immediate surrounds:

- native vegetation;
- TECs listed under the BC Act and EPBC Act; and
- threatened flora species.

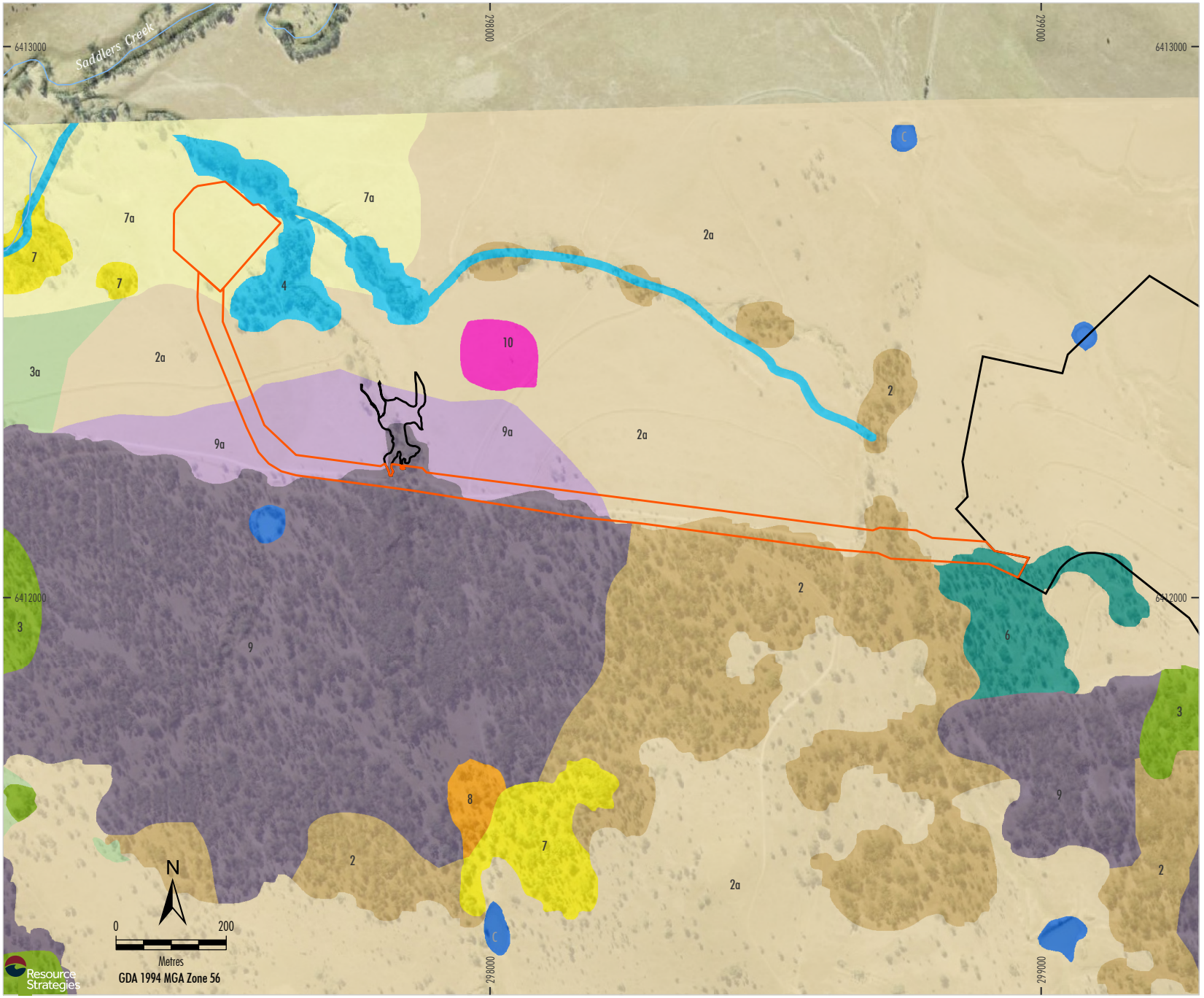
The flora surveys were undertaken in accordance with the BAM (DPIE, 2020a) and *Surveying Threatened Plants and Their Habitats: NSW Survey Guide for the Biodiversity Assessment Method* (DPIE, 2020b).

The surveys by Hunter Eco in 2021 and 2022 included sampling of vegetation integrity plots, identification of Plant Community Types (PCTs), and targeted searches for TECs, species and populations within the Modification Development Footprint.

A description of the methodology employed by Hunter Eco (2022) is provided in Appendix D.

Baseline Fauna

The *Maxwell Project Baseline Fauna Survey Report* (Future Ecology, 2019) (Attachment B of Appendix D) provides a description of targeted searches undertaken for the Project for threatened fauna species listed under the BC Act and/or EPBC Act that were known, or likely to occur, in the vicinity of the Project and surrounds.



LEGEND

Approved Surface Development Area

Modification Development Footprint

VEGETATION MAPPING

Dry Sclerophyll Forests (Shrub/grass sub-formation)

2 White Box - Ironbark - Red Gum Shrubby Forest (PCT1606) [1]

2a White Box - Ironbark - Red Gum Shrubby Forest - Derived Native Grassland (PCT1606) [1]

Dry Sclerophyll Forests (Shrubby sub-formation)

3 Slaty Box Shrubby Woodland (PCT1655) [2]

3a Slaty Box Shrubby Woodland - Derived Native Grassland (PCT1655)

Forested Wetlands

4 Swamp Oak Forest (PCT1731)

Grassy Woodlands

6 Bull Oak Grassy Woodland (PCT1692)

7 Yellow Box - Apple Grassy Woodland (PCT1693) [1]

7a Yellow Box - Apple Grassy Woodland - Derived Native Grassland (PCT1693) [1]

8 Fuzzy Box Woodland (PCT201)

9 Ironbark - Grey Box Grassy Woodland (PCT1691) [4]

9a Ironbark - Grey Box Grassy Woodland - Derived Native Grassland (PCT1691)

10 Weeping Myall Woodland (PCT116) [5]

Other

C Waterbody/Dam

[1] Listed BC Act, White Box Yellow Box Blakely's Red Gum Woodland; Listed EPBC Act, White Box - Yellow Box - Blakely's Red Gum Woodland

[2] Listed BC Act, Hunter Valley Footslopes Slaty Gum Woodland; Listed EPBC Act, Central Hunter Valley Eucalypt Forest and Woodland

[4] Listed BC Act, Central Hunter Grey Box - Ironbark Woodland; Listed EPBC Act, Central Hunter Valley Eucalypt Forest and Woodland

[5] Listed BC Act, Hunter Valley Weeping Myall Woodland; Listed EPBC Act, Hunter Valley Weeping Myall (Acacia pendula) Woodland

Source: NSW Spatial Services (2022); Hunter Eco (2022)
Orthophoto Mosaic: NSW Spatial Services (2020)

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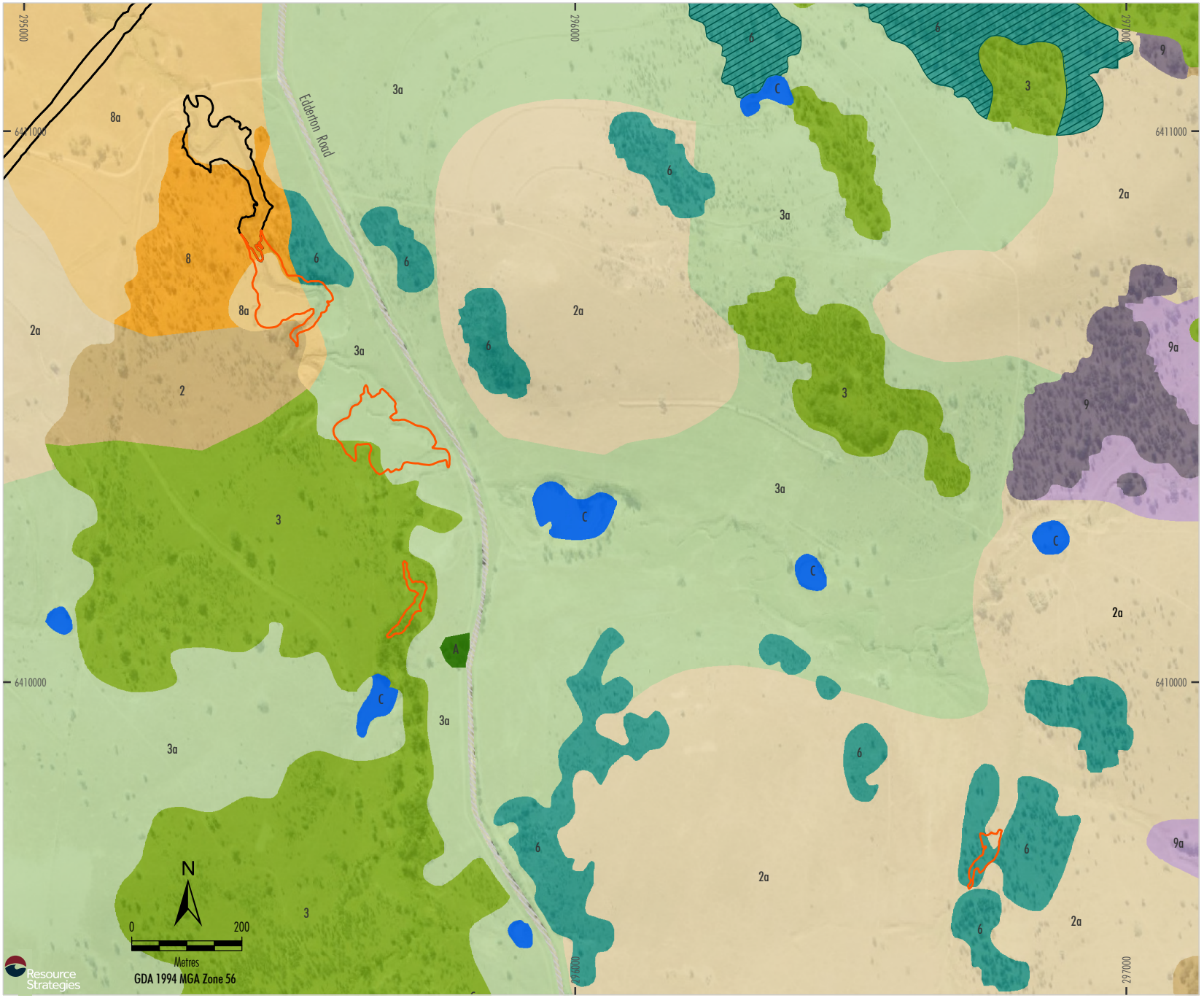
MAXWELL UNDERGROUND MINE PROJECT

Vegetation Mapping
- Modification Surface Development Area

Figure 11a



LEGEND

Approved Surface Development Area

Modification Development Footprint

VEGETATION MAPPING

Dry Sclerophyll Forests (Shrub/grass sub-formation)

1 White Box - Ironbark - Red Gum Shrubby Forest (PCT1606) [1]

1a White Box - Ironbark - Red Gum Shrubby Forest - Derived Native Grassland (PCT1606) [1]

Dry Sclerophyll Forests (Shrubby sub-formation)

3 Slaty Box Shrubby Woodland (PCT1655) [2]

3a Slaty Box Shrubby Woodland - Derived Native Grassland (PCT1655)

Grassy Woodlands

6 Bull Oak Grassy Woodland (PCT1692) [3]

8 Fuzzy Box Woodland (PCT201)

8a Fuzzy Box Woodland - Derived Native Grassland (PCT201)

9 Ironbark - Grey Box Grassy Woodland (PCT1691) [4]

9a Ironbark - Grey Box Grassy Woodland - Derived Native Grassland (PCT1691)

Other

A Planted Trees

D Waterbody/Dam

E Infrastructure/Cleared Land

[1] Listed BC Act, White Box Yellow Box Blakely's Red Gum Woodland; Listed EPBC Act, White Box - Yellow Box - Blakely's Red Gum Woodland

[2] Listed BC Act, Hunter Valley Footslopes Slaty Gum Woodland; Listed EPBC Act, Central Hunter Valley Eucalypt Forest and Woodland

[3] The hatched portions of this PCT is Listed EPBC Act, Central Hunter Valley Eucalypt Forest and Woodland

[4] Listed BC Act, Central Hunter Grey Box - Ironbark Woodland; Listed EPBC Act, Central Hunter Valley Eucalypt Forest and Woodland

Source: NSW Spatial Services (2022)
Orthophoto Mosaic: NSW Spatial Services (2020)

MALABAR

MAXWELL UNDERGROUND MINE PROJECT

Vegetation Mapping
- Areas of Potential Ponding

Figure 11b

Fauna survey techniques included habitat surveys, diurnal and nocturnal bird surveys, ground Elliott trapping, arboreal Elliott trapping, cage trapping, hair tubes, camera trapping, nest boxes, bat surveys, harp trapping, ultrasonic bat detection, microbat habitat searches, nocturnal call playback, spotlighting, Koala scat searches, searches for reptiles and amphibians (active searches, pitfall traps and artificial shelter habitat), tadpole surveys, and opportunistic observations (Future Ecology, 2019).

The *Maxwell Project Baseline Fauna Survey Report* (Future Ecology, 2019) also included consideration of the results of previous fauna surveys in the vicinity of the Project (Attachment B of Appendix D).

Landscape Features

The majority of the Modification Development Footprint has been cleared and used for agricultural grazing purposes for well over 100 years.

There are no Areas of Outstanding Biodiversity Value listed under the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation) associated with the Modification Development Footprint or defined potential flyways for migratory species listed under the EPBC Act that pass over the Modification Development Footprint (Appendix D).

Native Vegetation and Threatened Ecological Communities

The Modification Development Footprint consists entirely of native vegetation, predominantly derived native grassland along with woodland.

The Modification Development Footprint is approximately 13.3 ha comprising (Figures 11a and 11b):

- 3.8 ha of fragmented (i.e. not continuous) native woodland/forest vegetation; and
- 9.5 ha of derived native grassland.

Six PCTs were identified within the Modification Development Footprint consisting of eleven vegetation zones (Table 6; Figures 11a and 11b).

Two TECs listed under the EPBC Act and three TECs listed under the BC Act were identified within the Modification Development Footprint (Table 6).

Threatened Flora Species

Two threatened flora populations, *Acacia pendula* population in the Hunter Catchment and *Diuris tricolor* population in the Muswellbrook LGA, were recorded in the vicinity of the proposed surface development area (Appendix D), however the footprint of the Modification was altered to avoid any impacts on these two species (Appendix D).

Four threatened flora species that have associated PCTs within the additional potential subsidence ponding areas were assumed to be present (Appendix D) as they were unable to be surveyed during the appropriate time of year, namely:

- Austral Toadflax (*Thesium australe*) in PCT 1606 DNG and PCT 1655 DNG;
- Leafless Tongue Orchid (*Cryptostylis hunteriana*) in PCT 1655 woodland and DNG; and
- Pine Donkey Orchid (*Diuris tricolor*) and Tarengo Leek Orchid (*Prasophyllum sp. Wybong*) in PCT 201 woodland and DNG.

Threatened Fauna Species

Future Ecology (2019) recorded a number of threatened fauna species listed under the BC Act and EPBC Act that are 'ecosystem credit species' (i.e. species that can be predicted to be present based on a habitat assessment).

Three 'species credit species' (as defined by the *Threatened Biodiversity Data Collection*) have potential habitat within the Modification Development Footprint (Appendix D):

- Striped Legless Lizard (*Delma impar*);
- Squirrel Glider (*Petaurus norfolcensis*); and
- Southern Myotis (*Myotis macropus*).

The Striped Legless Lizard is also listed under the EPBC Act as vulnerable. The closest recording of a Striped Legless Lizard to the Modification Development Footprint was approximately 1 kilometre (km) south-east of the mine entry area, recorded by Future Ecology (2019) (Appendix D).

6.4.3 Impact Assessment Review

The likely direct and indirect impacts of the Modification on terrestrial ecology have been addressed in Appendix D and are described below.

Table 6
Mapped Vegetation Communities

Mapping Unit[A]	Generic Name	Conservation Status[B]		PCT	Modification Development Footprint (ha)		
		BC Act	EPBC Act		Surface Areas	Potential Subsidence Ponding	Total
Dry Sclerophyll Forests (Shrub/grass sub-formation)							
2	White Box – Narrow-leaved Ironbark – Blakely's Red Gum shrubby open forest of the central and upper Hunter[1]	CE	CE	1606	1.2	0.1	1.3
2a	White Box – Narrow-leaved Ironbark – Blakely's Red Gum shrubby open forest of the central and upper Hunter – DNG[1]	CE	CE	1606	2.5	0.1	2.6
3	Grey Box – Slaty Box shrub – grass woodland on sandstone slopes of the Upper Hunter Valley and Sydney Basin[2]	V	CE	1655	-	0.5	0.5
3a	Grey Box – Slaty Box shrub – grass woodland on sandstone slopes of the Upper Hunter Valley and Sydney Basin – DNG	-	-	1655	-	1.7	1.7
Grassy Woodlands							
6	Bull Oak grassy woodland of the Central Hunter Valley*	-	-	1692	0.4	0.2	0.6
7a	Yellow Box – Rough-barked Apple gassy woodland of the upper Hunter and Liverpool Plains – DNG	-	-	1693	2.5	-	2.5
8	Fuzzy Box woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	-	-	201	-	0.2	0.2
8a	Fuzzy Box woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion - DNG	-	-	201	-	1	1
9	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter[3]	E	CE	1691	1.2	-	1.2
9a	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter - DNG	-	-	1691	1.7	-	1.7
				Total Woodland/Forest	**2.8**	**1**	**3.8**
				Total Derived Native Grassland	**6.7**	**2.8**	**9.5**
				Total Area	**9.5**	**3.8**	**13.3**

Source: After Appendix D.

[A] Mapping units are shown on Figures 11a and 11b.

[B] Threatened ecological community (TEC) status under the BC Act and/or EPBC Act (current as at June 2022). V = Vulnerable; E = Endangered; CE = Critically Endangered.

[1] Listed BC Act, CE: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions; Listed EPBC Act, CE: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

[2] Listed BC Act, V: Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion; Listed EPBC Act, CE: Central Hunter Valley Eucalypt Forest and Woodland.

[3] Listed BC Act, E: Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions; Listed EPBC Act, CE: Central Hunter Valley Eucalypt Forest and Woodland.

* This occurrence of PCT 1692 does not meet the criteria for the EPBC Act, CE: Central Hunter Valley Eucalypt Forest and Woodland.

Note: Totals may differ due to rounding.

Measures to Avoid and Minimise Impacts

The location of the repositioned ventilation shaft and associated infrastructure has been selected to:

- make use of an existing track for the access road corridor;
- avoid a known population of Weeping Myall (*Acacia pendula*) recorded in the derived native grassland habitat north of the proposed access road;
- avoid known locations of Pine Donkey Orchid (*Diuris tricolor*) individuals recorded in the derived native grassland habitat adjacent to the proposed access road;
- avoid the clearance of woodland areas represented by PCTs 1693 and 1731; and
- minimise the clearance of woodland areas represented by PCTs 1606 and 1691 which cannot be completely avoided due to the location of the existing access track.

Malabar considered two alternative access road alignments but these were discounted on the basis that they would involve clearance of additional woodland vegetation (including riparian vegetation associated with a tributary of Saddlers Creek). The clearance of Box-Gum TEC for the Modification is unavoidable, as it covers a large area surrounding the Project surface facilities such that the Modification could not be moved in a way that would avoid or reduce the amount lost. However, the proposed upcast ventilation shaft is predominantly located in derived grassland, and minimises the need to clear woodland and natural drainage lines (Appendix D).

The measures to mitigate and manage impacts from the approved Project (as described in the EIS) would continue to be applied to the modified Project. These include:

- a vegetation clearance protocol;
- rehabilitation and revegetation of surface development areas;
- salvage and re-use of material for habitat enhancement within the rehabilitation areas;
- remediation of surface cracks;
- weed and feral animal management;
- site inductions for on-site personnel and presence of a trained wildlife handler;
- bushfire management; and
- implementation of fencing and on-site speed limits for roads.

Direct Impacts

The Modification would result in the clearance of approximately 13.3 ha of native vegetation (including 3.8 ha of potential subsidence ponding areas) (Table 6; Figures 11a and 11b), comprising 3.8 ha of fragmented native woodland/forest and 9.5 ha of derived native grassland.

Cumulative Impacts

The total surface development for the modified Project would involve direct disturbance of approximately 30 ha of fragmented native woodland/forest and 149.3 ha of derived native grassland. The total amount of native vegetation to be disturbed for the Project (incorporating the Modification) is approximately 179.3 ha.

Hunter Eco (2022) concluded the direct loss of habitat associated with the modified Project in combination with offset provisions would result in no net loss in biodiversity, as the biodiversity offset would be a greater area of land, which will be conserved and managed to achieve a gain in biodiversity values.

Other Indirect Impacts

Hunter Eco (2022) assessed other indirect impacts on habitat and vegetation (e.g. increased risk of fire or introduction of pest species) and concluded that the Modification is unlikely to result in an increase or an adverse indirect impact on native vegetation and habitat for threatened species.

Prescribed Biodiversity Impacts

The BC Regulation identifies actions that are prescribed as impacts to be assessed under the NSW Biodiversity Offsets Scheme.

An assessment of the potential 'prescribed biodiversity impacts' in relation to the Modification is provided in Appendix D.

Impacts on Habitat Resources Other Than Native Vegetation

There are no karsts, caves or cliffs or other areas of geological significance on, or in the vicinity of, the Project area (as modified).

No areas with rocky areas, rock crevices, human-made structures or areas of non-native vegetation that provide potential habitat for the any threatened species occur within the Modification Development Footprint and, therefore, there would be no associated impacts for the Modification (Appendix D).

Habitat Fragmentation and Fauna Movement

The Modification is not likely to impact well-defined movement patterns for any particular threatened species (Appendix D). The Modification may impact the habitat connectivity; however, sufficient connectivity would remain around the Modification Development Footprint such that no threatened species are likely to become isolated (Appendix D).

Water Quality, Water Bodies and Hydrological Processes that Sustain Threatened Species and Threatened Ecological Communities

The Modification would not impact water quality, water bodies or hydrological processes that are known to sustain a threatened species or ecological community (Appendix D).

Vehicle Strike

Vehicle strike of animals along the proposed ventilation shaft access road for the Modification is possible; however, it is not expected to be of a magnitude that would threaten the local persistence of any species (Appendix D). Fencing along the proposed ventilation shaft access road would also be installed (Appendix D).

Serious and Irreversible Impacts (SAII)

Under the BC Act, a determination of whether an impact is serious and irreversible must be made for 'potential SAII entities' identified in the BAM Credit Calculator. There is one 'potential SAII entity' relevant to the Modification, namely the Box-Gum TEC.

Approximately 6.4 ha of the Box-Gum TEC would be cleared due to the Modification, including 5.1 ha of derived native grassland used for grazing livestock and 1.3 ha of woodland (Figures 11a and 11b) (Appendix D).

In accordance with the *Guidance and Criteria to Assist a Decision-maker to Determine a Serious and Irreversible Impact* (DPIE, 2019), Hunter Eco (2022) concluded that the Modification is unlikely to have a serious and irreversible impact on the Box-Gum TEC (Appendix D).

Adherence to the NSW Biodiversity Offsets Scheme would result in the retirement of the required number and class of like-for-like biodiversity credits for the Box-Gum TEC (Section 6.4.5).

Matters of National Environmental Significance

The following five Matters of National Environmental Significance (MNES) were relevant to the Modification and were assessed in consideration of the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DotE, 2013a) (Appendix D):

- 12.1 ha of potential habitat for the Striped Legless Lizard;
- 3.8 ha of potential foraging habitat for the Swift Parrot;
- 3.2 ha of potential foraging habitat for the Regent Honeyeater;
- 1.7 ha of the Central Hunter Valley Eucalypt Forest and Woodland CEEC listed under the EPBC Act; and
- 6.4 ha of the Box-Gum TEC listed under the EPBC Act.

The loss of the above areas of potential habitat and the clearance of the above areas of TECs are not considered significant in consideration of the significant impact guidelines (Appendix D).

The potential impacts on the MNES would be offset in accordance with the NSW Biodiversity Offsets Scheme and would result in the retirement of the required number and class of like-for-like ecosystem and species credits, respectively (Section 6.4.5) (Appendix D).

Threatened Species – Ecosystem Credit Species

Table 7 provides a summary of the ecosystem credits required for each PCT in the Modification Development Footprint.

Threatened Species – Species Credit Species

Table 8 provides a summary of the habitat and credits required for species credit species within Modification Development Footprint.

Table 7
Modification Ecosystem Credit Requirements

PCT	PCT Name	TEC Listed under the BC Act	Area within Modification Development Footprint (ha)	Modification Credit Requirement
1606	White Box – Narrow-leaved Ironbark – Blakely's Red Gum shrubby open forest of the central and upper Hunter[1]	White Box - Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	1.3	56
1606	White Box – Narrow-leaved Ironbark – Blakely's Red Gum shrubby open forest of the central and upper Hunter – DNG[1]		2.6	36
1655	Grey Box – Slaty Box shrub – grass woodland on sandstone slopes of the Upper Hunter Valley and Sydney Basin[2]	Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion	0.5	4
1655	Grey Box – Slaty Box shrub – grass woodland on sandstone slopes of the Upper Hunter Valley and Sydney Basin – DNG	Not a TEC	1.7	0^
1692	Bull Oak grassy woodland of the Central Hunter Valley	Not a TEC	0.6*	15
1693	Yellow Box – Rough-barked Apple gassy woodland of the upper Hunter and Liverpool Plains – DNG	White Box - Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	2.5	45
201	Fuzzy Box woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Not a TEC	0.2	9
201	Fuzzy Box woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion - DNG	Not a TEC	1	18
1691	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter[3]	Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions	1.2	35
1691	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter - DNG	Not a TEC	1.7	29
		Total Woodland/Forest	**3.8**	**119**
		Total Derived Native Grassland	**9.5**	**128**
		Total	**13.3**	**247**

Source: After Appendix D.

1 Listed BC Act, CE: White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions.

2 Listed BC Act, V: Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion.

3 Listed BC Act, E: Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions.

^ This occurrence of PCT 1655 DNG does not require biodiversity credits as the vegetation integrity score is below the threshold for requiring an offset (<17) in accordance with the BAM (DPIE, 2020a).

* This occurrence of PCT 1692 does not meet the criteria for the EPBC Act, CE: Central Hunter Valley Eucalypt Forest and Woodland.

Note: Totals may differ due to rounding.

Table 8
Modification Species Credit Requirements

Species	Conservation Status[1]		Area of Potential Habitat within Modifiation Development Footprint (ha)[#]	Credit Requirement
	BC Act	EPBC Act		
Leafless Tongue Orchid (*Cryptostylis hunteriana*)	V	V	2.2	11
Pine Donkey Orchid (*Diuris tricolor*)	V/EP	-	1.2	17
Tarengo Leek Orchid (*Prasophyllum petilum*)	E	CE	1.2	21
Austral Toadflax (*Thesium australe*)	V	V	1.8	8
Striped Legless Lizard (*Delma impar*)	V	V	12.1	156
Squirrel Glider (*Petaurus norfolcensis*)	V	-	3.8	75
Southern Myotis (*Myotis macropus*)	V	-	0.3	9
			Total	**297**

Source: After Appendix D.

[1] Threatened species status under the BC Act and/or EPBC Act (current as at June 2022).

[#] The species habitats overlap (i.e. the habitats are not mutually exclusive).

Note: Totals may differ due to rounding.

State Environmental Planning Policy (Koala Habitat Protection)

The *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP) began on 1 March 2022 and consolidates, transfers and repeals provisions of various SEPPs in NSW including the Koala Habitat Protection SEPP (2020 and 2021). The provisions within the repealed SEPPs have been transferred to the new SEPP.

The land associated with the Modification Development Footprint is zoned RU1 Rural. Chapter 3 of the Biodiversity and Conservation SEPP (Koala Habitat Protection 2020) applies for all RU1, RU2 and RU3 zoned land outside of the Sydney Metropolitan Area and some LGAs of the Central Coast. The Muswellbrook LGA is included in the Central Coast Koala Management Area (KMA).

Schedule 3 of the Biodiversity and Conservation SEPP lists Koala use tree species for each KMA. For the Central Coast KMA, the following tree species are listed that occur in woodland within the Modification surface development area:

- White Box (*Eucalyptus albens*) in PCT 1606; and
- Grey Box (*Eucalyptus moluccana*) in PCT 1691.

The areas involved are small, PCT 1606 comprises only 1.3 ha and PCT 1691 only 1.2 ha, and adjoin large patches of these PCTs, viz. 30 ha of PCT 1606 and 67 ha of PCT 1691.

6.4.4 Mitigation Measures

Measures to mitigate impacts from the Project are outlined in Section 6.7 of the EIS (Malabar, 2019a). Potential impacts to biodiversity associated with the Project (incorporating the Modification) would also continue to be managed under the Biodiversity Management Plan prepared in accordance with Condition B51 of Development Consent SSD 9526.

6.4.5 Biodiversity Offset Strategy

Malabar would address NSW offset requirements (Tables 7 and 8) by one, or a combination of the following options, consistent with the NSW Biodiversity Offsets Scheme:

1. the retirement of biodiversity credits (either like-for-like or in accordance with the variation rules);
2. the funding of a biodiversity conservation action;
3. undertaking ecological mine rehabilitation; or
4. payment into the Biodiversity Conservation Fund.

6.5 ABORIGINAL HERITAGE

6.5.1 Methodology

The *EIS Aboriginal Cultural Heritage Assessment* (AECOM, 2019) assessed the potential impacts of the Project on Aboriginal heritage.

An ACHA has been prepared for the Modification by AECOM Australia Pty Ltd (AECOM) (Appendix E). AECOM assessed the potential impacts of additional surface development for the ventilation shaft construction and subsidence predictions from re-orientation of the longwalls in the Bowfield, Arrowfield and Woodlands Hill Seams.

The ACHA for the Modification has been undertaken in accordance with the following guidelines and regulations (Appendix E):

- *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010a).
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b).
- Clause 60 of the NSW *National Parks and Wildlife Regulation 2019*.
- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (Office of Environment and Heritage, 2011).
- *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* (Australia International Council on Monuments and Sites, 2013).
- *Ask First: A Guide to Respecting Indigenous Heritage Places and Values* (Australian Heritage Commission, 2002).
- *Engage Early – Guidance for Proponents on Best Practice Indigenous Engagement for Environmental Assessments under the Environment Protection and Biodiversity Conservation Act 1999* (DotE, 2016).

A detailed description of Aboriginal heritage (archaeological and cultural) in the vicinity of the Project is provided in the *EIS Aboriginal Cultural Heritage Assessment* (AECOM, 2019) and Section 6.12 of the EIS.

The ACHA (Appendix E) incorporates relevant information from previous assessments and consultation with the Aboriginal community.

6.5.2 Background

Previous Assessments

The *EIS Aboriginal Cultural Heritage Assessment* (AECOM, 2019) assessed the potential impacts of the Project on Aboriginal heritage and incorporated the following:

- results from extensive fieldwork and archaeological and cultural investigations previously undertaken by archaeologists and representatives of the Aboriginal community as part of previous investigations during 2012;
- search results from the Aboriginal Heritage Information Management System (AHIMS) database and other heritage registers;
- results of archaeological and cultural surveys conducted by archaeologists and representatives of the Aboriginal community for the Project during 2018;
- a consultation program undertaken for the Project from 2018 to 2019; and
- the outcomes of extensive consultation with the Aboriginal community regarding archaeological and cultural heritage values as part of both previous investigations and the ACHA.

The *Maxwell Underground Mine Project Mine Entry Area Modification Aboriginal Cultural Heritage Assessment* (AECOM, 2021) assessed the potential impacts of Modification 1 on Aboriginal Heritage. Modification 1 resulted in three open artefact sites being wholly or partially impacted by additional surface development. All three sites were assessed as low archaeological significance (AECOM, 2021).

Heritage Register Searches

Searches of the following heritage registers and planning instruments were undertaken:

- AHIMS database;
- The Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*;
- *Muswellbrook Local Environmental Plan 2009*; and

- Commonwealth Heritage List, National Heritage List and Register of the National Estate[1] (via the Australian Heritage Database).

Review of the AHIMS database indicates there are 238 sites that are located wholly or partially within the Project Area (as modified), comprising 236 open artefact sites (i.e. artefact scatter and isolated artefacts) and two stone quarries. Stone quarry site 'SC-QS-1/Quarry' (37-2-1955) recorded by Mills (2000) within the Project Area was not located during surveys undertaken by AECOM in 2012 and 2018. In addition, two open artefact sites have been subject to surface collection as part of the approved Project. Therefore, a total of 235 Aboriginal sites comprising 234 open artefact sites and one stone quarry are recognised as being located wholly or partially within the Project Area (as modified) (Appendix E).

Searches of the remaining heritage registers and planning instruments did not identify any further listed Aboriginal heritage sites.

Summary of Archaeological Findings

The key steps involved in the preparation of the ACHA and associated consultation are described in detail in Appendix E.

A detailed description of each of the Aboriginal heritage sites identified is provided in Appendix E.

All of the additional surface development areas for the Modification have been previously surveyed in by AECOM (Appendix E).

Cultural Values Assessment

A cultural values assessment for the Project was undertaken for the *EIS Aboriginal Cultural Heritage Assessment* (AECOM, 2019).

AECOM (2019) noted that, although the Project is situated within a broader landscape of high historical significance for contemporary Aboriginal people, the Project area itself is assessed as having a low historical significance, with no evidence of post-contact Aboriginal occupation identified within the area.

In addition, no historical records or oral histories specific to the use of the Project area by Aboriginal people were identified as part of the *EIS Aboriginal Cultural Heritage Assessment* (AECOM, 2019).

Consultation

Aboriginal community consultation for the Modification was undertaken in accordance with Heritage NSW's *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010a).

Stage 1 of the Consultation Requirements, related to identifying the relevant parties to consult with, was completed as part of the EIS Aboriginal Cultural Heritage Assessment in 2018 (AECOM, 2019). Malabar has maintained ongoing consultation and engagement with these groups since their individual expressions of interest (including during development of the approved Aboriginal Cultural Heritage Management Plan).

The draft assessment methodology was provided to all Registered Aboriginal Parties on 4 February 2022 and an information session was held at the Maxwell Infrastructure site office on 2 March 2022. Comments were received from four of the Registered Aboriginal Parties, all supporting the assessment methodology (Appendix E).

The draft Aboriginal Cultural Heritage Assessment was provided to all Registered Aboriginal Parties on 1 May 2022. Two responses were received from the Registered Aboriginal Parties, both supporting the findings of the assessment (Appendix E).

6.5.3 Impact Assessment Review

Avoiding and Minimising Harm

Malabar is committed to developing the Project (as modified) to limit potential impacts to Aboriginal heritage values.

The orientation of the longwall panels and repositioning of the ventilation shaft and associated infrastructure were designed with consideration of:

- the location of known Aboriginal heritage sites (i.e. avoiding direct impacts to known artefacts where possible);
- avoidance of undermining Aboriginal stone quarry site SC-QS-2 (37-2-1954) in order to reduce potential subsidence related impacts (i.e. the site is not expected to experience measurable tilts, curvatures or strains); and
- historical site disturbances (i.e. utilisation of existing access tracks).

[1] The Register of National Estate was repealed in 2007 and is no longer a statutory list; however, the register remains an archive of over 13,000 heritage places throughout Australia.

Potential Impacts from Additional Surface Development

Surface impacts from the Modification are related to the construction of the upcast ventilation shaft and associated infrastructure.

Three Aboriginal sites would be directly impacted by surface development associated with the Modification. Two open artefact scatter sites would be wholly impacted (37-2-4294 and 37-2-4358) and one artefact scatter would be partially impacted (37-2-0415) (Appendix E).

All three potentially impacted artefact scatter sites are classed as having low archaeological significance.

It is noted that the stone quarry site (SC-QC-2 (37-2-1954) assessed as having high significance would not be directly impacted by the Project (as modified).

Potential Impacts from Subsidence

There is one additional open artefact scatter site of low archaeological significance that would potentially be indirectly impacted by subsidence as a result of the Modification (37-2-4284) (Appendix E).

The remaining sites that would potentially be indirectly impacted from subsidence within the Project Area were previously approved for indirect impacts under the existing Development Consent (SSD 9526) (Appendix E).

Physical damage to specific artefacts is not expected as a result of subsidence. However, surface cracking or heaving within the boundary of an existing open artefact site (including stone quarry sites) resulting from subsidence has the potential to displace soils, including archaeological deposits, and move Aboriginal objects. Moreover, if remediation of the surface was required after mining, these works could potentially impact Aboriginal sites (Appendix E).

Other Indirect Impacts

Three culturally significant landscape features identified as relevant to the Modification by registered Aboriginal parties include Mount Arthur, the Hunter River and Saddlers Creek. All three features are located outside the Project area (AECOM, 2019) and would not be directly impacted by the Modification (Appendix E).

The MEA and ventilation shaft would be visible from both Mount Arthur and Saddlers Creek; however, given the existing views from these features include surrounding open cut mines, the extent and impact of the Modification is minor (Appendix E).

Cumulative Impacts

A consideration of the potential cumulative impacts associated with the modified Project has been undertaken (Appendix B). Cumulative impacts are assessed based on how effectively the modified Project applies the principles of ESD. In the context of Aboriginal cultural heritage, this can be achieved through the implementation of intergenerational equity and the precautionary principle (Appendix E).

AECOM concluded that the impact of the modified Project to the archaeological resource of the region is not significant, given that the majority of land within the region has not been physically inspected for Aboriginal heritage sites, and the known Aboriginal heritage sites that would be directly impacted by the Project are of low archaeological significance (Appendix E).

6.5.4 Mitigation Measures

Aboriginal Cultural Heritage Management Plan

The existing, approved ACHMP (Malabar, 2021b) would be reviewed and revised for the Modification in consultation with the registered Aboriginal parties (if required) to the satisfaction of the DPE (subject to any modified Development Consent conditions).

A salvage program, consisting of surface collection of portions of AHIMS sites would be undertaken prior to disturbance within Modification surface development areas. The salvage program would be undertaken in accordance with the approved ACHMP. Surface collection is considered an appropriate and effective mitigation option for affected sites given their contents and level of scientific significance.

General Mitigation Measures

The Project (as modified) would continue to implement the following general measures that have been formulated in consultation with the registered Aboriginal parties:

- An Aboriginal cultural heritage awareness package would be developed, and all relevant contractors and staff engaged on the Project who may have interactions with Aboriginal heritage would receive awareness training prior to commencing work on-site.

- Sites would be identified on relevant site plans, with details for the care of sites that would be conserved *in-situ* incorporated into the ACHMP.
- AHIMS site cards would be lodged in a timely manner with the DPE for any previously unidentified Aboriginal heritage site(s) that are discovered during the course of Project operations and/or further heritage assessments.
- Should any skeletal remains be identified during the course of the Project, work in that location would cease immediately and the find would be notified to the relevant authorities (including the NSW Police). Subject to the NSW Police requiring no further involvement, the management of any Aboriginal skeletal remains would be determined in consultation with the DPE and the registered Aboriginal parties.
- Subsidence monitoring would be conducted during mining and for a specified period post mining, with a digital record kept of the nature, location and extent of all subsidence-related surface impacts within the Project area.
- Further mitigation measures for subsidence may include further monitoring, surface collection or open area salvage excavation.

6.6 VISUAL AMENITY

6.6.1 Methodology

A Landscape and Visual Impact Assessment was prepared for the EIS by Van Pelt Allen Visual Planning and Assessment (VPA) (VPA, 2019) and described the potential visual impacts of the Project and visual sensitivity of the surrounding viewpoints.

A Visual Impact Assessment (VPA, 2022) was prepared to review and update the potential visual impacts as a result of the Modification.

Consistent with the methodology for the Landscape and Visual Impact Assessment (VPA, 2019), the potential visual impacts of the Project incorporating the Modification were assessed by evaluating the level of potential visual effect in the context of the visual sensitivity of relevant potential receivers.

Visual effect is a measure of the level of visual contrast and integration of the development with the existing landscape (VPA, 2019). Visual sensitivity is a measure of how critically a change to the existing landscape is viewed from various areas, and is a function of both land use and distance to the development (VPA, 2019).

The Visual Impact Assessment (VPA, 2022) focusses on the potential incremental visual impacts associated with the repositioned ventilation infrastructure on the existing landscape and visual amenity values of the area. There are no other proposed changes to the approved Project that would be visible from off-site locations.

6.6.2 Background

***Previous* Assessment**

Section 6.11.2 of the EIS and the Landscape and Visual Impact Assessment (VPA, 2019) provides a detailed description of the visual setting relevant to the Project.

The Landscape and Visual Impact Assessment (VPA, 2019) reviewed 13 potentially sensitive viewpoints to the Project. It concluded that views to the MEA and approved transport and services corridor are limited to the following locations in the west and distant south:

- Edderton Homestead on Edderton Road;
- a 600 m low-lying section of Edderton Road along Saddlers Creek;
- elevated locations on Coolmore Stud and Godolphin Woodland Stud properties; and
- views from the air.

There would be no views of the Project from the majority of the Coolmore Stud and Godolphin Woodlands Stud properties. At the highest vantage point on these properties, a section of the approved transport and services corridor would be potentially visible as it crosses ridgelines north-east of the MEA (at distances of over 7 km).

Malabar Commitments

Malabar planted screening vegetation in July 2019 along ridgeline contours west of the MEA to mitigate views to Edderton Road. The 2021 Malabar Annual Review (Malabar, 2022) describes overall tree growth as good, with several trees recorded at heights above 2 m. An additional 520 trees were planted in 2021.

6.6.3 Impact Assessment Review

The ventilation fans and associated infrastructure have been designed so that it would not be visible from the Godolphin Woodlands Stud or the Coolmore Stud.

Assessed Locations

Three viewpoints considered sensitive to potential visual impacts from the Modification have been reviewed. These include elevated locations south of the Modification within the Coolmore Stud (VP3) and Godolphin Woodlands Stud (VP4) properties and Edderton Road (VP11) to the west of the Modification (Appendix F).

Views to the Project (as modified) from the Golden Highway would continue to be screened by intervening topographic features and existing roadside vegetation.

Areas which do not have a view of the Modification would not be directly impacted.

Coolmore Stud Receptor (VP3)

Coolmore Stud is located south of the Modification, with elevated parts of the estate providing views beyond the immediate Hunter Valley landscape. Views to the north-east include existing mining operations and infrastructure associated with the Mt Arthur Coal Mine.

VP3 is the highest vantage point on Coolmore Stud property located on the Randwick Park Hill ridge system 5.7 km from the Modification (Appendix F).

Although the Coolmore Stud land use sensitivity is high, VP3 receiver is classed as having moderate visual sensitivity due to the distance to the Modification infrastructure (Appendix F).

Views to the Modification from VP3 would be obstructed by an intervening ridgeline approximately 4.5 km from the view location, with a minimum clearance of approximately 25 m (Appendix F).

As such, there is no direct view of the Modification from Coolmore Stud and there would be no incremental visual impact on Coolmore Stud as a result of the Modification (Appendix F).

Godolphin Woodlands Stud Receptor (VP4)

Godolphin Woodlands Stud is located south of the Modification. The Randwick Park Hill ridgeline provides distant views north across the Hunter Valley. Views from elevated locations include existing mining and power generation infrastructure.

VP4 is the highest vantage point on the property approximately 5.9 km from the Modification infrastructure (Appendix F).

Godolphin Woodlands Stud land use sensitivity is high, but VP4 is classed as having moderate visual sensitivity due to the distance from the Modification infrastructure (Appendix F).

Views to the Modification from VP4 would be obstructed by an intervening ridgeline approximately 4.9 km from the view location, with a minimum clearance of approximately 5 m (Appendix F).

As such, there is no direct view of the Modification from Godolphin Woodlands Stud and there would be no incremental visual impact on Coolmore Stud as a result of the Modification (Appendix F).

Edderton Road Receptor (VP11)

Edderton Road is a rural road linking Denman Road to the Golden Highway, and is considered important for the regional tourism experience. It acts as a thoroughfare between horse studs around Jerrys Plains and other equine services near Aberdeen and Scone.

VP11 on Edderton Road is along a low-lying section of Saddlers Creek 2.1 km from the Modification infrastructure. Rolling topography and creek line vegetation would screen views of the Modification infrastructure from Edderton road (Appendix F).

Direct and Diffuse Light Effects

Most lighting associated with the Modification is safety and operational lightning around the ventilation shaft area. Due to the location of the Modification, most direct lighting is screened to sensitive receptors by local topography and screening vegetation (Appendix F).

The screened, intermittent and isolated direct lighting would not be significantly greater than the lighting impacts of the approved Project (Appendix F).

Mining operations and power stations in the vicinity of the Modification already contribute to diffuse lights effects in the night sky. The Modification would spread the localised lighting effects of the approved Project, but not significantly increase the level of diffuse light emitted (Appendix F).

Summary of Potential Visual Impacts

A summary of potential visual impacts to relevant receivers due to the Modification are seen in Table 9.

Table 9
Summary of Visual Impacts

Receptor	Approved Visual Impact	Modification Incremental Change
Coolmore Stud	No impact to majority of the property. Low at highest vantage point.	No visibility. No change.
Godolphin Woodlands Stud	No impact to majority of the property. Low at highest vantage point.	No visibility. No change.
Edderton Road	Low	No visibility. No change.

Source: Appendix F.

6.6.4 Mitigation Measures

Potential impacts to visual amenity associated with the Modification would continue to be managed under the Visual Impact Management Plan required under Condition B61 of Development Consent SSD 9526.

Consistent with the above and in accordance with Condition B60 (a) and (f) of Development Consent SSD 9526, Malabar has designed and positioned the Modification to blend in as far as practicable with the surrounding landscape. Mitigation measures include:

- locating the ventilation shafts in a natural depression thus enclosing operational components within natural topography;
- reducing vertical profile of shafts; and
- the use of compatible tonal variations of existing colours in the surrounding landscape for building and cladding colours.

6.7 AIR QUALITY

6.7.1 Methodology

The *EIS Air Quality and Greenhouse Gas Assessment* (Todoroski Air Sciences, 2019) assessed the potential impacts of the Project on air quality and greenhouse gas emission in accordance with the following guidelines:

- *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (Environment Protection Authority [EPA], 2017a); and
- *Voluntary Land Acquisition and Mitigation Policy – For State Significant Mining, Petroleum and Extractive Industry Developments* (VLAMP) (NSW Government, 2018).

Todoroski Air Sciences (2022) completed an assessment of the potential air quality impacts to arise as a result of the Modification (Appendix H).

The EIS air dispersion model (Todoroski Air Sciences, 2019) was updated to reflect relevant features of the Modification.

The updated air dispersion model was run for one modification scenario including concurrent ventilation shaft construction and operation. Due to the different timing of these aspects of the Modification (i.e. construction would be completed prior to operation of the ventilation shaft), the predicted impacts are conservative (Appendix H).

6.7.2 Background

The *EIS Air Quality and Greenhouse Gas Assessment* (Todoroski Air Sciences, 2019) characterised the existing air quality of the Project area. The air dispersion model was run for three operational scenarios of the Project, nominally Year 1, Year 3 and Year 4.

No exceedances of the applicable Project-only or cumulative air quality criteria were predicted at any privately-owned receptors, and changes in particulate matter concentrations at nearby equine or viticulture enterprises were predicted to be negligible (Todoroski Air Sciences, 2019).

6.7.3 Impact Assessment Review

The Modification would not materially change the largest emission sources in the construction and early development years of the Project, namely (Todoroski Air Sciences, 2019):

- trucking of ROM coal to the Maxwell Infrastructure and movement of cut and fill material generated in construction;
- handling of ROM coal, product coal, and cut and fill material;
- wind erosion of exposed areas; and
- dozer operations.

As part of the modification, the upcast ventilation shaft has been repositioned and designs have been improved to allow for increased air flows. This would result in less total suspended particulate (TSP) emissions relative to the approved Project.

No significant change in dust level at any off-site receptor would occur from the mine as a result of the Modification (Appendix H).

Review of cumulative dust levels, including background levels and the emissions from all other mines, indicates the Modification would result in no discernible change relative to the approved levels (Appendix H).

Thus, with the continued implementation of the existing air quality mitigation measures described in the *Air Quality and Greenhouse Gas Management Plan* (Malabar, 2021c), including real-time meteorological and air quality monitoring and associated adaptive management measures, the air quality impacts of the Modification would be consistent with the approved Project (Appendix H).

6.7.4 Mitigation Measures

Potential impacts to air quality associated with the Project would continue to be managed under the Air Quality and Greenhouse Gas Management Plan required under Condition B23 of Development Consent SSD 9526.

6.8 NOISE

6.8.1 Methodology

The *EIS Noise Impact Assessment* (Wilkinson Murray, 2019) assessed potential operational noise and construction impacts of the Project in accordance with the relevant guidelines:

- *NSW Noise Policy for Industry* (NPfI) (EPA, 2017b);
- VLAMP (NSW Government, 2018);
- The Interim Construction Noise Guideline (ICNG) (Department of Environment and Climate Change, 2009).

A Noise Assessment has been prepared by RWDI (2022) for the Modification in accordance with the above guidelines. The Noise Assessment is presented in Appendix G.

The noise modelling methodology adopted in the Modification noise assessment is consistent with the methodology applied in the EIS assessment.

Given the distance between the repositioned ventilation shaft and the northern receivers, changes in noise levels at these receivers as a result of the Modification would be negligible relative to the approved Project. Accordingly, RWDI (2022) has subsequently focussed on potential impacts at the southern receivers near the Golden Highway and the Hunter River (Appendix G).

6.8.2 Background

The *EIS Noise Impact Assessment* (Wilkinson Murray, 2019) included noise modelling of three operational scenarios, including construction activities where relevant. The potential impacts of construction activities in isolation were also assessed.

The assessment identified some proximal privately-owned receptors to the north of the Project where 'negligible' (i.e. 1 to 2 A-weighted decibels [dBA]) or 'marginal' (i.e. 3 to 5 dBA) exceedances of the applicable noise criteria were predicted with the implementation of the adopted mitigation measures. As such, these receptors have specific noise criteria within Development Consent SSD 9526 (Condition B1, Schedule 2).

6.8.3 Impact Assessment Review

The Modification would not change the key sources of noise in the construction and early development years of the Project, namely (Wilkinson Murray, 2019):

- rehabilitation activities for previously mined areas;
- front-end loaders and dozers at the Maxwell Infrastructure; and
- construction of the most northern portion of the approved transport and services corridor.

Noise predictions indicate that operational and construction noise levels associated with the Modification would comply with the existing Project Approval noise limits at all privately-owned noise-sensitive receivers (Appendix G).

As such, the noise impacts of the Modification would be consistent with the approved Project with the continued implementation of the existing noise mitigation measures, including real-time meteorological and noise monitoring and associated adaptive management measures.

6.8.4 Mitigation Measures

Potential impacts to acoustic amenity associated with the Project would continue to be managed under the Noise and Blasting Management Plan developed in accordance with Condition B12 of Development Consent SSD 9526.

6.9 SOCIAL

6.9.1 Methodology

The *EIS Social Impact Assessment* (the SIA) (Elliott Whiteing Pty Ltd [Elliott Whiteing], 2019) considered the potential impacts of the Project on employment, population, community infrastructure demand and social values.

The SIA (Elliott Whiteing, 2019) was prepared in accordance with the *Social Impact Assessment guideline for State significant mining, petroleum production and extractive industry development* (DPE, 2017).

This Modification Report has been prepared in consideration of the *State Significant Development Guidelines* (DPIE, 2021a), in particular *Appendix E – Preparing a Modification Report*.

Other relevant State Significant Development Guidelines that have been considered in the preparation of this Modification Report include:

- *Undertaking Engagement Guidelines for State Significant Projects* (DPIE, 2021b) (Section 5);
- *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE, 2021c) (Section 6); and
- *Social Impact Assessment Guideline for State Significant Projects* (DPIE, 2021d).

The SIA (Elliott Whiteing, 2019) has been reviewed in consideration of potential changes as a result of the Modification and the relevant guidelines outlined above.

6.9.2 Background

The SIA (Elliott Whiteing, 2019) defined the Muswellbrook LGA, where the Project is located, and the adjoining Singleton LGA as the primary area of social influence for the Project (also referred to as the Project region), as this is where the majority of the Project operational workforce are predicted to reside.

The SIA (Elliott Whiteing, 2019) provided a detailed description of the area of social influence and focuses on nearby suburbs that may experience benefits along with social impacts as a result of the Project, including the suburbs of Muswellbrook, Singleton, Jerrys Plains and Denman.

The SIA (Elliott Whiteing, 2019) was informed by consultation undertaken by Malabar during the preparation of the EIS and further consultation has been undertaken for the Modification (Section 5).

The consultation undertaken for the Project, a detailed description of the social baseline and key community concerns regarding the potential impacts and benefits of the Project identified during consultation are provided in the SIA (Elliott Whiteing, 2019).

6.9.3 Impact Assessment Review

The Modification would not change the following components and matters that may have associated potential social benefits and impacts:

- workforce;
- mining method, resource or maximum annual production rate;
- mine life;
- hours of operation;
- visual amenity impacts (Section 6.6); and
- predicted air quality and noise impacts of the approved Project (Sections 6.7 and 6.8).

The Modification would potentially wholly or partially impact three open artefact scatter sites, which are all of low archaeological significance. An additional open artefact scatter site may also potentially be indirectly impacted mine subsidence (Section 6.5).

Both groundwater (Section 6.2) and surface water impacts (Section 6.3) due to the Modification are considered minor relative to the approved Project.

As such, the Modification would not materially change the potential impacts of the Project identified in the SIA (Elliott Whiteing, 2019) and, therefore, would not result in any additional social impacts to:

- way of life;
- community;
- accessibility;
- culture;
- health and wellbeing;

- surroundings;
- livelihoods; or
- decision-making systems.

The potential cumulative impacts of the Project and other potentially relevant approved and proposed developments within the Muswellbrook and Singleton LGAs have been considered in the SIA (Elliott Whiteing, 2019).

Key findings of the cumulative assessment included (Elliott Whiteing, 2019):

- cumulative housing requirements may result in rental housing shortages until supply and demand are balanced; and
- coincidence of construction and operation periods for different developments may result in skilled labour shortages, which would in turn impact the Project's local/non-local workforce profile and associated demand for housing and services.

As the Modification would not change the approved workforce, it is not expected that the Project (as modified) would have any additional cumulative impacts.

6.9.4 Mitigation Measures

Malabar would continue to work with local government and the local community to minimise potential social impacts of the Project (as modified) and maximise potential opportunities. Malabar would also maintain the commitments that would underpin the social impact management strategies for the Project as described in Section 6.17 of the EIS (Malabar, 2019a).

Potential social impacts associated with the Project would be managed under the Social Impact Management Plan required under Condition B94 of Development Consent SSD 9526.

6.10 ECONOMIC CONSIDERATIONS

The potential for the Project to create increased local employment options and support local businesses was a key benefit identified in local community and other stakeholder engagement for the EIS.

Annual export sales of product coal from the Project would be in the vicinity of $500 million to $700 million per annum, on average[2].

The DRG (2019) estimated that the Project would generate approximately $955 million in royalties (undiscounted) based on coal price forecasts of approximately US$140 per tonne for coking coal and US$70 per tonne for thermal coal.

The EIS Economic Assessment (DAE, 2019) concluded the Project would result in a total net benefit to the NSW economy of over $1 billion in net present value terms (2019), which:

- included the estimated costs for environmental externalities and internalisation of environmental management costs by Malabar; and
- conservatively excluded any indirect economic impacts associated with benefits to workers or suppliers.

The Project would contribute between $110 million and $140 million[2] per annum on average to the Commonwealth, NSW and local governments, in the way of company tax, coal royalties, payroll tax, land taxes and council rates.

Coal prices are currently much higher than the forecasts used to derive the Project benefits (including royalties). Accordingly, benefits arising from the Project are expected to be greater than previous estimates.

The Modification would not change the mining method, maximum annual production, mine life, total resource recovered and workforce and, therefore, there would be no material change to the net benefits of the Project to the State and local governments.

The Modification would provide the following economic benefits:

- less development drivage required to achieve first longwall coal, resulting in earlier commencement of longwall production (and associated economic and community benefits); and
- reduction in initial capital expenditure required to achieve steady-state production and future capital costs associated with modifications to longwall equipment.

[2] Based on 2019 coal price forecasts used by Deloitte Access Economics (DAE, 2019) and Malabar.

The Capital Investment Value of the approved Project was estimated in Attachment 5 of the EIS. Consistent with the relevant guidance documents, the estimated Capital Investment Value did not include replacement capital or sustaining capital.

The Modification is not anticipated to materially change the Capital Investment Value of the Project given:

- Deferred initial capital associated with the narrower longwall panels would still be required when panels are extracted at the full approved width.
- Savings in sustaining capital associated with the re-orientation of the longwall panels are excluded from the estimation of Capital Investment Value.

6.11 OTHER ENVIRONMENTAL CONSIDERATIONS

The EIS (Malabar, 2019a) was supported by a number of specialist studies that include detailed impact assessments covering environmental, social and economic aspects that may be potentially impacted by the Project.

The other environmental matters that were identified during the EIS include:

- agriculture;
- aquatic ecology;
- historic heritage;
- road transport;
- human health;
- greenhouse gas emissions; and
- hazards and risk.

Consideration of the other environmental matters for the Modification is provided in Table 10.

Table 10
Environmental Consideration of Other Environmental Matters

Other Environmental Matter	Environmental Consideration
Land Resources and Agriculture	The Modification would result in the clearance of up to approximately 9.5 ha of derived native grassland currently used for cattle grazing. This would have a negligible impact on land resources and agriculture in the context of the significant amount of land available for grazing in the vicinity of the Project.
Aquatic Ecology	The Modification would result in negligible change to the potential impacts to water resources and water quality and, therefore, there would be no change to the potential impacts to aquatic ecology.
Historic Heritage	No items of historic heritage would be directly disturbed by surface development for the Modification. The Modification would also result in no change to the indirect and cumulative impacts on any heritage places.
Road Transport	The Modification would not change the mine life, workforce and hours of operation and therefore, there would be no change to traffic generation. As such, there would be no impacts on the performance capacity, efficiency and safety of the road network as a result of the Modification.
Human Health	The Modification would not change the predicted impacts to water resources, water quality, air quality and noise and, therefore, there would be no human health issues of concern for the population in the vicinity of the Project (as modified).
Greenhouse Gas Emissions	The Modification would not change the mining method, maximum annual production, mine life, total resource recovered, management of reject material (i.e. stone-derived material) or product coal transport. As such, the Modification is not expected to change greenhouse gas emissions. The re-alignment of the longwall panels would result in extraction of initial panels in an area with lower gas content, which provides additional time to refine gas management strategies.
Hazards and Risk	The Modification would not change the hazards and risks associated with the Project as identified in the *Maxwell Project Preliminary Hazard Analysis* (Malabar, 2019b).

7 JUSTIFICATION OF THE MODIFIED PROJECT

This section provides a justification for the Modification and conclusion for the Modification Report.

As part of the justification of the modified Project, consideration has been given to:

- the engagement undertaken for the Modification (Section 7.1);
- key environmental assessment outcomes including the potential impacts of the Modification (Section 7.2);
- the relevant planning and policy objectives (Section 7.3); and
- the benefits of the Modification and the Project (Section 7.4).

7.1 STAKEHOLDER ENGAGEMENT OVERVIEW

Malabar has consulted with a number of stakeholders during the development of the Modification including:

- DPE;
- Aboriginal stakeholders;
- Muswellbrook Shire Council;
- the CCCs;
- near neighbours; and
- various government agencies.

Section 5 describes how engagement with these stakeholders has informed the preparation of this Modification Report.

7.2 CONSOLIDATED SUMMARY OF ASSESSMENT OF IMPACTS

Malabar will operate the Project in accordance with the existing environmental management plans and environmental monitoring programs.

Malabar has undertaken a review of the potential environmental impacts of the Modification to identify key potential environmental issues requiring assessment. The key environmental issues identified are summarised in Table 11.

In consideration of the assessment of impacts in Section 6, the Modification would involve minimal environmental impact as defined under section 4.55(2) of the EP&A Act.

7.3 CONSIDERATION OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

7.3.1 Objects of the Environmental Planning and Assessment Act 1979

Section 1.3 of the EP&A Act describes the objects of the EP&A Act as follows:

(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,

(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,

(c) to promote the orderly and economic use and development of land,

(d) to promote the delivery and maintenance of affordable housing,

(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,

(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),

(g) to promote good design and amenity of the built environment,

(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,

(i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,

(j) to provide increased opportunity for community participation in environmental planning and assessment.

Table 11
Key Outcomes of Environmental Review for the Modified Maxwell Underground Mine Project

Environmental Aspect	Summary of Key Environmental Review Conclusions
Subsidence	Re-orientation of the Bowfield, Arrowfield and Woodlands Hill panels would result in marginally increased depths and extents of potential ponding areas as a result of mine subsidence relative to the approved Project. There is one open artefact scatter site that would potentially be indirectly impacted by subsidence (37-2-4284). All other built and natural features would not be impacted due to the Modification beyond the approved impacts in the EIS. In accordance with Development Consent SSD 9526 Condition C8, Malabar must prepare an Extraction Plan for all second workings to be approved by the Planning Secretary. Malabar would also implement a subsidence monitoring program to manage risks associated with conventional and non-conventional subsidence.
Biodiversity	The Modification would result in the clearance of approximately 13.3 ha of native vegetation (including potential ponding areas), comprising 3.8 ha of native woodland/forest vegetation and 9.5 ha of derived native grassland. Malabar would satisfy the biodiversity credit requirements for the Modification using offset mechanisms allowed by the NSW Biodiversity Offsets Scheme.
Aboriginal Cultural Heritage	The Modification would result in three additional open artefact scatter sites being wholly (37-2-4292 and 37-2-4358) or partially (37-2-0415) impacted by the additional surface development for the re-positioning of the upcast ventilation shaft and associated access track. These sites have been assessed as low archaeological significance. The existing, approved ACHMP would be reviewed and revised for the Modification in consultation with the registered Aboriginal parties to the satisfaction of the DPE. A salvage program, consisting of surface collection of portions of AHIMS sites would be undertaken prior to disturbance within Modification surface development areas.
Groundwater	The predicted mine inflows to the Maxwell Underground workings for the Modification would be generally consistent with those predicted for the approved Project on an annual basis, with the Modification resulting in an overall reduction of approximately 500 ML in total groundwater inflows over the life of the Project. Groundwater model predictions found that depressurisation would not cause a material increase in drawdown in the Saddlers Creek and Saltwater Creek Alluvium. The Modification would result in a slight increase in river leakage from the Hunter River to the underlying alluvium (0.18 ML/year). River leakage due to the Project (incorporating the Modification) remains negligible relative to historical flow rates in the Hunter River. Potential impacts to water resources associated with the Project would continue to be managed under the Water Management Plan required under Condition B42 of Development Consent SSD 9526. Groundwater take for the modified Project would continue to be licensed in accordance with the requirements of the Water Management Act 2000.
Surface Water	The Modification results in the excision of an additional 2.4 ha of catchment from Saddlers Creek (or 0.02% of the total catchment of Saddlers Creek). Accordingly, the impact of the Modification on flows in Saddlers Creek would be negligible. The Modification would not impact water quality in downstream watercourses. The Modification would have two minor interactions with backwater flood flows in tributaries of Saddlers Creek, during a PMF event (i.e. the largest flood that could conceivably be expected to occur). Resultant changes to flood levels do not extend into the main Saddlers Creek channel and are considered very minor. The Modification would result in negligible change to the site water balance, including overall water balance, predicted mine-affected water levels and risk of overflows to the receiving environment. Potential impacts to water resources associated with the Project would continue to be managed under the Water Management Plan required under Condition B42 of Development Consent SSD 9526.
Visual Amenity	The ventilation fans and associated infrastructure have been designed so that they would not be visible from the Godolphin Woodlands Stud or the Coolmore Stud. The Modification infrastructure would also be screened from view from Edderton Road by intervening vegetation. Therefore, it is expected the Modification would have negligible visual incremental impacts on surrounding receivers.

Table 11 (continued)
Key Outcomes of Environmental Review for the Modified Maxwell Underground Mine Project

Environmental Aspect	Summary of Key Environmental Review Conclusions
Air Quality	No significant change in dust level at any off-site receptor would occur from the mine as a result of the Modification. A review of cumulative dust levels, including background levels and the emissions from all other mines, indicates the Modification would result in no discernible change relative to the approved levels.
Noise	Noise predictions indicate that operational and construction noise levels associated with the Modification would comply with the existing Development Consent noise limits at all privately-owned noise sensitive receivers
Other Aspects	The Modification would result in negligible or no change in potential impacts on other environmental, social and economic considerations.

The *Maxwell Underground Coal Mine Project SSD-9526 Statement of Reasons for Decision* (IPC, 2020) states the following regarding the approved Project:

> *Based on consideration of all issues, risks and potential impacts, and subject to appropriate conditions, the Commission finds that the Project is compliant with the objects of the EP&A Act; the principles of ecologically sustainable development; and the relevant policy framework. The Commission finds, after weighing all relevant considerations, that the Project is in the public interest.*

The Modification is considered to be generally consistent with the objects of the EP&A Act, because it is a Modification that:

- involves the orderly and economic use of land as the Modification surface development area is the minimum amount of land required to accommodate the Modification; and
- is an application under section 4.55(2) of the EP&A Act that would be determined by the NSW Government.

7.3.2 Evaluation under Section 4.15(1) of the Environmental Planning and Assessment Act 1979

In evaluating the Modification, under section 4.15(1) of the EP&A Act, the consent authority is required to take into consideration a range of matters as they are of relevance to the subject of the application, including:

> ***(1) Matters for consideration—general***
> *In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application—*
>
> *(a) the provisions of—*
>
> *(i) any environmental planning instrument, and*
>
> *(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and*
>
> *(iii) any development control plan, and*
>
> *(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and*
>
> *(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph),*
>
> *…*
>
> *that apply to the land to which the development application relates,*
>
> *(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,*
>
> *(c) the suitability of the site for the development,*
>
> *(d) any submissions made in accordance with this Act or the regulations,*
>
> *(e) the public interest.*

While this is a requirement of the consent authority, this Modification Report has been prepared to generally address the requirements of section 4.15(1) of the EP&A Act to assist the consent authority, as follows:

- Consideration of the requirements of relevant environmental planning instruments is provided in Section 4.3.

- Clause 2.10 of the *State Environmental Planning Policy (Planning Systems) 2021* states that development control plans do not apply to SSDs.
- The existing planning agreement offer to the Muswellbrook Shire Council would continue to apply to the modified Project.
- This Modification Report has been prepared in consideration of the prescribed matters in the EP&A Regulation.
- A description of the existing environment, an assessment of the potential environmental impacts associated with the Modification, and a description of the potential measures to avoid, mitigate, rehabilitate, remediate, monitor and/or offset the potential impacts of the Modification are described in Section 6 and Appendices A to H.
- The suitability of the proposed site for the Project was considered in Section 9.1 of the EIS (Malabar, 2019a) and would not change for the Modification (i.e. the Modification is wholly located within the approved Development Application Area and the Project, as modified, would remain substantially the same).
- Consideration of whether, on evaluation, the Modification is considered to be in the public interest is provided in Sections 7.4 and 7.5.

7.4 JUSTIFICATION FOR THE MODIFICATION

The Project will operate in accordance with Development Consent SSD 9526 granted by the IPC on 22 December 2020.

The Modification is located wholly within the approved Development Application Area and would comprise the following components:

- re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams resulting in a minor increase in the approved underground mining extent;
- reduction in the width of some of the longwall panels in the Woodlands Hill Seam;
- repositioning of the upcast ventilation shaft site and associated infrastructure; and
- other minor works and ancillary infrastructure components (e.g. ancillary water management infrastructure for the repositioned ventilation shaft site).

The Project would generate a significant net benefit to the State of NSW. The *Maxwell Underground Coal Mine Project SSD-9526 Statement of Reasons for Decision* (IPC, 2020) states:

> *In summary, the Commission finds the:*
>
> - *the Project to be a lawful and appropriate use of the land and notes the benefits associated with it being in the Hunter coalfield, close to several other mining operations and power stations, where sharing of infrastructure is possible*
>
> *…*
>
> - *the Project will deliver significant economic benefits for the local area, region and State including 250 construction and 350 operational jobs*

The Modification would also provide the following benefits:

- improved mine safety due to aligning the underground mine plan more favourably with the geotechnical environment;
- improved management of subsidence impacts on Edderton Road;
- less development drivage required to achieve first longwall coal, resulting in earlier commencement of longwall production (and associated economic and community benefits);
- reduction in initial capital expenditure required to achieve steady-state production and future capital costs associated with modifications to longwall equipment;
- extraction of initial longwall panels in an area with lower gas content, which provides additional time to develop gas management strategies; and
- improved ventilation efficiency.

As such, the approval of the Modification is considered to be justified.

7.5 CONCLUSION

The modified Project would be substantially the same as the approved Project.

The Project (as modified) would continue to comply with existing criteria, performance measures and limits described in Development Consent SSD 9526.

Malabar would also continue to operate the Project (as modified) in accordance with the existing management and monitoring regime described in Development Consent SSD 9526 and the EIS (Malabar, 2019a).

In weighing up the main environmental impacts (costs and benefits) assessed and described in this Modification Report, the Modification is, on balance, considered to be in the public interest of the State of NSW.

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ATTACHMENT 1
MODIFIED PROJECT DESCRIPTION

MAXWELL UNDERGROUND MINE PROJECT

PROJECT DESCRIPTION

DEVELOPMENT CONSENT SSD 9526
MODIFICATION 1
MODIFICATION 2

MALABAR

JUNE 2022
Project No. SHM-20-04
Document No. 01143260.docx

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3 PROJECT DESCRIPTION

The Project Description describes the Maxwell Underground Mine Project (the Project), **incorporating:**

- **changes made to the Project following EIS submission and prior to determination (refer green text);**
- **Modification 1 as described in the *Maxwell Underground Mine Project Mine Entry Modification - Modification Report* (Malabar, 2021) (refer blue text); and**
- **Modification 2 as described in the *Maxwell Underground Mine Project Mining Optimisation Modification – Modification Report* (Malabar, 2022) (refer purple text).**

3.1 COAL RESOURCE AND GEOLOGICAL FEATURES

The Project would target coal seams within the Wittingham Coal Measures.

The Project would produce high-quality coals with at least 75% of coal produced capable of being used in the making of steel (known as coking or metallurgical coals). The balance would be export thermal coals suitable for the new-generation High Efficiency, Low Emissions power generators.

Further information on the characteristics of the coal resource and geological features and resource recovery are provided below.

Malabar's understanding of the coal resource has been informed by extensive exploration across the target underground mining area.

In total, more than 950 exploration boreholes have been drilled. In addition to this, approximately 75% of the area is also covered by three-dimensional (3D) seismic survey.

3.1.1 Stratigraphy and Seam Characteristics

The Project is located in the Hunter Coalfield in the northern part of the Permo-Triassic Sydney Basin, which forms the southern portion of the Sydney-Gunnedah-Bowen Basin (DMR, 1988).

The Wittingham Coal Measures occur widely within the Hunter Coalfield and contain many recoverable seams. The Project targets mining of the Whynot, Woodlands Hill, Arrowfield and Bowfield Seams.

The target seams are within the Jerrys Plains Subgroup, forming part of the upper and middle units of the Wittingham Coal Measures (Figure 3-1).

Above the target seams, the stratigraphy of the area consists of a sequence of sandstone, siltstone and laminate units within the Wittingham Coal Measures (Figure 3-1).

A summary of the characteristics of the target seams is provided in Table 3-1.

Table 3-1
Seam Characteristics of the Maxwell Underground Area

Seam	Depth of Cover (m)	Working Section Thickness (m)
Whynot*	40 – 180	1.3 – 2.3 (average 2.0)
Woodlands Hill	125 – 365	1.7 – 3.5 (average 2.7)
Arrowfield	165 – 415	2.1 – 3.7 (average 2.9)
Bowfield	215 - 425	2.2 – 3.3 (average 2.8)

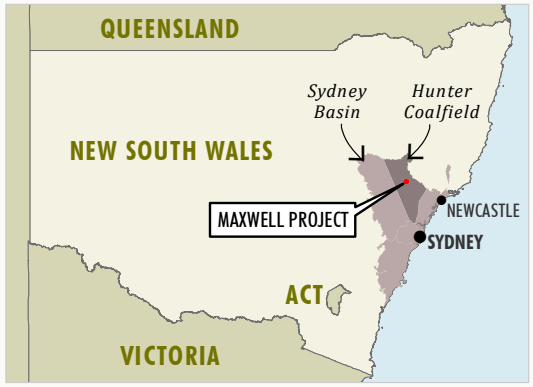
* Partial pillar extraction would not occur at depths of cover less than 50 m.

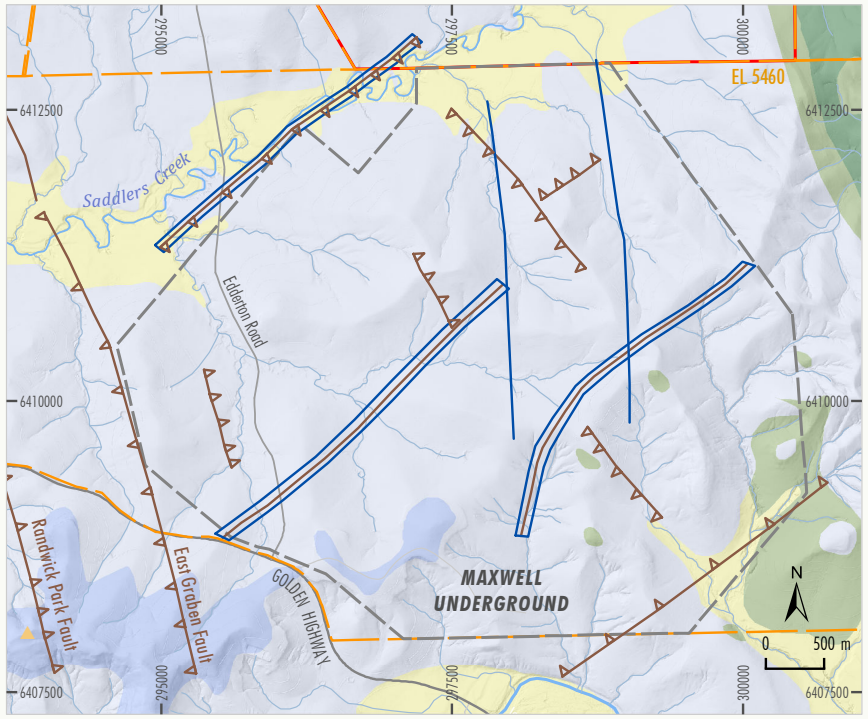
3.1.2 Geological Features

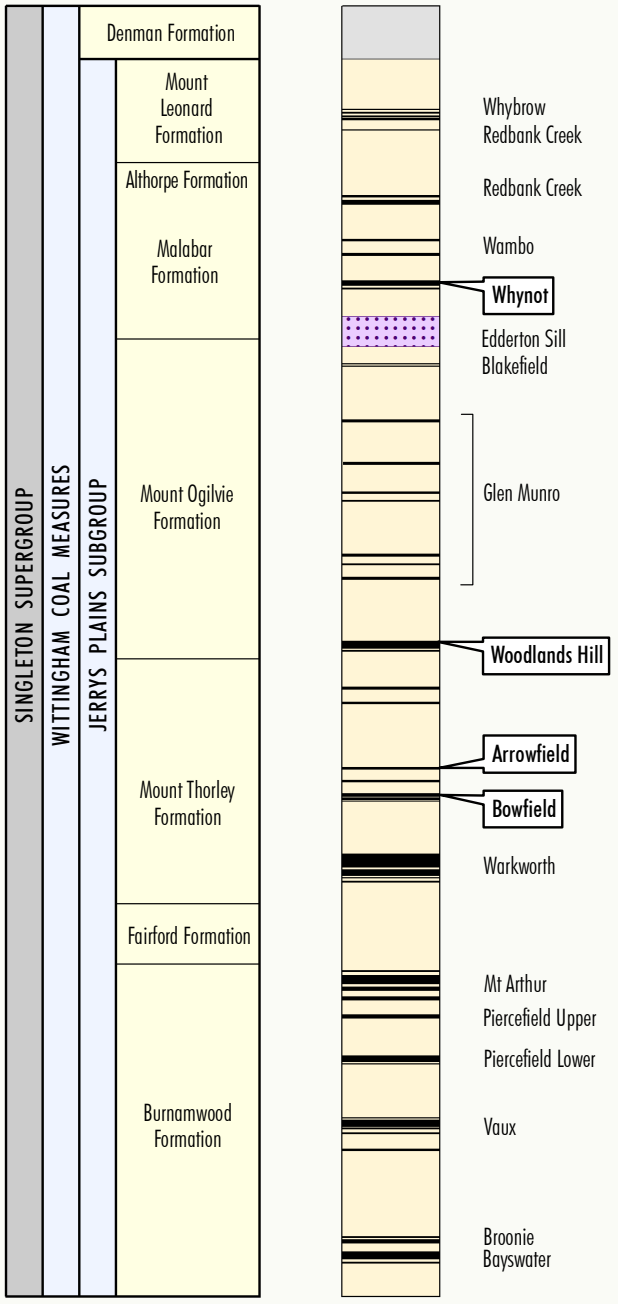
The target underground mining area sits on the western side of the Muswellbrook Anticline, which is a prominent regional geological feature. The strata in the area (including the coal seams) dip gently, with gradients varying between 3% and 5%.

Geological features identified in the target underground mining area and surrounds include:

- a north-northwest-orientated regional graben structure to the west of the Maxwell Underground;
- a north-east-trending fault located to the south-east of the Maxwell Underground with a throw of approximately 10 m;
- smaller faults within the mining area with throws of between approximately 2 m to 6 m;
- igneous dykes;
- dolerite sills intruded into the Whynot, Arrowfield and Bowfield Seams; and
- the Edderton Sill intruded into the interburden between the Whynot and Blakefield Seams, with a thickness of approximately 20 m.







LEGEND

Exploration Licence Boundary
Mining and Coal Lease Boundary
Indicative Extent of Underground Development

Stratigraphic Unit

- Quaternary
- Newcastle Coal Measures
- Wittingham Coal Measures
- Ungrouped Cenozoic Igneous Units
- Mulbring Siltstone

Geological Features

- Dolerite Sill
- Fault
- Dyke

Source: © NSW Department of Planning and Environment (2019); Department of Finance, Services & Innovation (2019); Department of Resources & Energy (2019); MBGS (2018)

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MAXWELL PROJECT

Geology of the Project Area

Figure 3-1

Resource Strategies

The regional graben structure to the west of the Maxwell Underground comprises the East Graben Fault and the Randwick Park Fault (Figure 3-1).

The East Graben Fault is sub-vertical and has a downthrow of up to 20 m to the west into the graben which forms with the sub-parallel Randwick Park Fault, which has a throw of up to 50 m to the east.

Igneous dykes have been observed as part of surface exploration (Figure 3-1). In-seam drilling would occur during the life of the Project (Section 3.15.2) to characterise the presence of any dykes at seam level.

Extraction through smaller identified faults and dykes is expected to be feasible with the implementation of specific management measures (including the installation of additional ground support or grouting).

Geological features in the Project area are described and considered in detail as part of the Subsidence Assessment (Appendix A) and the Groundwater Assessment (Appendix B).

3.1.3 Coal Resource and Resource Recovery

The Maxwell Underground area is located entirely within EL 5460. The total measured, indicated and inferred coal resource within EL 5460 is approximately 770 Mt.

The Project would recover approximately 148 Mt of ROM coal from the target coal seams.

Extraction in the Whynot Seam is constrained by a dolerite sill to the north-west, west, south, and east. Extraction in the north-east is constrained by depth of cover to the Whynot Seam.

The proposed longwalls in the Woodlands Hill, Arrowfield and Bowfield Seams are constrained by the following (Figure 3-1):

- the East Graben Fault to the south-west;
- the extent of EL 5460 in the south; and
- the north-east-trending fault to the south-east.

The north-eastern extents of the longwall layouts are constrained by seam dip in the Woodlands Hill Seam, by a dolerite sill in the Arrowfield Seam and by technical constraints associated with interburden thickness in the Bowfield Seam.

Malabar would seek to maximise resource recovery within geological, environmental and tenement constraints.

Further exploration or technical assessment may result in changes to the recoverable coal resource. Malabar also recognises that mining technology will advance over the life of the Project, influencing the ultimate coal reserves.

There is the potential to recover additional coal beyond the life of the Project, which would be subject to separate assessments and approvals. The Project would not be expected to have a significant impact on future extraction or recovery of coal in either deeper seams or beyond the proposed Maxwell Underground area.

3.2 PROJECT GENERAL ARRANGEMENT

The Project would involve an underground mining operation that would produce high-quality coals over a period of approximately 26 years.

Table 3-2 provides a tabulated summary of the key characteristics of the Project.

The main activities associated with the development of the Project would include:

- underground bord and pillar mining with partial pillar extraction in the Whynot Seam;
- underground longwall extraction in the Woodlands Hill, Arrowfield and Bowfield Seams;
- development and use of mine access drifts and underground roadways and shafts to access and service the underground mining areas;
- development and use of a mine entry and associated infrastructure, services and facilities that support underground mining and coal handling activities and provide for personnel and materials access to the underground mine;
- establishment of a site access road from Thomas Mitchell Drive to the underground mine entry;
- establishment of power transmission infrastructure, including power lines and substations;
- establishment of infrastructure associated with mine ventilation and gas management;

Table 3-2
Overview of the Maxwell Project

Component	Description
Mining Method	Underground extraction using "bord and pillar" and "longwall" mining methods.
Resource	Coal seams in the Wittingham Coal Measures within EL 5460 (Whynot Seam, Woodlands Hill Seam, Arrowfield Seam and Bowfield Seam).
Annual Production	Up to 8 million tonnes of ROM coal per annum.
Mine Life	**Mining operations may be carried out on the site until 30 June 2047**.
Total Resource Recovered	Approximately 148**.5** million tonnes of ROM coal (i.e. an annual average of approximately 5.7 million tonnes of ROM coal, yielding an annual average of approximately 4.8 million tonnes of product coal).
Coal Handling and Preparation	Handling and processing of up to 8 million tonnes of ROM coal per annum. Transport of coal from underground faces to the MEA (mine entry area) via an underground conveyor network. Use of a surge stockpile and coal sizing facilities at the underground MEA prior to transporting ROM coal to the Maxwell Infrastructure CHPP. Transportation of early ROM coal via internal roads to the Maxwell Infrastructure CHPP, while a covered, overland conveyor is constructed and commissioned. Subsequently, ROM coal would be transported via the covered, overland conveyor system. Use of the existing Maxwell Infrastructure CHPP with upgrades to coal handling and processing infrastructure.
Management of Reject Material (i.e. Stone-derived Material)	Emplacement of coarse rejects and tailings primarily within the existing "East Void" in ML 1531 at the Maxwell Infrastructure precinct.
General Infrastructure	Use of the existing Maxwell Infrastructure with upgrades. Development of an underground MEA and associated facilities that support the underground mining activities and provide for personnel and materials access to the underground mine. Development of infrastructure for power supply, ventilation and gas management for the underground mine.
Product Transport	Transport of product coal to market or to the Port of Newcastle for export via the existing Antiene Rail Spur and Main Northern Railway. ~~**or via conveyor to the Bayswater and/or Liddell Power Stations.**[1]~~ Transport of up to 7 million tonnes of product coal per annum along the rail loop (up to 12 train movements per day).
Water Management	On-site water management system, including: recycling of water on-site; storage of water on-site (including in voids); water treatment; irrigation; and sharing of water with Mt Arthur Mine and other users. Augmentations and extensions to existing water management infrastructure and development of new water management storages, sumps, pumps, pipelines, sediment control, mine dewatering, water treatment and wastewater treatment infrastructure.
Workforce	During operation, the Project would directly employ approximately 350 personnel. Initial construction activities would require an average of approximately 90 personnel, and a maximum of approximately 250 personnel. Additional contractors would also be required during short periods over the life of the Project; for example, during longwall change-outs, periods of higher underground development activities, scheduled plant shutdowns or other maintenance programs. These activities may require up to approximately 80 additional personnel.
Hours of Operation	Operated on a continuous basis, 24 hours per day, seven days per week.
Capital Investment Value	$509,000,000.

~~[1] **Consistent with the current approval for the Antiene Rail Spur (DA 106-04-00), coal may be hauled on public roads under emergency or special situations with the prior written permission of the Secretary of the DPIE, RMS and Muswellbrook Shire Council.**~~

- use of the existing water management systems;
- progressive development of dams, sumps, pumps, pipelines, water storages, water treatment and other water management infrastructure;
- production of up to 8 Mtpa of ROM coal;
- construction and use of a conveyor system to transport coal from the MEA to the existing CHPP at the Maxwell Infrastructure for processing;
- transportation of early ROM coal via internal roads from the MEA to the existing CHPP;
- handling and processing of coal and loading of coal onto trains at the existing Maxwell Infrastructure;
- transport of product coal via the existing Antiene Rail Spur and Main Northern Railway to market or to the Port of Newcastle for export, or via conveyor to the Bayswater and/or Liddell Power Stations;
- emplacement of coarse rejects, tailings and brine within existing voids in CL 229 and ML 1531;
- continued use of existing facilities and services at the Maxwell Infrastructure, with upgrades to coal handling infrastructure along with other minor upgrades;
- monitoring, rehabilitation and remediation of subsidence and other mining effects;
- management of subsidence impacts on Edderton Road;
- rehabilitation activities within CL 229, ML 1531 and CL 395, including the rehabilitation of reject and tailings emplacement areas;
- exploration activities within EL 5460 and A 173; and
- other associated minor infrastructure, plant, equipment and activities.

The Project area comprises the following main domains:

- Maxwell Underground – comprising the proposed area of underground mining operations and the MEA within EL 5460.
- Maxwell Infrastructure – the area within existing mining leases comprising the substantial existing infrastructure (including the CHPP) and previous mining areas.
- The transport and services corridor between the Maxwell Underground and Maxwell Infrastructure – this would comprise a site access road, a covered, overland conveyor, power supply and other ancillary infrastructure and services.
- ~~A potential~~ **The** realignment of Edderton Road (Section 3.15.1).

An indicative Project general arrangement showing the Maxwell Underground and Maxwell Infrastructure, respectively, is provided on Figures 3-2 and 3-3.

A description of the potential interactions between the Project and surrounding mining developments is provided in Section 2.3. Potential cumulative impacts associated with these developments have been considered in this EIS (Section 6).

The final landform and rehabilitation strategy for the Project is presented in Section 7 and Appendix U.

3.3 PROJECT SCHEDULE

Malabar anticipates that construction and operational activities associated with the Project would commence as soon as practicable after all necessary consents, approvals and licences for the Project have been obtained.

A provisional Project schedule is provided in Figure 3-4. The actual timing and sequence may vary to take account of: detailed design, project capital decisions, market conditions and contractor requirements. For example, commencement of longwall mining operations may also occur earlier, should conditions allow for this.

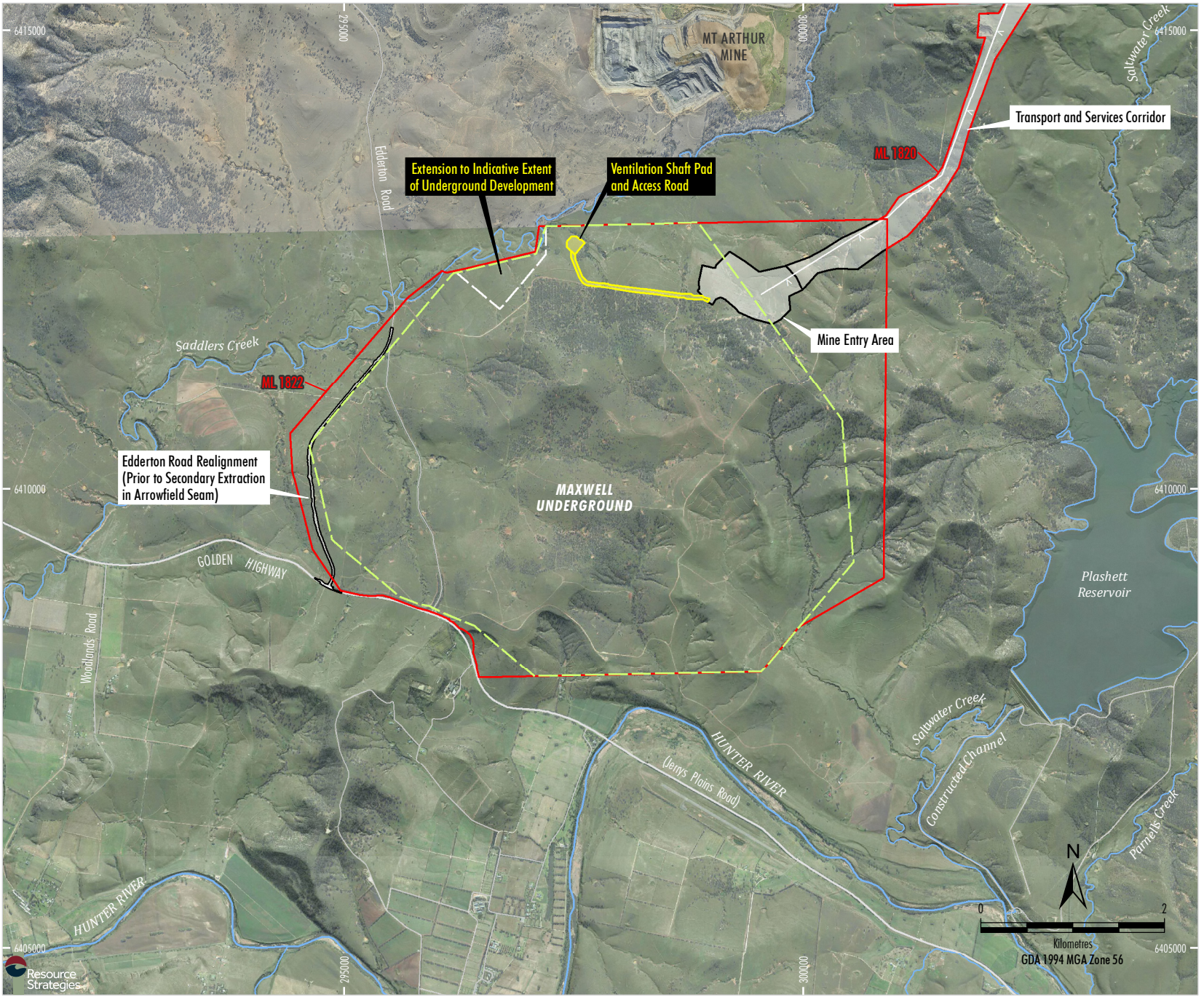
The Project would extract coal over a period of approximately 26 years.

3.4 PROJECT CONSTRUCTION AND OTHER DEVELOPMENT ACTIVITIES

The level of construction activity for the Project is reduced through the use of the substantial, existing Maxwell Infrastructure.

Additional infrastructure and upgrades to existing infrastructure required to support the Project would be progressively developed during the life of the Project, including:

- extension of the existing site access road to provide access to the MEA, and sealing along the full length;



LEGEND

- Mining and Coal Lease Boundary
- Indicative Extent of Underground Development
- Modified Indicative Extent of Underground Development
- 66 kV Power Supply
- Indicative Surface Development Area
- Indicative Additional Surface Development Area

Source: NSW Spatial Services (2022); MSEC (2019, 2022)
Orthophoto Mosaic: 2020, 2019

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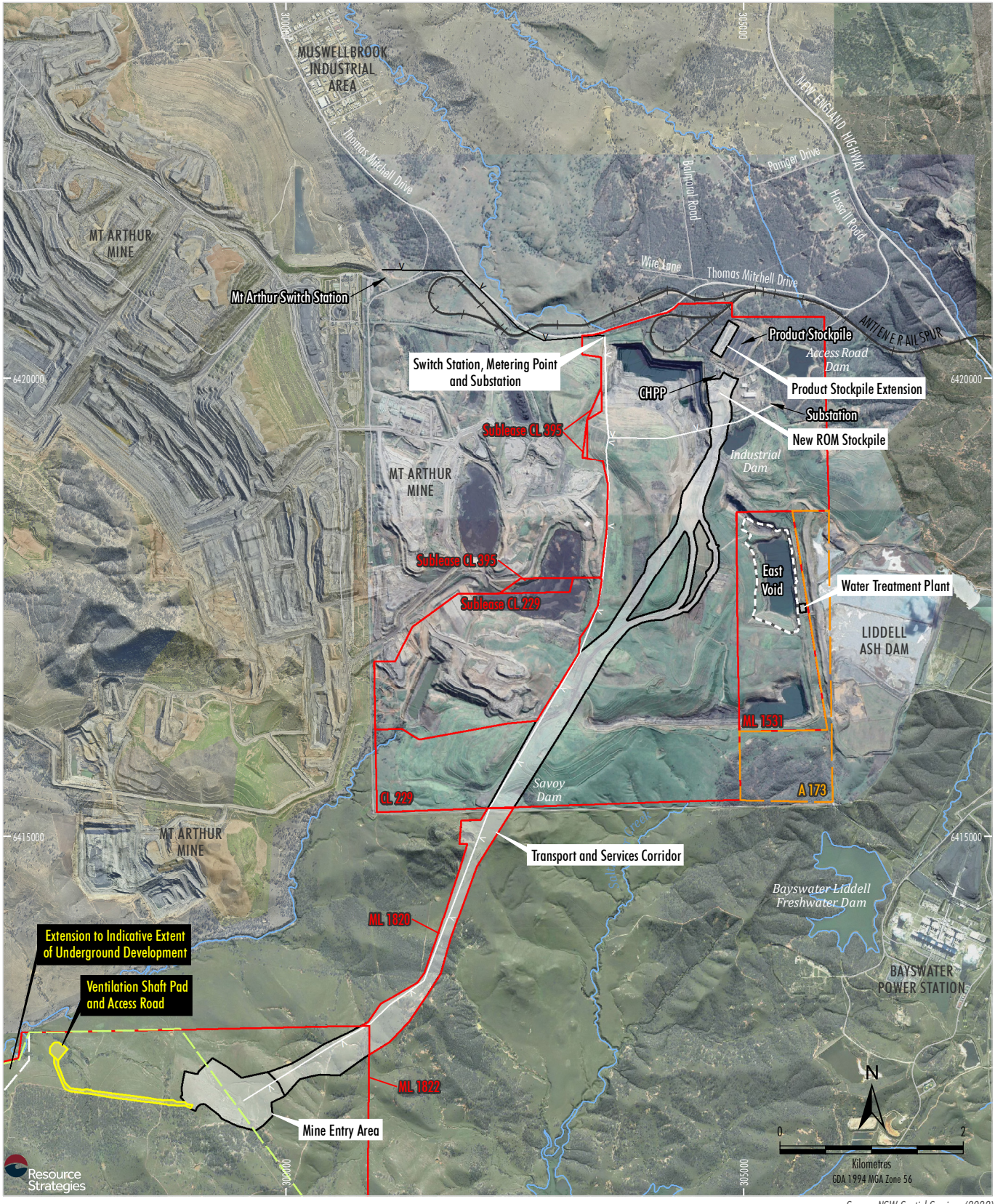
MAXWELL UNDERGROUND MINE PROJECT

General Arrangement
- Maxwell Underground (as Modified)

Figure 3-2



Source: NSW Spatial Services (2022)
Orthophoto Mosaic: 2020, 2019

LEGEND

- Railway
- Exploration Licence Boundary
- Mining and Coal Lease Boundary
- Indicative Extent of Underground Development
- Modified Indicative Extent of Underground Development
- Indicative Surface Development Area
- CHPP Reject Emplacement Area
- Indicative Additional Surface Development Area
- 66 kV Power Supply
- Proposed Ausgrid 66 kV Power Supply Extension #

Subject to separate assessment and approval.

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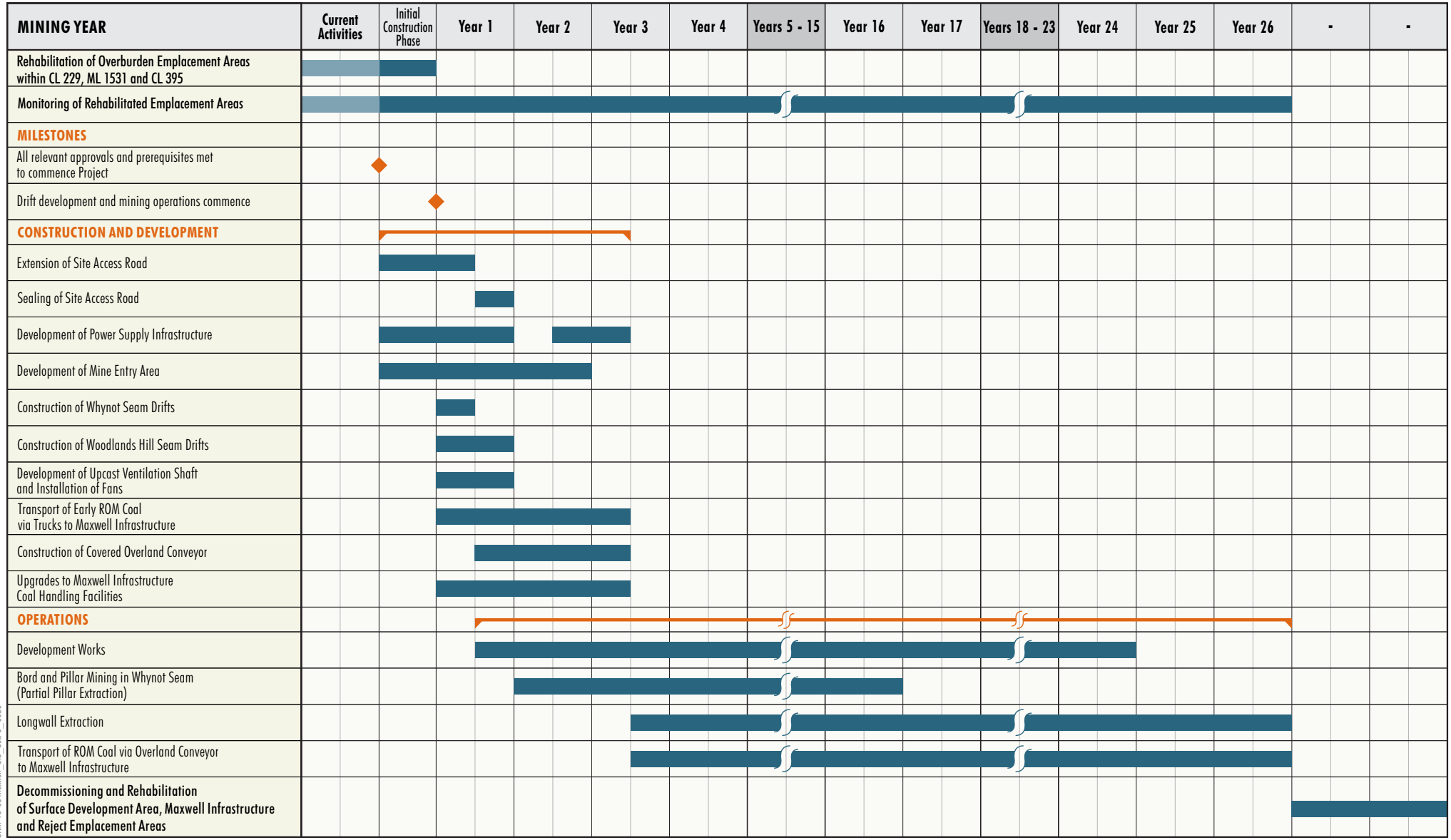
MAXWELL UNDERGROUND MINE PROJECT

General Arrangement - Maxwell Infrastructure (as Modified)

Figure 3-3



SMM-18-03 Maxwell_EIS_Sect 3_005C

Resource Strategies

LEGEND

Current Maxwell Infrastructure Activities (Project Approval 06_0202)

Maxwell Project Activities (SSD 18_9526)

Source: Malabar (2019)

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MAXWELL PROJECT

Provisional Project Schedule

Figure 3-4

- development of the MEA for the Maxwell Underground and its access drifts;
- establishment of infrastructure associated with mine ventilation and gas management;
- development of a transport and services corridor from the Maxwell Underground to Maxwell Infrastructure, including a covered, overland conveyor system;
- upgrades to ROM and product coal handling facilities at the Maxwell Infrastructure;
- construction of power transmission infrastructure, including power lines and substations;
- progressive development and augmentation of sumps, pumps, pipelines, water storages, water treatment and other water management equipment and structures;
- delivery, assembly and installation of specialised underground mining equipment, including a longwall machine;
- progressive development of underground conveyor systems and services;
- off-site maintenance, replacements and upgrades to roadway development machines and longwall mining machinery;
- the ~~potential~~ realignment of Edderton Road; and
- other minor upgrades at the existing Maxwell Infrastructure and removal of redundant infrastructure.

Construction activities may be undertaken up to 24 hours per day, 7 days per week, including surface construction activities. Upgrades at the Maxwell Infrastructure would be limited to 7.00 am to 6.00 pm Monday to Sunday.

Consideration of construction activities and their potential for noise generation and air quality impacts are provided in the Noise Impact Assessment (Appendix I) and Air Quality and Greenhouse Gas Assessment (Appendix J).

Further detail on construction and other development activities is provided below.

3.4.1 Site Access Road

The Project would use the existing site access to the Maxwell Infrastructure from Thomas Mitchell Drive (Plate 3-1). The site access road would be extended along the transport and services corridor to the MEA **(including along an existing internal haul road at the Maxwell Infrastructure)**.

The site access road would be progressively sealed during the first ~~year~~ six months of mining operations (Figure 3-4).

3.4.2 Mine Entry Area, Mine Access and Underground Development

Early preparatory works would occur at the MEA prior to the commencement of construction activities, including, but not limited to:

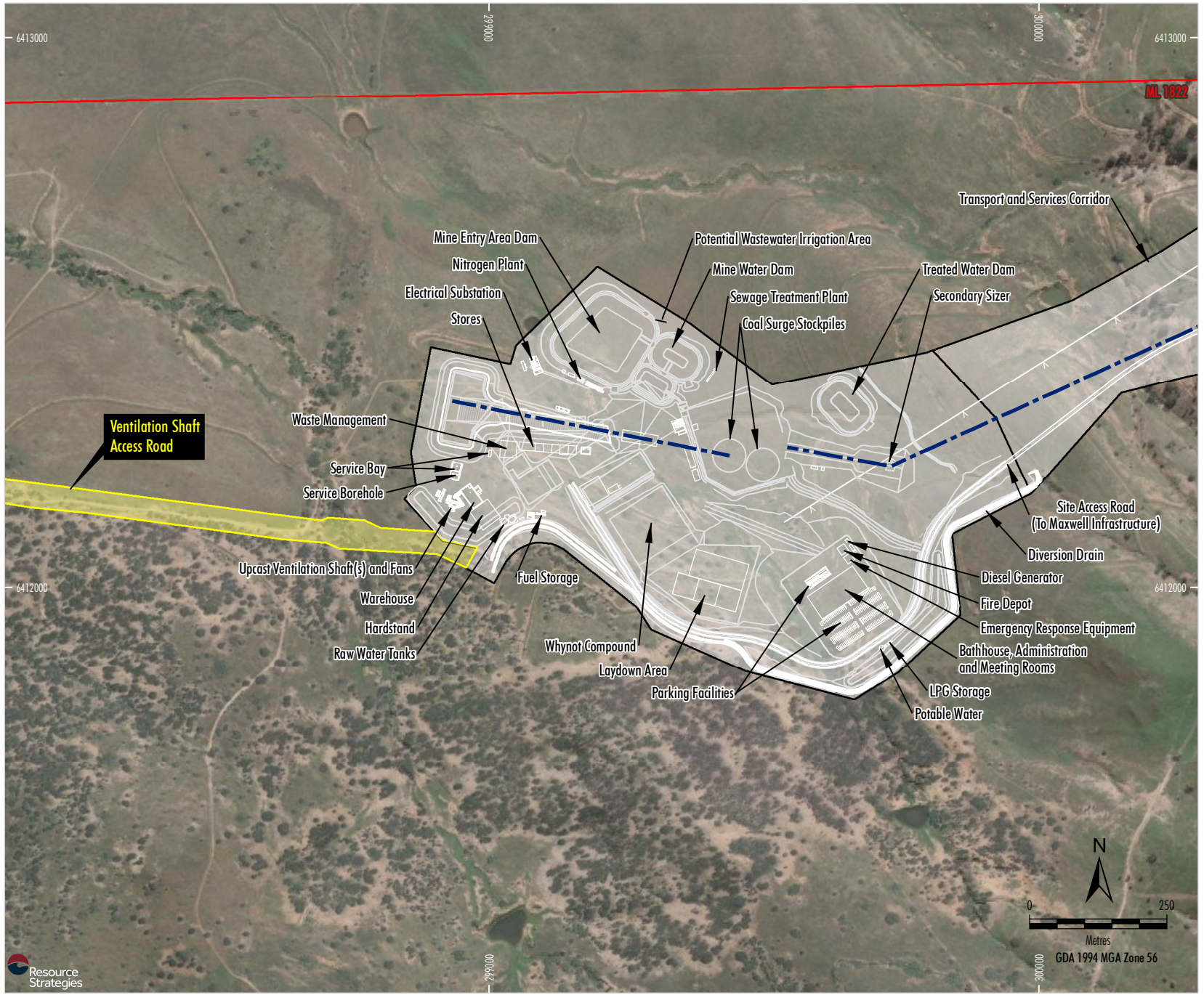
- site survey and demarcation activities;
- upgrades of existing access tracks;
- geotechnical testing to inform detailed design;
- salvage of Aboriginal artefacts;
- installation of temporary erosion and sediment controls; and
- installation of temporary buildings and site security to support construction activities.

Construction and development of the MEA would involve:

- vegetation clearance and topsoil stripping;
- construction of internal roads;
- excavation of the MEA (access floor and wall above the portal), portals and mine access drifts;
- construction of water management infrastructure, including sumps, pumps, drains, pipelines and water storages;
- construction and development of surface conveyors, ROM coal surge stockpiles and a coal sizing facility;
- construction of administration buildings, meeting rooms, bathhouse, workshop, fuel storage, laydown and parking facilities and other ancillary infrastructure;
- construction and installation of ancillary infrastructure and services for the MEA (e.g. power transmission infrastructure, site security); and
- other miscellaneous activities.

An indicative general arrangement of the MEA is provided in Figure 3-5.

Access to the underground workings would be via four drifts constructed from the MEA. The drifts would be constructed by road headers, tunnel boring machine or continuous miners. Drift conveyors would be installed in two of the drifts to transport coal from underground to the surface.



LEGEND

- Mining and Coal Lease Boundary
- Indicative Mine Entry Infrastructure
- Indicative Surface/Overland Conveyor Location
- Indicative Surface Development Area
- Indicative Additional Surface Development Area

Source: NSW Spatial Services (2021); Arkhill (2021)
Orthophoto: ESRI World Imagery (2021)

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MAXWELL UNDERGROUND MINE PROJECT

Indicative Mine Entry Area Layout (as Modified)

Figure 3-5

Plate 3-1 – Existing Site Access Road from Thomas Mitchell Drive

Source: VPA (2019).

The topsoil stripped during construction activities would be stockpiled for use on areas disturbed during the construction phase. The volume of topsoil stockpiled would be modest given the modest extent of the MEA.

Virgin excavated natural material excavated during development of the MEA and access drifts would preferentially be used as construction fill (e.g. for hardstand areas, dam embankments and road construction). Excess material would be emplaced in the existing South Void at the Maxwell Infrastructure.

Malabar would seek to eliminate or minimise the need for construction blasting, with material preferentially removed through the use of dozers and excavators only. Blasting of material may be required during construction activities; for example, to develop the coal surge stockpile area, site access road, access to the underground workings and/or water storage dams.

The requirement for blasting would be dictated by the geotechnical properties of the material being excavated.

Any blasts required for construction activities would be limited to a Maximum Instantaneous Charge (MIC) of approximately 500 kilograms (kg). This is substantially smaller than blasting that would occur in an open cut mining operation (an MIC typically in the order of 2,000 kg to 4,000 kg).

3.4.3 Mine Ventilation and Gas Management System

An upcast ventilation shaft site, including shaft(s), associated fans and ancillary infrastructure, would be constructed and installed at the MEA to provide adequate ventilation of the underground workings **in the Whynot Seam**.

A separate ventilation shaft would be established to the west of the MEA to provide adequate ventilation for underground workings in the Woodlands Hill, Arrowfield and Bowfield Seams. The location of the ventilation shaft pad is shown on Figure 3-4.

Development of the upcast ventilation shaft infrastructure would involve:

- development of concrete-lined or steel-lined shaft(s) ~~(approximately 5.5 m in diameter)~~;
- installation of ventilation fans;

- installation of a centralised gas management system;
- installation of a power supply and associated electrical switchroom, transformer and ancillary infrastructure for the ventilation fans;
- installation of appropriate security (i.e. fencing) to prevent unauthorised access to the ventilation shaft site; and
- installation of erosion and sediment control infrastructure.

~~It is expected that the ventilation shaft(s) would be constructed using the "blind bore" method. Using this method, the drilling would take place in advance of development workings, with material from the excavation being removed from the top of the shaft. The construction footprint of the shaft would be within the footprint of the MEA (Figure 3-5).~~

The excavated material resulting from the construction of the shafts would be used as construction fill or stockpiled on-site, revegetated and used for future rehabilitation of the shaft site upon decommissioning.

Further information on ventilation and gas management is provided in Section 3.5.6.

3.4.4 Transport and Services Corridor

A covered, overland conveyor and ancillary infrastructure would be developed to transport ROM coal from the MEA to the existing Maxwell Infrastructure.

The conveyor would be commissioned prior to transporting coal extracted by longwall mining machinery.

Early ROM coal would be transported to the existing Maxwell Infrastructure via truck on the site access road while the overland conveyor is constructed and commissioned.

Other site services and ancillary infrastructure would be developed within the transport and services corridor including, but not limited to, pipelines, pumps, telecommunication infrastructure, power transmission infrastructure and erosion and sediment controls.

A conceptual cross-section through a portion of the transport and services corridor is shown on Figure 3-6. Borrow pits may be developed within the surface development area to provide excavated material for use during construction activities.

3.4.5 Maxwell Infrastructure Upgrades

The existing product coal stockpile area at the Maxwell Infrastructure would be extended to allow for better management of different product coal blends and to provide sufficient capacity during longwall moves (Figure 3-7). The combined capacity of the product coal stockpiles would increase from approximately 320,000 tonnes (t) to approximately 500,000 t.

Construction of the product coal stockpile area would involve:

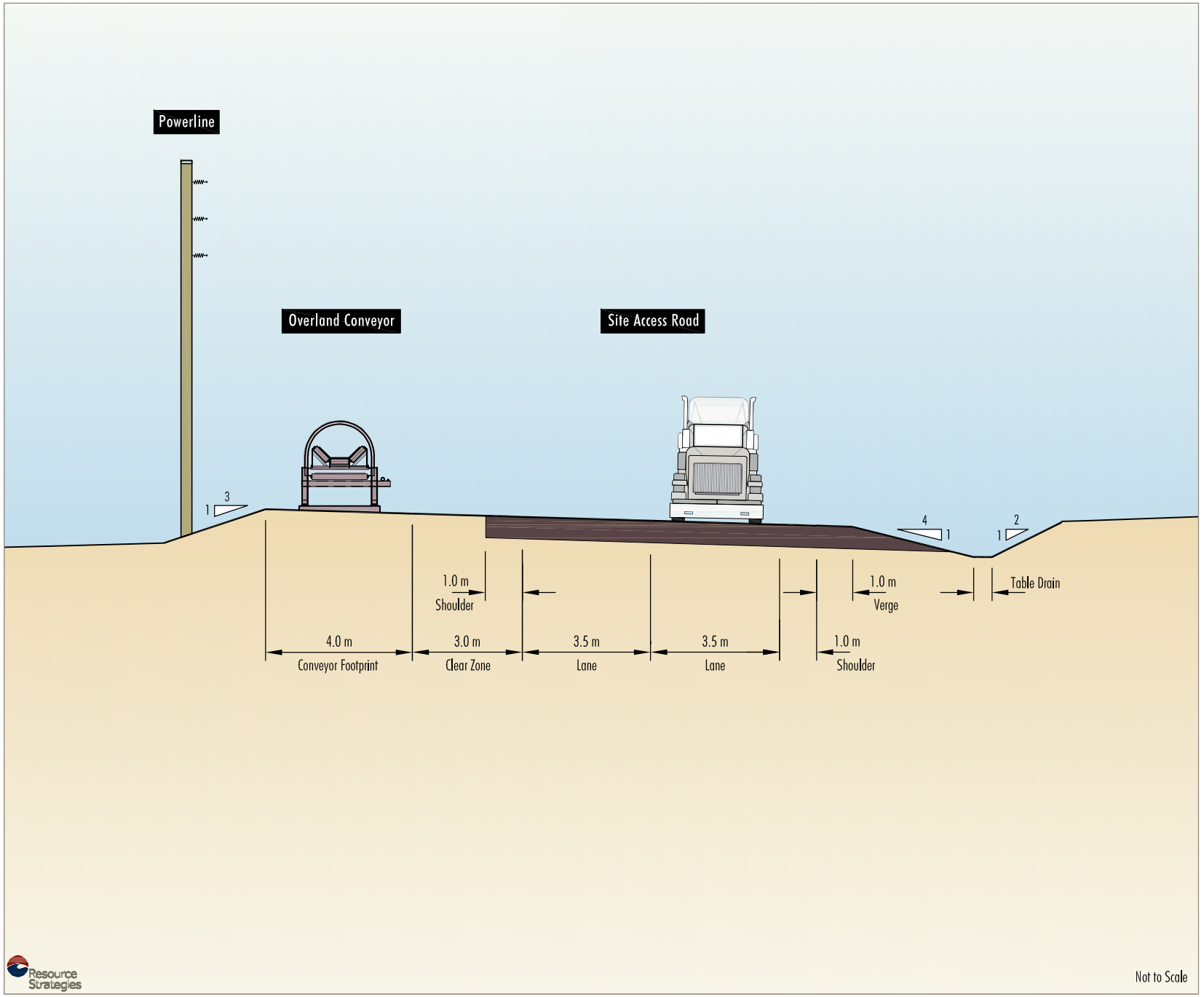
- vegetation clearance, topsoil stripping, grading and levelling;
- installation of coal reclaim valves and tunnel; and
- installation of a skyline conveyor system.

An additional ROM stockpile would also be developed adjacent to the coal processing plant to cater for delivery of ROM coal via the covered overland conveyor (Figure 3-7).

Material excavated during construction would preferentially be used as construction fill. Excess material would be emplaced in the existing North Void at the Maxwell Infrastructure.

In addition to the above, other works at the Maxwell Infrastructure may include:

- installation of additional conveyors to allow for bypass of coal around the existing coal processing plant;
- replacement, upgrades and augmentation of other conveyor systems;
- upgrade and/or replacement of the train load-out bin and transfer conveyors;
- upgrade and/or replacement of screens and other components within the coal processing plant;
- upgrades and/or replacement of CHPP reject handling infrastructure;
- **installation of a water treatment facility and associated ancillary infrastructure;**
- augmentation of sumps, pumps, pipelines, water storages and other water management equipment and structures;
- other minor upgrades and ancillary works; and
- removal of redundant infrastructure, such as primary and secondary sizers and hoppers at the CHPP.



Source: GHD (2019)

MALABAR COAL

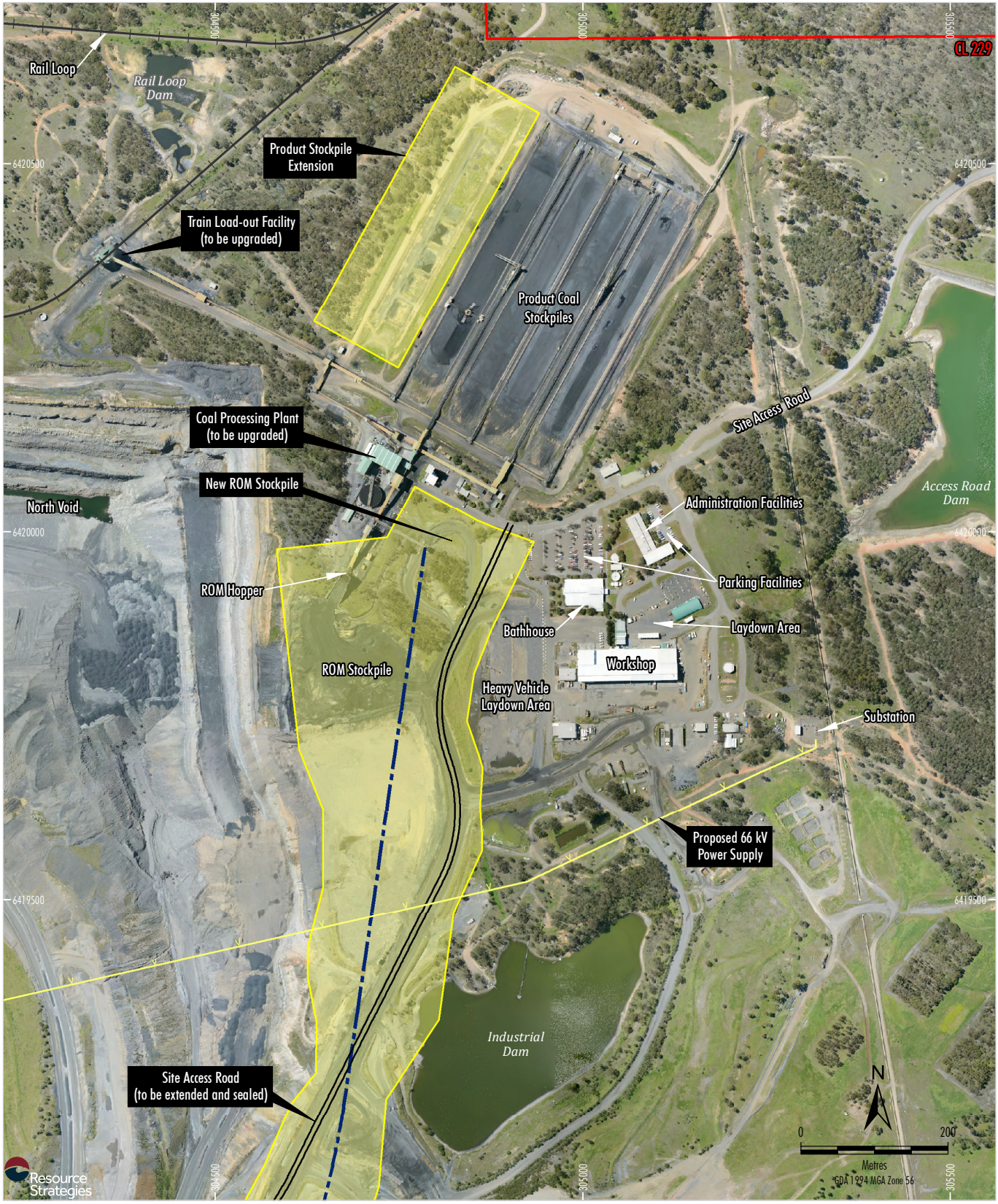
MAXWELL PROJECT

Typical Cross-section
- Transport and Services Corridor

Figure 3-6

Resource Strategies

SHM-18-03 Maxwell_EIS_Sect 3_101B



LEGEND

- Railway
- Mining and Coal Lease Boundary
- Indicative Surface Development Area
- Indicative Overland Conveyor
- Proposed 66 kV Power Supply

Source: © NSW Department of Planning and Environment (2019); NSW Department of Finance, Services & Innovation (2019) Orthophoto Mosaic: 2016

MALABAR COAL

MAXWELL PROJECT

Maxwell Infrastructure - Indicative Layout of Coal Handling and Processing Facilities

Figure 3-7

3.4.6 Power Supply

An overhead 66 kilovolt (kV) power line and associated switch station may be constructed from the Ausgrid network to the MEA to support Project activities (Figures 3-2 and 3-3).

If required, Ausgrid would separately construct an extension from an existing Ausgrid 66 kV power line to a proposed switch station, metering point and substation in the north-west of the existing Maxwell Infrastructure (Figure 3-3). This would be subject to separate assessment under Part 5 of the EP&A Act.

A power line would be established along the transport and services corridor.

Electricity would be supplied to the Maxwell Infrastructure via existing overhead power lines, with maintenance and upgrades undertaken as required.

3.4.7 Maxwell Underground

Underground mining equipment, including a longwall machine and continuous miners, would be delivered to the MEA via the site access road. Equipment would be assembled and installed on-site.

Over the life of the Project, a range of underground mining equipment would be replaced or upgraded as a component of general maintenance or to increase efficiency.

Underground roadways would be developed to access and support the Maxwell Underground (i.e. for access, ventilation and coal conveying).

Coal clearance infrastructure and other ancillary infrastructure would also be developed for the Maxwell Underground, including conveyors, sizers, drives, winders and supporting systems.

Other ancillary infrastructure required to support the Maxwell Underground would also be developed over the life of the Project (Section 3.5).

3.4.8 Management of Subsidence Impacts on Edderton Road

Potential subsidence impacts on Edderton Road would be managed through ~~either~~ road maintenance along the existing alignment ~~or~~ **prior to** the construction of a realignment of the road around the Maxwell Underground area.

The ~~potential~~ Edderton Road realignment is discussed further in Section 3.15.1.

3.5 UNDERGROUND MINING OPERATIONS

The Project would involve extraction of coal from four seams within the Wittingham Coal Measures using the following underground mining methods:

- bord and pillar with partial pillar extraction in the Whynot Seam; and
- longwall extraction in the Woodlands Hill, Arrowfield and Bowfield Seams.

The annual average ROM coal production from the Project would be approximately 5.7 Mtpa, yielding an annual average of approximately 4.8 Mtpa of product coal. Underground mining activities would be undertaken 24 hours per day, seven days per week.

The full working section of each coal seam (Table 3-1) would be extracted where practicable.

3.5.1 Indicative Mining Schedule

An indicative mining schedule for the Project is presented in Table 3-3. The maximum amount of ROM coal produced in any one year would be 8 Mt.

The actual timing, mining sequence and annual coal production profile may vary to take account of: localised geological features, coal quality characteristics, detailed mine design, mine economics, market volume requirements, and/or adaptive management requirements.

3.5.2 Coal Mining

The underground mining operations for the Project would extract approximately 148 Mt of ROM coal.

Bord and Pillar Mining Operations

Bord and pillar mining methods (with partial pillar extraction) are proposed for extraction of coal in the Whynot Seam.

Bord and pillar mining is an underground mining method that involves the extraction of coal using first workings from a network of underground roadways (known as panels), followed by the extraction of a portion of the remaining coal (secondary extraction).

Table 3-3
Indicative Mining Schedule

Project Year	Project ROM Coal Production (Mt)					CHPP Reject Material (Mt)	Product Coal (Mt)
	Whynot Seam	Woodlands Hill Seam	Arrowfield Seam	Bowfield Seam	Total ROM Coal		
1	-	-			-	-	-
2	0.2	0.3	-	-	0.6	0.3	0.4
3	1.1	2.3	-	-	3.4	1.2	2.4
4	0.8	2.9	-	-	3.8	1.2	2.8
5	1.0	4.8	-	-	5.8	2.0	4.2
6	0.5	7.5	-	-	8.0	2.5	5.9
7	0.8	7.2	-	-	8.0	3.1	5.4
8	0.7	6.5	-	-	7.2	2.7	5.0
9	0.3	7.5	-	-	7.8	2.6	5.7
10	0.3	6.9	0.1	-	7.3	2.1	5.6
11	0.2	6.7	0.3	-	7.1	1.9	5.5
12	0.2	4.7	1.4	-	6.2	1.5	5.0
13	0.4	1.0	3.9	-	5.4	0.9	4.7
14	0.8	-	5.8	-	6.6	1.2	5.6
15	0.8	-	6.6	-	7.4	1.6	6.0
16	0.3	-	7.2	-	7.5	1.3	6.4
17		-	7.4	0.1	7.5	0.9	6.8
18	-	-	7.2	0.3	7.5	0.7	7.0
19	-	-	4.7	1.9	6.6	0.5	6.2
20	-	-	1.3	4.2	5.5	0.5	5.1
21	-	-	-	5.5	5.5	0.8	4.9
22	-	-	-	6.2	6.2	1.0	5.4
23	-	<0.1	-	6.5	6.5	0.9	5.7
24	-	0.2	-	5.8	6.0	0.8	5.3
25	-	1.3	-	2.6	3.9	0.6	3.4
26	-	1.2	-	-	1.2	0.4	0.8
Total	**8.4**	**61.0**	**45.9**	**33.1**	148.5	33.2	121.2

Notes: The combined total of product coal and CHPP reject material is greater than total ROM coal due to changes in moisture content (data are presented on an “as received” moisture basis).

Other totals may not add exactly due to rounding.

The bord and pillar mining method would involve the following three stages:

- *Formation of Main Roadways (first workings)* – coal would be extracted to create stable and non-subsiding main roadways to provide access to groups of mining panels. Generally, this is a 4 or 5 heading layout with roadways for ventilation, coal conveyors and access for employees and materials.
- *Formation of Panels (first workings)* – from the main roadways, panels approximately 185 m wide would be developed to a logical boundary such as the limit of a conveyor, a geological constraint or a depth of cover constraint. Individual panels would be separated by a barrier pillar of approximately 55 m that would be left intact.
- *Partial Extraction of Panels (secondary extraction)* – from the panel boundary and retreating back to the main roadways, coal pillars that were formed during panel development would be removed, known as 'partial pillar extraction'.

Partial extraction of the pillars would occur to achieve approximately 55% to 70% coal recovery based on both first and secondary workings. There are various partial extraction methods that could achieve this level of coal recovery, including:

- partial extraction from remaining coal pillars; or
- removing alternate pillars.

Partial pillar extraction would not occur at depths of cover of less than 50 m.

Whynot Seam Layout

An indicative bord and pillar panel layout in the Whynot Seam is shown on Figure 3-8.

The actual layout of the workings in the Whynot Seam may vary due to localised geological features, detailed mine design and/or adaptive management requirements. The final layout would be subject to review and approval as a component of future Extraction Plans developed in consultation with the relevant authorities and to the satisfaction of the Secretary of the DPIE.

Longwall Mining Operations

Longwall mining methods are proposed for extraction of coal in the Woodlands Hill, Arrowfield and Bowfield Seams.

Longwall extraction is an underground mining method that involves the extraction of rectangular panels of coal defined by underground roadways constructed around each longwall (Figure 3-9). The longwall mining machine travels back and forth across the width of the coal face, progressively removing coal in slices from the panel.

As each slice of the coal face is removed from the longwall face, the hydraulic roof supports move forward, allowing the roof and a section of the overlying strata to collapse behind the longwall machine (referred to as forming the 'goaf') (Figure 3-9).

Extraction of coal by longwall mining methods results in the vertical and horizontal movement of the land surface. The land surface movements are generically referred to as subsidence effects. The type and magnitude of subsidence effects predicted as a result of the Project are described in Section 6.3 and the Subsidence Assessment (Appendix A).

Subsidence-related monitoring and remediation activities for the Project are detailed in Sections 3.15.3 and 3.14.2, respectively.

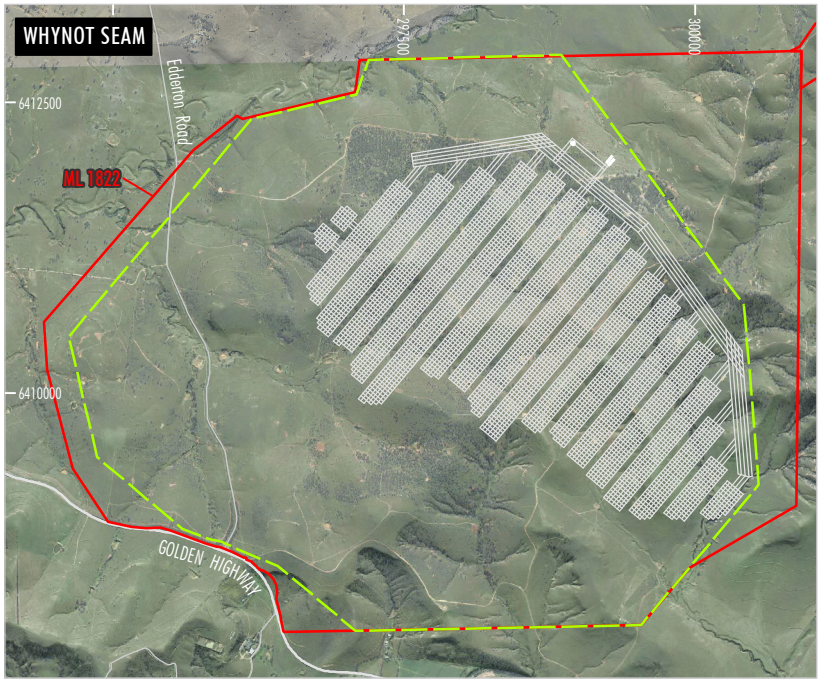
Longwall Mining Layout

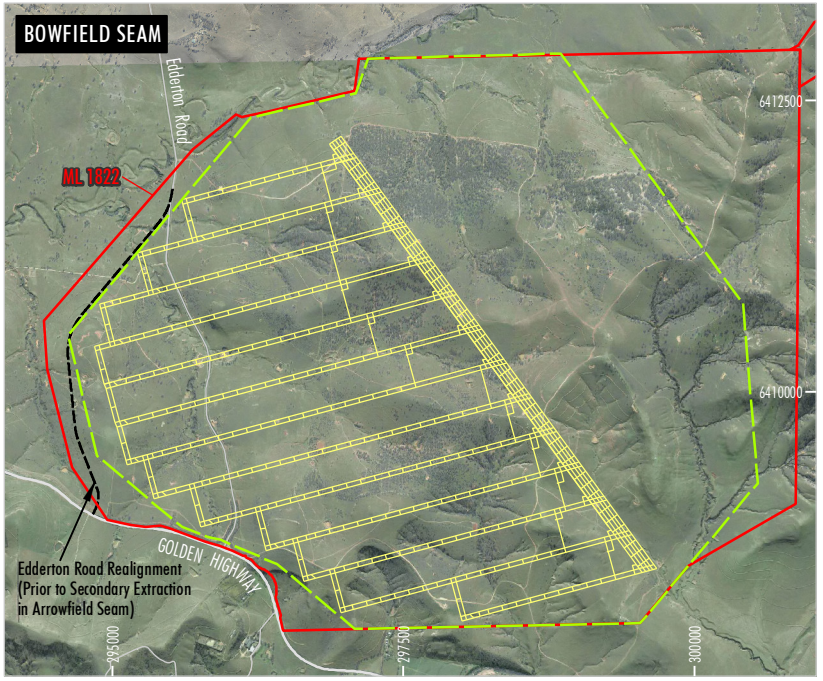
The longwalls would have overall void widths of approximately **150 m or** 305 m (including first workings), and lengths of between approximately **1,100** m and **5,000** m.

The longwalls would be staggered between seams so that the chain pillars would not align. This would reduce total subsidence at the surface.

Indicative longwall layouts in the Woodlands Hill, Arrowfield and Bowfield Seams are shown on Figure 3-8.

Malabar may extract coal from the Woodlands Hill Seam prior to, during, or following completion of extraction in the overlying Whynot Seam. A geotechnically stable and safe environment would be able to be maintained during either an undermining or overmining scenario. An adequate offset distance would be maintained between active working areas in the event of extraction occurring in both seams concurrently (nominally 1 km).





LEGEND

- Mining and Coal Lease Boundary
- Approved Indicative Underground Mining Layout
- Modified Indicative Underground Mining Layout
- Modified Indicative Exent of Underground Development

Source: NSW Spatial Services (2022); Arkhill (2021)
Orthophoto Mosaic: 2019

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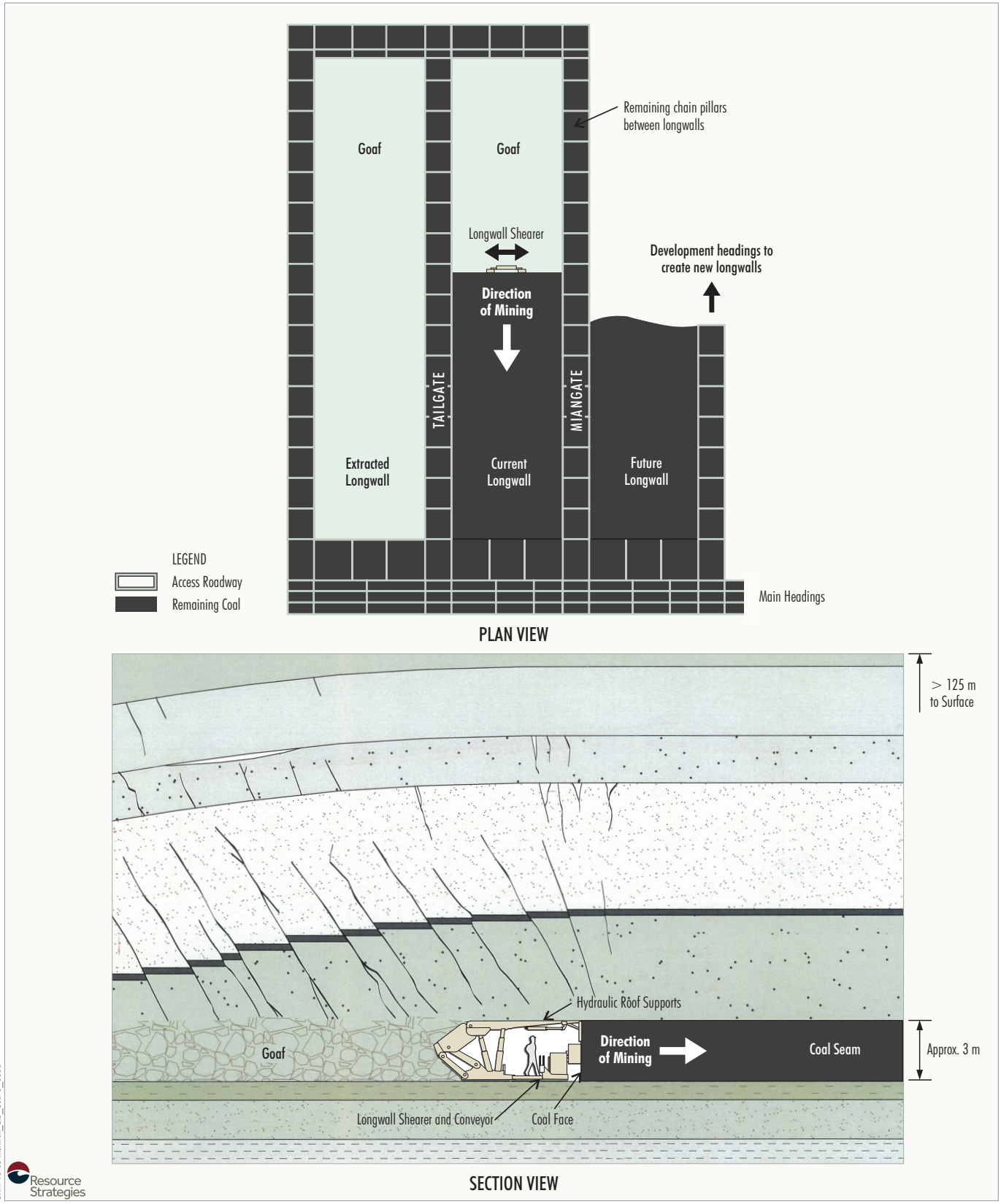
MALABAR

MAXWELL UNDERGROUND MINE PROJECT

Modified Indicative Underground Mining Layout

Figure 3-8



Source: After Hansen Consulting (2008)

MALABAR COAL

MAXWELL PROJECT

Longwall Mining Method -
Conceptual Cross-section and Plan

Figure 3-9

The actual mining order and layout of the longwalls may vary due to localised geological features, detailed mine design and/or adaptive management requirements. The final mining order and layout would be subject to review and approval as a component of future Extraction Plans developed in consultation with the relevant authorities and to the satisfaction of the Secretary of the DPIE.

3.5.3 Underground Mine Access and Materials Handling

The drifts at the MEA (Figure 3-5) would be used:

- for personnel, materials and equipment access;
- to convey coal from the longwall and development faces to the surface; and
- for ventilation of the underground workings.

3.5.4 Major Underground Equipment and Mobile Fleet

The major underground equipment and mobile fleet for underground mining activities would comprise:

- continuous miners;
- longwall shearers and roof supports;
- conveyors;
- transfer bins;
- feeder breakers;
- load haul dump vehicles;
- drill rigs;
- shuttle cars; and
- personnel carriers.

Over the life of the Project, a range of underground mining equipment would be replaced or upgraded as a component of general maintenance or to increase efficiency (Section 3.4.7).

3.5.5 Mine Ventilation Systems

Ventilation fans and associated surface infrastructure would be required for the Project to maintain a safe working environment within the underground workings.

The Project would use ~~an~~ upcast ventilation shaft**s** ~~site~~ to provide adequate ventilation of the underground workings. **These** site**s** would be located adjacent to **and west of** the MEA (Figure 3-5). The upcast (or exhaust) ventilation shaft site**s** would use fans to draw air out of the underground workings.

These site**s** may also be used for downcast (or intake) ventilation during the life of the Project.

The upcast ventilation shaft site**s** would have the following infrastructure:

- up to two concrete-lined or steel-lined shafts;
- up to three ventilation fans with combined flow rates of up to 600 cubic metres per second (m^3/s);
- electrical infrastructure;
- a centralised gas management system (Section 3.5.6);
- sediment control infrastructure; and
- other associated minor ancillary infrastructure (such as fencing and service boreholes).

The mine access drifts would also be used for ventilation. Auxiliary fans would be used on the mine access drifts early in the Project life.

No surface ventilation infrastructure is proposed in the southern portion of the Maxwell Underground.

3.5.6 Mine Safety Gas Management

Gas monitoring systems, and gas management and abatement activities would be required for the Project to maintain gas content at levels suitable for underground mining operations. The key gases monitored and managed in the underground workings would be carbon dioxide and methane.

Gas Drainage

Pre-mining gas drainage and goaf gas drainage would occur underground to reduce the gas content in the coal seams.

Gas would be drained from the coal seams, and adjacent strata, by drilling in-seam (i.e. horizontal) boreholes into the coal seam in advance of mining. Pre-mining gas drainage would generally be facilitated by underground cross-panel drilling. Gas would be drained through an underground collection system and delivered to the centralised gas management infrastructure at the surface.

Gas would also be drained from the goaf area post-mining to ensure safe operations and maintain the rate of longwall mining operations. Post-mining gas drainage would be undertaken via underground drilling methods into the goaf. Gas drained from the goaf areas would also be collected through an underground collection system for management at the surface.

Centralised Gas Management System

Centralised gas management infrastructure would be constructed in the vicinity of the upcast ventilation shafts.

Gas would be delivered to the centralised gas management infrastructure via a network of underground pipes and a shaft.

Gas would be flared or, if the gas was too low in methane content for flaring (or other operational reasons), vented to the atmosphere.

The majority of gas management infrastructure would be fully contained within a modular, purpose-built room (with the exception of vents and/or flares).

The centralised gas management infrastructure could consist of pumps, gas generators, nitrogen tanks, monitoring equipment, flares, water collection equipment and surface pipes.

Where there is sufficient methane content in the deeper coal seams, a small gas-powered plant (less than 5 MW) may be installed to generate power from gas drained in the underground workings. Power generated in any gas-powered plant would be used to supplement Project power supply.

3.5.7 Water Management

Water would be supplied to the underground mining operations for equipment cooling and dust suppression.

Groundwater and operational water that accumulates in the underground workings would be pumped to the surface via underground sumps, access drifts and/or boreholes. Overlying and adjacent workings may also be dewatered, if required for safety reasons.

Further discussion on the site water management system is provided in Section 3.10.

3.5.8 Other Supporting Infrastructure

Other infrastructure and activities associated with underground mining operations would include:

- infrastructure at the MEA, such as administration, bathhouse and parking facilities (Section 3.11.2);
- infrastructure for service delivery (e.g. drop-holes);
- infrastructure for servicing of underground mining equipment;
- infrastructure for electricity distribution and communication systems; and
- storage and handling of materials used by underground mining equipment (e.g. hydraulic fluids, roof bolts, wear plates, miscellaneous consumables and safety equipment).

3.6 ROM COAL HANDLING AND PROCESSING

The Project would include the use of the substantial existing Maxwell Infrastructure for handling, processing and transportation of coal for the life of the Project.

An indicative coal handling and processing schematic is provided on Figure 3-10.

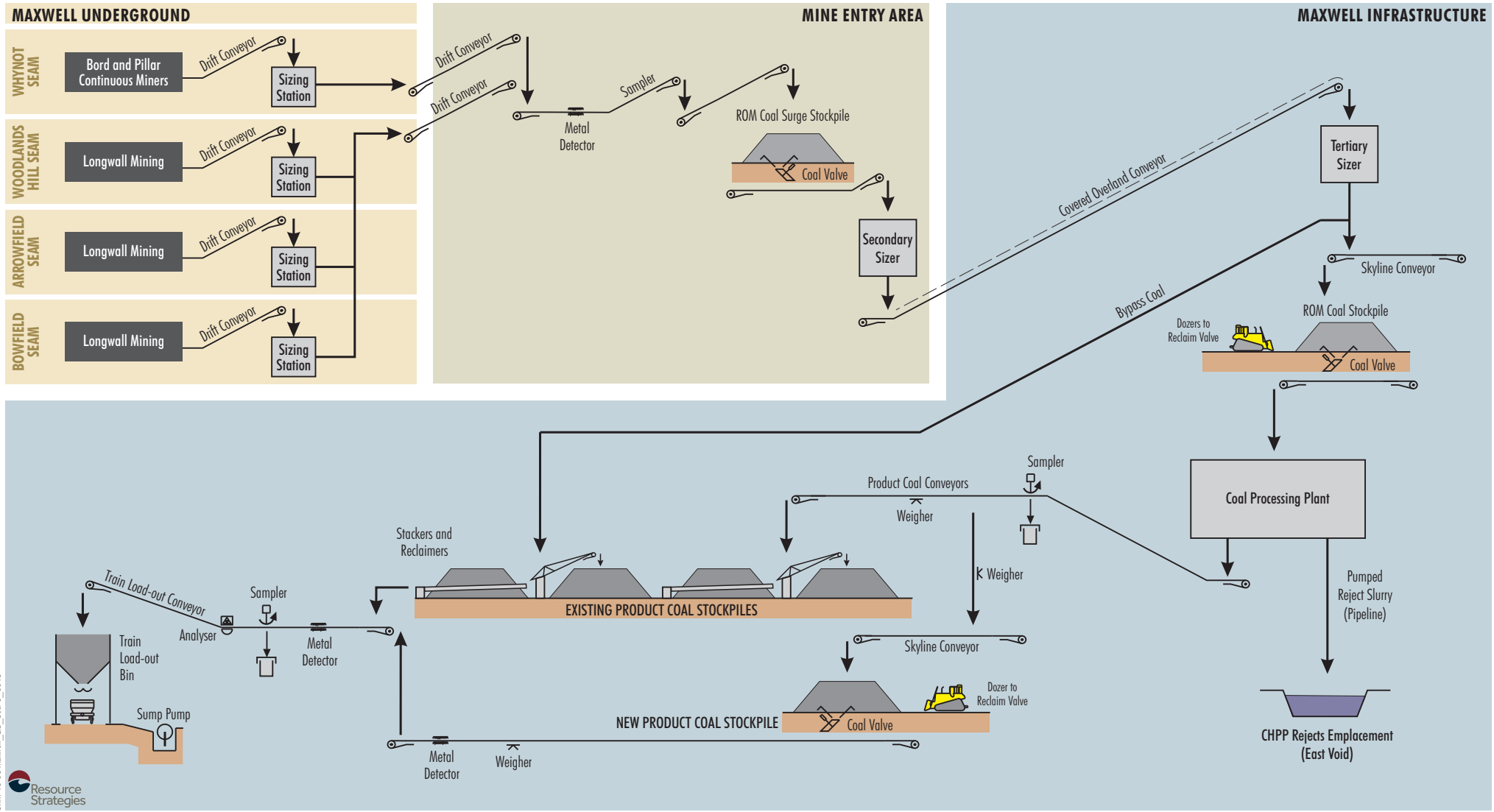
3.6.1 ROM Coal Stockpiling and Transport

ROM coal from the Maxwell Underground would be temporarily placed on surge stockpiles at the MEA prior to reclaiming and transportation to the CHPP at the Maxwell Infrastructure.

Sized ROM coal would be transported to the Maxwell Infrastructure via:

- a single-flight, covered, overland conveyor, which would be operational prior to the commencement of transport of coal extracted by longwall mining machinery; or
- trucking along the site access road while the overland conveyor is constructed and commissioned.

ROM coal would be fed directly into the CHPP, or would be temporarily stockpiled adjacent to the CHPP prior to processing (Section 3.6.2).



Source: Malabar (2019)

MALABAR COAL

MAXWELL PROJECT

Indicative Coal Handling and Processing Schematic

Figure 3-10

Trucks used for coal haulage would be units that are purpose-built for the transport of bulk materials, such as the truck shown in Plate 3-2. The large off-road coal haul trucks in general use at open cut mines would not be used.

Plate 3-2 – Road Registerable Bulk Haulage Truck

Source: Oldknow Earthmoving & Haulage (2019).

3.6.2 Coal Processing Plant

ROM coal would be handled and sized via a secondary/tertiary crusher at the existing CHPP. It would then be either beneficiated through the coal processing plant or bypassed directly to the product coal stockpile.

The CHPP would produce the following main streams:

- coking coal (also known as metallurgical coal);
- export-quality thermal coal; and
- CHPP reject material.

During the early development stage of the Project, the CHPP would operate up to 24 hours per day, six days per week. At full development, the CHPP would operate 24 hours per day, seven days per week.

The existing coal processing plant comprises a range of components that can be generally classified into four major circuits: bypass and the coarse coal, medium coal and fine coal circuits. These circuits include components that separate coal materials on the basis of size (e.g. screens, classifying cyclones) and on the basis of material type (e.g. cyclones, teetered bed separator, jig/drum).

The medium coal and fine coal circuits also include components that mechanically dewater coal products (e.g. centrifuges) and components that are used to dewater CHPP reject material (e.g. thickeners and filters).

Further details on product coal handling and transportation and CHPP reject material management are provided in Sections 3.7 and 3.8, respectively.

3.7 PRODUCT COAL HANDLING AND TRANSPORTATION

An indicative schedule for product coal production is provided in Table 3-3.

Product coal would be stacked at the product coal stockpiles using a combination of stackers and a skyline conveyor.

The four existing product coal stockpiles, combined with the product coal stockpile extension, would have a combined capacity of approximately 500,000 t.

Coal would be reclaimed from the stockpiles using a combination of bucket-wheel type reclaimers and a coal reclaim tunnel with coal valves. Dozers would be used as required to manage coal at the coal stockpiles.

Coal would then be transferred to an overhead bin at the train load-out facility for filling the trains on the rail loop (Plate 3-3).

Plate 3-3 – Existing Train Load-out Facility

Product coal would be transported via the existing Antiene Rail Spur and Main Northern Railway to local markets or to the Port of Newcastle for export.

Loaded trains would be sprayed with water (or other suitable dust suppressant) to reduce dust emissions during transportation.

Coal transported along the Maxwell Infrastructure rail loop would be limited to 7 Mtpa. The peak number of train movements along the Maxwell Infrastructure rail loop would be limited to 12 movements per day.

~~Consistent with the current approval for the Antiene Rail Spur (DA 106-04-00), coal may be hauled on public roads under emergency or special situations with the prior written permission of the Secretary of the DPIE, RMS and Muswellbrook Shire Council.~~

~~A portion of coal may also be reclaimed from the product coal stockpile and transported via conveyor or rail to the Bayswater and/or Liddell Power Stations.~~

3.8 MANAGEMENT OF CHPP REJECT MATERIAL

3.8.1 CHPP Reject Material Production

Approximately 22 million bank cubic metres (Mbcm) of CHPP reject material would be produced over the life of the Project, including coarse rejects and tailings.

An indicative CHPP reject material production schedule is provided in Table 3-3. Whilst the total CHPP reject material quantities are based on planned maximum production, the actual quantity produced in any one year may vary with ROM coal production and product coal specifications.

This CHPP reject material would primarily be emplaced within the existing East Void in ML 1531 at the Maxwell Infrastructure.

3.8.2 Geochemical Characteristics of CHPP Reject Material

CHPP reject material generated by the Project would generally consist of a mixture of carbonaceous shale and mudstone with minor proportions of sandstone and coal.

The Geochemistry Assessment (Appendix P) characterised CHPP reject material that would be generated by the four coal seams in the Jerrys Plains Subgroup being targeted for the Project (GEM, 2019).

The CHPP reject material from processing of coal mined as part of the Project is likely to have low acid neutralising capacity (ANC). The material would typically be potentially acid forming (PAF), with only a low capacity to generate acid. This is consistent with the geochemical characteristics of CHPP rejects generated by other mining operations targeting the Jerrys Plains Subgroup in the Hunter Valley (GEM, 2019).

Processing of coal mined from the Greta Coal Measures occurred at the Maxwell Infrastructure from late 2004 to 2016 (Section 2.2.2). CHPP reject material was emplaced in the East Void from 2012.

Monitoring of the decant water from the CHPP reject emplacement area in 2018 and 2019 indicates that electrical conductivity (EC) is approximately 8,000 microSiemens per centimetre (µS/cm) and the pH is slightly alkaline (range of 7.9 to 8). Consideration of metal concentrations in the East Void is presented in the Surface Water Assessment (Appendix C).

3.8.3 CHPP Reject Emplacement Area

The Project would involve pumping CHPP rejects slurry into the existing East Void within the Maxwell Infrastructure, via a pipeline. Both coarse rejects, and tailings would be disposed of in the East Void.

CHPP reject material would be progressively emplaced in the East Void from the south to the north. The CHPP rejects would be disposed below the estimated post-mining groundwater level.

Decant water from the CHPP rejects emplacement area would be collected in sump(s) and pumped to the Access Road Dam or Industrial Dam for re-use (Section 3.10). If required, decant water would be treated prior to use in the CHPP.

Infrastructure for the transfer of CHPP rejects and decant water would be developed and relocated progressively over the life of the Project and, as such, this minor ancillary infrastructure is not shown on Figure 3-3.

Brine that is produced as a by-product of water treatment (reverse osmosis or similar technologies) would also be stored in the East Void with the CHPP rejects.

At the conclusion of the Project, emplacement areas would be capped and rehabilitated, unless consent for continued emplacement is granted.

Malabar will continue to investigate beneficial uses for the voids in CL 229 and ML 1531. This will include emplacing CHPP reject material from possible future underground mining activities undertaken by Malabar within EL 5460 and EL 7429 (Spur Hill Underground Coking Coal Project) and engagement with other mining and industrial facilities in the region (subject to separate assessments and approvals).

3.9 WORKFORCE

3.9.1 Construction and Development

Initial construction activities would occur over a period of approximately 12 months. These activities would be expected to require an average of approximately 90 personnel, and a maximum of approximately 250 personnel.

Additional contractors would also be required during short periods over the life of the Project; for example, during longwall change-outs, periods of higher underground development activities, scheduled plant shutdowns or other maintenance programs. These activities may require up to approximately 80 additional personnel.

3.9.2 Operations

At full development, the Project would employ approximately 350 operational personnel.

Additional employment may also be generated through support functions (e.g. cleaners, security personnel).

Operations would occur 24 hours per day, seven days per week.

Shift arrangements may be adjusted to meet operational and industry best practice requirements. Indicative shift arrangements for the Project would be:

- Production day shift personnel – 6.30 am to 5.00 pm.
- Afternoon maintenance shift personnel – 1.00 pm to 11.00 pm.
- Production night shift personnel – 9.00 pm to 7.30 am.
- CHPP day shift personnel – 6.30 am to 6.30 pm.
- CHPP night shift personnel – 6.30 pm to 6.30 am.

Management and support personnel would primarily work daytime hours.

A description of Malabar's approach to local employment is provided in Section 6.17.4. This approach would include policies and strategies to:

- prioritise recruitment of personnel from the Muswellbrook, Singleton and Upper Hunter LGAs; and
- recruit operational employees from outside the underground mining sector, supported by appropriate workforce training and development.

3.10 WATER MANAGEMENT

A detailed description of the operation and predicted performance of the site water management system is provided in the Surface Water Assessment (Appendix C) prepared by WRM (2019), **the Surface Water Assessments prepared by WRM (2021; 2022) for the Project (as modified)**.

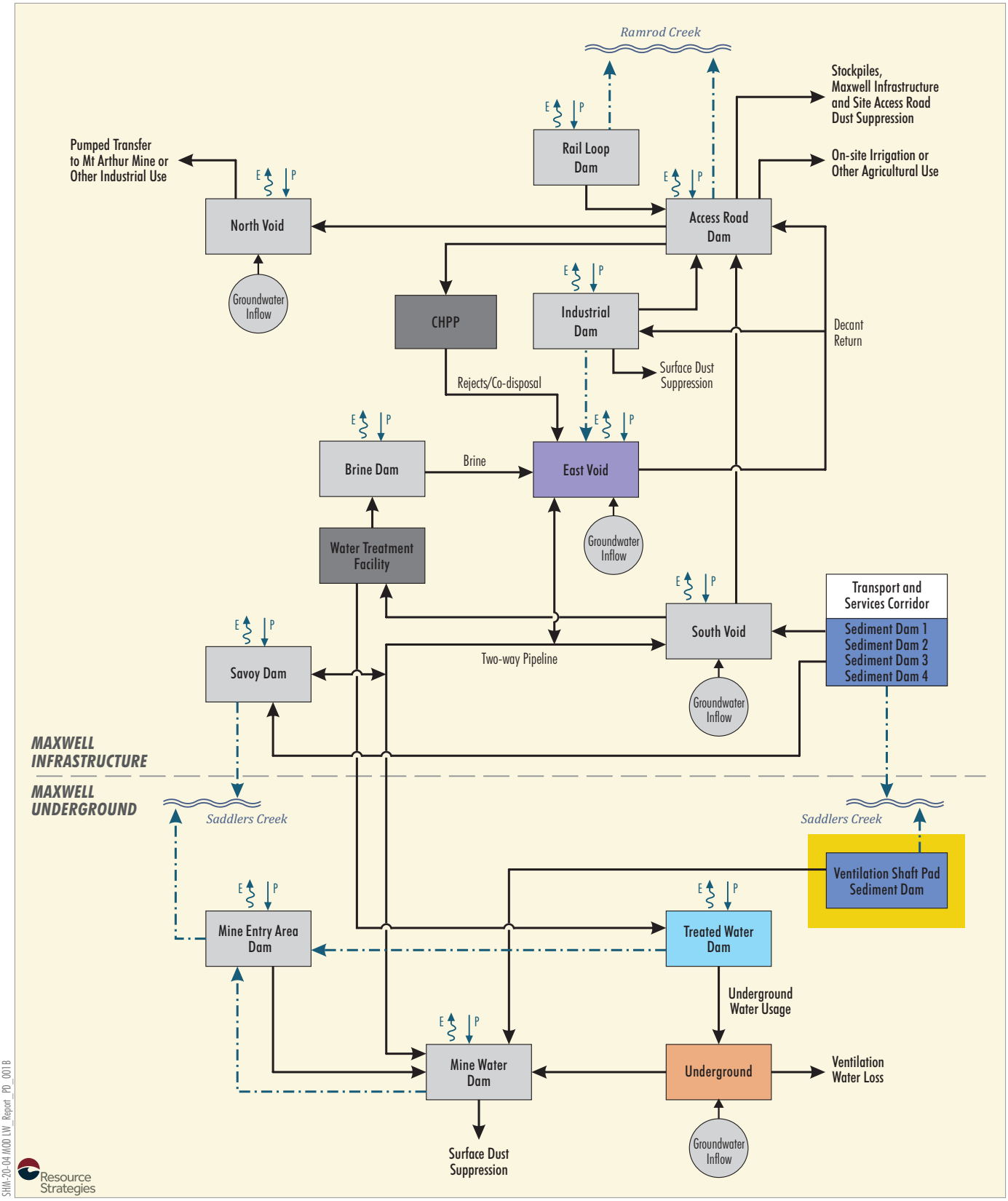
An indicative water management schematic, providing an overview of the water management strategy, is presented as Figure 3-11.

3.10.1 Project Site Water Management System

The objectives and design criteria of the Project site water management system would be to:

- protect the integrity of local and regional water resources;
- separate runoff from undisturbed, rehabilitated and mining-affected areas;
- design and manage the system to operate reliably throughout the life of the Project in all seasonal conditions, including both extended wet and dry periods;
- provide water for use in mining operations that is of sufficient volume and quality;
- maximise the re-use of water on-site; and
- manage groundwater inflows and CHPP process water on-site.

The Project would involve the use of a combination of mine water, recycled treated mine water and potable water in underground and surface operations.



SHM-20-04 MOD LW_Report_PD_001B

Source: WRM (2022)

LEGEND

- Approved Water Management System
- Modification to Approved Water Management System
- Evaporation
- Precipitation/Catchment Runoff
- Pumped/Siphoned
- Overflow
- Treated Water Dam
- Underground Mine
- Mine Affected Water Storage
- Sediment Dam
- Rejects/Co-disposal Storage

NOTES

Overflow Direction: Good engineering practice is to include a stabilised spillway as a contingency for dam safety. This arrow does not indicate that these discharges (overflows) will occur. The arrow is to show the direction of water flow (by gravity) should the dam water level exceed the dam spillway level.

Seepage between voids/storages may occur through previously emplaced waste rock, including seepage between voids and native water storages.

Water management system would change if Malabar pursue an alternative management option for excess water (refer excess water management hierarchy in Section 3.10.3 of the EIS).

Dirty water management system storages are not shown.

Portal Dams and Sediment Dam at the Mine Entry Area are not shown as these are located within the catchment of and report to the Mine Entry Area Dam.

Savoy Dam may be used a staging storage to transfer water to the South Void.

Pringles Dam, which is used to supply water for livestock, is not shown as it does not form part of the mine water management system.

MALABAR

MAXWELL UNDERGROUND MINE PROJECT

Indicative Water Management Schematic

Figure 3-11

Water would be required for CHPP operation, underground mining operations (e.g. for cooling and underground dust suppression), dust suppression on roads, stockpile dust suppression, washdown usage, and other minor non-potable uses.

The main water sources for the operation are:

- groundwater inflows to underground workings and existing mine voids;
- recovery from CHPP rejects (through dewatering and/or decant return water);
- catchment runoff and infiltration; and
- small volumes of potable water imported to site.

Post-mining water management would incorporate some aspects of the site water management system (i.e. some storages and water management structures would be retained as permanent features) (Section 7).

Up-catchment Runoff Control

Temporary and permanent up-catchment diversion structures would be constructed over the life of the Project to divert runoff from undisturbed areas around the MEA (Figure 3-5) and the transport and services corridor.

Stabilisation of up-catchment diversions would be achieved by the design of appropriate channel cross-sections and gradients and the use of channel lining materials, such as grass or rock fill.

Rehabilitated Areas

Malabar is progressing the rehabilitation of previous mining areas at the Maxwell Infrastructure, including overburden emplacement areas (Section 3.14).

As vegetation establishes on these areas, Malabar would progressively develop drainage works, with the aim of minimising the long-term catchment areas of the mine voids at the Maxwell Infrastructure as far as practicable.

Water Storages

Contained water storages for the Project would include the existing storages at the Maxwell Infrastructure and the development of additional storages at the Maxwell Underground (Table 3-4).

Table 3-4
Water Storage Details

Storage Name	Approximate Storage Volume (Megalitres)
Maxwell Infrastructure ~~– Existing~~ Storages	
Access Road Dam	750
Industrial Dam	750
Rail Loop Dam	18
Savoy Dam[1]	140
North Void[2]	17,000
East Void[2]	24,000 [reducing to 5,900] [3]
South Void[2]	18,000
Pringles Dam[4]	**20**
Brine Dam	**4**
Maxwell Underground – Proposed Storages at the MEA	
Mine Entry Area Dam	110
Sediment Dam[5]	**4**
Portal Dams[5]	**12**
Mine Water Dam	17
Treated Water Dam	15
~~Brine Dam~~	**4**
Ventilation Shaft Site	
VSP Sediment Dam	**2**

1 Savoy Dam may be removed as part of the transport and services corridor. This would not materially affect the performance of the site water management system (Appendix C).

2 Approximate storage volume of open void. Additional storage would be available within the in-pit spoil adjacent to the open void (Appendix C).

3 The volume of the East Void available for water storage would reduce over the life of the Project as CHPP reject material is progressively placed in the void.

4 Pringles Dam is used to supply water for livestock and does not form part of the mine water management system.

5 The Sediment Dam and Portal Dams are located within the catchment of and report to the Mine Entry Area Dam.

Sediment dams would be established to manage runoff from the transport and services corridor. In accordance with Condition B40 of Development Consent SSD 9526, these sediment dams would be designed in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and *Volume 2E Mines and Quarries* (DECC, 2008).

Conditions B35 and B40 of Development Consent SSD 9526 require Malabar to design, install and maintain sediment dams to avoid off-site discharges, except as may be permitted by under an EPL and the relevant provisions of the POEO Act. Accordingly, Malabar may dewater sediment dams by pumping to the South Void or Mine Entry Area Dam if water quality monitoring indicates that discharge is not appropriate (e.g. if water quality indicates that discharge would cause pollution to occur under section 120 of the POEO Act).

Water Treatment

The Project would include the development of water treatment facilities at the **~~MEA~~ Maxwell Infrastructure**, including a reverse osmosis plant (and/or other suitable water treatment technologies), to treat water for supply to underground mining operations (e.g. for cooling and underground dust suppression).

Treated water would be stored at the MEA in the Treated Water Dam.

Brine and/or precipitate from water treatment activities would be temporarily stored in a holding dam at the **~~MEA~~ Maxwell Infrastructure** (Brine Dam), prior to being **~~transferred to the Maxwell Infrastructure and~~** co-disposed with the CHPP reject material in the East Void.

Transfer of Water

The transfer of water between water storages is integral to the site water management system.

Water transfer infrastructure would include pumps, pipelines and associated power supply. This infrastructure would be developed and relocated progressively over the life of the Project and, as such, this minor ancillary infrastructure is not shown on Figures 3-2 and 3-3.

Providing appropriate commercial terms are in place between Malabar and BHP, water may also be transferred between the Project and BHP's Mt Arthur Mine. Any transfer infrastructure between the two sites would be located along previously disturbed land and would be documented in the MOPs for both operations.

3.10.2 Groundwater Inflows

Groundwater and operational water that accumulates in the underground workings would be pumped to the surface via underground sumps, access drifts and/or boreholes. Overlying and adjacent workings may also be dewatered, if required for safety reasons.

Predicted groundwater inflows to the underground workings over the life of the Project are predicted to be up to approximately 3 megalitres per day (ML/day) (Appendix B).

Groundwater inflows would continue to accumulate in the North, South and East Voids at the Maxwell Infrastructure until an equilibrium water level is reached.

Licensing of the predicted groundwater inflows for the Project is assessed and described in Appendix B, Section 6.4 and Attachment 8.

3.10.3 Water Consumption

The water consumption requirements and water balance of the system would fluctuate with climatic conditions, production rate and as the extent of the mining operation changes over time.

Underground Mining Operations

Water used in underground mining operations would be treated water.

Treated water used in underground mining operations would peak at approximately 1.5 ML/day.

Coal Handling and Preparation Plant Make-Up

Water used in the CHPP would be recycled from the CHPP rejects with any necessary make-up water obtained from mine water storages.

The CHPP make-up water demand is related directly to the rate of ROM coal feed to the CHPP, the amount of coal bypassed around the coal processing plant, and the rate of production and moisture content of CHPP rejects. The estimated make-up demand varies between less than 1 ML/day up to approximately 3.5 ML/day over the life of the Project (Appendix C).

Dust Suppression and Washdown Usage

Dust suppression would be required along the site access road in the first ~~year~~ **six months** of operations, prior to it being sealed (Section 3.4.1). Water would also be required for construction activities and dust suppression of coal stockpiles at the MEA and the Maxwell Infrastructure.

Following the commissioning of the overland conveyor, dust suppression and washdown usage would be in the order of approximately 0.05 ML/day to 0.08 ML/day.

Management of Excess Water

The water consumption requirements for an underground mining operation are typically lower than for open cut mines given there is significantly less surface disturbance area that requires watering for dust suppression. Accordingly, under some climate conditions, the Project has the potential to receive groundwater and surface water inflows in excess of its consumption requirements.

In the event that excess water accumulates at the Project, Malabar would manage this excess water according to the following hierarchy:

1. Sharing mine water with BHP's neighbouring Mt Arthur Mine (e.g. for use in dust suppression), so reducing that operations' reliance on other water sources.
2. Sharing mine water or treated water with other industrial users (e.g. AGL), so reducing their reliance on water sourced from the environment (e.g. the Hunter River).
3. Sharing treated water with agribusiness (e.g. viticulture or equine industries).
4. Irrigation or evaporation of water within the Project site (i.e. on land catchments that report to the site water management system, such as rehabilitation areas). Evaporation cannons may also be used in these areas to remove excess water from the site water management system.
5. Beneficial use on Malabar-owned pastoral property (e.g. irrigation with treated water).

3.10.4 Simulated Performance of the Site Water Management System

A simulated site water balance based on 129 years of climatic data has been prepared by WRM (**2022**) to simulate the performance of the water management system over the life of the Project (incorporating the Maxwell Infrastructure and the Maxwell Underground).

The site water balance modelling demonstrates the proposed water management system has sufficient capacity and flexibility to accommodate a wide range of groundwater inflows and climate scenarios while (Appendix C):

- providing security of supply for mine operations;
- containing mine-affected water on-site, with no uncontrolled off-site release; and
- avoiding controlled release of water to the Hunter River.

3.11 INFRASTRUCTURE AND SERVICES

The Project would include the use of the existing Maxwell Infrastructure and the development of new infrastructure.

An indicative operational surface mobile equipment fleet that would be used during operations is provided in Table 3-5. Additional surface fleet may be present for short periods; for example, during longwall change-outs, scheduled plant shutdowns or other maintenance programs.

3.11.1 Maxwell Infrastructure

Key existing infrastructure at the Maxwell Infrastructure includes:

- site access road from Thomas Mitchell Drive;
- CHPP, which includes:
  - ROM coal stockpile and ROM hopper;
  - coal processing plant; and
  - product coal stockpiles;
- train load-out facility and rail loop (connecting to the Antiene Rail Spur);
- administration, employee amenities, training centre, emergency services, workshops, washdown bays, store and parking facilities;
- explosives storage facilities;
- electrical distribution infrastructure; and
- site water management infrastructure (including water storages, pumps and pipelines**, a water treatment facility** and a wastewater treatment facility).

Table 3-5
Indicative Operational Surface Mobile Equipment Fleet

Fleet Item	Early ROM Coal Stage [prior to commissioning of the covered, overland conveyor]			Full Development Stage [following commissioning of the covered, overland conveyor]	
	Mine Entry Area	Maxwell Infrastructure	Site Access Road	Mine Entry Area	Maxwell Infrastructure
Personnel Transporters	8	-	-	12	-
Dozers	1	-	-	1	3
Front End Loaders	1	1	-	-	-
Graders	-	-	1	-	-
Water Trucks	-	-	1	-	-
Coal Haulage Trucks	-	-	5	-	-
Utilities/Light Vehicles	As required	As required	As required	As required	As required

The Project would utilise the existing surface facilities (such as administration buildings, training facilities, bathhouses, workshops and storage areas) at the Maxwell Infrastructure.

Some existing buildings at the Maxwell Infrastructure may be relocated to the MEA.

The Project would involve upgrades to ROM and product coal handling facilities at the Maxwell Infrastructure, and other minor upgrades.

The existing workshop facilities at the Maxwell Infrastructure may be used for maintenance of underground mining equipment throughout the life of the Project.

3.11.2 Maxwell Underground

Key infrastructure at the Maxwell Underground (at the MEA) would include (Figure 3-5):

- site access road;
- mine access drifts;
- surface conveyors, ROM coal surge stockpiles and coal sizing facility;
- administration, meeting rooms, bathhouse, workshop, fuel storage, laydown, first aid, parking facilities and helipad (primarily for emergency use);
- ventilation and gas management infrastructure;
- electrical distribution infrastructure; and
- site water management infrastructure (including water storages, pumps and pipelines, water treatment facilities and a sewage treatment facility).

3.11.3 Site Access

The Project would use the existing site access road at the Maxwell Infrastructure, which would be extended to the MEA.

The site access road would be used for personnel and visitor access and deliveries. The southern (internal) portion of the road from the MEA to the Maxwell Infrastructure would also be used for haulage of early ROM coal and material excavated during construction activities.

Construction activities to realign Edderton Road would access the construction area via the Golden Highway or via Denman Road from the north.

Agricultural and other land management activities would continue on Malabar-owned properties throughout the life of the Project. Access for these activities would continue to use existing access points on the Golden Highway and Edderton Road.

3.11.4 Electricity Supply and Distribution

Energy consumption would be predominantly electricity. Diesel fuel would also be used.

The main electricity requirements for the Project would include;

- mine ventilation fans;
- longwall and continuous miners;
- conveyors (including the overland conveyor);
- compressors and pumps;
- bathhouse heating;

- coal handling and processing at the CHPP;
- product coal stockpile reclaiming and train loading; and
- other activities associated with underground mining operations.

Electricity would be supplied to the Maxwell Infrastructure via existing overhead power lines. A new 66 kV power supply may be constructed to the MEA (Section 3.4.6).

Electricity would be distributed around the site using a combination of overhead and underground power lines.

Diesel fuel demand would be associated with the use of mobile equipment (such as stockpile dozers, personnel and material transporters and vehicles supporting underground mining operations).

3.11.5 Service Boreholes

Services such as compressed air and water required by underground mining operations would be delivered from the surface via the MEA and service boreholes.

As the mining operations progress, additional service boreholes (also known as drop-holes) may be installed, and would generally be located adjacent to other surface infrastructure areas (e.g. ventilation shafts), resulting in minimal additional disturbance.

Service boreholes of typically less than 25 centimetres (cm) in diameter, located outside of the MEA would:

- restrict disturbance to the practical minimum;
- avoid disturbance of mature shrubs and trees;
- avoid verified Biophysical Strategic Agricultural Land (BSAL);
- incorporate erosion and sediment control and site water management measures in accordance with applicable guidelines;
- manage Aboriginal heritage sites in accordance with a Heritage Management Plan; and
- be decommissioned, sealed and rehabilitated when no longer required.

A typical service borehole is shown in Plate 3-4.

Plate 3-4 – Typical Service Borehole Site

Source: Imagineering.

3.11.6 Site Security and Communications

Site security measures would be maintained for the Project. Additional security fencing for the Project would be erected where necessary (for example, at the upcast ventilation shaft site).

The existing communications systems at the Maxwell Infrastructure would be retained for the Project and augmented as necessary.

Surface and underground communications at the MEA would be developed. The provision of any additional external connections for the Project would be the subject of a separate assessment approvals process.

3.11.7 Water Supply and Use

Underground and surface operations would use a combination of potable and recycled water. Potable water to the Maxwell Infrastructure would continue to be supplied by pipeline from Muswellbrook.

Further details on water supply and use for the Project are provided in Section 3.10.

3.12 WASTE MANAGEMENT

The key waste streams for the Project would comprise:

- CHPP reject materials (as described in Section 3.8);
- general solid waste and recyclables;
- waste oil and grease;
- sewage and effluent; and
- minor quantities of other waste from mining and workshop activities (e.g. worn tyres and used oil filters).

To minimise waste, Malabar would apply general waste minimisation principles (i.e. reduce, re-use and recycling where practicable).

An overview of the waste types likely to be generated by the Project is presented in Table 3-6.

Further details on the management of general waste and sewage and effluent are provided below.

3.12.1 General Waste

General waste produced by the Project would be deposited into general waste bins. General waste bins would then be transported to an off-site approved waste handling facility for sorting and recycling or disposal.

3.12.2 Sewage and Effluent

At the Maxwell Infrastructure, the existing wastewater treatment plant would continue to be used to treat effluent on-site, with the treated water discharged to a rehabilitation area. Effluent disposal at the Maxwell Infrastructure area would continue to be regulated under EPL No. 1323.

Table 3-6
Waste Types Likely to be Generated by the Project

Waste Stream	Indicative Waste Class	Management Method
CHPP Reject Materials	-	Refer to Section 3.8.
Timber, cardboard, paper, steel, scrap metal, commingle, food waste, etc.	General Solid Waste (non-putrescible and putrescible)	Transported to an approved waste handling facility and recycled or disposed.
Used oil filters	General Solid Waste (non-putrescible)	Temporarily stored on-site in designated bins prior to removal by licensed waste contractor(s).
Used particulate filters	General Solid Waste (non-putrescible)	Temporarily stored on-site in designated bins prior to removal by licensed waste contractor(s).
Other workshop wastes (e.g. rags and oil-absorbent materials that only contain non-volatile hydrocarbons and do not contain free liquids)	General Solid Waste (non-putrescible)	Temporarily stored on-site in designated bins prior to removal by licensed waste contractor(s).
Worn tyres	Special	Worn tyres would be segregated and collected for either repair (if possible) or disposal by licensed waste contractor(s).
Bathhouse water	Liquid	On-site treatment at either the MEA or Maxwell Infrastructure water treatment facility for reuse as recycled water.
Sewage and effluent	Liquid	Refer to Section 3.12.2.
Waste oil and grease	Liquid	Used containers would be drained into bulk containers and temporarily stored prior to collection by licensed contractor(s) for processing off-site.
Hazardous waste (e.g. lead-acid or nickel-cadmium batteries and containers that have not been cleaned containing residue of dangerous goods)	Hazardous	Temporarily stored on-site in the designated area prior to removal by licensed hazardous waste contractor(s).
Contaminated waste or asbestos (if identified)	-	Further assessment and advice would be sought regarding waste classification, handling, treatment, disposal and reporting requirements prior to appropriate disposal.

Sewage and wastewater from the MEA ablution facilities would be collected and treated in a biocycle sewage treatment system and serviced by a licensed waste disposal contractor on an as-needed basis. Treated effluent would be irrigated in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (NSW Department of Environment and Conservation, 2004).

3.13 MANAGEMENT OF DANGEROUS GOODS

The transportation, handling and storage of all dangerous goods for the Project would be conducted in accordance with the requirements of the NSW *Work Health and Safety Regulation, 2017* (or its latest equivalent).

The dangerous goods stored for the Project would include compressed gases, flammable and combustible liquids, and corrosive substances.

Based on the quantities proposed to be stored for the Project, it is not anticipated that a Dangerous Goods Licence would be required.

3.13.1 Transport

Dangerous goods required for the Project would be transported in accordance with State legislation.

3.13.2 Hydrocarbon Storage

Hydrocarbons used at the Project during construction and operation would include fuels (diesel and petrol), liquid petroleum gas (LPG), oils, greases, degreaser, kerosene and minor quantities of other hydrocarbons (e.g. acetylene).

Currently one 860 kilolitre (kL) tank near the main fuelling area and two 110 kL tanks at the in-pit refuelling area are used to store diesel at the Maxwell Infrastructure.

A diesel storage facility capable of storing up to approximately 50 kL would be established at the MEA for the refuelling of underground support and transport vehicles.

All fuel storage facilities would be constructed and operated in accordance with Australian Standard (AS) 1940 *The Storage and Handling of Flammable and Combustible Liquids*.

3.13.3 Explosives Storage

Section 3.4.2 describes the situations where blasting may be required during construction activities.

Explosives storage would be conducted in accordance with the NSW *Explosives Act, 2003* and *Explosives Regulation, 2013* (or their latest versions). The *Explosives Regulation, 2013* details the requirements for the safe storage, land transport and handling, and disposal of the explosive, with reference to AS 2187.2:2006 *Explosives – Storage and Use – Use of Explosives* for specific guidelines.

Explosives would continue to be stored at the Maxwell Infrastructure in a licensed explosives magazine (licence XSTR100017) in accordance with Workcover requirements and applicable Australian Standards. The current maximum capacity of ammonium nitrate stored at the Maxwell Infrastructure is 80 t. Given the future limited requirement for blasting, the quantity of explosives stored at the Maxwell Infrastructure would be substantially less than this maximum capacity.

3.13.4 Safety Data Sheets and Chemical Storages

The management and storage of chemicals at the Project would be conducted in accordance with Australian Standards and relevant codes.

No chemical or hazardous material would be permitted on-site unless a copy of the appropriate Safety Data Sheet (SDS) is available on-site or, in the case of a new product, it is accompanied by an SDS.

3.14 REHABILITATION AND REMEDIATION ACTIVITIES

The Project would include ongoing rehabilitation and remediation activities within the Maxwell Infrastructure, and rehabilitation of any remaining disturbance areas at mine closure.

A summary of the key components is provided below. Further details of the Project rehabilitation and mine closure activities are provided in Section 7.

3.14.1 Rehabilitation of Previous Mining Areas

The Project would also include the continued rehabilitation of previous mining disturbance areas within CL 229, ML 1531 and CL 395, including overburden emplacement areas, and eventual relinquishment of areas not required to support the Project.

3.14.2 Subsidence Monitoring and Remediation

Remediation and rehabilitation of subsidence impacts and associated environmental consequences would occur in accordance with approved Extraction Plans and in consultation with DPIE.

3.14.3 Decommissioning and Rehabilitation of Surface Facilities

Surface facilities used for the Project would be decommissioned when they are no longer required or at the end of the mine life where no further ongoing beneficial use is identified.

At closure, works would include the decommissioning and removal of infrastructure, the sealing of mine entrances and land rehabilitation.

3.14.4 CHPP Reject Emplacement Areas and Final Voids

At the conclusion of the Project, emplacement areas would be capped and rehabilitation completed, unless consent for continued emplacement is granted.

Remaining final voids would be made safe, stable and non-polluting.

Malabar will continue to investigate beneficial uses for the voids in CL 229 and ML 1531. This will include CHPP reject material from possible future underground mining activities undertaken by Malabar within EL 5460 and EL 7429 (Spur Hill) and engagement with other mining and industrial facilities in the region (subject to separate assessments and approvals).

3.15 OTHER ACTIVITIES

3.15.1 ~~Potential~~ Edderton Road Realignment

Potential subsidence impacts on Edderton Road would be managed through ~~either: (i)~~ road maintenance along the existing alignment **during mining of the Woodlands Hill Seam followed by~~;~~ ~~(ii) or the~~** realignment of the road around the Maxwell Underground area **(prior to secondary extraction in Arrowfield Seam)**.

Any realignment of Edderton Road would be subject to necessary approvals under the NSW *Roads Act, 1993* and consultation with RMS and Muswellbrook Shire Council.

The ~~potential~~ realignment of Edderton Road would intersect the Golden Highway at a new T-intersection, located approximately 1.2 km west along the Golden Highway from the existing T-intersection.

The realignment would be approximately 3.2 km from the Golden Highway to the existing alignment of Edderton Road.

The realigned portion of Edderton Road would have a two-way sealed carriageway and would be designed to comply with Austroads (2016) or an alternative agreed standard.

The new T-intersection with the Golden Highway would include a channelised right turn lane and an auxiliary left turn lane in the Golden Highway for vehicles turning into Edderton Road.

3.15.2 Exploration Activities

Exploration activities would continue over the life of the Project to progressively refine the understanding of geological structures and seam gas content, so providing input to detailed mine planning and engineering.

Exploration activities would include in-seam drilling, surface-to-seam drilling, low-impact seismic acquisition, surface mapping and airborne and ground-based geophysical surveys.

Surface-to-seam drilling activities would require only small surface areas and would involve the use of typical truck-mounted surface drilling rigs and supporting equipment.

3.15.3 Monitoring Activities

Collection of environmental baseline data and monitoring of subsidence effects, subsidence impacts and associated environmental consequences would occur throughout the life of the Project.

Proposed monitoring is summarised in Section 8. The location, extent and methods adopted for monitoring would be adjusted throughout the life of the Project based on results and stakeholder feedback.

REFERENCES

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ATTACHMENT 2
DETAILED STATUTORY COMPLIANCE RECONCILIATION TABLE

Table A2-1
Summary Statutory Compliance for State Legislation

Relevant Legislation or Instrument	Mandatory Consideration	Relevant Section in the Project EIS	Relevant Section in Modification Report	Modified Project Compliance Status
Environmental Planning and Assessment Act 1979 (EP&A Act)				
section 1.3	Relevant objects of the EP&A Act: • Promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources. • Facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment. • Promote the orderly and economic use and development of land. • Protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats. • Promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage). • Promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State. • Provide increased opportunity for community participation in environmental planning and assessment.	Section 4.3 and Attachment 7 of the EIS	Section 7.3	✓
section 4.15	Relevant environmental planning instruments: • *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP). • *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP). • *State Environmental Planning Policy (Resources and Energy) 2021* (Resources and Energy SEPP). • *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP). • *Muswellbrook Local Environmental Plan 2009* (Muswellbrook LEP). • Any planning agreement or draft planning agreement that a developer has entered into under section 7.4 of the EP&A Act. • The EP&A Regulation. In 2021, DPE consolidated a number of previous SEPPs in place at the time the EIS was prepared into a reduced number of new SEPPs (including those listed above). The SEPP consolidation does not change the legal effect of existing SEPPs (DPE, 2021). Accordingly, the consideration of the Project against the SEPPs presented in the EIS and subsequent assessment by the NSW Government remains relevant to the updated SEPPs. The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality; the suitability of the site for the development; any submissions made in accordance with the EP&A Act or the EP&A Regulation; the public interest.	Section 4.3 and Attachment 7 of the EIS	No change.	✓

Table A2-1 (Continued)
Summary Statutory Compliance for State Legislation

Relevant Legislation or Instrument	Mandatory Consideration	Relevant Section in the Project EIS	Relevant Section in Modification Report	Modified Project Compliance Status
EP&A Regulation				
clause 115	An application for the modification of a development consent under sections 4.55(1), (1A) or (2) or 4.56(1) of the EP&A Act must contain information outlined in clause 115(1) and must satisfy clause 115(1A). Clause 115(2) also provides the notification requirements of clause 49 of the EP&A Regulation apply.	Sections 1 and 4.3.7 of the EIS	Section 1	✓
Roads Act 1993				
section 138	The Project would require necessary consents under section 138 of the *Roads Act 1993* associated with either mining under, or realigning, Edderton Road. In accordance with section 4.42(1)(f) of the EP&A Act, as the Project was approved as State Significant Development, the grant of a consent under section 138 of the *Roads Act 1993* cannot be refused if that consent is necessary for the carrying out of the Project and is to be substantially consistent with the Development Consent.	Sections 4.3.4 and 4.5 of the EIS	No change.	✓
Mining Act 1992				
section 380AA	An application for development consent to mine for coal cannot be made or determined unless the applicant is the holder of an authority that is in force in respect of coal for the relevant land, or the applicant has the written consent of the holder of such an authority to make the application.	Sections 4.3.4 and 4.5 and Attachment 4 of the EIS	No change.	✓
Biodiversity Conservation Act 2016				
section 7.14(2)	The consent authority is to take into consideration the likely impact of the proposed development on biodiversity values as assessed in the BDAR.	Sections 6.7 and 6.8 and Appendix E of the EIS	Section 6.4 and Appendix D	✓
section 7.16(3)	If the consent authority is of the opinion that the Project is likely to have serious and irreversible impacts on biodiversity values, the consent authority is required to: • take those impacts into consideration; and • determine whether there are any additional and appropriate measures that will minimise those impacts if consent or approval is to be granted.	Sections 6.7 and 6.8 and Appendix E of the EIS	Section 6.4 and Appendix D	✓
Protection of the Environment Operations Act 1997 (PoEO Act)				
section 43	The Project currently operates under EPL 1323, granted under the PoEO Act, which allows for coal works and mining for coal as scheduled activities. The EPL contains conditions that relate to emission and discharge limits, environmental monitoring and reporting.	Sections 4.3.4 and 4.5 of the EIS	Section 3.4.1	✓

Table A2-1 (Continued)
Summary Statutory Compliance for State Legislation

Relevant Legislation or Instrument	Mandatory Consideration	Relevant Section in the Project EIS	Relevant Section in Modification Report	Modified Project Compliance Status
Water Management Act 2000				
sections 89, 90 and 91	As the Project is an approved State Significant Development, water use approvals under section 89, water management works approvals under section 90, or activity approvals (excluding aquifer interference approvals) under section 91 of the *Water Management Act 2000* would not be required for the Project. Appropriate licences under the Water Management Act 2000 would be sought and obtained in consultation with WaterNSW, the NSW Natural Resources Access Regulator and the DPE (or the relevant government agencies at the time).	Sections 4.3.3 and 4.5, Attachment 8 and Appendices B and C of the EIS	No change.	✓
Dams Safety Act 2015				
section 48(4)	A consent authority must, before granting Development Consent for mining operations within a notification area of a declared dam, refer the application to Dams Safety NSW and take into consideration any matters raised by Dams Safety NSW.	Section 4.5 of the EIS	No change.	✓
Coal Mine Subsidence Compensation Act 2017 (CMSC Act)				
section 8	At all times while the Project is an active mine, Malabar (or the relevant proprietor) would be liable to pay compensation in relation to damage caused by subsidence arising from the Project on improvement or goods under Part 2 of the CMSC Act. Any claims for compensation under the CMSC Act would be lodged with Subsidence Advisory NSW. The Project is not located within a Mine Subsidence District declared under section 20 of the CMSC Act, and in the regulations made under the CMSC Act.	Section 4.5 of the EIS	No change.	✓
National Parks and Wildlife Act 1974 (NPW Act)				
section 90	As the Project is an approved State Significant Development, an Aboriginal heritage impact permit under section 90 of the NPW Act would not be required for the Project.	Section 4.3.3 of the EIS	Section 6.5 and Appendix E	✓
Heritage Act 1977				
section 139	No items of historic heritage would be directly disturbed by surface development for the Project (as modified). Notwithstanding, as the Project is an approved State Significant Development, an approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977* would not be required for the Project.	Section 4.3.3 of the EIS	No change.	✓

Table A2-2
Summary Statutory Compliance for Environmental Planning Instruments

Relevant Legislation or Instrument	Mandatory Consideration	Relevant Section in the Project EIS	Relevant Section in Modification Report	Modified Project Compliance Status
Chapter 2 of the State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP)				
clause 2.1	Clause 2.1 of the Planning Systems SEPP outlines the aims, that includes identifying development that is State significant development. The Project falls within Item 5 of Schedule 1 of the Planning Systems SEPP as it is development for the purpose of mining that is coal mining. Under clause 2.6 of the Planning Systems SEPP, the Project is, therefore, State Significant Development for the purposes of the EP&A Act.	Section 4.3.2 and Attachment 7 of the EIS	No change.	✓
Chapter 2 of the State Environmental Planning Policy (Resources and Energy) 2021 (Mining SEPP)				
clause 2.17	Before determining an application for consent for the purposes of mining the consent authority must: (a) consider – (i) the existing uses and approved uses of land in the vicinity of the development, and (ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and (iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and (b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a)(i) and (ii), and (c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a)(iii).	Section 9 and Attachment 7 of the EIS	No change.	✓
clause 2.18	Before determining an application for consent for the purposes of mining the consent authority must consider relevant provisions of the *Voluntary Land Acquisition and Mitigation Policy* (NSW Government, 2018a).	Section 6 and Appendices I and J of the EIS	Sections 6.7 and 6.8	✓
clause 2.19	Before determining an application for development in the vicinity of mining, petroleum or extractive industry, the consent authority must (among other things) consider whether or not the development is likely to have a significant impact on current or future extraction or recovery of minerals, petroleum or extractive materials (including by limiting access to, or impeding assessment of, those resources), and any ways in which the development may be incompatible with any of those existing or approved uses or that current or future extraction or recovery.	Section 9 and Attachment 7 of the EIS	No change.	✓

Table A2-2 (Continued)
Summary Statutory Compliance for Environmental Planning Instruments

Relevant Legislation or Instrument	Mandatory Consideration	Relevant Section in the Project EIS	Relevant Section in Modification Report	Modified Project Compliance Status
Chapter 2 of the State Environmental Planning Policy (Resources and Energy) 2021 (Mining SEPP) (Continued)				
clause 2.20	Before determining an application for consent for the purposes of mining the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner (including conditions to ensure that impacts on significant water resources, including surface and groundwater resources, are avoided, or are minimised to the greatest extent practicable, that impacts on threatened species and biodiversity, are avoided, or are minimised to the greatest extent practicable, and that greenhouse gas emissions are minimised to the greatest extent practicable). This includes considering an assessment of greenhouse gas emissions (including downstream emissions) having regard to any applicable State or national policies, programs of guidelines concerning greenhouse gas emissions.	Sections 6 and 9, Attachment 7 and Appendices B, C, E, F and J of the EIS	Sections 6.2, 6.3, 6.4 and Appendices B, C and D	✓
clause 2.21	Before determining an application for consent for the purposes of mining the consent authority must consider the efficiency of the development in terms of resource recovery and whether or not the consent should be issued subject to conditions aimed at optimising the efficiency of resources recovery and the reuse or recycling of material.	Section 3 and Attachment 7 of the EIS	No change.	✓
clause 2.22	Before determining an application for consent for the purposes of mining the consent authority must consider whether or not the consent should be issued subject to conditions regarding transport of materials.	Section 6 and Appendix K of the EIS	No change.	✓
clause 2.23	Before determining an application for consent for the purposes of mining the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring the rehabilitation of land that will be affected by the development, including the particular considerations set out in clause 2.23(2).	Section 7 and Appendix U of the EIS	No change.	✓
Chapter 3 of the State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP)				
clause 3.12	A consent authority must consider current circulars or guidelines published by the DPE relating to hazardous or offensive development, whether to consult with relevant public authorities regarding any environmental or land use safety requirements, a preliminary hazard analysis prepared by the applicant, feasible alternatives to the development and likely future use of surrounding land.	Section 6, Attachment 7 and Appendix T of the EIS	No change.	✓
Chapter 4 of the State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP)				
clause 4.6(1)	A consent authority must consider whether the land is contaminated and be satisfied that, if the land is contaminated, the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out.	Attachment 7 of the EIS	No change.	✓

Table A2-2 (Continued)
Summary Statutory Compliance for Environmental Planning Instruments

Relevant Legislation or Instrument	Mandatory Consideration	Relevant Section in the Project EIS	Relevant Section in Modification Report	Modified Project Compliance Status
Chapter 2 of State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP)				
clause 2.48(2)	Before determining a development application (or an application for modification of a consent) for development to which this clause applies the consent authority must give written notice to the electricity supply authority for the area in which the development is to be carried out, inviting comments about potential safety risks and take into consideration any response to the notice that is received within 21 days after the notice is given.	Attachments 7 and 11 of the EIS	No change.	✓
clause 2.97(2)	Before determining a development application for development to which this clause applies, the consent authority must within 7 days after the application is made, give written notice of the application to the rail authority for the rail corridor, and take into consideration: (i) any response to the notice that is received within 21 days after the notice is given, and (ii) any guidelines that are issued by the Secretary for the purposes of this clause and published in the Gazette.	Attachment 7 of the EIS	No change.	✓
Muswellbrook LEP				
clause 2.3	A consent authority must have regard to the objectives for development in a zone when determining a development application in respect of land within that zone.	Section 4.6 and Attachment 7 of the EIS	No change.	✓
clause 5.10(4)	If applicable, a consent authority must, before granting consent under clause 5.10 in respect of a heritage item of heritage conservation area, consider the effect of the proposed development on the heritage significance of the item or area concerned.	Section 6.13 and Appendix H of the EIS	Section 6.5	✓
clause 5.10(8)	If applicable, a consent authority must, before granting consent under clause 5.10 to the carrying out of development in an Aboriginal place of heritage significance, consider the effect of a proposed development on the heritage significance of the place and any Aboriginal object known or reasonably likely to be located at the place by means of an adequate investigation and assessment.	Section 6.12 and Appendix G of the EIS	Section 6.5 and Appendix E	✓
clause 7.6	If applicable, a consent authority must, before granting development consent for earthworks, consider the effect of proposed earthworks on drainage patterns, soil stability, quality of fill, likely amenity impacts, likelihood of disturbing relics and proximity to and potential impacts on water courses.	Section 6, Attachment 7 and Appendices B, C, D, N, O, P, Q of the EIS	Section 6 and Appendix C	✓

ATTACHMENT 3
SUMMARY OF MITIGATION MEASURES

MAXWELL UNDERGROUND MINE PROJECT

SUMMARY OF MITIGATION MEASURES

DEVELOPMENT CONSENT SSD 9526
MODIFICATION 1
MODIFICATION 2

MALABAR

JUNE 2022
Project No. SHM-20-04
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8 SUMMARY OF MITIGATION MEASURES

This attachment provides a summary of mitigation measures for the Maxwell Underground Mine Project (the Project). Mitigation requirements introduced following EIS submission (e.g. through the Project assessment/determination process or the final Development Consent conditions) are shown in green text. Additional mitigation requirements identified in the *Maxwell Underground Mine Project Mine Entry Modification - Modification Report* (Modification 1) (Malabar, 2021) are shown in blue text and *Maxwell Underground Mine Project Mining Optimisation Modification – Modification Report* (Modification 2) (Malabar, 2022) are shown in purple text.

In accordance with the SEARs, this section provides a consolidated summary of Malabar's commitments in relation to mitigation and monitoring activities for the Project.

Section 8.1 describes the general approach to environmental management for the Project. Section 8.2 lists key specific environmental mitigation measures and monitoring. Section 8.3 describes adaptive management measures, while Section 8.4 describes relevant environmental reporting for the Project.

8.1 PROJECT ENVIRONMENTAL MANAGEMENT

Section 6 of this EIS outlines proposed environmental mitigation, adaptive management, monitoring and offset measures for the Project.

These include measures relating to subsidence, groundwater, surface water, land resources and agriculture, biodiversity, noise, air quality, visual and landscape character, Aboriginal cultural heritage, road transport, social impact, greenhouse gas emissions, hazards, rehabilitation and mine closure.

Section 7 and Appendix U of this EIS describe the approach to rehabilitation, and how surface disturbance areas (including those disturbed by Project subsidence impacts) will be rehabilitated and remediated for the Project. The Biodiversity Offset Strategy for the Project is described in Section 6.7.6 of this EIS.

Malabar has implemented an Environmental Management System at the Maxwell Infrastructure to minimise the potential environmental impacts of its rehabilitation and care and maintenance activities (Section 2.2.2). These existing monitoring and management plans at the Maxwell Infrastructure will be reviewed accordingly to address Project activities.

Subsidence performance measures and mining constraints will be detailed in Extraction Plans for the Project, along with monitoring, mitigation, adaptive management and contingency measures.

Table 8-1 presents a proposed list of management plans for the Project. Management plans relating to potential impacts associated with underground operations will be included as part of Extraction Plans for the Project, and will be progressively updated as mining progresses.

It is recognised that changes to the Project environmental mitigation, adaptive management, monitoring and reporting proposed in the EIS may be considered necessary during further consultation with government agencies in the assessment and approval process for the Project, as well as an outcome of adaptive management during the life of the Project.

Project environmental mitigation, adaptive management, monitoring and reporting will be conducted in accordance with the finalised Development Consent conditions and associated licences and approvals, with the final monitoring details (locations, parameters and frequencies) to be provided in the relevant management plans and monitoring programs for the Project.

8.2 KEY SPECIFIC ENVIRONMENTAL MITIGATION MEASURES

There are numerous mitigation measures incorporated into the design of the Project (Section 3).

Malabar is committed to developing the Project solely as an underground mining operation. Underground mining methods significantly reduce environmental impacts, including dust produced, noise and surface disturbance, in comparison to open cut mining methods.

Table 8-1
Summary of Project Management, Mitigation, Monitoring and Reporting

Proposed Management, Monitoring and Reporting	Key EIS Sections and Appendices
Underground Mining Area – Plans to be Incorporated into Extraction Plan	
• Water Management Plan.	Sections 6.4 and 6.5 and Appendices B, C and D.
• Land Management Plan.	Section 6.6 and Appendix Q.
• Biodiversity Management Plan.	Section 6.7 and Appendix E.
• ~~Aboriginal Cultural~~ Heritage Management Plan.	Section**s** 6.12 **and 6.13** and Appendi**ces** G **and H**.
• Built Features Management Plan.	Section 6.3 and Appendix A.
• Public Safety Management Plan.	Section 6.3.
• Subsidence Monitoring Program.	Section 6.3 and Appendix A.
• **Trigger Action Response Plan.**	**-**
• **Contingency Plan.**	**-**
Overall Project Operations	
• Environmental Management Strategy.	-
• Water Management Plan, incorporating: – Groundwater Management Plan. – Surface Water Management Plan. – Site Water Balance. – **Salt Balance.** – Erosion and Sediment Control Plan.	Sections 6.4 and 6.5 and Appendices B, C and D.
• Biodiversity Management Plan.	Section 6.7 and Appendix E.
• Biodiversity Offset Strategy.	Section 6.7 and Appendix E.
• Noise **and Blasting** Management Plan.	Sections 6.9 and 6.15 and Appendix I.
• Air Quality and Greenhouse Gas Management Plan.	Sections 6.10 and 6.19 and Appendix J.
• **Spontaneous Combustion Management Plan**	**Section 6.9**
• Aboriginal Cultural Heritage Management Plan.	Section 6.12 and Appendix G.
• Workforce Conduct Policy.	Section 6.17 and Appendix L.
• Emergency Response Management Plan.	Section 6.20.
• Bushfire Management **Plan** ~~Procedure~~.	Section 6.20 and Appendix T.
• Pollution Incident Response Management Plan.	Section 6.20 and Appendices S and T.
• Spill Response Procedure.	Section 6.20 and Appendix T.
• Mining Operations Plan.	Section 7.6 and Appendix U.
• Mine Closure Plan.	Sections 6.16, 6.17 and 7.7 and Appendices L, and U.
• Final Void Management Plan.	Sections 6.4, 6.5 and 7.3 and Appendices B, C and U.
• **Visual Impact Management Plan.**	**Sections 6.11 and Appendix N**
• **Traffic Management Plan**	**Section 6.14 and Appendix K**
• **Social Impact Management Plan**	**Section 6.17 and Appendix L**
• **Rehabilitation Strategy.**	**Section 7 and Appendix U**
• **Rehabilitation Management Plan.**	**Section 7 and Appendix U**
Reporting Requirements	
• Annual Review.	Section 4.5.1.
• Greenhouse Gas Reporting.	Sections 4.5.2 and 6.19.
• Community Consultative Committee.	Section 6.17.4 and Appendix L.
• Complaints Register.	Section 6.17.4 and Appendix L.

In addition to the proposed mining method, the following key Project design measures and constraints have been incorporated by Malabar in response to stakeholder feedback:

- limiting the requirement to develop new infrastructure through the use of the substantial existing Maxwell Infrastructure;
- placement of the MEA in a natural valley, and reducing the height of infrastructure components, to restrict direct views of the MEA from the Golden Highway and neighbouring horse studs;
- use of the existing site access to the Maxwell Infrastructure from Thomas Mitchell Drive, to limit Project traffic movements on the Golden Highway and Edderton Road;
- sealing the extended site access road to the MEA during the first **six months** ~~**year**~~ of mining operations;
- use of a covered, overland conveyor to transport coal extracted by longwall mining machinery to further reduce potential dust and noise impacts;
- avoiding direct subsidence impacts on the Hunter River, the Hunter River alluvium and Saddlers Creek by imposing constraints on the design of the mine layout;
- limiting the extent of the underground mine layout to beneath freehold land owned by Malabar (i.e. there would be no direct subsidence impacts to land owned by neighbouring horse studs);
- use of water treatment systems that maximise the re-use of water on-site and remove any requirement to source water externally for mining operations (e.g. from the Hunter River); and
- development of a site water management system that avoids the need for controlled release of mine-affected water to the Hunter River.

In addition, key environmental mitigation measures and commitments to be implemented for the Project include:

- management of potential Project subsidence impacts and associated consequences to natural and built features, which will be included in Extraction Plans for the Project;
- holding appropriate water licences under the NSW *Water Management Act, 2000* for water taken incidentally for the Project;
- ongoing groundwater and surface water monitoring programs, and validation of the predicted impacts throughout the Project life;
- biodiversity offsets for threatened species and communities;
- implementation of reasonable and feasible mitigation measures on-site to minimise noise and dust generation during construction and operation; and
- ongoing communication and engagement with Coolmore and Godolphin Woodlands Studs and Hollydene Estate Wines and neighbours to the north of the Maxwell Infrastructure.

The key environmental mitigation measures and commitments are described in the sections below, with reference to the relevant sections of this EIS where further detail is available.

8.2.1 Subsidence

Extraction Plans

Prior to causing any subsidence, Malabar will prepare and submit an Extraction Plan for approval by the DPIE.

Extraction Plans will be prepared for a series of panels that are a subset of the approved mine layout. Malabar will review the adequacy and effectiveness of an Extraction Plan during the preparation of a new Extraction Plan for subsequent panels.

The Extraction Plans will include performance measures for natural and built features. Malabar will implement an adaptive management approach to achieve the performance measures for the Project. Adaptive management will involve the monitoring and periodic evaluation of the environmental consequences against the performance measures, and adjustment (if necessary) of the management and control measures to achieve the adopted performance measures.

Extraction Plans prepared for the Project will include:

- a summary of relevant background or baseline data;
- a review of predictions of the potential subsidence effects, subsidence impacts and environmental consequences, incorporating any relevant information obtained since the EIS (such as monitoring results obtained during mining);

- a monitoring program to provide data to assist with the management of the risks associated with subsidence, validate subsidence predictions and analyse the relationship between subsidence effects and impacts and any ensuing environmental consequences;
- a plan to manage and remediate subsidence impacts and/or environmental consequences (e.g. remediation of observed cracking);
- trigger action response plans to identify risks and outline specific follow-up actions to avoid exceedances of agreed performance measures;
- contingency plans that provide for adaptive management where monitoring indicates that there has been an exceedance of agreed performance measures; and
- reporting and review mechanisms.

Extraction Plans for the Project will include the following key component documents:

- Water Management Plan;
- Land Management Plan;
- Biodiversity Management Plan;
- ~~**Aboriginal Cultural**~~ Heritage Management Plan;
- Built Features Management Plan(s);
- Public Safety Management Plan;
- **Trigger Action Response Plan;**
- **Contingency Plan; and**
- Subsidence Monitoring Program.

Public Infrastructure

A Built Features Management Plan will be developed for the Golden Highway in consultation with RMS prior to mining within 500 m of the highway. The Built Features Management Plan will include:

- pre-mining inspections for structural stability and potential susceptibility to subsidence;
- implementation of appropriate pre-mining mitigation measures to minimise impacts, where appropriate;
- implementation of a monitoring program, including subsidence surveys and visual monitoring at appropriate frequencies and locations (including cuttings and the bridge at Bowmans Crossing);
- development of trigger action response plans for unexpected subsidence impacts, including a commitment to mitigate, repair or compensate any impacts in a timely manner;
- development of protocols for the distribution of results to relevant stakeholders; and
- annual reporting procedures.

Potential subsidence impacts on Edderton Road will be managed through ~~**either: (i)**~~ road maintenance along the existing alignment **during mining of the Woodlands Hill Seam followed by**~~**; (ii) or the**~~ realignment of the road around the Maxwell Underground area **(prior to secondary extraction in Arrowfield Seam)**.

In the event that Edderton Road is undermined, a Built Features Management Plan will be prepared in consultation with Muswellbrook Shire Council. The Built Features Management Plan will include:

- implementation of pre-mining mitigation measures to minimise impacts, where appropriate;
- implementation of a monitoring program, including subsidence surveys and visual monitoring at appropriate frequencies and locations;
- development of appropriate mitigation measures to maintain safety and serviceability, including:
  - a commitment to mitigate, repair, replace or compensate any impacts in a timely manner;
  - processes to schedule road pavement repairs outside of peak traffic times wherever possible; and
  - imposition of appropriate temporary speed restrictions;
- processes for notification of the community and other key stakeholders of works on Edderton Road during active subsidence;
- development of trigger action response plans for unexpected subsidence impacts;
- development of protocols for the distribution of results to relevant stakeholders; and
- annual reporting procedures.

Prior to Project-related maintenance or construction work on Edderton Road, Malabar will provide information about the road works program to Jerrys Plains, Coolmore Stud, Godolphin Woodlands Stud, Hollydene Estate Wines and residences on Edderton Road, along with contact details for the Project and details of Malabar's complaints mechanisms.

Potential subsidence consequences on the Ausgrid 11 kV overhead power line will be managed in consultation with Ausgrid, and may include the implementation of preventive measures such as the provision of cable rollers, guy wires or additional poles, or relocation of the power line around the Maxwell Underground area. A Built Features Management Plan will be developed in consultation with Ausgrid.

Malabar will manage the impacts of mine subsidence on survey marks in consultation with NSW Spatial Services, including lodging relevant applications under the *NSW Surveying and Spatial Information Regulation, 2017* as required by the *Surveyor-General's Direction No. 11 Preservation of Survey Infrastructure*.

Malabar-owned Infrastructure

Malabar will manage potential subsidence consequences for its own infrastructure as a component of the Extraction Plans.

Subsidence Monitoring

Surface subsidence monitoring data will be collected in accordance with the subsidence monitoring programs detailed in the Extraction Plans.

Subsidence monitoring may include transverse and longitudinal subsidence lines and survey lines/pegs around features of interest.

The subsidence monitoring data will be reviewed as part of the Extraction Plan and reporting processes to assist with the management of risks associated with subsidence, validate subsidence predictions and inform the adaptive management process.

8.2.2 Groundwater

Malabar will hold appropriate water licences under the NSW *Water Management Act, 2000* for water taken incidentally for the Project.

Groundwater Monitoring

Groundwater monitoring for the Project will be undertaken as documented under an approved Groundwater Management Plan (as part of the Water Management Plan), including:

- manual groundwater level monitoring for all open monitoring bores, with dataloggers installed within selected bores to gather temporal variations in water levels;
- recording of pressure readings in VWPs;
- sampling of field analytes (pH and EC); and
- annual sampling for laboratory analysis of a suite of analytes, including physio-chemical indicators, major ions, total alkalinity and dissolved and total metals.

Malabar will establish additional alluvial monitoring bores in the Saddlers Creek alluvium.

Yearly reporting of groundwater monitoring results will be included in the Annual Review. Where relevant, the reporting will include comparison to climate trends and surface water monitoring results to identify changes in the surface water and groundwater interactions.

Numerical Model Review

After the first three years of mining, and every **three** ~~**five**~~ years thereafter, the validity of the groundwater model predictions will be assessed and if the data indicates significant deviation from the model predictions, an updated groundwater simulation model will be developed.

A program for further hydraulic testing of the fault in the vicinity of Saddlers Creek within the first three years of mining and incorporation into reviews of the groundwater model would be undertaken in accordance with Condition B42(v) of Development Consent SSD 9526.

Make Good Provisions

Should monitoring or an investigation show greater than 2 m drawdown at a privately-owned bore, and the drawdown is attributable to the Project, 'make good' provisions for the affected groundwater user will be implemented, and may include:

- deepening the affected groundwater bore;
- construction of a new groundwater bore; and/or
- provision of an alternative water supply of suitable quality and quantity.

8.2.3 Surface Water

Malabar will hold appropriate water licences under the NSW *Water Management Act, 2000* for water taken incidentally for the Project.

Prior to operating the water treatment facility, Malabar would prepare a Brine Management Plan for the Project in consultation with the EPA.

Malabar will also implement all reasonable and feasible measure to avoid off-site discharges from the Access Road Dam and the Rail Loop Dam in accordance with Condition B36 of Development Consent SSD 9526. If discharge from these dams is required, it will be undertaken in accordance with the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*.

Erosion and Sediment Control

Erosion and sediment control structures will be maintained in accordance with *Managing Urban Stormwater Soils and Construction* (Landcom, 2004).

Proper drainage of the site will be maintained by:

- removing accumulated sediment from basins/drains (if required);
- checking that drains are operating as intended and any damaged works are repaired where necessary;
- confirming recent works have not resulted in the diversion of sediment-laden water away from their intended destination; and
- checking that rehabilitated lands have established sufficient groundcover.

Surface Water Monitoring

Surface water monitoring for the Project will be undertaken as documented under an approved Surface Water Management Plan (as part of the Water Management Plan), and will address the following issues:

- water quality;
- water balance;
- site water management system integrity;
- erosion and sediment control;
- stream health; and
- geomorphic response to subsidence.

Yearly reporting of surface water monitoring results will be included in the Annual Review.

Malabar would include additional surface water monitoring sites requested by the Muswellbrook Shire Council to monitor for potential off-site sediment generation due to subsidence. The location of these sites would be documented in an Extraction Plan required prior to the commencement of secondary extraction.

8.2.4 Land Resources and Agriculture

Mitigation and Remediation of Potential Subsidence Impacts on Agricultural Land

Temporary remedial actions to mitigate the potential subsidence impacts could include the following:

- relocation of stock outside of the areas directly above active underground mining;
- installation of fencing to limit access by livestock or unauthorised personnel to areas of active subsidence;
- where necessary, ripping, tyning and/or infilling of surface cracks; and
- erosion control measures and/or revegetation works.

Remediation of grazing land affected by subsidence will be undertaken, as required, during Project operations to minimise hazard to persons, livestock and native fauna, and long-term potential environmental impacts.

The requirement and methodology for any subsidence remediation techniques will be determined in consideration of:

- potential impacts of the unmitigated impact, including potential risks to public safety and the potential for self-healing or long-term degradation; and
- potential impacts of the remediation technique, including site accessibility.

Subsidence remediation will generally be undertaken using conventional earthmoving equipment (such as a backhoe or grader), and will include:

- in-fill of minor surface cracks by cultivation of the ground surface;
- in-fill of larger surface cracks with suitable soil or other material;

- localised regrading or reshaping to limit the potential for water ponding; and/or
- stabilisation of disturbed areas with temporary erosion controls (e.g. silt fences) and long-term measures (e.g. vegetation planting).

Minor cracks (i.e. less than 50 mm) that develop are not expected to require remediation, as these cracks would not impact agricultural productivity and geomorphological processes would result in the cracks filling naturally over time.

The above mitigation and remediation measures will be outlined in further detail in the Land Management Plan component of future Extraction Plans (Section 8.2.1). This will include a program to monitor the success of subsidence remediation supported by trigger action response plans to implement specific follow-up actions in the event that monitoring indicates additional measures are required.

Soil Resource Management Measures

General soil resource management practices will involve the stripping and stockpiling of soil resources prior to any Project-related surface disturbance.

The objectives of soil resource management for the Project will be to:

- identify and quantify potential soil resources for rehabilitation;
- optimise the recovery of useable topsoil and subsoil during stripping operations;
- manage topsoil and subsoil reserves so they do not degrade whilst stockpiled;
- establish effective soil amelioration procedures to maximise the availability of soil for future rehabilitation; and
- take into account the need to provide conditions that minimise the risk of soil loss via wind and water erosion during and after rehabilitation.

Further details on soil resource management will be provided in the MOP for the Project (or equivalent documentation).

Land Contamination

General measures to reduce the potential for contamination of land will include the following:

- The transportation, handling and storage of all dangerous goods for the Project will be conducted in accordance with the requirements of the NSW *Work Health and Safety Regulation, 2017* (or its latest equivalent).
- Dangerous goods required for the Project will be transported in accordance with State legislation.
- On-site consumable storage areas will be designed with appropriate bunding.
- Fuel and explosive storage areas will be regularly inspected and maintained.
- The response to any accidental spills or ground contamination will be assessed on a case-by-case basis and remediated in accordance with the Spill Response Procedure.
- Emergency response procedures will be enacted as required under a Pollution Incident Response Management Plan.

Prior to undertaking any of the following activities, Malabar will undertake a hazardous material survey (e.g. to assess the potential for asbestos-containing material) and will develop and implement appropriate mitigation measures (and removal actions) for any identified contamination:

- soil excavation or disturbance near the identified former sheep dip;
- disturbance of any soil that may contain fragments of asbestos-containing materials;
- demolition or other works on rural residences and structures (including the Nissen hut);
- soil excavation in areas of surface staining adjacent to rural structures; and
- disturbance of any previously-imported fill material.

8.2.5 Biodiversity

Measures to mitigate impacts from the Project on biodiversity are outlined in Table 8-2. In addition, the following measures will be implemented to conserve threatened flora not likely to be impacted by the Project:

- Malabar will erect a livestock-proof fence around a 20 m buffer from the *Hunter Valley Weeping Myall (Acacia pendula) Woodland*/*Acacia pendula* population in the Hunter Catchment. The area will be signed 'Environmental Protection Area'.
- Malabar **has erected** a livestock-proof fence around a 20 m buffer from the *Diuris tricolor* records **identified in Appendix E of the EIS**. The area will be signed 'Environmental Protection Area'.
- **Malabar will erect a livestock-proof fence around the *Diuris tricolor* records identified to the north of the Modification 2 surface development area**.
- **In the event that *Prasophyllum petilum* or *Pterostylis chaetophora* are identified within the Maxwell Underground, Malabar will erect a livestock proof fence around a 20 m buffer from the population. The area would be signed 'Environmental Protection Area'.**

Malabar will implement a monitoring program for the riparian vegetation along Saddlers Creek and outcomes would be reported in the Annual Review.

Biodiversity Offset Strategy

Existing Biodiversity Offsets

The existing biodiversity offsets for the Maxwell Infrastructure will be incorporated into the Biodiversity Offset Strategy for the Project.

Project Biodiversity Offset Strategy

The sub-sections below describe how the Project Biodiversity Offset Strategy will address both Commonwealth and NSW biodiversity offset requirements.

Malabar will consult with Mining, Exploration and Geoscience (MEG) regarding potential resource sterilisation in biodiversity offset areas that are identified for the Project.

NSW Biodiversity Offset

Malabar will address NSW offset requirements **(for the Project as modified)** by one, or a combination of the following options, consistent with the NSW Biodiversity Offsets Scheme:

1. the retirement of biodiversity credits (either like-for-like or in accordance with the variation rules);
2. the funding of a biodiversity conservation action;
3. undertaking ecological mine rehabilitation; or
4. payment into the Biodiversity Conservation Fund.

Commonwealth Biodiversity Offset

Malabar will undertake like-for-like biodiversity offset measures for relevant EPBC Act listed threatened species and ecological communities as required by the EPBC Act. These biodiversity credits or other offset measures will be associated with the following EPBC Act listed threatened species and communities:

- *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland*;
- *Central Hunter Valley Eucalypt Forest and Woodland*;
- Pink-tailed Legless Lizard;
- Striped Legless Lizard;
- Swift Parrot; and
- Regent Honeyeater.

Table 8-2
Measures to Mitigate and Manage Potential Biodiversity Impacts

Potential Impact	Mitigation Measure	Techniques	Timing/Frequency
Displacement of Fauna	Presence of a Trained Ecological or Licensed Wildlife Handler	Capture and release.	During native vegetation clearance and clearance of rocky areas.
Clearance Impacts on Native Vegetation and Habitat	Vegetation Clearance Protocol	Areas to be cleared are delineated to prevent accidental damage during vegetation clearance activities or other works.	During native vegetation clearance and clearance of rocky areas.
		Pre-clearance fauna surveys by suitably qualified personnel.	During native vegetation clearance and clearance of rocky areas.
		Impacts on fauna are managed during clearing activities by suitably qualified personnel.	During native vegetation clearance and clearance of rocky areas.
		Review of environmental impacts that may result from subsidence remediation (threatened flora species and populations, rocky areas that may provide habitat for threatened lizards) and consideration of whether alternative methods of remediation are warranted (e.g. without machinery).	Prior to any remediation of surface cracks.
		Restricting vegetation clearance to the slashing of vegetation where possible along power line easements (i.e. leaving the lower stem and roots *in-situ* to maximise the potential for natural regrowth).	During vegetation clearance.
		Lopping of branches, rather than the removal of trees where possible along power line easements.	During vegetation clearance.
	Mine Site Rehabilitation and Revegetation	Surface disturbance areas associated with the Biodiversity Assessment Development Footprint will be rehabilitated and revegetated.	Over the life of the Project. Surface facilities used for the Project will be decommissioned when they are no longer required or at the end of the mine life where no further ongoing beneficial use is identified.
	Salvage and Re-use of Material for Habitat Enhancement within the Mine Site Rehabilitation	Identification of habitat features (e.g. cleared trees, surface rocks) that will be beneficial for habitat enhancement.	During and after vegetation clearance.
	Site Induction	Where possible, encourage Malabar personnel to use existing tracks for site access to Project areas to minimise potential disturbance of soils and revegetated areas.	During construction and operational stages.
	Access	Use of defined tracks to access sites to minimise the disturbance of soils.	During construction and operational stages.

Table 8-2 (Continued)
Measures to Mitigate and Manage Potential Biodiversity Impacts

Potential Impact	Mitigation Measure	Techniques	Timing/Frequency
Subsidence Impacts on Native Vegetation and Habitat	Remediation of Surface Cracks	Remediation of mine subsidence effects (e.g. surface cracking and minor erosion).	As required, where impacts are identified as part of the subsidence monitoring program.
Indirect Impacts on Native Vegetation and Habitat	Feral Animal Management	Maintain a clean, rubbish-free environment to discourage scavenging and reduce the potential for colonisation of these areas by non-endemic fauna.	During construction and operational stages.
	Weed Management	When they have been off-road, washdown of vehicles and mechanical equipment to minimise seed transport off the site.	During construction and operational stages.
		Identification of weeds requiring control.	Regular site inspections.
		Mechanical removal of identified weeds and/or the application of approved herbicides.	During construction and operational stages.
		Follow-up site inspections to determine the effectiveness of the eradication programs.	During construction and operational stages.
	Bushfire Management	According to the Bushfire Management **Plan** ~~**Procedure**~~.	During construction and operational stages.
Vehicle Strike	Fencing	Fencing along the length of the site access road to exclude kangaroos (and cattle).	Installation during construction of the site access road.
	Speed Limits	Imposing a maximum 60 km per hour speed limit on internal roads and maximum 80 km per hour speed limit on the sealed site access road.	During construction and operational stages.

Source: After Appendix E.

8.2.6 Noise

Real-time Monitoring and Meteorological Forecasting System

The noise management system for the Project will include a real-time noise and meteorological monitoring network, as well as a meteorological forecasting system.

Real-time noise monitors will be installed in locations that will provide representative noise levels at privately-owned receivers most likely to experience noise impacts associated with the Project (e.g. to the north of the Maxwell Infrastructure). Locations for these monitors will be determined once operations commence and in consultation with the relevant government agencies and local landowners.

Real-time meteorological data will be recorded at the Maxwell Infrastructure AWS (or a suitable replacement).

A meteorological forecasting system will also be implemented for the Project to anticipate upcoming periods of adverse weather conditions (e.g. based on wind speed, direction and atmospheric stability).

Attended Noise Monitoring

Attended noise monitoring will be undertaken regularly at locations representative of the most sensitive receivers to determine compliance of Project noise levels with relevant Development Consent criteria.

Monitoring results will be assessed against the NPfI with respect to modifying factors (including for low frequency noise). If monitoring results are found to contain dominant low-frequency content, appropriate modifying factors will be applied to measured noise levels, in accordance with the NPfI, to account for additional annoyance at the receiver.

Noise and Blasting Management Plan

A Noise Management Plan will be prepared for the Project, which will describe the noise management system for the Project, including details of:

- applicable Development Consent noise and vibration criteria;
- the noise mitigation measures for the Project;
- attended noise monitoring locations;
- real-time noise monitoring locations;
- the predictive meteorological forecasting system;
- the pro-active noise management system (Section 8.3.5);
- specified trigger levels for the implementation of additional mitigation measures;
- protocols for the implementation of additional mitigation measures; and
- complaint response protocols.

Noise Management Zone

The privately-owned receivers where noise emissions are predicted to exceed the Project Noise Trigger Levels (i.e. with either negligible or marginal exceedances) will be classified as being within the Project's noise management zone.

In addition to the mitigation measures described above, proposed management procedures for receivers in this zone will include:

- response to any community issues of concern or complaints including discussions with relevant landowners;
- refinement of on-site noise mitigation measures and mine operating procedures; and
- implementation of feasible and reasonable acoustical mitigation at receivers with predicted marginal residual impacts, in accordance with the Voluntary Land Acquisition and Mitigation Policy (NSW Government, 2018b) (or its latest version).

Rail Noise

The Project will use locomotives and rolling stock approved to operate on the NSW rail network in accordance with EPLs issued by the EPA.

Road Transport Noise

Project employees will be made aware of the potential for road noise impacts through site-specific inductions and staff education programs to reinforce quiet driving styles/attitudes.

Other Measures

Malabar will design the parameters required for any blasting activities with a high margin of conservatism to meet the applicable criteria at the nearest sensitive receivers or any proximal infrastructure (e.g. Liddell Ash Dam).

8.2.7 Air Quality

Real-time Air Quality Monitoring

Malabar currently operates a meteorological monitoring station and real-time air quality monitoring station at the Maxwell Infrastructure.

The real-time monitoring network will be reviewed for the operation of the Project and detailed in the Air Quality and Greenhouse Gas Management Plan.

Trigger levels will be determined to facilitate the implementation of adaptive management in response to elevated particulate matter concentrations being identified (Section 8.3.6).

Air Quality and Greenhouse Gas Management Plan

An Air Quality and Greenhouse Gas Management Plan will be prepared for the Project and will include:

- details of the air quality mitigation measures to be implemented for the Project;
- measures to avoid potential spontaneous combustion events, including mine planning, risk identification and assessment and identification of hot spots;
- measures to control dust emissions from rail wagons, such as streamlining, consistent profiling and regular collection of coal spillages;
- the real-time air quality monitoring program;
- details of trigger levels for the investigation of additional mitigation measures; and
- adaptive management response protocols (Section 8.3.6).

Spontaneous Combustion Management Plan

In accordance with Condition B20 of Development Consent SSD 9526, a Spontaneous Combustion Management Plan will be prepared and implemented for the Project.

8.2.8 Visual and Landscape Character

Mitigation measures proposed in relation to reducing visual impacts relevant to the Project include:

- on-site treatments to reduce visual effects of the Project components by reducing the level of visibility at potential viewer locations and reducing the level of contrast; and
- off-site treatments at viewer locations to reduce visual sensitivity.

Visual Impact Management Plan

In accordance with Condition B61 of Development Consent SSD 9526, a Visual Impact Management Plan will be prepared and implemented for the Project.

On-site Treatments

The following on-site treatments will be implemented for the Project:

- Earthwork batters within the transport and services corridor will be vegetated.
- Areas disturbed for construction laydown areas and access will be revegetated as soon as practicable after the completion of construction.
- Where feasible, landscaping will be undertaken to emulate existing landscape patterns, colours and texture continuums.
- Compatible tones will be used for the covered, overland conveyor infrastructure and cladding colours.
- Power line design will consider the placement of poles in locations of high visual absorption, where possible.

Malabar will maintain the screening vegetation adjacent to the MEA planted in July 2019, on the west slope of the bounding ridgeline to reduce the visual effect of the Project on Edderton Road.

Night-lighting

All external lighting associated with the Project will comply with *AS/NZS 4282:2019 – Control of the Obtrusive Effects of Outdoor Lighting*, including the minimisation of light spill through the following:

- Installation of light fittings will consider adequate aiming (including consideration of mounting heights).
- Shielded fittings will be used, where available and safe to do so.
- Anti-reflective paint will be used on surfaces which night-lighting could spill onto.
- Upward spill light will be minimised and lighting will generally be directed either downwards, or away from the sensitive receptors to the south and Edderton Road.

- Night-lighting will be restricted to the minimum required for operational and safety requirements so as to avoid over-lighting.
- Energy-efficient lighting will be used for any new fixed lighting installed, where available and safe to do so.
- Where floodlights are required, asymmetric beams will be used.
- Fixed lights will not be directed towards reflective surfaces.
- Lighting for fixed installations will use warm white colours, where available and if compliant with industrial lighting standards.

Off-site Treatments

If requested by the landowner (i.e. BHP) and/or tenant, landscaping works along the eastern and southern boundary fence line of Edderton Homestead will be undertaken to supplement existing vegetation and further screen views of the Project.

Implementation of the visual mitigation measures will be subject to consultation and agreement with the landowner and/or tenant.

Other Measures

Malabar will implement the following measures to mitigate potential impacts on knowledge-based perceptions, in addition to the Project design measures already incorporated and the engagement conducted to date:

- Malabar has offered (and will reiterate the offer) to meet with representatives of the Coolmore and Godolphin Woodlands Studs to discuss the findings of this EIS, once it is on public exhibition.
- Malabar will continue to offer to meet regularly with representatives of the Coolmore Stud and Godolphin Woodlands Stud over the life of the Project.
- Malabar will maintain fence lines, entrances and roadside plantings within Malabar-owned properties to present a visually pleasing appearance that is congruent and sympathetic with the appearance of surrounding rural properties.
- Malabar will discourage workers from wearing high-visibility clothing when visiting smaller, local communities.
- When and where appropriate, Malabar will:
  - Use appropriate media platforms to disseminate current Project information that outlines the relative benefits of underground mining and the beneficial outcomes of the Project.
  - Offer to release joint media with horse studs or other sensitive receptors regarding the potential for co-existence between underground mining and other local industries (including equine, viticulture and agriculture).

8.2.9 Aboriginal Cultural Heritage

Aboriginal Cultural Heritage Management Plan

An ACHMP will be developed for the Project in consultation with the registered Aboriginal parties to the satisfaction of the DPIE.

A summary of measures expected to be included in the ACHMP and implemented over the life of the Project is provided below. Further detail is provided in Appendix G.

Surface Development

An archaeological salvage program will be documented in the ACHMP to manage potential impacts to Aboriginal heritage from surface disturbance, including:

- Creation and maintenance of an Aboriginal Site Database for known Aboriginal heritage sites within the Project area and surrounds.
- Progressive surface collection of Aboriginal objects/sites potentially impacted by surface development.
- A program of open area salvage excavation for sites AHIMS #37-2-0004 and AHIMS #37-2-0505, representing the only sites assessed of moderate scientific significance that would be directly impacted by the Project (these sites lie within 100 m of each other and essentially comprise a single archaeological site).
- **A program of open area salvage for the area of high archaeological sensitivity within the Modification 2 Surface Development Area (AECOM, 2022).**
- Involvement of a qualified archaeologist and field representative(s) from registered Aboriginal parties in salvage works.
- Submission of Aboriginal Site Impact Recording forms for all salvaged sites.

Sites assessed of moderate significance will be subject to surface collection and other forms of mitigation (such as detailed recording, test or open area excavation).

During the development of the ACHMP, registered Aboriginal parties will be requested to provide advice on the curation of all the Aboriginal objects salvaged as part of the excavation program.

Potential Impacts from Subsidence

The following measures will be undertaken to manage potential impacts to Aboriginal heritage from subsidence throughout the life of the Project:

- Subsidence monitoring will be conducted during mining and for a specified period post-mining, with a digital record kept of the nature, location and extent of all subsidence-related surface impacts within the Project area.
- Where subsidence-related impacts, such as surface cracking, are identified within the boundary of an existing site of moderate (or high) scientific significance, or where remediation works are required to address subsidence impacts, the site will be inspected by a qualified archaeologist to determine the nature and extent of impacts, and whether mitigation is required.
- Mitigation measures for subsidence may include further monitoring, surface collection or open area salvage excavation.

General Mitigation Measures

In additional to the above, Malabar will implement the following general measures that have been formulated in consultation with the registered Aboriginal parties:

- An Aboriginal cultural heritage awareness package will be developed, and all relevant contractors and staff engaged on the Project who may have interactions with Aboriginal heritage will receive awareness training prior to commencing work on-site.
- Sites will be identified on relevant site plans, with details for the care of sites that will be conserved *in-situ* incorporated into the ACHMP.
- AHIMS site cards will be lodged in a timely manner with the DPIE for any previously unidentified Aboriginal heritage site(s) that are discovered during the course of Project operations and/or further heritage assessments.
- The ACHMP will outline provisions to guide the management of any previously unrecorded Aboriginal heritage sites that may be identified during future investigations or works consistent with the protocol in the ACHA (Appendix G).
- Should any skeletal remains be identified during the course of the Project, work in that location would cease immediately and the find would be notified to the relevant authorities (including the NSW Police). Subject to the NSW Police requiring no further involvement, the management of any Aboriginal skeletal remains would be determined in consultation with the DPIE and the registered Aboriginal parties.

Malabar will maintain a file of historical information regarding the former Drayton Mine on-site. Malabar will make the information available to the public upon request (e.g. for students completing research projects). Malabar will also make the material available to Muswellbrook Shire Council should it wish to establish a permanent memorial to the former Drayton Mine.

8.2.10 Road Transport

The Road Transport Assessment concluded that the existing road network can satisfactorily accommodate the forecast traffic demands resulting from the Project without any specific additional road upgrade requirements.

Should Malabar elect to realign the southern portion of Edderton Road, the realigned road and new intersection with the Golden Highway will be designed and constructed consistent with Austroads (2017c) *Guide to Road Design* requirements and in consultation with Muswellbrook Shire Council and RMS.

Malabar will continue to consult with Muswellbrook Shire Council and the DPIE to develop a plan to contribute to the maintenance of local roads under the control of the Muswellbrook Shire Council.

Malabar will consult with Muswellbrook Shire Council regarding the post-mining use of the site access road prior to mine closure, including consideration of dedicating the site access road as a public road post-mining.

Traffic Management Plan

In accordance with Condition B91 of Development Consent SSD 9526, a Traffic Management Plan will be prepared and implemented for the Project.

Management of Deliveries to the Project

The proposed movement for any oversize vehicles will be negotiated with RMS and relevant local councils on a case-by-case basis. All oversize loads will be transported with the relevant permits and load declarations obtained in accordance with *Additional Access Conditions for Oversize and Overmass Heavy Vehicles and Loads* (RMS, 2019) (or its latest version), and any other licences and escorts as required by regulatory authorities.

The transportation, handling and storage of all dangerous goods at the Project will be conducted in accordance with the requirements of the *Storage and Handling of Dangerous Goods – Code of Practice 2005* (WorkCover, 2005) (or its latest version). Dangerous goods required for the Project will be transported in accordance with relevant legislation.

8.2.11 Social and Community Infrastructure

Malabar will work with local government and the local community to minimise potential social impacts of the Project and maximise potential opportunities. In addition to other commitments identified in Section 8, Malabar maintains the following commitments that will underpin the Project's social impact management strategies:

- A strong local employment commitment.
- Planned recruitment of approximately 50% of the operational workforce from individuals outside of the underground mining sector, including young people, and people who are unemployed.
- A strong workforce diversity policy with a target for individuals new to the underground mining sector to be 20% female and 10% Indigenous.
- A Workforce Conduct Policy establishing:
  - clear standards of behaviour for employees and contractors while on and off-shift;
  - clear standards in relation to drug and alcohol use; and
  - fatigue management requirements.
- Community investment support for:
  - local community infrastructure, including health, education and childcare;
  - local community values and cohesion, including support for local events and community-led projects; and
  - community liveability, promoting environmental qualities, family life and community resilience.
- Positive contributions to local agriculture and agricultural suppliers and services, as Malabar is actively improving its agricultural properties and viticultural operations so that these will be long-term sustainable and productive businesses.
- Continued support to local farmers by providing agistment opportunities on improved pastures owned by Malabar, and where possible leasing excess water rights to neighbours.

Section 6.17.4 outlines in detail the mitigation strategies that have been identified in the SIA and will be implemented by Malabar.

Social Impact Management Plan

In accordance with Condition B94 of Development Consent SSD 9526, a Social Impact Management Plan will be prepared and implemented for the Project.

8.2.12 Greenhouse Gas Emissions

The Project will use various mitigation measures to minimise the overall generation of greenhouse gas emissions.

Greenhouse gas abatement measures for the Project will be documented in the Air Quality and Greenhouse Gas Management Plan, including:

- Where practical, storage of gas underground in the goaf.
- A small gas-powered plant may be used to generate power from gas drained in the underground workings, subject to the presence of sufficient methane content in the deeper coal seams.
- The gas management system will flare gas if it contains sufficient methane to do so, in the absence of a small gas-powered plant.
- Selection and design of equipment and processes will aim to optimise efficiency and reduce energy consumption.
- Equipment and plant will be regularly maintained.
- The consumption of fuel and electricity will be monitored.

- Electricity will be sourced from renewable resources where available, and economically reasonable and feasible.

Ongoing monitoring and management of greenhouse gas emissions and energy consumption at the Project will occur through Malabar's participation in the NGERS (Section 8.4.6).

8.2.13 Hazards and Risk

Malabar has a safety management system to manage risks to health and safety in accordance with the requirements of the *Work Health and Safety (Mines and Petroleum Sites) Act, 2013* and the *Work Health and Safety (Mines and Petroleum Sites) Regulation, 2014*. Malabar will continue to meet these obligations for the Project.

In addition, a number of hazard control and mitigation measures will be described in management plans for the Project, including:

- Water Management Plan.
- Pollution Incident Response Management Plan.
- Bushfire Management **Plan** ~~**Procedure**~~.

The following hazard control and mitigation measures will be adopted for the Project:

- *Maintenance* – Maintenance of all mobile and fixed plant equipment consistent with the maintenance schemes required by legislation and the original equipment manufacturer.
- *Staff Training* – Only those personnel authorised to undertake skilled or potentially hazardous work will be permitted to do so.
- *Engineering Structures* – Mining and civil engineering structures will be constructed in accordance with applicable codes, guidelines and Australian Standards. Where applicable, Malabar will obtain the necessary licences and permits for engineering structures.
- *Contractor Management* – All contractors engaged by Malabar will be required to operate in accordance with the relevant Australian Standards and NSW legislation.
- *Water Management* – Water management structures will be constructed to generally separate runoff from undisturbed areas and disturbed areas (Section 3.10) and in accordance with the *Dams Safety Act, 1978* and/or *Dams Safety Act, 2015*.
- *Coal Stockpile Management* – Coal stockpiles will be managed to reduce the potential for spontaneous combustion.
- *Storage Facilities* – Storage and usage procedures for potentially hazardous materials (e.g. fuels, oils, greases) will be developed in accordance with Australian Standards and relevant legislation (Section 3.13).
- *Emergency Response* – Fire-fighting and spill management equipment will be kept on-site in appropriate locations. Emergency response training, procedures, manuals and systems will continue to be implemented.

Bushfire Hazards

Bushfire risk mitigation measures currently employed by Malabar, as part of the existing Bushfire Management **Plan** ~~**Procedure**~~, will continue for the Project.

Malabar will continue to promote bushfire awareness through:

- provision of fire safety training for all personnel and contractors undertaking work associated with the Project; and
- provision of relevant information regarding bushfire management, where appropriate, via notice boards and during daily pre-start meetings.

Specific mitigation measures to reduce bushfire risk will include:

- maintenance of non-operational, grassed areas to reduce fuel loads;
- slashing infrastructure areas and property boundaries prior to the summer period;
- establishment and maintenance of fire breaks and access tracks;
- where practical, limiting all activities classed as 'hot work' to workshop and hardstand areas;
- regular inspection of vegetation within power line easements to avoid interference with power lines;
- limiting vehicular movements to existing access tracks where possible to reduce the potential for spark emissions;
- prohibiting smoking in any restricted area, such as near fuel storage areas, inside vehicles or buildings, or within any area designated as a non-smoking area; and
- prohibiting the lighting of fires or fireworks.

Further to the measures described above, fire-fighting equipment located on-site will continue to be regularly serviced and maintained in accordance with relevant Australian Standards.

Fire-fighting equipment will continue to be provided around each building along with a trailer equipped for mobile fire-fighting on-site. The equipment on-site will include fire extinguishers, aqueous film-forming foam, fire hydrants, hoses, and appropriate fittings and nozzles.

Malabar will continue to consult with the Edinglassie Rural Fire Brigade with regard to bushfire management on-site, and will report any bush or grass fires on-site to the Edinglassie Rural Fire Brigade. The Emergency Response Management Plan will outline the protocol to be followed in the event of a fire.

If the Project is approved, Malabar will review and update the Bushfire Management **Plan** ~~**Procedure**~~ to consider the additional surface infrastructure and activities required to support the Project.

Prescribed Dams

Malabar will continue to operate the Access Road Dam under the *Dams Safety Act, 1978* and/or *Dams Safety Act, 2015*, including construction and inspection requirements.

Malabar will comply with the *Dams Safety Act, 1978* and/or *Dams Safety Act, 2015*, where relevant, for new dams constructed as part of the Project.

Malabar will continue to consult with Dams Safety Committee regarding the management of prescribed dams operated by Malabar (including the Access Road Dam) and interactions with the Liddell Ash Dam (and associated levee) adjacent to the Maxwell Infrastructure.

8.2.14 Rehabilitation and Mine Closure

Appendix U provides a preliminary rehabilitation and mine closure strategy for the Project. Key components are summarised below.

In the long-term, all sites will be rehabilitated to a safe, stable and sustainable landform of a similar character to surrounding areas. A conceptual post-mining land use of a combination of agriculture and nature conservation has been selected for the majority of the Project domains.

Malabar recognises that government and community stakeholders may identify final land uses that provide greater net benefits to the locality. Malabar will encourage and be supportive of other community and government proposals or initiatives for the use of Malabar land or infrastructure that can co-exist with the Project. These alternative final land uses would be subject to separate assessments and approval, and do not form part of the Project.

A MOP will be developed for the Project in accordance with the latest NSW Government guidelines. The MOP will describe the rehabilitation and performance measures and completion criteria, including more detailed and quantified criteria where applicable (based on the Development Consent conditions for the Project). The rehabilitation performance measures and completion criteria included in the MOP will be specific, measurable, realistic and time-bound.

Over the life of the Project, rehabilitation performance measures and completion criteria will, periodically, be updated and refined in consultation with relevant regulatory authorities and stakeholders to reflect evolving mine site rehabilitation practices and standards.

A Mine Closure Plan will be developed for the Project approximately five years prior to closure, which will be developed in consultation with the Muswellbrook Shire Council, the DPIE and the local community.

The Mine Closure Plan will include consideration of amelioration of potential adverse socio-economic effects due to the reduction in employment at Project closure.

In accordance with Conditions B79 and B82 of Development Consent SSD 9526, a Rehabilitation Strategy and a Rehabilitation Management Plan will be prepared and implemented for the Project.

If, by the end of 2025, no clear resolution is reached with other mining and industrial facilities in the region, Malabar will rehabilitate the South Void highwall and North Void low wall in accordance with the approved Final Void Management Plan, unless otherwise agreed with the Resources Regulator. The North Void highwall works would be completed once the rail and CHPP infrastructure are no longer required.

Malabar supports the establishment of a working party to be established by 2035 to plan for the transition to an alternative post-mining land use. Malabar will also continue to consult with the Aboriginal community as part of the final land use planning for the Project.

8.3 ADAPTIVE MANAGEMENT

8.3.1 Subsidence

Malabar will implement an adaptive management approach during the life of the Project, including:

- the use of subsidence monitoring data collected during the life of the Project to validate and refine subsidence predictions;
- evaluation of environmental monitoring results against performance measures, with adjustment (if necessary) of the management and control measures to, as a minimum, achieve the adopted performance measures;
- monitoring of the performance of subsidence remediation methods, and adjustment (if necessary) to improve long-term outcomes; and
- implementation of contingency measures in the event of unexpected subsidence impacts.

Where relevant, performance measures, monitoring locations/methods, trigger action response plans and contingency measures will be developed in consultation with relevant asset owners and government agencies.

8.3.2 Groundwater

The Water Management Plan will specify groundwater level and quality triggers for the Project, along with trigger action response plans and contingency measures.

Observed groundwater levels will also be reviewed against the model predictions on an annual basis. A suitably qualified hydrogeologist will determine when water levels deviate significantly from that predicted by the groundwater model and determine the reason for this deviation. The review will consider the impact of mining, and other factors that could result in declining water levels including climatic conditions, rainfall recharge and pumping from privately-owned bores and/or other mining operations.

During the Project, additional hydrogeological data will be collected, including details on lithology, groundwater intersection and intersection of structures (i.e. faults and dykes). The additional hydrogeological data will be stored and made available as required for future groundwater investigations and/or updates to the model.

In the event of a reasonable groundwater-related complaint from a local landholder in relation to a potential mine-related effect on their groundwater supply, Malabar would facilitate the provision of temporary water supply to provide immediate relief while an impact investigation is undertaken.

8.3.3 Surface Water

The Water Management Plan will specify surface water trigger levels for the Project based on historical monitoring data, along with trigger action response plans and contingency measures.

A process of adaptive management will also be used to address the risk of knickpoint formation and stream channel alignment change as a result of subsidence. This process will involve:

- regular monitoring to detect if and where a potential geomorphic risk occurs;
- an assessment to determine the potential consequences of the observed risk; and
- development and implementation of appropriate control works.

If a significant increase is observed in the rate of knickpoint development or migration, these will be assessed by a suitably qualified geomorphologist in order to determine the most appropriate control measure in accordance with the Extraction Plan.

8.3.4 Biodiversity

Monitoring of potential subsidence impacts on threatened ecological communities, threatened fauna habitat and threatened flora will occur in accordance with the Biodiversity Management Plan prepared as a component of the Extraction Plan. In the event that significant environmental consequences are observed as a result of subsidence, Malabar will implement remediation measures and/or additional compensatory measures in accordance with approved contingency plans.

8.3.5 Noise

Pro-active Noise Management System

A pro-active noise management system will be implemented to manage noise levels from the Project at nearby receivers (i.e. to reduce the likelihood that Project noise levels will exceed predicted operational noise levels at receiver locations).

The meteorological forecasting system will be used in conjunction with the real-time noise monitoring system, and will provide an alert for Malabar personnel to review the real-time data and manage surface operations as may be required.

The Noise **and Blasting** Management Plan will provide details on the operation of the pro-active noise management system. It is anticipated that the process will involve a review of meteorological forecasting data by a nominated person prior to the commencement of each mining shift. If favourable conditions are predicted, then typical operations will be conducted. If unfavourable conditions are predicted, Malabar will plan operational alternatives.

During operations, if noise from the Project exceeds specified trigger levels, Malabar personnel will be alerted and additional mitigation measures will be implemented until noise levels reduce below the trigger levels. This will occur even if surface operations have already been modified.

The trigger levels will be specified such that the equivalent noise level at the closest receivers will be below the permitted maximum operational noise levels.

Transport Noise

Project road and rail transport noise adaptive management measures will include response to any community issues of concern or complaints, including discussions with relevant landowners and liaison with rail operators regarding train operating procedures.

8.3.6 Air Quality

When the real-time air quality monitoring system indicates specified short-term trigger levels are reached or exceeded, a message will be delivered to a Malabar representative, alerting them to the elevated short-term dust levels.

The Project meteorological station will report wind conditions at the time, allowing personnel to evaluate the likely origin of the elevated dust levels (i.e. on-site or off-site sources), enabling appropriate mitigation and response measures to be implemented.

Project personnel will also undertake visual monitoring of stockpiles and exposed areas. In the event that any substantial dust plumes are observed, additional dust management measures will be implemented.

Project air quality adaptive management measures will include response to any community issues of concern or complaints, including discussions with relevant landowners and/or refinement of on-site air quality mitigation measures and mine operating procedures.

8.3.7 Social and Community Infrastructure

Preliminary proposed performance measures and monitoring and reporting requirements for each mitigation actions related to potential social and community infrastructure impacts are provided in Appendix L.

Social indicators will be monitored to support adaptive management of cumulative social impacts and benefits. Key social indicators and their proposed monitoring frequency are summarised in Section 6.17.5.

8.3.8 Greenhouse Gas Emissions

Malabar will manage its contribution to Australian greenhouse gas emissions inventories through participation in the NGERS, as well as any other government initiatives implemented to manage emissions at the national level.

8.3.9 Rehabilitation and Mine Closure

A rehabilitation monitoring program will be developed for the Project that, along with the application of adaptive management, will allow the desired outcomes to be achieved. It is expected that the rehabilitation monitoring will include (subject to final land use agreement):

- Baseline monitoring to determine conditions pre-mining and during mining.
- Documentation of all rehabilitation activities undertaken.
- Initial monitoring for a period of one to two years post-closure and comparison with control sites.
- Ongoing monitoring (less frequently) from two years post-mining until lease relinquishment.
- Post-lease relinquishment monitoring (to be negotiated with future landholders).
- Use of adaptive management techniques and facilitation of research trials where appropriate.

Malabar will undertake field investigations to identify appropriate control/reference sites for each secondary rehabilitation domain and collect monitoring data, which will be used to assess the status of rehabilitation against completion criteria.

The effectiveness of subsidence remediation practices will also be monitored and the outcomes used to inform the application of subsidence remediation in future.

Trigger action response plans will specify follow-up actions in the event that monitoring indicates additional remediation or other measures are required.

8.3.10 Other Aspects

Throughout the life of the Project, Malabar will review and regularly report its environmental performance and local community feedback received on the Project. Malabar will investigate and respond to any community issues of concern or complaints.

Environmental management plans prepared for the Project will include:

- contingency plans to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible; and
- programs to investigate and implement ways to improve the environmental performance of the Project over time.

8.4 REPORTING

The following subsections describe the expected reporting requirements for the Project (based on requirements at the time of preparation of this EIS). Malabar will adjust its reporting should requirements change in the future.

8.4.1 Incident Reporting

Consistent with the reporting requirements of the *Standard Conditions for State Significant Development Mining Projects August 2018* (NSW Government, 2018c), Malabar will notify the DPIE immediately after becoming aware of the incident.

Malabar will also notify the EPA and any other relevant government agencies of incidents causing or threatening material harm to the environment immediately after becoming aware of the incident, in accordance with Part 5.7 of the PoEO Act and consistent with any requirements of an EPL for the Project.

Within seven days after becoming aware of the incident, Malabar will give written incident notification to the DPIE and within 30 days of the date on which the incident occurred, provide a detailed report on the incident to the Secretary and any relevant government agencies.

8.4.2 Annual Review

Malabar will produce an Annual Review to describe the environmental performance of the Project for a 12 month reporting period. Copies of the Annual Review will be made available on the Malabar website, consistent with the reporting requirements of the *Standard Conditions for State Significant Development Mining Projects August 2018* (NSW Government, 2018c).

Environmental monitoring results will be compared against relevant statutory requirements, the requirements of any plan or program required under the Development Consent, monitoring results of previous years and relevant predictions of this EIS.

Biodiversity management, proposed development and rehabilitation, as well as environmental performance improvement measures proposed for the next 12 month period will also be discussed in the Annual Review.

8.4.3 Development Consent Requirements

Malabar will provide regular reporting of environmental performance of the Project on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of the Development Consent and associated licences and approvals.

8.4.4 Community Consultative Committee

Malabar will operate a CCC in accordance with the conditions of the Development Consent and consistent with the *Community Consultative Committee Guideline: State Significant Projects January 2019* (NSW Government, 2019) (or its latest equivalent version).

8.4.5 Independent Environmental Auditing

Consistent with the reporting requirements of the *Standard Conditions for State Significant Development Mining Projects August 2018* (NSW Government, 2018c), Malabar will commission an independent environmental audit of the Project within one year of the commencement of any Development Consent, and every three years after or at an alternative interval, as required by any Development Consent for the Project.

Upon completion of the independent environmental audit, Malabar will submit a copy of the independent environmental audit and its responses to the DPIE.

8.4.6 Other Reporting

Annual Return

A summary of the results of any monitoring required by an EPL, granted under the PoEO Act, for the Project (including a register of any complaints) and a Statement of Compliance will be provided in Annual Returns and submitted to the EPA.

EPBC Act Approval – Annual Reporting

Malabar will prepare annual reports assessing compliance with relevant conditions of an EPBC Act approval for the Project, as required.

Greenhouse Gas Reporting

The Project is anticipated to trigger the current NGER Act reporting threshold during the Project life, based on the Scope 1 and 2 greenhouse gas emission estimates provided in Appendix J. If required, Malabar will report relevant energy use and greenhouse gas emissions associated with its activities.

Community Complaints Register

A community complaints register will be maintained for the Project. Complaints and subsequent actions undertaken will be reported in the Annual Review and on the Malabar website.

REFERENCES

AECOM Australia Pty Ltd (2022) ***Maxwell Underground Mine Project Modification 2 Aboriginal Cultural Heritage Assessment.***

Landcom (2004) ***Managing Urban Stormwater, Soils and Construction*****.**

Malabar Resources Limited (2021) ***Maxwell Underground Mine Project Mine Entry Modification - Modification Report*****.**

Malabar Resources Limited (2022) ***Maxwell Underground Mine Project Mining Optimisation Modification – Modification Report*****.**

New South Wales Government (2018b) ***Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments*****.**