Bengalla Mine Modification 8

Modification Report
Bengalla Mining Company Pty Limited
November 2025

Executive Summary

Bengalla Mining Company Pty Limited (BMC) operates Bengalla Mine (Bengalla), located in the Upper Hunter Valley of New South Wales (NSW). Bengalla operates under Development Consent SSD-5170 (SSD-5170) granted under the then Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Modification

BMC is seeking to modify SSD-5170 to adjust the disturbance footprint for the realignment of Bengalla Link Road (BLR) described in the '*Continuation of Bengalla Mine Environmental Impact Statement*' (Bengalla EIS) (Hansen Bailey, 2013) to facilitate construction activities (the Modification). The Modification will require the disturbance of approximately 67.5 hectares (ha) of vegetation in addition to that already authorised under SSD-5170. BMC's application to modify SSD-5170 is made pursuant to Section 4.55(2) of the EP&A Act.

Context of the Modification

SSD-5170 was granted on 3 March 2015 and authorised the continuation of mining at Bengalla for 21 years until 28 February 2039. SSD-5170, as originally granted, anticipated that the BLR would need to be relocated in Year 15.

At the time, BMC committed to designing and constructing the realigned section of the BLR in consultation with Muswellbrook Shire Council (MSC) and in accordance with relevant guidelines. It was identified that detailed design plans for the road alignment and intersection were necessary to reflect the traffic environment at the time of its construction. For that reason, Condition 34 of Schedule 3 of SSD-5170 was imposed which included a conceptual road design (within Appendix 8 of SSD-5170) but overall required the road to be designed and constructed to the satisfaction of MSC.

Consideration of Substantially the Same Development

BMC's application to modify SSD-5170 is made pursuant to Section 4.55(2) of the EP&A Act. Section 4.55(2) authorises the Minister for Planning, as the consent authority for SSD-5170, to modify the consent if satisfied, that the development to which the consent as modified is substantially the same development as the development for which consent was originally granted.

Determining whether the development as modified is substantially the same development involves consideration of the differences, including qualitative and quantitative differences, between the development authorised by the consent as granted and the consent as modified.

For reasons described more fully below, the development authorised by the consent as modified is substantially the same as the development for which the consent was originally granted. The environmental impacts associated with the Modification can be adequately addressed by imposing appropriate conditions of development consent.

Environmental Impacts of the Modification

Section 4.55(3) of the EP&A Act requires the consent authority to take into consideration such of the matters referred to in Section 4.15(1) as are of relevance to the development the subject of the application.

The key environmental aspects of the Modification requiring further assessment relate to potential air, noise, biodiversity, visual and Aboriginal cultural heritage impacts associated with adjusting the disturbance boundary for the construction of the BLR. Suitably qualified experts have been engaged to assess these potential impacts. Where appropriate, the environmental assessments completed for this Modification Report have identified additional management and mitigation measures to be implemented for the development.

The following provides a summary of the key findings from the environmental assessments undertaken for the Modification.

Air Quality

The Modification has the potential to generate dust through vehicle movements, material handling, exhaust emissions, and windblown dust from temporarily exposed stockpiles. The Air Quality and Greenhouse Gas Assessment estimated that during construction of the realigned BLR, dust emissions would increase by approximately 2%. Given construction activities are temporary and will occur over approximately 18 months, no discernible change in air quality impacts is expected at sensitive receiver locations. The minor increase is unlikely to be discernible beyond the existing dust levels at private receptors in the vicinity of Bengalla and will be managed through the implementation of construction controls described in the '*Bengalla Air Quality Management Plan'* (BMC, 2022). Greenhouse gas (GHG) emissions associated with the Modification activities will have a negligible contribution to national and global emissions levels. Notwithstanding, GHG mitigation and offset measures will be implemented.

Noise

The Modification may generate noise through the use of mobile equipment for construction of the BLR realignment. The construction fleet will advance along the road alignment on multiple work fronts, with work occurring near each receptor only briefly during each phase. The construction noise assessment indicates that the predicted worst case construction noise levels are likely to exceed the approved '*Interim Construction Noise Guideline* (DECCW, 2009) (ICNG) noise criteria at the closest receiver locations. The '*Bengalla Noise Management Plan'* (BMC, 2023a) will be reviewed and updated for the Modification to identify construction noise management measures to be implemented to minimise potential impacts during the construction phase.

Biodiversity

Native vegetation within the Modification Disturbance Boundary has been assigned to the Central Hunter Ironbark Grassy Woodland Plant Community Type (PCT), occurring in two condition states: Woodland and Derived Native Grass (DNG). The portions of this community within the Modification Disturbance Boundary that were assessed as Woodland condition (approximately 39 ha) correspond to Central Hunter Valley Eucalypt Forest and Woodland, a Critically Endangered Ecological Community (CEEC) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This vegetation community is also listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) as an Endangered Ecological Community (EEC).

Targeted surveys identified two candidate fauna species within the Modification Disturbance Boundary, being the Hunter Valley Delma (*Delma vescolineata)* and Southern Myotis (*Myotis macropus)*. The Hunter Valley Delma is listed as Endangered under both the EPBC Act and BC Act. Accordingly, an assessment against the significant impact criteria for Matters of National Environmental Significance (MNES) was completed for the Modification. The assessment of significance completed for this species concluded that the Modification would remove known habitat and fragment remaining habitat outside the Modification Disturbance Boundary. Accordingly, it is considered that the Modification has potential to interfere with the recovery of this species.

The Modification is a Controlled Action and requires assessment and approval under the EPBC Act. The Modification will therefore be assessed in accordance with the bilateral assessment pathway between the NSW State government and Australian Federal government.

The Biodiversity Development Assessment Report and supporting calculations identified that a total of 1,780 ecosystem credits and 2,396 species credits are required to offset the biodiversity impacts of the Modification.

Visual

Views of Bengalla from the realigned BLR will be limited by strategic cut / fill placement, to enhance existing topographic and vegetation screening effects. The Modification has the potential to alter viewing locations for road users along the approved BLR realignment within the Western View Sector of Bengalla. Receptors driving on Roxburgh Road may have intermittent views of the unrehabilitated face of the main Bengalla overburden emplacement area. The Modification will not increase potential viewing locations.

The visual impacts associated with the Modification are considered negligible and will remain consistent with the existing impacts from approved Bengalla operations (both as originally approved and as modified). Modification disturbance outside of the realigned BLR corridor will be temporary and rehabilitated as soon as practicable following the completion of construction. The sensitivity of residential receptors remains unchanged, with existing views, viewing distances, and intervening topography continuing to limit visibility of Bengalla. As soon as practicable after completion of the constructed BLR landform and relocation of existing third party infrastructure, BMC will conduct a review and determine the need for additional screening measures.

Aboriginal Cultural Heritage

An Aboriginal Cultural Heritage Assessment was completed to assess the potential impacts of the Modification on items of Aboriginal cultural heritage value. A total of eight sites of archaeological significance (including four new sites) were identified during the field survey of the Modification Disturbance Boundary. All sites recorded have low scientific value, primarily due to their low artefact density and degraded condition. The area within the Modification Disturbance Boundary will be salvaged through the recording and collection of surface artefacts prior to the start of construction. Long-term management of Aboriginal objects will be conducted in accordance with the relevant protocols outlined within the existing '*Bengalla Aboriginal Cultural Heritage Management Plan'* (BMC, 2017a).

Justification

The Modification involves adjustments to the approved BLR disturbance boundary to facilitate construction. The Bengalla EIS described the realignment of the BLR, which assumed an 80 kilometre (km) / hour (hr) speed limit at the northern section of the road leading to its intersection with Wybong Road. Since the determination of SSD-5170, the development of the Mount Pleasant Mine has involved upgrades to the existing BLR / Wybong Road intersection, where a 100 km / hr speed limit now applies. In addition, the detailed design process has resulted in adjustments to the BLR realignment to address constraints such as land tenure, topography, the existing road network, and power and communications infrastructure.

The potential environmental impacts of the Modification do not significantly vary or alter the character or scale of the development (as originally approved or as modified). The Modification will result in a road that is consistent with the surrounding road network and supports an appropriate level of amenity and utility, including for Over Size Over Mass (OSOM) vehicles likely to utilise the road for the transport of renewable energy related infrastructure. Given that the Modification will not materially change the impacts on the surrounding environment and sensitive receptors, the environmental costs of the Modification are outweighed by its benefits.

Contents

1. Introduction 1
   - 1.1 Background 1
   - 1.2 Approvals History 1
   - 1.3 Modification Overview 5
   - 1.4 Objectives of the Modification 5
   - 1.5 Applicant 5
   - 1.6 Document Purpose 5
2. Strategic Context 7
   - 2.1 Surrounding Environment 7
   - 2.2 Land Ownership 7
   - 2.3 Land Use Planning 9
   - 2.4 Hazards 9
   - 2.5 Cumulative Impacts 11
   - 2.6 Planning Agreement 11
   - 2.7 Government Policies and Plans 12
3. Modification Description 15
   - 3.1 Overview 15
   - 3.2 Development Consent Conditions 15
   - 3.3 Comparison with Approved Development 16
   - 3.4 Alternatives Considered 21
4. Statutory Context 22
   - 4.1 Overview 22
   - 4.2 Environmental Planning and Assessment Act 1979 24
   - 4.3 Key Regulatory Matters 25
   - 4.4 Other Legislative Considerations 26
5. Stakeholder Engagement 28
   - 5.1 Regulatory Consultation 28
   - 5.2 Registered Aboriginal Parties 30

5.3 Community Consultation 31
6. Impacts, Management and Mitigation 32
6.1 Air Quality and Greenhouse Gas 32
6.2 Noise 35
6.3 Biodiversity 38
6.4 Water 46
6.5 Visual Amenity 46
6.6 Aboriginal Cultural Heritage 47
6.7 Historic Heritage 49
6.8 Traffic 50
6.9 Other Environmental Aspects 52
7. Merit Evaluation 53
7.1 Project Evaluation in the ESD Context 53
7.2 Merit Evaluation 54
References 55
Abbreviations 57

Appendices

Appendix A EPBC SEARs
Appendix B Air Quality and Greenhouse Gas Assessment
Appendix C Noise Impact Assessment
Appendix D Biodiversity Development Assessment Report
Appendix E Visual Review
Appendix F Aboriginal Cultural Heritage Assessment Report
Appendix G Historic Heritage Impact Assessment
Appendix H Bengalla Link Road Design Summary Report
Appendix I Schedule of Land

Figures

Figure 1	Regional Locality	2
Figure 2	Approved Development Layout	4
Figure 3	Conceptual Modification Layout	6
Figure 4	Landownership	8
Figure 5	Bushfire Prone Land and Mine Subsidence District	10
Figure 6	Vegetation Communities	42

Tables

Table 1	Voluntary Planning Agreement with Muswellbrook Shire Council	11
Table 2	Comparison of the Modification to the Approved Development	17
Table 3	Relevant Legislation Provisions	22
Table 4	Stakeholder Engagement and Consultation	28
Table 5	Predicted Worst Case Construction Noise Levels of BLR Realignment	36
Table 6	Predicted Traffic Noise Levels of BLR Realignment	37
Table 7	Presence of Fauna Species in the Modification Disturbance Footprint	41
Table 8	Biodiversity Impact Comparison	44
Table 9	Impacts that Require and Offset – Ecosystem Credits	45
Table 10	Impacts that Require an Offset – Species Credits	45
Table 11	Newly Recorded Aboriginal Cultural Heritage Sites	48
Table 12	Previously Recorded Aboriginal Cultural Heritage Sites	49
Table 13	Principles of Ecologically Sustainable Development	53

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To be initialled and dated by the person who actions the issue of the documents.

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1. Introduction

This section introduces the Modification, the applicant and the development sought to be modified.

1.1 Background

Bengalla Mining Company Pty Limited (BMC) operates the Bengalla Mine (Bengalla) in the Upper Hunter Valley of New South Wales (NSW). Bengalla is located approximately 130 kilometres (km) north-west of Newcastle and 4 km west of Muswellbrook (see **Figure 1**).

Bengalla operates under Development Consent SSD-5170 (SSD-5170) granted under the then Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). SSD-5170 (as modified) enables the continuation of open cut coal mining and associated activities at Bengalla until 28 February 2039. The approved activities at Bengalla include:

- Continuation of activities approved under the previous development consent including use of existing mining infrastructure;
- Open cut mining towards the west at a maximum extraction rate of 15 million tonnes per annum (Mtpa) of run of mine (ROM) coal;
- The use of a dragline, excavators and loaders, a truck fleet and other ancillary equipment for the purpose of uncovering and extracting the coal resource;
- An Overburden Emplacement Area (OEA) for spoil material including a temporary OEA;
- Processing, handling and transportation of coal via a Coal Handling and Preparation Plant (CHPP) and rail loop for domestic and export sale;
- Rejects and tailings co-disposal in the Main OEA and temporary in-pit reject emplacement;
- Disposal of tyres in-pit;
- Relocation of a 6 km section of Bengalla Link Road (BLR) at approximately Year 15 near the existing mine access road to facilitate coal extraction;
- The diversion of Dry Creek via dams and pipe work with a later permanent alignment of Dry Creek through rehabilitation areas when emplacement areas are suitably advanced;
- Relocation of water storage infrastructure as mining progresses through existing dams (including the Western Diversion Levee, Staged Discharge Dam and Hunter River Raw water dam);
- Geotechnical investigations and prospecting operations; and
- A workforce of approximately 900 full time equivalent personnel (plus contractors) at peak production.

1.2 Approvals History

BMC was originally granted development consent Development Application (DA) 211/93 in 1996 to construct and operate an open cut coal mine and associated activities. Mining operations at Bengalla commenced in 1998. DA211/93 was surrendered on 22 December 2016. SSD-5170 (as modified) presently applies to the operation of Bengalla.



JBA 2422 Bengalla - (MOD 8) Regional Locality (30/05/2025)

BENGALLA MINE MOD 8

Regional Locality

FIGURE 1

SSD-5170 has been modified on six occasions as follows:

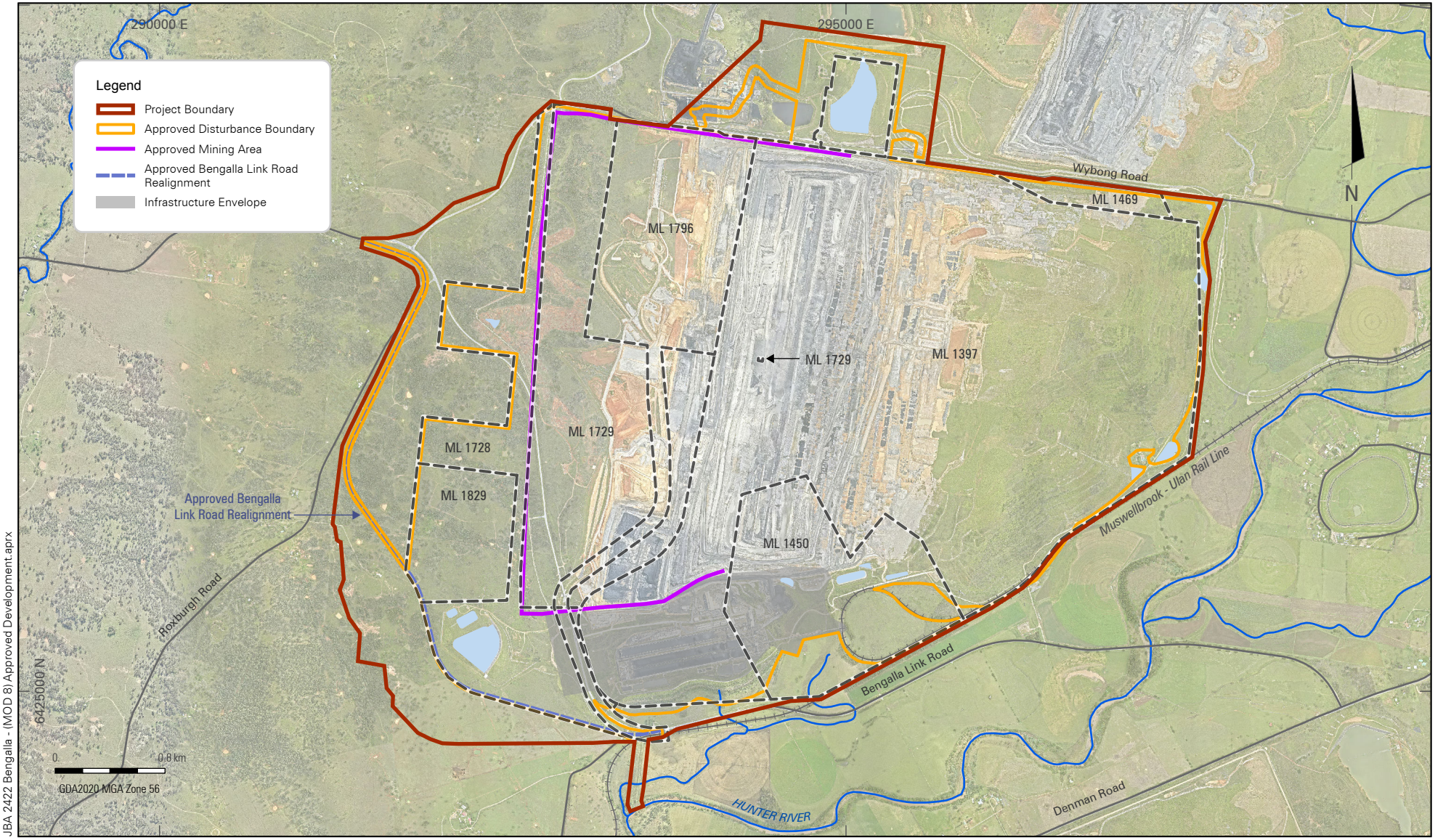
- MOD 1 - alterations to various water management infrastructure and the relocation of an explosives storage facility;
- MOD 2 - amended the approved Main OEA to improve visual amenity and establish a new access road;
- MOD 3 - authorised minor adjustments to the positioning and operation of an explosives and reload facility, realignment of the Hunter River pipeline and emplacement and use of temporary topsoil stockpiles;
- MOD 4 - authorised updates to the water management system, temporary storage of earthen materials for dam construction and other suitable clay material for the future construction of the Dry Creek realignment, increased capacity of (and location for) ROM coal stockpiles and additional storage locations for temporary emplacement of reject material;
- MOD 5 - authorised the use of a mobile crusher to process hard rock for use on-site, the expansion of the ROM coal stockpiling area, changes to the Southern visual bund, realignment of diversion drains, in-pit disposal of tyres and minor administrative changes to conditions of SSD-5170; and
- MOD 7 - authorised a Temporary OEA within the footprint of the Main OEA.

SSD-5170 Modification 6 proposes the installation and operation of two water pipelines from the Muswellbrook Shire Council (MSC) Wastewater Treatment Plant to Bengalla, to transfer recycled and potable water for use in site operations. SSD-5170 Modification 6 is currently on hold.

Condition 2 of Schedule 2 of SSD of SSD-5170 requires the development to be carried out generally in accordance with:

- '*Continuation of Bengalla Mine Environmental Impact Statement*' (Hansen Bailey, 2013) as modified by the '*Continuation of Bengalla Mine Response to Submissions*' (Hansen Bailey, 2014) (collectively referred to as the Bengalla EIS);
- '*Bengalla Mine Development Consent Modification Statement of Environmental Effects*' (Hansen Bailey, 2015a) and Response to Submissions (Hansen Bailey, 2015b) (MOD1 SEE);
- '*Bengalla Mine Development Consent Modification Statement of Environmental Effects*' (Hansen Bailey, 2016a) and Response to Submissions (Hansen Bailey, 2016b) (MOD2 SEE);
- '*Bengalla Mine Development Consent Modification 3 Statement of Environmental Effects*' (Hansen Bailey, 2016c) and Response to Submissions (Hansen Bailey, 2016d) (MOD3 SEE);
- '*Bengalla Mine Development Consent SSD-5170 Modification 4 Statement of Environmental Effects*' (Hansen Bailey, 2017), Response to Submissions (Hansen Bailey, 2018) and additional information dated July 2018 and November 2018 (MOD4 SEE);
- '*Bengalla Mine Development Consent SSD-5170 Modification 5 Modification Report*' (James Bailey Associates, 2021), Submissions Response and 'Response to Request for Additional Information' (James Bailey Associates, 2022) (MOD5); and
- '*Bengalla Mine Temporary Emplacement Area Modification Report*' (Xenith Consulting Pty Ltd (Xenith), 2025) and Response to Submissions (Xenith, 2025) (MOD7).

Figure 2 shows the existing development layout approved by SSD-5170 (as modified).



JBA 2422 Bengalla - (MOD 8) Approved Development.aprx

BENGALLA MINE MOD 8

Approved Development Layout

FIGURE 2

1.3 Modification Overview

BMC is seeking a Modification to adjust the disturbance boundary for the realignment of BLR as described in the Bengalla EIS to facilitate construction activities. The revised BLR alignment will require the disturbance of approximately 67.5 hectares (ha) of vegetation in addition to that approved under SSD-5170.

The Modification is described in **Section 3** and illustrated in **Figure 3**.

1.4 Objectives of the Modification

The Modification is required to support the realignment of the BLR and ensure it is able to:

- Reflect contemporary road safety design guidelines and requirements for intersections with the local road network, including Wybong Road and Roxburgh Road;
- Facilitate construction works, including required erosion and sediment control measures, water management infrastructure and design cut/fill requirements;
- Allow for the relocation of existing third party infrastructure including communications and power infrastructure;
- Avoid mining authorities held by other parties;
- Reflect consultation that has occurred with MSC; and
- To facilitate the safe use of the BLR by Over Size Over Mass (OSOM) associated with the NSW Renewable Energy Zone (REZ) projects.

1.5 Applicant

The applicant is BMC which is owned by the Bengalla Joint Venture (BJV). The BJV consists of:

- New Hope Bengalla Pty Limited (a wholly owned subsidiary of New Hope Corporation Limited) – 80%; and
- Taipower Bengalla Pty Limited (a wholly owned subsidiary of Taiwan Power Company) – 20%.

The contact details for BMC are:

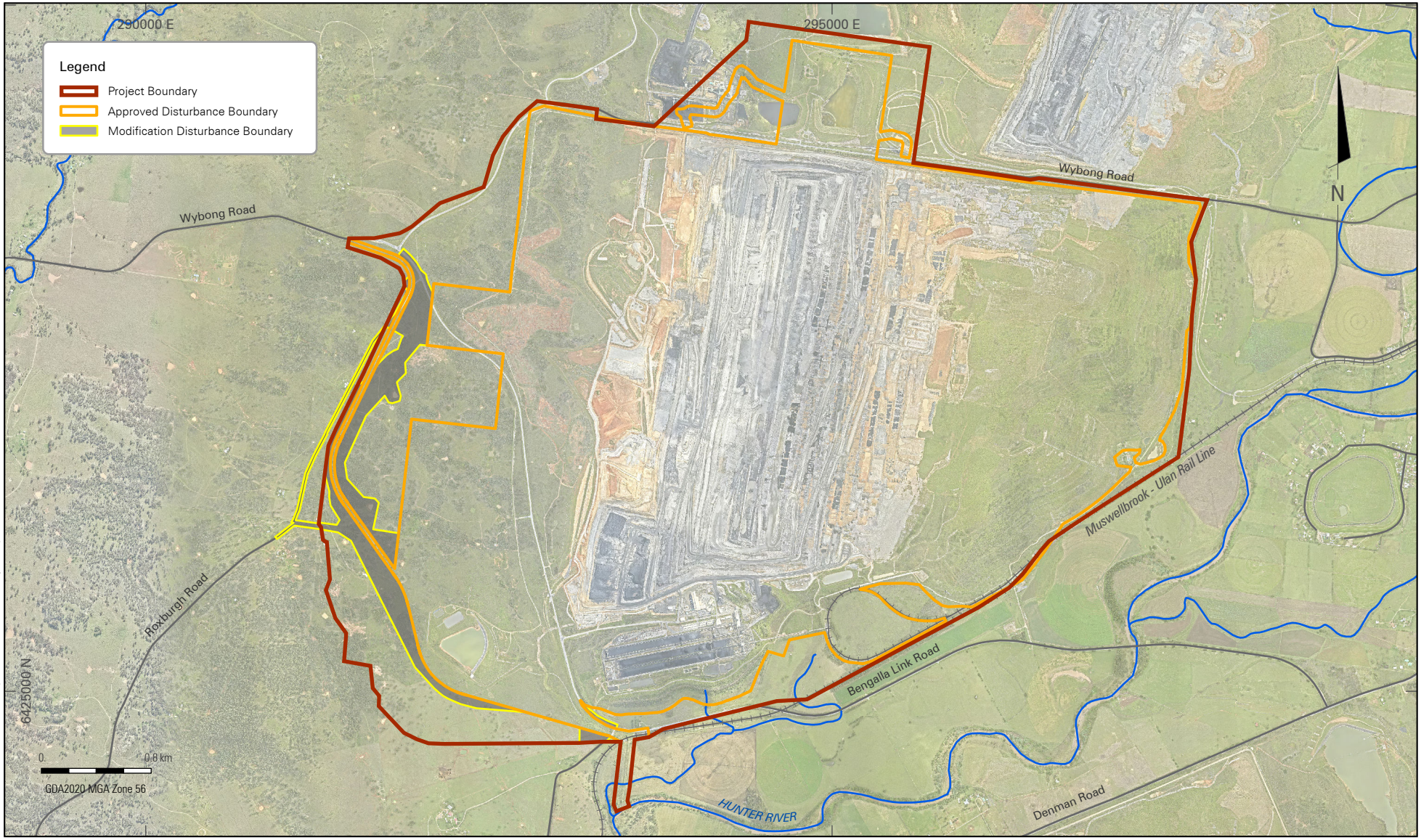
Bengalla Mining Company Pty Limited

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Website: https://newhopegroup.com.au/bengalla-mine/

1.6 Document Purpose

BMC is seeking to modify SSD-5170 under Section 4.55(2) of the EP&A Act to facilitate adjustments to the realignment of BLR. This Modification Report has been prepared to satisfy Clauses 99 and 100 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation), and is consistent with the '*State Significant Development Guidelines – Preparing a Modification Report*' (Department of Planning, Infrastructure and Environment, 2022).



BENGALLA MINE MOD 8

Conceptual Modification Layout

FIGURE 3

2. Strategic Context

This section outlines the environmental and planning context that is relevant to the Modification. It identifies the surrounding environmental features, key planning considerations and relevant government policies.

2.1 Surrounding Environment

2.1.1 Regional Setting

Bengalla is located within the Muswellbrook Local Government Area (LGA), which has a mix of residential, agricultural and industrial land uses. The township of Muswellbrook is located approximately 4 km east of Bengalla. The Muswellbrook Industrial Estate is located on Thomas Mitchell Drive, approximately 4 km south-east of Bengalla. The Muswellbrook Industrial Estate includes a variety of businesses that provide support services to the mining and power generation industries.

Coal mining and associated power generation are prominent and long-standing land uses in the area. The other coal mining and power generation operations in the LGA include Mount Pleasant Mine, Mt Arthur Coal Mine, Maxwell Underground Mine, Mangoola Mine and the Bayswater Power Station.

2.1.2 Topography

The land within the SSD-5170 Project Boundary (Project Boundary) is generally undulating sloping towards the Hunter River to the south. The local drainage network generally consists of relatively steep gullies draining from the surrounding hills into tributaries across the Hunter River floodplain.

2.1.3 Natural Features

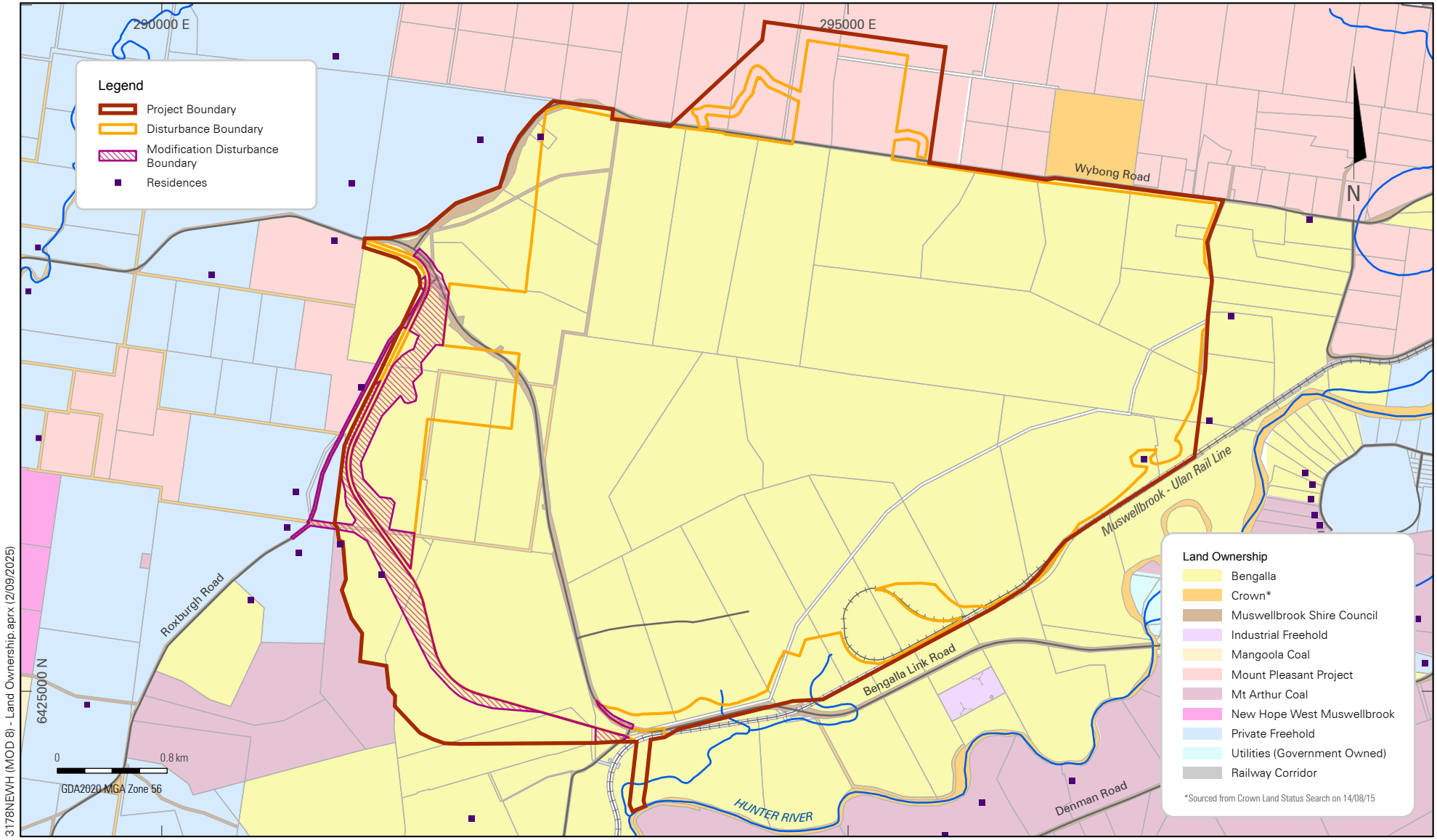
Much of locality surrounding Bengalla consists of industry, farmland and remnant vegetation. The area within the Project Boundary has been previously subject to land clearing and is comprised of a patchwork of remnant native vegetation and grassland areas. Fauna habitat includes Derived Native Grasslands and to a lesser extent, regenerating woodland and open forest that have been partially thinned or cleared in the past for extensive farming practices in the area.

The key natural feature in the vicinity of Bengalla is the Hunter River, which has a catchment of approximately 4,300 km^2 to Muswellbrook. The Hunter River is regulated by Glenbawn Dam. The main channel of the Hunter River meanders to the south of Bengalla, with a small portion of its floodplain being located within the approved Project Boundary.

Dry Creek was an ephemeral tributary of the Hunter River and had a total catchment area of approximately 18 km^2. Dry Creek was a third order stream that flowed in a southerly direction through the centre of the Project Boundary. SSD-5170 authorises the temporary diversion of Dry Creek during mining operations. The temporary diversion has been completed and consists of a clean water dam (CW1) and a pump and pipeline system to capture and circulate clean runoff around the mining area. Dry Creek will be re-instated within rehabilitated land following the completion of mining at Bengalla.

2.2 Land Ownership

The major community in the locality is the township of Muswellbrook, located approximately 4 km east of Bengalla. The smaller community of Denman is located 15 km to the south-west. The ownership of land in the vicinity of Bengalla is illustrated in **Figure 4**. Bengalla is adjoined to the north by the Mount Pleasant Mine (operated by MACH Energy Australia Pty Limited (MACH)). The Mt Arthur Coal Mine (operated by Hunter Valley Energy Coal Pty Ltd (HVEC) is located to the south-east.



BENGALLA MINE MOD 8

Landownership

FIGURE 4

BJV / BMC owns all the freehold land within the Project Boundary except for some parcels north of Wybong Road which are owned by MACH. BMC holds Mining Lease (ML) 1711 or its infrastructure in this area. MACH owns the land to the north of Bengalla and HVEC owns most of the land to the south. Several privately owned rural-residential properties are located immediately to the west of Bengalla.

The Modification is situated predominantly on freehold land owned by the BJV in their respective shares. The proposed BLR realignment, includes a stub road partially within HVEC freehold land with the remainder in what is currently a Crown road (which is proposed to be transferred to MSC in connection with dedication of the realigned section of BLR as a public road).

2.3 Land Use Planning

Bengalla is located within the Muswellbrook LGA on land zoned as RU 1 (Primary Production) and C3 (Environmental Management) under the *Muswellbrook Local Environmental Plan 2009* (Muswellbrook LEP). The permissibility of mining is discussed in **Section 4.3.2**.

Coal mining and associated power generation are prominent and long-standing land uses in the Bengalla locality. The other coal mining and power generation operations in the LGA include Mount Pleasant Mine, Mt Arthur Coal Mine, Maxwell Underground Mine, Mangoola Mine and the Bayswater Power Station.

Agricultural activities (predominantly grazing) are undertaken on rural properties in the LGA including on the majority of BMC's surplus landholdings. The major transport corridors in the locality are the New England Highway and the Main Northern Rail Line.

2.4 Hazards

2.4.1 Flood Prone Land

The existing southern extent of the approved Project Boundary is located within the floodplain of the Hunter River. The Bengalla rail loop is within the flood extent for a 1% annual exceedance probability storm event, as modelled in the '*Hunter River Flood Study (Muswellbrook to Denman)'* (Worley Parsons, 2014). The Bengalla open cut mining area and mine infrastructure area are located entirely outside of the modelled flood extent for all events up to and including the probable maximum flood (PMF).

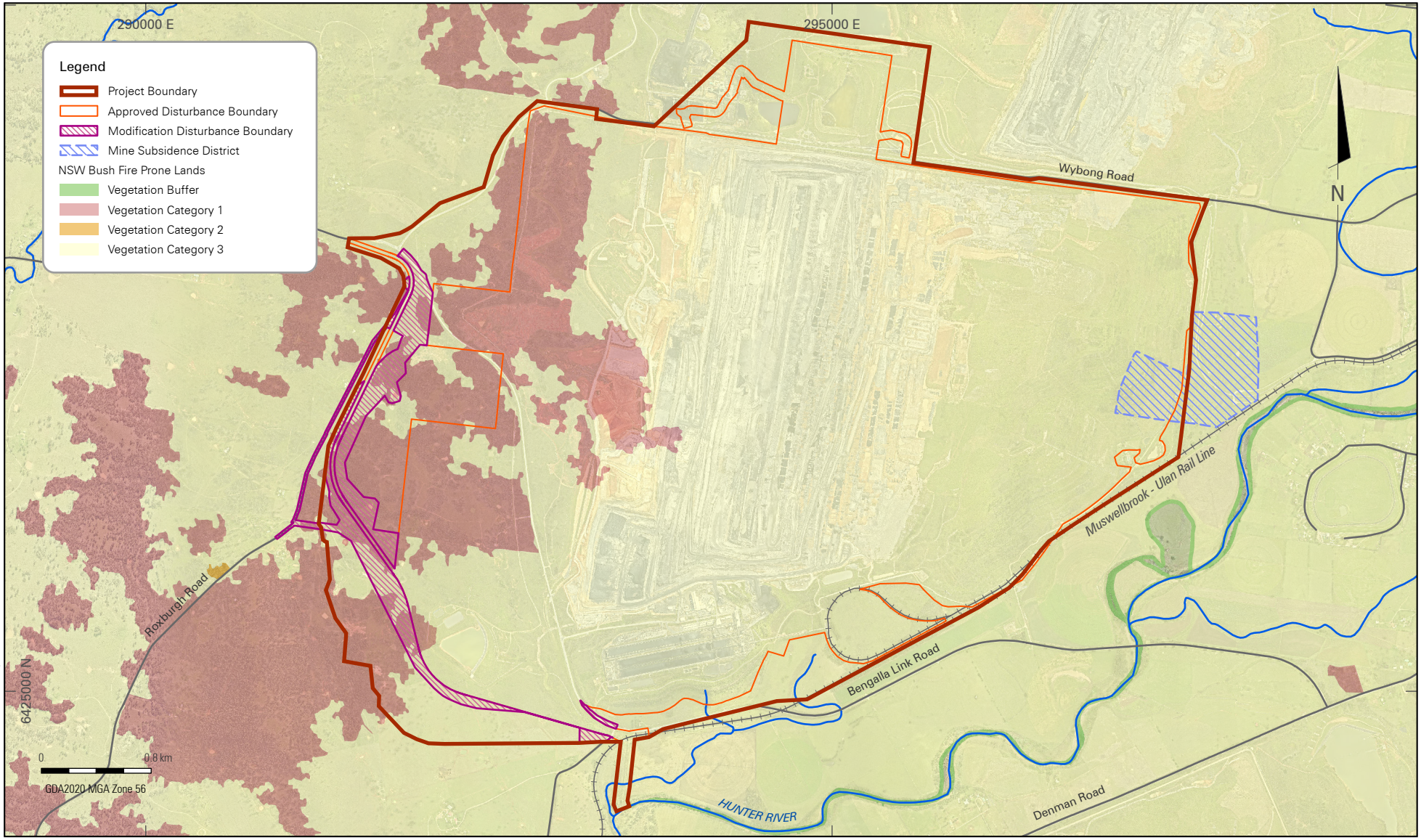
The activities proposed by the Modification will be located outside of the PMF extent of the Hunter River.

2.4.2 Bushfire Prone Land

Bengalla is mapped as bushfire prone land. Bushfire prone land falls into three categories according to the level of risk:

- Vegetation Category 1 represents the highest bushfire risk and includes forests, woodlands, heaths and timber plantations;
- Vegetation Category 2 represents the lowest risk and includes rainforests, remnant vegetation and land that is actively managed; and
- Vegetation Category 3 is the most recently introduced category and falls between categories 1 and 2. Vegetation Category 3 includes grasslands and shrublands.

As shown in **Figure 5**, the land on which the Modification is proposed is either Vegetation Category 1 or Vegetation Category 3. Bengalla is equipped with first-response firefighting equipment and has an emergency response protocol which addresses notification of emergency services.



BENGALLA MINE MOD 8

Bushfire Prone Land and Mine Subsidence District

FIGURE 5

2.4.3 Mine Subsidence Districts

The eastern portion of the Project Boundary is located within the Muswellbrook Mine Subsidence District (MSD). As shown in **Figure 5**, this MSD applies to part of the rehabilitated OEA. No aspects of the Modification will be undertaken within this MSD.

2.4.4 Contaminated Lands

The NSW Environment Protection Authority (EPA) maintains a register of contaminated land in NSW. The Modification is not located on or near a notified contaminated site.

2.5 Cumulative Impacts

Bengalla is adjoined to the north by the Mount Pleasant Mine and Mt Arthur Coal Mine is located to the south-east. The primary potential for any cumulative impacts resulting from the Modification are associated with temporary air quality and noise emissions during construction. Assessments of cumulative air quality and noise impacts have been previously considered as part of the environmental assessments completed for Bengalla (including the Bengalla EIS and subsequent modifications to SSD-5170). Environmental strategies have been developed for Bengalla to manage these cumulative impacts.

The environmental assessments completed for the Modification have similarly considered the potential for cumulative impacts in accordance with the '*Cumulative Impact Assessment Guidelines for State Significant Projects*' (DPIE, 2022). As described in **Section 6**, the potential air quality and noise emissions generated by the Modification are negligible in the context of the overall development and surrounding developments in the vicinity of Bengalla. The Modification will not result in any material additional contribution to the cumulative impacts of those developments.

2.6 Planning Agreement

BMC have entered into a Voluntary Planning Agreement (VPA) with MSC in accordance with the conditions of SSD-5170 (as modified). The VPA facilitates the community benefits listed in **Table 1**. Following the '*Modification 7 Submissions Response*' (Xenith, 2025), BMC are in consultation with MSC about proposed changes to the mechanism for the payment of VPA contributions, noting that any such changes may necessitate an amendment to the VPA and / or associated alternative Community Funding Deed with MSC.

Table 1 Voluntary Planning Agreement with Muswellbrook Shire Council

Component	BMC Commitment
General contribution	$0.065 cents per tonne of product coal produced in excess of 8.5 Million tonnes (Mt) of product coal from the
Bengalla Coal Community Fund	$400,000 per annum
Road maintenance requirements within the Muswellbrook LGA	$125,000 per annum
MSC Environmental Officer position	$20,000 per annum
A commitment to training of local apprentices	Four apprentices per annum sourced from the local area

2.7 Government Policies and Plans

2.7.1 Hunter Regional Plan 2036

The '*Hunter Regional Plan 2041'* (NSW Government, 2022a) (HRP) aims to guide the NSW Government's land use planning priorities and decisions over the next 13 years in the Hunter Region. It provides an overarching framework to guide subsequent and more detailed land use plans, development proposals and infrastructure funding decisions.

The HRP includes nine objectives. The strategies within each objective aim to set the policy positions and provide a preferred pathway for achieving the objective. If a planning proposal is not consistent with a strategy, performance outcomes listed with each objective provide the assessment framework that determines whether an alternative approach still achieves the objectives and vision of the HRP.

Objective 1 of the HRP is to diversify the Hunter's mining, energy, and industrial capacity. The objective acknowledges,

> *'The Hunter is an economic powerhouse, driven by the mining, energy and manufacturing sectors. These sectors will remain important contributors to the regional economy into the future, generating employment which sustains our communities.'*

The Modification will continue to achieve the relevant performance outcome:

> *'1 Power stations and coal mines facilitate diverse job opportunities on their land either during operation or following closure, with land uses responsive to the characteristics of the locality.'*

BMC will continue to provide employment for approximately 900 permanent employees and contribute to economic development in the region. The other objectives of the HRP are not relevant to the Modification.

2.7.2 Community Strategic Plan

MSC has prepared the '*Muswellbrook Shire 2022-2032 Community Strategic Plan'* (MSC, 2022) (Community Strategic Plan) which outlines the future direction and vision for the Muswellbrook LGA. The Community Strategic Plan confirms that mining operations in the MSC account for 75.8% of regional exports. Mining and energy producers are identified as key contributors to assist in achieving the first goal of the Community Strategic Plan, which is:

> *'A dynamic local economy with full employment for current and future residents in a diverse range of high value industries.'*

The Modification is aligned with the Community Strategic Plan as it aims to continue supporting opportunities for economic development and employment in the Muswellbrook LGA.

2.7.3 Climate Change Policy

The NSW EPA has a critical role in protecting the environment from climate related threats and delivering appropriate actions to assist in achieving net zero emissions in NSW by 2050. The '*Environment Protection Authority Climate Change Policy'* (NSW EPA, 2023) (EPA CCP) outlines the statutory objectives to protect the environment and reduce risks to human health. The EPA CCP aims to provide clear objectives and guidelines to ensure environmental protection from climate change in NSW. The policy adopts, supports, and builds on the NSW Government's overarching climate change objectives.

The objectives of the EPA CCP are:

- To maximise the economic, social, and environmental wellbeing of NSW in the context of climate change;
- To reduce greenhouse gas (GHG) emissions in accordance with the NSW Governments net zero targets; and
- To make NSW more adaptable to a changing climate.

As part of this CCP, the EPA has recently released guidelines entitled '*NSW Guide for Large Emitters: Guidance on How to Prepare a Greenhouse Gas Assessment as Part of the NSW Environmental Planning Processes'* (GHG Guide; NSW EPA, 2025).

GHG emissions associated with the activities proposed by the Modification are not predicted to exceed the threshold criteria for a 'large emitter' in accordance with the GHG Guide. Further, the GHG Guide applies only to ongoing operational emissions and not to emissions arising from short-term construction activities. Page 12 of the GHG Guide provides:

> *'The 25,000 tonne CO2-e threshold applies to ongoing operational emissions. This is to ensure that the GHG assessment requirements do not create a barrier for projects that will have low ongoing operational emissions but large construction emissions in the short-term. The requirements do not apply to projects for activities listed under Schedule 1 of the POEO Act that involve only construction activities, or pilot plants.'*

Accordingly, the requirements within the GHG Guide have not been considered within the GHG assessment for the Modification (see **Section 6.1**).

2.7.4 Climate Change (Net Zero Future) Act 2023

The NSW *Climate (Net Zero Future) Act 2023* (Net Zero Future Act) legislates the NSW Government's approach to addressing climate change, incorporating a whole-of-government approach to climate action to achieve net zero by 2050.

The objects of the Net Zero Future Act are:

- To establish guiding principles for action to address climate change;
- To set targets for the reduction in net GHG emissions in NSW until 2050;
- To get an objective for NSW to be more resilient to changing climate; and
- To establish a Net Zero Commission (NZC) to independently monitor, review and report on the progress in NSW towards the targets, the adaptation objective, and other matters.

The NZC has explicit power to provide advice / recommendations to Government agencies and the NSW Independent Planning Commission. The NZC will provide advice over the progress towards the legislated targets as well as making recommendations on actions and policy required to meet such targets.

The likely environmental impacts of climate change associated with the Modification on the natural and built environment of the Muswellbrook locality is considered in **Section 6.1.2.3**.

2.7.5 Safeguard Mechanism

The Australian Government employs numerous policies and legislative requirements that aim to achieve a reduction in GHG emissions over time. The '*National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015*' (Safeguard Mechanism) is the Australian Government's scheme for reducing emissions from large industrial facilities within Australia. The Safeguard Mechanism is one of the measures used to implement the Commonwealth Government's Net Zero Plan and emissions reductions target, made in accordance with commitments made under the Paris Agreement.

Established under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act), the Safeguard Mechanism requires facilities that emit more than 100,000 t of CO_2-e of Scope 1 GHG emissions (in a financial year) to keep their net emission levels at or below its predetermined baseline. Bengalla exceeds this threshold and is a facility to which the Safeguard Mechanism applies. Bengalla will be required to reduce emissions in accordance with the Safeguard Mechanism. The Safeguard Mechanism has been considered in the preparation of the GHG assessment completed for the Modification (refer to **Section 6.1**).

3. Modification Description

This section provides a description of the Modification for which approval is sought. It also provides a justification and discussion on the alternatives considered.

3.1 Overview

The Modification seeks to adjust the Disturbance Boundary for the realignment of BLR as described in the Bengalla EIS to facilitate construction activities. The conceptual layout of the proposed Modification is shown on **Figure 3**.

The Bengalla EIS described the realignment of the BLR (approved BLR realignment), which established an 80 kilometre (km) / hour (hr) speed limit at the northern section of the road leading to its intersection with Wybong Road. The detailed design process has identified necessary adjustments to the construction footprint to address constraints such as land availability and tenure, site topography, the current road network, and anticipated power and communications infrastructure.

The proposed design of the BLR realignment:

- Reflects contemporary road safety design guidelines and requirements for intersections with the local road network, including Wybong Road and Roxburgh Road;
- Considers the current road network including other third party upgrades to the BLR / Wybong Road intersection, such that a 100 km / hr speed limit now applies;
- Considers the current and future utility of the road in the context of other major project works including for use by OSOM vehicles associated with the NSW REZ projects;
- Facilitates construction works, including required erosion and sediment control measures, water management infrastructure and design cut/fill requirements;
- Allows for the relocation of existing third party infrastructure including communications and power infrastructure; and
- Avoids mining authorities held by other parties.

3.2 Development Consent Conditions

The environmental impacts associated with the Modification can be adequately addressed by imposing appropriate conditions of development consent.

Condition 34 of Schedule 3 of SSD-5170 details the requirements for BMC to design and construct the realigned BLR and associated intersections as show conceptually in Appendix 8 of SSD-5170. These conditions will need to be modified to reflect the proposed adjustments to the SSD-5170 disturbance boundary required to facilitate construction activities for the realignment of BLR and associated intersections.

The updated BLR realignment design has been developed in consideration of contemporary road safety design guidelines and requirements for intersections with the local road network. This updated BLR realignment design will prevail to the extent of any inconsistency, ambiguity or conflict with Commitment 38 from the Bengalla EIS:

> *'Commitment 38. BMC will construct the approximate 6 km realignment of the Bengalla Link Road to replicate the existing two lane, two way rural road that was constructed by BMC in 2009. BMC will consult with MSC prior to undertaking the realignment of Bengalla Link Road.'*

Updated design considerations are described in detail in the '*Bengalla Link Road Design Summary Report*' (WSP, 2025) provided in **Appendix H**.

Condition 41 of Schedule 3 of SSD-5170 describes the screening measures required prior to construction along the proposed BLR realignment. As described in **Section 6.5**, multiple physical and environmental constraints have impeded the planting of tree screens prior to construction of the realigned BLR. Alternate screening measures have been proposed for the updated BLR design, including a 1.8 m screening fence on the eastern side of the northern extent of the realigned section of road and a detailed review following construction to determine additional visual screening measures required.

Appendix 1 of SSD-5170 includes a Schedule of Land within the Project Boundary. An updated Schedule of Land proposed for the Modification is included as **Appendix I**.

3.3 Comparison with Approved Development

The realignment of the BLR was approved by SSD-5170. BMC committed to the construction of the realignment of approximately 6 km of the BLR to replicate the existing two lane, two way rural road in consultation with MSC.

The '*State Significant Development Assessment Bengalla Continuation Project (SSD 5170) - Secretary's Environmental Assessment Report Section 89E of the Environmental Planning and Assessment Act 1979*' (NSW Department of Planning and Environment, 2014) (Environmental Assessment Report), describes the predicted impacts and merit assessment of the Bengalla Continuation Project. The Environmental Assessment Report considered the BLR realignment design constraints and accepted a conceptual alignment with the understanding that future detailed design would be required.

It was determined that future consultation with MSC would be required to comply with contemporary design standards and to align with any future road network requirements. The Environmental Assessment Report specified:

> *'The Department acknowledges that alternative options for the proposed road realignment are largely constrained by BMC's existing mining authorities and land owned by BMC and topography within the western portion of the project area that includes elevated areas of high relief. Additionally, the function and alignment of the road as proposed would essentially remain the same as the existing road (i.e. it would continue to provide an access road of good condition between Denman Road and Wybong Road).'*
>
> *'the Department is satisfied that the realignment of Bengalla Link Road can be completed without significant impacts on the safety and convenience of road users and can be integrated with any future broader strategy for the western regional road network.'*

BMC has consulted with MSC and has undertaken detailed design of the proposed road realignment and intersections. It has also considered the constructability of the proposed road.

Having considered a number of options and following consultation with MSC, BMC seeks to modify the realigned BLR as described in this application. The proposal, while increasing the area of disturbance, is consistent with the outcomes anticipated by Condition 34 of Schedule 3 of SSD-5170, and for the reasons set out in this application, involves substantially the same development as the development authorised by SSD-5170 as originally granted.

Table 2 compares the activities proposed for the Modification with the equivalent aspects of SSD-5170 as granted (and modified). It is noted that the SSD-5170 Modification 6 application is on hold and has been excluded from **Table 2**.

Table 2 Comparison of the Modification to the Approved Development

SSD-5170 Aspect	Approved Development	MOD1	MOD2	MOD3	MOD4	MOD5	MOD7	MOD8
Project Boundary	As shown in Appendix 2 of SSD-5170	No change	No change	No change	No change	No change	No change	Amendment to the Project Boundary as shown in **Figure 3**
Landuse	Coal mining and ancillary activities	No change	No change	No change	No change	No change	No change	No change
Surface Disturbance	Westward extension of mining comprising an additional 964 ha, with the total area disturbed equivalent to 1,938 ha	Clearing 3.52 ha (including 1.24 ha of EEC) and indirectly impacting on an extra 5.56 ha	No change	No change	No change	No change	No change	Clearing an additional 67.5 ha (including 63.41 ha of EEC)
Project Duration	Mining operations until 28 February 2039	No change	No change	No change	No change	No change	No change	No change
Mining Method	Open cut mining using a dragline, excavators, truck fleet and ancillary equipment	No change	No change	No change	No change	No change	No change	No change
Production Rate (ROM coal)	Maximum production rate of 15 Mtpa of ROM coal	No change	No change	No change	No change	No change	No change	No change
ROM Coal Stockpile	› 350,000 t ROM coal stockpile capacity (including 40,000 t capacity at the ROM hopper) › Total stockpile capacity 1,215,000 t	No change	No change	No change	› Increase ROM stockpile capacity to 1,250,000 t › Total stockpile capacity increased to 2,115,000 t	Increase ROM pad stockpile capacity to 150,000 t	No change	No change

SSD-5170 Aspect	Approved Development	MOD1	MOD2	MOD3	MOD4	MOD5	MOD7	MOD8
Blasting	Maximum of 2 blasts a day and 6 blasts per week averaged over a calendar year	No change	No change	No change	No change	No change	No change	No change
Surface Infrastructure	Coal Handling and Preparation Plant (CHPP), rail loadout facility, offices, bathhouse, workshop, fuel storages, vehicle wash bays, powerlines, access roads, realignment of BLR and water management infrastructure	› Additional locations for the approved explosives storage facility › Placing soil from construction of the CW1 dam adjacent to the dam › Various changes to water management infrastructure	Construct the Bengalla Homestead access road (500 m gravel access track)	Relocate surface infrastructure as mining progresses including: › Explosives storage facility and reload facility › Hunter River Pipeline › Temporary topsoil stockpiles	Temporary clay stockpile within the main OEA or to the west for later use in reinstatement of Dry Creek	› Addition of a mobile crushing facility › Upgrade of the haul road from the mining area to the ROM coal stockpile	No change	No change
Water Management	› Diversion of clean water around disturbed areas, primarily using the Western Diversion Levee › 900 ML clean water diversion dam (CW1), Mt Pleasant Discharge Dam and relocation of existing infrastructure › Temporary diversion of Dry Creek. › Capture and containment of mine-affected water in mine water dams for reuse or it can be discharged in accordance	› Clean water diversion levees associated with CW1 › Satellite Pit used as a temporary dirty water storage dam › Revising the locations of the Hunter River Raw	No change	No change	› Increase capacity of ED1 from 300ML to 700ML › Construction of Dry Creek East Dam for additional mine water storage › Relocation of approved temporary	Realignment of sections of the Western Diversion Levee and additional diversion drains within the Disturbance Boundary. Clean water will continue to be diverted around disturbed areas.	No change	No change

SSD-5170 Aspect	Approved Development	MOD1	MOD2	MOD3	MOD4	MOD5	MOD7	MOD8
	with the Hunter River Salinity Trading Scheme › Capture and treatment of sediment-laden water in sediment dams	Water and Washery dams › Relocation of the Staged Discharge Dam HRSTS discharge point			OEA Sediment Dam on the Main OEA			
Management of Overburden and Reject Materials	› Overburden disposed in the Overburden Emplacement Area to the west of mining and in pit once mining from that area has ceased › Construct the Main OEA to a height of 270 m Reduced Level (RL) › Coarse rejects and tailings dewatered and co-disposed with overburden materials	No change	Addition of two Visual Relief Areas on top of the Main OEA as macro topographic highs (or knolls) that mimic the surrounding natural undulating landscape	No change	Flexibility in the location for temporary stockpile of reject material	Dispose of end-of-life heavy plant tyres within the approved OEA	No change	No change
Coal Transportation	Rail transportation of product coal to Newcastle Port for export Transportation of up to 16 laden trains per day	No change	No change	No change	No change	No change	No change	No change
Employment	Maximum of 900 FTE personnel	No change	No change	No change	No change	No change	No change	No change
Operational Hours	24 hours a day, 7 days per week	No change	No change	No change	No change	No change	No change	No change
Final Landform	› Progressive rehabilitation of the site › Rehabilitated to agricultural use (grazing), with plantings of	Revised conceptual final landform to account for the modified project	Revised SSD-5170 Appendix 9 conceptual final landform	No change	No change	No change	The landform within the TOEA footprint will be approximately 25 metres (m)	No change

SSD-5170 Aspect	Approved Development	MOD1	MOD2	MOD3	MOD4	MOD5	MOD7	MOD8
	native woodland vegetation on the eastern face of the OEA › Reinstate Dry Creek through rehabilitated mine landform › Final void approximately 411 ha predicted to fill with water in the long-term (1,000 years) to Reduced Level (RL) 71 m, approximately 100 m below the rehabilitated surface level › Conceptual final landform generally in accordance with Appendix 9 of SSD-5170		to account for the modified project				higher than the approved final landform, however it remains 20 m lower than the maximum approved final landform height of RL 300 m	
Exploration Activities	Not described	No change	No change	No change	No change	Approval to undertake geotechnical investigations and prospecting operations in accordance with relevant approvals	No change	No change
Visual	Install tree screening along those sections of Denman Road, Roxburgh Road and Wybong Road that will have direct views of mining operations	No change	No change	No change	No change	Allowed flexibility around the visual mitigation measures required to be implemented along Denman Road, Roxburgh Road and Wybong Road	No change	No change

3.4 Alternatives Considered

3.4.1 Do Nothing

If approval for the Modification was not sought and subsequently approved, BMC would proceed with mining operations as currently approved. However, due to the engineering difficulties associated with the construction of the approved BLR realignment, it could create difficulties with mining through the existing BLR. This constraint would potentially result in the sterilisation of approximately 13 Mt of ROM coal within the currently approved mining extent or have significant impacts on the amenity and efficiency of the road network. This additional 13 Mt of ROM coal is expected to deliver product coal which is low ash and high energy which is suitable for sale as premium export quality thermal coal.

Sterilisation of 13 Mt of ROM coal that has been approved for extraction would represent a missed opportunity for the ongoing provision of socio-economic benefits realised by Bengalla. The sterilisation will present a reduction in royalties to NSW, revenue for the Federal government, continued employment opportunities and flow on benefits to the local community.

As outlined in **Section 7.1**, the Modification has been assessed against the principles of ecologically sustainable development (ESD) as required by the EP&A Act. The assessment demonstrates that the Modification is consistent with the objects of the EP&A Act relating to ESD.

Based on this, and with the implementation of appropriate management and mitigation measures discussed in **Section 6**, the benefits of the Modification outweigh the potential impacts. Consequently, BMC considers that the alternative of not proceeding with the Modification is not in the public interest.

3.4.2 Modification Alternatives

Bengalla is approved under SSD-5170 to realign the BLR to the west, to allow for the progression of mining operations. As discussed in **Section 3.1**, the modified BLR realignment has been designed to:

- Reflect contemporary road safety and design guidelines and requirements for intersections with the existing local road network;
- Consider the current road network;
- Consider the current and future utility of the road in the context of other major project works including for use by OSOM vehicles associated with the NSW REZ projects;
- Facilitate construction works;
- Allow for the relocation of existing communications and power infrastructure; and
- Avoid mining authorities held by other parties.

Options for the realignment of BLR realignment were limited by various constraints including topography, surrounding landownership, the approved realignment location and limited options to feasibly construct an alternate route. Different options of the BLR realignment disturbance footprint were also considered to minimise the impact on biodiversity (see **Section 6.3**).

Detailed ecological and design studies have been undertaken to identify the optimal alignment for the BLR realignment, assess the current road network conditions, confirm current design requirements, prepare detailed road designs, evaluate construction constraints, and identify the required construction footprint. No areas of lower ecological value were identified within a reasonable proximity to the existing alignment that would allow for a feasible relocation BLR and result in any reduction in the disturbance footprint. The Modification Disturbance Boundary has been refined to minimise the disturbance footprint and associated impacts to native vegetation and habitat for threatened species.

The BLR will be dedicated as a public road once completed. As such BMC has been in ongoing consultation with MSC and Crown Roads about the technical design and placement within relevant Crown Land and cadastral boundaries.

4. Statutory Context

This section provides a summary of the legislative provisions that are relevant to the Modification.

4.1 Overview

Table 3 summarises the regulatory framework that is relevant to the Modification. The aspects of the regulatory framework that warrant greater analysis are discussed further below.

Table 3 Relevant Legislation Provisions

Aspect	Relevant Provisions	Applicability to Modification
Power to modify approval	Section 4.55(2) of the EP&A Act	The consent authority has the power to modify the existing approval under Section 4.55(2) if the modified development is considered substantially the same development for which consent was originally granted (as explained in **Section 4.3.1**). In accordance with the provisions of the EP&A Act, Section 4.55(2) considerations applicable to the Modification include: › Whether the proposed modification is substantially the same as the approved development; › Whether any identified additional impacts are manageable and/or mitigated; and › Whether the development remains within the scope of the Bengalla EIS.
Permissibility	Muswellbrook LEP Clause 2.9(1)(b) of *State Environmental Planning Policy (Resources and Energy) 2021* (Resources SEPP)	The land within the Project Boundary is zoned as either RU1 Primary Production or C3 Environmental Management under the Muswellbrook LEP. Open cut mining is permissible on this land pursuant to Clause 2.9 (1)(b) of the Resources SEPP. Further detail is provided in **Section 4.3.2**.
Gateway process	Clause 103 of the EP&A Regulation Clause 2.24 of the Resources SEPP	The Modification does not fall within the definition of 'mining or petroleum development' because no new mining leases are required. Accordingly, the Gateway process does not apply to the Modification.
Matters for consideration	Section 4.55(3) of the EP&A Act Part 2.3 of the Resources SEPP	The consent authority must consider the matters under Section 4.15(1) of the EP&A Act that are relevant to the Modification. Part 2.3 of the Resources SEPP prescribes additional matters that must be considered for mining proposals. These matters are discussed in **Section 4.3.3**.
Other Approvals	Section 48 of the *Protection of the Environment Operations Act 1997* (POEO Act)	BMC holds Environment Protection Licence (EPL) 6538 granted under the POEO Act, which will be applied to the proposed Modification. The EPL will be

Aspect	Relevant Provisions	Applicability to Modification
		reviewed and updated as required to address any changes necessary for the Modification.
	Sections 5 and 6 of the *Mining Act 1992* (Mining Act)	Mining activities associated with the Modification will be located wholly within existing mining leases granted under the Mining Act.
	Section 68 of *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Section 7.9 and s7.17 of the *Biodiversity Conservation Act 2016* (BC Act) Section 30 and 30A of the *Biodiversity Conservation (Savings and Transitional) Regulation 2017*	The Modification proposes the additional disturbance of approximately 67.5 ha of native vegetation. The Modification has the potential to have significant impact on protected Matters of National Environmental Significance (MNES). A referral under Section 68 of the EPBC Act has been lodged for the Modification, which was determined to be a controlled Action on 31 October 2025 for potential impacts to biodiversity. Relevant environmental assessments completed to accompany the application for approval under the provision of the EPBC Act are discussed in **Section 6**. A Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with Section 7.7 of the BC Act (refer to **Section 6.3** and **Appendix D**).
	National Parks and Wildlife Act 1974 (NPW Act)	Section 86 of the NPW Act states that it is an offence to harm or desecrate an Aboriginal object unless authorised by an Aboriginal Heritage Impact Permit (AHIP). Section 4.41(1)(d) of the EP&A Act provides that an AHIP is not required for an SSD that is authorised by a Development Consent. Accordingly, the provisions of the NPW Act that prohibit an activity without such an authority do not apply. The Aboriginal Cultural Heritage Assessment Report (ACHAR) for the Modification (refer to **Section 6.6**) provides further information on the Aboriginal heritage items located within the Modification Disturbance Boundary.
	Heritage Act 1977 (Heritage Act)	There are five historic heritage items listed on the State Heritage Register and / or a Muswellbrook LEP in proximity to Bengalla. No listed places will be impacted by the Modification. Accordingly, the provisions of the Heritage Act do not apply to the Modification.
	Section 23C of the *Native Title Act 1993*	All activities proposed by the Modification will be undertaken on land where native title has been extinguished. Freehold estates were granted or roads dedicated in respect of all the land within the Modification Disturbance Boundary prior to 23 December 1996. Therefore, BMC's legal advisers have confirmed that no native title rights exist within the Modification Disturbance Boundary.

Aspect	Relevant Provisions	Applicability to Modification
	Part 2 of the *Water Management Act 2000* (WM Act)	Surface water and groundwater sources in the vicinity of BMC are all the subject of Water Sharing Plans. The realignment of BLR will not require any changes to the Bengalla water licensing arrangements.
	Sections 89, 90 and 91 of WM Act Section 4.41 of EP&A Act	The realignment of BLR will not require any changes to water use approvals, water management work approvals or activity approvals under the WM Act.

4.2 Environmental Planning and Assessment Act 1979

4.2.1 Objects of the EP&A Act

The objects of the EP&A Act are listed under Section 1.3 of the Act to include:

'(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.'

Environmental impact assessments completed for the Modification indicate that the associated impacts are generally consistent with those currently approved under SSD-5170 (both as granted and as modified).

The disturbance of an additional 63.41 ha of native vegetation that provides habitat for a number of threatened fauna species will be appropriately compensated by the mitigation measures proposed for the Modification (see **Section 6.3.4.1**).

No material additional environmental or socio-economic impacts are anticipated to arise from the Modification.

4.3 Key Regulatory Matters

4.3.1 Power to Modify

Section 4.55(2) of the EP&A Act enables a consent authority to modify a development consent. This power to modify is governed by certain requirements including the need for the consent authority to be satisfied that the modified development is 'substantially the same development' as the original development (before any modifications) for which consent was granted.

The Modification seeks to amend the spatial extent of the approved disturbance footprint to accommodate a revised realignment of the BLR. The realignment of the BLR was approved as a commitment under the Bengalla EIS:

> *'Commitment 38. BMC will construct the approximate 6 km realignment of the Bengalla Link Road to replicate the existing two lane, two way rural road that was constructed by BMC in 2009. BMC will consult with MSC prior to undertaking the realignment of Bengalla Link Road.'*

Following consultation with MSC and detailed design considerations since the 2015 approval, a revised BLR alignment is required to facilitate the road construction. The proposed realignment of the BLR is considered substantially the same as that already approved SSD-5170 (as originally granted and as modified).

The Modification will not alter the mining operations approved by SSD-5170. There will be no changes to the approved mining methods, mining extent, production rate, duration of mining operations, operating hours or workforce size.

The quantitative and qualitative differences between the development as approved and the Modification, demonstrates the modified development meets the requirement of being 'substantially the same development'. Therefore, the consent authority may exercise its power under Section 4.55(2) of the EP&A Act to modify the relevant consent.

4.3.2 Permissibility

The land within the Project Boundary is zoned wholly within the area to which the Muswellbrook LEP applies. Under the Muswellbrook LEP, the land on which the Modification is proposed to be carried out on is zoned as either RU1 Primary Production or C3 Environmental Management. The land use table in the Muswellbrook LEP states that open cut mining is permissible with consent in zone RU1. The Muswellbrook LEP does not list open cut mining as permissible development within zone C3.

The permissibility of mining development is also provided for in the Resources SEPP. Clause 2.9(1)(b) of the Resources SEPP states that mining can be carried out on any land where agriculture or industry is permissible (with or without consent). The Muswellbrook LEP permits 'extensive agriculture' within zone C3. Therefore, mining is also permissible within zone C3 by virtue of Clause 29(1)(b) of the Resources SEPP.

4.3.3 State Environmental Planning Policy (Resources and Energy) 2021

The Resources SEPP provides the planning provisions for the assessment and development of mining, petroleum production and extractive material resource proposals in NSW.

Section 2.16 of the Resources SEPP identifies non-discretionary development standards. The assessments completed for the Modification have demonstrated that associated impacts will generally comply with the relevant development standards.

Sections 2.17 and 2.19 of the Resources SEPP contain a requirement to ensure mining development is compatible with the existing land use. The Modification does not seek to change the approved rehabilitation objectives specified in SSD-5170. Consistent with the current approach for Bengalla, rehabilitation objectives seek to provide a stable landform capable of sustaining woody vegetation communities and promoting biodiversity values for the post-mining land uses of biodiversity, agriculture, heritage preservation, final void, and the reinstated Dry Creek. Accordingly, the changes sought by the Modification will not materially change the compatibility of the Project with these land uses, beyond those previously approved.

Section 2.20 of the Resources SEPP requires the consent authority to consider whether or not the consent should be issued subject conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner. **Section 6** of this Modification Report considers the impacts of the Modification to the surrounding environment which has been assessed to be generally consistent with those environmental impacts previously approved under SSD-5170.

Section 2.23 of the Resources SEPP outlines the requirements for the consent authority to consider whether or not the consent should be issued subject to conditions aimed at ensuring the rehabilitation of land affected by the development. Specifically, Section 2.23 requires the consent authority to consider whether conditions of the consent should include the requirement to prepare a Rehabilitation Management Plan, appropriate treatment of waste generated by the development or rehabilitation, remediation of soil contamination and the avoidance of public safety risks. No changes to rehabilitation objectives and final land uses are proposed for the Modification. Accordingly, the existing conditions as outlined in SSD-5170 remain appropriate and adequate.

4.4 Other Legislative Considerations

4.4.1 Mining Act 1992

This Modification Application does not relate to any new mining or material changes to mining operations. No new mining leases are required to authorise the activities proposed by this application.

4.4.2 Protection of the Environment Operations Act 1997

Section 48 of the POEO Act provides that an EPL is required in respect of premises at which any '*… scheduled activity is carried on …*'. Coal works and coal mining are scheduled activities.

BMC holds EPL 6538 in respect to its currently approved mining operations. Should the consent authority grant approval for the Modification, EPL 6538 will be reviewed to confirm whether a variation should be sought under the POEO Act to align the EPL with the approved activities.

4.4.3 Biodiversity Conservation Act 2016

The BC Act was enacted on 23 November 2016 and commenced on 25 August 2017. It repealed the former *Threatened Species Conservation Act 1995* (TSC Act). On the repeal of the TSC Act the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (BC Transitional Regulation) came into operation. Section 30 of the BC Transitional Regulation had the effect of applying the BC Act to modification of planning approvals (such as SSD5170) granted before the commencement of the BC Act. Clause 30A of the BC Transitional Regulation applies the provisions of Division 4 of Part 7 to applications to modify planning approvals. Part 7 of the BC Act imposes a framework for the assessment of impacts to listed threatened species and ecological communities including, in this case, the requirement to prepare a biodiversity assessment report (BDAR).

The Modification proposes the additional disturbance to approximately 67.5 ha land. This area contains native vegetation which comprises habitat for a number of threatened flora and fauna species. A BDAR has been prepared for the Modification (see **Section 6.3**). The residual biodiversity impacts from the Modification will require offsetting in accordance with the BC Act. Further details on the offset liability associated with the Modification is outlined in **Section 6.3.6**.

4.4.4 National Parks and Wildlife Act 1974

Under Section 86 of the NPW Act it is an offence to harm or desecrate an Aboriginal object unless the harm or desecration was authorised by an Aboriginal Heritage Impact Permit (AHIP) issued under Section 90.

Section 4.41(1)(d) of the EP&A Act provides that an AHIP is not required for an SSD that is authorised by a Development Consent. Accordingly, the provisions of the NPW Act that prohibit an activity without an AHIP do not apply.

Section 6.6 provides a summary of the ACHAR completed for the Modification. The Modification will impact upon eight sites which were assessed as low scientific significance. The '*Bengalla Aboriginal Cultural Heritage Management Plan'* (BMC, 2017a) will be reviewed and updated as necessary in the event that the Modification is approved.

4.4.5 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act outlines the role of the Commonwealth in the protection of the environment. The EPBC Act provides protection for listed MNES including but not limited to: Threatened Ecological Community (TEC), Threatened Flora and Fauna, and Water Resources in connection with coal mining operations.

A proponent must make a Referral under Section 68 of the EPBC Act if the proposed action has the potential to result in significant impacts to MNES. An EPBC referral for the Modification was submitted to the Federal Minister for the Environment on 8 July 2025 under Section 68 of the EPBC Act. The Modification application was determined to be a controlled action on 31 October 2025 under the EPBC Act because of impacts on listed threatened species and communities. The Modification will therefore be assessed in accordance with the bilateral assessment agreement between the Australian (Federal) and NSW (State) governments. The Commonwealth EPBC Secretary's Environmental Assessment Requirements (SEARs) are provided in **Appendix A** including a reference to where they are incorporated into this Modification Report. **Section 6.3** provides discussion on the environmental assessments completed to meet the State and Commonwealth assessment requirements.

5. Stakeholder Engagement

5.1 Regulatory Consultation

Table 4 outlines the regulatory consultation undertaken for the Modification, up to the submission of this Modification Report. BMC has consulted with the NSW DPHI, Commonwealth DCCEEW, NSW DCCEEW Conservation Programs, Heritage and Regulation (CPHR) and Water (DCCEEW Water) Divisions, Transport for NSW (TfNSW), Crown Lands, the NSW EPA, the NSW Resources Regulator and local government representatives (MSC).

The general objectives of the consultation were to provide stakeholders with information about the Modification and to seek feedback on the assessments being completed. Outcomes from discussions have been incorporated into this Modification Report. **Section 6** includes consideration of the issues raised in **Table 4**.

Table 4 Stakeholder Engagement and Consultation

Stakeholder	Method of Engagement	Purpose and Outcome of Consultation
DPHI	MS Teams Meeting on 13 March 2024	Meeting held to provide an update on exploration activities and introduce the Modification to DPHI. DPHI confirmed that EPBC referral would require SEARs to be issued and noted the release of the GHG Guide for consideration.
	MS Teams Meeting on 23 September 2024	Meeting held to confirm the appropriate approvals pathway under the provisions of the EP&A Act and to confirm the scope of Modification environmental assessments. DPHI confirmed that the appropriate approvals process for the Modification would be by way of a modification application under Section 4.55(2) of the EP&A Act. DPHI also confirmed environmental assessment requirements and agreed on the issues required to be addressed in this Modification Report and associated technical studies.
	Scoping letter dated 11 April 2025	BMC submitted a scoping request to DPHI on 11 April 2025 providing an overview of the Modification and the environmental considerations which were proposed to be undertaken as part of the approvals process. The request was amended on 2 June 2025 to provide further clarification on the potential impacts and scope of technical assessments.
	MS Teams Meeting on 24 September 2025	Meeting held with DPHI to provide an update on the Modification application. The Modification scoping request has been revised to address the BLR realignment and to outline technical studies which are proposed to be undertaken. DPHI and BMC discussed proposed consultation requirements with other departments, and the potential timeline delays associated with amending the EPBC referral.

Stakeholder	Method of Engagement	Purpose and Outcome of Consultation
		An amended scoping request was provided to DPHI via email following the meeting to provide clarification on the proposed Modification application and outline the scope of technical assessments.
DPHI – Crown Lands	Email on 12 May 2025	BMC provided DPHI – Crown Lands with an overview of the Modification and relevant consultation with MSC with regard to transfer of the BLR to MSC. On 14 May 2025 DPHI – Crown Lands responded via email, providing support in principle for the relocation of the BLR subject to BMC obtaining relevant approvals. DPHI – Crown Lands also outlined a proposed transfer process required for BLR.
NSW DCCEEW - CPHR	MS Teams Meeting on 28 January 2025	Meeting held to provide an overview of the Modification and to seek feedback and any additional considerations for the BDAR. The outcome of discussions with NSW DCCEEW – CPHR has been considered in the development of the BDAR for the Modification (see **Section 6.3**).
NSW DCCEEW - Water	Email on 11 April 2025	BMC provided an overview of the Modification and sought feedback necessary to be considered in the environmental assessment. BMC acknowledged DCCEEW – Water's previous comment to decline to provide feedback. A response email was received on 16 April 2025 from the Department.
Commonwealth DCCEEW	Email on 21 February 2025	BMC provided preliminary information on the Modification and requested a pre-referral meeting.
	MS Teams Meeting on 04 March 2025	At the pre-referral meeting BMC provided an overview of the Modification, outlined potential impacts to MNES, and discussed proposed mitigation and management measures. BMC clarified with Commonwealth DCCEEW on how the Modification interacts with the existing BMC EPBC 2012/6378, and where the Modification application was up to within the NSW planning approval process. Commonwealth DCCEEW outlined the timeframe and process to determine whether the Modification would be captured under a bilaterial agreement.
	Submission of EPBC 2025/10236 Referral on 16 July 2025	BMC submitted the EPBC 2025/10236 Referral via the EPBC Act Public Portal for the Modification on 16 July 2025. Commonwealth DCCEEEW confirmed receipt of the Referral via email and that the public exhibition period had commenced on the same day. BMC provided a formal request to vary EPBC 2025/10236 to only include the BLR realignment and responded to additional information requests on the 15 September 2025.

Stakeholder	Method of Engagement	Purpose and Outcome of Consultation
EPA	MS Teams Meeting on 21 October 2024	Meeting to provide an overview of the Modification and describe assessments being completed and to seek any further considerations required for assessment. No issues were raised.
Resources Regulator (RR)	MS Teams Meeting on 13 March 2025	Meeting to provide RR with a general Modifications update and overview of the Modification, and update on rehabilitation activities. RR sought clarification on whether the Modification required any changes from a ML perspective which BMC confirmed there wouldn't be.
TfNSW	Briefing Meeting on 10 September 2024 including MSC representatives	Meeting to introduce the Modification to TfNSW and have discussions on road design and whether traffic studies are required. MSC and TfNSW outlined requirements for a Deed of Agreement for the design and construction of the BLR.
MSC	Face to Face Meeting on 11 April 2024	Meeting held with MSC representatives on 11 April 2024 to discuss the Modification and to begin discussions regarding the BLR realignment and MSC requirements.
	Face to Face Meeting on 17 May 2024	Meeting held with MSC representatives on 17 May 2024 to provide an update on the Modification.
	Fact to Face Meeting on 28 Feb 2025	Meeting with Council Staff to discuss all other elements of Modification 7 and 8.

5.2 Registered Aboriginal Parties

Consultation regarding the ACHAR for the Modification followed the '*Aboriginal cultural heritage consultation requirement for proponents'* (DECCW, 2010b) (ACHCRs) and involved four main stages. These stages aimed to identify Aboriginal stakeholders who wished to be involved throughout the Modification process to provide information regarding cultural values of artefacts and locations within and surrounding the proposed Modification area. Ultimately this involvement of the Registered Aboriginal Parties (RAPs) and results from fieldwork led to the development of a comprehensive ACHAR (as summarised in **Section 6.6**).

Engagement with RAPs include the initial request for expressions of interest from those RAPs who wished to be involved with or consulted for the Modification. Methods of consultation include an advertisement published in the Singleton Argus on 28 November 2024 and a letter seeking information from various agencies sent out on 12 September 2024. The Agencies include Heritage NSW, the Wanaruah Local Aboriginal Land Council (LALC), the Office of The Registrar, Aboriginal Land Rights Act 1983, the National Native Title Tribunal, Native Title Services Corporation Limited (NTSCORP), MSC and Hunter Tablelands Local Land Services. Information was disseminated on the 7 January 2025 to the RAPs followed by field surveys and review of Aboriginal heritage methodology conducted on the 12 and 13 February 2025. Further details about consultation that occurred during the ACHAR preparation is provided in **Appendix F**.

During the surveys, RAPs present were invited to have face-to-face meetings to provide further feedback regarding the Modification. On 26 February 2025, a representative from the LALC, attended a face-to-face meeting with Xenith where feedback was sought. Discussions focussed on BMC supporting employment programs with mentorship and incentives to promote employment, and for inclusion of cultural days within employment contracts. The importance of promoting increased cultural awareness amongst the BMC workforce was also raised.

5.3 Community Consultation

The local community was consulted during the preparation of the Modification Report for the Modification via the following engagement methods:

- Meetings with the BMC Community Consultative Committee (CCC) on 28 August 2024, 27 November 2024 and 26 February 2025;
- Distribution of a community newsletter in August 2024, which provided an overview of the proposed Modification. The November 2024 newsletter provided a Modification update and detailed the associated technical assessments being completed to assess any potential environmental and socio-economic impacts;
- A survey was available via the online platform Survey Monkey for a period of approximately 8 months, from 17 October 2024 to 7 July 2025;
- BMC held their most recent Bengalla Open Day at the Muswellbrook showgrounds on 26 October 2024. Information about the location and scope of the Modification proposal were available at the open day. Surveys were also made available to community members at the event;
- BMC hosted a show stand attended the Muswellbrook Show on 14 and 15 March 2025. Information about the Modification was made available to community members and surveys were also made available at the event;
- BMC distributed hard copies of the survey to near neighbours on the week commencing 17 March 2025;
- Near neighbours were contacted from 6 June 2025 via telephone call and were offered face-to-face meetings and an opportunity to provide feedback on the Modification. Near neighbours were also offered for an on-line QR code for the survey to be sent through via email.
- Distribution of surveys in May 2025 to BMC employees and mine contractors, and key services and organisations in the local area.

The majority of the survey respondents indicated overall support for the Modification with some indicating a neutral stance. The general consensus was that the Modification will provide long term employment for the Upper Hunter and keeps the local economy thriving enabling a stronger local community.

Findings from the community survey also identified a number of potential negatives. The most prominent concerns were related to air quality, groundwater, blast vibration, ecology and traffic. Other concerns included agriculture, health, noise, housing affordability, surface water and visual amenity. Feedback has been considered in the preparation of the impact assessments for the Modification (see **Section 6**).

6. Impacts, Management and Mitigation

This section outlines the potential environmental impacts of the Modification and describes the measures that will be implemented to mitigate these impacts.

6.1 Air Quality and Greenhouse Gas

6.1.1 Background

An air quality and greenhouse gas assessment (AQGHGA) for the Modification was undertaken by Todoroski Air Sciences. The AQGHGA is provided in **Appendix B**. This assessment considered the activities proposed by the Modification that have the potential to generate additional dust emissions and associated air quality impacts, including GHG emissions. The impacts of the Modification are considered relative to those of approved Bengalla operations, which represented the baseline for this assessment.

The AQGHGA report was prepared with consideration of the following NSW EPA documents:

- *'Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales'* (NSW EPA, 2022); and
- GHG Guide.

6.1.2 Assessment of Impacts

A qualitative AQGHGA was undertaken to identify any potential increases in dust emissions and related air quality impacts resulting from the Modification, in comparison to the currently approved Bengalla operations (as modified). The GHG emissions resulting from the Modification were also determined.

6.1.2.1 Air Quality

6.1.2.1.1 Construction Dust Emissions

Construction work associated with the BLR realignment has the potential to generate additional dust emissions. Potential dust emission generated from construction would primarily be associated with:

- Material handling;
- Vehicle movement;
- Exhaust emissions from vehicles and equipment; and
- Wind erosion of exposed material/stockpiles.

The activities would be carried out during daytime hours when atmospheric dispersion conditions are generally favourable.

The assessment provides a comparison of the total annual dust emissions for approved Bengalla (under SSD-5170) and the Modification. It was determined dust emissions associated with the Modification will increase by approximately 1.7-2.1%. This change in dust emissions is relatively minor. Given that construction activities are temporary and will occur over an 18-month period, no discernible change in air quality impacts is expected at sensitive locations.

6.1.2.2 Greenhouse Gas

During the construction phase of the proposed Modification elements, Scope 1 GHG emissions would be primarily generated from the use of diesel-powered machinery during the construction phase and land clearing. Scope 3 emissions are attributed to upstream production and supply of additional diesel used in Modification construction activities.

During FY2026 and FY2027, the construction phase of the Modification is expected to produce maximum Scope 1 GHG emissions of 18,373 t CO_2-e which is below the threshold for detailed greenhouse gas emissions assessment of 25,000 t CO_2-e as outlined by the GHG Guide. Further, the emissions associated with the Modification will be produced by short-term construction activities and will not affect the ongoing operational emissions at Bengalla. The requirements under the GHG Guide do not, therefore, apply to the Modification.

Compared to Australia's estimated annual GHG emissions (as at June 2024), the maximum annual Scope 1 emissions from the Modification would represent approximately 0.004% of the national emissions. Compared to the NSW annual GHG emissions, maximum Scope 1 emissions of the Modification are estimated to contribute approximately 0.02% to the net annual NSW GHG emissions. Overall, GHG emissions of the Modification activities contribute a negligible increment on national and global emissions levels. Notwithstanding, mitigation and offset measures will be implemented as set out in **Section 6.1.3.2**.

6.1.2.3 Climate Change Impacts

Climate change impacts on the locality have been considered utilising the '*Hunter Climate Change Snapshot*' (NSW DCCEEW, 2025) which summarises the latest climate projections for regions from the NSW and Australian Regional Climate Modelling (NARCLiM) project. The projected impacts of climate change across the Hunter Region, as modelled by the NARCLiM project include:

- Increase in average temperature and number of hot days per year;
- Decrease in the number of cold nights;
- Rainfall is projected to remain variable however climate change will likely influence rainfall patterns and decrease the average winter rainfall; and
- Increase in severe fire weather days per year.

The Modification is not anticipated to materially contribute to climate change or result in any associated impacts on the locality. Sources of GHG emissions identified as a result of the Modification include:

- Scope 1: Fuel consumption (diesel) by construction equipment during the construction of the BLR realignment, and loss of carbon sequestration when vegetation is cleared; and
- Scope 3 (inside Australia): Purchase and transport of diesel for use during construction activities.

As described above the GHG emissions associated with the Modification are considered negligible, representing an immaterial contribution to both national and global emission inventories. Given the cumulative and globally dispersed nature of GHG emissions, no discernible or measurable localised climate impacts can be directly attributed to the Modification.

The Modification requires the disturbance and clearance of native vegetation which was assessed in accordance with the *Greenhouse Gas Assessment Workbook for Road Projects* (TAGHG, 2013) (TAGG Workbook). The TAGG Workbook specifies:

> *"where vegetation is reused or left to decompose naturally on site, the rate at which GHG are emitted is very slow and considered negligible"*

The application of the TAGG Workbook to the Modification presents a conservative methodology which calculates GHG emissions linked to the loss of carbon sequestration when vegetation is cleared for projects. It assumes:

- All carbon pools (including biomass, debris, and soil) are removed during vegetation clearance;
- All carbon removed is fully converted to CO_2 and released into the atmosphere; and,
- Any future carbon uptake from revegetation works is excluded from the calculation.

Cleared vegetation will be retained at Bengalla and repurposed for rehabilitation, rather than being removed for disposal or combusted. Additionally, a significant proportion of the temporary BLR disturbance footprint will be progressively rehabilitated following completion of construction activities, with only the permanent road infrastructure remaining cleared. As these rehabilitated areas mature, they will progressively sequester atmospheric carbon and restore the site's carbon sink functionality, thereby offsetting a substantial portion of the emissions.

The Modification will not result in the removal of any carbon pools from the site and reasonable measures are proposed to realise carbon sequestration benefits from progressive rehabilitation.

6.1.3 Mitigation

6.1.3.1 Air Quality

BMC implements a suite of dust management measures and controls in accordance with the approved '*Bengalla Air Quality Management Plan'* (BMC, 2022) (AQMP). The AQMP will be reviewed and updated for the Modification to reflect any changes to relevant conditions and to consider additional dust mitigation measures for construction activities. Proposed construction mitigation measures include but not limited to:

- Proactive management in response to predicted weather conditions;
- Dedicated water cart fleet and designated fill points for to efficiently manage dust suppression across disturbed areas;
- Visual inspections to identify dust generating activities, allocate water carts and adjust activities where required;
- Activities to be assessed during adverse weather conditions and modified as required. Activities will cease where reasonable levels of visible dust cannot be maintained;
- Vehicles and plant are to be fitted with pollution reduction devices where practicable;
- Minimise drop height for loading and handling material where practical;
- Adequate maintenance and demarcation of trafficable areas and vehicle manoeuvring areas;
- Implementation of site speed limits;
- Where possible the extent of disturbance will be limited during construction to reduce exposed surfaces;
- Stabilisation and seeding of exposed areas as soon as practical following construction to reduce exposed surfaces;
- Engines of on-site vehicles and plant to be switched off when not in use;
- Further speed restrictions should sustained elevated visible dust levels occur; and
- Vehicle loads are covered when transporting material on and off-site.

6.1.3.2 Greenhouse Gas

Despite the negligible contribution of greenhouse gas emissions from the Modification, having regard to the Commonwealth Government Net Zero Plan and the Net Zero Future Act, BMC is committed to mitigating and reducing emissions at Bengalla, including emissions from the use of diesel fuel. BMC currently implements reasonable and feasible measures to limit the production of GHG emissions at Bengalla. BMC will continue to implement the current mitigation measures in accordance with the approved AQMP to limit the generation of GHG emissions. These mitigation measures will be applied to the proposed construction activities forming the Modification, where appropriate and feasible.

BMC will also continue to monitor and report GHG emissions in accordance with the requirements of the NGER Act, the *National Greenhouse and Energy Reporting Regulations 2008* and the Safeguard Mechanism. BMC will continue to comply with applicable and reduced baselines, including through emissions abatements and offsets. BMC is continuously exploring opportunities to reduce emissions across the whole of Bengalla.

6.2 Noise

6.2.1 Background

A Noise Impact Assessment (NIA) was undertaken by Bridges Acoustics to consider the activities proposed by the Modification and the potential additional noise emissions and impacts that may be generated as a result.

The primary objective of the NIA was to evaluate whether BMC (including changes sought by the Modification) can continue to operate in accordance with the approved noise criteria described in SSD-5170.

Technical policies and guidelines considered within the NIA include the:

- *'NSW Noise Policy for Industry'* (EPA, 2017) (NPfI);
- *'NSW Road Noise Policy'* (DECCW, 2011) (RNP);
- *'Interim Construction Noise Guideline'* (DECCW, 2009) (ICNG); and
- *'Draft Construction Noise Guideline'* (EPA, 2020) (dCNG).

To evaluate traffic noise impacts from the realigned BLR on nearby residences, considering the unique traffic patterns, the NIA included:

- A review of historical traffic data from 2016 to 2020 which indicates an average of 1,680 vehicles per day with 11 percent heavy vehicles;
- A traffic noise survey undertaken over a period of 16 days from 27 November to 13 December 2024. An unattended noise monitor was located installed on the south-western side of the existing BLR approximately 17 m from the centre of the road, 785 m south of the Roxburgh Road intersection and 1,060 m south of the Wybong Road intersection;
- Noise modelling to assess the predicted traffic noise levels using the RTA Technology's Environmental Noise Model; and
- Worst -case noise impacts associated with the construction of the BLR realignment were assessed based on the estimated sound power levels for the required equipment and the closest distance from the realigned road footprint to each potentially affected receptor.

The NIA is provided in **Appendix C**, with a summary in the following sections.

6.2.2 Assessment of Impacts

6.2.2.1 BLR Realignment Construction Noise Levels

Construction of the BLR realignment is expected to occur over an 18-month period, with major construction phases including:

- Bulk earthworks;
- Road base, shoulder and drain construction;
- Road pavement construction;
- Road furniture installation (including intersection lighting); and
- Rehabilitation of disturbed areas.

The construction fleet will advance along the road alignment on multiple work fronts, with intensive work occurring near each receptor only briefly during each phase. Predicted construction noise levels are set out in **Table 5** below, which indicates that predicted worst case construction noise levels are likely to exceed the approved ICNG noise criteria at closest receptors. Mitigation measures have been recommended as outlined in **Section 6.2.3**.

Table 5 Predicted Worst Case Construction Noise Levels of BLR Realignment

Receptor	Closest Distance (m)	Predicted Construction Noise Level ($L_{Aeq\ (15min)}$)				
		Bulk earthworks 117 dBA	Road base 111 dBA	Pavement 110 dBA	Road furniture 106 dBA	Rehabilitation 109 dBA
152	570	54	48	47	43	46
154	570	54	48	47	43	46
156	410	57	51	50	46	49
ICNG Criteria		Noise Affected Level 40 LAeq,15min Highly Noise Affected Level 75 LAeq,15min				

6.2.2.2 BLR Realignment Traffic Noise Levels

To predict traffic noise impacts resulting from the BLR realignment, the NIA included a noise survey to determine traffic noise levels from the existing BLR and noise modelling to predict traffic noise levels at potentially affected residences in the vicinity of the BLR realignment. Receptor locations in relation to the realigned BLR are shown in the noise contour figures in **Appendix C.**

Predicted traffic noise levels are shown in **Table 6** below and were modelled on the most affected privately owned receptors in the vicinity of the BLR realignment. It is expected that all predicted traffic noise levels remain within the approved noise criteria, and therefore additional operational mitigation measures are not required.

Table 6 Predicted Traffic Noise Levels of BLR Realignment

Receptor	Predicted Traffic Noise Level, LAeq, period	
	Day (7 am – 10 pm)	Night (10 pm – 7 am)
152	40	38
154	34	32
156	42	40
Criteria	55 LAeq,15hr	50 LAeq,9hr

6.2.3 Mitigation

BMC manages noise impacts in accordance with the management measures described in the approved '*Bengalla Noise Management Plan*' (BMC, 2023a) (NMP). As outlined in the NMP, BMC operates a comprehensive noise management system at Bengalla which utilises a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day-to-day planning of mining operations and the implementation of both proactive and reactive noise mitigation and management measures. BMC will continue to apply noise mitigation and management measures during operational activities at Bengalla, as outlined in the NMP.

The NMP will be reviewed and updated for the Modification to reflect any changes to relevant conditions and to consider noise management measures to minimise construction noise levels, particularly during prevailing weather conditions. The NMP will be updated to detail controls relevant to construction activities including:

- A clear description of the proposed scope of construction activities, including the types of equipment to be used and the estimated duration of distinct tasks or work components;
- Specific strategies to minimise noise impacts including equipment selection, operational practices and working hours;
- Construction activities will be undertaken during daytime hours between the hours of 7 am to 6 pm Monday to Friday, and 8 am to 1 pm on Saturdays, when atmospheric dispersion conditions are generally favourable;
- Deliveries will occur between 6am and 8pm Monday to Saturday when atmospheric dispersion conditions are generally favourable;
- A strategy to review the expected construction noise levels at specific receptor locations and develop appropriate mitigation strategies in consultation with any potentially affected landholders. This may include additional restrictions on construction hours or specific activities when in proximity to a residence or any other measure deemed reasonable by BMC and the individual landholder;
- Provision of contact details for the Bengalla community enquiries and complaints line related to noise or other environmental concerns, ensuring accessible and responsive communication channels; and
- Implement the existing complaints management process ensuring timely, empathetic engagement and identification of practical adjustments to equipment or processes to reduce impacts.

6.3 Biodiversity

6.3.1 Background

SLR has prepared a BDAR for the Modification to determine the likely impacts to ecological values associated with the additional disturbance within the Modification Disturbance Footprint. A copy of the BDAR is provided within **Appendix D**, with a summary in the following sections.

Given that Bengalla is an existing operation currently approved under SSD-5170, the Modification therefore requires approval under Section 4.55 of the EP&A Act. For SSD projects (including modifications of SSD projects), the Biodiversity Offset Scheme (BOS) is triggered.

The BOS has been established under the BC Act to provide a framework to avoid, minimise and offset impacts on biodiversity from development and clearing. The proponent for a development to which the BOS applies is required to prepare a BDAR in support of an application for approval. Given that the Modification Disturbance Footprint is located on land zoned as either RU1 Primary Production or C3 Environmental Management under the Muswellbrook LEP and involves the disturbance to a footprint of approximately 67.5 ha of land, the Modification exceeds the BOS threshold. Accordingly, the Biodiversity Assessment Method (BAM) was triggered and a BDAR was required to accompany this Modification Report.

The BDAR uses the BAM to determine the number and type of biodiversity credits required to compensate/offset the biodiversity impacts of the development. The BOS applies where a proposal exceeds the following thresholds:

- Where the area of native vegetation being cleared exceeds the relevant threshold areas (based on Lot sizes under the relevant LEP);
- Whether the impacts occur within an area where significant biodiversity values have been identified on the Biodiversity Values Map published by the Minister of Environment; or
- Where the impacts are likely to result in a significant impact on any threatened species, populations or ecological communities.

Under the EPBC Act, proposed actions with the potential to significantly impact matters protected under the provisions of the EPBC Act must be referred to the Australian Minister for the Environment and Water, to determine whether they are controlled actions and require approval from the Minister. This includes actions likely to have a significant impact on MNES. As a result of a referral for the Modification which was submitted under the EPBC Act (EPBC 2025/10236), the Commonwealth DCCEEW determined the activities proposed by the Modification to be a controlled action for potential significant impacts to biodiversity values. The Commonwealth DCCEEW also confirmed that EPBC 2025/10236 could be assessed in conjunction with the Modification under the provisions of the bilateral agreement with NSW Government in accordance with Section 45 of the EPBC Act.

6.3.2 Methodology

The Modification Disturbance Boundary, which was subject to the BDAR ecological field assessments, covers an area of approximately 67.3 ha.

Background research and desktop searches were completed in respect of this area to identify threatened flora and fauna species, populations and ecological communities, Commonwealth listed migratory species or critical habitat recorded previously or predicted to occur within the locality of the Modification Disturbance Footprint. Landscape features requiring consideration were initially determined via desktop assessment including searches of available aerial imagery and topographic contour data. The landscape features were verified during field surveys undertaken from 20 to 24 February 2023.

Native vegetation extent within the Modification Disturbance Boundary was ground-truthed by a botanist and ecologist during field surveys undertaken from 20 to 24 February 2023 to examine and verify the mapping, condition and extent of the different vegetation communities. Ten vegetation integrity assessments were undertaken across the Modification Disturbance Boundary.

Threatened flora species surveys have been undertaken across the Modification Disturbance Boundary. Habitat constraints and microhabitats for candidate threatened flora species within the Modification Disturbance Footprint were reviewed and identified during the desktop assessment and field surveys. Targeted threatened flora surveys were undertaken species credit species that were assessed as candidate species credit species for further assessment. These surveys incorporated random meanders and grid based survey techniques in accordance with *'Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method'* (DPIE 2020).

Targeted threatened fauna surveys were undertaken for species credit species or breeding habitat for species/ecosystem credit species that were assessed as candidate species credit species for further assessment. This included survey for species listed under the EPBC Act with the potential to occur within the subject land. The fauna surveys completed for the Modification were conducted in accordance with the following guidelines and assessment methodologies:

- *'Biodiversity Assessment Method'* (NSW Government, 2020);
- *'Threatened Biodiversity Survey and Assessment Guidelines for Development and Activities (Working Draft)'* (Department of Environment and Conservation (NSW), 2004);
- *'"Species credit" threatened bats and their habitats, NSW survey guide for the Biodiversity Assessment Method'* (NSW Government, 2018);
- *'Threatened Reptiles - Biodiversity Assessment Method survey guide'* (NSW Government, 2022c);
- *'Koala (Phascolarctos cinereus), Biodiversity Assessment Method survey guide'* (NSW Government, 2022d); and
- *'Survey Guidelines for Australia's Threatened Birds'* (Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA), 2010).

6.3.3 Avoid and Minimise

The BAM outlines the 'Avoid and Minimise' requirements that must be addressed to demonstrate reasonable measures have been undertaken to avoid or minimise clearing of native vegetation and threatened species habitat during the Modification design. While the Modification is subject to both ecological and non-ecological constraints, opportunities were investigated to minimise potential impacts through adjustments to its location and design. A summary of the associated constraints and opportunities is provided below. A detailed assessment against the requirements is included in the BDAR in **Appendix D**.

6.3.3.1 Constraints

The approved disturbance corridor, particularly in the northern section, is too narrow to accommodate road construction to current design standards. The currently approved disturbance footprint does not provide sufficient space to accommodate key activities fundamental for the construction of the BLR realignment including cut depths, fill heights and associated batters, relocation of third party infrastructure, dedicated turning lanes, water management infrastructure and laydown areas.

BMC commissioned WSP to undertake prefeasibility and feasibility studies, including an assessment of the existing road network, road design requirements and construction requirements to identify the optimal alignment and construction footprint. Various options were considered, including those consistent with the Bengalla EIS and alternatives further west. The detailed design for the BLR realignment was developed in accordance with contemporary road design standards to ensure safety and compliance with current best practices.

The selected modification footprint was based on its ability to meet key design and operational requirements. The disturbance limits have been minimised as much as reasonably practicable while still accommodating critical infrastructure features.

The BLR realignment detailed design has considered various onsite constraints including topography, geotechnical considerations and landownership. The alignment traverses terrain between elevated landforms in the north and the Hunter River floodplain in the south and east. The undulating topography required significant cut-and-fill works to maintain safe road geometry and to accommodate OSOM vehicle movements, including those linked to NSW REZ projects. Geotechnical investigations have provided further guidance on excavation methods, batter angles, and pavement design, resulting in features such as 4 m benches in deep cuts and steepened batters to reduce clearing. The alignment has been strategically aligned to consider the approved alignment and remain primarily within BMC owned land, avoiding private properties. A small section intersects land owned by HVEC and Crown road reserve, which is proposed for transfer to MSC to support public road dedication.

6.3.3.2 Avoid and Minimise Direct and Indirect Impacts

The location and design of the BLR Modification have been guided by biodiversity values in accordance with the BAM (refer to **Appendix D**). Detailed ecological studies identified native vegetation conforming to the Central Hunter Ironbark Grassy Woodland (see **Section 6.3.4.1**). While the study area has experienced historical disturbance from agriculture, no alternative alignments within reasonable proximity offered significantly lower ecological value or feasible relocation options.

Multiple design iterations and feasibility studies were undertaken to minimise the disturbance footprint and associated impacts. Constraints such as topography, land ownership, and existing infrastructure limited any feasible relocation options. Alternative technologies (e.g. elevated structures, tunnels) and routes were considered but deemed impractical due to cost, terrain, and operational requirements. The proposed BLR realignment design incorporates measures to reduce biodiversity impacts, including improved curvature of the northern tie-in which has reduced the BLR realignment by 500 m. Mitigation strategies have been developed to address unavoidable impacts, as detailed in **Section 6.3.5**.

6.3.3.3 Avoid and Minimise Prescribed Impacts

Habitat connectivity loss, vehicle strike risk, water quality degradation, and disruption to hydrological processes have been identified as prescribed impacts for the Modification. The Modification has sought to avoid and minimise these prescribed impacts through reducing the disturbance footprint through iterative design, staging vegetation clearing, and implementing erosion and sediment controls aligned with the Bengalla Water Management Plan. Stabilisation and drainage strategies have been designed to reduce erosion and water quality degradation risks. Additional measures include rehabilitating non-operational areas associated with construction to enhance habitat connectivity and installation of signage to alert drivers to potential wildlife presence. A detailed description of all mitigation measures is included in **Appendix D**.

6.3.4 Assessment of Impacts

6.3.4.1 Vegetation Communities

Field validation surveys confirmed that approximately 63.42 ha of the Modification Disturbance Boundary is covered by native vegetation, representing 94 %. The native vegetation across the site includes a combination of remnant woody species and derived native grasslands (DNG), along with scattered patches of planted native vegetation located along the public road within the proposed BLR realignment. The extent of the PCTs identified within the Modification Disturbance Boundary is detailed in **Figure 6**.

The native vegetation within the Modification Disturbance Footprint includes 63.42 ha comprising a mix of remnant woody vegetation and Derived Native Grass (DNG), with a small patch (one tree) of planted native vegetation. It was determined that the native vegetation within the subject land aligned with one Plant Community Type (PCT) 3431 held within the BioNet Vegetation Classification database, Central Hunter Ironbark Grassy Woodland, occurring in two condition states; Woodland and DNG. The portions of this community within the proposed action area that were assessed as Woodland condition (approximately 39 ha) correspond to Central Hunter Valley Eucalypt Forest and Woodland, a Critically Endangered Ecological Community (CEEC) listed under the EPBC Act. This vegetation community is also listed under the BC Act as an EEC.

Approximately 0.38 ha of the Modification Disturbance Footprint is comprised of non-native vegetation consisting of exotic dominated grasslands, predominantly within a small area in the south of the existing BLR.

6.3.4.2 Threatened Flora

No candidate threatened flora species were determined present within the Modification Disturbance Footprint, and none are considered likely to occur.

6.3.4.3 Threatened Fauna

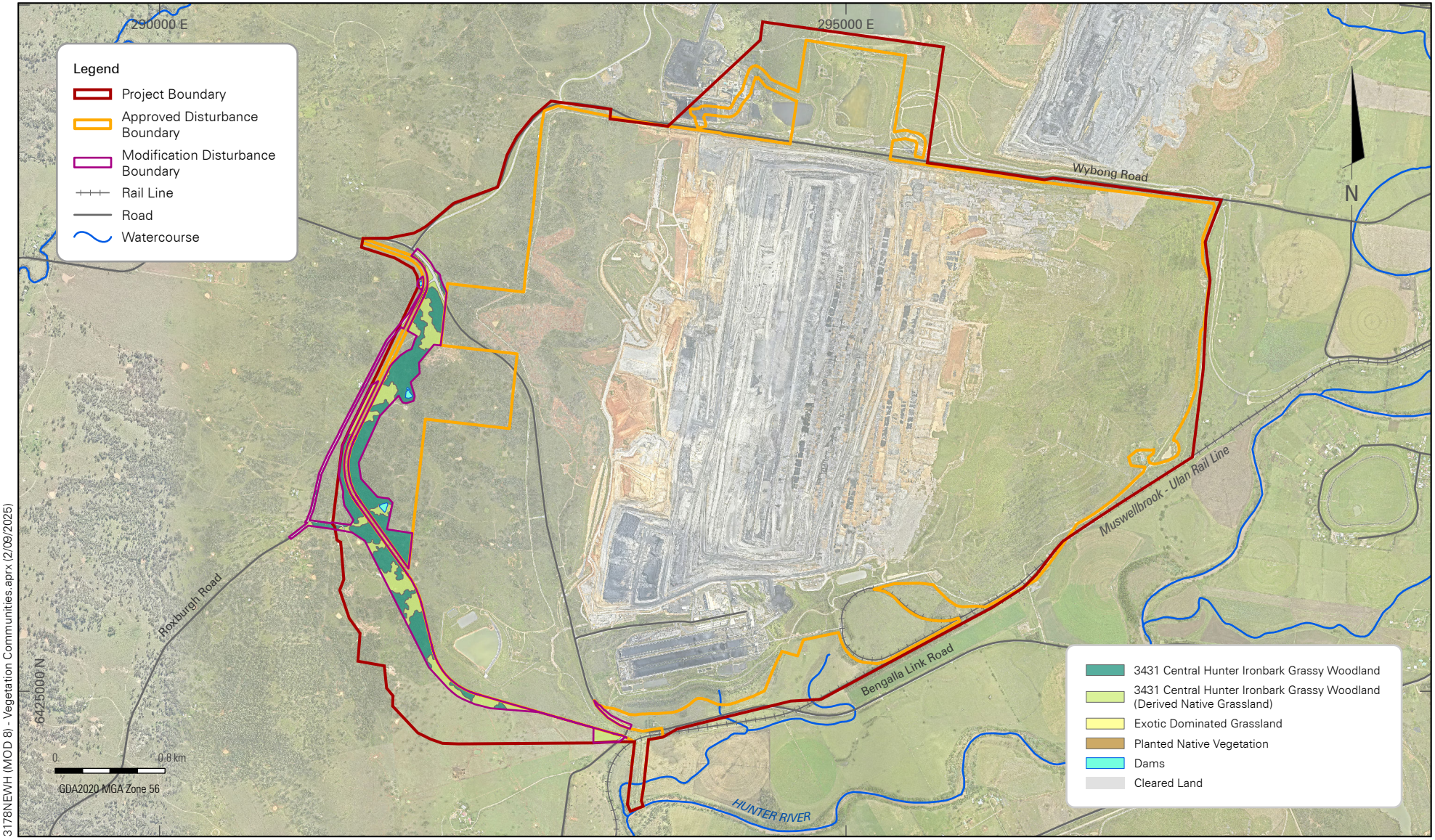
Table 7 lists the candidate threatened fauna species credit species which were determined present within the Modification Disturbance Footprint.

Table 7 Presence of Fauna Species in the Modification Disturbance Footprint

Common Name	Scientific Name	BC Act Status	EPBC Act Status	Species Recorded During Targeted Surveys
Hunter Valley Delma	*Delma vescolineata*	Endangered	Endangered	Yes
Southern Myotis	*Myotis macropus*	Vulnerable	N/A	Yes

6.3.4.3.1 Delma vescolineata

Targeted surveys conducted within the study area recorded 14 instances of the Hunter Valley Delma (*Delma vescolineata*). Of these, 10 individuals were detected using artificial cover boards, while the remaining four were observed during active habitat inspections.



3178NEWH (MOD 8) - Vegetation Communities.aprx (2/09/2025)

BENGALLA MINE

Vegetation Communities

FIGURE 6

6.3.4.3.2 Myotis Macropus

Bat detectors recorded potential calls of the Southern Myotis at two separate locations. However, due to the similarity in call frequency with the Long-eared Bats from the Nyctophilus genus, these detections are not conclusive. Adopting a precautionary approach, the species has been considered present based on these recordings. No individuals were captured using harp traps.

6.3.4.4 Assessments of Significance

Assessments of significance have been prepared for the EPBC Act listed species in accordance with the '*Matters of National Environmental Significance – Significant Impact Guidelines 1.1'* (DoE, 2013) for impacts to threatened species.

The assessment of MNES considered that Modification is likely to have significant impacts on the following species:

- Central Hunter Valley Eucalypt Forest and Woodland (Central Hunter Woodland); and
- Hunter Valley Delma (*Delma vescolineata*).

Surveys completed for the Modification did not identify any migratory species within the Modification Disturbance Footprint. The Modification has been considered unlikely to substantially modify, destroy or isolate an area of important habitat for any EPBC Act listed migratory species.

Further detail on the assessments of significance to MNES is provided in **Appendix D**. The Commonwealth EPBC Secretary's Environmental Assessment Requirements (SEARs) are provided in **Appendix A** including a reference to where they are incorporated into this Modification Report.

6.3.4.5 Serious and Irreversible Impacts

No Serious and Irreversible Impacts (SAII) entities will be impacted by the Modification. One SAII entity, the Large Bent-winged Bat (*Miniopterus orianae oceanensis*) was recorded within the Modification Disturbance Footprint. The species is only an SAII entity for breeding habitat, and the Modification Disturbance Footprint is not considered to comprise breeding habitat for this species. Therefore, this species has not been assessed as a candidate SAII entity.

6.3.4.6 Indirect Impacts

Indirect impacts are defined in the BAM as impacts that occur when a given project affects native vegetation and threatened species habitat beyond the Modification Disturbance Footprint or within retained areas. This includes impacts from activities related to the construction and/or operational phase of the Modification. Indirect impacts associated with the Modification include:

- Inadvertent impacts on adjacent habitat or vegetation;
- Reduced viability of adjacent habitat due to edge effects;
- Reduced viability of adjacent habitat due to noise, dust or light spill;
- Transport of weeds, pests and pathogens from the site to adjacent vegetation;
- Increased risk of starvation, exposure and loss of shade or shelter;
- Loss of breeding habitat; and
- Removal and disturbance of rocks, including bush rock.

Residual indirect impacts likely to occur on native vegetation, threatened entities and their habitat beyond the Modification Disturbance Boundary is detailed in **Appendix D**.

6.3.4.7 Prescribed Impacts

Prescribed impacts were assessed to include habitat connectivity and fragmentation, non-native vegetation clearing, water quality and hydrological processes and increased vehicle strikes. Prescribed impacts associated with Modification are considered to be minimal as detailed in detailed in **Appendix D**.

6.3.4.8 Biodiversity Impact Comparison

Table 8 presents the impacts to biodiversity values associated with the Modification in comparison to the original SSD-5170 approval and currently approved operations (i.e. the incremental impacts approved under MOD 1 to MOD 7).

Table 8 Biodiversity Impact Comparison

Original SSD-5170	SSD-5170 (as modified)	The Modification
964 ha of disturbance with the total area disturbed equivalent to 1,938 ha	Additional 9.07 ha of disturbance equivalent to 1,947.07 ha	Additional 67.5 ha of disturbance (increase of disturbance by approximately 4 % to 2,014.57 ha)

Table 8 above demonstrates that there will be a 4 % increase in ground disturbance for the Modification when compared to the original SSD-5710 approval. This is a relatively minor increase to the total disturbance footprint of the Bengalla. The disturbance will occur to vegetation communities which are located within and surrounding the Bengalla Project Boundary. Accordingly, the ecological impact of the development footprint is qualitatively and quantitatively similar to both the originally approved, and currently approved development.

6.3.5 Mitigation

BMC manages potential impacts to ecological values at Bengalla through the implementation of the following environmental management plans:

- *'Biodiversity Management Plan'* (BMC, 2017c) (BMP);
- *'Biodiversity Offset Management Plan'* (BMC, 2017d) (BOMP);
- *'Rehabilitation Management Plan'* (BMC, 2024a) (RMP); and
- *'Rehabilitation Strategy'* (BMC, 2024b).

The current approved BMP will be updated following approval of the Modification to outline measures to avoid and minimise impacts to flora and fauna. Mitigation measures recommended for revision/inclusion in the revised BMP include:

- Updates to the Biodiversity Management Plan describing timing of clearing and delineation requirements;
- Staged clearing, delineation and pre-clearance procedure;
- Pre-clearance surveys;
- Development of an Erosion and Sediment Control Plan (see **Section 6.4**);
- Habitat salvage;
- Weed monitoring and management for construction areas; and
- Species Management Plan for the Hunter Valley Delmar including translocation requirements and habitat restoration activities.

Further detail regarding the mitigation measures for the Modification can be found in **Appendix D**.

6.3.6 Biodiversity Offset Strategy

Biodiversity offset calculations for the Modification were developed following the completion of ecological field surveys. These estimates were determined using the BAM-C.

Table 9 outlines the impacts of the Modification that require offsetting via the application of ecosystem credits, and **Table 10** identifies the impacts on threatened species (species credit species).

Table 9 Impacts that Require and Offset – Ecosystem Credits

PCT Name	PCT #	Area (ha)	TEC	Number of Ecosystem Credits Required
Central Hunter Ironbark Grassy Woodland	3431	63.4	Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	1,780

Table 10 Impacts that Require an Offset – Species Credits

Common Name	Scientific Name	BC Act Status	EPBC Act Status	Estimated Species Polygon (ha)	Number of Species Credits Required
Hunter Valley Delmar	*Delma vescolineata*	Endangered	Endangered	63.4	1,780
Southern Myotis	*Myotis macropus*	Vulnerable	N/A	17.1	616

The Modification Disturbance Footprint is predominantly covered by remnant native vegetation which provides habitat for threatened fauna species. Surveys conducted within the Modification Disturbance Footprint (and adjacent areas) have indicated a high degree of certainty of likely key biodiversity impacts and risks.

BMC's existing Biodiversity Offset Areas (BOAs) are managed under the current BOMP. BMC have been actively working towards the retirement of credits and finalising the Biodiversity Stewardship Agreements (BSAs). There are no surplus BAM credits available to satisfy all or part of the Modification offset liability. The residual impacts will be offset by utilising the BOS.

6.4 Water

6.4.1 Background

This Modification will not result in any significant disturbance within additional catchment areas, nor does it propose any changes to the assumptions utilised in the surface water or groundwater impact assessments previously completed for SSD-5170 (as modified).

6.4.2 Assessment of Impacts

Potential impacts of the Modification on surface water resources are limited to potential erosion and sedimentation impacts associated with construction of the realigned BLR. The Modification will not result in any significant changes to the currently approved Site Water Management System (SWMS) at Bengalla. As this Modification will not result in an increase of the maximum approved water take from water sources regulated under the WM Act, no additional water access licences will be required. It is noted that the SWMS will continue to evolve as the mine develops, however the realignment of the BLR will not significantly alter or require any additional mine water management structures to be constructed.

6.4.3 Mitigation

The existing SWMS at Bengalla is operated in accordance with the approved '*Bengalla Water Management Plan'* (BMC, 2023b) (WMP). In accordance with the approved WMP, erosion and sediment controls must be implemented during the construction, operation and rehabilitation phases of the operation, including construction of the BLR realignment. Appropriate erosion and sediment controls for construction of the BLR realignment will be designed, installed, and maintained in accordance with *'Managing Urban Stormwater: Soils and Construction'* (Landcom, 2004) (the Blue Book).

6.5 Visual Amenity

6.5.1 Background

A Visual Impact Review has been undertaken for the Modification and is provided in **Appendix E**. The purpose of the assessment was to identify the character of the existing surrounding visual landscape and to quantify any additional visual impacts associated with the Modification when considered against the existing and approved visual elements of Bengalla. The visual impacts of Bengalla were assessed in the Bengalla EIS, MOD2 SEE, MOD4 SEE, MOD5 and MOD7.

6.5.2 Assessment of Impacts

It was determined that the Modification has the potential to slightly alter viewing locations for road users along the approved BLR realignment within the Western View Sector of Bengalla. A topographical cross-section and viewshed analysis were developed to assess the visibility of Bengalla operations from the proposed BLR realignment, which confirmed:

- Receptors driving on Roxburgh Road may have intermittent views of the unrehabilitated face of the Main OEA;
- Bengalla current pit void and proposed final void are not visible from the road; and
- Strategic cut / fill placement within the revised detailed BLR design will enhance topographic screening beyond what was originally generated by the approved realignment.

The visual impacts associated with the Modification were assessed to be low. The visual impacts associated with the Modification are considered negligible and remain consistent with the existing impacts from approved Bengalla operations for the following reasons:

- The Modification will not increase potential viewing locations;
- The Modification will result in only minor changes to viewing locations along the approved BLR realignment, as the revised alignment follows the same general corridor through the landscape;
- Additional disturbance associated with the road construction is considered temporary and will be rehabilitated as soon as practicable; and
- Sensitivity of residential receptors to views of Bengalla will remain unchanged, with existing views of approved mining operations, viewing distance, and intervening topography continuing to reduce visibility.

6.5.3 Mitigation

In accordance with Schedule 3 Condition 41 of SSD-5170, BMC is required to provide tree screens or some other visual screening measure along the proposed BLR realignment. Detailed feasibility assessment identified multiple physical constraints that have impeded the planting of additional tree screens prior to BLR construction. Existing communications and power infrastructure restricted suitable planting locations, while the narrow road verge did not provide sufficient space to accommodate both the required construction activities and compliance with contemporary road safety design guidelines. Consequently, the implementation of tree screening will be considered following construction, in consultation with relevant land holders and utility providers.

BMC will continue to implement visual mitigation measures at Bengalla in accordance with the approved '*Bengalla Visual Impact Mitigation Plan'* (BMC, 2016) (VIMP), RMP, relevant conditions of SSD-5170 and other applicable guidelines. Additionally, a 1.8 m screening fence will be installed on the eastern side of the northern extent of the realigned BLR to assist in restricting views into Bengalla Mine.

As soon as practicable after completion of the constructed BLR landform and relocation of existing third party infrastructure, BMC will conduct a review and determine the need for additional visual screening measures. Where road alignment geometry results in vehicular sight lines being directly oriented toward Bengalla operations and risks of driver distraction are reasonably considered to be introduced, mitigation will be implemented.

6.6 Aboriginal Cultural Heritage

6.6.1 Background

An ACHAR was undertaken by OzArk Environment & Heritage Pty Ltd (OzArk) for the Modification and is provided as **Appendix F**.

The ACHAR aimed to identify the cultural values, archaeological context of the Modification Disturbance Boundary, findings from previous assessments, and findings from survey efforts. Findings from the ACHAR have been utilised to inform reasonable and feasible mitigation and management techniques to ensure the Modification has minimal impact upon the Aboriginal cultural heritage within and surrounding the Modification Disturbance Boundary.

The archaeological assessment followed the '*Code of Practice for the Investigation of Aboriginal Objects in New South Wales* '(DECCW 2010) (Code of Practice). The Aboriginal cultural heritage assessment which was completed in conjunction with the ACHAR followed the '*Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW'* (OEH, 2011) (the Guide) and the ACHCRs.

The ACHAR for the Modification applied the Code of Practice, the Guide, and the ACHCRs in the completion of the Aboriginal cultural heritage assessment to meet the following objectives:

- Undertake background research on the Modification Disturbance Boundary to formulate a predicative model for the site location;
- Identify and record Aboriginal cultural heritage values within the Modification Disturbance Boundary. This includes intangible cultural values, Aboriginal objects, and any landforms likely to contain further archaeological deposits;
- Assess the significance of any recorded Aboriginal cultural values, Aboriginal objects, or sites in consultation with RAPs; and
- Assess the likely impacts of the proposed work to Aboriginal cultural heritage values and provide management recommendations.

Field surveys were conducted on 12 to 13 February 2025 within the Modification Disturbance Boundary using standard archaeological field survey and recording methods. Representatives of the RAPs were present during these surveys.

Based on the topography of the Modification Disturbance Boundary, three survey units were identified to capture major topographical features and determine which landform types are more likely to contain aboriginal objects. Survey units included moderate and steep slopes and landforms within 50 m of ephemeral drainage lines.

6.6.2 Assessment of Impacts

A total of four new sites of archaeological significance were identified during the field survey of the Modification Disturbance Boundary, as described in **Table 11.** This included one low-density artefact scatter and three isolated finds. Four previously recorded AHIMS sites within the Modification Disturbance Boundary were also visited during the field surveys. The previously recorded sites consist of three isolated finds and an artefact scatter, as described in **Table 12**.

All sites present within the Modification Disturbance Boundary are considered to have low scientific value, primarily due to their low artefact density and degraded condition. These factors reduce their potential to inform key archaeological questions regarding Aboriginal occupation and use of the Hunter Valley.

The assessment concluded that eight Aboriginal sites will be directly impacted by the proposed Modification.

Table 11 Newly Recorded Aboriginal Cultural Heritage Sites

AHIMS ID	Site Name	Site Type
37-2-6708	Bengalla Link Road Realignment OS1	Artefact scatter
37-2-6709	Bengalla Link Road Realignment IF1	Isolated find
37-2-6710	Bengalla Link Road Realignment IF2	Isolated find
37-2-6711	Bengalla Link Road Realignment IF3	Isolated find

Table 12 Previously Recorded Aboriginal Cultural Heritage Sites

AHIMS ID	Site Name	Site Type
37-2-4452	BM-AS 20-12	Artefact scatter
37-2-4472	BM - IA 14-12	Isolated find
37-2-4473	BM - IA 15-12	Isolated find
37-2-6578	Wyndham Arms Row IF-01	Isolated find

6.6.3 Mitigation

Bengalla currently operates in accordance with an approved ACHMP. The ACHMP was prepared in consultation with BMC RAPs and will be reviewed and updated to address requirements of the Modification.

Disturbance related to the Modification will be confined to the Modification Disturbance Boundary and subject to the relevant procedures outlined within the ACHMP. Upon the identification of a previously unidentified Aboriginal object, any work would immediately cease in the area and an archaeologist and RAPs notified to ascertain the significance of the object. The procedures outlined in the ACHMP will then be implemented to identify the appropriate course of action. Furthermore, relevant BMC employees and contractors will undertake Aboriginal cultural heritage training to ensure they have a general awareness and understanding of Aboriginal culture, and how Aboriginal sites are protected under the NPW Act.

Given that eight Aboriginal sites have been recorded within the Modification Disturbance Boundary that cannot be avoided, the area will be salvaged through the recording and collection of the surface artefacts prior to construction works proceeding. The methodology for salvage is outlined within **Appendix F** and will include:

- Flagging each artefact in the field;
- Photography of the site after flagging and before artefact recording;
- Recording of all relevant artefact information;
- Photography of artefacts (particularly any formal tool types);
- Completion of a salvage report within 12 months of the salvage; and
- Submissions of an Aboriginal Site Impact Recording Form (ASIRF) by the archaeologist detailing the salvage process at the site.

Long-term management of Aboriginal objects will continue to be conducted in accordance with the relevant protocols outlined within the existing ACHMP.

6.7 Historic Heritage

6.7.1 Background

A Historic Heritage Impact Assessment (HHIA) was undertaken by OzArk to assess any impacts to historic heritage sites that would be encountered during the Modification. The HHIA methodology follows the:

- *'The Australia ICOMOS Charter for Places of Cultural Significance'* (Burra Charter) (The International Council on Monuments and Sites, 2013);
- *'Guidelines for preparing a statement of heritage impact'* (Department of Planning and Environment, 2023a); and
- *'Assessing heritage significance. Guidelines for assessing places and objects against the Heritage Council of NSW criteria'* (Department of Planning and Environment, 2023b).

The objectives of the HHIA, including the field investigation, were to:

- Assess the significance of any recorded historical heritage items or areas;
- Determine whether the Modification is likely to cause harm to recorded historical heritage items or areas; and
- Provide management recommendations and options for mitigating impacts.

The field survey component of the HHIA took place at the same time as the Aboriginal heritage assessment for the Modification. This was undertaken on 12 to 13 February 2025 using standard archaeological field survey and recording methods.

The HHIA is provided within **Appendix G**, with a summary in the following sections.

6.7.2 Assessment of Impacts

There are no listed heritage items within the Modification Disturbance Boundary. A search of the National, State, and local heritage databases, including the Muswellbrook LEP, returned no records for historical heritage sites within the designated search areas.

Five registered historic heritage items have been previously identified in proximity to the Modification area. However, as these items are located outside the Modification Disturbance Boundary, the Modification is assessed as having no direct impact on their heritage values. The listed historic items are as follows:

- Dalmar Stud;
- Edinglassie Homestead;
- Rous Lench Cottage;
- Bengalla Homestead; and
- Keys Family Private Cemetery.

No historic heritage items were recorded during the survey of the Modification Disturbance Boundary with no historic evidence of any structures existing within the confines of the Modification Disturbance Boundary.

6.7.3 Mitigation

Given that no items of historic heritage significance were identified within the Modification Disturbance Boundary, no additional management measures are required. However, should the Modification be approved, the '*Bengalla Historic Heritage Management Plan'* (BMC, 2017b) (HHMP) will be updated to include the area of the Modification Disturbance Boundary. Relevant BMC employees and contractors will continue undertake training to ensure they have an awareness and understanding of the potential for historic heritage items to be present within the vicinity of Bengalla and the general requirements of the HHMP.

6.8 Traffic

6.8.1 Background

Bengalla is currently approved under SSD-5170 to realign the BLR to the west, to allow for the progression of mining operations. During the preparation of the Bengalla EIS, only conceptual road design plans were available. The impacts of the realignment were assessed in detail in the '*Traffic and Transport Impact Assessment*'(DC Traffic Engineering Pty Ltd, 2013).

As described in **Section 3.1**, the modified BLR realignment has been designed to:

- Reflect contemporary road safety and design guidelines and requirements for intersections with the existing local road network;
- Consider the current road network;
- Consider the current and future utility of the road in the context of other major project works including for use by OSOM vehicles associated with the NSW REZ projects;
- Facilitate construction works;
- Allow for the relocation of existing communications and power infrastructure; and
- Avoid mining authorities held by other parties.

WSP has been engaged to develop a detailed design for the BLR realignment and have prepared a design summary report titled '*Bengalla Link Road Relocation Design Summary Report*' (BLR Design Summary; WSP, 2025). The BLR Design Summary has been prepared to support the proposed BLR realignment design and confirm compliance with the relevant road safety design guidelines for intersections with the local road network, including Wybong Road and Roxburgh Road. A copy of the BLR Design Summary is provided in **Appendix H**.

6.8.2 Assessment of Impacts

The Modification does not involve any increase to the maximum operational workforce at Bengalla. Whilst it will not generate additional traffic, the Modification will result in project-related traffic for approximately 18 months during the construction of the realigned BLR. The Traffic and Transport Impact Assessment undertaken by DC Traffic Engineering to support the Bengalla EIS concluded that all modelled intersections were acceptable and have sufficient capacity to accommodate peak construction traffic demands (DC Traffic Engineering Pty Ltd, 2013).

The realigned BLR will continue to be dedicated as a public road and BMC has been in ongoing consultation with MSC, TfNSW and Crown Roads regarding the technical design and placement within relevant Crown Land and cadastral boundaries. The conceptual design for the BLR realignment is provided in Appendix A within the BLR Design Summary (see **Appendix H**). The BLR Design Summary also outlines the relevant design standards used to inform the detailed design.

Following realignment proposed for the Modification, the BLR will continue to serve as a vital freight transport route accommodating over-size over-mass vehicle movements for the mines in the Muswellbrook LGA and providing access to the REZ in the Central West Orana and New England regions. The government announced in 2024 that Bengalla Road will be reclassified from local to state owned (NSW Government, 2024). Upgrading and widening the BLR to meet contemporary design guidelines will benefit both the community and various industries through improved road safety.

6.8.3 Mitigation

The operation of the existing road network will be maintained during construction for public and emergency vehicles. A Traffic Management Plan will be prepared prior to construction in accordance with the '*Traffic control at work sites (TCAWS) Technical Manual*' (TfNSW, 2022) and relevant Austroads guidelines, in consultation with MSC and TfNSW.

6.9 Other Environmental Aspects

The Bengalla EIS provided a comprehensive assessment of socio-economic and environmental impacts and risk associated with Bengalla operations. The assessment of these impacts and risks have been supported by further assessments associated with historical modifications to SSD-5170.

The potential socio-economic and environmental impacts identified in previous assessments prepared for Bengalla were reviewed during the preparation of this Modification Report and determined that the Modification will not result in any material additional impacts and risk beyond those previously considered and subsequently approved under SSD-5170.

BMC has prepared and implements a comprehensive Environmental Management Strategy which includes supporting environmental management plans and procedures for the management, monitoring and reduction of potential impacts operations to the surrounding environment. These plans and procedures provide for the ongoing monitoring and management of environmental impacts at Bengalla. Notwithstanding, the plans and procedures associated with the Environmental Management Strategy will be reviewed and updated (as required) to accommodate any potential impacts arising from the Modification.

7. Merit Evaluation

This section provides a justification and evaluation, integrating the findings of previous sections to weigh up the positive and negative impacts of the Modification.

7.1 Project Evaluation in the ESD Context

The objects of the EP&A Act include facilitating '… *ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment*' (Section 1.3(b)). '*Ecologically sustainable development*' has the same meaning as in Section 6(2) of the *Protection of the Environment Administration Act 1991*'.

Table 13 lists the four principles of ESD and explains how the Modification satisfies these principles.

For the reasons described below, the Modification is consistent with the objects of the EP&A Act relating to ESD. The Modification will also promote other objects of the EP&A Act including '*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*' and '*to promote the orderly and economic use and development of land*'.

Table 13 Principles of Ecologically Sustainable Development

ESD Principles	Where Addressed
The precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	The potential environmental impacts of the Modification have been assessed using the best scientific methods available. As such, the precautionary principle does not apply as this is not a case where there is lack of scientific certainty. In any event, appropriate controls have been adopted to minimise environmental impacts.
Inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.	SSD-5170 and the proposed Modification provides thermal coal which is required to meet the energy needs of the current generation as is evident by the demand for coal both within Australia and internationally. Upon completion of mining, disturbed areas will be rehabilitated to enable future generations to use the land, potentially for alternative energy sources. This will not change as a result of the Modification.
Conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.	A key consideration in the design process for the realigned BLR was the need to avoid and minimise the need for impacts on biodiversity values in addition to those approved under SSD-5170. Disturbed areas will also be rehabilitated as soon as practicable following construction of the realigned BLR. BMC has established biodiversity offset areas in accordance with Schedule 3, Condition 26 of SSD-5170. BMC will review biodiversity offset requirements following any determination of the Modification.

ESD Principles	Where Addressed
Improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services.	The Modification is consistent with the 'polluter pays' principle for the following reasons: › The proponents (i.e. BMC) bear the cost of all environmental controls, including monitoring and biodiversity offsets; and › The proponents compensate for their social impacts through their VPAs and other contributions (including mining royalties and company tax).

7.2 Merit Evaluation

Bengalla is approved by SSD-5170, which was granted by the Secretary of the then Department of Planning and Environment (DP&E) following a review by the NSW Planning Assessment Commission. In its determination of the Project, DP&E (2015) concluded that:

> *'The Department has carefully weighed the impacts of the project against the significance of the resource and the social and economic benefits. On balance, the Department believes that the project's benefits outweigh its residual costs, and that it is in the public interest and should be approved, subject to stringent conditions'.*

The BLR realignment will allow mining in a westerly direction to continue in accordance with the approved SSD-5170 and prevent sterilisation of approximately 13 Mt ROM Coal. Mining of the approved coal reserves will prevent the early ramp down of mining operations and allow for continued employment and economic benefits to the community.

The NSW Government's '*Strategic Statement on Coal Exploration and Mining in NSW*' (NSW Government, 2022b) has identified that whilst some countries are moving away from thermal coal uses, the demand for thermal coal is likely to remain, if not increase, to accommodate for demand in developing countries regarding the provision of and access to electricity. This forecast growth in developing countries could see the overall global demand for thermal coal being sustained for at least the next two decades. The use of coal in the production of steel (coking coal) is likely to be sustained longer as there is currently limited practical substitutes available. This Modification will assist BMC in continuing to supply its high energy, low ash premium quality thermal coal to its long-term international clients.

Specialist assessments have been undertaken to support this Modification Report, with findings of these environmental assessments summarised in **Section 6**. These environmental assessments have not identified any material additional environmental impacts from the Modification which are not able to be appropriately managed.

Given that the Modification will not materially increase the environmental impacts of the operation, the benefit of Bengalla (as described in the Bengalla EIS and subsequent assessments) will continue to outweigh its social and environmental costs.

The Modification will realise improved outcomes for BMC, including:

› Efficient progression of mining operations; and

› Prevent the sterilisation of an already approved resource with significant socio-economic benefits.

The Modification will not result in any additional material environmental or social impacts beyond those currently approved for Bengalla, and it will continue to deliver direct and indirect economic activity to the local, State and National economies. The Modification is justified on environmental, social and economic grounds, aligns with the principles of ESD and is the public interest.

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Abbreviations

Abbreviation	Meaning
ACHAR	Aboriginal Cultural Heritage Assessment Report
AHIP	Aboriginal Heritage Impact Permit
AQGHGA	Air Quality Greenhouse Gas Assessment
AQMP	Air Quality Management Plan
ASIRF	Aboriginal Site Impact Recording Form
Environmental Assessment Report	'*State Significant Development Assessment Bengalla Continuation Project (SSD 5170) - Secretary's Environmental Assessment Report Section 89E of the Environmental Planning and Assessment Act 1979'* (NSW Department of Planning and Environment, 2014)
BC Act	*Biodiversity Conservation Act 2016*
Bengalla EIS	Environmental impact statement titled '*Continuation of Bengalla Mine, Environmental Impact Statement'* (6 volumes), dated September 2013, as modified by the *Response to Submissions* dated March 2014
BJV	Bengalla Joint Venture
BMC	Bengalla Mining Company Pty Limited
BMP	Biodiversity Management Plan
CCC	Community Consultative Committee
CHPP	Coal Handling and Preparation Plant
DA	Development Application
dBA	A-weighted decibels
EIS	Environmental Impact Statement
EPA CCP	*'Environment Protection Authority Climate Change Policy'* (NSW EPA, 2023)
EP&A Act	*Environmental Planning & Assessment Act 1979*
EPBC Act	*Environment Protection & Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
GHG	Greenhouse gas
GHG Guide	*'NSW Guide for Large Emitters: Guidance on How to Prepare a Greenhouse Gas Assessment as Part of the NSW Environmental Planning Processes'* (NSW EPA, 2025).

Abbreviation	Meaning
ha	hectare
Heritage Act	*Heritage Act 1977*
ICNG	*Interim Construction Noise Guideline*
JBA	James Bailey & Associates (now part of Xenith Consulting)
kt	kilotonne
LEP	Local Environmental Plan
LGA	Local Government Area
M	metres
Mbcm	Million bank cubic metres
Mining Act	*Mining Act 1992*
Mlcm	Million loose cubic metres
ML	Mining Lease
MNES	Matters of National Environmental Significance
MOD	Modification
MSD	Mine Subsidence District
Mtpa	Million tonnes per annum
NMP	Noise Management Plan
NPfI	*NSW Noise Policy for Industry*
NPW Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
NT Act	*Native Title Act 1993*
NZC	Net Zero Commission
OEA	Overburden Emplacement Area
OSOM	Over Size, Over Mass
Planning Systems SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
PM_{10}	Particulate matter with a diameter of 10 micrometres (µm) or smaller.
$PM_{2.5}$	Fine particulate matter with a diameter of 2.5 micrometres (µm) or smaller.

Abbreviation	Meaning
POEO Act	*Protection of the Environment Operations Act 1997*
RAPs	Registered Aboriginal Parties
Resources SEPP	*State Environmental Planning Policy (Resources and Energy) 2021*
REZ	NSW Renewable Energy Zone
RL	Reduced Level
RNP	NSW Roads Noise Policy
ROM	Run of Mine
Safeguard Mechanism	*National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015*
SEE	Statement of Environmental Effects
SEP	Stakeholder Engagement Plan
SSD	State Significant Development
SWMS	Site Water Management System
TfNSW	Transport for NSW
TSP	Total Suspended Particulates
WM Act	*Water Management Act 2000*
WMP	Water Management Plan

Appendix A
EPBC SEARs

Table A-1 EPBC SEARs

Ref	Requirement	Where Addressed
Introduction		
1	On 31 October 2025, a delegate of the Federal Minister for the Department of Climate Change, Energy, the Environment and Water (DCCEEW) determined that the Continuation of Bengalla Coal Mine – Modification 8 was a controlled action under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act controlling provisions for the proposed action are: i. listed threatened species and communities (sections 18 and 18A).	Section 4.4.5 of *'Bengalla Mine Modification 8 – Modification Report'* (Xenith, 2025) (Modification Report)
2	The proposed action will be assessed in accordance with the bilateral assessment agreement between the Australian and NSW governments (*Amending Agreement No.1, 2020*). The assessment documentation must include: i. an assessment of all impacts that the action is likely to have on each matter protected by a provision of Part 3 of the EPBC Act; ii. enough information about the proposal and its relevant impacts to allow the Federal Minister to make an informed decision on whether or not to approve; and iii. information addressing the matters outlined in Schedule 4 of *the Environment Protection and Biodiversity Conservation Regulations 2000* (EPBC Regulations).	Section 4.1 and Section 4.4.5 of Modification Report
3	The Applicant must undertake an assessment of all protected matters that may be impacted by the development under the controlling provisions identified in paragraph 1. DCCEEW considers that there is likely to be a significant impact on the following: i. Central Hunter Valley Eucalypt Forest and Woodland – critically endangered; ii. Hunter Valley Delma (*Delma vescolineata*) – endangered; and iii. Grey-headed Flying-fox (*Pteropus poliocephalus*) – vulnerable.	Section 5 and Section 11.3 of *'Bengalla Mine Modification 8 Biodiversity Development Assessment Report'* (SLR, 2025) (BDAR)
4	Based on DCCEEW's Reporting Tool and information provided by the Species Profiles and Threats Database (SPRAT), DCCEEW also considers that the proposed action may result in significant impacts to the following species: i. Regent Honeyeater (*Anthochaera phyrgia*) – critically endangered; ii. Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) (SE mainland population) – Endangered; iii. South-eastern Hooded Robin (*Melanodryas cucullata cucullata*) – Endangered iv. Diamond Firetail (*Stagonopleura guttata*) – Vulnerable; v. Brown Treecreeper (south-eastern) (*Climacteris picumnus victoriae*) – Vulnerable	Section 5 and Section 11.3 of BDAR

Ref	Requirement	Where Addressed
	These species require further assessment, surveys and analysis to determine whether they are likely to be significantly impacted.	
6	The Applicant must consider each of the protected matters under the triggered controlling provisions that may be impacted by the action. Note that the above may not be a complete list and it is the responsibility of the Applicant to undertake an analysis of the significance of the relevant impacts and ensure that all protected matters that are likely to be significantly impacted are assessed for the Commonwealth Minister's consideration.	Section 11.2 of BDAR
General Requirements		
6	*Relevant Regulations* The Modification Report must address the matters outlined in Schedule 4 of the EPBC Regulations and the matters outlined below in relation to the controlling provisions.	Section 1 and Section 4 of Modification Report
7	*Project Description* The title of the action, background of the action and current status.	Section 1 and Section 3 of Modification Report
8	The precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on Matters of National Environmental Significance (MNES).	Section 2 and Section 3 of Modification Report
9	How the action relates to any other actions that have been, or are being taken in the region affected by the action.	Section 2 of Modification Report
10	How the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts on MNES.	Section 11 of BDAR
11	*Impacts* The Modification Report must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions, including: i. a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long-term relevant impacts; ii. a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible; iii. analysis of the significance of the relevant impacts; and iv. any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	Section 11 of BDAR
12	*Avoidance, mitigation and offsetting* For each of the relevant matters protected that are likely to be significantly impacted by the action, the Modification Report must provide information on	Section 6.3 Modification of Report; Section

Ref	Requirement	Where Addressed
	proposed avoidance and mitigation measures to manage the relevant impacts of the action including: i. a description, and an assessment of the expected or predicted effectiveness of the mitigation measures, ii. any statutory policy basis for the mitigation measures; iii. the cost of the mitigation measures; iv. an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing; v. the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.	7, Section 9 and Section 10 of BDAR
13	Where a significant residual adverse impact to a relevant protected matter is considered likely, the Modification Report must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.	Section 9.4 and Section 10.3 of BDAR
14	For each of the relevant matters likely to be impacted by the action the Modification Report must provide reference to, and consideration of, relevant Commonwealth guidelines and policy statements including any: i. conservation advice or recovery plan for the species or community; ii. relevant threat abatement plan for a process that threatens the species or community; iii. wildlife conservation plan for the species; and iv. any strategic assessment. [Note: the relevant guidelines and policy statements for each species and community are available from DCCEEW's Species Profiles and Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl]	Relevant policies and guidelines are referenced throughout the BDAR and listed in Section 13
15	*Key risks* Key risks associated with the proposed action from the Commonwealth perspective include impacts EPBC listed threatened species and ecological communities.	Section 11.3 of BDAR
Assessment Requirements		
16	*Listed threatened species and communities* For each of the EPBC Act listed species predicted to occur in the project site, and each of the EPBC Act listed ecological communities likely to be significantly impacted, the Modification Report must provide: i. Survey results, including details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Commonwealth guidelines and policy statements. For ecological communities, this includes any condition thresholds provided in the listing advice or approved conservation advice.	Section 2 and Section 11.3 of BDAR

Ref	Requirement	Where Addressed
	ii. A description and quantification of habitat in the study area (including suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including species and communities listing advice, conservation advice, recovery plans and threat abatement plans.	Section 4 and Section 5 of BDAR
	iii. Maps displaying the above information (specific to EPBC matters) overlaid with the proposed action. It is acceptable, where possible, to use the mapping and assessment of Plant Community Types (PCTs) and the species surveys prescribed by the BAM as the basis for identifying EPBC Act-listed species and communities. The Modification Report must clearly identify which PCTs are considered to align with habitat for the relevant EPBC Act-listed species or communities and provide individual maps for each species or community.	Figures appended to BDAR
	iv. A description of the nature, geographic extent, magnitude, timing and duration of any likely direct, indirect and consequential impacts on any relevant EPBC Act-listed species and communities. It must clearly identify the location and quantify the extent of all impact areas to each relevant EPBC Act-listed species or community.	Section 10 of BDAR
	v. Information on proposed avoidance and mitigation measures to deal with the impacts of the action, and a description of the predicted effectiveness and outcomes that the avoidance and mitigation measures will achieve.	Section 6.3 of Modification Report, Section 7 and Section 9 of BDAR
	vi. Quantification of the offset liability for each species and community significantly impacted, and information on the proposed offset strategy, including discussion of the conservation benefit for each species and community, how offsets will be secured, and the timing. It is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action i.e., 'like-for-like'. a) Like-for-like includes protection of native vegetation that is the same ecological community or habitat being impacted (preferably in the same region where the impact occurs), or funding to provide a direct benefit to the matter being impacted e.g., threat abatement, breeding and propagation programs or other relevant conservation measures.	Section 9 of BDAR
17	*Other approvals and conditions* Information in relation to any other approvals or conditions required must include the information prescribed in Schedule 4 Clause 5 (a) (b) (c) and (d) of the EPBC Regulations.	Modification Report Section 3 and Section 4
18	*Information Sources* For information given in an Modification Report, the Modification Report must state the source of the information, how recent the information is, how the reliability of the information was tested; and what uncertainties (if any) are in the information.	Modification Report References
	Relevant References and Guidelines	

Ref	Requirement	Where Addressed
	International Conventions, Management Plans and Principles The international conventions, management plans and principles that must be considered in relation to this proposal include: • Listed threatened species and communities - Australia's obligations under the: o Convention on Biological Diversity o The Convention on Conservation of Nature in the South Pacific (Apia Convention) o The Convention on International Trade in Endangered Species of Wild Fauna and Flora o (CITES). - Any relevant recovery plans or threat abatement plans.	Noted
	Policies and Plans The polices and plans that must be considered in relation to this proposal include: • Significant Impact Guidelines 1.1: Matters of National Environmental Significance (Significant Impact Guidelines 1.1); • DCCEEW Offsets Mitigation Hierarchy; • EPBC Act Environmental Offsets Policy (2012); • Relevant conservation advice/s: http://www.environment.gov.au/cgibin/sprat/public/sprat.pl Commonwealth Listing Advice, Survey Guidelines and Referral Guidelines contain information on threatened species and ecological communities which may provide further support to proponents and NSW DPHI in considering and evaluating the significance of residual impacts on the action's controlling provisions. These documents may be found in the DCCEEW's Species Profile and Threats Database: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl	Section 11.3 and Section 13 of BDAR
	REFERENCES • Environment Protection and Biodiversity Conservation Act 1999 - section 51-55, section 96A(3)(a)(b), 101A(3)(a)(b), section 136, section 527E • Environment Protection and Biodiversity Conservation Regulations 2000 Schedule 4 • Commonwealth and NSW Governments Bilateral Agreement (Amending Agreement No.1, 2020) - Item 2 (a)(i) of Schedule 1 • Matters of National Environmental Significance - Significant impact guidelines 1.1 (2013) EPBC Act • Environment Protect and Biodiversity Conservation Act 1999 Environmental Offsets Policy October 2012	Noted

Appendix B
Air Quality and Greenhouse Gas Assessment

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6 November 2025

Sarah Moore
Principal Environmental Scientist
Xenith Consulting
Via email: sarah.moore@xenith.com.au

RE: Air Quality and Greenhouse Gas Assessment (AQGHGA) – Bengalla Mine Modification 8

Dear Sarah,
Todoroski Air Sciences has assessed the potential for air quality impacts to arise due to the proposed Modification 8 for Bengalla Mine (Bengalla). This report investigates the likely change in dust and greenhouse gas (GHG) emissions associated with the Modification, relative to the approved *Continuation of Bengalla Mine Environmental Impact Statement* (Bengalla EIS) (**Hansen Bailey, 2013**).

This report has been prepared with consideration of the New South Wales (NSW) Environment Protection Authority (EPA) documents *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW EPA, 2022**) and the *NSW Guide for Large Emitters* (**NSW EPA, 2025**).

Overview
Bengalla is an open cut coal mine located approximately 4 kilometres (km) west of Muswellbrook in the Upper Hunter Valley of NSW. Bengalla Mining Company Pty Limited (BMC) was granted approval on 3 March 2015 for the continuation of mining under State Significant Development (SSD) Consent SSD-5170. SSD-5170 has been since been modified on six occasions with one Modification (Modification 6) pending. SSD-5170 (as modified) authorises the continuation of open cut coal mining and associated activities at Bengalla until 28 February 2039.

BMC is seeking approval for a modification to SSD-5170 (hereafter referred to as the Modification). The Modification involves adjustments to the disturbance footprint for the realignment of Bengalla Link Road (BLR) as described in the Bengalla EIS to facilitate construction activities.

The conceptual layout of the Modification is presented in **Figure 1**. The Modification will require approximately 67.5 hectares (ha) of additional disturbance for development of the BLR realignment (Modification Disturbance Boundary).

The construction works associated with the Modification are proposed to occur between 7:00am and 6:00pm, Monday to Friday, and between 8:00am and 1:00pm on Saturdays. The construction period is anticipated to extend over an approximate 18-month period.

There are no proposed changes to the currently approved mining methods, annual Run of Mine (ROM) and product coal limits, transport methods, operational workforce or life of development.

A qualitative assessment has been conducted to determine the potential additional dust emissions and associated air quality impacts with the Modification relative to the approved Bengalla. The GHG assessment estimates the additional emissions generated by the Modification activities.

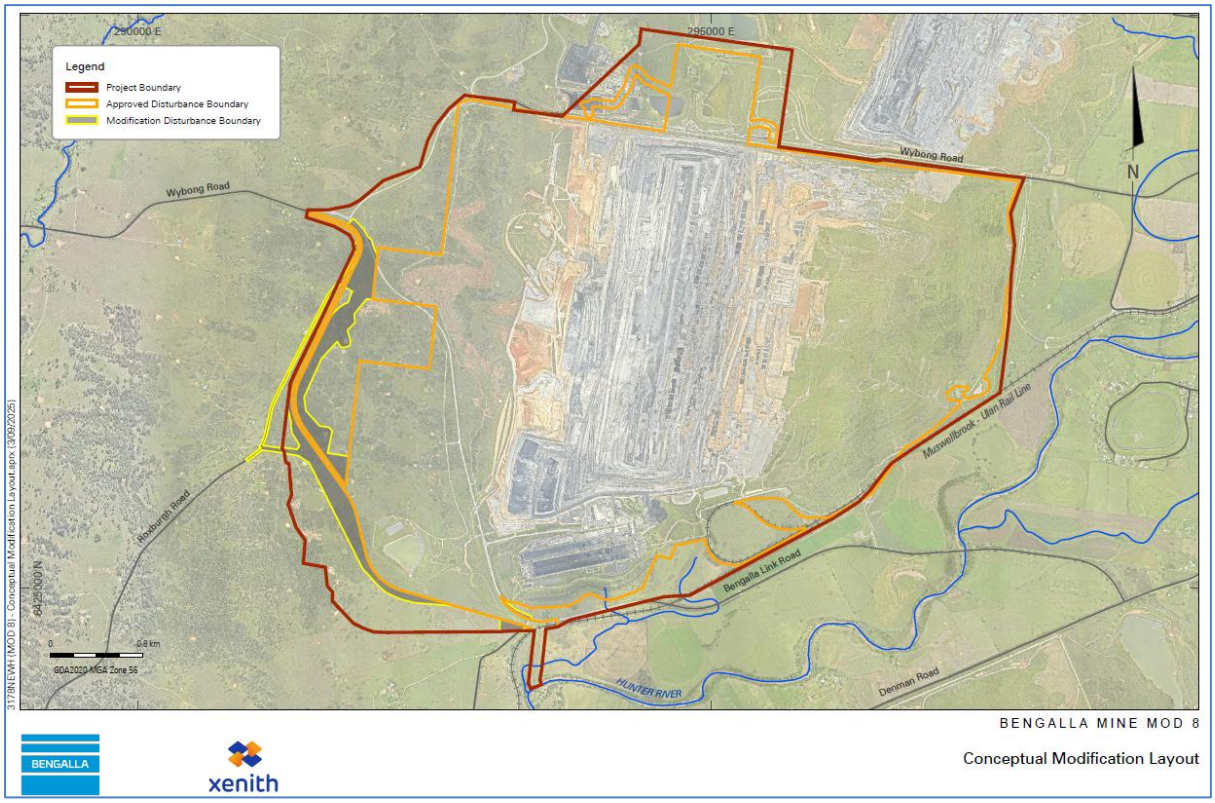


Figure 1: Conceptual MOD 8 layout

MOD 8 description

The Bengalla EIS assessed the realignment of the BLR (Approved BLR Realignment), which established an 80 kilometre per hour (km/hr) speed limit at the northern section of the road around the intersection with Wybong Road. Since the determination of the SSD-5170, the development of the Mount Pleasant Mine has subsequently involved upgrades to the existing BLR / Wybong Road intersection, where a 100 km / hr speed limit now applies. In addition, the detailed design process has resulted in adjustments to the approved disturbance footprint for the BLR realignment to address constraints such as land availability, site topography, the existing road network, and power and communications infrastructure.

The proposed BLR realignment (as shown on **Figure 1**):

- Reflects contemporary road safety design guidelines and requirements for intersections with the local road network, including Wybong Road and Roxburgh Road;
- Considers the current road network including other third party upgrades to the BLR / Wybong Road intersection, such that a 100 km / hr speed limit applies;

- Considers the current and future utility of the road in the context of other major project works including for use by Over Size, Over Mass (OSOM) vehicles associated with the NSW Renewable Energy Zone (REZ) projects;
- Facilitates construction works, including required erosion and sediment control measures, water management infrastructure and design cut/fill requirements;
- Allows for the relocation of existing third-party infrastructure including communications and power infrastructure; and
- Avoids mining authorities held by other parties Development of hardstand / stockpile areas for use during construction.

The revised BLR realignment will require the disturbance of approximately 67.5 ha of vegetation in addition to that approved under SSD-5170. The associated construction activities associated with the revised realignment have the potential to result in the generation of dust and GHG emissions, and these matters have been explicitly considered in this assessment.

Air quality assessment

To investigate the potential effects of the Modification on dust emissions, an analysis was undertaken to compare the proposed change in dust levels with those associated with the approved Modification 7 (**Todoroski Air Sciences, 2025**), in order to determine the scale of emissions and potential for air quality impacts.

Construction dust emissions

Construction activity associated with the Modification, have the potential to generate some dust emissions. The construction activities will be temporary as they will occur over an 18-month period and of a much smaller scale compared to the approved mining operations, hence any impacts generated from these activities will be short-term and easily manageable with appropriate mitigation measures.

The potential construction dust emissions for the Modification would be primarily generated from the handling of material, vehicle movements, exhaust emissions from vehicles and plant and windblown dust generated from exposed areas. These activities would be limited to daytime hours typically when atmospheric dispersion conditions are generally favourable.

A summary of the estimated total dust emissions from the Modification is presented in **Table 1**. A detailed dust emissions inventory is presented in **Appendix A**.

Table 1: Summary of estimated dust emission rate for construction activities associated with the Modification

Activity	TSP emission	PM_{10} emission	$PM_{2.5}$ emission
Construction of proposed BLR realignment			
Dozer working	9,067	1,496	952
Loading material to haul truck	1,497	708	107
Hauling to material	32,205	7,369	737
Unloading material	1,497	708	107
Wind erosion of exposed areas/ stockpiles	199,728	99,864	14,980
Grading roads	6,155	2,150	191
Diesel exhaust emissions	1,820	1,820	1,765
Total emissions BLR Construction	**251,968**	**114,115**	**18,839**
Total emissions (kg over 18-months)	**251,968**	**114,115**	**18,839**
Total emissions (kg/yr.) – 12-months	**167,979**	**76,077**	**12,559**

To consider the potential effect of construction dust emissions associated with the Modification, the estimated dust emissions are compared with the levels of dust for the approved Bengalla operations.

A comparison of the estimated total annual dust emissions for Year 8, Year 15 and Year 24 of the approved mining operation (**Todoroski Air Sciences, 2025**) and the construction activities for the Modification are presented in **Table 2**. It is important to note that construction activities will be temporary, occurring over an 18-month period. The Modification's emissions have been compared to all mine year scenarios in order to assess the potential worst case air quality impacts in any given year.

Table 2: Comparison of estimated TSP emission rate for construction activities associated with the Modification

Scenario	TSP emissions (kg/year)[1] (Approved)	Construction activities for the Modification (kg/year)	Percent of approved total dust emissions
Year 8	8,090,126	167,979	2.1%
Year 15	8,812,466	167,979	1.9%
Year 24	9,849,348	167,979	1.7%

[1]Source: **Todoroski Air Sciences (2025)**

It is calculated that the net total annual dust emissions associated with the construction activities for MOD 8 would increase dust emissions by approximately 1.7-2.1% relative to the approved Bengalla operations. This change in dust emissions is relatively minor, noting the construction activities are temporary occurring over an 18-month period, it is not expected to result in any discernible change in air impacts at any sensitive receptor locations.

Construction dust mitigation and management measures

To ensure activities associated with the construction activities for the Modification have a minimal effect on the surrounding environment and at sensitive receptor locations, it is recommended that appropriate dust mitigation measures for construction activities should be implemented where feasible and reasonable as outlined in **Table 3**.

Table 3: Suggested dust mitigation measures for construction activities

Source	Mitigation Measure
Construction activity	Visual monitoring of construction activities is to be undertaken to identify dust generation.
	Activities to be assessed during adverse weather conditions and modified as required (e.g. cease activity where reasonable levels of visible dust cannot be maintained).
	Vehicles and plant are to be fitted with pollution reduction devices where practicable.
	Vehicle traffic is to be restricted to designated routes.
	The extent of exposed surfaces and stockpiles is to be kept to a minimum.
	Exposed areas and stockpiles are either to be covered or are to be dampened with water as far as is practicable if dust emissions are visible, or there is potential for dust emissions outside operating hours.
	Dampen material when excessively dusty during handling.
	Reduce drop heights from loading and handling equipment where practical.
	Engines of on-site vehicles and plant to be switched off when not in use.
	Vehicles are to abide by site speed limits.
	Vehicle loads are covered when transporting material on and off-site.

GHG assessment

The Modification would generate additional Scope 1 GHG emissions (and associated Scope 3 emissions) primarily from the use of diesel-powered equipment during the construction phase and land clearing. Corresponding Scope 3 emissions are attributed to the upstream production and supply of this additional diesel for use on-site associated with the construction.

Table 4 presents the estimated annual diesel requirements for the Modification. Construction activity is scheduled to occur for approximately 60 hours per week (during SSD-5170 construction hours), for 78 weeks assuming utilisation. The hourly fuel consumption is based on available equipment manufacturer data and provides a reasonable estimate for this assessment.

Table 4: Estimated annual diesel requirements for construction of the Modification

Equipment	Quantity	Hours	Fuel consumption (L/hr)	Diesel consumption (kL)
Excavator 45t	1	4,680	43	203
Excavator 30t	1	4,680	35	161
Excavator 25t	1	4,680	19	88
Excavator 20t	1	4,680	19	87
Excavator 12t	1	4,680	12	54
Excavator 7t	1	4,680	7	32
Scraper 627	1	4,680	81	381
Dozer D10	1	4,680	73	343
Dozer D8	1	4,680	44	204
Dozer D6	1	4,680	29	135
Compactor 815	1	4,680	42	197
Compactor 825	1	4,680	67	315
Grader 14	1	4,680	25	116
Roller Smooth Drum	1	4,680	15	71
Roller Pad Foot	1	4,680	15	71
Posi-Track TBC	1	4,680	24	110
Dump Truck 40t	1	4,680	31	143
Dump Truck 30t	1	4,680	23	106
Concrete Pump Boom Pump	1	4,680	31	143
Crane Franner	1	4,680	19	91
Watercart Artic	1	4,680	150	702
Watercart 6,500>10,000 Road Watercart	1	4,680	150	702
On road Truck 12t Rigid	1	4,680	31	143
On road Truck & Trailer 32t Truck & Trailer	1	4,680	23	106
			Total	**4,701**

The GHG assessment for the Modification has considered the guidance in the *NSW Guide for Large Emitters* (**NSW EPA, 2025**) and incorporates updated emissions factors sourced from the *National Greenhouse Accounts Factors* (NGA Factors) document (**Cth DCCEEW, 2024a**) and *Greenhouse Gas Assessment Workbook for Road Projects* (**TAGHG, 2013**) (TAGG Workbook).

The **TAGG Workbook (2013)** outlines a process for calculating GHG emissions linked to the loss of carbon sequestration when vegetation is cleared for projects. It applies broad assumptions that will overstate emissions, including:

- All carbon pools (including biomass, debris, and soil) are removed during vegetation clearance;
- All carbon removed is fully converted to CO_2 and released into the atmosphere; and,
- Any future carbon uptake from revegetation works is excluded from the calculation.

As such, applying this method adopts a conservative approach that will overestimate the actual emissions associated with the proposed vegetation clearing methodology. The methodology estimates emissions based on the carbon stored in vegetation at the time of clearing and the additional carbon that would have been sequestered if the vegetation remained intact.

To calculate GHG emissions from land clearing, vegetation was assumed to include "Class D Open Woodlands" and "Class I Grassland" using a biomass class of "Class 3: 100-150 (tonnes of dry matter per hectare)", based off ecological field assessments undertaken by SLR for the Modification.

The proposed works will require the disturbance and clearance of approximately 64 hectares of native vegetation. The land clearing has been distributed across the construction timeline to reflect the anticipated program, with construction in financial year (FY) FY26 assumed to occur over 12 months, and construction in FY27 expected to extend for 6 months. Based on this schedule, approximately 26.3 ha of open woodland will be cleared in FY26 and 13.2 ha in FY27, while approximately 16.3 ha of grassland will be cleared in FY26 and 8.2 ha in FY27.

The emission factors used are summarised in **Table 5**.

Table 5: Summary of emission factors

Type	Energy content factor	Emission factor			Units	Scope
		CO_2	CH_4	N_2O		
Diesel	38.6	69.9	0.1	0.2	kg CO_2-e/GJ	1
		17.3	-	-		3
*Land clearing (Open woodland)	-	307	-	-	t CO_2-e/ha	1
*Land clearing (Grassland)	-	110	-	-	t CO_2-e/ha	1

Note: kg = kilogram, GJ = gigajoule, t = tonne, ha = hectare, CO_2 = Carbon Dioxide, CH_4 = Methane and N_2O = Nitrous Oxide
*Source: **TAGHG Workbook (2013)**

As discussed, since construction is expected to last 18 months, the first financial year of construction (FY26) is assumed to cover 12 months (52 weeks), while the subsequent financial year (FY27) is assumed to cover a full 6 months (26 weeks).

Table 6 presents the estimated annual carbon dioxide equivalent (CO_2-e) emissions for the Modification during each financial year for the construction timeline.

Table 6: Summary of CO_2-e emissions for the Modification (t CO_2-e)

Period	Scope 1	Scope 3
	Construction	Construction
FY26	18,373	2,093
FY27	9,187	1,046

During FY26 and FY27, when the construction phase is anticipated to occur, GHG emissions are expected to result in a maximum 18,373 t CO_2-e (Scope 1) which remains below the threshold of 25,000 t CO_2-e in accordance with the *NSW Guide for Large Emitters* (**NSW EPA, 2025**).

For context, Australia's estimated annual GHG emissions up to June 2024 was 440.6 Mt CO_2-e (**Cth DCCEEW, 2024b**). In comparison, the maximum annual Scope 1 emissions of 0.02Mt CO_2-e (Scope 1) for the Modification equate to approximately 0.004 per cent (%) of the national emissions. At the state level, the NSW GHG emissions for 2022 were 111.0 Mt CO_2-e (**Cth DCCEEW, 2025**), making the Modification contribution approximately 0.02% of state emissions.

While the TAGG Workbook methodology has been applied to quantify potential GHG emissions from vegetation clearing, existing Bengalla rehabilitation management practices will substantially reduce the actual emissions profile of the Modification. Cleared vegetation will be retained at Bengalla and repurposed for rehabilitation, rather than being removed for disposal or combusted. As noted in the

TAGG Workbook, "*where vegetation is reused or left to decompose naturally on site, the rate at which GHG are emitted is very slow and considered negligible*". Additionally, a significant proportion of the temporary BLR disturbance footprint will be progressively rehabilitated following completion of construction activities, with only the permanent road infrastructure remaining cleared. As these rehabilitated areas mature, they will progressively sequester atmospheric carbon and restore the site's carbon sink functionality, thereby offsetting a substantial portion of the emissions.

When considering these site-specific mitigation measures, particularly the negligible emission rate from on-site vegetation decomposition and the carbon sequestration benefits of progressive rehabilitation, the actual net GHG impact is expected to be substantially lower than the estimate presented. The calculated emissions represent a worst-case scenario that does not account for the offsetting benefits of the proposed vegetation management and rehabilitation strategy.

The Modification's GHG emissions are considered immaterial, contributing only a negligible increment to national and global totals. Given the cumulative and globally mixed nature of GHG emissions, no measurable local climate effects can be directly attributed to the Modification.

Summary and Conclusions

The construction activities associated with the Modification are predicted to approximately 1.7-2.1% more dust relative to the approved Bengalla. This change is within the modelling accuracy and the normal variation which naturally occurs in background dust levels daily or between years.

It is concluded that the Modification will not result in any discernible additional impact above that presented in **Todoroski Air Sciences (2013)** and subsequent modification reports. Nevertheless, appropriate dust management measures will be implemented during the construction phase to minimise potential air emissions.

The GHG emissions associated with the Modification will see an increase in Scope 1 emissions due to the construction activity, however this increase will be temporary in nature. Overall, the GHG emissions are determined to be minor when compared to emissions at both the national and state levels.

Please feel free to contact us if you would like to clarify any aspect of this report.

Yours faithfully,
Todoroski Air Sciences





Emilie Aragnou

Philip Henschke

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"Australia's emissions projections 2024" prepared by the Department of Climate Change, Energy, the Environment and Water [DCCEEW], November 2024.

Commonwealth Department of Climate Change, Energy, the Environment and Water (2025)

State and Territory greenhouse gas inventories: 2022 emissions - Department of Climate Change, Energy, the Environment and Water [DCCEEW] website, Accessed January 2025. https://www.dcceew.gov.au/climate-change/publications/national-greenhouse-accounts-2022/state-and-territory-greenhouse-gas-inventories-2022-emissions

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NSW EPA (2025)

"NSW Guide for Large Emitters: Guidance on how to prepare a greenhouse gas assessment as part of NSW environmental planning processes", NSW Environment Protection Authority, January 2025.

TAGHG (2013)

"Greenhouse Gas Assessment Workbook for Road Projects", Transport Authorities Greenhouse Group, February 2013.

Todoroski Air Sciences (2025)

"Air Quality Assessment – Bengalla Temporary Overburden Emplacement Area (TOEA)", prepared for Xenith by Todoroski Air Sciences, February 2025.

Appendix A – Emission Calculations

Table A-1: Construction emissions

Activity	TSP emission	PM10 emission	PM2.5 emission	Intensity	Units	EF - TSP	EF - PM10	EF - PM25	Units	Var 1	Units	Var 2	Units	Var 3	Units	Var 4 - TSP	Var 4 - PM10	Var 4 - PM25	Units	Var 5	Units	Var 6	Units	Control Factor
BLR																								
Dozer working on BLR	9,067	1,496	952	2,496	hr/yr	3.6327	0.5992	0.3814	kg/h	2.8	S.C. %	2	M.C %											
Loading material to haul truck	1,497	708	107	1,116,000	t/yr	0.0013	0.0006	0.0001	kg/t	1.133	Ave(WS/2.2)^1.3 (m/s)	2	M.C %											
Hauling to material to BLR	32,205	7,369	737	1,116,000	t/yr	0.1924	0.0440	0.0044	kg/t	209	t/load	281	Vehicle gross (t)	10.0	km/rt	4.0	0.9	0.1	kg/VKT	2.8	S.C %	85	% C	Watering
Unloading material at BLR	1,497	708	107	1,116,000	t/yr	0.0013	0.0006	0.0001	kg/t	1.133	Ave(WS/2.2)^1.3 (m/s)	2	M.C %											
Wind erosion of exposed areas/ stockpiles (BLR)	199,728	99,864	14,980	76	ha	5,256	2,628	394	kg/ha/yr	13,140	hours											50	% C	Watering
Grading roads at BLR	6,155	2,150	191	10,000	km/y	1	0.2	0.02	kg/VKT	8	speed of graders (km/h)													
Diesel exhaust emissions	1,820	1,820	1,765																					
Total emissions (kg/yr)	**251,968**	**114,115**	**18,839**																					

Appendix C
Noise Impact Assessment

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BENGALLA MINE

MODIFICATION 8

NOISE IMPACT ASSESSMENT

REPORT J0254-26-R1
30 OCTOBER 2025

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TABLE OF CONTENTS

1 INTRODUCTION 2
1.1 Environmental Noise Policies 2
2 NOISE CRITERIA 4
2.1 BLR Traffic Noise 4
2.2 Construction Noise 4
3 ASSESSMENT 4
3.1 Existing Traffic Flows 5
3.2 Traffic Noise Survey 5
3.3 Traffic Noise Model 6
3.4 Predicted Traffic Noise Levels 7
3.5 Construction of the BLR Realignment 7
4 CONCLUSION 8
5 REFERENCES 8
APPENDIX A – NOISE CONTOUR FIGURES – REALIGNED BLR 9
APPENDIX B – NOISE SURVEY DETAILS 11
APPENDIX C – INSTRUMENT CALIBRATION CERTIFICATES 21

1 INTRODUCTION

Bengalla Mining Company Pty Limited (BMC) operates Bengalla Mine (Bengalla), an open cut coal mine located in the Upper Hunter Valley of NSW. Bengalla is approved by State Significant Development (SSD) 5170 (as modified) granted under Part 4 of the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act). BMC is proposing to lodge an application to modify SSD-5170 under Section 4.55(2) of the EP&A Act to adjust the disturbance footprint for the Bengalla Link Road (BLR) as described in the *Continuation of Bengalla Mine Environmental Impact Statement* (Bengalla EIS) (Hansen Bailey, 2013) to facilitate construction activities. Construction of the BLR realignment will require the disturbance of approximately 67.5 ha of vegetation in addition to that approved under SSD-5170.

The Bengalla EIS described the realignment of the BLR (Approved BLR Realignment), which established an 80 kilometre/hour (km/hr) speed limit at the northern section of the road leading to its intersection with Wybong Road. Since the determination of SSD-5170, the development of Mount Pleasant Mine has subsequently involved upgrades to the existing BLR/Wybong Road intersection where a 100 km/hr speed limit now applies. In addition, the detailed design process has resulted in adjustments to the approved disturbance footprint for the BLR realignment to address constraints such as land availability, site topography, the existing road network, and power and communications infrastructure.

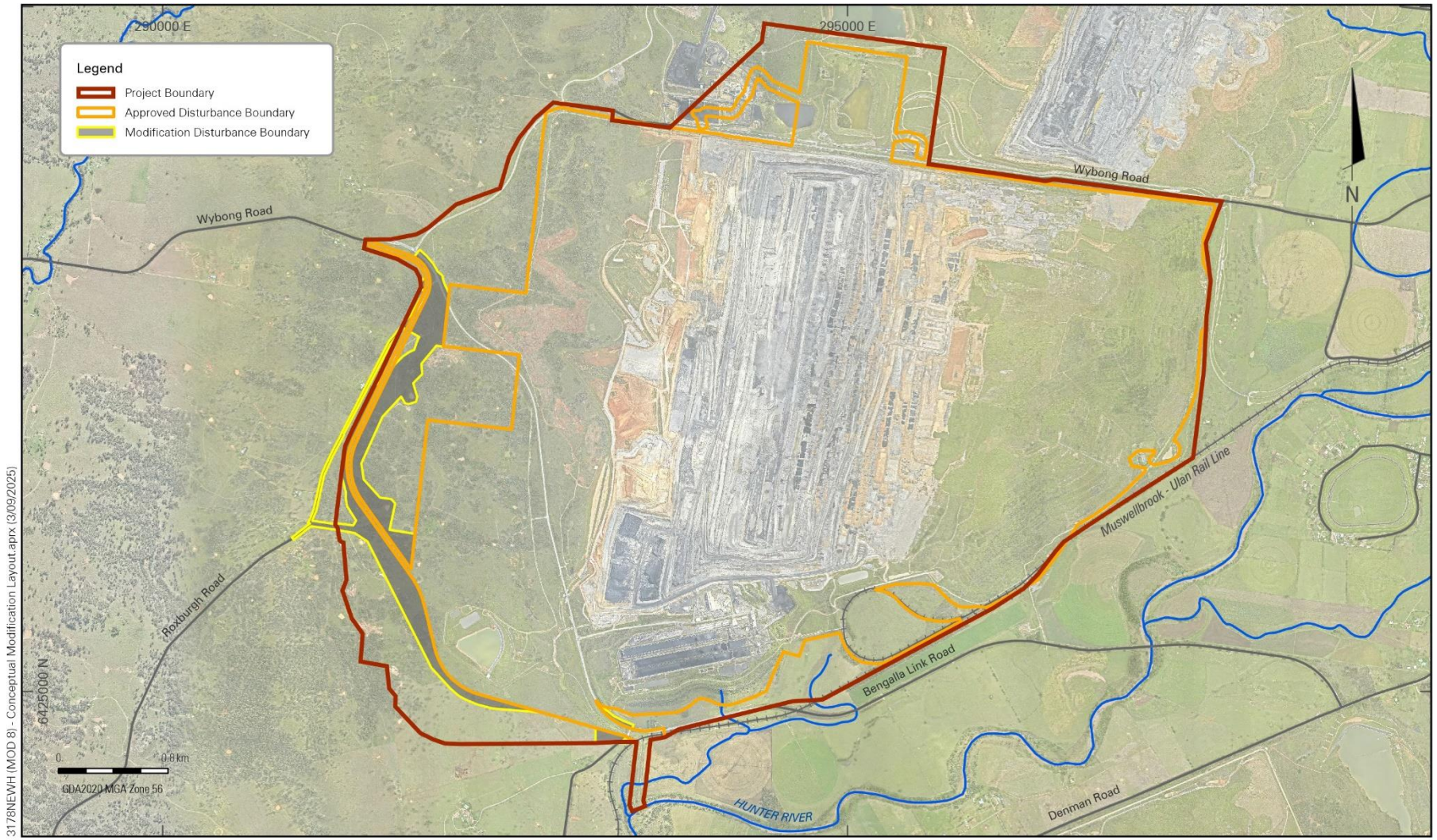
The proposed BLR realignment is shown on **Figure 1**.

This report was commissioned by Xenith Consulting (Xenith) on behalf of BMC to assess and report on environmental noise levels from the proposed Modification.

1.1 Environmental Noise Policies

The NSW government has developed or adopted policies and recommended procedures to assess environmental noise levels from various noise source categories. The following policy documents are relevant to this assessment:

- The *NSW Road Noise Policy* (RNP) (EPA, 2011) includes recommended traffic noise criteria for highways and other road categories, for various situations including additional traffic due to proposed developments or projects;
- The *Interim Construction Noise Guideline* (ICNG) (EPA, 2009) includes recommended construction hours, quantitative noise management levels and qualitative methods to assess construction noise impacts to receptors; and
- The *Draft Construction Noise Guideline* (dCNG) (EPA, 2020) contains draft amendments to the ICNG and was prepared for public review and comments. Differences between the ICNG and the dCNG are relatively minor with similar recommended construction noise management levels. An assessment to the ICNG is therefore considered appropriate in the absence of a finalised guideline based on the dCNG.



BENGALLA MINE MOD 8

Conceptual Modification Layout

FIGURE 1

2 NOISE CRITERIA

Noise from the Modification is assessed to the most appropriate noise criteria for each source type, with road traffic noise and construction noise sources assessed separately.

2.1 BLR Traffic Noise

Section 2.3 of the RNP specifies road traffic noise criteria from public roads to both residential and non-residential land uses. For existing residences affected by noise from new road corridors, which is the most relevant situation considered in the RNP, the RNP recommends:

- 55 LAeq,15hr during the day (7 am to 10 pm) and 50 LAeq,9hr during the night (10 pm to 7 am) from arterial and sub-arterial roads to 1 m from the external façade of residences; and
- 55 LAeq,1hr during the day and 50 LAeq,1hr during the night from local roads to 1 m from the external façade of residences.

The BLR could be classified as either a sub-arterial or a local road. Noise criteria are not strongly affected by the road classification, differing only by the one hour or period averaging time. This assessment considers the BLR is more correctly considered a sub-arterial road and adopts noise criteria of 55 LAeq,15hr during the day and 50 LAeq,9hr during the night. These criteria apply 1 m from the external façade of a residence.

2.2 BLR Construction Noise

The ICNG recommends a quantitative construction noise assessment for potentially significant projects.

Table 2 of the ICNG recommends the following construction noise management levels are applied during normal construction hours of 7 am to 6 pm Monday to Friday and 8 am to 1 pm Saturday:

- A Noise Affected level set 10 dBA above the Rating Background Level (RBL). The noise affected level represents the point above which there may be some community reaction to noise. Predicted construction noise over this level triggers a recommendation that all feasible and reasonable mitigation measures be applied during the construction period; and
- A Highly Noise Affected level set at 75 LAeq. The highly affected level represents the point above which there may be a strong community reaction to noise and requires consideration of respite periods considering community feedback regarding sensitive times in each day and other relevant factors.

Previous Bengalla environmental noise assessments have indicated a RBL of 30 LA90,15min applies during the day, evening and night at all receptors in the vicinity of the BLR. A noise affected level of 40 LAeq,15min has therefore been adopted for this assessment.

Should construction work occur outside the normal construction hours, the ICNG recommends a noise affected level of 5 dBA above the RBL or 35 LAeq,15min. This is equivalent to the SSD-5170 noise criterion for all receptors near the BLR.

3 ASSESSMENT

The existing BLR carries traffic to rural areas north-west of Muswellbrook and to Bengalla, Mount Pleasant Mine and Mangoola Mine. Mine-related traffic is expected to result in different daily traffic patterns and percentage of vehicle types compared to other rural roads. The assessment therefore included a noise survey to determine traffic noise levels from the existing BLR and detailed noise modelling to predict traffic noise levels at potentially affected residences near the realigned BLR.

3.1 Existing Traffic Flows

Traffic flows on the BLR and other nearby roads were surveyed by others during the period 2016 to 2020 (Bitzios Consulting, 2020). An average of 1680 vehicles per day including 11% heavy vehicles was measured on the BLR north of the Bengalla site access road.

As this assessment includes detailed traffic noise measurements with current traffic flows, average traffic flows in previous years are not critical to the assessment. However, the percentage of heavy vehicles on the northern section of the BLR from Bitzios Consulting (2020) was adopted for this assessment.

3.2 Traffic Noise Survey

Traffic noise levels from the existing BLR were measured using an unattended noise monitor from 7 am 27 November to 7 am 13 December 2024, a period of 16 days. The monitor was a Svan 957 Class 1 sound level meter fitted with a 12.7 mm condenser microphone and a windshield. The sound meter was housed in a weather resistant case with the microphone attached via an extension cable and mounted approximately 1.5 m above the ground. The case and microphone were contained within a security cage chained to a tree.

The noise monitor was installed on the south-western side of the existing BLR approximately 17 m from the centre of the road, 785 m south of the Roxburgh Road intersection and 1060 m south of the Wybong Road intersection.

As the ground under the microphone was approximately 1 m above the road pavement, the microphone was located approximately 2.5 m above the road pavement. Traffic on this section of the BLR was free-flowing with a speed limit of 100 km/hr and an approximate road gradient of 5 in 300 or 1.7%.

The noise monitor was programmed to measure and store 10-second 1/3 octave LAeq spectra over the audible frequency range 20 Hz to 20 kHz. Results from the noise monitor were subsequently analysed to:

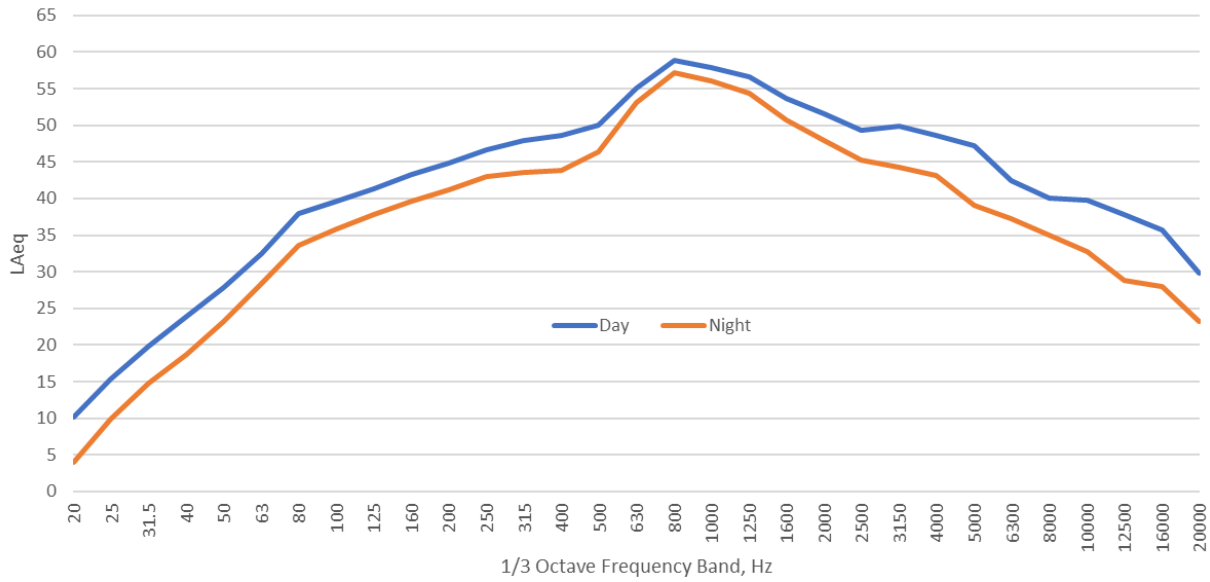
- Identify and remove data affected by wind, rain or other atypical sources. High wind speeds and rain were identified based on data from Bengalla's weather station which measures wind speeds at the standard height of 10 m above the ground. Wind speeds at microphone height were significantly lower and rarely affected measured noise levels;
- Separate remaining data by day (7 am to 10 pm) and night (10 pm to 7 am) periods; and
- Calculate 1/3 octave Leq traffic noise spectra for the day and night averaged over the entire 16 day monitoring period.

Appendix B contains photographs of the noise monitor and daily noise level charts for the 16 day monitoring period.

Monitor calibration was checked before and after the survey using a Svan SV-36 Class 1 acoustic calibrator which produced 94 dB at 1 kHz. Each reading was within 0.2 dB of the 94 dB calibrator signal which is within the allowable tolerance for a Class 1 sound meter. Instrument calibration certificates for the sound level meter and calibrator are attached to this report in **Appendix C**.

Total measured traffic noise levels were 65 LAeq,day and 63 LAeq,night at 17 m from the centre of the existing BLR. **Figure 2** shows the measured average day and night spectra at the noise monitor near the existing BLR alignment, shown as dBA spectra rather than the more common dBL to highlight the dominant frequencies produced by traffic. The spectra indicate traffic produces dominant noise in the frequency range 500 to 2000 Hz. Some noise in the higher frequency bands is likely to have been produced by insects or birds, however the contribution from insects and birds is relatively minor and the spectra have not been corrected for these sources.

Figure 2: Measured Day and Night LAeq Spectra, Existing BLR



3.3 Traffic Noise Model

Traffic noise from the realigned BLR was predicted using a software-based model of the road alignment, topography, residence locations and other relevant details. RTA Technology's Environmental Noise Model (ENM) was used to calculate noise contours from the realigned BLR using the following input parameters:

- Terrain elevation based on supplied topographic data for the road alignment and the surrounding area;
- Terrain type set to 'asphalt' for the road surface and 'rough pasture' for all other land;
- Traffic noise sources spaced at 10 m intervals along the road alignment and divided into separate sources 0.5 m and 3.5 m above the road surface to represent combined tyres/engines/car exhausts and elevated truck exhausts;
- 11% heavy vehicles included in the vehicle mix with elevated exhausts producing approximately 25% of total heavy vehicle noise concentrated in the frequency range 20 to 125 Hz;
- Total source sound power per 10 m of road, from combined 0.5 m and 3.5 m sources, was adjusted to coincide with the measured day and night 1/3 octave spectra shown in Figure 1 at 17 m from the road; and
- Atmospheric conditions including 25 °C, 70% relative humidity, no wind and no vertical temperature gradient. Winds and temperature gradients are expected to have a minor effect on traffic noise levels over the relatively short distances to nearest receptors, particularly when average noise levels are calculated, and have not been considered in detail.

No correction for road gradient was applied to the modelled sound power levels as the existing BLR alignment has a gradient of approximately 1.7% in the vicinity of the noise monitor and the realigned BLR would have a similar gradient of approximately 1.8% in the vicinity of closest receptors. Similarly, no corrections for road surface, traffic speed or other factors affecting traffic noise levels were required.

3.4 Predicted Traffic Noise Levels

Table 1 shows predicted traffic noise levels to the closest and potentially most affected privately owned receptors near the realigned BLR. Receptor locations in relation to the realigned BLR are shown in the noise contour figures in **Appendix A**.

Table 1: Predicted Traffic Noise Levels, Realigned BLR, LAeq,period

Receptor	Predicted Traffic Noise Level, LAeq,period	
	Day 7 am – 10 pm	Night 10 pm – 7 am
152	40	38
154	34	32
156	42	40
Criteria	55 LAeq,15hr	50 LAeq,9hr

Table 1 indicates the realigned BLR is expected to produce traffic noise levels within relevant noise criteria at all privately owned receptors. No traffic noise mitigation measures are recommended for this component of the Modification.

Receptor 168 is located north-west of the realigned BLR and Wybong Road intersection. This receptor is expected to receive similar traffic noise levels from the realigned BLR as it is located near a section of the BLR that is proposed to remain in its current alignment.

Receptors 153 and 156 are located further from the realigned BLR and are predicted to remain well outside the 35 LAeq,period noise contour from the realigned BLR. All other privately owned receptors near Bengalla are also expected to receive less than 35 LAeq,period from the realigned BLR.

3.5 Construction of the BLR Realignment

BLR realignment works are expected to require approximately 18 months to complete including the following major construction phases:

- Bulk earthworks including a fleet of earthmoving machines such as a dozer, excavator, posi-track, trucks, grader and roller, for an estimated worst case sound power level of 117 LAeq assuming all machines operating simultaneously;
- Road base, shoulder and drain construction requiring a fleet of machines such as an excavator, backhoe, posi-track, trucks, scraper, compactor, crane, concrete pump, grader and roller, for an estimated total sound power level of 111 dBA;
- Road pavement construction requiring aggregate and asphalt trucks, posi-track with a road brush and rollers, with an estimated total sound power level of 110 dBA;
- Road furniture installation and line-marking requiring medium trucks, a posi-track with a post hole digger and various hand tools, with a combined sound power level of 106 LAeq; and
- Rehabilitation of disturbed areas requiring mulch/seed trucks and spreaders, a water truck and perhaps a skid-steer loader, with a combined sound power level of 109 LAeq.

The construction fleet would progress along the road alignment during each phase. Construction work would therefore occur close to each receptor for only part of each construction phase. Table 2 shows predicted construction noise levels for each phase, based on the estimated sound power levels listed above and the closest distance from the road alignment to each potentially affected receptor.

Table 2 indicates predicted worst-case construction noise levels are likely to exceed the noise affected level of 40 LAeq,15min at closest receptors. Accordingly, the BMC Noise Management Plan should be revised to consider noise management measures to minimise construction noise levels, particularly during prevailing weather conditions. The plan should at least include the following:

- Description of the works, equipment to be used and expected duration of separately identifiable tasks or works components;
- Noise mitigation and management measures to be applied to equipment, work practices, working hours and other relevant details;
- Expected construction noise levels at potentially affected receptors with the proposed noise mitigation and management measures in place;
- Contact details for any community enquiries or complaints regarding noise or other environmental issues; and
- Complaints tracking and handling procedures with a focus on prompt, sympathetic responses to complaints and identification of any changes that can be made to construction machines or processes to minimise noise or other environmental issues.

Table 2: Predicted BLR Realignment Construction Noise Levels, LAeq,15min

Receptor	Closest Distance, m	Predicted Construction Noise Level, LAeq,15min				
		Bulk earthworks 117 dBA	Road base 111 dBA	Pavement 110 dBA	Road furniture 106 dBA	Rehabilitation 109 dBA
152	570	54	48	47	43	46
154	570	54	48	47	43	46
156	410	57	51	50	46	49
ICNG Criteria		Noise Affected Level 40 LAeq,15min Highly Noise Affected Level 75 LAeq,15min				

4 CONCLUSION

This assessment has shown the proposed Modification to SSD-5170 is unlikely to result in any exceedances of the SSD-5170 noise criteria at any receptor.

Traffic noise from the realigned BLR is expected to meet relevant noise criteria. Construction of the BLR realignment is likely to exceed the noise affected level recommended in the ICNG at the four closest receptors. The existing Noise Management Plan is recommended to be revised to include proposed noise mitigation measures for construction activities to result in the lowest construction noise levels that can be reasonably achieved.

Based on the results in this assessment, the proposed Modification is considered acoustically acceptable.

5 REFERENCES

NSW Road Noise Policy (RNP) (EPA, 2011)

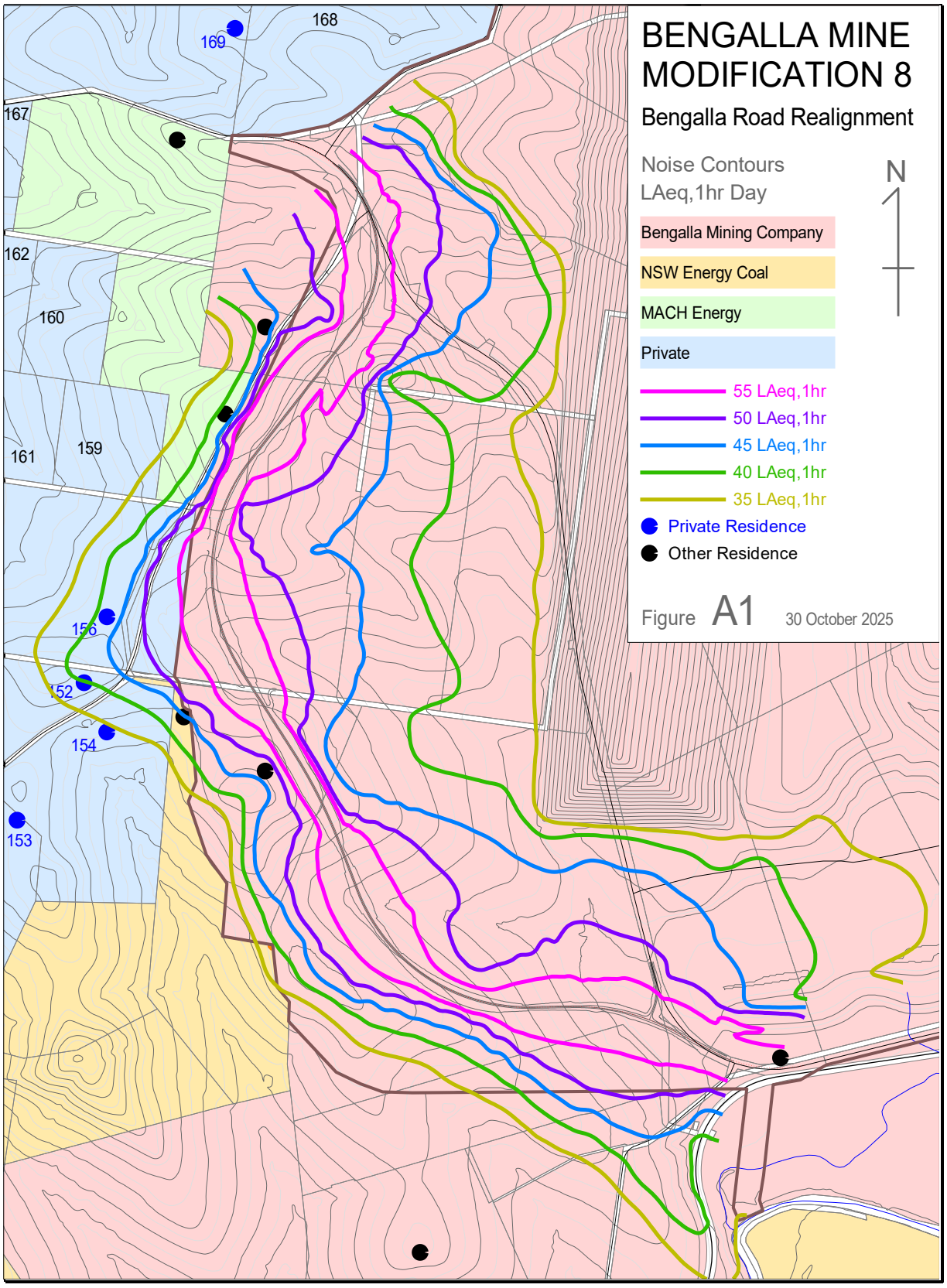
Interim Construction Noise Guideline (ICNG) (EPA, 2009)

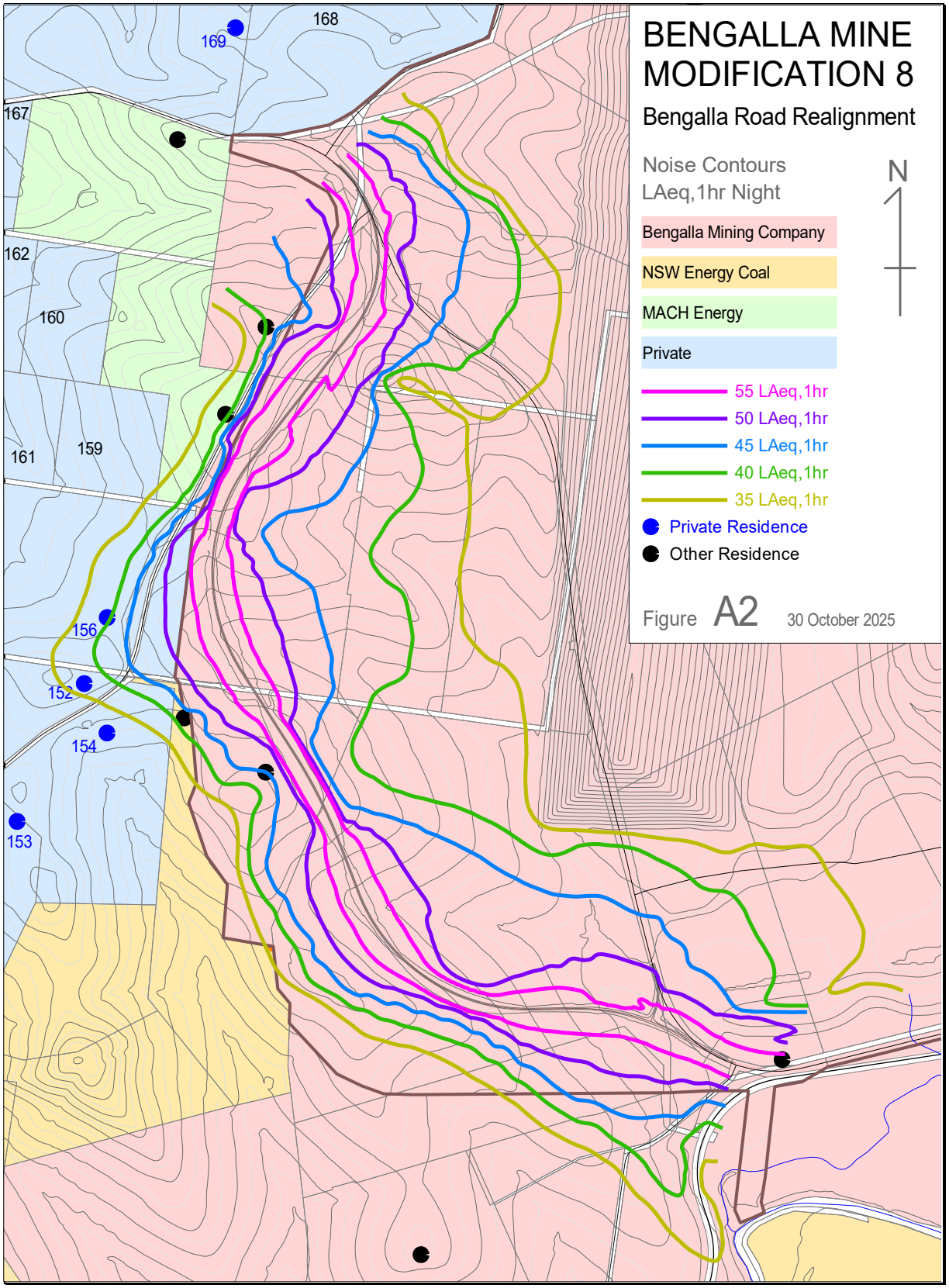
Draft Construction Noise Guideline (dCNG) (EPA, 2020)

State Significant Development (SSD) 5170

Muswellbrook Mine Affected Roads Network Plan Review (Bitzios Consulting, 2020)

APPENDIX A – NOISE CONTOUR FIGURES – REALIGNED BLR




BENGALLA MINE MODIFICATION 8
Bengalla Road Realignment
Noise Contours
LAeq,1hr Night
N
Bengalla Mining Company
NSW Energy Coal
MACH Energy
Private
55 LAeq,1hr
50 LAeq,1hr
45 LAeq,1hr
40 LAeq,1hr
35 LAeq,1hr
Private Residence
Other Residence
Figure A2
30 October 2025
168
169
167
162
160
161
159
156
152
154
153

APPENDIX B – NOISE SURVEY DETAILS



View looking approximately north-east from the monitor past the existing BLR



View looking approximately east from the monitor past the existing BLR

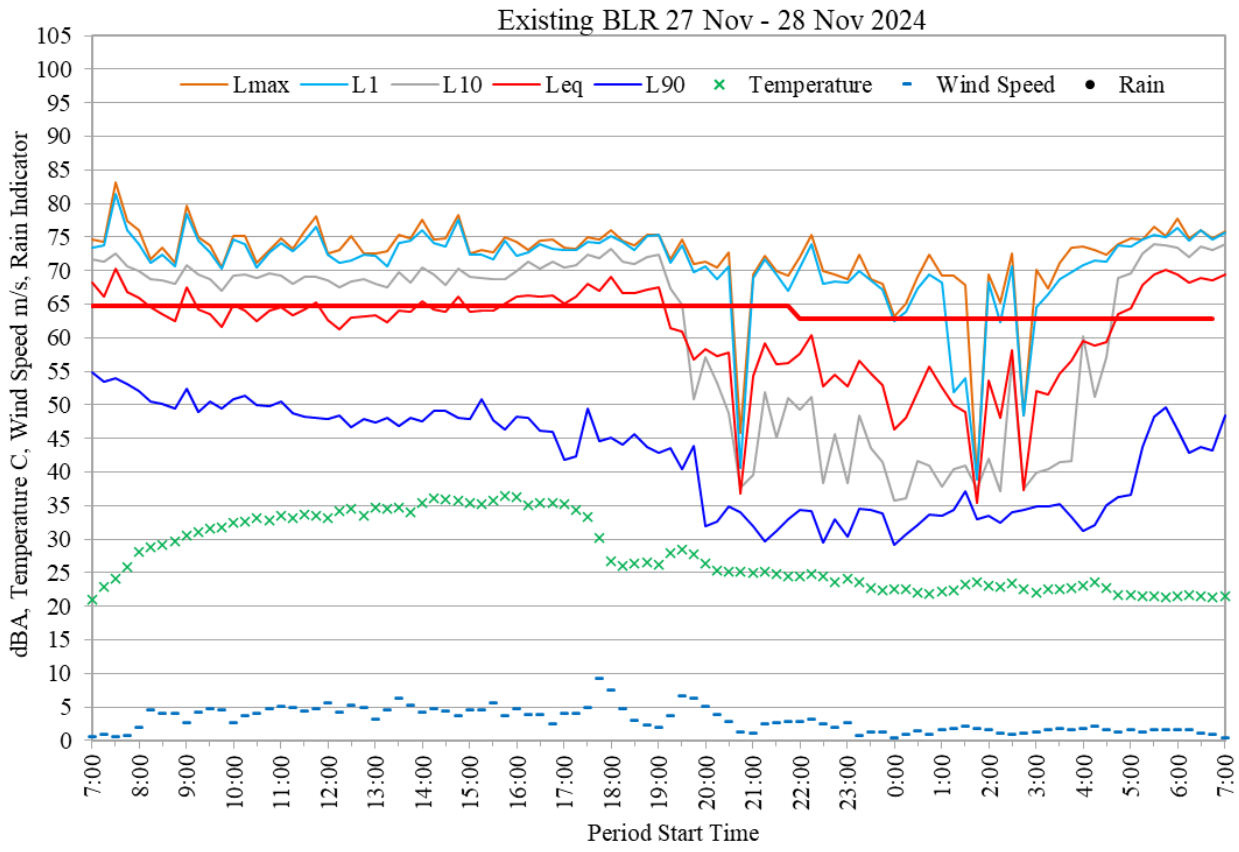


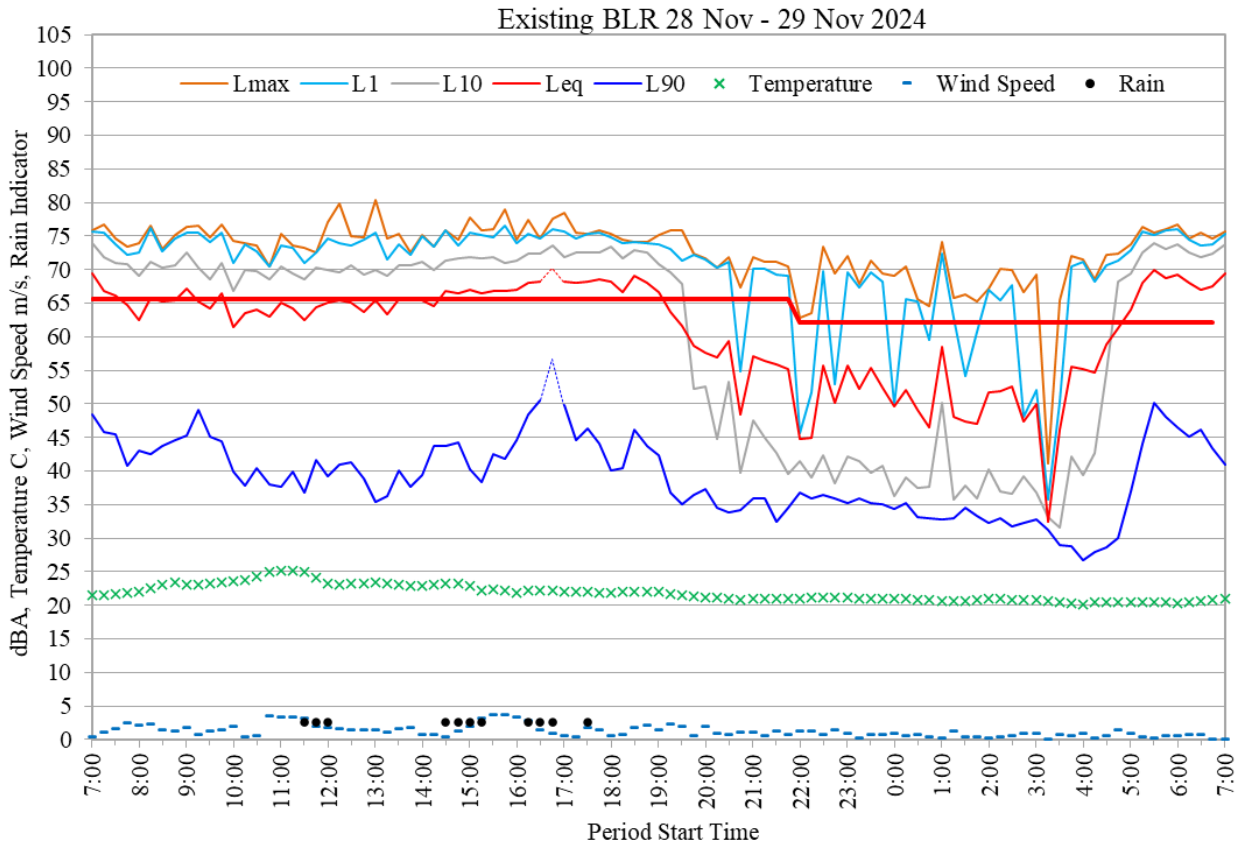
View looking approximately south-west towards the monitor

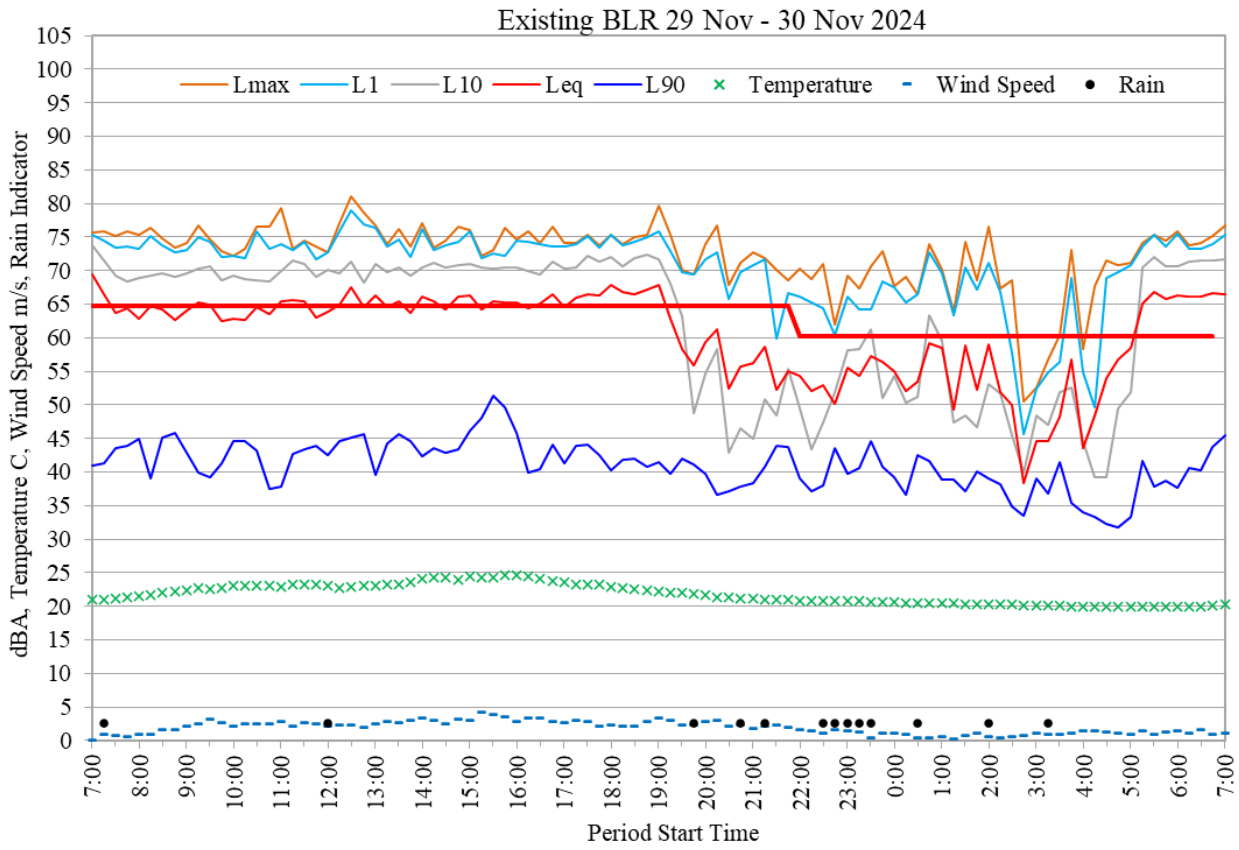
Following are daily noise level charts, each starting at 7 am which is the start of the day period, showing the following data in 15 minute intervals:

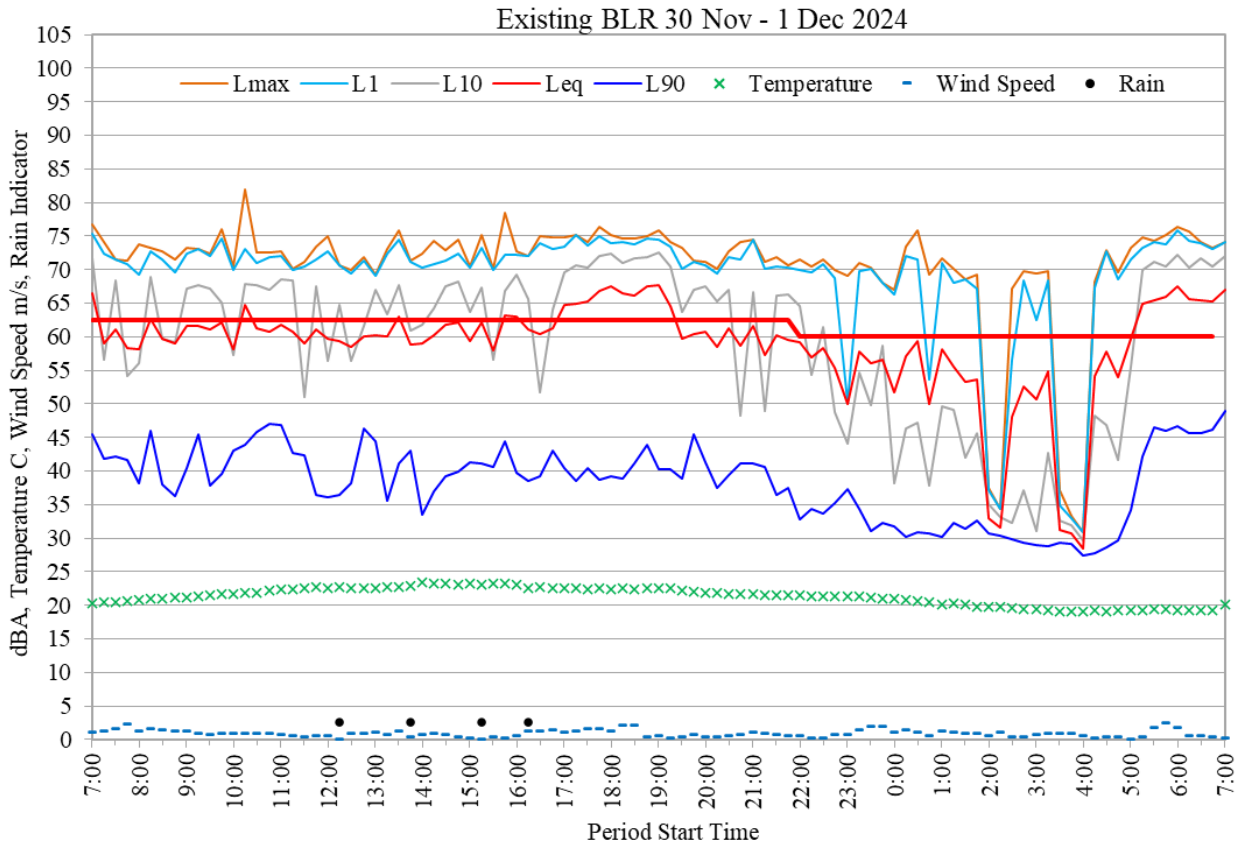
- Maximum noise level LAmax;
- Average maximum level LA1;
- Loudest 10% level LA10;
- Average level LAeq and the average day and average night LAeq levels;
- Average minimum level LA90;
- Air temperature ℃;
- Wind speed m/s; and
- An indicator showing if any rain was measured during that period.

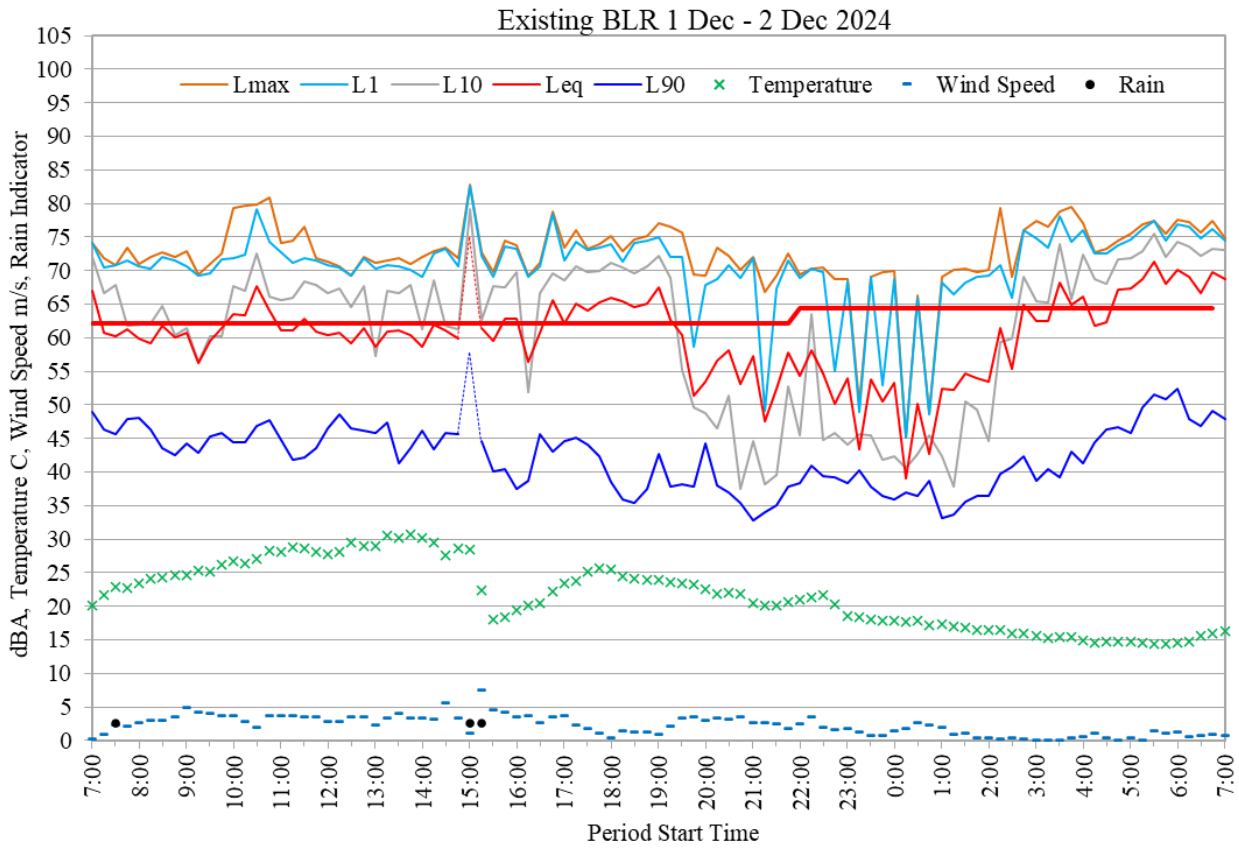
Lighter sections of the LAeq and LA90 lines in each chart indicate noise data deleted due to wind, rain or interference from other atypical sources.

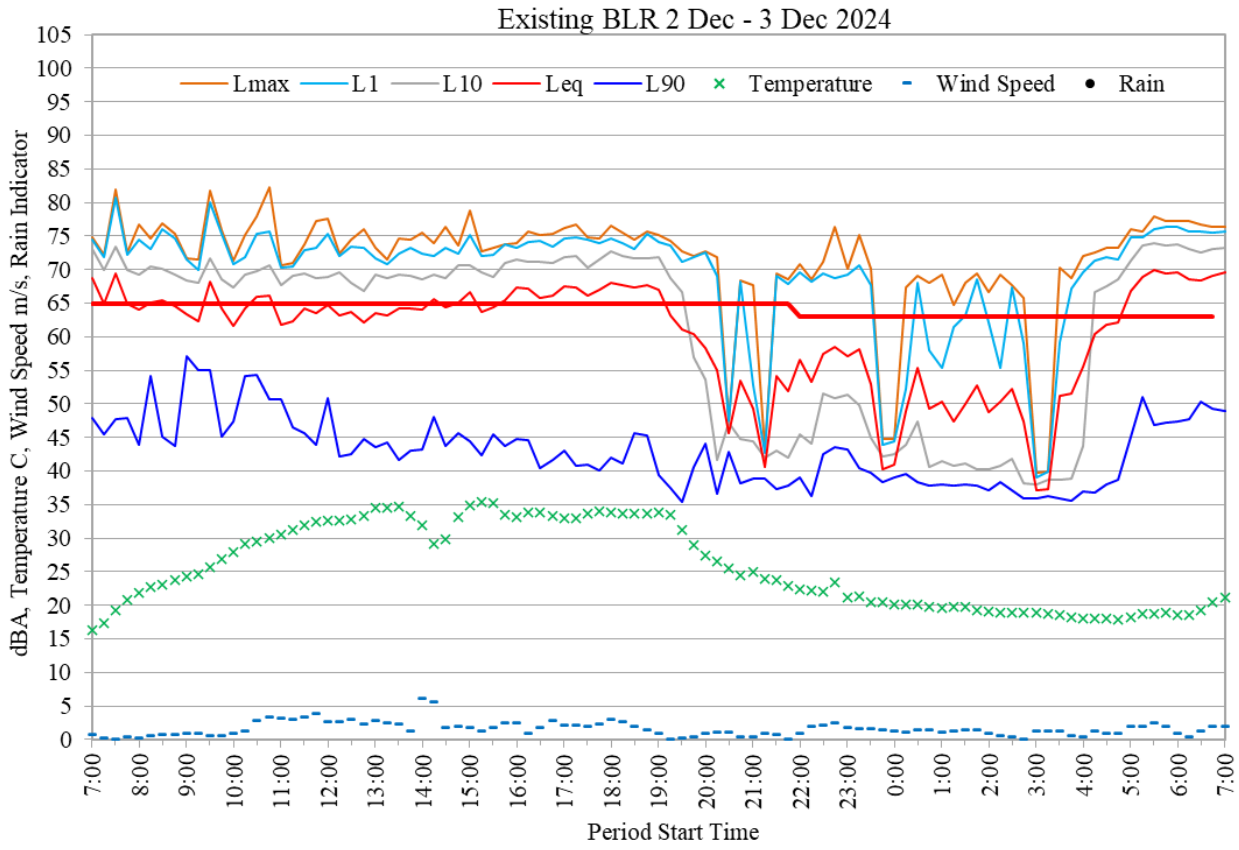

Existing BLR 27 Nov - 28 Nov 2024
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time

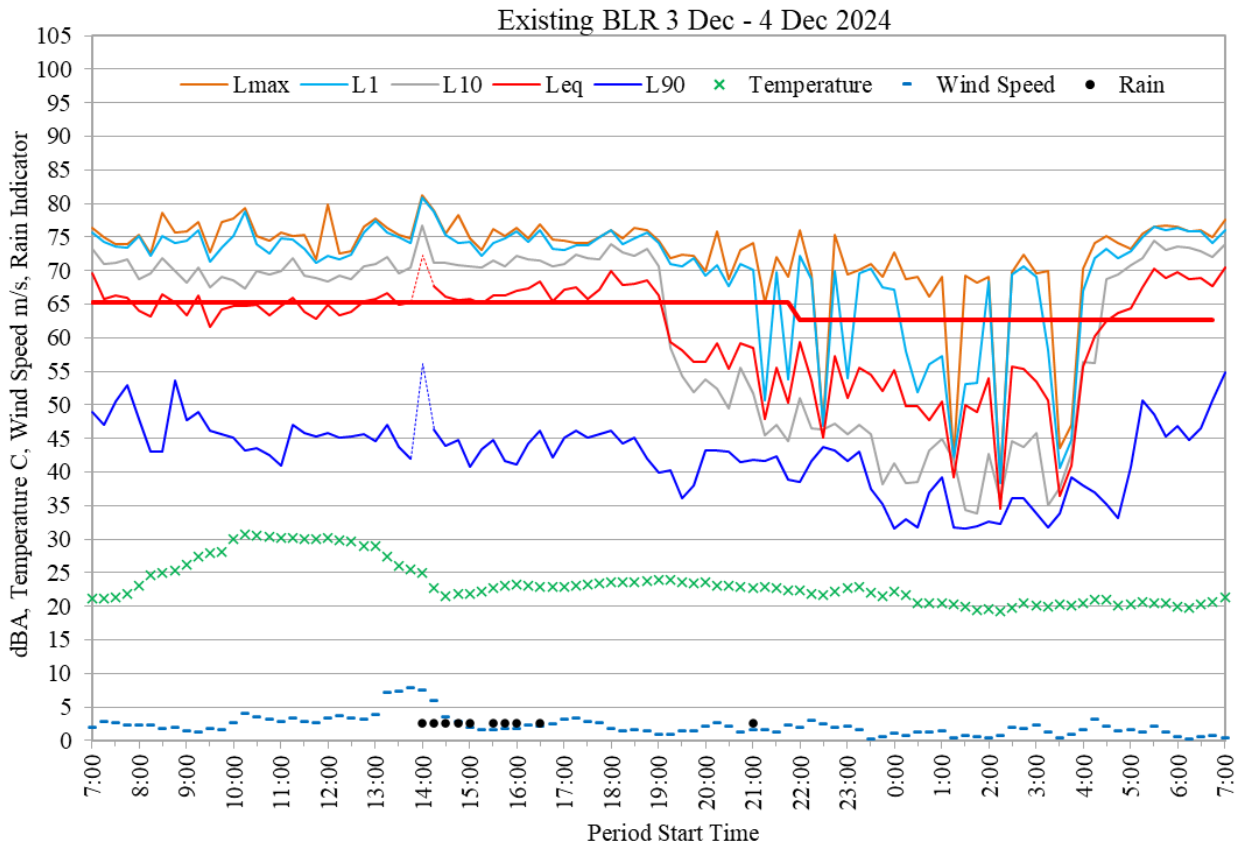

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Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time

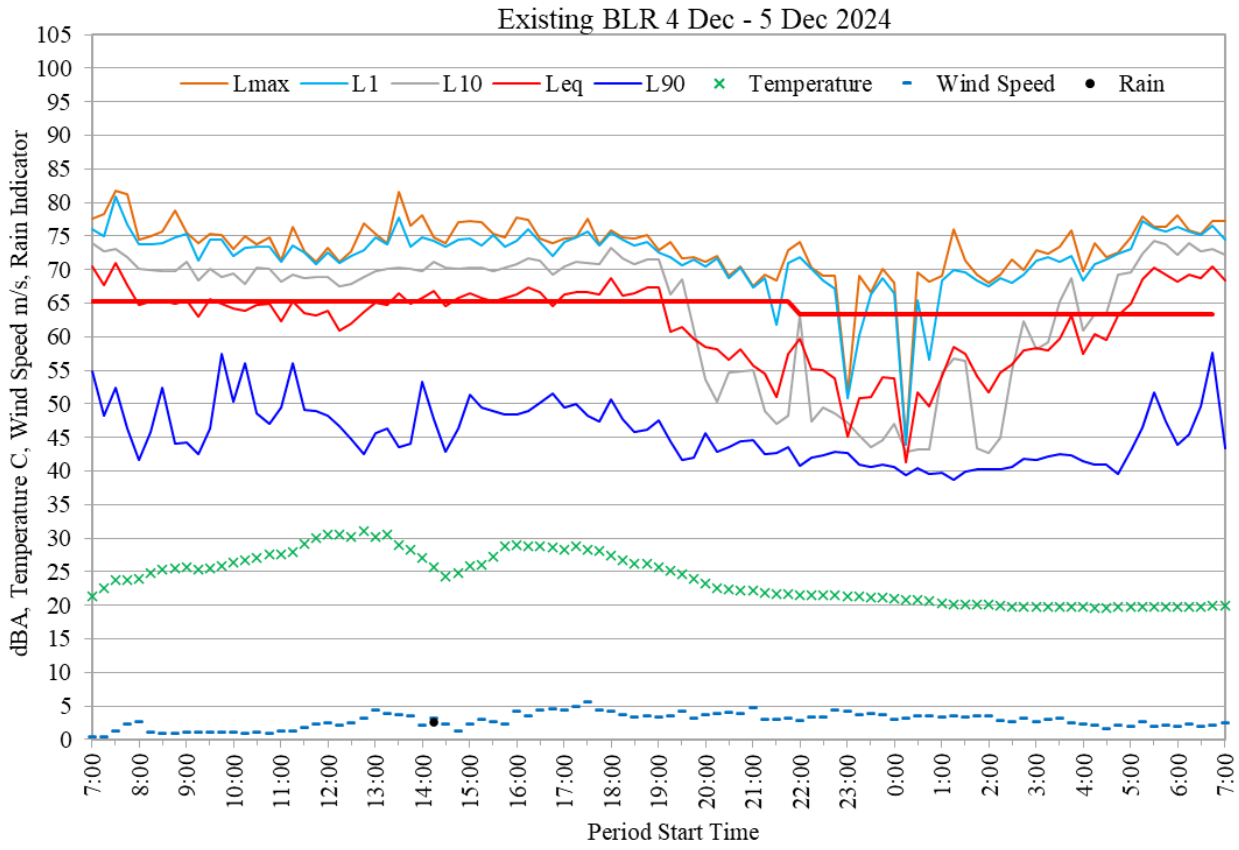

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L1
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Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time

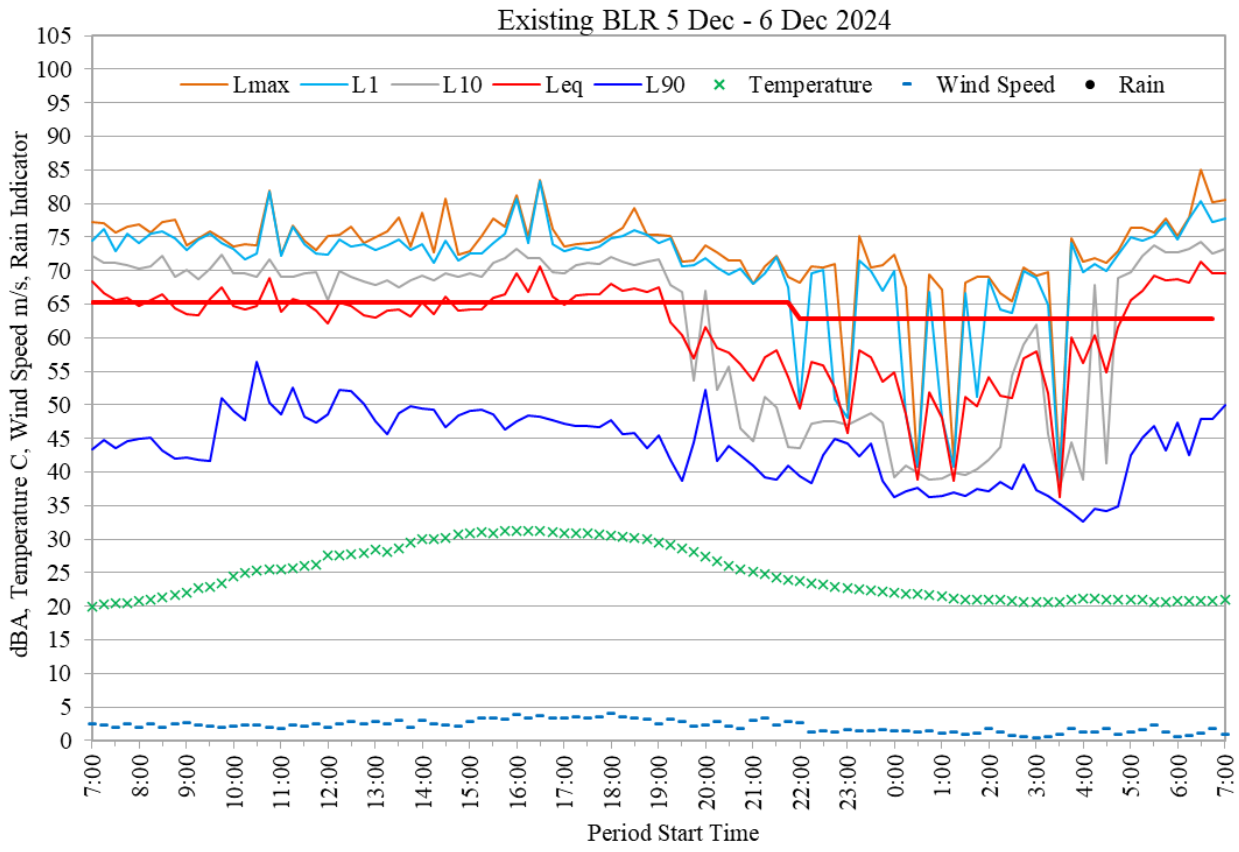

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Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time

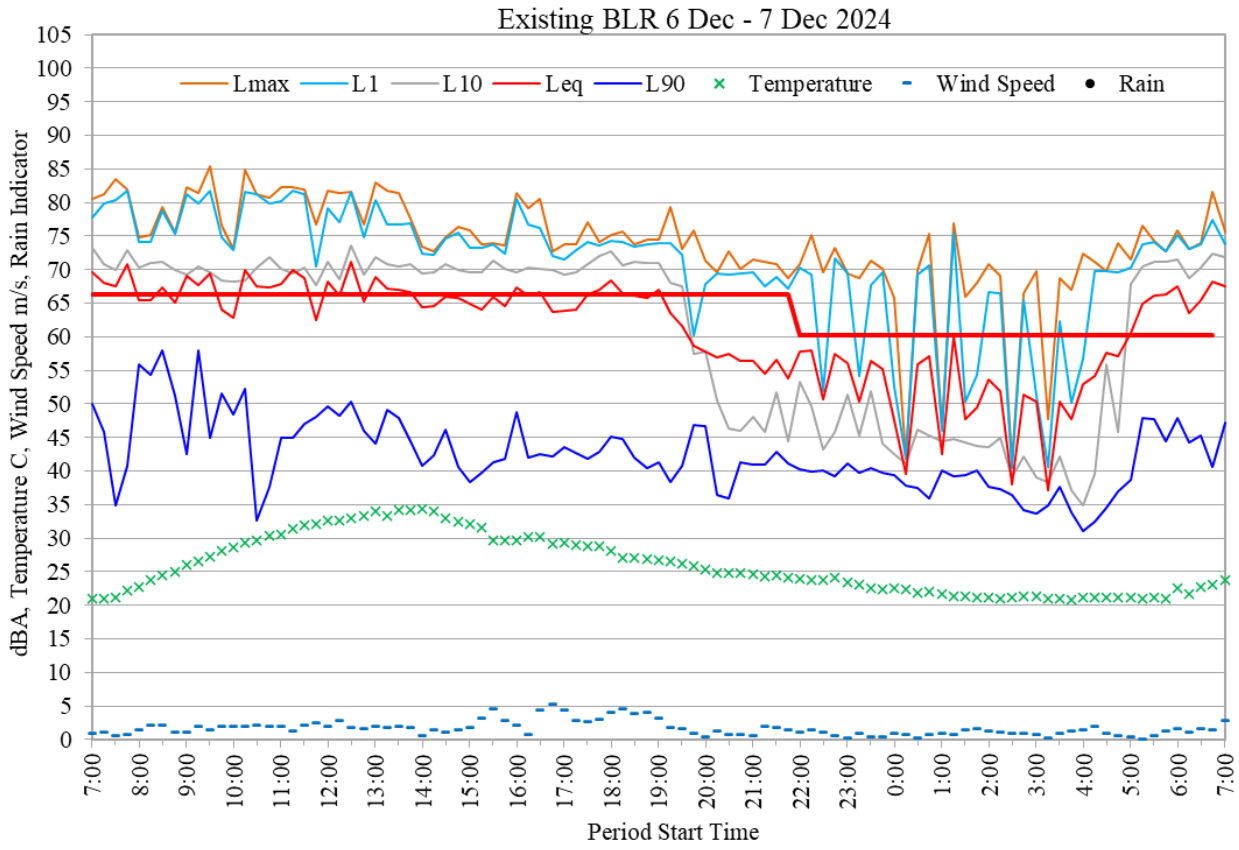

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L10
Leq
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Temperature
Wind Speed
Rain
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Period Start Time

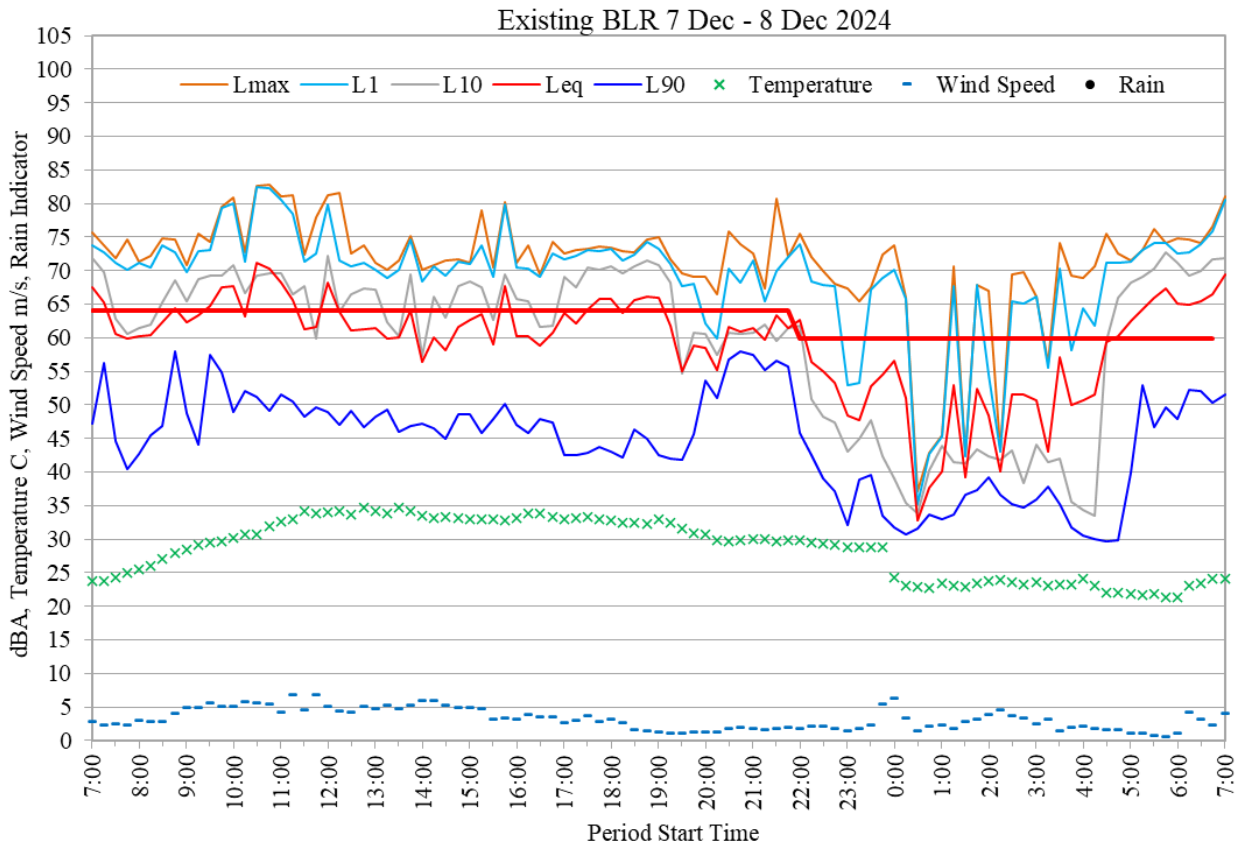

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Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time

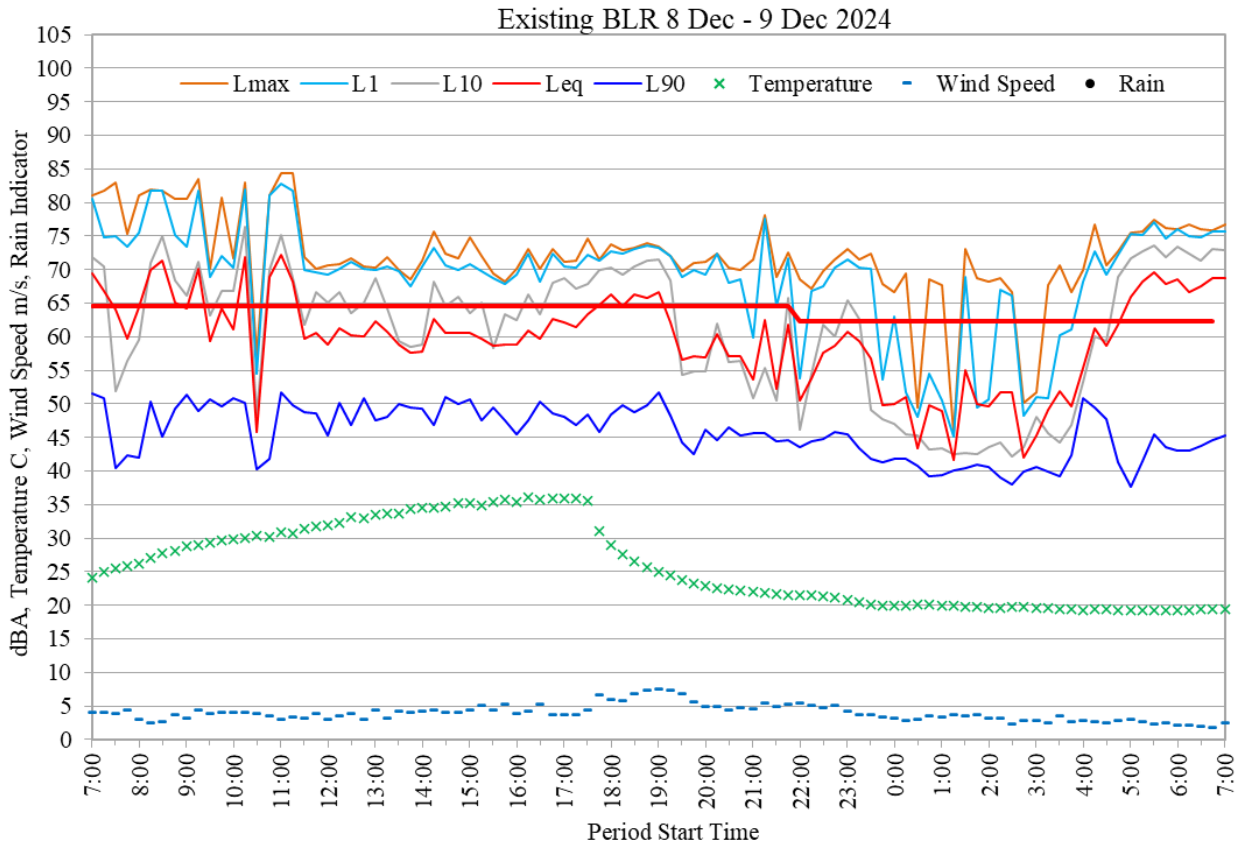

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Lmax
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Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time

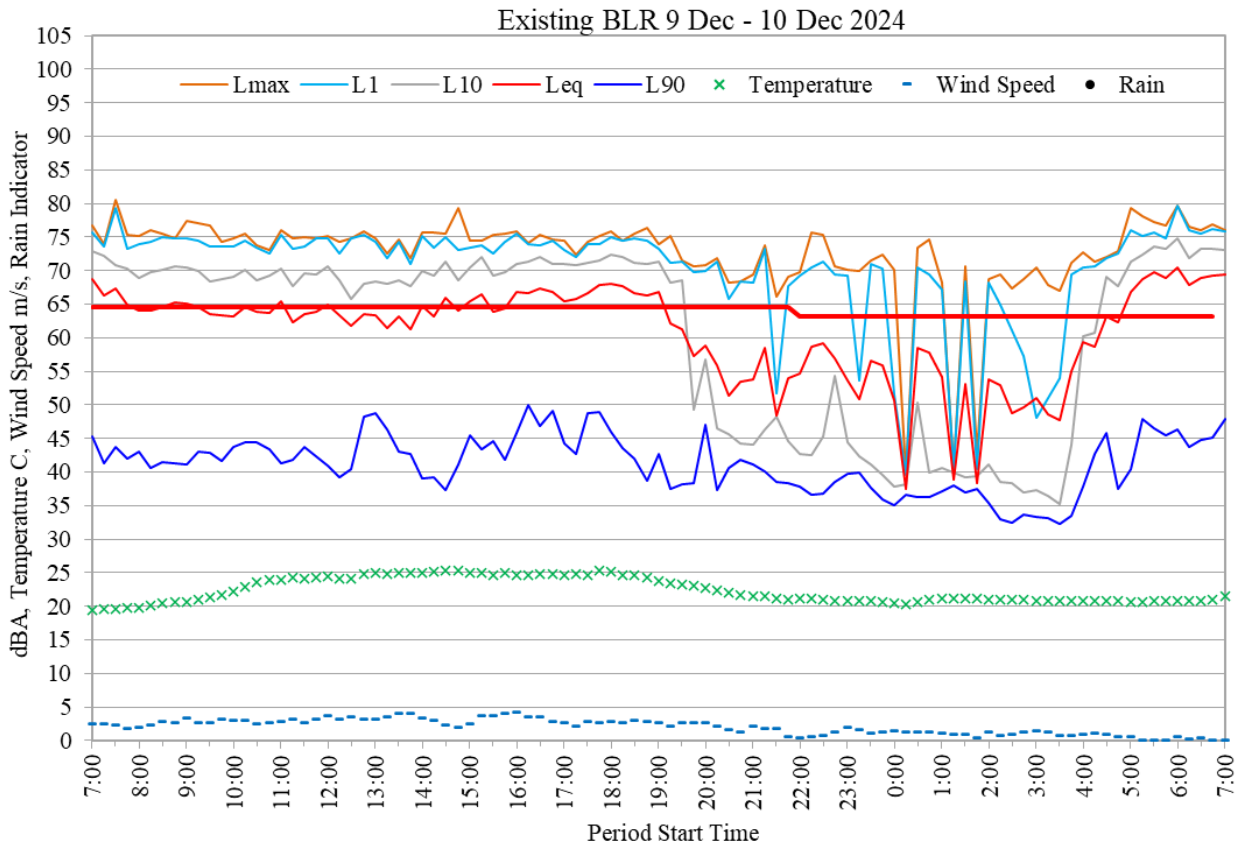

Existing BLR 4 Dec - 5 Dec 2024
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Leq
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Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time

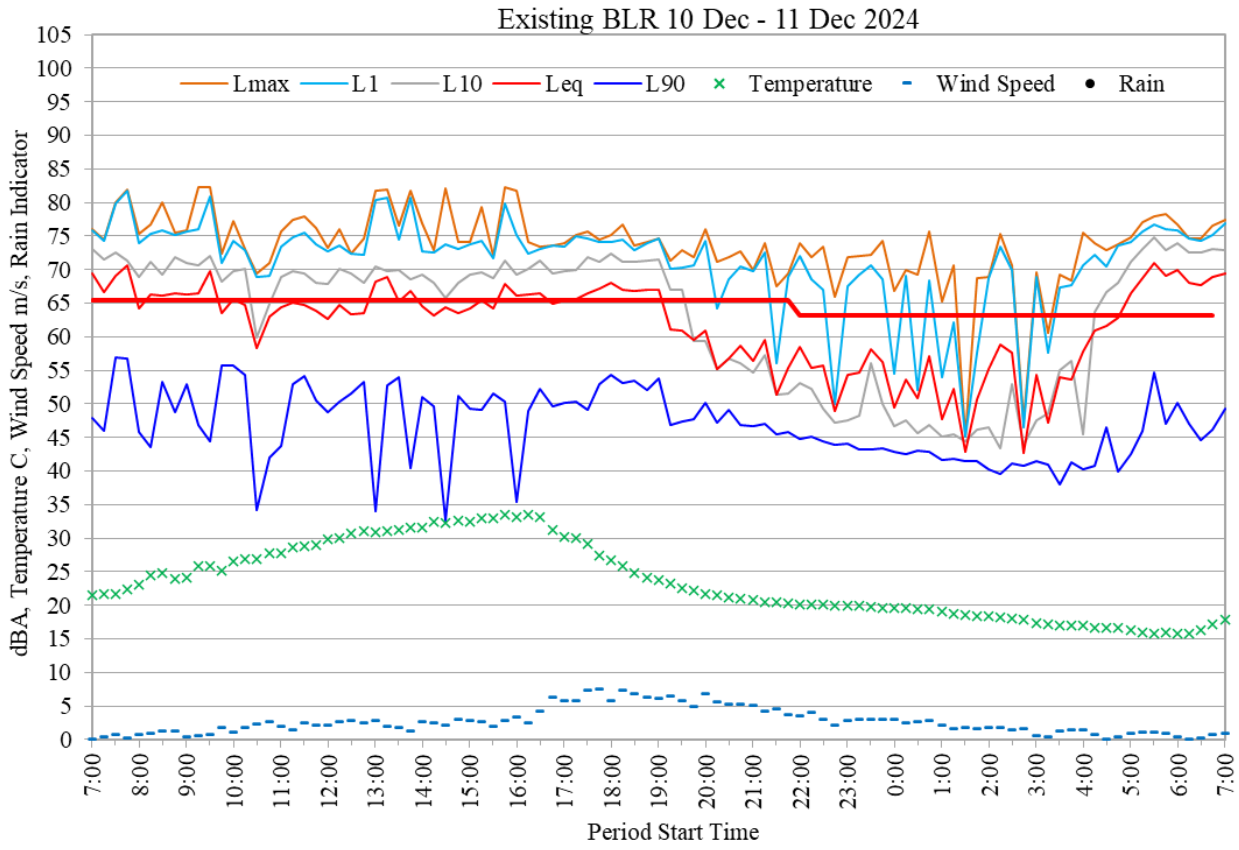

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Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time

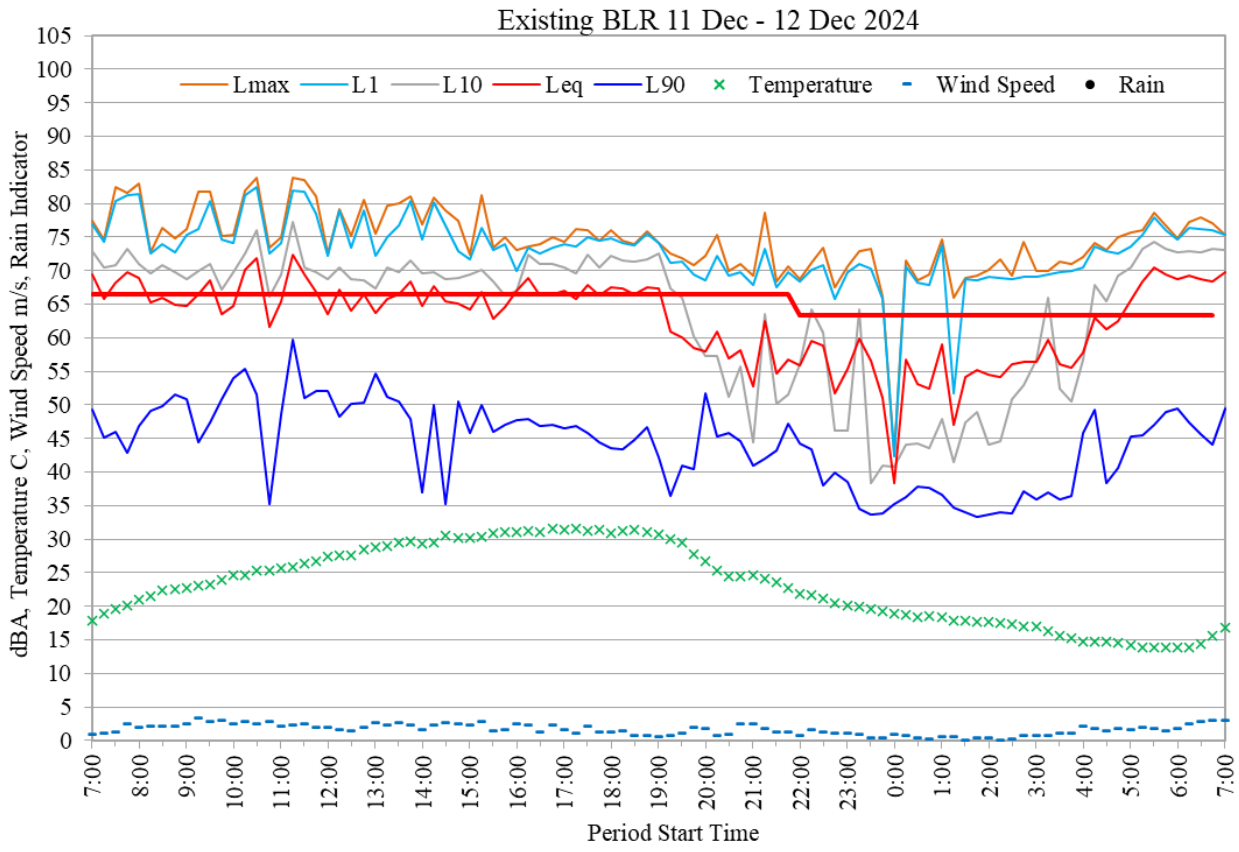

Existing BLR 6 Dec - 7 Dec 2024
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time

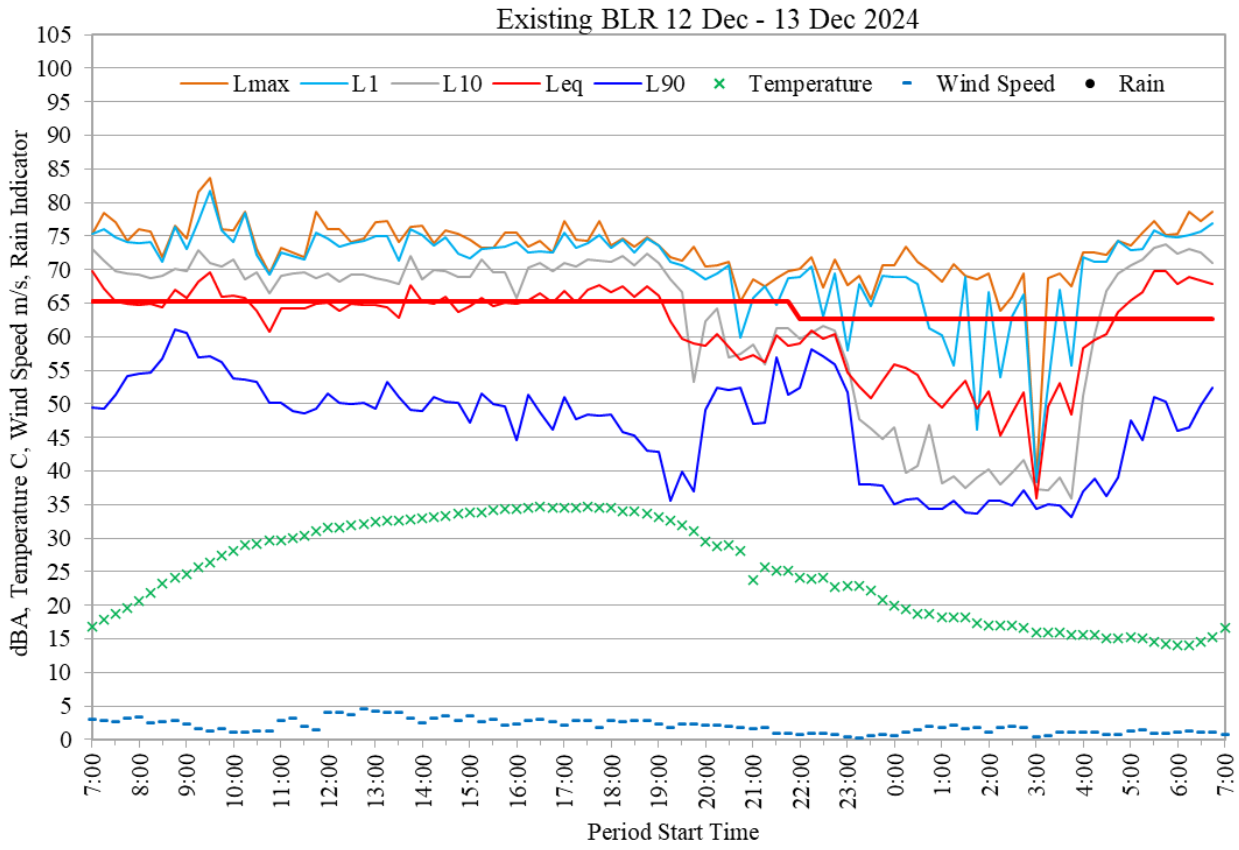

Existing BLR 7 Dec - 8 Dec 2024
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time


Existing BLR 8 Dec - 9 Dec 2024
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time


Existing BLR 9 Dec - 10 Dec 2024
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time


Existing BLR 10 Dec - 11 Dec 2024
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time


Existing BLR 11 Dec - 12 Dec 2024
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time


Existing BLR 12 Dec - 13 Dec 2024
Lmax
L1
L10
Leq
L90
Temperature
Wind Speed
Rain
dBA, Temperature C, Wind Speed m/s, Rain Indicator
Period Start Time

APPENDIX C – INSTRUMENT CALIBRATION CERTIFICATES

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM51887

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Svantek		
Type No:	SVAN 957	**Serial No:**	23829
Mic. Type:	PLACID PMP21	**Serial No:**	230065
Pre-Amp. Type:	SV 12L	**Serial No:**	5539
Filter Type:	1/3 Octave	**Test No:**	F051897

Owner: Bridges Acoustics
78 Woodglen Close
Paterson, NSW 2421

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1000	hPa ±1 hPa	**Date of Receipt :**	07/11/2024
Temperature	23	°C ±1° C	**Date of Calibration :**	13/11/2024
Relative Humidity	55	% ±5%	**Date of Issue :**	15/11/2024

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: .....

AUTHORISED SIGNATURE: ..... Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

Acu-Vib Electronics
ACOUSTICS AND VIBRATIONS
Head Office & Calibration Laboratory
Unit 14, 22 Hudson Avenue, Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Laboratory No. 9262
Acoustic and Vibration Measurements

Page 1 of 2 Calibration Certificate
AVCERT10.14 Rev.2.0 14/04/2021

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C50386

EQUIPMENT TESTED : Acoustic Calibrator

Manufacturer: Svantek
Type No: SV 36 **Serial No:** 155477
Class: 1
Owner: Bridges Acoustics
78 Woodglen Close
Paterson, NSW 2421
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	1019	hPa ±1 hPa	**Date of Receipt :**	27/06/2024
Temperature	21	°C ±1° C	**Date of Calibration :**	03/07/2024
Relative Humidity	49	% ±5%	**Date of Issue :**	03/07/2024

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

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Acoustic and Vibration Measurements

Page 1 of 2 Calibration Certificate
AVCERT02.1 Rev.2.0 14.04.2021

The Calibrator described in this report has been tested to the requirements of the standard IEC 60942-[Ed 4]:2017-11.
The tests described in Annex B of the standard (Periodic tests) were carried out under the environmental conditions listed above to the following clauses:

Clause	**Test description**
B4.6	Sound Pressure Level (By comparison with a reference calibrator).
B4.7	Frequency (By measurement with a calibrated frequency meter).
B4.8	Total distortion and noise. (By measurement with a calibrated Noise and Distortion meter).

Notes:

1. The calibrator was calibrated with the main axis vertical and facing down.
2. No corrections have been made for atmospheric pressure, temperature, or humidity.

Parameter	Pre-Adj	Adj Y/N	Output: **(dB re 20 µPa)**	Frequency **(Hz)**	THD&N **(%)**
Level1:	NA	N	94.14 dB	1000.00 Hz	0.40 %
Level2:	NA	N	114.11 dB	1000.00 Hz	0.45 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %
Uncertainty (at 95% c.l.) k=2					

Parameter	Class 1		Class 2	
Nominal Frequency	250 Hz	1 kHz	250 Hz	1 kHz
Output dB SPL	0.25 dB	0.25 dB	0.40 dB	0.40 dB
Frequency Hz	0.7 % (1.75 Hz)	0.7 % (7 Hz)	1.7 % (4.25 Hz)	1.7 % (17 Hz)
THD&N	2.5 %	2.5 %	3.0 %	3.0 %

Tolerance limits from AS/IEC60942 (edition 4)

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Page 2 of 2
AVCERT02 Rev.2.0 14.04.2021
End of Calibration Certificate

Appendix D
Biodiversity Development Assessment Report

Bengalla Mine Modification 8

Biodiversity Development Assessment Report

Xenith

25 November 2025

Final

cumberland ecology

PART OF SLR

(02) 9868 1933 | PO Box 2474 Carlingford Court NSW 2118 | cumberlandecology.com.au

Report No. 22198RP2

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or commendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Version	Date Issued	Amended by	Details
001	25/11/2025	MF, AM, TP	Final

Approved by:	**Matthew Freeman**
Position:	Principal Ecologist
Signed:	
Date:	25 November, 2025

Table of Contents

Glossary vii

Declarations ix

1. Introduction A.1

1.1. Requirement for BDAR A.1
1.2. Purpose A.1
1.3. Modification Description A.2
1.4. Information Sources A.3

2. Methodology A.5

2.1. Review of Existing Data A.5
2.2. Landscape Features A.5
2.3. Native Vegetation Survey A.5
2.4. Threatened Flora Species Survey A.6
2.5. Threatened Fauna Species Survey A.9
2.6. Weather Conditions A.16

3. Landscape Features A.19

3.1. Assessment Area A.19
3.2. Landscape Features A.19
3.3. Native Vegetation Cover A.20

4. Native Vegetation A.21

4.1. Native Vegetation Extent A.21
4.2. Plant Community Types A.21
4.3. Other Vegetation Communities A.26
4.4. Threatened Ecological Communities A.28
4.5. Vegetation Integrity Assessment A.29

5. Threatened Species A.31

5.1. Threatened Species for Assessment A.31
5.2. Ecosystem Credit Species A.32
5.3. Species Credit Species A.35
5.4. Additional EPBC Act Listed Species A.44

6. Prescribed Impacts A.45

7. Avoid and Minimise A.49

7.1. Design Constraints A.49
7.2. Onsite Constraints A.52
7.3. Avoid and Minimise Direct and Indirect Impacts on Native Vegetation and Habitat A.54
7.4. Avoid and Minimise Prescribed Impacts A.57
7.5. Summary A.58

8. Impact Assessment A.60

8.1. Direct Impacts A.60

8.2. Change in Vegetation Integrity Score A.61
8.3. Indirect Impacts A.61
8.4. Prescribed Impacts A.64
9. Mitigation Measures A.69
9.1. Mitigation of Impacts to Native Vegetation and Habitat A.69
9.2. Mitigation Measures for Prescribed Impacts A.77
9.3. Adaptative Management for Uncertain Impacts A.78
9.4. Use of Biodiversity Credits to Mitigate or Offset Indirect or Prescribed Impacts A.78
10. Thresholds of Assessment A.79
10.1. Introduction A.79
10.2. Impacts on Serious and Irreversible Impact Entities A.79
10.3. Impacts that Requires an Offset A.79
10.4. Impacts that Do not Require an Offset A.80
10.5. Impacts that do not Require Further Assessment A.80
10.6. Application of the No Net Loss Standard A.80
11. Assessment of MNES A.82
11.1. Introduction A.82
11.2. Identifying Relevant MNES A.82
Survey Methodology and Results A.82
11.3. Assessments of Significance A.83
11.4. Measures to Avoid, Mitigate and Offset MNES A.93
11.5. Summary of MNES Assessment A.93
12. Conclusion A.94
13. References A.95

Table of Tables

Table 1 Personnel x
Table 2 BAM plot survey requirements A.6
Table 3 Threatened flora survey dates and methods A.7
Table 4 Fauna species credit species surveyed within the subject land A.10
Table 5 Weather conditions during field surveys A.16
Table 6 Plant community types within subject land A.22
Table 7 Threatened ecological communities within the subject land A.29
Table 8 Vegetation zones within the subject land A.30
Table 9 Predicted ecosystem credit species A.32
Table 10 Predicted species credit species A.36
Table 11 Species credit species assessed as present within the subject land A.41
Table 12 Relevance of prescribed impacts A.45

Table 13 Summary of measures to avoid impacts A.58
Table 14 Extent of direct impacts to vegetation within the subject site A.60
Table 15 Extent of threatened species impacts (species polygons) within the subject land A.60
Table 16 Change in vegetation integrity score for vegetation zones A.61
Table 17 Indirect impacts of the Modification A.61
Table 18 Summary of mitigation measures for impacts to native vegetation and habitat A.75
Table 19 Summary of impacts to native vegetation requiring an offset A.79
Table 20 Summary of impacts to threatened species requiring an offset A.80
Table 21 Summary of ecosystem credit liability A.81
Table 22 Like for like offsetting options A.81
Table 23 Summary of species credit liability A.81
Table 24 Significant Impact Criteria for Critically Endangered or Endangered Vegetation Communities A.84
Table 25 Significant Impact Criteria for Critically Endangered or Endangered Species A.86
Table 26 Significant Impact Criteria for Vulnerable Species A.91
Table 27 Significant Impact Criteria for Migratory Species A.92
Table 28 BAM Plot Data A.100
Table 29 Flora likelihood of occurrence assessment A.104
Table 30 Fauna likelihood of occurrence assessment A.107

Table of Photographs

Photograph 1 Woodland condition of PCT 3431 within the subject land A.24
Photograph 2 PCT 3431 DNG present within the subject land A.25
Photograph 3 Planted native vegetation adjacent to Roxborouh Road A.27
Photograph 4 Exotic dominated grassland within the subject land A.28

Table of Appendices

APPENDIX A : Bat Data Analysis
APPENDIX B : BAM Plot Data
APPENDIX C : PMST Report
APPENDIX D : Likelihood of Occurrence Assessment
APPENDIX E : BAM-C Credit Report

Table of Figures

Figure 1 Site map
Figure 2 Location map
Figure 3 Layout of the project
Figure 4 Historical imagery (1958)
Figure 5 Historical imagery (1989)
Figure 6 Flora survey locations – BAM Plots
Figure 7 Flora survey locations – vegetation mapping and targeted threatened flora searches
Figure 8 Fauna survey locations
Figure 9 Native vegetation extent within the subject land
Figure 10 Plant community types within the subject land
Figure 11 Threatened ecological communities within the subject land
Figure 12 vegetation zones within the subject land
Figure 13 Threatened species recorded within the study area
Figure 14 Closest cliffs/caves to the subject land
Figure 15 Species polygon – Hunter Valley Delma
Figure 16 Species polygon – Southern Myotis
Figure 17 Bengalla Link Road Conceptual Road Design
Figure 18 Bengalla Link Road Realignment Cross Sections
Figure 19 Hollow-bearing trees within the subject land
Figure 20 Extent of prescribed impacts within the subject land
Figure 21 Thresholds for assessment

Glossary

Term	Definition
AHD	Australian Height Datum
Approved Disturbance Boundary	Land subject to the existing development consent (SSD-5170)
Assessment area	Area of land within 1500m of the Subject Land as required by the BAM for non-linear developments
BAAS	Biodiversity Assessor Accreditation System
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
Bengalla EIS	Continuation of Bengalla Mine Environmental Impact Statement
BC Act	NSW Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BLR	Bengalla Link Road
BMC	Bengalla Mining Company Pty Ltd
BMP	Biodiversity Management Plan
°C	Degrees Celsius
CEEC	Critically Endangered Ecological Community
DA	Development application
DBH	Diameter at breast height
DCCEEW (Cth.)	Commonwealth Department of Climate Change, Energy, the Environment and Water
DNG	Derived Native Grassland
EEC	Endangered Ecological Community
EHG	NSW Environment and Heritage
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	Kilometres
LGA	Local Government Area
Modification	SSD-5170 Modification 8 – involving the realignment of the BLR
MNES	Matters of National Environmental Significance
MSC	Muswellbrook Shire Council

Term	Definition
NSW	New South Wales
OSOM	Over Size Over Mass
PCT	Plant Community Type
PMST	Protected Matters Search Tool
SAII	Serious and Irreversible Impact
SAT	Spot Assessment Technique
SSD	State Significant Development
Study area	All land subject to detailed surveys, including vegetation mapping, plot surveys and targeted threatened species surveys
Subject land	The land subject to this BDAR assessment as required under the BAM
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
TfNSW	Transport for NSW
WSP	WSP Australia Pty Ltd
VI Score	Vegetation Integrity Score

Declarations

i. Certification of Biodiversity Development Assessment Report

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method (BAM) and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Name: Matthew Freeman

Signature: 

Date: 25/11/2025

BAM Assessor Accreditation no: BAAS19019

This Biodiversity Development Assessment Report (BDAR) has been prepared to meet the requirements of BAM 2020.

ii. Conflict of Interest

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest in the preparation of this Biodiversity Development Assessment Report (BDAR).

Name: Matthew Freeman

Signature: 

Date: 25/11/2025

BAM Assessor Accreditation no: BAAS19019

iii. Authors and Contributors

This document has been prepared by Matthew Freeman (BAM Accredited Assessor No: BAAS19019) with assistance from personnel as outlined in **Table 1**.

Table 1 Personnel

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
Matthew Freeman	Report preparation, vegetation mapping, targeted threatened fauna surveys, data analysis, BAM-C calculations	Bachelor of Natural Science (Nature Conservation) University of Western Sydney, 2012. BAM Accredited Assessor Training, Muddy Boots 2018. BAM Accredited Assessor Renewal Training, Greencap 2022. BAM Accredited Assessor Renewal Training, DCCEEW 2025 (Accredited to April 2028)	BAAS19019
Tim Playford	Document review	Bachelor of Science (Honours) in Ecology, Adelaide University 2004, Bachelor of Environmental Management, Flinders University of South Australia, 2003 BAM Accredited Assessor Training. Muddy Boots, 2017	-
Bryan Furchert	Vegetation mapping, BAM plot surveys, targeted threatened flora surveys, PCT selection, document preparation assistance	Bachelor of Biodiversity and Conservation. Macquarie University, 2012 Diploma of Conservation and Land Management. TAFE NSW, 2008 BAM Accredited Assessor Training, Muddy Boots 2017. BAM Accredited Assessor Renewal Training, Greencap 2022. BAM Accredited Assessor Renewal Training, DCCEEW 2025 (Accredited to June 2028)	BAAS18095
Dr Rohan Mellick	Vegetation mapping, BAM plot surveys, targeted threatened flora surveys, PCT selection, document preparation assistance	Doctor of Philosophy, Evolutionary Ecology. The University of Adelaide, 2012 Bachelor of Applied Science (Honours) in Natural Resource Management, Southern Cross University, 2000. BAM Accredited Assessor Training, Muddy Boots 2018. BAM Accredited Assessor Renewal Training, Greencap 2022. BAM Accredited Assessor Renewal Training, DCCEEW 2025 (Accredited to April 2028)	BAAS18075
Michael Davis	GIS mapping, figure preparation	Bachelor of Biodiversity and Conservation. Macquarie University, 2016 BAM Accredited Assessor Training. Muddy Boots, 2017	-

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
Jesse Luscombe	GIS mapping, figure preparation	Bachelor of Marine Science. Macquarie University, 2013 Certificate III in Conservation and Land Management. TAFE NSW, 2016 BAM Accredited Assessor Training. Muddy Boots, 2018	-
Callum Fleming	Targeted threatened flora surveys	Bachelor of Science (Zoology). Western Sydney University, 2019 Master of Research (Environmental Science). Western Sydney University, 2021 Certificate III in Conservation and Ecosystem Management. TAFE NSW, 2023	-
Joel Taylor	Targeted threatened fauna surveys	Bachelor of Science (Biology). Macquarie University, 2021 BAM Accredited Assessor Training. Greencap, 2024	-
Brooke Crismale	Targeted threatened fauna surveys	Bachelor of Science (Zoology) and Bachelor of Natural Science (Animal Science). Western Sydney University, 2020	-
Daniel Santana	Targeted threatened fauna surveys	Post Doctor's Degree, Biological Sciences, Universidade Federal da Paraíba, Brazil, 2018. Doctor of Philosophy (PhD), Zoology/Animal Biology, Universidade Federal da Paraíba, Brazil, 2016. Master's Degree, Ecology and Conservation, Universidade Federal de Sergipe, 2012. Bachelor's Degree, Biological Sciences, Universidade Federal de Sergipe, 2009.	-
Alix Murray	Targeted threatened fauna surveys, report preparation	Master of Biodiversity, Conservation and Ecosystem Management. University of Newcastle Upon Tyne, 2018 Bachelor of Science (Biology and Psychology). University of Newcastle Upon Tyne, 2017 Diploma (Zoology). Centre of Excellence, 2020	-

1. Introduction

Cumberland Ecology (Part of SLR) was commissioned by Xenith Consulting (Xenith) on behalf of the Bengalla Mining Company Pty Ltd (BMC) to prepare a Biodiversity Development Assessment Report (BDAR) to support a modification application to adjust the disturbance boundary for the realignment of the existing Bengalla Link Road (BLR) as described in the *Continuation of Bengalla Mine Environmental Impact Statement* (Bengalla EIS) (Hansen Bailey, 2013) to facilitate construction activities.

The proposed changes are hereafter referred to as the 'Modification'. The area subject to the Modification is referred to hereafter as the 'subject land' (**Figure 1**).

BMC is seeking a modification of the existing Development Consent (SSD-5170 Modification 8) under Section 4.55(2) of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1. Requirement for BDAR

The Modification is classified as State Significant Development (SSD) under Section 5 of Schedule 1 of the *State Environmental Planning Policy (Planning Systems) 2021*, as it requires modification to a development application for mining related works which have a capital investment value of more than $30 million.

In accordance with Part 7.17 of the NSW *Biodiversity Conservation Act 2016* (BC Act), modifications of a development consent are required to submit a BDAR prepared in accordance with the Biodiversity Assessment Method where the modification results in the development consent exceeding the Biodiversity Offsets Scheme (BOS). As the Modification is likely to have a significant impact on threatened communities and threatened species, the BOS is triggered and therefore this BDAR has been prepared to accompany the SSD application.

1.2. Purpose

The purpose of this BDAR is to document the findings of an assessment undertaken for the Modification in accordance with Stage 1 (Biodiversity Assessment) and Stage 2 (Impact Assessment) of the BAM.

Specifically, the objectives of this BDAR are to:

- Identify the landscape features and site context (native vegetation cover) within the subject land and assessment area (**Figure 2**);
- Assess native vegetation extent, plant community types (PCTs), threatened ecological communities (TECs) and vegetation integrity (site condition) within the subject land;
- Assess habitat suitability for threatened species that can be predicted by habitat surrogates (ecosystem credits) and for threatened species that cannot be predicted by habitat surrogates (species credit species);
- Identify potential prescribed biodiversity impacts on threatened species and communities;
- Describe measures to avoid and minimise impacts on biodiversity values and prescribed biodiversity impacts during project planning;
- Describe impacts to biodiversity values and prescribed biodiversity impacts and the measures to mitigate and manage such impacts;

- Identify the thresholds for the assessment and offsetting of impacts, including:
    - Impact assessment of potential entities of serious and irreversible impacts (SAII);
    - Impacts for which an offset is required;
    - Impacts for which no further assessment is required; and
    - Describe the application of the no net loss standard, including the calculation of the offset requirement.

1.3. Modification Description

1.3.1. Location

The Modification proposes an adjustment to the previously approved disturbance boundary associated with the realignment of the BLR. The area subject to assessment for the Modification are referred to as the subject land and comprise approximately 67.3 hectares (ha) of land. Note that the Modification will encompass portions of BMC's approved disturbance boundary, however these areas do not require further approval and have been excluded from the subject land and assessment within this BDAR.

A site map and location map have been prepared in accordance with the BAM and are presented in **Figure 1** and **Figure 2**, respectively.

1.3.2. Modification Overview

The Modification involves the adjustment of the approved disturbance footprint for the realignment of BLR as described in the Bengalla EIS to facilitate construction activities.

The development footprint for the BLR realignment will mainly comprise a strip of land running approximately 4.8 km in a north-south orientation between the existing BLR in the south and Wybong Road in the north. The BLR realignment is located west of the existing Bengalla Mine as approved under SSD-5170 (see **Figure 3**). The subject land footprint area is approximately 67.3 ha(see **Figure 3**). The layout of the Modification is shown in **Figure 3**.

1.3.3. Identification of the Development Site Footprint

The development site or disturbance footprint comprises 67.3 ha of land directly impacted by the Modification and is referred to within this BDAR as the 'subject land'. For the purposes of this assessment, the disturbance footprint comprises both the construction footprint and the operational footprint of the Modification. It is expected that the construction footprint will be greater than that of the operation footprint, particularly along the proposed road alignment, as it encompasses all areas that will be cleared for the realignment of the road, including road batters as well as temporary and ancillary structures. It is expected that all temporary and ancillary structures will be removed once construction has been completed, and therefore, the operation footprint will be comprised of the road and services corridor only.

A wider 'study area' has also been identified which includes all areas of land subject to detailed surveys, including vegetation mapping, plot surveys and targeted threatened species surveys. The study area also includes portions of the approved disturbance boundary that are located in proximity to the subject land.

1.3.4. General Description of the Subject Land

The subject land is located in the western section of the approved project boundary for Bengalla Mine (see **Figure 2**), and predominantly outside of the approved disturbance boundary. The approved disturbance boundary does include a narrow part of the proposed road corridor which has been excluded from the subject land. This excluded area represents the existing SSD-5170 disturbance boundary for the BLR realignment.

Within the subject land, the vegetation comprises native woodland and grassland vegetation that conforms to the PCT Central Hunter Ironbark Grassy Woodland, which is listed as an Endangered Ecological Community (EEC) under the BC Act, and a Critically Endangered Ecological Community (CEEC) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Historical aerial imagery held within the Historical Imagery Viewer (NSW Government Spatial Services 2023), indicates that the subject land has been subject to past disturbance, including significant clearing of understorey vegetation. Historical aerials imagery from 1958 and 1989 show predominantly remnant trees within the subject land and wider study area. The historical imagery of the subject land from November 1958 June 1989 is shown in **Figure 4** and **Figure 5**, respectively.

The subject land occurs in an undulating landscape with small hills. The subject land has a topographic high of 270m Australian Height Datum (AHD) in the north, and a topographic low of 140m AHD in the south.

The subject land falls within the Bayswater and Roxburgh soil landscape. Bayswater soil landscapes are characterised by undulating low hills south-west of Muswellbrook, comprised predominantly of yellow solodic soils on slopes and alluvial soils in drainage lines. Roxburgh soil landscapes are characterised by undulating low hills and undulating hills with yellow podzolic soils on upper to mid slopes and red solodic soils on more rounded hills (NSW Government 2025).

A number of first and second order streams are mapped within the subject land, as well as artificial farm dams, as shown in **Figure 2**.

1.4. Information Sources

1.4.1. Databases

A number of databases were utilised during the preparation of this BDAR, including:

- NSW Environment and Heritage (EHG) BioNet Atlas (EHG 2025a);
- EHG Threatened Biodiversity Data Collection (TBDC) (EHG 2025c);
- EHG BioNet Vegetation Classification database (EHG 2025b);
- Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW (Cth.)) Species Profile and Threat Database (DCCEEW 2025); and
- NSW Government Spatial Services databases.

1.4.2. Literature

This BDAR has utilised the results and/or spatial data from the following documents:

- Cumberland Ecology (2013). Continuation of Bengalla Mine Project Ecological Impact Assessment;
- NSW Government (2020). Biodiversity Assessment Method 2020; and
- NSW State Vegetation Type Map (EHG 2024e).

Other sources of information have been referenced throughout this BDAR.

1.4.3. Aerial Photography

The aerial imagery utilised in this BDAR is sourced from NearMap and is dated 6 March 2024. Additional aerial images available on NearMap and SixMaps were also consulted.

2. Methodology

2.1. Review of Existing Data

Existing information on biodiversity values within the assessment area (defined by the BAM as the subject land and a 1500 m buffer around it) was reviewed, including:

- Species data that is held in the BioNet Atlas (EHG 2025a);
- NSW State Vegetation Type Map (DPE 2024);
- NSW BioNet Vegetation Classification database (EHG 2025b); and
- NSW TBDC (EHG 2025c).

This existing information was considered and included, where appropriate, into survey design, vegetation mapping and reporting.

2.2. Landscape Features

Landscape features requiring consideration were initially determined via desktop assessment. The desktop assessment included searches of available aerial imagery from NearMap, and topographic contour data available from SixMaps. The field surveys undertaken on 20 – 24 February 2023 sought to verify the occurrence of the following landscape features:

- Rivers, streams and estuaries;
- Important and local wetlands;
- Karsts, caves, crevices, cliffs and areas of geological significance; and
- NSW BioNet Landscapes.

No amendments were required to be made to any of the identified landscape features following field surveys.

2.3. Native Vegetation Survey

2.3.1. Vegetation Mapping

The vegetation within subject land was ground-truthed by a botanist and ecologist from Cumberland Ecology on 20 – 24 February 2023 to examine and verify the mapping of the condition and extent of the different vegetation communities by conducting random meander searches, noting key characteristics of areas in similar broad condition states such as similar tree cover, shrub cover, ground cover, weediness or combinations of these. Soils were also inspected.

Where vegetation community boundaries were found to differ from the broad scale mapping of the Hunter Region, records were made of proposed new boundaries using a hand-held Global Positioning System (GPS) and mark-up of aerial photographs. The resultant information was synthesised using Geographic Information Systems (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the subject land.

2.3.2. Vegetation Integrity Assessment

Vegetation integrity assessments were undertaken across the subject land in accordance with the BAM between 20 – 24 February 2023 and 20 November 2024 (hereafter referred to as 'BAM plots'). A total of 10 BAM plots were undertaken within the subject land, and their locations are shown on **Figure 6**. The BAM plots required the establishment of a 20 x 50 m plot with an internal 20 x 20 m plot. The following vegetation data was collected within the BAM plots:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within the 20 m x 20 m floristic plot;
- Structure of each growth form group as the sum of all the individual projected foliage cover estimates of all native plant species recorded within each growth form group within the 20 m x 20 m floristic plot;
- Cover of 'High Threat Exotic' weed species within the 20 m x 20 m floristic plot;
- Assessment of function attributes within the 20 m x 50 m plot, including:
    - Count of number of large trees;
    - Tree stem size classes, measured as 'diameter at breast height over bark' (DBH);
    - Regeneration based on the presence of living trees with stems <5 cm DBH;
    - The total length in metres of fallen logs over 10 cm in diameter;
- Assessment of litter cover within five 1 m x 1 m plots evenly spread within each 20 m x 50 m plot; and
- Number of trees with hollows that are visible from the ground within each 20 m x 50 m plot.

The location of plots has sought to capture the environmental variation of the PCTs identified within the subject land. **Table 2** summarises the plot requirements based on the size and number of vegetation zones in the subject land. As shown in this table, the minimum number of plots has been completed for each vegetation zone.

Table 2 BAM plot survey requirements

Vegetation Zone	PCT	Condition	Area (ha)	Min. No. of Plots Required	No. of Plots Completed
1	3431	Woodland	39.31	4	4
2	3431	DNG	24.10	4	6

2.4. Threatened Flora Species Survey

This section provides details of the threatened flora species surveys that have been undertaken in the subject land.

2.4.1. Habitat Constraints and Geographic Limitations

Under Section 5.2.2 of BAM 2020, species credit species can be excluded from further assessment, and thereby targeted surveys, if it is determined that none of the species-specific habitat constraints are present within the subject land or if the subject land is outside of the species known geographic range. Furthermore, under Section 5.2.3 of BAM 2020, a candidate species credit species can be considered unlikely to occur on the subject land (or specific vegetation zones) if after carrying out a field assessment, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land (or specific vegetation zones).

Desktop assessments and field surveys within the subject land included assessment of habitat constraints and microhabitats for predicted species credit flora species.

2.4.2. Targeted Threatened Species Survey

Targeted threatened flora surveys were undertaken within the subject land for species credit species that were assessed as candidate species credit species for further assessment (see ***Section 5.3***). **Table 3** provides a summary of the flora species credit species surveyed for within the subject land.

Table 3 Threatened flora survey dates and methods

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey	Survey Method
Acacia pendula - endangered population	*Acacia pendula* population in the Hunter catchment	Jan – Dec	20 – 24 February 2023 9 – 12 October 2023 20 November 2024	Random meander, plot survey, grid based searches
Cymbidium canaliculatum - endangered population	*Cymbidium canaliculatum* population in the Hunter Catchment	Jan – Dec	20 – 24 February 2023 9 – 12 October 2023 20 November 2024	Random meander, plot survey, grid based searches
Diuris tricolor	Pine Donkey Orchid	Sep – Oct	20 – 24 February 2023 9 – 12 October 2023 20 November 2024	Random meander, plot survey, grid based searches
Diuris tricolor - endangered population	Pine Donkey Orchid population in the Muswellbrook local government area	Sep – Oct	20 – 24 February 2023 9 – 12 October 2023 20 November 2024	Random meander, plot survey, grid based searches

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey	Survey Method
Eucalyptus glaucina	Slaty Red Gum	Jan – Dec	20 – 24 February 2023 9 – 12 October 2023 20 November 2024	Random meander, plot survey, grid based searches
Ozothamnus tesselatus	-	Sep – Oct	20 – 24 February 2023 9 – 12 October 2023 20 November 2024	Random meander, plot survey, grid based searches
Persoonia pauciflora	North Rothbury Persoonia	Jan – Dec	20 – 24 February 2023 9 – 12 October 2023 20 November 2024	Random meander, plot survey, grid based searches
Pomaderris queenslandica	Scant Pomaderris	Jan – Dec	20 – 24 February 2023 9 – 12 October 2023 20 November 2024	Random meander, plot survey, grid based searches
Prasophyllum petilum	Tarengo Leek Orchid	Jan – Dec	20 – 24 February 2023 9 – 12 October 2023 20 November 2024	Random meander, plot survey, grid based searches
Prasophyllum sp. *Wybong*	-	Jan – Dec	20 – 24 February 2023 9 – 12 October 2023 20 November 2024	Random meander, plot survey, grid based searches
Pterostylis chaetophora	-	Jan – Dec	20 – 24 February 2023 9 – 12 October 2023 20 November 2024	Random meander, plot survey, grid based searches

2.4.2.1. Random Meander

Target Species: As listed in **Table 3** above.

Targeted threatened flora searches using random meanders was incorporated into the vegetation mapping surveys during the February 2024 surveys. The random meander surveys were also supplemented by the vegetation integrity plot surveys noted in ***Section 2.3.2***.

2.4.2.2. Grid-based Surveys

Target Species: As listed in **Table 3** above.

The methodology for the targeted threatened flora surveys is required to follow *'Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method'* (DPIE 2020). Surveys were undertaken in accordance with the two-phase grid based systematic survey approach for large areas (comprising areas of suitable habitat >50ha) whereby a 100 m grid was nested within a one-square-kilometre grid from a topographic map image and then overlayed onto the study area using GIS.

Surveys were then undertaken within the subject land where the 100 m gridlines intersect. At each survey location (grid intersect), a 40-metre diameter area (pre-loaded onto a GPS) was systematically searched via parallel traverses. The separation distance of the parallel traverses was determined by the life form or habit of the target threatened plant species and by the habitat. Specifically, since the subject land included habitats ranging from grasslands to open woodlands, traverses ranged between 5 m and 10 m. Traverses were recorded on a GPS, and their locations are provided in **Figure 7**.

2.5. Threatened Fauna Species Survey

2.5.1. Habitat Constraints and Geographic Limitations

Under Section 5.2.2 of BAM 2020, species credit species can be excluded from further assessment, and thereby targeted surveys, if it is determined that none of the species-specific habitat constraints are present within the subject land or if the subject land is outside of the species known geographic range. Furthermore, under Section 5.2.3 of BAM 2020, a candidate species credit species can be considered unlikely to occur on the subject land (or specific vegetation zones) if after carrying out a field assessment, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land (or specific vegetation zones).

Desktop assessments and field surveys within the subject land included assessment of habitat constraints and microhabitats for predicted species credit fauna species. This included desktop assessment of proximity of the subject land to features such as caves and waterways and field inspection of microhabitats suitable for significant fauna species. Features that were assessed include, but are not limited to:

- Anthropogenic disturbances and grazing pressure;
- Presence of water bodies;
- Tree height and presence of mature trees;
- Presence of hollows and size of hollows;
- Presence of nests;

- Presence of rock outcrops or surface rock;
- Presence of cliffs, overhangs or escarpments; and
- Incidental fauna sightings.

2.5.2. Targeted Threatened Species Survey

Targeted threatened fauna surveys were undertaken within the subject land for species credit species or breeding habitat for species/ecosystem credit species (hereafter referred to as dual credit species) that were assessed as candidate species credit species for further assessment (see ***Section 5.3***). This included survey for species listed under the EPBC Act with the potential to occur within the subject land. The survey design was guided by the following:

- NSW Government (2020): Biodiversity Assessment Method;
- DEC (NSW) (2004): Threatened Biodiversity Survey and Assessment Guidelines for Development and Activities (Working Draft);
- NSW Government (2018): 'Species credit' threatened bats and their habitats, NSW survey guide for the Biodiversity Assessment Method;
- NSW Government (2022b): Threatened Reptiles - Biodiversity Assessment Method survey guide;
- NSW Government (2022a): Koala (*Phascolarctos cinereus*), Biodiversity Assessment Method survey guide; and
- Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA 2010): Survey Guidelines for Australia's Threatened Birds'.

Table 4 provides a summary of the fauna species credit species surveyed for within the subject land. Details of each survey method utilised within the subject land are provided below. The locations of the targeted fauna species surveys are shown in **Figure 8**. Some of the threatened species targeted during surveys include species listed under the EPBC Act that were identified through the Commonwealth Protected Matters Search Tool (PMST) and details for these species have also been included in **Table 4**.

Table 4 Fauna species credit species surveyed within the subject land

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey within Subject land	Survey Method
Aprasia parapulchella	Pink-tailed Legless Lizard	Sep - Nov	16 – 27 October 2023 31 October 2024 1 November 2024 7 – 8 November 2024 14 – 15 November 2024 21 – 22 November 2024 28 – 29 November 2024	Artificial cover boards, habitat searches

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey within Subject land	Survey Method
			5 – 6 December 2024 12 – 13 December 2024 19 – 20 December 2024	
Burhinus grallarius	Bush Stone-Curlew	All year	20 – 24 February 2023 27 – 31 March 2023 17 – 21 July 2023 16 – 27 October 2023 19 – 23 August 2024 26 – 27 August 2024	Diurnal bird surveys, spotlighting, call playback, opportunistic sightings
Callocephalon fimbriatum	Gang-gang Cockatoo	Oct - Jan	20 – 24 February 2023 27 – 31 March 2023 17 – 21 July 2023 16 – 27 October 2023 19 – 23 August 2024	Tree hollow searches, diurnal bird census, , opportunistic sightings
Calyptorhynchus lathami	Glossy Black-Cockatoo	Apr - Aug	20 – 24 February 2023 27 – 31 March 2023 17 – 21 July 2023 16 – 27 October 2023 19 – 23 August 2024	Tree hollow searches, diurnal bird census, opportunistic sightings
Delma impar	Striped Legless Lizard	Sept-Dec	16 – 27 October 2023 31 October 2024 1 November 2024 7 – 8 November 2024 14 – 15 November 2024 21 – 22 November 2024 28 – 29 November 2024 5 – 6 December 2024 12 – 13 December 2024 19 – 20 December 2024	Artificial cover boards, pitfall trapping, habitat searches
Delma vescolineata	Hunter Valley Delma	Sept-Dec	16 – 27 October 2023 31 October 2024 1 November 2024 7 – 8 November 2024 14 – 15 November 2024 21 – 22 November 2024 28 – 29 November 2024 5 – 6 December 2024 12 – 13 December 2024 19 – 20 December 2024	Artificial cover boards, pitfall trapping, habitat searches

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey within Subject land	Survey Method
Haliaeetus leucogaster	White-bellied Sea-Eagle	Jul-Dec	20 – 24 February 2023 27 – 31 March 2023 17 – 21 July 2023 16 – 27 October 2023 19 – 23 August 2024	Diurnal bird census, raptor nest searches, opportunistic sightings
Hieraaetus morphnoides	Little Eagle	Aug-Oct	20 – 24 February 2023 27 – 31 March 2023 17 – 21 July 2023 16 – 27 October 2023 19 – 23 August 2024	Diurnal bird census, raptor nest searches, opportunistic sightings
Hoplocephalus bitorquatus	Pale-headed Snake	Jan-Mar, Nov-Dec	27 – 31 March 2023	Funnel trapping, spotlighting
Lophoictinia isura	Square-tailed Kite	Jan, Sep-Dec	20 – 24 February 2023 27 – 31 March 2023 17 – 21 July 2023 16 – 27 October 2023 19 – 23 August 2024	Diurnal bird census, raptor nest searches, opportunistic sightings
Myotis macropus	Southern Myotis	Jan-Mar, Oct-Dec	20 – 24 February 2023 27 – 31 March 2023	Acoustic call detection, harp trapping
Ninox connivens	Barking Owl	May - Dec	20 – 24 February 2023 27 – 31 March 2023 17 – 21 July 2023 19 – 23 August 2024 26 – 27 August 2024	Tree hollow searches, spotlighting, call playback
Ninox strenua	Powerful Owl	May - Aug	20 – 24 February 2023 27 – 31 March 2023 17 – 21 July 2023 19 – 23 August 2024 26 – 27 August 2024	Tree hollow searches, spotlighting, call playback
Pandion cristatus	Eastern Osprey	Apr - Nov	20 – 24 February 2023 27 – 31 March 2023 17 – 21 July 2023 16 – 27 October 2023 19 – 23 August 2024	Diurnal bird census, raptor nest searches, opportunistic sightings
Petaurus norfolcensis	Squirrel Glider	All year	20 February – 31 March 2023 17 – 21 July 2023 19 – 23 August 2024	Infra-red cameras, spotlighting

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey within Subject land	Survey Method
			26 – 27 August 2024	
Petauroides Volans	Southern Greater Glider	All year	20 February – 31 March 2023 17 – 21 July 2023 19 – 23 August 2024 26 – 27 August 2024	Infra-red cameras, spotlighting
Phascolarctos cinereus	Koala	All year	20 February – 31 March 2023 17 – 21 July 2023 19 – 23 August 2024 26 – 27 August 2024	Infra-red cameras, spotlighting, call playback, SAT surveys
Phascogale tapoatafa tapoatafa	Brush-tailed Phascogale	Dec-June	20 February – 31 March 2023 17 – 21 July 2023 19 – 23 August 2024 26 – 27 August 2024	Infra-red cameras, spotlighting
Planigale maculata	Common Planigale	All year	20 February – 31 March 2023 16 – 27 October 2023	Elliot trapping, infra-red cameras, pitfall trapping
Pteropus poliocephalus	Grey-Headed Flying Fox	Oct-Dec	20-24 February 2023, 27-31 March 2023, 17-21 July 2023	Active diurnal search, spotlighting
Tyto novaehollandiae	Masked Owl	May - Aug	20 – 24 February 2023 27 – 31 March 2023 17 – 21 July 2023 19 – 23 August 2024 26 – 27 August 2024	Tree hollow searches, spotlighting, call playback

Details of each of the surveys undertaken within the study area for the species listed in **Table 4** are provided in the following sections. Locations of surveys can be found in **Figure 8**.

2.5.2.1. Habitat Searches

Target Species: Striped Legless Lizard, Hunter Valley Delma

A habitat search was undertaken across the entire study area. The habitat search involved turning over suitable sized rocks and logs as well as dry cow pats (where possible). Additional, habitat searches were undertaken in conjunction with artificial cover surveys (see ***Section 2.5.2.2***) within areas of suitable habitat that comprised rocks, logs and grass tussocks. Searches were undertaken once each week, whereby rocks and logs were carefully turned over, checked and placed back into their original position.

2.5.2.2. Artificial Cover Surveys

Target species: Striped Legless Lizard, Hunter Valley Delma

Concrete roof tiles (Monier 100) installed in a grid array were used to target the two Delma species potentially occurring within the study area. Ten tile grids were established, each consisting of 10 x 5m tiles, with 5 m spacing. The tile grids were installed within the study area in August (being 3 months prior to first surveys as outlined in the NSW survey guide for threatened reptiles). Tiles were checked once per week commencing in November 2024 for eight consecutive weeks.

2.5.2.3. Raptor Nest Searches

Target Species: Eastern Osprey, Square-tailed Kite, White-bellied Sea-Eagle, Little Eagle

The subject land was assessed for important components of habitat for raptors with particular focus on the presence of large stick nests. During this assessment, any evidence for presence of these species from observation or calls was recorded using a hand-held GPS.

2.5.2.4. Diurnal Bird Census

Target Species/Population: Glossy Black-cockatoo, Gang-gang Cockatoo

Diurnal bird surveys were based on 'Threatened Biodiversity Survey and Assessment: Guidelines for Activities and Developments' (DPE 2004) and 'Survey Guidelines for Australia's Threatened Birds' (DPE 2010). These surveys commenced at sunrise and were performed across three sites within the subject land for 20 minutes for four mornings by two ecologists. Diurnal bird survey sites were chosen based upon the proximity of relevant habitat features such as dams and hollow-bearing trees, and their locations can be found in **Figure 8**.

Bird surveys conducted during the July 2023 survey period were specifically targeted at detection of the Glossy Black-Cockatoo and were supplemented by searches for chewed cones around *Casuarina* and *Allocasuarina* species.

2.5.2.5. Spot Assessment Technique Survey

Target Species: Koala

Surveys for Koala was undertaken using a method known as the Spot Assessment Technique (SAT). A 250m grid was placed over the study area, with the grid centred over suitable habitat. Within the study area suitable habitat included all areas of PCT 3431 (woodland condition) due to the presence of koala use trees (predominantly *Eucalyptus crebra*). Survey sites were selected at grid intersect points that were positioned within suitable habitat. The subject land comprises approximately 40 ha of suitable habitat, and as such a minimum of six survey sites were required (total hectares divided by 6.25) (NSW Government 2022a). A total of eight survey sites were identified across the subject land and surveyed during the July 2023 survey period.

At each site, a central food tree was established, and a minimum of two person minutes was spent searching for faecal pellets (scats) within a one metre radius of the base of the central tree and 29 of the nearest surrounding trees. Tree trunks were searched for scratch marks, and the canopy was observed for any Koalas present.

2.5.2.6. Spotlighting

Target Species: Squirrel Glider, Koala, Barking Owl, Bush Stone-curlew, Eastern Pygmy Possum, Pale-headed Snake, Powerful Owl, Southern Greater Glider, Brush-tailed Phascogale, Common Planigale, Grey-headed Flying Fox, Masked Owl

Spotlighting was undertaken via transects throughout the subject land using high powered hand-held torches, focussing on the potential for presence of the target species. Each transect was undertaken once each night by two ecologists for four nights.

2.5.2.7. Broadcast Surveys

Target Species: Powerful Owl, Masked Owl, Barking Owl, Bush Stone-curlew, Koala

Threatened owl surveys were conducted at approximately three locations (approximately 1 kilometre (km) apart) within the study area using a call playback technique with a recording of the targeted species call.

Prior to the call playback, ten minutes were spent listening and watching for any of the owl species. A pre-recorded call of each species was played using a speaker for approximately 15 seconds, followed by 30 seconds of listening time. This was done repeatedly for at least 15 minutes, followed by 15 minutes of spotlighting for the species. This was repeated for each of the species, with the Masked Owl occurring last in each sequence of calls being broadcast. This was conducted once per night for six nights over a two-week period.

2.5.2.8. Pitfall Trapping

Target species: Striped Legless Lizard, Common Planigale

Pitfall traps were established within areas of suitable habitat in the subject land and set for 10 nights between 16 – 20 and 23 - 27 October 2023. Five pitfall traps consisting of 20 litre buckets were dug into the ground at approximate 4m spacing along a 20m drift fence. Leaf litter and small twigs were placed in the bottom of each bucket to provide shelter for trapped animals. Traps were checked each morning within two hours of sunrise and lids were placed over traps during the day to prevent diurnal fauna from falling in and becoming trapped. Traps were then re-opened in the afternoon within 2 hours of sunset.

2.5.2.9. Terrestrial Elliot Trapping

Target species: Common Planigale, Brush-tailed Phascogale

Terrestrial Elliot trapping was undertaken along trap lines using Elliot A traps placed at 10m intervals. Each trap was baited with a small mammal bait mix consisting of peanut butter, honey and rolled oats. Elliot trapping was undertaken over four consecutive nights between 32-31 March 2023 with traps checked each morning within 2 hours of sunrise. Any fauna captured was identified and released and the bait replaced.

2.5.2.10. Funnel Trapping

Target species: Pale-headed Snake

This species is not considered as a candidate species for further assessment and is not identified by the BAM calculator for this assessment. However, preliminary assessments and BAM calculations undertaken for the

study area in 2022 using legacy PCTs mapped within the study area identified the species as a potential candidate species credit species. As such surveys were undertaken on a precautionary basis for this species.

Funnel trapping for this species was undertaken along transects. At each transect approximately 20m of drift fencing was installed with funnel traps placed in pairs (one on either side of the drift fence) at 5m intervals. Funnel traps were set for 4 consecutive nights between 27 – 31 March 2023 and checked each morning within 2 hours of sunrise. Any fauna captured was identified and released.

2.5.2.11. Infra-red Camera Detection

Target Species: Southern Greater Glider, Squirrel Glider, Brush-tailed Phascogale, Common Planigale

Motion sensor cameras were utilised to survey for the above species. Bait stations comprised of PVC piping and a vent cowl were baited with a standard small mammal bait mix of honey, oats and peanut butter and mounted on the side of trees, with an infrared camera aimed at the bait. Each camera was set to take three photos in succession when triggered.

The motion sensor cameras were set on the 20 February 2023 and collected on the 31 March 2023.

2.5.2.12. Acoustic Call Detection

Target Species: Southern Myotis

Acoustic call detection for microbats are based on *'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method'* (DPE 2018). Bat detectors, including both Anabat Swift and Chorus units, were placed in proximity to areas of the most suitable waterbody habitat and left onsite for four consecutive nights to record microbat activity between 20 – 24 February 2023 and the 27 – 31 March 2023. The bat detectors were retrieved, and the recorded bat calls were analysed, and species identified by an experienced expert (see **Appendix A** for detailed bat analysis).

2.5.2.13. Harp Trapping

Target species: Southern Myotis

Harp traps were set in the subject land in the areas of most suitable habitat that are likely to be utilised by microchiropteran bat (microbat) species as 'fly ways'. Harp traps were set each evening and left to stand overnight, then checked the following morning within an hour of sunrise and left dismantled during the day. Harp trapping occurred over four consecutive nights between the 20 – 24 February 2023.

2.6. Weather Conditions

Weather conditions during the field survey was appropriate for detection of target species credit species. A summary of weather conditions in the wider locality of the subject land from the Bureau of Meteorology (BOM Weather Station 061363 - Scone Airport) during the field surveys is provided in **Table 5**.

Table 5 Weather conditions during field surveys

Date	Temperature Minimum (°C)	Temperature Maximum (°C)	Rainfall (mm)
20/02/2023	21.8	35.3	0.0

Date	Temperature Minimum (ºC)	Temperature Maximum (ºC)	Rainfall (mm)
21/02/2023	15.8	33.8	0.0
22/02/2023	18.7	18.9	1.2
23/02/2023	14.6	27.9	7.2
24/02/2023	14.6	28.0	0.0
27/03/2023	15.5	25.6	0.0
28/03/2023	17.6	28.6	4.2
29/03/2023	18.5	28.0	2.4
30/03/2023	12.1	24.9	1.0
31/03/2023	7.5	25.8	0.2
17/07/2023	7.9	18.9	0.0
18/07/2023	3.5	23.3	0.0
19/07/2023	1.5	17.5	0.0
20/07/2023	-5.5	20.4	0.0
21/07/2023	1.0	16.0	0.0
09/10/2023	4.3	28.4	0.0
10/10/2023	6.9	26.5	0.0
11/10/2023	12.6	29.2	0.0
12/10/2023	5.6	32.5	0.0
16/10/2023	8.9	30.0	0.0
17/10/2023	3.2	22.0	0.0
18/10/2023	7.2	23.5	0.0
19/10/2023	5.2	26.4	0.0
20/10/2023	6.3	31.2	0.0
23/10/2023	6.8	31.4	0.0
24/10/2023	5.9	35.8	0.0
25/10/2023	12.8	34.8	0.0
26/10/2023	12.5	13.3	0.6
27/10/2023	10.3	17.7	27.4
19/08/2024	9.8	20.1	0.0
20/08/2024	7.1	23.3	0.0
21/08/2024	10.2	24.1	0.0
22/08/2024	6.9	22.3	0.0
23/08/2024	2.8	21.2	0.0
26/08/2024	15.9	25.7	2.8
27/08/2024	2.2	24.7	0.0

Date	Temperature Minimum (ºC)	Temperature Maximum (ºC)	Rainfall (mm)
31/10/2024	6.9	32.5	0.0
01/11/2024	14.8	27.8	0.0
08/11/2024	14.8	30.4	11.2
15/11/2024	16.6	27.2	0.2
20/11/2024	11.1	28.7	0.0
29/11/2024	20.2	25.9	2.8
06/12/2024	19.2	35.0	0.0
13/12/2024	12.2	37.4	0.0
20/12/2024	8.1	30.7	0.0

3. Landscape Features

3.1. Assessment Area

The subject land is approximately 67.3 ha in area and is shown in **Figure 2**. As the Modification is being assessed as a site-based project, the assessment area comprises the area of land within a 1,500 m buffer around the outer boundary of the subject land. The assessment area is approximately 2,865 ha in size and is shown in **Figure 2.**

3.2. Landscape Features

Landscape features identified within the subject land and assessment area are outlined below. The extent of these features within the subject land is shown in **Figure 1** and the extent within the assessment area is shown in **Figure 2**.

3.2.1. IBRA Bioregions and IBRA Subregion

The subject land and assessment area occur within the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion. The subject land and assessment area both occur entirely within the Hunter Subregion.

3.2.2. Rivers, Streams and Estuaries

The subject land and assessment area occur within the Hunter River catchment. There are a number of hydro lines mapped within the subject land including one second order stream and several first order streams, all of which are considered to be dry drainage lines and only contain water following heavy rainfall events. These drainage lines are present within patches of remnant woodland as well as agricultural managed land comprised of derived native grasslands. Three small farm dams are also present in the subject land. The location of hydro lines and dams are shown in **Figure 2**.

Several other hydro lines are mapped within the wider assessment area ranging from first to sixth order streams, including Dry Creek and the Hunter River.

3.2.3. Important and Local Wetlands

No important wetlands listed in the Directory of Important Wetlands in Australia are present in the subject land and/or assessment area. No mapped areas of wetlands under the Coastal Management State Environmental Planning Policy are present in the subject land or assessment area.

The subject land contains three human-made waterbodies (dams), which comprise approximately 0.52 ha of the subject land. Two of the dams are located along drainage lines within the central portion of the subject land, while the third dam is located within a patch of Derived Native Grassland (DNG) adjacent to Roxborough Road in the north of the subject land.

3.2.4. Geology and Soils

The subject land falls within the Hunter, Bayswater and Roxburgh soil landscapes. Hunter soil landscapes comprise the floodplains of the Hunter River and its tributaries, and the main soils are all formed on alluvium. Bayswater soil landscapes are characterised by undulating low hills south-west of Muswellbrook, comprised predominantly of yellow solodic soils on slopes and alluvial soils in drainage lines. Roxburgh soil landscapes

are characterised by undulating low hills and undulating hills with yellow podzolic soils on upper to mid slopes and red solodic soils on more rounded hills (DPE 2023).

3.2.5. Habitat Connectivity

The subject land does not form part of a regional biodiversity corridor, flyway for migratory species, or estuary.

The vegetation within the subject land comprises a mix of woodland and grassland vegetation. The woodland vegetation provides connectivity across the subject land and wider assessment area allowing native species to disperse throughout the landscape. The patches of DNG are not considered to hinder the dispersal of native species given the contiguous nature of the woodland within the wider assessment area.

3.2.6. Karsts, Caves, Crevices, Cliffs and Areas of Geological Significance

No karsts, caves, crevices, cliffs or areas of geological significance have been identified within the subject land or assessment area based on searches of available aerial imagery from NearMap, or topographic data available from SixMaps.

3.2.7. Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value have been mapped within the subject land and/or assessment area.

3.2.8. BioNet NSW Landscapes

The subject land is located predominantly within the 'Central Hunter Foothills' BioNet NSW Landscape. The assessment area comprises a combination of the 'Central Hunter Foothills' and 'Upper Hunter Channels and Floodplains' landscapes. The Central Hunter Foothills' landscape is described as 'undulating lowlands, rounded to steep hills with rock outcrop on ridges on Permian lithic sandstone, conglomerate, shale and coal, general elevation 40 to 300m with a few higher peaks, local relief 30 to 120m. Red-brown to yellow brown harsh texture-contrast soils on slopes, dark coloured clays in valleys and limited accumulations of sand and gravel in streams (Mitchell 2002).

3.2.9. Soil Hazard Features

No acid sulphate soils as per the EHG Acid Sulfate Soils Risk mapping (NSW Government 2025) have been mapped within the subject land and assessment area.

3.3. Native Vegetation Cover

The native vegetation cover was determined through the use of GIS. To map native vegetation cover within the subject land and assessment area, this assessment utilised the detailed vegetation mapping prepared by Cumberland Ecology in conjunction with NSW State Vegetation Type Map (EHG 2024e). The native vegetation cover within the assessment area is shown in **Figure 2**. The assessment area is approximately 2,865 ha in size, of which approximately 1,275 ha comprises native vegetation cover, which represents 44.5% of the assessment area. Therefore, the native vegetation cover value is assigned to the cover class of >30–70%.

4. Native Vegetation

4.1. Native Vegetation Extent

The subject land has been subject to detailed surveys by Cumberland Ecology for the purpose of this BDAR. The native vegetation extent within the subject land was determined through aerial photograph interpretation and field surveys. The native vegetation extent within the subject land is shown in **Figure 9**. It occupies approximately 63.42 ha, which represents 94% of the subject land. The native vegetation extent within the subject land comprises a mix of remnant woody vegetation and DNG, with a small patch (one tree) of planted native vegetation.

The remaining areas within the subject land are comprised of exotic/cleared areas and dams. In accordance with Section 5.1.1.5 of the BAM, these areas do not require further assessment, unless they provide habitat for species credit species.

No apparent visual differences between the aerial photographs used in this assessment and the native vegetation cover shown in **Figure 9** have been identified.

4.2. Plant Community Types

4.2.1. Introduction

Identification of the PCTs occurring within the subject land was guided by the results of the surveys undertaken by Cumberland Ecology. The data collected during surveys of the subject land and surrounds was analysed in conjunction with a review of the PCTs held within the BioNet Vegetation Classification database and information presented. In selecting PCTs, consideration was given to the following:

- Occurrence within the Hunter IBRA subregion;
- Vegetation formation;
- Alignment with TECs;
- Landscape position; and
- Upper, mid and ground strata species.

The analysis determined that the native vegetation within the subject land aligned with one PCT held within the BioNet Vegetation Classification database, Central Hunter Ironbark Grassy Woodland, occurring in two condition states; Woodland and DNG. **Table 6** provides a summary of the two condition states of the PCT identified within the subject land. The distribution of the two condition states of the PCT within the subject land is shown in **Figure 10**. Detailed descriptions of the two condition states of the PCT and the justification for PCT selection is provided in the sections below.

Table 6 Plant community types within subject land

PCT #	PCT Name	Condition	Area (ha)
3431	Central Hunter Ironbark Grassy Woodland	Woodland	39.31
3431	Central Hunter Ironbark Grassy Woodland	DNG	24.10
Total			**63.42**

4.2.2. Central Hunter Ironbark Grassy Woodland

Vegetation Formation: Dry Sclerophyll Forests (Shrub/grass sub-formation)

Vegetation Class: Hunter-Macleay Dry Sclerophyll Forests

PCT Scientific Name: Central Hunter Ironbark Grassy Woodland

Percent Cleared Value: 86.47%

4.2.2.1. General Description

Central Hunter Ironbark Grassy Woodland is an open sclerophyll forest to woodland with a dry mid-stratum and a mid-dense grassy ground layer that occurs on the undulating floor of the Central Hunter Valley, NSW. The canopy very frequently includes *Eucalyptus crebra* (Small-leaved Ironbark), *Brachychiton populneus* subsp. *populneus* (Kurrajong) and occasionally *Eucalyptus moluccana* (Grey Box) which can be locally prominent. The lower small tree layer commonly is dominated by *Allocasuarina luehmannii* (Bull Oak). The mid-stratum is sparse and commonly includes chenopod and *Acacia* species, of which *Maireana microphylla* (Bluebush), *Enchylaena tomentosa* (Ruby Saltbush), *Acacia salicina* (Native Willow) and *Acacia falcata* (Hickory Wattle) are the most frequent and abundant. The mid-dense ground layer is mainly comprised of grasses and forbs with some graminoids, twiners, hardy ferns, low growing shrubs and sedges, very frequently including *Aristida ramosa* (Purple Wiregrass), *Glycine tabacina* (Variable Glycine), *Cymbopogon refractus* (Barbed Wire Grass), *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern) and *Dichondra repens* (Kidney Weed). This PCT is widespread on Permian sediments, where it primarily occurs in small, often disturbed patches in a landscape dominated by agriculture and coal mining. It occurs in warm, dry environments with a mean annual rainfall typically below 730 mm (EHG 2022a).

4.2.2.2. Site Description

Two condition classes of this PCT occur on the subject land:

- Woodland; and
- DNG.

Further details of each condition class are provided in subsequent sections.

i. Woodland Condition

BC Act Status: EEC

EPBC Act Status: CEEC

The woodland condition of Central Hunter Ironbark Grassy Woodland occurs throughout the subject land and study area. This condition class of this community includes regrowth, scattered trees and mature stands of vegetation. The vegetation has a long history of disturbance due to historical clearing and management as pastureland. It is characterised by a canopy of *Eucalyptus crebra* (Small-leaved Ironbark), *Brachychiton populneus* subsp. *populneus* (Kurrajong) and *Eucalyptus moluccana* (Grey Box). The sub-canopy includes canopy species as well as frequent occurrences of *Allocasuarina luehmannii* (Bull Oak), *Notelaea microcarpa* var. *microcarpa* (Velvet Mock Olive), *Myoporum montanum* (Water Bush) and to a lesser degree *Acacia salicina* (Native Willow). The shrub layer is sparse but includes *Maireana microphylla* (Bluebush), *Notelaea microcarpa* var. *microcarpa* (Velvet Mock Olive), *Myoporum montanum* (Water Bush) and *Psydrax odorata* (Shiny-leaved Canthium). The groundcover includes *Austrostipa scabra* subsp. *falcata*, *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Bothriochloa decipiens* (Pitted Bluegrass), *Elymus scaber* (Wheatgrass), *Aristida ramosa* (Purple Wiregrass), *Cymbopogon refractus* (Barbed Wire Grass), *Sida corrugata* (Corrugata Sida), *Glycine tabacina* (Variable Glycine), *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern), *Enchylaena tomentosa* (Ruby Saltbush) and *Dichondra repens* (Kidney Weed). Common weeds throughout this community include *Verbena bonariensis* (Purpletop), *Verbena rigida* (Veined Verbena), *Conyza sumatrensis* (Tall Fleabane), *Sida rhombifolia* (Paddys Lucerne) and *Cirsium vulgare* (Spear Thistle).

An example of this vegetation community in the subject land is shown in **Photograph 1**.

Photograph 1 Woodland condition of PCT 3431 within the subject land



ii. Derived Native Grassland Condition

BC Act Status: EEC

EPBC Act Status: Not listed

Central Hunter Ironbark Grassy Woodland (Derived Native Grassland) occurs throughout the subject land. The DNG condition class of this community includes a high prevalence of native grasses and other native groundcovers such as *Aristida ramosa* (Purple Wiregrass), *Austrostipa scabra* subsp. *falcata*, *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Bothriochloa decipiens* (Pitted Bluegrass), *Elymus scaber* (Wheatgrass), *Cymbopogon refractus* (Barbed Wire Grass), *Sida corrugata* (Corrugata Sida), *Glycine tabacina* (Variable Glycine) and *Cheilanthes sieberi* subsp. *sieberi* (Poison Rock Fern). Common weeds throughout this community include *Verbena bonariensis* (Purpletop), *Verbena rigida* (Veined Verbena), *Conyza sumatrensis* (Tall Fleabane), *Sida rhombifolia* (Paddys Lucerne) and *Cirsium vulgare* (Spear Thistle).

An example of this vegetation community in the subject land is shown in **Photograph 2**.

Photograph 2 PCT 3431 DNG present within the subject land



4.2.2.3. PCT Justification

PCT 3431 was selected due to the presence of the characteristic canopy species *Eucalyptus crebra* (Small-leaved Ironbark), *Brachychiton populneus* subsp. *populneus* (Kurrajong) and *Eucalyptus moluccana* (Grey Box) with a small tree layer dominated by *Allocasuarina luehmannii* (Bull Oak). Furthermore, the mid-stratum species *Maireana microphylla* (Bluebush), *Enchylaena tomentosa* (Ruby Saltbush) and *Acacia salicina* (Native Willow) are also characteristic of PCT 3431.The identification of this PCT in the subject land is also supported by its geographic position on an undulating valley floor on Permian sediments of the Hunter Valley, which is where PCT 3431 is found.

4.2.2.4. Alignment with Threatened Ecological Communities

i. Woodland Condition Class

The woodland condition class of PCT 3431 is associated with the TEC Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions, which is listed as an EEC under the BC Act within the BioNet Vegetation Classification database, and it also corresponds to Central Hunter Valley Eucalypt Forest and Woodland which is listed as CEEC under the EPBC Act.

The occurrence of this condition class on the subject land conforms to the listing criteria under the BC Act due to the species present, the landscape position on an undulating valley floor, and the geographic area where the subject land is located. The occurrence of this condition class on the subject land also conforms to the EPBC Act listed CEEC, due to the patch size being ≥ 5 ha, ≥ 50% of perennial understorey vegetative cover is native and the patch contains at least 12 native understorey species as stated in Table 1 of the EPBC Act Listing Advice for the community (Threatened Species Scientific Committee 2015).

ii. DNG Condition Class

The DNG condition class of PCT 3431 is associated with the TEC Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions, which is listed as an EEC under the BC Act.

The occurrence of this condition class on the subject land conforms to the listing criteria under the BC Act due to the species present, the landscape position on an undulating valley floor, and the geographic area where the subject land is located.

However, this condition class does not comprise a TEC under the EPBC Act as the derived native grasslands and shrublands of the nationally protected ecological community (Central Hunter Valley Eucalypt Forest and Woodland) are not listed under the EPBC Act.

4.3. Other Vegetation Communities

4.3.1. Planted Native Vegetation

Planted natives are found within a small patch within the subject land along Roxborough Road While these are not located directly within the subject land, a very small area of approximately 0.002 ha of canopy overhangs the subject land. The trees within this patch are planted in rows suggesting that they were planted for visual screening and aesthetic purposes. The main species planted in proximity to the subject land are *Eucalyptus moluccana* (Grey box), *Eucalyptus Crebra* (Narrow-leaved Ironbark), and *Acacia salicina* (Native Willow).

An example of this vegetation community in the subject land is shown in **Photograph 3**.

Photograph 3 Planted native vegetation adjacent to Roxborouh Road



4.3.2. Exotic Dominated Grassland

Exotic dominated grassland is located within the subject land near the intersection of Bengalla Road and Old Bengalla Road. a high level of disturbance immediately adjacent to the roads. Dominant species within the community include *Galenia pubescens* (Galenia), *Chloris gayana* (Rhodes Grass), *Cynodon dactylon* (Common Couch), *Setaria parviflora, Paspalum dilatatum* (Paspalum), *Eragrostis curvular* (African Lovegrass) and *Polygonum aviculare* (Wireweed). .

An example of this vegetation community in the subject land is shown in **Photograph 4**.

Photograph 4 Exotic dominated grassland within the subject land



4.4. Threatened Ecological Communities

As described in ***Section 4.2*** above, both condition classes of the PCT present on the subject land have been assessed as being associated with a TEC. **Table 7** summarises the TECs identified within the subject land and their distribution is shown in **Figure 11**.

Table 7 Threatened ecological communities within the subject land

TEC Name	Status	Associated PCT	Associated Vegetation Zone	Subject Land (ha)
BC Act Listed TECs				
Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	EEC	3431: Central Hunter Ironbark Grassy Woodland	Woodland	39.42
	EEC	3431: Central Hunter Ironbark Grassy Woodland	DNG	24.16
EPBC Act listed TECs				
Central Hunter Valley Eucalypt Forest and Woodland	CEEC	3431: Central Hunter Ironbark Grassy Woodland	Woodland	39.42

4.5. Vegetation Integrity Assessment

The native vegetation identified within the subject land was assigned to two vegetation zones based on the broad condition states of the PCT present. A patch size (**Figure 2**) was subsequently assigned for the vegetation zones. The extent of the vegetation zones within the subject land are shown in **Figure 12**.

The vegetation zones were assessed using survey plots/transects (see ***Section 2.3.2***) to determine the vegetation integrity score. Composition, Structure and Function attributes were assessed against benchmark data as per the BioNet Vegetation Classification database. No local benchmarks were utilised for assessments within this BDAR.

A summary of BAM plot data utilised within the BAM Calculator (BAM-C) to determine the vegetation integrity score is provided in **Appendix B**. As per the BAM Stage 2 Operation Manual (pg. 4), field data sheets, electronic copies of raw data and spatial datasets have been uploaded into BOAMs and submitted as part of the BAM-C.

Vegetation zones, patch sizes and vegetation integrity scores for the subject land are summarised in **Table 8**.

Table 8 Vegetation zones within the subject land

Vegetation Zone	PCT #	PCT Name	Condition Name	Area (ha)	Patch Size Class (ha)	Vegetation Integrity Score
1	3431	Central Hunter Ironbark Grassy Woodland	Woodland	39.42	>100	72.2 (Composition: 71.6 Structure: 72.2 Function: 72.9)
2	3431	Central Hunter Ironbark Grassy Woodland	DNG	24.16	>100	29.9 (Composition: 48.6 Structure: 40.1 Function: 13.8)

5. Threatened Species

5.1. Threatened Species for Assessment

5.1.1. BAM-C Species Lists

The BAM-C generates a list of threatened species requiring assessment utilising a number of variables. The following criteria have been utilised to predict the threatened species requiring further assessment:

- IBRA subregion: Hunter;
- Associated PCTs: 3431;
- Percent native vegetation cover in the assessment area: 44.5%;
- Patch size: >100 ha; and
- Credit type: Ecosystem and/or species.

Based on the above variables, the BAM-C generated a list of 33 ecosystem credit species and 27 species credit species. These totals include 12 dual credit species which are considered as ecosystem credit species for their foraging habitat and as species credit species for their breeding habitat. One additional species has been added as an ecosystem credit species on a precautionary basis given its threatened status listing under the EPBC Act. Further details on this species are provided in ***Section 5.4***.

Ecosystem credit species and species credit species are assessed further in ***Section 5.2*** and ***Section 5.3***, respectively.

5.1.2. EPBC Act Listed Species

The species lists generated by the BAM-C include nine (9) threatened species listed under the EPBC Act. Furthermore, an analysis of the PMST was also undertaken and the PMST report is provided in **Appendix C**. An assessment of the likelihood of occurrence assessment was subsequently undertaken to identify species listed under the EPBC Act that are considered likely to occur within the subject land (**Appendix D**). The EPBC Act listed species identified comprise a mix of ecosystem credit species, dual credit species and species credit species and have been assessed in accordance with the BAM in the following sections:

- Brown Treecreeper (eastern subspecies) – Ecosystem credit species (***Section 5.2***);
- Diamond Firetail – Ecosystem credit species (***Section 5.2***);
- Green and Golden Bell Frog – Species credit species (***Section 5.3***);
- Grey-headed Flying-fox – Dual credit species (***Sections 5.2*** and ***5.3***);
- Koala – Dual credit species (***Sections 5.2*** and ***5.3***);
- North Rothbury Persoonia - Species credit species (***Section 5.3***);
- *Ozothamnus tesselatus* – Species credit species (***Section 5.3***);
- *Prasophyllum* sp. Wybong – Species credit species (***Section 5.3***);

- Regent Honeyeater – Dual credit species (***Sections 5.2*** and ***5.3***);
- Slaty Red Gum – Species credit species (***Section 5.3***);
- South-eastern Glossy Black-Cockatoo – Dual credit species (***Sections 5.2*** and ***5.3***);
- Spotted-tailed Quoll – Ecosystem credit species (***Section 5.2***);
- Striped Legless Lizard – Species credit species (***Section 5.3***);
- Swift Parrot – Dual credit species (***Sections 5.2*** and ***5.3***);
- Tango Leek Orchid – Species credit species (***Sections 5.3***); and
- White-throated Needletail – Ecosystem credit species (***Section 5.2***).

The following species identified in the PMST were not included in the species lists generated by the BAM-C:

- South-eastern Hooded Robin; and
- Hunter Valley Delma.

These species are addressed further in **Section 5.4**.

5.2. Ecosystem Credit Species

5.2.1. Overview

A total of 33 ecosystem credit species are predicted for the vegetation zones within the subject land. One additional species, the South-eastern Hooded Robin (*Melanodryas cucullata cucullata*) has been added as an ecosystem credit species on precautionary basis given its threatened status listing under the EPBC Act . **Table 9** lists the predicted ecosystem credit species, and whether they have been retained within the assessment following consideration of habitat constraints, geographic limitations, vagrancy and quality of microhabitats. All ecosystem species have been retained in the assessment.

5.2.2. Justification for Removal

No ecosystem credit species have been removed from the assessment. Therefore, no justification is provided for any ecosystem credit species.

Table 9 Predicted ecosystem credit species

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Relevant PCTs	Sensitivity to Gain Class	Retained in Assessment?
Anthochaera phrygia	Regent Honeyeater (Foraging)	CE	CE	3431	High	Yes

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Relevant PCTs	Sensitivity to Gain Class	Retained in Assessment?
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	3431	Moderate	Yes
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	E	E	3431	Moderate	Yes
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo (Foraging)	V	V	3431	High	Yes
Chthonicola sagittata	Speckled Warbler	V	-	3431	High	Yes
Circus assimilis	Spotted Harrier	V	-	3431	Moderate	Yes
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	3431	High	Yes
Daphoenositta chrysoptera	Varied Sittella	V	-	3431	Moderate	Yes
Dasyurus maculatus	Spotted-tailed Quoll	V	E	3431	High	Yes
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	3431	Moderate	Yes
Falco subniger	Black Falcon	V	-	3431	Moderate	Yes
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	3431	High	Yes
Glossopsitta pusilla	Little Lorikeet	V	-	3431	High	Yes
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	V	-	3431	High	Yes
Hieraaetus morphnoides	Little Eagle (Foraging)	V	-	3431	Moderate	Yes

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Relevant PCTs	Sensitivity to Gain Class	Retained in Assessment?
Hirundapus caudacutus	White-throated Needletail	-	V	3431	High	Yes
Ixobrychus flavicollis	Black Bittern	V	-	3431	Moderate	Yes
Lathamus discolor	Swift Parrot (Foraging)	E	CE	3431	Moderate	Yes
Limicola falcinellus	Broad-billed Sandpiper (Foraging)	V	-	3431	High	Yes
Lophoictinia isura	Square-tailed Kite (Foraging)	V	-	3431	Moderate	Yes
Melanodryas cucullata	South-eastern Hooded Robin	E	E	3431	Moderate	Yes
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	3431	Moderate	Yes
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	3431	High	Yes
Miniopterus australis	Little Bent-winged Bat (Foraging)	V	-	3431	High	Yes
Miniopterus orianae oceanensis	Large Bent-winged Bat (Foraging)	V	-	3431	High	Yes
Neophema pulchella	Turquoise Parrot	V	-	3431	High	Yes
Pandion cristatus	Eastern Osprey (Foraging)	V	-	3431	Moderate	Yes
Petroica boodang	Scarlet Robin	V	-	3431	Moderate	Yes

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Relevant PCTs	Sensitivity to Gain Class	Retained in Assessment?
Petroica phoenicea	Flame Robin	V	-	3431	Moderate	Yes
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	3431	Moderate	Yes
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	V	V	3431	High	Yes
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	3431	High	Yes
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	3431	High	Yes
Stagonopleura guttata	Diamond Firetail	V	-	3431	Moderate	Yes

5.3. Species Credit Species

5.3.1. Overview

A total of 11 flora species credit species and 29 fauna species credit species have been predicted for the subject land. Of these, one threatened flora species has been excluded from further assessment due to geographic constraints. All remaining threatened flora species have been targeted during surveys as outlined in ***Section 2.4***. Of the threatened fauna species predicted, 11 species, including one endangered fauna population, have been excluded from further assessment due to habitat degradation, a lack of habitat constraints and/or geographic limitations identified in the Threatened Species Data Collection (EHG 2023) as described in ***Section 5.3***.

No threatened species were manually added to the list of predicted species credit species in BAM-C.

Table 10 below lists the predicted species credit species for the vegetation zones within the subject land, and whether they have been retained within the assessment following consideration of habitat constraints, geographic limitations, vagrancy and quality of microhabitats. Justification is provided below this table for species that have been removed from the assessment in accordance with Steps 1-3 of Section 5.2 of the BAM. All species not removed from consideration (i.e. retained in the assessment) are by default candidate species credit species that require further assessment.

Of the assessed candidate species, a total of 10 flora species and 18 fauna species have been retained for further assessment and have been targeted during surveys outlined in ***Section 2.4*** and ***Section 2.5***, respectively.

Table 10 Predicted species credit species

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Relevant PCTs	Sensitivity to Gain Class	Retained in Assessment?
Flora						
Acacia pendula - endangered population	*Acacia pendula* population in the Hunter catchment	EP	-	3431	Very High	Yes
Cymbidium canaliculatum - endangered population	*Cymbidium canaliculatum* population in the Hunter Catchment	EP	-	3431	Moderate	Yes
Diuris tricolor	Pine Donkey Orchid	V	-	3431	Moderate	Yes
Diuris tricolor - endangered population	Pine Donkey Orchid population in the Muswellbrook local government area	EP	-	3431	Moderate	Yes
Eucalyptus glaucina	Slaty Red Gum	V	V	3431	High	Yes
Ozothamnus tesselatus	-	V	V	3431	Moderate	Yes
Persoonia pauciflora	North Rothbury Persoonia	CE	CE	3431	Very High	No
Pomaderris queenslandica	Scant Pomaderris	E	-	3431	High	Yes
Prasophyllum petilum	Tarengo Leek Orchid	E	E	3431	High	Yes
Prasophyllum sp. Wybong	-	-	CE	3431	Moderate	Yes
Pterostylis chaetophora	-	V	-	3431	Moderate	Yes
Fauna						
Anthochaera phrygia	Regent Honeyeater (Breeding)	CE	CE	3431	High	No
Burhinus grallarius	Bush Stone-curlew	E	-	3431	High	Yes

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Relevant PCTs	Sensitivity to Gain Class	Retained in Assessment?
Callocephalon *fimbriatum*	Gang-gang Cockatoo (Breeding)	E	E	3431	High	Yes
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V	V	3431	High	Yes
Cercartetus nanus	Eastern Pygmy-possum	V	-	3431	High	Yes
Chalinolobus dwyeri	Large-eared Pied Bat	E	E	3431	Very High	No
Delma vescolineata	Hunter Valley Delma	E	E	3431	High	Yes
Dromaius novaehollandiae - endangered population	Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	EP	-	3431	Moderate	No
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	V	-	3431	High	Yes
Hieraaetus morphnoides	Little Eagle (Breeding)	V	-	3431	Moderate	Yes
Lathamus discolor	Swift Parrot (Breeding)	E	CE	3431	Moderate	No
Limicola falcinellus	Broad-billed Sandpiper (Foraging)	V	-	3431	High	No
Litoria aurea	Green and Golden Bell Frog	E	V	3431	High	No
Lophoictinia isura	Square-tailed Kite (Breeding)	V	-	3431	Moderate	Yes
Miniopterus australis	Little Bent-winged Bat (Breeding)	V	-	3431	Very High	No
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	V	-	3431	Very High	No
Myotis macropus	Southern Myotis	V	-	3431	High	Yes
Ninox connivens	Barking Owl (Breeding)	V	-	3431	High	Yes
Ninox strenua	Powerful Owl (Breeding)	V	-	3431	High	Yes
Pandion cristatus	Eastern Osprey (Breeding)	V	-	3431	Moderate	Yes
Petauroides volans	Southern Greater Glider	-	V	3431	High	Yes
Petaurus norfolcensis	Squirrel Glider	V	-	3431	High	Yes

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Relevant PCTs	Sensitivity to Gain Class	Retained in Assessment?
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	3431	Very High	No
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	3431	High	Yes
Phascolarctos cinereus	Koala	V	V	3431	High	Yes
Planigale maculata	Common Planigale	V	-	3431	High	Yes
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	V	V	3431	High	No
Tyto novaehollandiae	Masked Owl (breeding)	V	-	3431	High	Yes
Vespadelus troughtoni	Eastern Cave Bat	V	-	3431	Very High	No

5.3.2. Justification for Removal

This section provides justification for the removal from consideration of species credit species that have been predicted to occur in the subject land.

5.3.2.1. North Rothbury Persoonia

North Rothbury Persoonia *(Persoonia pauciflora)* has an extremely restricted distribution with all but one plant that make up the only known population occurring within a 2.5 km radius of the original specimen at North Rothbury in the Cessnock local government area (LGA). As the subject land is not located within 10km of North Rothbury, the species has been removed from the assessment due to geographical constraints.

5.3.2.2. Regent Honeyeater

The Regent Honeyeater (*Anthochaera phrygia*) is listed as a species credit species for breeding habitat only, as defined by mapped important areas. However, as the subject land is not located within a mapped important area, the species does not require further assessment.

5.3.2.3. Large-eared Pied Bat

The TBDC profile for the Large-eared Pied Bat (*Chalinolobus dwyeri*) states that the species is found in well-timbered areas containing gullies, and roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features (EHG 2022c). The TBDC also lists the habitat constraint for the species as 'within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two km of old mines or tunnels' (EHG 2022c). The subject land is not located within 2 km of these features and therefore the Large-eared Pied Bat has been removed from the assessment.

5.3.2.4. Emu population in the New South Wales North Coast Bioregion and Port Stephens Local Government Area

The Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area has been removed from the assessment due to geographical constraints, as the subject land does not lie within the Port Stephens LGA.

5.3.2.5. Swift Parrot

The Swift Parrot (*Lathamus discolor*) is listed as a species credit species for breeding habitat only, as defined by mapped important areas. Nevertheless, as the subject land is not located within a mapped important area, the species does not require further assessment.

5.3.2.6. Broad-billed Sandpiper

The Broad-billed Sandpiper (*Limicola falcinellus*) is listed as a species credit species for breeding habitat only, as defined by mapped important areas. Nevertheless, as the subject land is not located within a mapped important area, the species does not require further assessment.

5.3.2.7. Green and Golden Bell Frog

The Green and Golden Bell Frog (*Litoria aurea*) has been removed the assessment as potential habitat for the species is highly degraded. The subject land comprises three farm dams that have been used by stock for grazing. The banks of the dams are eroded from trampling and there is no emergent or fringing vegetation favoured by the species such as bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.) (EHG 2022b). Given the degraded condition of the dams within the subject land, and the absence of records from the locality in the past 40 years, the subject land is not considered to comprise suitable habitat for the Green and Golden Bell Frog. Therefore the species has been removed from the assessment.

5.3.2.8. Little Bent-winged Bat

The Little Bent-winged Bat (*Miniopterus australis*) is listed as a species credit species for breeding habitat only, described as caves, tunnels, mines, culverts or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature (EHG 2024d). As none of these features or records are present within the subject land, or within a 100m buffer, the subject land is not considered to comprise suitable breeding habitat. Therefore the species has been removed from the assessment.

5.3.2.9. Large Bent-winged Bat

The Large Bent-winged Bat (*Miniopterus orianae oceanensis*) is a species credit species for breeding habitat only, described as caves, tunnels, mines, culverts or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature (EHG 2024c).

As none of these features or records are present within the subject land, or within a 100m buffer, the subject land is not considered to comprise suitable breeding habitat. Therefore the species has been removed from the assessment.

5.3.2.10. Brush-tailed Rock-wallaby

The TBDC profile for the Brush-tailed Rock-wallaby (*Petrogale penicillata*) states that the species occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges (EHG 2024a). Furthermore, the TBDC lists the habitat constraint for the species as 'land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines' (EHG 2024a). The subject land is not located within 1 km of these features and therefore the Brush-tailed Rock-wallaby has been removed from the assessment.

5.3.2.11. Grey-headed Flying-fox

The Grey-headed Flying-fox (*Pteropus poliocephalus*) has been removed from the assessment as the subject land does not contain the habitat constraint required by this species (i.e. breeding camps) (EHG 2020). No breeding camps were observed during surveys of the subject land. As the subject land does not contain suitable breeding habitat, the species does not require further assessment.

5.3.2.12. Eastern Cave Bat

The TBDC profile for the Eastern Cave Bat (*Vespadelus troughtoni*) states that the species is a cave-roosting species usually found in dry open forest and woodland, near cliffs or rocky overhangs (EHG 2024b). The TBDC also lists the habitat constraint for the species as 'within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines, tunnels, old buildings or sheds' (EHG 2024b). The subject land is not located within 2 km of these features and therefore the Eastern Cave Bat has been removed from the assessment.

5.3.3. Candidate Species for Further Assessment

The following species were identified as candidate species credit species for further assessment.

- Flora
    - *Acacia pendula* – endangered population (Endangered population in the Hunter catchment);
    - *Cymbidium cancliculatum* – endangered population (Endangered population in the Hunter catchment);
    - *Diuris tricolor* (Pine Donkey Orchid);
    - *Diuris tricolor* – endangered population (Pine Donkey Orchis population in the Muswellbrook local government area);
    - *Eucalyptus galucina* (Slaty Red Gum);
    - *Ozothamnus tesselatus;*
    - *Pomaderris queenslandica* (Scant Pomaderris);
    - *Prasophyllum* sp. Wybong; and
    - *Pterostylis chaetophora.*

- Fauna
    - Bush Stone-curlew (*Burhinus gallarius*);
    - Gang-gang Cockatoo (*Callocephalon fimbriatum*);
    - South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*);
    - Eastern Pygmy Possum (*Cercartetus nanus*);
    - Hunter Valley Delma (*Delma vescolineata*);
    - White-bellied Sea-Eagle (*Haliaeetus leucogaster*);
    - Little Eagle (*Hieraaetus morphoides*);
    - Square-tailed Kite (*Lophoictinia isura*);
    - Southern Myotis (*Myotis macropus*);
    - Barking Owl (*Ninox connivens*);
    - Powerful owl (*Ninox strenua*);
    - Eastern Osprey (*Pandion cristatus*);
    - Southern Greater Glider (*Petauroides volans*);
    - Squirrel Glider (*Petaurus norfolcensis*);
    - Brush-tailed Phascogale (*Phascogale tapoatafa*);
    - Koala (*Phascolarctos cinereus*);
    - Common Planigale (*Planigale maculata*); and
    - Masked Owl (*Tyto novaehollandiae*).

5.3.4. Presence of Candidate Species

Table 11 lists the candidate species credit species that have been assessed as occurring within the subject land. In addition, a further three non-candidate threatened species have been recorded from the subject land, and these are considered in ***Section 5.3.4.3***.

Table 11 Species credit species assessed as present within the subject land

Scientific Name	Common Name	Biodiversity Risk Weighting	Presence
Delma vescolineata	Hunter Valley Delma	2	Present within the subject land, as determined by artificial cover surveys and habitat searches.

Scientific Name	Common Name	Biodiversity Risk Weighting	Presence
Myotis macropus	Southern Myotis	2	Present within subject land, as determined by positive call identification on acoustic detectors.

**Species also listed under EPBC Act

5.3.4.1. Hunter Valley Delma

A total of 14 records were made of the Hunter Valley Delma (*Delma vescolineata*) during targeted surveys within the subject land (**Figure 13**). Of these 10 records were from artificial cover board surveys and four were identified during habitat searches.

5.3.4.2. Southern Myotis

A possible call of the Southern Myotis was recorded on bat detectors at two locations (**Figure 13**). These records are not definitive due to their similar call frequency with long-eared bats from the Nyctophilus genus. As a precautionary approach, these calls are assumed to be from the Southern Myotis and therefore the species has been assessed as present. No individuals were captured in the harp traps.

5.3.4.3. Non-candidate Species

Calls for the following non-candidate threatened bat species were recorded using acoustic detectors:

- Large Bent-winged Bat (*Miniopterus orianae oceanensis*);
- Yellow-bellied sheath-tailed bat (*Saccolaimus flaviventris*); and
- Eastern Cave Bat (*Vespadelus troughtoni*).

The Large Bent-wing Bat was recorded within the subject land during acoustic call detection surveys. The species is a dual species credit species, being a species credit species for breeding habitat (caves, tunnel, mine, culvert or other structure known or suspected to be used for breeding) and an ecosystem credit species for foraging. As the habitat constraints for breeding are absent from the subject land, the species has been assessed as an ecosystem credit species for foraging habitat only.

The Yellow-bellied Sheathtail-bat was recorded within the subject land during acoustic call detection surveys (**Appendix A**). The species is an ecosystem credit species.

The Eastern Cave Bat is a species credit species. This species was recorded within the subject land during acoustic call detection surveys (see **Appendix A**). However, the species is not considered to be a species credit species requiring further assessment as the subject land does not provide potential habitat, or potential breeding habitat for the species as described in the TBDC. The TBDC and the BAM survey guidelines, *'Species credit' threatened bats and their habitats,* identify habitat for the species as either 'potential habitat' or 'potential breeding habitat', as described below (EHG 2024b).

- ***Potential habitat:*** *All areas with the PCTs associated with the species (as per the TBDC) on the subject land where the subject land is within 2 km of caves, scarps, cliffs, rock overhangs and discussed mines.*

- ***Potential breeding habitat:*** *All potential habitat on the subject land where the subject land is within 100m of caves, scarps, cliffs, rock overhangs and disused mines.*

The TBDC states that high resolution aerial imagery and topographic maps are to be used to identify and map potential roost habitat features on the subject land within 2 km of caves, scarps, cliffs etc. The species polygon boundary should align with PCTs on the subject land to which the species is associated that are within 2 km of identified potential roost habitat features. Given the required habitat features do not occur within 2 km of the subject land, and the subject land is not located within a 2 km buffer of these features in the wider locality, the subject land is not considered to comprise suitable habitat for this species (see **Figure 14**). Therefore no further assessment is required for this species.

In addition to the threatened bat species recorded within the subject land, one threatened bird, the Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) was recorded. The Grey-crowned Babbler (eastern subspecies) was observed at one location within the subject land. This species is an ecosystem credit species.

5.3.5. Extent of Habitat

5.3.5.1. Hunter Valley Delma/Striped Legless Lizard

The Hunter Valley Delma is known almost entirely from a 25 km wide corridor in the Hunter Valley, NSW between Maitland and Muswellbrook, with the exception of a record of the species approximately 80 km north-west of Muswellbrook suggesting that the species may be more widespread in this region.

The Final Determination for the Hunter Valley Delma states that the species has been recorded in secondary native grassland remaining after the removal or dieback of previous woody canopy vegetation in association with sparse box-gum or ironbark woodland. The primary canopy species consists of *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus crebra* (Narrow-leaved Ironbark), with a diverse ground cover layer containing multiple grasses including *Austrostipa* spp., *Bothriochloa* spp., and *Chloris* spp. (DCCEEW 2024, NSW Threatened Species Scientific Committee 2024). The species has been recorded sheltering under rocks and discarded rubbish, including building rubble, metal and organic waste. The Hunter Valley Delma has also been detected under dried cow pats in agricultural land that is heavily disturbed by livestock and contain no natural surface refugia and sheltering in roadside verges (DCCEEW 2024, NSW Threatened Species Scientific Committee 2024). This suggests at least some capacity for dispersal within the landscape where most records for the species occur.

As previously stated, the Hunter Valley Delma has been assessed as the Striped Legless Lizard in accordance with the TBDC. Therefore, the species polygon provided is for the Striped Legless Lizard. Suitable habitat for the Striped Legless Lizard within the subject land is to include all PCTs in the subject land associated with the species in the TBDC. Given the results of the surveys and presence of the species in both woodland and derived native grassland conditions of PCT 3431, the mapped species polygon has been prepared to include all areas of PCT 3431 within the subject land. The species polygon for the Striped Legless Lizard is shown in **Figure 15**.

5.3.5.2. Southern Myotis

The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. The species generally roosts close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, wharves, bridges and in dense foliage. The Southern Myotis forages over streams and pools for insects and small fish.

The potential habitat for the Southern Myotis comprises all PCTs within the subject land associated with the species within 200m of the bank of any medium to large permanent creeks, rivers, lakes or other waterways (i.e. with pools/stretches of water 3 m or wider. As the species is a fishing bat, but uses roosting/sheltering habitat in the form of hollow-bearing trees and trees with decorticating bark, only the woodland condition of PCT 3431 within the subject land is considered to comprise suitable habitat for the species. Therefore, the species polygon has been mapped to include all areas PCT 3431 – Woodland that is within 200m of the three farm dams within the subject land. The species polygon for the Southern Myotis is shown in **Figure 16**.

5.4. Additional EPBC Act Listed Species

The following species was not included in the species list generated by the BAM-C however were identified in the PMST analysis and considered to have the potential to occur within the subject land (see **Appendix D**):

- South-eastern Hooded Robin (*Melanodryas cucullata cucullata*).

The list of species generated by the BAM-C is primarily based on species associations with selected PCTs as well as occurrence with the relevant IBRA sub-region.

The South-eastern Hooded Robin is associated with the Hunter IBRA subregion, however is not associated with any PCTs occurring within the subject land. A review of the NSW BioNet identified one record of the species in the locality, located north-west of the subject land. This record was from 2013 where the species was recorded adjacent to Sandy Creek between two PCTs including, PCT 3485 – Central Hunter Slaty Gum Grassy Forest and PCT 4015 – Central Hunter Riparian Forest. Although the South-eastern Hooded Robin is not associated with PCT 3431 within the subject land, given the proximity of the record and similar habitat types, this species has been added as an ecosystem credit species within the BAM-C.

6. Prescribed Impacts

Prescribed impacts are identified in Clause 6.1 of the *Biodiversity Conservation Regulation 2017*. Prescribed impacts are those that are additional to the clearing of native vegetation and associated habitat. These include:

- Development on the habitat of threatened species or ecological communities associated with:
  - Karst, caves, crevices, cliffs, rock outcrops and other geological features of significance;
  - Human-made structures; and
  - Non-native vegetation;
- Development on areas connecting threatened species habitat, such as movement corridors;
- Development on water quality, water bodies and hydrological processes that sustain threatened species and TECs (including from subsidence or upsidence from underground mining);
- Wind turbine strikes on protected animals; and
- Vehicle strikes on threatened species or on animals that are part of a TEC.

An assessment of the relevance of these prescribed impacts to the Modification is provided in **Table 12**.

Table 12 Relevance of prescribed impacts

Prescribed Impact	Present	Feature Characteristic and Location	Potential Impact	Associated Threatened Entities	Section of BDAR Where Addressed
Karst, caves, crevices, cliffs, rock outcrops and other geological features of significance	No	No features have been identified from topographic maps or field surveys.	Not relevant.	N/A	N/A
Human-made structures	No	No human-made structures are present within the subject land.	Not relevant.	N/A	N/A
Non-native vegetation	Yes	A small area of exotic grassland is present within the ROM expansion area.	No impacts are anticipated as native species are not considered to rely on exotic grassland foraging habitat. Furthermore, no native fauna is expected to rely on the exotic	None identified	N/A

Prescribed Impact	Present	Feature Characteristic and Location	Potential Impact	Associated Threatened Entities	Section of BDAR Where Addressed
			grassland within the ROM expansion area given the absence of shelter habitat such as rocks, logs and tussock grasses. This area has been grazed and although dry cow pats are present, these are not expected to be relied upon by the Hunter Valley Delma given no other suitable shelter habitat is available.		
Habitat connectivity	Yes	Stepping stone connectivity between vegetation on the and north of the subject land which extends into the wider locality.	Relevant. Although the native vegetation of the subject land is fragmented and occurs as patches of trees in native grassland, they provide a degree of stepping stone habitat connectivity in the landscape. While the approved disturbance footprint would result in fragmentation of habitat, the additional vegetation proposed to be removed under the Modification will have additional impacts on habitat connectivity, particularly during the construction phase of the Modification. The re-aligned road will form a barrier to less mobile species such as the Hunter Valley Delma. However most species affected are	Hunter Valley Delma, microchiropteran bats (including non-threatened species), Grey-headed Flying-fox (foraging), threatened and non-threatened birds.	Section 8.4

Prescribed Impact	Present	Feature Characteristic and Location	Potential Impact	Associated Threatened Entities	Section of BDAR Where Addressed
			highly mobile species that are likely to be able to cross the road if required.		
Waterbodies, water quality and hydrological processes	Yes	Multiple hydro lines ranging from 1st to 6th order streams are mapped within the assessment area. Of these several 1st order streams are present within the subject land. Additionally three farm dams are present within the subject land.	Several 1st order streams are mapped within the subject land of which are all considered to function as drainage lines. These drainage lines will be impacted by the Modification and their hydrological processes affected. However these drainage lines are dry and only contain water during heavy rainfall events. Proposed drainage systems will be developed to manage runoff as part of the Modification. The three farm dams may be removed which will reduce foraging habitat for native species.	All native fauna species (ecosystem and species credit species)	Section 8.4
Wind turbine strikes	No	Not relevant	The Modification does not comprise a wind farm development.	N/A	N/A
Vehicle strikes	Yes	Throughout the subject land which is proposed for the realignment of the BLR, .	Relevant. Given the Modification is for the re-alignment of the BLR, there is potential for vehicle strikes during construction and operation stages. However this is not expected to increase beyond current conditions. Any increase in vehicle	All native fauna species (ecosystem and species credit species)	Section 8.4

Prescribed Impact	Present	Feature Characteristic and Location	Potential Impact	Associated Threatened Entities	Section of BDAR Where Addressed
			strike is considered to be associated with the extended length of the BLR (approximately 1 km), rather than an increase in the volume of traffic.		

7. Avoid and Minimise

Under the BAM, measures taken to avoid and minimise impacts on biodiversity values from the development need to be documented. This section sets out the steps taken to avoid and minimise impacts on biodiversity values identified within the subject land, which includes assessment of direct, indirect and prescribed impacts. Any mention of the development footprint within this chapter is synonymous with the subject land.

Although the Modification is subject to ecological and non-ecological constraints, avoidance and minimisation of impacts can still be achieved to a degree by the amendment of the location and design of the Modification.

Details of the road design requirements and construction footprint are outlined in ***Section 7.1*****,** while the onsite constraints associated with location are outlined in ***Section 7.2***. Compliance with the avoidance and minimisation measures adopted for the Modification are outlined in ***Section 7.3*** and a summary is provided in **Table 13**.

7.1. Design Constraints

The realignment of the BLR was approved by SSD5170. The following commitment was made in the Bengalla EIS:

> *"Commitment 38. BMC will construct the approximate 6 km realignment of the Bengalla Link Road to replicate the existing two lane, two way rural road that was constructed by BMC in 2009. BMC will consult with MSC prior to undertaking the realignment of Bengalla Link Road."*

The '*State Significant Development Assessment Bengalla Continuation Project (SSD 5170) - Secretary's Environmental Assessment Report Section 89E of the Environmental Planning and Assessment Act 1979*' (NSW Department of Planning and Environment, 2014) (Environmental Assessment Report), describes the predicted impacts and merit assessment of the Bengalla Continuation Project. The Environmental Assessment Report considers the known BLR realignment design constraints and accepted a conceptual alignment with the understanding future detailed design. Further consultation with Muswellbrook Shire Council (MSC) was required to comply with contemporary design standards and to align with any future road network requirements. The Environmental Assessment Report said

> *"The Department acknowledges that alternative options for the proposed road realignment are largely constrained by BMC's existing mining authorities and land owned by BMC and topography within the western portion of the project area that includes elevated areas of high relief. Additionally, the function and alignment of the road as proposed would essentially remain the same as the existing road (i.e. it would continue to provide an access road of good condition between Denman Road and Wybong Road)."*
>
> *"the Department is satisfied that the realignment of Bengalla Link Road can be completed without significant impacts on the safety and convenience of road users and can be integrated with any future broader strategy for the western regional road network."*

7.1.1. Adequacy of Bengalla EIS BLR Corridor

The detailed design process for the BLR has resulted in adjustments to the required construction footprint to address constraints including land ownership, site topography, the current road network, and anticipated relocation of power and communications infrastructure. Geometric design of the road, including vertical and

horizontal alignments are governed by current Austroads Guides to Road Design and Transport for NSW (TfNSW) design requirements.

Detailed design of the BLR has identified that the approved disturbance corridor, particularly in the northern section, is too narrow to physically accommodate any road to current design standards. The currently approved disturbance footprint does not provide sufficient space to accommodate key activities fundamental for the construction of the BLR, including:

- The required cut depths, fill heights and associated batters to satisfy the design requirements for horizontal and vertical road alignments
- Relocation of third party infrastructure at the required standoff from any cut/fill embankments (including Telstra optical fibre and Ausgrid 11kV power line and maintenance access tracks);
- Sections of the road requiring three lanes to incorporate dedicated turning lanes, which cannot be accommodated within the currently approved disturbance footprint.
- Required temporary and permanent water management infrastructure including sediment dams, drains, pumps and pipes; and
- Areas required for construction activities including : temporary facilities (offices, crib facilities, toilets, carparks), stockpiling of imported construction materials (base, sub base, rock, culverts), processing of site-won material (crushing and conditioning to generate suitable construction materials), hardstand areas and site access tracks.

Figure 17 indicatively presents the essential road components required for the construction of the BLR realignment within the subject land. The disturbance limits have been minimised as much as reasonably practicable while still accommodating critical infrastructure features. The typical BLR conceptual cross sections depicted in **Figure 18** illustrates the variety of road infrastructure components and associated construction limits required within the corridor. These cross sections demonstrate that the physical implementation of the design, in most locations, is not feasible within the currently approved disturbance footprint.

7.1.2. Design Requirements

The detailed design for the BLR realignment has been developed in consideration of the current design standards including:

- *Austroads Guide to Road Design Part 3 – Geometric Design*
- *Austroads Guide to Road Design Part 4 – Intersections and Crossings*
- *Austroads Guide to Road Design Part 4A – Unsignalized and Signalised Intersections*
- *Austroads Guide to Road Design Part 5 – Drainage Road Surface Networks, Basins and Subsurface*
- *Austroads Guide to Road Design Part 5B – Drainage, Open Channels, Culverts and Floodway Crossings*
- *Austroads Guide to Road Design Part 6 – Roadside Design Safety and Barriers*

- *TfNSW Guidelines Delineation Section 16 - Guide Posts and Delineation of Safety Barriers*
- *TfNSW Guidelines Delineation Section 15 – Raised Pavement Markers*
- '*Managing Urban Stormwater – Soils and Construction* (Blue Book)'(Landcom, 2004); and
- '*Managing Urban Stormwater – Soils and Construction, Volume 2E Mines and quarries'* (Department of Environment and Climate Change, 2008).

WSP Australia Pty Ltd (WSP) were commissioned by BMC to undertake detailed prefeasibility and feasibility studies for the BLR realignment. The scope included refining the alignment, considering the current road network conditions, confirming current design requirements, preparing detailed road designs, evaluating construction constraints, and identifying the required construction footprint. Seven separate routes were considered, including routes generally in accordance with the conceptual design shown in 2015 Bengalla EIS, and alternate routes further to the west.

During the detailed design phase, WSP applied the following principles:

- Avoid, and where avoidance is not practical, minimise additional disturbance by generally aligning the BLR design with the approved BLR realignment which is located entirely within BMC owned land. The design also focussed on retaining the existing scale and features of the current BLR;
- Contemporary road safety design guidelines and requirements for intersections with the local road network;
- Incremental expansion of the disturbance footprint was implemented to achieve compliance with contemporary roadside safety standards along the verge;
- Consideration of the current road network including other third party upgrades to the BLR / Wybong Road intersection, such that a 100 km/hr speed limit now applies beyond the extent of BLR along Wybong Road towards Sandy Hollow;
- Consideration of the current and future utility of the BLR, including passage of Over Size Over Mass (OSOM) vehicles as part of NSW Renewable Energy Zone (REZ) projects;
- Outcomes of consultation undertaken with MSC and TfNSW;
- The constructability of the works, including required erosion and sediment control measures, water management infrastructure and design cut/fill requirements;
- Allowing for the relocation of existing third party infrastructure including communications and power infrastructure; and
- Avoiding mining authorities held by other parties and remaining within BMC owned land.

The Modification has been through multiple design changes to avoid and minimise the disturbance footprint and associated impacts to native vegetation and habitat for threatened species. The design has been reviewed

to identify whether further avoidance or minimisation measures could be implemented within the overall purpose of the proposed works, but no material additional measures have been able to be identified.

7.1.3. Contemporary Adjacent Road Network

In 2015 MSC commissioned the '*Muswellbrook Mine Affected Roads Report*' (Cardno, 2105) to assess mine related traffic on the local road network including strategies to potentially improve the road network. In 2020 MSC commissioned the '*Muswellbrook Mine Affected Roads Network Plan Review*' (Northrop, 2020) to assess changes to mining operations and approvals associated with the road network since 2015. The report identified Mount Pleasant Mine was no longer proposing the closure of Wybong Road, prompting a reassessment of the adjacent road network including the BLR. The Wybong Road intersection has also been upgraded such that a 100km/hr speed limit now applies. As such, the 80km/hr speed limit anticipated in the Bengalla EIS is inconsistent with current 100km/hr adjacent road network.

The feasibility studies investigated an alternative design that increased the design speed of BLR realignment and the curve that tied into the existing road at the north end of the relocation. This option was selected, as the increased speed limit of 100km/hr also allowed for a connection into the existing road to the south of the existing BLR and Wybong Road intersection, which in turn reduced the extent of works required and minimised disruption to the surrounding road network.

The increased design speed has delivered several key benefits:

- 100km/h speed replicates the existing local road network that has been developed since BMC's 2013 EIS and subsequent 2015 Development Consent (SSD-5170);
- Improved curvature at the northern tie-in, resulting in a reduction in the total length of the approved realignment by approximately 500 m;
- A design that facilitates construction with minimal disruption to existing traffic flows and reduced interaction with road users during the construction phase; and
- Provides more consistency across road network for road users.

7.2. Onsite Constraints

7.2.1. Topography

The BLR realignment is situated between a topographic rise in the north and north-west and the Hunter River floodplain in the east and south. There are no major creeks flowing through the subject land. The topography of the surrounding area consists generally of low and undulating hills that decline towards the Hunter River floodplain in the south. The topographic elevation varies between approximately 140 and 270 m Australian Height Datum (mAHD), with the lowest elevations recorded proximal to the Hunter River, and the highest elevations recorded proximal to the northern part of the Disturbance Boundary.

The topography has required a series of significant sections of cut/fill to allow the road to pass across gullies and rises, whilst maintaining the required vertical and horizontal road alignment to support a 100km/hr speed limit as well as future use by all road users including OSOM vehicles and OSOM movements associated with

NSW REZ projects. Where feasible cut and fill batters were selected to be sympathetic to adjacent topography and in other areas relatively steep cut and fill batters were required.

7.2.2. Geotechnical Considerations

Geotechnical investigations were undertaken in 2020 and 2022 to inform the feasibility and detailed design of the Modification. The 2020 study involved five boreholes along the proposed alignment, while the 2022 investigation conducted by WSP included four boreholes, seven pavement cores, and 12 test pits.

The investigations were used to assess subsurface conditions and provide design guidance for, batter angles, site preparation, excavation conditions, pavement design, and the potential reuse of on-site materials. Key design outcomes included:

- Adoption of 4 m wide benches in deep cuts (>6 m) where slope heights exceeded 7 m;
- Steepening of permanent cut batters in low to medium strength rock to 1H:1V to reduce the extent of clearing required; and
- Inclusion of 4 m wide benches on embankment batters exceeding 7 m in height.

These outcomes then drove the road footprint.

7.2.3. Land Ownership

The proposed BLR realignment has been carefully designed to remain predominantly within land owned by BMC, ensuring the alignment is both operationally feasible and consistent with land tenure arrangements. The road corridor has been planned to avoid encroachment into privately owned or ecologically sensitive lands wherever possible, while maintaining a continuous and functional alignment essential for a safe and efficient transport route.

Bengalla is bounded by Wybong Road to the north, Overton Ridge to the east, the Muswellbrook-Ulan Rail Line and Hunter River floodplain to the south, and Roxburgh Road to the west. The site is surrounded by other mining operations, including Mount Pleasant Mine to the north, Mt Arthur Coal to the south, and Mangoola Coal to the west. These boundaries, along with existing infrastructure and topographical constraints, have influenced the available options for road placement.

The proposed BLR realignment is situated predominantly on freehold land owned by the Bengalla Joint Venture. A short section of the alignment, referred to as the stub road, extends partially into freehold land owned by Hunter Valley Energy Coal (Mt Arthur Coal), as well as a portion of Crown road reserve. This Crown road is proposed to be transferred to MSC in connection with the dedication of the realigned BLR as a public road.

By maintaining the alignment within BMC-owned land and utilising existing road reserves where possible, the Modification avoids unnecessary disturbance to surrounding properties and land tenure changes. This approach reflects a considered balance between operational requirements, environmental impacts, and land ownership constraints.

7.3. Avoid and Minimise Direct and Indirect Impacts on Native Vegetation and Habitat

7.3.1. Modification Location

Section 7.1.1 of the BAM states that knowledge of biodiversity values should inform the decision-making process relating to the location of a project. Measures to avoid or minimise impacts from clearing native vegetation and threatened species habitat can include locating the Modification in areas lacking or with low biodiversity values, avoiding areas mapped on the important habitat map, or avoiding native vegetation that is a TEC. A discussion of the considerations, measures and constraints relevant to avoidance of impacts on native vegetation are discussed in the sections below. A range of mitigation measures have been developed for the Modification to minimise the impacts to native vegetation and habitat that are unable to be avoided and are described in detail in **Section 9**.

7.3.1.1. Considerations

In selecting the Modification's final development footprint, the following matters were considered in accordance with the BAM:

a. *Knowledge of biodiversity values should inform decisions about the location of the proposal.*

The location of the proposed BLR realignment has been informed by a comprehensive understanding of the site's biodiversity values. Detailed ecological investigations were undertaken by Cumberland Ecology to assess the biodiversity significance of the subject land. These studies identified native woodland and grassland vegetation that conforms to the PCT Central Hunter Ironbark Grassy Woodland, which is listed as an EEC under the BC Act, and a CEEC under the EPBC Act.

A review of historical aerial imagery indicates that the subject land and surrounding areas have experienced prior disturbance from agricultural activities, including extensive clearing of vegetation. Alternative alignments were considered; however, no areas of significantly lower ecological quality were identified within reasonable proximity to the existing alignment that would support a feasible relocation of the BLR or result in a reduction in the subject land. The alignment, where possible, has used the approved disturbance boundary where vegetation was already approved for removal under SSD5170.

a. *Selecting a final proposal location may be an iterative process.*

As explained above, the detailed design for the BLR realignment is limited by various constraints including topography, surrounding landownership, an already approved BLR realignment location and limited options to feasibly construct an alternate route. WSP were commissioned by BMC to undertake detailed prefeasibility and feasibility studies to identify the optimal alignment for the BLR realignment, assess the current road network conditions, confirm current design requirements, prepare detailed road designs, evaluate construction constraints, and identify the required construction footprint.

Seven separate routes were considered including routes generally in accordance with the conceptual design shown in 2015 Bengalla EIS and alternate routes further to the West. Field surveys were undertaken within the study area to identify ecological constraints and inform the refinement of the construction footprint. The

subject land has been refined to minimise the disturbance footprint and associated impacts to native vegetation and habitat for threatened species.

b. Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas lacking biodiversity values.

As described above alternative alignments were considered; however, no areas of lower ecological value were identified within a reasonable proximity to the existing alignment that would allow for a feasible relocation BLR and result in any reduction in the disturbance footprint.

c. Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a low vegetation integrity score).

Options to avoid and minimise impacts on native vegetation and threatened species habitat were limited as ecological assessments conducted by Cumberland Ecology indicate that the entire study area has been subject to historical wide-spread disturbance, primarily due to long-term agricultural use. As a result, the native vegetation within the subject land is relatively uniform and poor in condition, and representative of vegetation within the surrounding landscape. As such there were no areas identified of notably better, or poorer quality vegetation and threatened species habitat suitable for the BLR relocation.

No alternative locations within reasonable proximity to the existing BLR on BMC owned land were identified that would impact on land with lower biodiversity value while still supporting the functional and logistical requirements of the BLR realignment. Consequently, the current alignment has been selected as the most appropriate option.

d. Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC or a highly cleared PCT.

As described above, the Modification has been through multiple iterations to avoid and minimise impacts to the largest extent possible while meeting the requirements for the construction and operation of the BLR. The detailed design has incorporated the existing road features to minimise disturbance activities. The improved curvature of the northern tie-in has also reduced the BLR re-alignment by 500 m. Given the distribution of native vegetation and associated habitat within the assessment area, there are no alternative locations suitable to further minimise impacts on native vegetation and threatened species habitat.

e. *Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas outside of the buffer area around breeding habitat features such as nest trees or caves.*

The subject land is not located within buffer areas of known breeding habitat features. While a number of hollow-bearing trees have been identified within the subject land which have the potential to support threatened species, these features are present throughout the wider assessment area. As such, relocating the

Modification would not reduce impacts on breeding habitat features, as similar features with the potential to support threatened fauna are distributed throughout the broader assessment area.

7.3.1.2. Measures

In selecting the Modification's final development footprint, the following avoidance and minimisation measures have been considered in accordance with the BAM:

f. Consideration of alternative modes or technologies that would avoid or minimise impacts on biodiversity values

The nature of the Modification as a road realignment associated with a regional road network, necessitates a conventional transport corridor to meet operational, safety, and logistical requirements.

Given these constraints, alternative technologies such as elevated structures, tunnels, or alternative transport modes were considered impractical due to cost, terrain, integration with existing road network and legacy assets to later be maintained by MSC. It was also considered that these options would not significantly reduce the footprint or avoid impacts on native vegetation and habitat, and in some cases could result in greater disturbance due to construction complexity. It would also substantially change the approved project.

Instead, the proposal has focused on avoiding and minimising impacts through detailed design, which aims to reduce the overall biodiversity impact by minimising the disturbance footprint while maintaining the functionality and safety of the infrastructure.

b. Consideration of alternative routes that would avoid or minimise impacts on biodiversity values

Seven separate routes were considered including routes generally in accordance with the conceptual design shown in 2015 Bengalla EIS and alternate routes further to the West. Field surveys were undertaken within the study area to identify ecological constraints and inform the refinement of the construction footprint. No alternative route is likely to further avoid or minimise impacts on biodiversity values. The Modification disturbance boundary has been rigorously scrutinised to minimise the disturbance footprint and associated impacts on biodiversity values.

c. Consideration of alternative locations that would avoid or minimise impacts on biodiversity values

No alternative location is likely to further avoid or minimise impacts on biodiversity values. The feasibility of relocating BLR is constrained by the need to maintain proximity to existing road alignment (which is already approved to be cleared), as well as by topographical and logistical limitations. Ecological assessments indicate that the native vegetation across the study area is relatively consistent in type and condition, having been subject to historical disturbance and long-term agricultural use. No alternative locations within the immediate vicinity were identified that would result in significantly lower biodiversity impacts while still meeting the design specifications for the BLR realignment. *Consideration of alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values.*

Given the nature of a road realignment, and further its context in the current road network, maintaining a continuous and functional alignment is essential. This requirement significantly limits the ability to relocate sections of the road to alternative sites within a property without compromising engineering feasibility, safety

standards, and connectivity to existing infrastructure. Due to the need for a continuous corridor and the absence of significantly degraded areas within any specific property, the selected alignment represents the most practical option. In the context of the approved project, no alternative sites would result in further avoidance or minimisation of impacts on biodiversity.

7.3.2. Modification Design

Section 7.1.1 of the BAM states that a project must document the reasonable measures taken by the proponent to avoid or minimise clearing of native vegetation and threatened species habitat during proposal design, including placement of temporary and permanent ancillary construction and maintenance facilities.

Based on constraints associated with land availability, the existing road network and power/communications infrastructure, the proposed BLR realignment was determined to be the preferred option. As described above the revised construction footprint was minimised as far as possible to limit impacts on biodiversity as follows:

- The approved disturbance corridor, particularly in the northern section, is insufficient to accommodate the physical requirements of the BLR design, including roadway, cut/fill batters, stormwater management infrastructure, third party infrastructure and essential ancillary construction activities;
- An increased design speed was adopted to replicate the existing 100km/h local road network that has been developed since BMC EIS in 2013. The improved curvature at the northern tie-in shortens realignment length by approximately 500 m;
- Incremental expansion of the footprint is necessary to meet contemporary roadside safety standards, especially along the verge areas;
- The revised design enables construction with minimal disruption to existing traffic and reduces interaction with road users during the construction phase; and
- The conceptual cross sections demonstrate that the range of required road components cannot be physically accommodated within the currently approved disturbance limits.

A range of mitigation measures have been developed for the Modification to minimise the impacts to native vegetation and habitat that are unable to be avoided, as described in detail in **Section 9**.

7.4. Avoid and Minimise Prescribed Impacts

Habitat connectivity, non-native vegetation, vehicle strike and water bodies, water quality and hydrological processes have been identified as prescribed impacts for the Modification. In determining the location and design of the disturbance area, the Modification has sought to avoid and minimise these prescribed impacts by:

- Reducing the disturbance footprint to the maximum extent possible through multiple iterations, thereby retaining native vegetation and associated habitat and minimising impacts on habitat connectivity;
- Staging of clearing;

- Implementing erosion and sediment controls throughout the construction of the realigned BLR and proposed ROM Pad extension in accordance with the existing *Bengalla Water Management Plan* (BMC, 2023) and relevant policies, procedures and standards;
- Utilising stabilisation strategies and drainage structures that avoid/minimise requirement to redirect natural flows along existing watercourses, thereby maintaining existing hydrological processes;
- Utilising stabilisation strategies that employ stabilising forces of existing vegetation and structures thereby minimising risk of erosion and sediment discharge downstream;
- Implementation of additional signage to warn vehicles of wildlife that may be encountered whilst travelling along the realigned BLR; and
- Rehabilitating areas within the subject land that are not part of the operational footprint to improve habitat connectivity.

A range of mitigation measures have been developed for the Modification to minimise the impacts to native vegetation and habitat that are unable to be avoided and are described in detail in **Section 9**.

7.5. Summary

Table 13 summarises the measures to avoid and minimise impacts of the Modification.

Table 13 Summary of measures to avoid impacts

Action	Adopted (Yes/No/In part)	Justification	Timing (if adopted)	Responsibility (if adopted)	Outcome
Implementation of a suite of mitigation measures	Yes	To minimise the impacts on biodiversity, a suite of mitigation measures will be implemented, including pre-clearing and clearing procedures, delineation of clearing areas, erosion and sediment management, habitat salvage, weed management, and a Hunter Valley Delma Translocation Plan and Habitat Restoration Plan.	Pre and post construction and during operation phase	Proponent and consultant team	Minimise impacts on biodiversity
Locate the Modification within areas of low biodiversity value.	In part	The Modification has been located adjacent to the approved disturbance footprint for the BLR and utilise large areas of DNG. Although these areas of	During design and approval	Proponent and consultant team	Reducing impacts on areas of high biodiversity value.

Action	Adopted (Yes/No/In part)	Justification	Timing (if adopted)	Responsibility (if adopted)	Outcome
		DNG still conform to a TEC and provide habitat for threatened species, these areas are considered to be of lower value than areas comprised of remnant woodland. While the Modification still requires the removal of remnant woodland, opportunities to further reduce impacts are not possible due to the design requirements of the Modification.			
Partial development of the study area to avoid/minimise impacts on biodiversity	No	The Modification cannot be reduced in scale to avoid/minimise impacts on biodiversity due to the highly specific design requirements.	-	-	-
'Do-nothing' option to avoid all impacts on biodiversity	No	The do-nothing option for the Modification Is not feasible as the road requires relocation to enable the continuation of mining under the existing approval.	-	-	-
Consideration of alternative sites and layouts for the Modification within the assessment area	No	The Modification has utilised land within the approved disturbance boundary, which was approved for the relocation of the BLR. Alternative locations are not feasible for the relocation of the BLR having regard to the project's overall purpose.	-	-	-

8. Impact Assessment

8.1. Direct Impacts

The primary and direct impact resulting from the Modification is the loss of native vegetation and associated habitat within the subject land. **Tables 14-15** identify the proposed impacts to vegetation and threatened species habitat within the subject land.

Table 14 Extent of direct impacts to vegetation within the subject site

Vegetation Zone	PCT #	PCT Name	BC Act Status	EPBC Act Status	Area in the Subject Land (ha)
Zone 1	3431	Central Hunter Ironbark Grassy Woodland (Woodland)	EEC	CEEC	39.31
Zone 2	3431	Central Hunter Ironbark Grassy Woodland (DNG)	EEC	-	24.10

Table 15 Extent of threatened species impacts (species polygons) within the subject land

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Area in the Subject Land (ha)
*Delma vescolineata**	Hunter Valley Delma	E	E	63.41
Myotis macropus	Southern Myotis	V	-	17.06

**Area based on species polygon prepared for the Striped Legless Lizard*

8.1.1. Loss of Hollow-bearing Trees

Sixty-four (64) hollow-bearing trees occur within the subject land. This includes 18 that contain small hollows (<7 cm), 21 that contain medium hollows (7-14 cm) and 25 that contain large hollows (≥15 cm). These hollows provide suitable roosting/breeding habitat for a range ecosystem and species credit species.

The location of hollow-bearing trees within the subject land is shown in **Figure 19**.

The loss of hollow-bearing trees is considered to be a long-term impact. The removal of hollow-bearing trees is assessed within the BAM-C via the plot data collected for each vegetation zone. This data adds to the value of the habitat to be removed, thereby requiring a greater number of credits to be retired. Therefore, no specific requirement to offset hollows has been identified. Mitigation measures have been recommended to address the clearing risks to resident species (***Section 9.1***).

8.2. Change in Vegetation Integrity Score

Table 16 details the change in vegetation integrity score for each vegetation zone and management zone. The direct impacts of the Modification only involve one management zone, being the total clearing of vegetation within the subject land.

Table 16 Change in vegetation integrity score for vegetation zones

Vegetation Zone	PCT #	Management Zone	Area (ha)	Current VI Score	Future VI Score	Change in VI Score
Zone 1	3431: Central Hunter Ironbark Grassy Woodland	Complete Clearance	39.31	72.2	0	-72.2
Zone 2	3431: Central Hunter Ironbark Grassy Woodland	Complete Clearance	24.10	29.9	0	-29.9

8.3. Indirect Impacts

Potential indirect impacts arising from the Modification are outlined in **Table 17**. Indirect impacts have been developed based on a number of factors, including:

- Presence of native vegetation and habitats directly adjacent to the subject land, and the potential for surrounding vegetation and habitat to be negatively affected by the Modification; and
- Landscape scale impacts to habitat connectivity.

No indirect impact zones have been identified for the purpose of this assessment.

Table 17 Indirect impacts of the Modification

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
Inadvertent impacts on adjacent habitat or vegetation	Construction activities may result in inadvertent impacts on retained vegetation outside the subject land, such as increase sedimentation.	Retained native vegetation outside the subject land	Short term (during construction)	Central Hunter Ironbark Grassy Woodland	Reduced condition of retained native vegetation outside the subject land.
Reduced viability of adjacent habitat	Removal of vegetation within the subject land may increase edge	Retained native vegetation	Potential long-term	Central Hunter Ironbark Grassy Woodland	Reduced condition of retained native vegetation

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
due to edge effects	effects in the retained vegetation to the west.	outside the subject land			outside the subject land.
Reduced viability of adjacent habitat due to noise, dust or light spill	The construction and operation activities associated with the Modification are likely to increase the noise, dust and light above current levels within the subject land which may impact adjacent retained native vegetation.	Retained native vegetation outside the subject land	Short term (during construction)	Ecosystem credit species	Disruption of fauna habitat usage during construction and operation of the BLR.
Transport of weeds and pathogens from the subject site to adjacent vegetation	A number of high threat exotic weeds are known to occur within the subject land and may be inadvertently spread to retained native vegetation outside the subject land.	Retained native vegetation outside the subject land	Potential long-term	Central Hunter Ironbark Grassy Woodland	Reduced condition of the Central Hunter Ironbark Grassy Woodland occurring outside the subject land.
Increased risk of starvation, exposure and loss of shade or shelter	The Modification will result in the removal of foraging resources and shelter resources such as hollow-bearing trees.	Vegetation Zone 1	Long-term	Ecosystem credit species	Reduction in foraging resources, predominantly of highly mobile fauna species, and loss of shelter habitat in the form of hollow-bearing trees.
Loss of breeding habitat	The Modification will result in the removal of hollow-bearing trees.	Vegetation Zones 1-2	Long-term	Hollow-dependent ecosystem credit species (e.g. microchiropteran bats)	Reduction in available breeding habitat of hollow-dependent fauna and increased competition

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
					for hollows outside of the subject land.
Trampling of threatened flora	Not applicable. No threatened flora species recorded within the subject land.	-	-	-	-
Inhibition of nitrogen fixation and increased soil salinity	Impact unlikely. Indirect impacts associated with nitrogen fixation and increased soil salinity are considered to be negligible.	-	-	-	-
Fertiliser drift	Impact unlikely. The Modification does not propose the use of fertilisers.	-	-	-	-
Wood collection	Impact unlikely to occur, considering the nature of the subject land and the future industrial development.	-	-	-	-
Removal and disturbance of rocks, including bush rock	The Modification will result in the removal of some bush rock, predominantly surface rocks. These are predominantly small surface rocks <300mm in diameter.	Vegetation Zones 1-2	Long-term	Hunter Valley Delma	Reduction in available shelter habitat and increased competition for habitat within retained native vegetation outside of the subject land.
Increase in predatory species populations	Impact unlikely. As the subject land already occurs in a highly modified landscape the Modification is considered unlikely to result in an increase in predatory species populations.	-	-	-	-

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
Increase in predatory species populations	Impact unlikely. The Modification includes the realignment of the existing road and is considered unlikely to result in an increase in predatory species populations.	-	-	-	-
Increase in pest animal populations	Impact unlikely. The Modification includes the re-alignment of the existing road and is considered unlikely to result in an increase in pest species populations.	-	-	-	-
Increased risk of fire	Impact unlikely. The Modification is unlikely to increase the risk of bushfire.	-	-	-	-
Disturbance to specialist breeding and foraging habitat	Impact unlikely. No specialist breeding or foraging habitat has been recorded within or adjacent to the subject land	-	-	-	-

8.4. Prescribed Impacts

The following prescribed impacts are relevant to the proposal:

- Connectivity of different areas of habitat that facilitates movement across a species range;
- Non-native vegetation;
- Water quality and hydrological processes; and
- Vehicle strike.

These are discussed in detail below and their location is shown on **Figure 20**.

8.4.1. Habitat Connectivity

8.4.1.1. Nature

The subject land contains a mixture of remnant native canopy vegetation above a predominantly native understorey and DNG. Although modified by historical agricultural land use, the vegetation in the subject land provides "stepping stone" habitat for native species and connects to similar types of vegetation in the surrounding locality, particularly to the south and east. That notwithstanding, the Bengalla Approved Disturbance Boundary occurs to the east of the subject land, and some of the existing vegetation to the east will be removed (see **Figure 10**). Beyond the Bengalla Approved Disturbance Boundary to the east is the existing Bengalla Mine, and therefore, there are no significant areas of habitat to the east that the subject land provides connectivity to. There will be an area on the eastern side of the subject land that will be retained and is not within the Bengalla Approved Disturbance Boundary that will be disconnected from areas of habitat to east and south. There is also a large area of fragmented native woodland outside the subject land to the south, however the subject land occurs predominantly on the northern edge of this area, and directly adjacent to the Bengalla Approved Disturbance Boundary, and therefore the connectivity with the vegetation to the south will not be fragmented.

8.4.1.2. Extent

Habitat connectivity will be reduced by the removal of 63.41 ha of native vegetation including both woodland and native grasslands which provide connectivity to other fragmented patches of native vegetation outside the subject land.

8.4.1.3. Duration

Direct impacts to habitat connectivity would occur during the construction and operational phase of the Modification. The reduction of habitat connectivity is a long-term impact, as previously identified in the Bengalla EIS for the approved realignment of BLR.

8.4.1.4. Threatened Entities Affected

The habitat provided by the native vegetation in the subject land provides foraging and breeding habitat for ecosystem species, such as microbats, and woodland birds as well as species credit species including the Hunter Valley Delma and Southern Myotis (see ***Section 5.2*** *and* ***Section 5.3***).

8.4.1.5. Consequences

The Modification will result in the reduction of native vegetation within the subject land and will result in further fragmentation of habitat within the wider assessment area. The Modification is likely to reduce habitat connectivity as the realigned BLR will form a barrier between patches of native vegetation, however most of the native vegetation on the north-eastern side of the subject land is located within the Bengalla Approved Disturbance Boundary and will be removed in the future. It is noted that the approved relocation of the BLR identified that there was likely to be an impact to habitat connectivity, however this will be increased given the increase to the total disturbance of the Modification.

Most native species likely to utilise the habitat within the subject land are highly mobile and will still be able to access habitat on either side of the realigned BLR. Furthermore, the habitat on the north-eastern side of the

subject land will be somewhat isolated in future given the extension of the Bengalla Mine into the Bengalla Approved Disturbance Boundary. Nevertheless, there is still sufficient habitat within this patch (~67 ha) for threatened species, including highly mobile birds and bats which can cross the disturbed areas relatively easily, as well as resident, less mobile species such as the Hunter Valley Delma, which is considered to have a small home range similar to that of the Striped Legless Lizard whose home range has been estimated at $10m^{2,}$, with the species capable of moving distances of 20-50m into new adjacent habitat over longer periods (DCCEEW 2024, NSW Threatened Species Scientific Committee 2024). Therefore, impacts to habitat connectivity are expected to be minor as most affected species are mobile and are expected to be able to continue to access habitats after the Modification is complete. The Hunter Valley Delma has a small home range and is not likely to need to disperse widely throughout its life cycle, and therefore reduction in connectivity is a lesser impact to this species.

8.4.2. Non-native Vegetation

8.4.2.1. Nature

The subject land comprises 0.38 ha of non-native vegetation. The non-native vegetation within the subject land consists of exotic dominated grasslands, located within a small area along the existing BLR to the south.

8.4.2.2. Extent

Non-native vegetation within the subject land will be reduced by 0.38 ha, which consists of exotic dominated grasslands in the east of the subject land.

8.4.2.3. Duration

Direct impacts to non-native vegetation would occur during the construction and operational phase of the Modification. The reduction of non-native vegetation is a long-term impact.

8.4.2.4. Threatened Entities Affected

No threatened species are considered to be affected by the loss of non-native vegetation. Although the Hunter Vally Delma is known to occur within grassland areas, the areas of non-native vegetation do not comprise a diverse ground cover layer required by the species for refuge from predators and for foraging and breeding.

8.4.2.5. Consequence

The Modification will result in the removal of all non-native vegetation within the subject land. Although the non-native vegetation may provide some habitat value for native fauna in terms of foraging resources, these areas are unlikely to be favoured over the woodland habitats outside of the subject land within the assessment area of the Modification. Therefore, impacts associated with the removal of non-native vegetation are considered to be minimal.

8.4.3. Water Quality and Hydrological Processes

8.4.3.1. Nature

Several first order streams are mapped within the subject land, of which are all considered to comprise small drainage lines within the landscape. These drainage lines are all ephemeral and only contain water during heavy rainfall events. The subject land also comprises three farm dams, of which two are located along mapped

the mapped streams, of which any overflow during heavy rainfall events would continue downstream beyond the subject land. The Modification may require alteration to the mapped first and second order streams as well as decommissioning of the three farm dams.

Water quality within these systems may also be impacted by the Modification as a result of surface water runoff.

8.4.3.2. Extent

Five first order streams and one second order stream will be impacted by the Modification. The first and second order streams will be modified with suitable drainage systems in place under the realigned BLR to ensure the continued functioning of the drainage lines. The three farm dams will be decommissioned and removed from the subject land. Work during the construction and operational phases of the Modification also have the potential to reduce water quality due surface water runoff.

8.4.3.3. Duration

Direct impacts to water quality and hydrological process will be ongoing during the construction and operational phase of the Modification. Impacts such as sedimentation and erosion during the construction phase are considered short-term impacts, however ongoing changes to hydrological processes are considered to be a long-term impact.

8.4.3.4. Threatened Entities Affected

No threatened fauna species are expected to be impacted by potential changes to water quality and hydrological processes within the subject land.

8.4.3.5. Consequence

The Modification will result in the removal of three farm dams and modification to the existing drainage lines. The consequence of the development also includes increased hard surfaces and potential for runoff downslope/downstream. The Modification will implement erosion and sediment controls to manage runoff and associated impacts on water quality.

8.4.4. Vehicle Strike

8.4.4.1. Nature

The Modification involves the realignment of the BLR. The BLR is not proposed as a new road, but rather the realignment of an existing road. Therefore vehicle movements are not expected to increase beyond that of current conditions once the realigned BLR is commissioned. Instead, the increase in vehicle movements has been considered due to the extension in length of the realigned BLR within the subject land.

8.4.4.2. Extent

The extent of potential impacts is likely to be limited to occasional incidence of vehicle strike to individual fauna. Any increase in vehicle strike is considered to be associated with the extended length of the BLR (approximately 1 km), rather than an increase in the volume of traffic.

8.4.4.3. Duration

The impacts of vehicle strike will be ongoing during the construction and operational phase of the project. The potential for vehicle strike is a long-term impact.

8.4.4.4. Threatened Entities Affected

Threatened species most at risk of vehicle strike include threatened birds. This includes small woodland birds that may be moving across the landscape as well as raptors that may be attracted to the road due to roadkill (i.e. macropods and small mammals). Nevertheless, threatened species are considered less likely to be impacted by vehicle strike in comparison to commonly occurring fauna species including macropods (Eastern Grey Kangaroo (*Macropus giganteus*) and Common Wallaroo (*Osphranter robustus*)), Common Brushtail Possum (*Trichosurus vulpecular*) and Lace Monitor (*Varanus varius*).

8.4.4.5. Consequence

There is no data or relevant literature available to enable an estimate of vehicle strikes; however, the consequence of increased vehicle strike on native species known to occur in the locality is not considered likely to be significant as it is expected that the numbers of wildlife struck by vehicles will be similar to current conditions. This is because the Modification requires the realignment of an existing road, rather than the construction of a new road. It is expected that increases in vehicle strikes is likely to be attributed to the increased length of the BLR. Nevertheless, the potential increase in vehicle strikes is considered to be minimal.

9. Mitigation Measures

A range of mitigation measures have been developed for the Modification to mitigate the impacts to native vegetation and habitat that are unable to be avoided. These include a range of measures to be undertaken before and during construction to limit the impact of the Modification. Each mitigation measure is discussed in detail below, and a summary is provided in **Table 18**.

9.1. Mitigation of Impacts to Native Vegetation and Habitat

A range of mitigation measures have been developed for this Modification to mitigate the impacts that are unable to be avoided. These include a range of measures to be undertaken before and during construction to limit the impact of the Modification.

Further details of the mitigation measures proposed will be provided post approval in detailed plans including an updated Biodiversity Management Plan (BMP) and any other required management plans as directed by the conditions of consent. It is envisaged that these mitigation measures will form part of the conditions of consent for the Modification and all measures will be approved or endorsed by the Minister for Planning or delegate as part of the SSD approval process.

9.1.1. Biodiversity Management Plan

While the existing BMP will apply to the Modification, the existing BMP is to be updated to include additional mitigation measures identified in the following sub-sections which are not currently identified in the BMP.

9.1.1.1. Timing of Clearing

Subject to exceptional circumstances, clearance of woodland areas will be avoided during May to November in order to avoid key breeding and hibernation seasons for threatened microchiropteran bat species and the Hunter Valley Delma. If clearing is to occur during May to November, a written assessment by a suitably qualified ecologist justifying clearing activities must be recorded. Furthermore, vegetation clearance is not to commence until pre-clearance surveys have been completed by a qualified ecologist, as outlined in ***Section 9.1.4***).

In the event that species are identified roosting/nesting during the pre-clearance survey, removal of these features must not be undertaken until the ecologist determines the breeding period for that species has ended and juveniles have moved on.

9.1.1.2. Delineation of Clearing Areas

Clearing limits for the project will be marked either by high visibility tape on trees, metal/wooden pegs, fencing or an equivalent boundary marker that will be installed prior to any clearing. To avoid unnecessary or inadvertent vegetation and habitat removal or impacts on fauna, disturbance will be restricted to the delineated area and no ancillary construction facilities (e.g. stockpiles) will occur beyond this boundary. The site supervisor will be responsible for communicating disturbance limits and delineation to all construction personnel and ensuring that the clearing limit markers are installed and maintained.

9.1.1.3. Erosion, Sedimentation and Pollution Control

The Modification may result in erosion and transport of sediments as a result of soil disturbance during construction. In order to reduce, as far as practical, this impact construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures:

- Installation of sediment control fences;
- Stabilisation of soil stockpiles;
- Avoiding or minimising soil disturbance prior to predicted heavy rainfall; and
- Rehabilitation of construction disturbance following completion of the road

To reduce sedimentation during construction, erosion control measures will be implemented. This includes minimising the amount of exposed soils at any given time. Sediment fences will be established where required to prevent the impacts of sedimentation on the adjoining vegetation. During development, precautions will be taken to ensure that no pollution, such as petrochemical substances or water containing suspended solids, escapes the construction site. Efficient removal of pollution to an off-site location is required, and will be implemented, to help to minimise pollution impacts.

9.1.1.4. Pre-clearance Procedure

In order to avoid impacts to fauna species during construction, pre-clearing surveys will be undertaken by a suitably qualified ecologist, in accordance with the existing BMC Ground Disturbance Permit process, and Biodiversity Management Plan. Pre-clearing surveys will be undertaken ahead of clearing, to limit fauna injury and mortality and to identify habitat features to be relocated. Pre-clearance surveys will be conducted by suitably qualified ecologists as follows:.

- Tree clearing activities must be conducted within one month of the pre-clearing survey;
- Native trees and shrubs will be assessed for their potential as seed sources and, where available, seed will be harvested for storage and/or distribution on rehabilitation areas;
- If present, occurrences of *Cymbidium cancliculatum* (Tiger Orchid) will be recorded and assessed for relocation;
- Vegetation health will be assessed and documented. If it is suspected that vegetation dieback may be a result of the pathogen Phytophthora cinnamomi, plant matter testing will be undertaken to confirm plant pathogens, and, if necessary, quarantine measures will be implemented;
- Trees with hollows or other significant habitat features will be identified, recorded and marked with the letter "H" (for habitat) and flagged with fluorescent tape for easy identification;
- Suitable salvage items such as boulders, woody debris or hollow logs will be identified, recorded and marked with the letter "S" (for salvage) and flagged with fluorescent tape;
- Hollows will be observed to see if any arboreal fauna (e.g. gliders, bats) are using them. The ground around each tree will be inspected for scats, and the trees for scratch marks;

- Threatened flora and fauna species along with those likely to occur will be recorded;
- Fauna utilising the area will be recorded and a suitable qualified person will encourage mobile fauna to leave the area, or will capture and relocate the fauna into pre-determined habitat;

All relocations will be reported on as part of the Annual Environmental Review and Annual EPBC Reporting processes.

9.1.1.5. Clearance Procedure

The clearing will be conducted using a two-stage clearing process as follows:

i. Stage 1

- All vegetation and salvage items, other than the habitat trees identified in the pre-clearance procedure, will be removed; and
- Habitat trees will be left to stand overnight to enable any resident fauna to self-relocate upon nightfall, when foraging typically occurs.

ii. Stage 2

- A suitably qualified person will conduct a final pre-clearing inspection to identify and capture any fauna;
- Habitat trees will be lightly shaken by machinery prior to felling to encourage remaining fauna to leave the hollows and move on. Only in limited instances (due to factors such as steep terrain, surface stability, etc.) where it is not possible to be completed safely, will habitat trees not be nudged prior to their removal;
- Appropriate machinery will be used to fell the tree;
- If required, a suitably qualified person will carefully remove any *Cymbidium canaliculatum* (Tiger Orchid) felled with the tree and translocate it to the same species of tree in a nearby area;
- A suitably qualified person will investigate the felled habitat trees for the presence of fauna. Fauna will be captured and relocated into pre-determined habitat;
- The felled habitat tree will be left over night to allow any remaining fauna time to leave the hollow; and
- Branches with hollows and sections of trunk are to be removed and set aside for transfer to a storage area, rehabilitation area or areas of remanent vegetation.

The two-stage clearing process enables fauna a chance to self-relocate upon nightfall, when foraging typically occurs.

Provisions will be made to protect any native fauna during clearing activities by the following means:

- All staff working on the vegetation clearing will be briefed about the possible fauna present and should avoid injuring any present;
- Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations; and

- If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal by an appropriately trained/qualified person (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanised).

At the end of clearing works (or relevant stages thereof), a clearing supervision report will be provided detailing the total number and species of individuals recorded and details of their release and/or treatment in case of injured fauna. A summary of the report will be provided as part of the Annual Environmental Review and Annual EPBC Reporting processes.

9.1.1.6. Habitat Salvage

If available, suitable hollow-bearing trees, hollow-bearing logs and rocks will be salvaged for reuse in rehabilitation areas. Such materials vary in quality and quantity among different parts of Bengalla. Whilst some woody materials provide a valuable habitat resource for native fauna, others are not suitable for salvage because they are structurally unsound and/or decayed to the extent that they may not survive felling, translocation and replacement on the recipient site.

Salvage of habitat features will take place during all stages of clearing. The salvaged habitat features will be moved to rehabilitation sites or to an appropriate site for storage until a time that they can be emplaced on areas of rehabilitation or remanent vegetation. Vegetation that is not salvaged as a habitat feature may be applied to rehabilitation areas to provide additional organic matter or disposed of appropriately.

9.1.1.7. Weed Management

In order to minimise the spread of weeds throughout the subject land, appropriate weed control activities will be undertaken in accordance with the existing BMP as well as all state and regional weed management plans.

The subject land lies within the Hunter Local Land Services Area and is subject to the Hunter Regional Strategic Weed Management Plan 2023 – 2027 (Local Land Services 2022) and management of Weeds of National Significance (WoNS).

The NSW *Biosecurity Act 2015* and regulations provide specific legal requirements for state level priority weeds and high-risk activities, as provided in the Appendices of the Hunter Regional Strategic Weed Management Plan (Local Land Services 2022). In order to comply with the objectives of the Hunter Regional Strategic Weed Management Plan, it is recommended the following measures be implemented as part of a management plan for the subject land.

i. Prevention

Appropriate construction site hygiene measures will be implemented to prevent entry of new weeds to the area such as the use of wash bays.

ii. Eradication

Initial weed management will be carried out over the development site with a focus on targeting species listed under Appendices 1 and 2 of the Hunter Regional Strategic Weed Management Plan 2023 – 2027 (Local Land Services 2022).

Initial weed treatment will include eliminating woody species and targeting large dominant infestations of exotic herbs. In particular, High Threat Exotic weed species occurring within the subject land will be managed in order to prevent further spread. Prior to any vegetation clearance, High Threat Exotic weeds should be identified as part of the pre-clearance survey in order for these to be managed separately from native material.

iii. Containment

Follow-up monitoring and maintenance should be undertaken in areas of the development site that have received past primary weeding treatments in the following months, to contain any re-emergence of weed species.

iv. Minimisation

Minimisation of weed species that cannot be effectively controlled on the site, such as exotic grasses, will be prevented from further spread through construction and operational phase site hygiene procedures.

9.1.2. Hunter Valley Delma Translocation and Habitat Restoration Plan

In order to mitigate impacts on the Hunter Valley Delma which is known to occur within the subject land, a Hunter Valley Delma Translocation and Habitat Restoration Plan will be prepared. This will include the following components.

9.1.2.1. Translocation Plan

The Translocation Plan will be developed in consultation with the DCCEEW (NSW) and will follow the template provided in Appendix E of the NSW Translocation Operational Policy (OEH 2019). The Commonwealth Policy Statement for the Translocation of listed threatened species (DSEWPC 2013) will also be considered when preparing the Translocation Plan. The Translocation Plan will include, but not be limited to:

- Summary, including:
    - Project title including key details of the project, target species and location/source;
    - Project team responsible for undertaking the translocation, including relevant experience, qualifications, and contact details;
    - Identification of the required licences and permits for staff responsible for the translocation of captured individuals.
    - Nature of the translocation;
    - Background information on the species and details on why translocation is proposed for the species; and
    - Justification for translocation and why actions to harm the species cannot be avoided.
- Source population, including:
    - Description of the site where the species will be captured from, including details on the vegetation and habitat present as well as current land management.

- Estimates on the population size and density; and
- Details on individuals to be translocated.

- Recipient sites, including:
  - Location detail such as geographic name, GPS coordinates and map;
  - Description of the land use and future land management strategies;
  - Justification of suitable locations for the translocation with consideration of microhabitats where individuals were captured and where they will be released;
  - Pre-release preparation of recipient sites including establishment of temporary shelters for released animals, and habitat enhancement works (i.e. habitat restoration); and
  - Interactions with other native species at recipient sites in regard to predation, competition for resources (carrying capacity).
- Objective and targets, including:
  - Overarching objectives of the translocation; and
  - Where possible, identification of quantifiable targets.
- Methods; including:
  - Capture techniques, such as the use of artificial cover boards and active habitat searches (surveys will likely need to be undertaken for several months prior to the commencement of pre-clearance surveys and vegetation clearance);
  - Survey timing, in consideration of periods when the species is most active;
  - Protocols for handling and transport of captured individuals prior to release, including safe storage spaces for captured individuals;
  - Protocols for the release of individuals, including timing of release, how individuals are released, how many individuals are released;
  - Monitoring frequency, timing, personnel; and
  - Assumptions/limitations.
- Reporting, including
  - Capture locations and habitat types;
  - Number of individuals captured; and
  - Release locations.

9.1.2.2. Habitat Restoration Plan

A Habitat Restoration Plan will be developed and will include methods for habitat restoration within adjoining habitats, on Bengalla owned land, and in mine rehabilitation. The species is known to occur in mine rehabilitation and pastoral land (DCCEEW 2024) which are not complex habitats. Records of the species within the subject land have largely been located within open woodland and grassland areas that comprise tussock grasses, logs and litter (primarily bark from Ironbarks) and therefore the restoration and or re-creation of suitable habitat is possible. Suitable habitat features including logs, and bark are to be salvaged from the subject land and used within areas identified for restoration. This will need to occur in conjunction with vegetation clearing to enable the salvage of materials from the subject land. The Habitat Restoration Plan will provide maps to identify land subject to restoration, including areas adjoining the subject land and areas of existing mine rehabilitation. Habitat restoration for the species should also be implemented within future mine rehabilitation.

Table 18 Summary of mitigation measures for impacts to native vegetation and habitat

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
Vegetation Clearance Timing	Where possible, clearing is to be avoided between May and November. This avoids clearing during winter months (June, July, August) when fauna are less active, particularly microbats which are in torpor.	Construction	Prior to clearing	Contractor	Moderate	Increased and unnecessary mortality of native fauna.
Delineation of clearing limits	Clearing limits marked either by high visibility tape on trees of metal/wooden pickets, fencing or an equivalent boundary marker. Disturbance, including stockpiling, restricted to clearing limits.	Construction	Once	Contractor	High	Unnecessary damage to trees to be retained.
Erosion, sedimentation and pollution control	Construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures: Installation of sediment control measured; and	Construction	Throughout construction period	Contractor	High	Sedimentation into retained and adjoining vegetation.

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
	Avoiding/ minimising soil disturbance prior to heavy rainfall					
Pre-clearance survey	Pre-clearance surveys will be conducted in all areas of vegetation that are required to be cleared. Pre-clearing surveys will be undertaken within one month of clearing. Habitat features will be marked during the pre-clearing survey.	Construction	Once	Contractor	Moderate	Increased and unnecessary mortality of native fauna.
Staging of clearing	Vegetation clearing will be conducted using a two-stage clearing process. Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanized)	Construction	Once	Contractor	High	Increased and unnecessary mortality of native fauna.
Habitat Salvage	Trees felled during vegetation clearance as well as suitable logs and rocks will be identified for salvage. Habitat suitable for salvage will be determined by the ecologist during clearance supervision and should then be moved to a suitable location for stockpiling and use in future rehabilitation. Furthermore, suitable features will also be used to restore habitat for the	Construction	Once	Contractor	High	Increased and unnecessary mortality of native fauna.

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
	Hunter Valley Delma as identified in the Hunter Valley Delma Habitat Restoration Plan.					
Weed management	Appropriate weed control activities will be undertaken in accordance with the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2017).	Construction	Prior to construction, following vegetation clearing	Contractor	High	Spread of weeds throughout the study area and surrounding land.
Hunter Valley Delma Translocation Plan	A Translocation Plan is to be developed for the Hunter Valley Delma that includes a summary of the project, occurrence of the species, aims of translocation, suitable recipient locations, methods for capture, holding and relocation and monitoring and reporting.	Prior to construction	Once	Contractor	High	Increased mortality of the Hunter Valley Delam which is an Endangered species under the BC Act and EPBC Act.
Hunter Valley Delma Habitat Restoration Plan	A Habitat Restoration Plan is to be developed for the Hunter Valley Delma that includes details for the restoration of habitat within proposed translocation sites as well as mine rehabilitation	Prior to construction	Once	Contractor	High	Increased mortality of the Hunter Valley Delma which is an Endangered species under the BC Act and EPBC Act.

9.2. Mitigation Measures for Prescribed Impacts

The following mitigation measures are relevant to prescribed impacts:

- Delineation of clearing limits and establishment of no-go zones;

- Application of pre-clearance survey procedures;
- Establishment of erosion and sediment controls;
- Staging of clearing; and
- Habitat feature salvage.

Additionally, installation of appropriate signage notifying vehicles of potential fauna presence is proposed to mitigate impacts for the prescribed impact of vehicle strike.

9.3. Adaptative Management for Uncertain Impacts

The Modification is considered unlikely to result in any uncertain impacts that require adaptive management.

9.4. Use of Biodiversity Credits to Mitigate or Offset Indirect or Prescribed Impacts

The Modification does not propose to use additional biodiversity credits to mitigate or offset indirect or prescribed impacts as the impacts are not considered to be significant when the proposed management strategies for these impacts are taken into consideration.

10. Thresholds of Assessment

10.1. Introduction

Under the BAM, the assessment thresholds that must be considered in a BDAR include the following:

- Impacts on an entity that is at risk of a SAII;
- Impacts for which the assessor is required to determine an offset requirement;
- Impacts for which the assessor is not required to determine an offset requirement; and
- Impacts that do not require further assessment by the assessor.

The following sections outline these assessment thresholds and their relevance to the Modification.

10.2. Impacts on Serious and Irreversible Impact Entities

No SAII entities will be impacted by the Modification. One SAII entity, the Large Bent-winged Bat was recorded within the subject land. The species is only an SAII entity for breeding habitat. As discussed in ***Section 5.3.4.2***, the subject land is not considered to comprise breeding habitat for this species. Therefore, this species has not been assessed as a candidate SAII entity.

10.3. Impacts that Requires an Offset

10.3.1. Native Vegetation

In accordance with the BAM, the Modification requires offsets for the clearing of native vegetation as the following criteria are met:

- A vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an EEC or CEEC.

The PCT and vegetation zones requiring offsets are documented in **Table 19**. These areas are mapped in **Figure 21**.

Table 19 Summary of impacts to native vegetation requiring an offset

Vegetation Zone	PCT #	PCT Name	Area (ha)	Current VI Score	Future VI Score	Total VI loss
1	3431_Woodland	Central Hunter Ironbark Grassy Woodland (Woodland)	39.31	72.2	0	-72.2
2	3431_DNG	Central Hunter Ironbark Grassy Woodland (DNG)	24.10	29.9	0	-29.9

10.3.2. Threatened Species

An offset is required for the threatened species impacted by the Modification that are determined to be species credit species. The relevant species and associated species credits required are documented in **Table 20** below.

Table 20 Summary of impacts to threatened species requiring an offset

Scientific Name	Common Name	Vegetation Zone	Area (ha)
Delma vescolineata	Hunter Valley Delma	1_Woodland	39.3
		2_DNG	24.1
Myotis macropus	Southern Myotis	1_Woodland	17.1

10.4. Impacts that Do not Require an Offset

In accordance with the BAM, no offsets are required for impacts on 0.002 ha of Planted Native Vegetation, as these were not assigned to a PCT as per Appendix D of the BAM.

10.5. Impacts that do not Require Further Assessment

All areas identified as cleared land (2.94 ha), exotic dominated grassland (0.38 ha) and dams (0.52 ha) that occur within the subject land do not require further assessment or an offset. These areas comprise approximately 3.84 ha and are shown on **Figure 21.**

10.6. Application of the No Net Loss Standard

The BAM sets a standard that will result in no net loss of biodiversity values where the impacts on biodiversity values are avoided, minimised and mitigation, and all residual impacts are offset by retirement of the required number of biodiversity credits.

The ecosystem credit requirement for the Modification is summarised in **Table 21**, whilst the 'like for like' offsetting options for the ecosystem credits are provided in **Table 22**. A credit summary report from the BAMC has been included in **Appendix E**. A summary of assessments for Matters of National Environmental Significance (MNES) species and communities, as listed in the referral submitted to DCCEEW (Cth.) is provided in **Chapter 11**.

The proponent has the ability to satisfy the credit liability in accordance with the offset rules described in Clause 6.2 of the BC Regulation. It is likely that the options to be pursued by the proponent are:

- The retirement of the required number and class of like-for-like biodiversity credits; and/or
- Payment into the Biodiversity Conservation Fund determined in accordance with the offsets payment calculator to satisfy the requirement to retire biodiversity credits.

Table 21 Summary of ecosystem credit liability

PCT #	PCT Name	TEC	Area (ha)	Credits Required
3431	Central Hunter Ironbark Grassy Woodland	Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	63.4	1,780

Table 22 Like for like offsetting options

Any PCT with the below TEC	Containing Hollow-bearing Trees?	In the below IBRA Subregions
Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions This includes PCT's: 1603, 1605, 1691, 1692, 3314, 3431, 3485	Yes	Hunter , Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

Table 23 Summary of species credit liability

Species	Vegetation Zone	Area / Count	Credits
Delma vescolineata/Hunter Valley Delma	Zone 1, Zone 2	63.4	1,780
Myotis Macropus/Southern Myotis	Zone 1	17.1	616

11. Assessment of MNES

11.1. Introduction

This section provides an assessment of MNES entities that either have been recorded or have potential to occur in the subject land due to the presence of suitable habitat.

Some of this information has been presented previously, however it is presented again here in order to present a consolidated assessment of MNES. To avoid excessive replication, previous sections of the BDAR are referenced where appropriate.

11.2. Identifying Relevant MNES

The MNES considered for the Modification were the MNES recorded from the locality by database searches including the PMST and BioNet. The PMST results are presented in **Appendix C** and were based on a search of a 20 km radius around the subject land.

A likelihood of occurrence assessment has been conducted that assessed the potential for all the species recorded from database analysis to occur on the subject land (see **Appendix D**). The following ecological communities and species were considered to have potential to occur based on the presence of suitable habitat and were considered for the Modification:

- Central Hunter Valley Eucalypt Forest and Woodland – Critically Endangered;
- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered;
- Hunter Valley Delma (*Delma vescolineata*) – Endangered;
- South-eastern Hooded Robin (*Melanodryas cucullata cucullata*) – Endangered;
- Spotted-tailed quoll (*Dasyurus maculatus*) – Endangered;
- Brown Treecreeper (*Climacteris picumnus victoriae*) – Vulnerable;
- Diamond Firetail (Stagonopleura guttata) – Vulnerable;
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable;
- Koala (Phascolarctos cinereus) – Vulnerable;
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – Vulnerable; and
- White-throated Needletail (*Hirundapus caudacutus*) – Migratory.

Survey Methodology and Results

11.2.1. Vegetation Communities

As outlined in ***Section 2.3.1***, vegetation within the subject site was ground-truthed by a botanist and ecologist from Cumberland Ecology to examine and verify the mapping of the condition and extent of the different

vegetation communities by conducting random meander searches, noting key characteristics of areas in similar broad condition states. PCTs were then assigned to the vegetation communities.

Within the subject land, the native vegetation was assigned to PCT 3431, including two condition states; Woodland and DNG. Of these condition states, only the Woodland condition of PCT 3431 was identified as conforming the EPBC Act listing of the community (see ***Section 4.4***).

11.2.2. Fauna Species

A total of ten threatened and/or migratory species listed under the EPBC Act (see ***Section 11.2***) were considered to have the potential to occur within the subject land based on a combination of known records, available habitat, migratory behaviour and/or mobility of the species.

Of these species, five are listed as ecosystem credit species under the BOS (South-eastern Hooded Robin, Brown Treecreeper – eastern subspecies, Spotted-tailed Quoll, White-throated Needletail and Diamond Firetail) and in accordance with the BAM these species were not subject to targeted surveys. The Regent Honeyeater is listed as both an ecosystem credit species for its foraging habitat and a species credit species for its breeding habitat. Under the BAM, assessment of breeding habitat for the Regent Honeyeater is based on the Important Habitat Maps published by the NSW Department of Planning, Industry and Environment. The subject land is not mapped on the Important Habitat Map as such the species was removed from further assessment as outlined ***Section 5.3.2***. The remaining four species (Large-eared Pied Bat, Hunter Valley Delma, Koala and Grey-headed Flying-fox) are listed as species credit species under the BOS. Of these, the Large-eared Pied Bat and Grey-headed Flying Fox were removed from further assessment as outlined in ***Section 5.3.2***, while the Hunter Valley Delma and Koala were subject to targeted surveys in accordance with the BAM as outlined in ***Section 2.5.2***.

Field surveys in the study area have recorded the presence of the Hunter Valley Delma. There have been 12 records of the species across both woodland and DNG condition states of the Central Hunter Ironbark Grassy Woodland within the subject land. This species is known to utilise derived native grasslands, and therefore all areas of the subject land, including both the woodland and DNG condition states of Central Hunter Ironbark Grassy Woodland are likely to provide suitable habitat for the species.

The Grey-headed Flying-fox was also recorded within the subject land. This species was only recorded foraging within the subject land and no breeding camps are present. The location of breeding camps of the Grey-headed Flying-fox are well known and are not located in close proximity to the subject land.

The Large-eared Pied Bat and Koala were not recorded within the subject land during targeted surveys.

11.3. Assessments of Significance

The Significant Impact Criteria provided in the 'Matters of National Environmental Significance: Significant impact guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*' (DoE, 2013) have been applied to all MNES considered to have potential to be impacted by the Modification and are presented in subsequent subsections.

11.3.1. Critically Endangered or Endangered Ecological Communities

Communities assessed: Central Hunter Valley Eucalypt Forest and Woodland

Table 24 Significant Impact Criteria for Critically Endangered or Endangered Vegetation Communities

Significant Impact Criteria	Response
Reduce the extent of an ecological community	Based on the current mapping and development footprint, the proposed action (i.e. the Modification described in ***Section 1.3*** within the subject land on Figure 2) will result in the removal of approximately 63.41 ha of Central Hunter Valley Eucalypt Forest and Woodland, comprising 39.31 ha of woodland and 24.10 ha of DNG that will be disturbed by the Modification, of which only woodland condition vegetation conforms to the TEC listing under the EPBC Act.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	While the approved disturbance footprint would result in fragmentation of habitat, the additional vegetation proposed to be removed under for the proposed action will increase fragmentation of habitat within the wider assessment area. The re-aligned road will form a barrier to less mobile species such as the Hunter Valley Delma, however most species affected are highly mobile species that are likely to be able to cross the road if required. Although some similar vegetation will remain outside the subject land to the east, most of this is within the approved Bengalla Mine disturbance boundary and is likely to be removed. Therefore the connectivity values in this direction are low. Connectivity between remnant vegetation to the west of the subject land will not be affected.
Adversely affect habitat critical to the survival of an ecological community	The woodland occurrence of this community within the subject land is considered to be critical to the survival of the community in accordance with the condition categories and thresholds listed in the Draft Conservation Advice (Threatened Species Scientific Committee 2015). However, the woodland vegetation within the subject land is comprised of predominantly regrowth vegetation rather than fully mature woodlands. As outlined in the Conservation Advice, regrowth vegetation provides fewer habitat resources such as tree hollows or mature flowering resources.

Significant Impact Criteria	Response
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The Modification is unlikely to reduce groundwater levels or alter surface water drainage patterns such that other occurrences of this community outside the direct surface footprint will be significantly affected.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The areas of Central Hunter Valley Forest and Woodland within the subject land will be entirely removed. However, there are other areas of this community in the locality that make up the "occurrence" of this community, and these areas will not be affected by the Modification. Accordingly, the Modification is not considered likely to cause a substantial change in the species composition of an occurrence of this community.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: **assisting invasive species, that are harmful to the listed ecological community, to become established, or** **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or**	It is not expected that the Modification will result in a substantial reduction in the quality or integrity of the occurrence of the portions of this community outside of the subject land. The condition of the vegetation within the subject land is currently being impacted as a result of previous and current land uses. Invasive flora and fauna species are known to occur and agricultural activities such as grazing have resulted in reduced species diversity within derived native grasslands. The existing BMP will be updated as required to ensure it details appropriate weed management measures to be implemented for the Modification to minimise the risks of invasive species.
Interfere with the recovery of an ecological community	The clearing of 39.31 ha of Central Hunter Valley Forest and Woodland listed under the EPBC Act is not considered to interfere with the recovery of this community. The areas of this community to be cleared have been cleared historically and comprise predominantly regrowth vegetation which is not actively managed and continues to be impacted by previous and current land uses.

11.3.2. Critically Endangered or Endangered Species

Species Assessed: Spotted-tailed Quoll, Hunter Valley Delma, Koala, Large-eared Pied Bat and South-eastern Hooded Robin and Regent Honeyeater.

Targeted surveys for the Spotted-tailed Quoll have not been conducted as surveys are not required for this species under current NSW legislation. However, as there are several records for this species in the locality and

this species is known to have large home ranges (200 – 4000 ha), the species is considered to have potential to occur based on presence of woodland habitats (albeit sub-optimal).

The Hunter Valley Delma has been recorded from the subject land and has potential to occur in most areas of the subject land due to its known ability to utilise secondary grassland derived from the clearing of woodland. Both remnant areas of woodland and DNG occur in the subject land, and due to its known occurrence, the entirety of the subject land is considered to provide potential habitat for this species.

The Large-eared Pied Bat has been recorded from the locality and potential foraging habitat is present in the subject land in the form of woodland. As no sandstone cliffs or escarpments are present in the subject land, no breeding habitat is present and the potential habitat is limited to foraging habitat only.

The Koala has been recorded from the locality and has potential to occur in the subject land due to the presence of suitable habitat in the form of eucalypt canopy trees. That notwithstanding, targeted surveys have been conducted for this species and no Koalas have been recorded from the subject land. Accordingly, it is considered unlikely that there is a resident population of Koalas in the subject land, although they may use the habitat present on occasion for foraging or to access other habitats in the wider locality.

The South-eastern Hooded Robin has only been recorded once within the locality, and the species was not recorded during field surveys. Nevertheless, the subject land contains potential habitat for the species, and it is therefore considered to have the potential to occur. This species is not considered likely to rely on the habitat within the subject land and is only likely to utilise the habitats present from time to time as part of a larger foraging range.

The Regent Honeyeater has not been recorded within the locality, and the species was not recorded during field surveys. Additionally, the subject land is not within the Important Habitat Map for the species. Nevertheless, the subject land contains potential habitat for the species, and it is therefore considered to have the potential to occur. This species is not considered likely to rely on the habitat within the subject land and is only likely to utilise the habitats present from time to time as part of a larger foraging range.

Table 25 Significant Impact Criteria for Critically Endangered or Endangered Species

Significant Impact Criteria	Response
Will the action lead to a long-term decrease in the size of a population	The Spotted-tailed Quoll has not been recorded from the subject land however it has been recorded from the locality. As the species is highly mobile, this species could potentially utilise woodland habitats within the subject land as part of a larger territory, especially as males can occupy territories ranging from 500 to 4000 ha. Given the degraded nature of the potential habitat in the subject land and the limited occurrence of Spotted-tailed Quoll within the locality, the Modification is not considered likely to lead to a long-term decrease in the size of a population for this species. The Hunter Valley Delma has been recorded in the subject land. It is known almost entirely from a 25km wide corridor

Significant Impact Criteria	Response
	in the Hunter Valley NSW, between Maitland and Muswellbrook and therefore the removal of known habitat for this species (that has an already very small range) will likely result in a long-term decrease in the size of the population. The Large-eared Pied Bat has not been recorded from the subject land, although it has been recorded from the locality. This species roosts and breeds in rocky escarpment areas and old mine shafts, and these habitats are not present in the subject land. This area would be likely be used only sporadically for foraging purposes and therefore the Modification is considered unlikely to result in a long-term decrease in the size of the Large-eared Pied Bat population. The Koala has not been recorded from the subject land, but it is known from the locality and due to the potential habitat that is present in the subject land, it has potential to occur. That notwithstanding, this species was not recorded from the subject land despite targeted searches being undertaken, and therefore would likely use the site on a transitory basis only. There are large areas of similar habitat that will remain in the locality and the Modification is considered unlikely to result in a long-term decrease in the size of the Koala population. The South-eastern Hooded Robin has not been recorded from the subject land, although it has been recorded once from the locality. The subject land would be likely be used only sporadically for foraging purposes as part of a larger foraging range, and therefore the Modification is considered unlikely to result in a long-term decrease in the size of the population of this species. The Regent Honeyeater has not been recorded from the subject land nor in the locality. The subject land is not mapped on the Important Habitat Map for the species, therefore it is unlikely that the subject land would be utilised as breeding habitat. The subject land would be likely be used only sporadically for foraging purposes as part of a larger foraging range, and therefore the Modification is considered unlikely to result in a long-term decrease in the size of the population of this species.
Will the action reduce the area of occupancy of the species	With the exception of the Hunter Valley Delma, the species with potential to occur (Large-eared Pied Bat, Koala, South-eastern Hooded Robin, Regent Honeyeater and Spotted-tailed Quoll) have not previously been recorded from the subject land. Although they have been assessed as having some potential to occur in the subject land, the habitat

Significant Impact Criteria	Response
	available is not considered to be utilised extensively by these species and the proposed action is considered unlikely to reduce the area of occupancy of these species. The Hunter Valley Delma has been recorded from the subject land and the removal of habitat by the action will reduce the area of occupancy of this species.
Will the action fragment an existing population into two or more populations	The majority of the species assessed in this section (Large-eared Pied Bat, Koala, South-eastern Hooded Robin, Regent Honeyeater and Spotted-tailed Quoll) are highly mobile species that forage over large areas and removal of a small portion of potential habitat is unlikely to fragment existing populations of these species. The Hunter Valley Delma is not highly mobile and a known population occurs in the subject land. Similar habitats occur outside the subject land and it is likely that the species also occurs in adjacent habitats. Accordingly, it is considered likely that the action will fragment an existing population into two or more populations.
Will the action adversely affect habitat critical to the survival of a species	The majority of the species with potential to occur in the subject land (Large-eared Pied Bat, Koala, South-eastern Hooded Robin, Regent Honeyeater and Spotted-tailed Quoll) have not previously been recorded from the subject land, although they have been assessed as having some potential to occur. Because a known population has not been recorded, the available habitat is not considered to be critical to the survival of these species. Large areas of similar habitat occur in the wider locality that will remain. The habitat critical to the survival of the Hunter Valley Delma is not well understood, but according to the DCCEEW (Cth.) conservation advice (DCCEEW 2024) likely includes the secondary native grassland of the Hunter Valley between Maitland and Muswellbrook where the species is known to occur. The Hunter Valley Delma has been recorded from the subject land and secondary native grassland habitat is present, and therefore the habitat to be removed is likely to be critical to the survival of this species. The action will remove known habitat and fragment remaining habitat outside the subject land. Accordingly, it is considered that the action is likely to adversely affect habitat critical to the survival of this species.
Will the action disrupt the breeding cycle of a population	No critical breeding sites or critical habitat for Spotted-tailed Quoll is known to occur within the subject land. No breeding habitat for the Large-eared Pied bat is present due to the lack of sandstone escarpments and outcrops. The Koala and South-eastern Hooded Robin have not been

Significant Impact Criteria	Response
	recorded from the subject land and these species are not known to breed there. The Regent Honeyeater has not been recorded within the subject land, and the subject land is not mapped on the Important Habitat Map for the species. The proposed action is therefore considered unlikely to disrupt the breeding cycle of any known population of the above-mentioned species. The Hunter Valley Delma has been recorded from the subject land and is likely to breed there. The habitat in the subject land is likely to be important to the survival of this species given its very small distribution. The proposed action will also remove known habitat and fragment remaining habitat outside the subject land. Accordingly, it is considered that the action has potential to disrupt the breeding cycle of a population of this species.
Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The majority of the fauna species with potential to occur in the subject land (Spotted-tailed Quoll, Large-eared Pied Bat, Koala, Regent Honeyeater and South-eastern Hooded Robin) have not previously been recorded from the subject land. Although they have been assessed as having some potential to occur in the subject land, they are likely to use the habitat sporadically as part of a much larger foraging range. Large areas of similar habitat occur in the wider locality that will remain. Accordingly, the proposed action is considered unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that these fauna species are likely to decline. The Hunter Valley Delma has been recorded from the subject land and is likely to breed there. The habitat in the subject land is likely to be important to the survival of this species given its very small distribution. The proposed action will remove known habitat and fragment remaining habitat outside the subject land. Accordingly, it is considered that the proposed action has potential to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that this species is likely to decline.
Will the action result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Invasive species such as foxes, rabbits, cats and dogs already occur within the subject land as a result of past and current land uses. The proposed action is unlikely to result in another invasive species harmful to these species becoming established.
Will the action introduce disease that may cause the species to decline	The proposed action is unlikely to lead to processes capable of introducing diseases that may cause these species to decline.

Significant Impact Criteria	Response
Will the action interfere with the recovery of the species	The majority of the fauna species with potential to occur in the subject land (Large-eared Pied Bat, Koala, South-eastern Hooded Robin, Regent Honeyeater and Spotted-tailed Quoll) have not previously been recorded from the subject land. Although they have been assessed as having some potential to occur in the subject land, they are likely to use the habitat sporadically as part of a much larger foraging range. Large areas of similar habitat occur in the wider locality that will remain. Accordingly, the proposed action is considered unlikely to interfere with the recovery of these species. The Hunter Valley Delma has been recorded from the subject land and is likely to breed there. According to the DCCEEW (Cth.) conservation advice for the species (DCCEEW 2024), all populations of the Hunter Valley Delma are important for conservation across its range. Due to the limited area of occupancy, extent of occurrence and habitat decline, all sites where the Hunter Valley Delma has been detected are potentially important for species survival (DCCEEW 2024). Therefore, the habitat in the subject land is likely to be important to the survival of this species given its very small distribution. The proposed action will remove known habitat and fragment remaining habitat outside the subject land and accordingly, it is considered that the action has potential to interfere with the recovery of this species.

11.3.3. Vulnerable Species

Species Assessed: Brown Treecreeper (southeastern) (*Climacteris picumnus victoriae*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Diamond Firetail (*Stagonopleura guttata*),and White-throated Needletail (*Hirundapus caudacutus*).

The vulnerable fauna species assessed as having potential to occur in the subject land are all highly mobile species that access resources from a wide area. Although potential habitat resources are present, none of these species has been recorded from the subject land and they are only likely to use this area sporadically as part of a larger foraging territory. Large areas of similar habitats occur in the wider locality that will remain, and it is unlikely that the habitats in the subject land are important for the survival of any of the vulnerable fauna species assessed.

Table 26 Significant Impact Criteria for Vulnerable Species

Significant Impact Criteria	Response
Will the action lead to a long-term decrease in the size of an important population of a species	The proposed action is not considered likely to result in a long-term decrease in the size of the populations of any of the vulnerable species assessed. Although potential habitat for these species is present, they have not been recorded and it is unlikely that the subject land supports an important population of any of these species. Large areas of similar habitats occur in the locality that will remain. As the subject land does not support an important population of any of these vulnerable species, the proposed action is not considered to result in the long-term decrease in the size of an important population of any of these species.
Will the action reduce the area of occupancy of an important population	Although potential habitat for these vulnerable species is present, they have not been recorded and it is unlikely that the subject land supports an important population of any of these species. Large areas of similar habitats occur in the locality that will remain. As the subject land does not support an important population of any of these species, the proposed action is not considered likely to result in the long-term decrease in the size of an important population of any of these species.
Will the action fragment an existing important population into two or more populations	Although potential habitat for these vulnerable species is present, they have not been recorded and it is unlikely that the subject land supports an important population of any of these species. Large areas of similar habitats occur in the locality that will remain. As the subject land does not support an important population of any of these species, the proposed action is not considered likely to fragment an existing important population into two or more populations.
Will the action adversely affect habitat critical to the survival of a species	Although potential habitat for these vulnerable species is present, they have not been recorded and it is unlikely that the subject land contains habitat critical to the survival of any of these species. Large areas of similar habitats occur in the locality that will remain. The proposed action is therefore not considered to affect habitat critical to survival of these species.
Will the action disrupt the breeding cycle of an important population	Although potential habitat for these vulnerable species is present, they have not been recorded and it is unlikely that the subject land supports an important population of any of these species.

Significant Impact Criteria	Response
	Therefore, the proposed action is not considered likely to result in the disruption of the breeding cycle of an important population of any of these species. Furthermore, as these species have not been recorded, it is unlikely that the habitat in the subject land is relied upon for breeding by these species.
Will the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Although potential habitat for these vulnerable species is present, they have not been recorded and it is unlikely that the removal of potential habitat from the subject land will result in the decline of these species. Large areas of similar habitats occur in the locality that will remain.
Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Invasive species such as foxes, rabbits, cats and dogs already likely occur within the subject land as a result of past and current land uses. The proposed action is unlikely to result in any other invasive species becoming established.
Will the action introduce disease that may cause the species to decline	The proposed action is considered unlikely to introduce disease that may cause these species to decline.
Will the action interfere substantially with the recovery of the species	The proposed action is not considered likely to interfere substantially with the recovery of these vulnerable species. They are likely to persist within the surrounding area and wider locality. Large areas of similar habitats occur in the locality that will remain. Avoidance and mitigation measures will be implemented to minimise the impacts to these species.

11.3.4. Migratory Species

Species Assessed: White-throated Needletail

The White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. It occurs over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy. Due to its very large distribution, it is likely that the species forages over the subject land on occasion, however there are very large areas of similar habitats in the locality, and the subject land does not provide higher quality habitat than other areas that will remain.

Table 27 Significant Impact Criteria for Migratory Species

Significant Impact Criteria	Response
Will the action substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an	The habitat proposed to be cleared within the study area is not considered to be important habitat for the White-throated Needletail. No key breeding habitat is present within the subject land and occurrence is likely to be

Significant Impact Criteria	Response
area of important habitat for a migratory species	limited to fly-throughs as part of a wider migratory range as preferred/optimal habitats for this species are largely absent. Large areas of similar habitats occur in the locality that will remain.
Will the action result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The habitat proposed to be cleared within the subject land is not considered to be important habitat for the White-throated Needletail. Large areas of similar habitats occur in the locality that will remain. The proposed action is unlikely to result in an invasive species becoming established. The existing BMP will be updated to ensure it contains appropriate weed and feral animal management measures to be implemented for the proposed action that will minimise these risks.
Will the action seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The subject land is not considered to support an ecologically significant portion of the population of the White-throated Needletail. The proposed action is not considered likely to seriously disrupt the lifecycle of the White-throated Needletail as preferred habitats for this species are largely absent. Large areas of similar habitats occur in the locality that will remain.

11.4. Measures to Avoid, Mitigate and Offset MNES

Measures to avoid and minimise impacts, including impacts to MNES are presented in **Chapter 7**, and measures to mitigate and offset impacts are presented in **Chapter 9** and **Chapter 10**, respectively.

A range of measures have been developed for this Modification to mitigate the impacts that are unable to be avoided on threatened species and communities, including those listed under the EPBC Act. These include a range of measures to be undertaken before and during construction to limit the impact of the Modification. It is envisaged that these mitigation measures will form part of the conditions of consent for the Modification and all measures will be approved or endorsed by the Minister for Planning or delegate as part of the approval process.

11.5. Summary of MNES Assessment

Following the completion of the assessments of significance and assessment of impacts to threatened communities and species within Chapter 8, it is considered likely that the Modification will result in a significant impact on the CEEC Central Hunter Valley Eucalypt Forest and Woodland as well as the Hunter Valley Delma, listed as Endangered under the EPBC Act. As such, a range of mitigation measures (see **Chapter 9**) have been identified to minimise the impacts of the Modification on these communities/species. Furthermore, biodiversity credits have been calculated to offset the residual impacts of the Modification on these communities/species as identified in ***Section 10.6***.

12. Conclusion

This BDAR has been prepared to assess the impacts of the proposed development on biodiversity values in accordance with the BAM. The Modification involves removal of native vegetation outside the Approved Disturbance Boundary of SSD-5710 to allow for the realignment of the BLR on .

The Modification is classified as State Significant Development (SSD) under Clause 5 of Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011*.

In accordance with Part 7.17 of the BC Act, modifications of a development consent are required to submit a BDAR prepared in accordance with the Biodiversity Assessment Method where the modification results in the development consent exceeding the BOS. As the Modification triggers entry into the BOS, this BDAR has been prepared to accompany the SSD application.

Native vegetation occurring within the subject land comprises one PCT, PCT 3431 Central Hunter Ironbark Grassy Woodland occurring in a woodland condition and DNG condition states. Both condition states of PCT 3431 align with the TEC listed under the BC Act, Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions, which is listed as an EEC. Furthermore, the woodland condition of PCT 3431 aligns with the TEC, Central Hunter Valley Eucalypt Forest and Woodland which is listed as a CEEC under the EPBC Act.

The Modification requires the removal of all native vegetation within the subject land for the construction of the realigned BLR. As the Modification includes the removal of native vegetation, a number of offsets are required in the form of ecosystem credits. This assessment indicates that the removal of the native vegetation within the subject land requires a total of 1,780 ecosystem credits of PCT 3431.

No threatened flora species that are considered as species credit species were recorded within the subject land and none are considered likely to occur. Therefore, no flora species credits species are required to be offset.

Fauna species credits have been calculated for the removal of habitat for two threatened fauna species, the Hunter Valley Delma and the Southern Myotis. A total of 1,780 credits for the Hunter Valley Delma and 616 credits for the Southern Myotis.

When considering the requirements of the road realignment and the extent of earthworks required for its construction, opportunities to avoid impacts to biodiversity values are limited. Nevertheless, the subject land has been through multiple iterations to minimise the footprint to the smallest extent possible that will still facilitate the construction and operation of the realigned BLR. Therefore all native vegetation within the subject land is proposed to be removed as part of the Modification.

A suite of mitigation measures is proposed to minimise and manage the impacts to biodiversity values, such as implementation of pre-clearing and clearing procedures, delineation of clearing areas, erosion and sediment management, habitat salvage, weed management, and a Hunter Valley Delma Translocation and Habitat Restoration Plan.

The Modification is considered to be consistent with the No Net Loss standard as impacts to biodiversity values have been avoided/minimised/mitigated where feasible and all residual impacts are to be offset by retirement of the required number of biodiversity credits.

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APPENDIX A :
Bat Data Analysis

Microbat Call Identification Report

Prepared for ("Client"):	Cumberland Ecology
Survey location/project name:	Bengalla, Hunter Valley, NSW
Survey dates:	February & March 2023
Client project reference:	
Job no.:	CE-2308
Report date:	23 January 2024

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Methods

Data received

Balance! Environmental received 6536 WAV files recorded with Anabat Chorus and Song Meter detectors deployed over two survey periods (20-23 February and 27-30 March 2023). GPS metadata contained within the Swift WAV files (see **Table 1**) indicates each unit sampled a single site for the duration of the relevant survey period. While no GPS positions were obtained by the Song Meter units, it is assumed these each also sampled a single site during the February deployment period.

Call analysis and species identification

Call analysis was performed in *Anabat Insight* (v2.0.8; Titley Scientific, Brisbane), with all WAV files first processed through a generic noise filter to exclude files with only non-bat noise. Files that passed the noise filter were run through a Decision Tree Analysis to group and label similar calls based on zero-crossing analysis metrics (e.g. characteristic frequency (Fc), pulse duration (Dur) and time between pulses (TBC)). Species present in each Decision Tree group were then confirmed by manually comparing call spectrograms and derived metrics with those of reference calls and published call descriptions (Pennay et al. 2004). The likelihood of species' presence was confirmed by referring to distributional information in Australasian Bat Society 2021, Churchill 2008; Baker & Gynther 2023.

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at http://www.ausbats.org.au/. Species nomenclature follows Armstrong *et al.* (2020).

Table 1 Detector positions during the Bengalla surveys; derived from GPS metadata in the WAV files.

Survey	Detector	Nights	Latitude	Longitude
Feb-23	656183	20 Feb	-32.2728	150.7892
	656231	20 Feb	-32.2841	150.7885
	656245	20 Feb	-32.2809	150.7867
	656258	20 Feb	-32.2756	150.7847
	CE-SM2-2	20-23 Feb	Not recorded	
	CE-SM2-3	20-23 Feb	Not recorded	
Mar-23	656245	27-30 Mar	-32.2723	150.7896
	SW-1	27-30 Mar	-32.2800	150.7862
	SW-2	27-30 Mar	-32.7824	150.8826

Results & Discussion

Noise filtration excluded 4032 WAV files from further analysis. The other 2504 files contained 2572 identifiable bat calls, 68% (1755) of which were positively identified to 13 distinct taxa. The remaining 817 "unresolved" calls could not be reliably identified and were assigned to several multi-species groups.

No bats were recorded on Song Meter SM2-3 when it was deployed on 20-23 February 2023.

At least 13 and possibly 15 species were detected. The 13 reliably identified call types were allocated to 12 distinct species plus the undifferentiated *Nyctophilus* genus (see top section of **Table 1**). Two *Nyctophilus* species (*N. geoffroyi, N. gouldi*) probably occur in the study area. The distributional boundary of *N. corbeni* lies ~25km north-west of the study area, but there is a low likelihood of it occurring in the woodlands present at the detection sites.

Most of the "unresolved" calls were allocated to groups representing species that were positively identified from more diagnostic calls; however, six calls from two sites potentially represent one additional species – *Myotis macropus* – that was not otherwise identified.

Spectrograms of each identified call type appear in **Appendix 1**.

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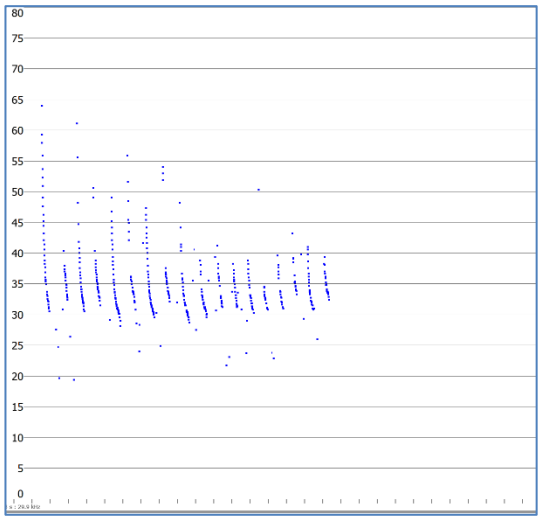
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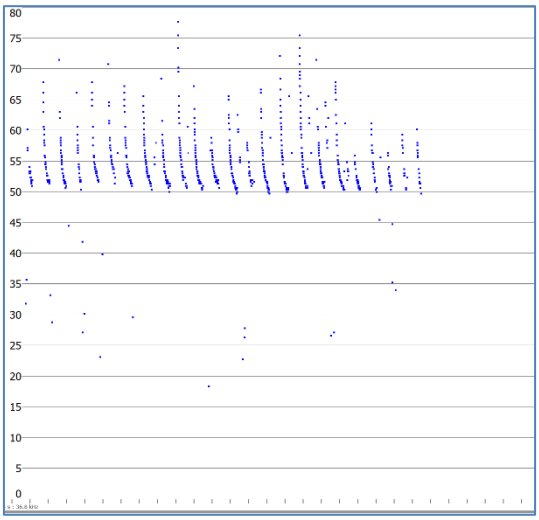
Table 2 Bats recorded during the Bengalla surveys, 20-23 February and 27-30 March 2023.
Number of calls attributed per species per site.

Survey:	February					March			Species Total
Detector:	656183	656231	656245	656258	CE-SM2-2	656245	SW-1	SW-2	
Positively identified calls									
Chalinolobus gouldii	13	69	4	99	277	52	33	11	558
Chalinolobus morio	4	14		4	19	48	26		115
Nyctophilus sp.	2	14	1	2	1	6	1		27
Scotorepens balstoni		7		10	8		1		26
Scotorepens orion				5	20				25
Scotorepens sp. (*sensu* Parnaby 1992)	1	2	1	4	2		1		11
Vespadelus troughtoni		1			3	6			10
Vespadelus vulturnus		585	2	4	9	3			603
Miniopterus orianae oceanensis		2		3	3	26	3		37
Austronomus australis		2		2	1	2	10		17
Ozimops planiceps	4	26	1	39	30	13	124		237
Ozimops ridei	3	2		1	1	8	9	1	25
Saccolaimus flaviventris						1	63		64
Unresolved calls									
C. gouldii / O. ridei	2	29		36	3	40	32		142
C. gouldii / S. balstoni				1					1
Nyctophilus sp. / *Myotis macropus*					2	4			6
S. balstoni / S. orion				9	12				21
V. vulturnus / V. troughtoni		22		2	7	1			32
Vespadelus sp. / *C. morio*	10	88	2	2	393	45	73	2	615
Site Total	39	863	11	223	791	255	376	14	2572

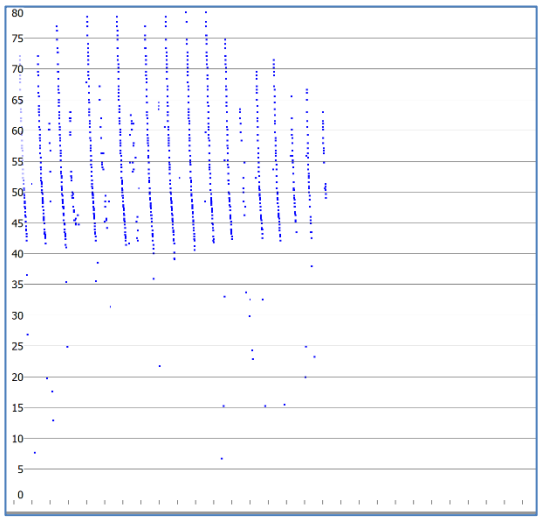
Appendix 2 Representative bat-calls from the Bengalla survey, February-March 2023.
X-axis (time)=10 msec per tick; time between pulses compressed



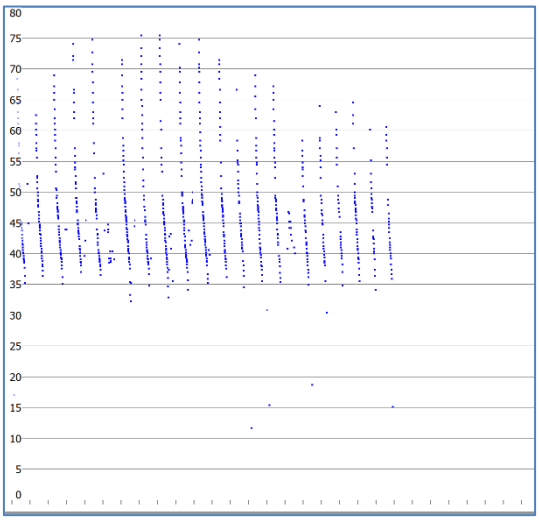
Chalinolobus gouldii



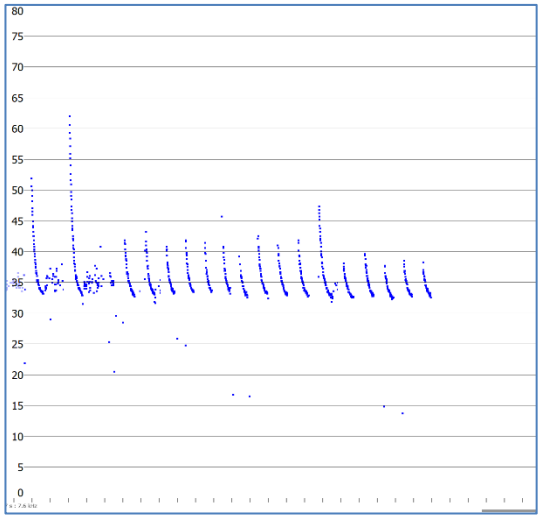
Chalinolobus morio



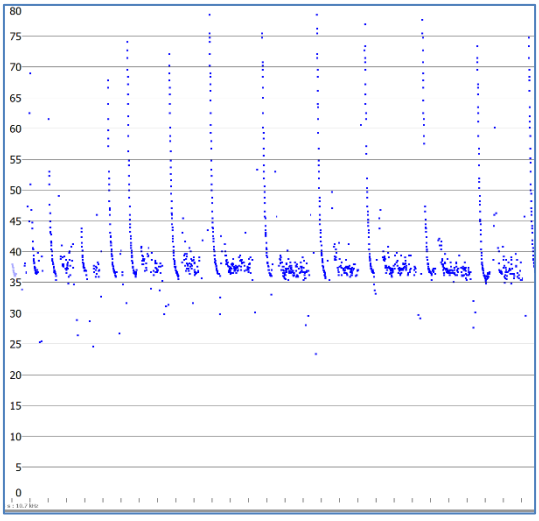
Nyctophilus sp.



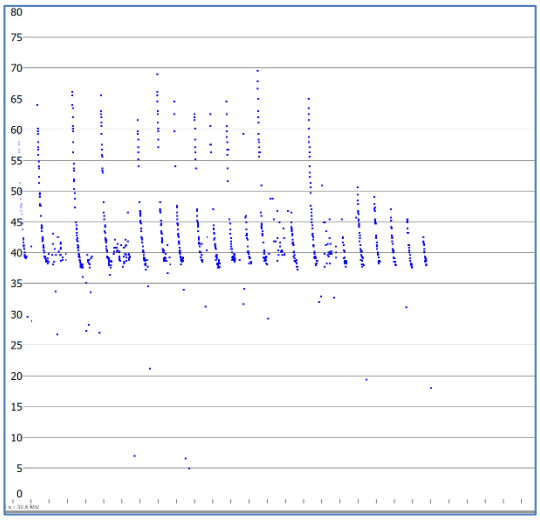
Nyctophilus sp. or *Myotis macropus*



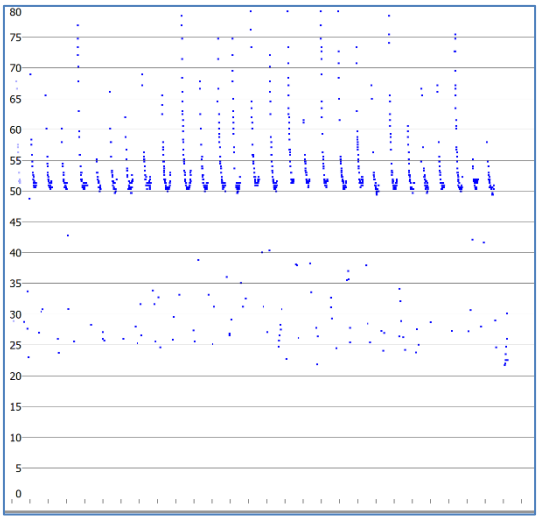
Scotorepens balstoni



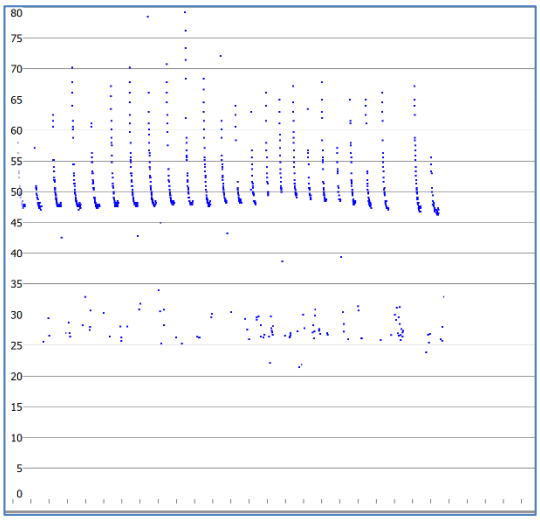
Scotorepens orion



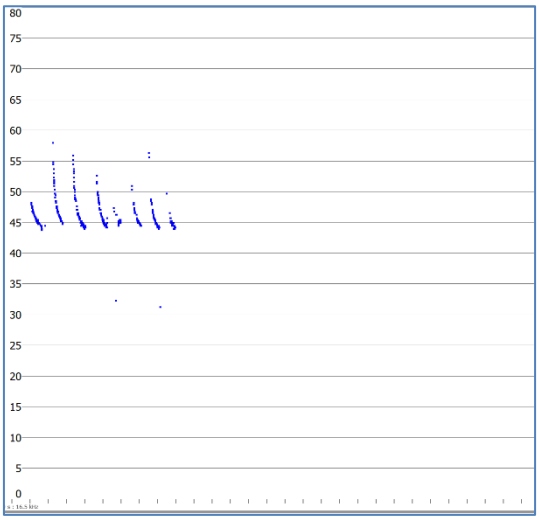
Scotorepens sp. (*sensu* Parnaby 1992)



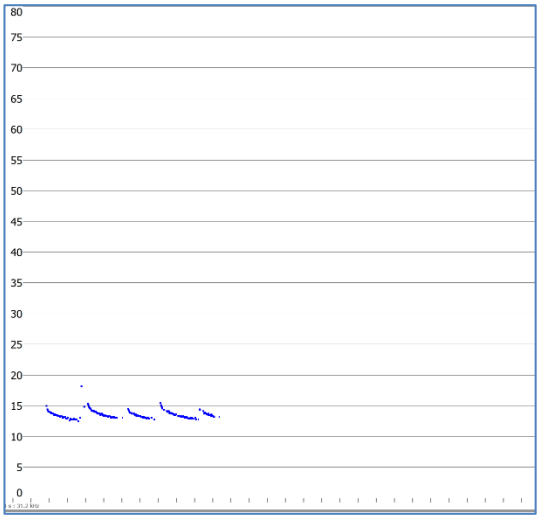
Vespadelus troughtoni



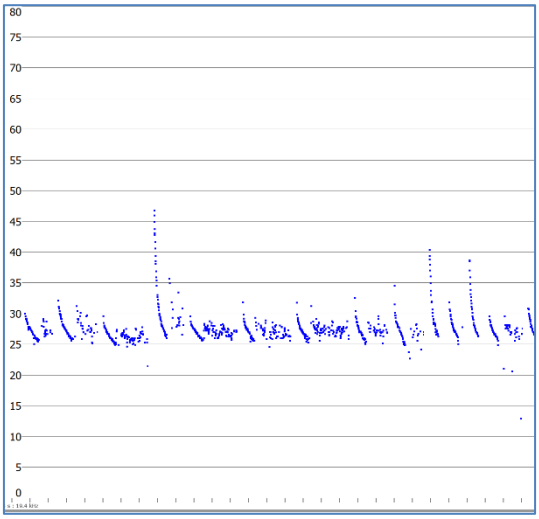
Vespadelus vulturnus



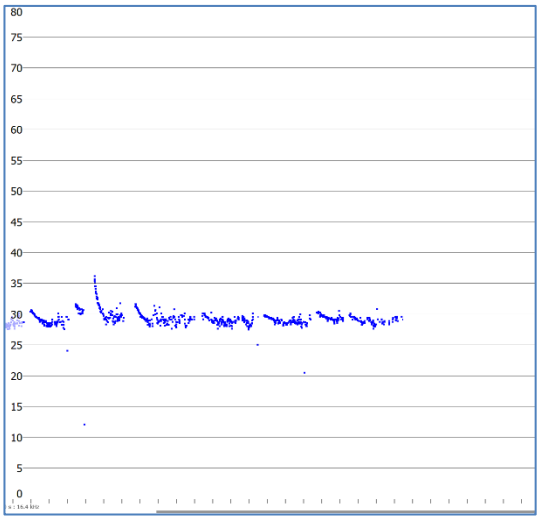
Miniopterus orianae oceanensis



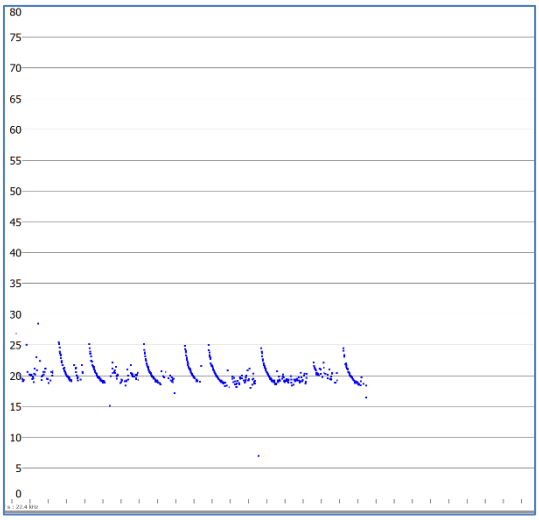
Austronomus australis



Ozimops planiceps



Ozimops ridei



Saccolaimus flaviventris

APPENDIX B :
BAM Plot Data

Table 28 BAM Plot Data

plot	pct	area	patchsize	conditionclass	compTree	compShrub	compGrass	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic
1	3431	28.8	100	DNG	0	2	13	5	0	2	0.0	0.8	82.4	1.6	0.0	1.1	0	1	33.2	0.0	0	0	0	0	0	0	0.9
5	3431	28.8	100	DNG	0	0	6	4	0	1	0.0	0.0	100.0	0.6	0.0	0.2	0	1	5.6	0.0	0	0	0	0	0	0	0.9
7	3431	28.8	100	DNG	0	2	6	7	0	2	0.0	0.5	100.0	1.7	0.0	0.4	0	1	0.0	0.0	0	0	0	0	0	1	1.2
A (1)	3431	28.8	100	DNG	1	0	7	7	0	2	0.2	0.0	31.1	1.5	0.0	0.3	0	0	19.0	0.0	0	0	0	0	0	1	21.8
B (2)	3431	28.8	100	DNG	1	1	9	15	0	2	0.1	1.0	31.2	3.5	0.0	1.1	0	0	9.0	0.0	0	0	0	0	0	1	5.4
C (3)	3431	28.8	100	DNG	2	1	9	10	1	3	0.2	0.1	36.6	3.5	0.4	1.3	0	0	7.0	3.0	0	0	0	0	0	1	16.4
4	3431	42.6	100	Woodland	2	3	6	7	1	2	50.2	0.6	43.1	1.2	0.1	0.2	1	1	32.0	12.5	1	1	1	1	1	1	2.5
6	3431	42.6	100	Woodland	4	5	9	12	0	3	50.7	1.4	76.3	1.6	0.0	0.3	1	1	31.0	12.0	1	1	1	1	1	1	0.6
8	3431	42.6	100	Woodland	2	3	6	12	1	2	50.4	0.5	90.6	1.8	0.3	0.3	16	1	19.6	9.5	1	1	1	1	1	1	0.7
9	3431	42.6	100	Woodland	5	5	19	20	1	3	33.7	12.6	103.3	3.7	0.1	0.3	1	1	17.0	7.0	1	1	1	1	1	1	0.4

APPENDIX C :
PMST Report

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 05-Nov-2024

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	41
Listed Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	19
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	13
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Hunter estuary wetlands	50 - 100km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community likely to occur within area	In feature area
Hunter Valley Weeping Myall (Acacia pendula) Woodland	Critically Endangered	Community may occur within area	In feature area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community may occur within area	In feature area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia			
Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Aphelocephala leucopsis			
Southern Whiteface [529]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat may occur within area	In buffer area only
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat known to occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat likely to occur within area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area	In feature area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat known to occur within area	In feature area
FISH			
Galaxias sp. nov. 'Hunter' Hunter Galaxias, Hunter Upland Galaxias [90728]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
FROG			
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat known to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
PLANT			
Dichanthium setosum			
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Eucalyptus glaucina			
Slaty Red Gum [5670]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Euphrasia arguta			
[4325]	Critically Endangered	Species or species habitat may occur within area	In feature area
Ozothamnus tesselatus			
[56203]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Picris evae			
Hawkweed [10839]	Vulnerable	Species or species habitat may occur within area	In feature area
Pomaderris brunnea			
Rufous Pomaderris, Brown Pomaderris [16845]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Prasophyllum sp. Wybong (C.Phelps ORG 5269)			
a leek-orchid [81964]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Prostanthera cryptandroides subsp. cryptandroides			
Wollemi Mint-bush [68496]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pterostylis gibbosa			
Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area	In buffer area only
Thesium australe			
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area	In feature area
REPTILE			
Aprasia parapulchella			
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Delma vescolineata			
Hunter Valley Delma [92599]	Endangered	Species or species habitat known to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus			
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
[Chalcites osculans as Chrysococcyx osculans](#) Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
[Lathamus discolor](#) Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
[Monarcha melanopsis](#) Black-faced Monarch [609]		Species or species habitat may occur within area overfly marine area	In buffer area only
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area

Extra Information

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State	Buffer Status
North East NSW RFA	New South Wales	In feature area

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Mount Pleasant Optimisation Project	2020/8735		Post-Approval	In feature area
Mt Arthur Coal Mine Modification 2	2024/09796		Referral Decision	In buffer area only
Controlled action				
Continuation of Bengalla Mine	2012/6378	Controlled Action	Post-Approval	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Mangoola Coal Continued Operations Project, NSW	2018/8280	Controlled Action	Post-Approval	In buffer area only
Mount Pleasant Project	2011/5795	Controlled Action	Post-Approval	In feature area
Mt Arthur Coal Extension Project Hunter Valley NSW	2011/5866	Controlled Action	Post-Approval	In buffer area only
Mt Arthur Coal open cut mine modification, Muswellbrook, NSW	2014/7377	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
Anvill Hill Project coal mine	2007/3228	Not Controlled Action	Completed	In buffer area only
clearing of GWB Woodland for residential development	2004/1771	Not Controlled Action	Completed	In feature area
Dartbrook Mine Bord and Pillar Mining, Hunter Valley, NSW	2018/8295	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
Aerial baiting for wild dog control	2006/2713	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Referral decision				
Mount Pleasant Project	2010/5529	Referral Decision	Completed	In feature area

Bioregional Assessments			[Resource Information]
SubRegion	BioRegion	Website	Buffer Status
Hunter	Northern Sydney Basin	BA website	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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APPENDIX D :
Likelihood of Occurrence Assessment

Table 29 Flora likelihood of occurrence assessment

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Dichanthium setosum	Bluegrass	V	V	Occurs on the northern tablelands and is associated with heavy basaltic black soils and stony red-brown hard-setting loam with clay subsoil.	Unlikely. Suitable habitat and soil types are not present in the subject land.
Eucalyptus glaucina	Slaty Red Gum	V	V	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils.	Unlikely. Suitable habitat is present in the subject land, however targeted surveys did not detect the species.
Euphrasia arguta	-	CE	CE	Species is distributed from Sydney to Bathurst and north to Walcha. Occurs in relatively few places in areas of open forest country, grassy country, meadows near rivers and eucalypt forest.	Unlikely . Although broadly suitable habitat is present in the subject land this species is only known from relatively few locations and has not been recorded from the locality. Targeted surveys did not detect the species.
Ozothamnus tesselatus	-	V	V	Restricted to a few locations in an east-west zone south of Bunnan and between west Bylong and east Ravensworth. Grows in eucalypt woodland.	Low. Suitable habitat is present in the subject land which is within the known distribution of this species, however the species was not detected during targeted surveys.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Picris evae	Hawkweed	V	V	Occurs within QLD and NSW in Eucalyptus open woodland with a grassy understorey composed of *Dichanthium spp.*.	Unlikely. Although open Eucalyptus woodland is present in the subject land, the understorey is not composed of *Dicanthium* spp. Furthermore, targeted surveys did not detect the species.
Pomaderris brunnea	Brown Pomaderris	E	V	In the region, the species is only found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Unlikely. No suitable habitat is present in the subject land and the species was not recorded during targeted surveys.
Prasophyllum sp. Wybong (C.Phelps ORG 5269)	-	-	CE	Known within NSW and is associated with open eucalypt woodland and grassland. Species distribution overlaps with White Box-Yellow Box-Blakey's Red Gum Grassy Woodland and Derived Native Grassland.	Low. Suitable habitat is present in the subject land, however the species has not been recorded in the locality and was not detected during targeted surveys.
Prostanthera cryptandroides subsp. cryptandroides	Wollemi Mint-bush	V	V	Known from Glen Davis to Capertee and extending to the Goulburn River valley, NSW. Occurs in dry sclerophyll forested slopes and gullies, in rocky areas, especially at the base of scree slopes and sandstone boulders, and in shallow sandy loam, as an understorey species to Eucalyptus spp. and Acacia spp.	Unlikely. No suitable habitat is present in the subject land. The species was not recorded in the locality and not detected during targeted surveys.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Pterostylis gibbosa	Illawarra Greenhood	E	E	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by *Eucalyptus tereticornis* (Forest Red Gum), *E. longifolia* (Woollybutt), and *Melaleuca decora (White Feather Honey-myrtle)*. Near Nowra, the species grows in open forest of *Corymbia maculata* (Spotted Gum), *E. tereticornis,* and *E. paniculata* (Grey Ironbark). It is only visible above the ground between late summer and spring, and only when soil moisture levels can sustain its growth. The species is currently only known to occur at five sites three in the Illawarra, one near Nowra, and one at Milbrodale in the Hunter Valley.	Unlikely. The subject site is not one of the known locations for the species and the habitat present is not suitable for the species. There are no records of the species in the locality and the species was not recorded during targeted surveys.
Thesium australe	Austral Toadflax	V	V	Found in very small populations scattered across eastern NSW. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*).	Low. Suitable habitat is present in the subject land however there are no records in the locality and the species was not recorded within the subject land.

Table 30 Fauna likelihood of occurrence assessment

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Amphibians					
Litoria booroolongensis	Booroolong Frog	E	E	Lives exclusively along rocky sections of permanent streams in wet and dry forest, woodland, and cleared grazed land. The species is reliant on permanent running water and does not occupy ephemeral streams, or streams that have dried during severe drought.	Unlikely. No suitable habitat is present in the subject land
Birds					
Anthochaera phrygia	Regent Honeyeater	CE	CE	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes.	Low. No records in the locality and the subject land is outside the main breeding areas. However, species is highly mobile and some key foraging species are present within the subject land.
Aphelocephala leucopsis	Southern Whiteface	V	V	Occur across most of mainland Australia south of the tropics, from the northeastern edge of the Western Australian wheatbelt, east to the Great Dividing Range. They live in a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains. The species forages almost exclusively on the ground, favouring habitat with low tree densities and an herbaceous understorey litter cover.	Low. Potential habitat is available within the subject land, however there are no previous records of the species in the locality and the species was not recorded during surveys within the subject land.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Botaurus poiciloptilus	Australasian Bittern	E	E	Occurs in freshwater wetlands, and more rarely, estuarine wetlands. It favours wetlands with tall, dense vegetation, and forages in shallow water up to a depth of 0.3m. It nests in deep vegetative cover over shallow pools.	Unlikely. No suitable habitat is present in the subject land. Although two small farm dams are present, they are highly degraded and do not contain the requisite fringing vegetation.
Calidris acuminata	Sharp-tailed Sandpiper	-	V, M	Species prefers muddy edges of shallow fresh or brackish wetlands with inundated or low vegetation. Known to occur lagoons, swamps, lakes, dams, and other waterbodies. Roosts at the edges of wetlands.	Unlikely. No suitable habitat is present in the subject land. Although two small farm dams are present, they are highly degraded and do not contain the requisite fringing vegetation.
Calidris ferruginea	Curlew Sandpiper	CE	CE, M	The Curlew Sandpiper is found in coastal areas with intertidal mudflats, including estuaries, inlets and lagoons, and ponds in saltworks. The species have also occasionally been recorded inland around lakes , dams and waterholes with mud or sand present. Main requirements for feeding habitats are the presence of mudflats or shallow water up to 60mm. The Curlew Sandpiper may also forage in saltmarsh environments and flooded paddocks.	Unlikely. No suitable habitat in the form of estuarine, littoral and intertidal habitats are present in the subject land.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Callocephalon fimbriatum	Gang-gang Cockatoo	E	E	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. In NSW, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes.	Low. Although broadly suitable habitat is available in the subject land, this species has not been recorded from the locality and is unlikely to occur in the small patches of degraded woodland in the subject land.
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V	V	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur.	Low. Although woodland vegetation is present in the subject land, requisite tree species for foraging are sparse. The species was not recorded during targeted surveys within the subject land and there is only one record from the locality. Any occurrence is likely to be limited to fly-throughs as part of a wider foraging range.
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern)	V	V	Found in eucalypt woodlands and dry open forest of the inland slopes and plains inland of the Great Dividing Range. The species favours woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. Fallen timber is an important habitat component for foraging.	Possible. Suitable habitat is present in the subject land. Although the species was not recorded during surveys, there are several records in the locality.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Erythrotriorchis radiatus	Red Goshawk	E	E	This unique Australian endemic raptor is very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens. It inhabits open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers. In winter in eastern Australia, the birds appear to move from nesting sites in the ranges to coastal plains, where they are associated with permanent wetlands.	Unlikely. The Hunter Valley is outside of the main distribution of this species and its preferred habitat is not present in the subject land.
Falco hypoleucos	Grey Falcon	V	V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500mm rainfall in NSW. The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter	Unlikely. The Hunter Valley is outside of the main distribution of this species and its preferred habitat is not present in the subject land. The species has not been recorded during surveys.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Gallinago hardwickii	Latham's Snipe	V	V, M	Seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	Unlikely. Although two small farm dams are present in the subject land, they are degraded and do not provide dense cover or fringing vegetation.
Grantiella picta	Painted Honeyeater	V	V	Occurs in Boree, Brigalow and Box-Gum Woodlands and Box-Ironbarks. Feeds primarily on mistletoe fruit and insects.	Low. Suitable habitat is present in the subject land, however the species has not been recorded in the locality. Furthermore, the species was not recorded during surveys within the subject land.
Hirundapus caudacutus	White-throated Needletail	V	V, M	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy.	Possible. Suitable habitat is present in the subject land and the species has been recorded in the locality.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Lathamus discolor	Swift Parrot	E	CE	In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as *Eucalyptus robusta*, *Corymbia maculata*, *C. gummifera*, *E. sideroxylon*, and *E. albens*. Breeds in Tasmania in spring and summer.	Low. Vegetation within the subject land is comprised predominantly of Ironbark's (*E. crebra*). Although some scattered feed trees are present within the subject land, these are unlikely to support the species. Furthermore, the species has not been recorded within the locality and the subject land is located outside of known breeding areas.
Melanodryas cucullata cucullata	South-eastern Hooded Robin, Hooded Robin (south-eastern)	E	E	Hooded Robins prefer dry eucalypt and acacia woodlands and shrublands with an open understorey, some grassy areas and a complex ground layer.	Possible. Although the species has only been recorded once within the locality, suitable habitat is present. The species was not recorded during field surveys and is not considered to rely on the habitat within the subject land. Nevertheless, given the availability of habitat the species has the potential to occur.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Neophema chrysostoma	Blue-winged Parrot	V	V	Inhabit a range of habitats from coastal, sub-coastal and inland areas, through to semi-arid zones. They tend to favour grasslands and grassy woodlands and are often found near wetlands both near the coast and in semi-arid zones. Pairs or small parties of blue-winged parrots forage mainly near or on the ground for seeds of a wide range of native and introduced grasses, herbs and shrubs.	Low. Suitable habitat is present in the subject land although the species was not recorded during surveys and there are no records in the locality. Furthermore, the subject land is located outside of the main population distribution.
Polytelis swainsonii	Superb Parrot	V	V	Occurs in Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	Unlikely. No suitable habitat is present in the subject land and no records from the locality.
Rostratula australis	Australian Painted Snipe	E	E	Inhabits fringes of shallow inland wetlands, swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Unlikely. Although two small farm dams are present in the subject land, they are degraded and do not provide fringing vegetation.
Stagonopleura guttata	Diamond Firetail	V	V	Occurs in grassy eucalypt woodland, open forest and riparian areas.	Possible. Suitable habitat is present in the subject land and the species has been recorded in the locality.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Apus pacificus	Fork-tailed Swift	-	V	The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. They sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines. They forage aerially, up to hundreds of metres above ground, but also less than 1 m above open areas or over water. They often occur in areas of updraughts, especially around cliffs.	Low. No records in the locality but some potential foraging habitat is present.
Calidris melanotos	Pectoral Sandpiper	-	M	In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. It prefers shallow fresh to saline wetlands and is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum.	Unlikely. Wetland habitats within the subject land are limited to small farm dams that do not provide suitable habitat for this species.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Actitis hypoleucos	Common Sandpiper	-	M	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties .	Unlikely. Wetland habitats within the subject land are limited to small farm dams that do not provide suitable habitat for this species.
Motacilla flava	Yellow Wagtail	-	V	Found in well-watered open grasslands and the fringes of wetlands. Roosts in mangroves and other dense vegetation	Unlikely. No suitable habitat is present in the subject land and no records from the locality.
Mammals					
Chalinolobus dwyeri	Large-eared Pied Bat	E	E	The species is associated with areas dominated by sandstone escarpments; sandstone cliffs and fertile woodland valley habitat occurring in close proximity to each other is important for the species. It roosts in cliff/escarpment areas and forages in fertile forest. Roosting is predominately in arch caves with dome roofs, but has been observed in disused mines shafts, overhangs, and disused Fairy Martin nests.	Possible. The species was not recorded during surveys within the subject land and although there is no breeding habitat in the form of sandstone escarpments or cliffs, the species been recorded from the locality and may utilise the subject land for foraging purposes.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Dasyurus maculatus maculatus (SE mainland population)	Spotted-tailed Quoll (southeastern mainland population)	V	E	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites.	Possible. Suitable habitat is present in the subject land and the species has been recorded in the locality.
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	Found in a wide range of inland woodland vegetation types, and is most abundant in extensive stands of vegetation. The species is dependant on old-growth vegetation and has a large home range.	Low. The subject land does not contain old growth vegetation favoured by the species. Given there are no records from the locality the species in not considered likely to utilise the subject land.
Petaurus australis australis	Yellow-bellied Glider (south-eastern)	V	V	Occurs in tall, mature, eucalypt forest generally in areas with high rainfall and nutrient rich soils. It feeds primarily on plant and insect exudate, with insects providing protein. It extracts sap from trees by biting into the trunk and branches leaving distinctive 'V' shaped scars. It dens in large hollows within trees, in groups of two to six individuals.	Low. Potential habitat available however no records of the species in the locality and the species was no recorded during surveys.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Prefers rocky habitats, including loose boulder-piles, rocky outcrops, steep rocky slopes, cliffs, gorges, and isolated rock stacks. Vegetation types associated with the species include dense forest, wet sclerophyll forest, vine thicket, dry sclerophyll forest, and open forest.	Unlikely. No suitable habitat is present in the subject land. The species was not recorded during surveys and there are no records in the locality.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)	Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	E	E	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred feed species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Possible. Suitable habitat is present in the subject land and this species has been recorded from the locality. However the species was not detected during surveys within the subject land.
Pseudomys novaehollandiae	New Holland Mouse	-	V	Occurs in open habitats (heathland, woodland and forest) with a heath understorey and vegetated sand dunes. The species prefers deep soft top soils in order to burrow.	Unlikely. No suitable habitat is present in the subject land. The species was not recorded during surveys and there are no records in the locality.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Possible. Suitable foraging habitat is present in the subject land, although no breeding habitat is present as no roosting camp is present in the subject land.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence
Reptiles					
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	In NSW the species is only known from the Central and Southern Tablelands and the South Western Slopes, where sites are widespread, but highly isolated from each other. The pink-tailed worm-lizard's habitat includes primary and secondary grassland, grassy woodland and woodland communities, and the species usually inhabits sloping sites that contain rocky outcrops or scattered, partially buried rocks. These rocky habitats tend to be well-drained mid-slope or ridge-top sites with loosely embedded rocks on soil substrate with ant galleries present. Microhabitat attributes, such as rockiness and the presence of ground-layer species, especially native grasses, are the principal determinants of occurrence.	Low. Potential habitat is available within the subject land, although rocky microhabitats are limited. Nevertheless, the species has not been recorded in the locality. Targeted surveys for the species have been undertaken within the subject land, including habitat searches, pitfall trapping and tile arrays, and the species has not been recorded.
Delma vescolineata	Hunter Valley Delma	E	E	Known almost entirely from a 25km wide corridor in the Hunter Valley NSW, between Maitland and Muswellbrook. Occurs in secondary native grassland remaining after the removal or dieback of woody canopy vegetation. Associated with sparse Box-gum or Ironbark woodland. Shelters under rocks and discarded rubbish.	Known to occur. Suitable habitat is present in the subject land and the species has been recorded during targeted surveys.

APPENDIX E :
BAM-C Credit Report

BAM Credit Summary Report

Proposal Details

Assessment Id
00054619/BAAS19019/25/00054620

Proposal Name
22198 - Bengalla MOD8

BAM data last updated *
05/08/2025

Assessor Name
Matthew Freeman

Report Created
25/11/2025

BAM Data version *
Current classification (live - default) (82)

Assessor Number
BAAS19019

BAM Case Status
Finalised

Date Finalised
25/11/2025

Assessment Revision
0

BOS entry trigger

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Central Hunter Ironbark Grassy Woodland												
1	3431_Woodland	Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions	72.2	72.2	39.3	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		1419
2	3431_DNG	Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions	29.9	29.9	24.1	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		361
											Subtotal	**1780**
											Total	**1780**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits

Delma vescolineata / Hunter Valley Delma (Fauna)									
3431_Woodland	72.2	72.2	39.3	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	1419
3431_DNG	29.9	29.9	24.1	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	361
								Subtotal	**1780**
Myotis macropus / Southern Myotis (Fauna)									
3431_Woodland	72.2	72.2	17.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	616
								Subtotal	**616**

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00054619/BAAS19019/25/00054620

Proposal Name
22198 - Bengalla MOD8

BAM data last updated *
05/08/2025

Assessor Name
Matthew Freeman

Assessor Number
BAAS19019

BAM Data version *
Current classification (live - default) (82)

Proponent Names

Report Created
25/11/2025

BAM Case Status
Finalised

Assessment Revision
0

BOS entry trigger

Assessment Type
Major Projects

Date Finalised
25/11/2025

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3431-Central Hunter Ironbark Grassy Woodland	Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions	63.4	1780	0	1780

BAM Biodiversity Credit Report (Like for like)

3431-Central Hunter Ironbark Grassy Woodland

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions This includes PCT's: 1603, 1605, 1691, 1692, 3314, 3431, 3485	-	3431_Woodland	Yes	1419	Hunter, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions This includes PCT's: 1603, 1605, 1691, 1692, 3314, 3431, 3485	-	3431_DNG	Yes	361	Hunter, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

BAM Biodiversity Credit Report (Like for like)

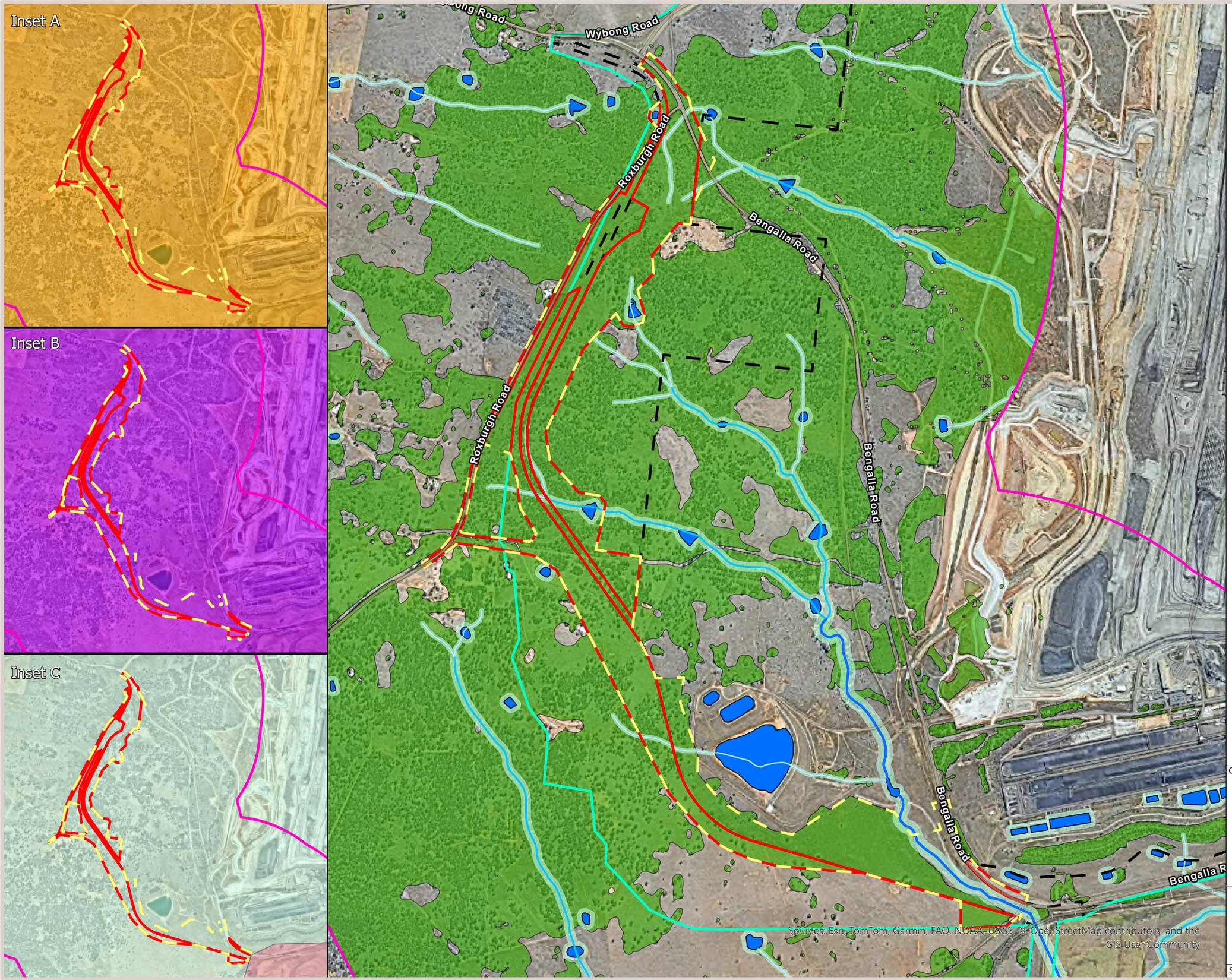
Species	Vegetation Zone/s	Area / Count	Credits
Delma vescolineata / Hunter Valley Delma	**3431_Woodland, 3431_DNG**	63.4	1780.00
Myotis macropus / Southern Myotis	**3431_Woodland**	17.1	616.00

Credit Retirement Options

Like-for-like credit retirement options

Delma vescolineata / Hunter Valley Delma	Spp	IBRA subregion
	Delma vescolineata / Hunter Valley Delma	Any in NSW
Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW

FIGURES



Legend

- Subject Land
- Study Area
- Assessment Area (1500 m)
- Bengalla Project Boundary
- Bengalla Approved Disturbance Boundary
- Native Vegetation Cover
- Wetland
- Riparian Buffer

Watercourse

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 6th Order Steam and above

Inset A: IBRA Region

- Sydney Basin

Inset B: IBRA Subregion

- Hunter

Inset C: Mitchell Landscape

- Central Hunter Foothills
- Upper Hunter Channels and Floodplain

Image Source: Nearmap © (2024) Dated: 06/03/2024
Data Source: Sixmaps Clip & Ship, DCS Spatial Services
NSW Department of Customer Services
Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Regions, Subregions)
© Commonwealth of Australia and Department of Climate Change, Energy, the Environment and Water 2024
NSW (Mitchell) Landscapes - version 3.1
© State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water 2016
State Environmental Planning Policy (Resilience and Hazards) 2021
© State Government of NSW and NSW Department of Planning, Housing and Infrastructure 2022

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Spatial Reference: GDA 1994 MGA Zone 56

0 100 200 400 600 800 m

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Figure 1. Site map

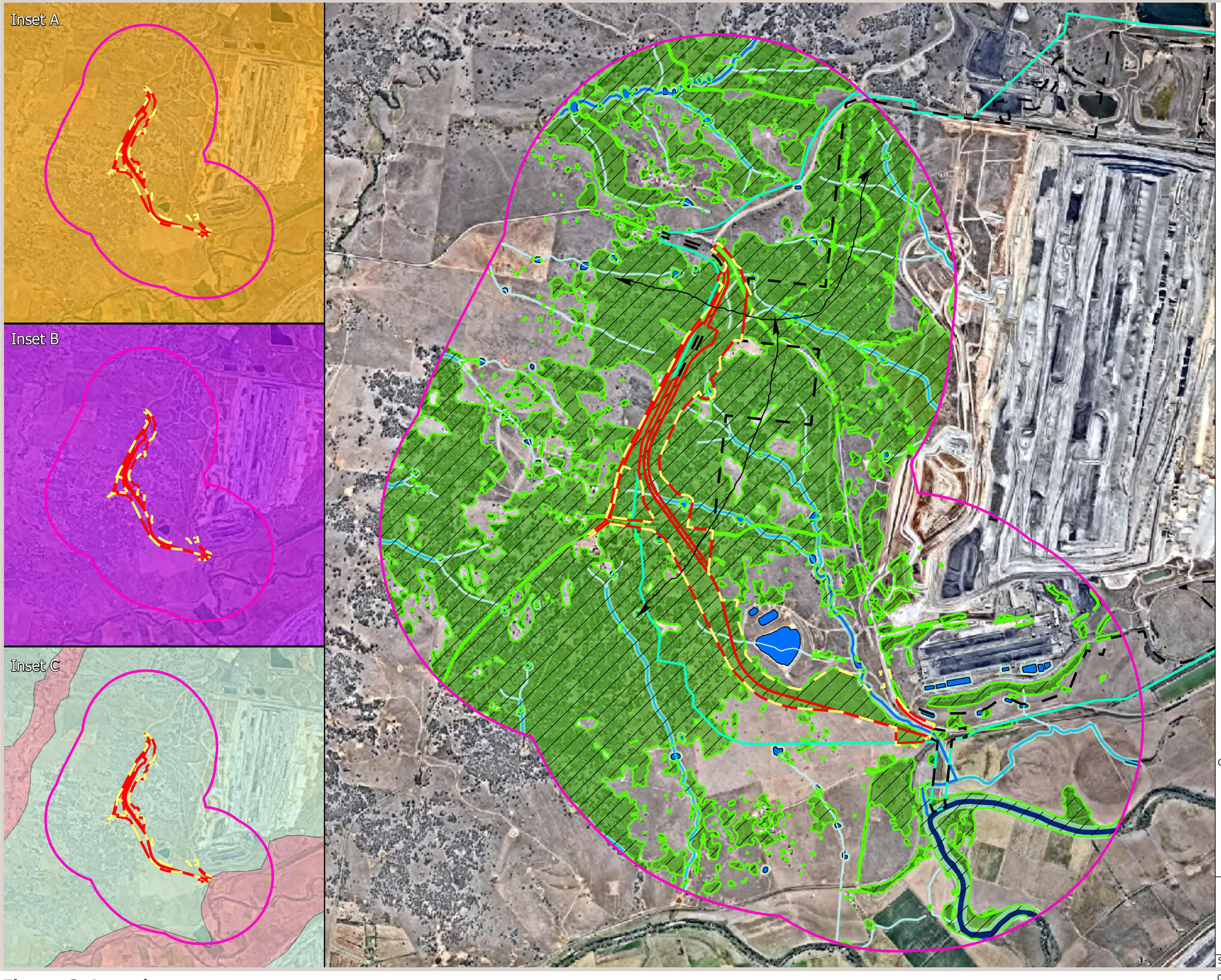


Figure 2. Location map

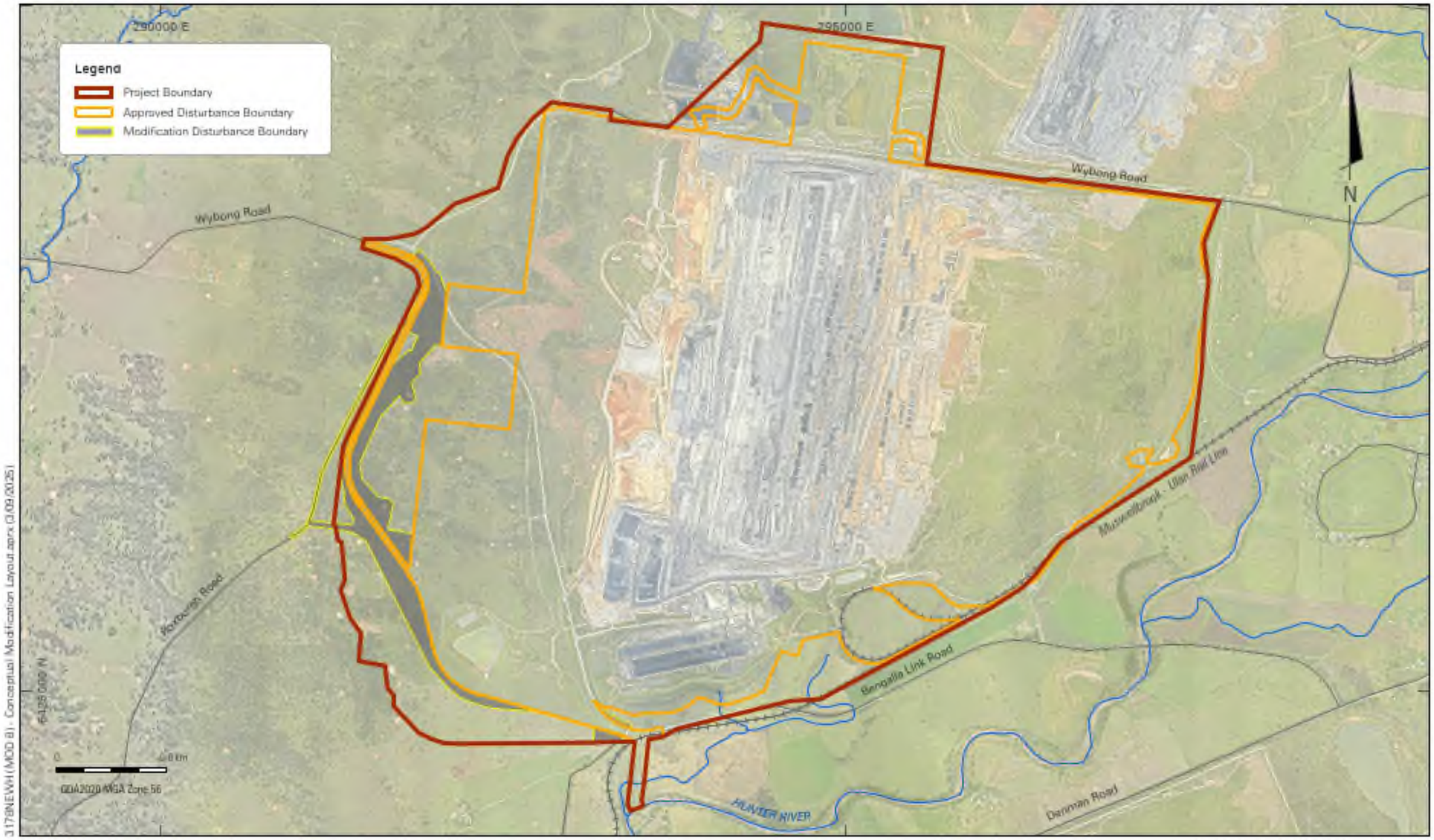


Figure 3. Layout of the project

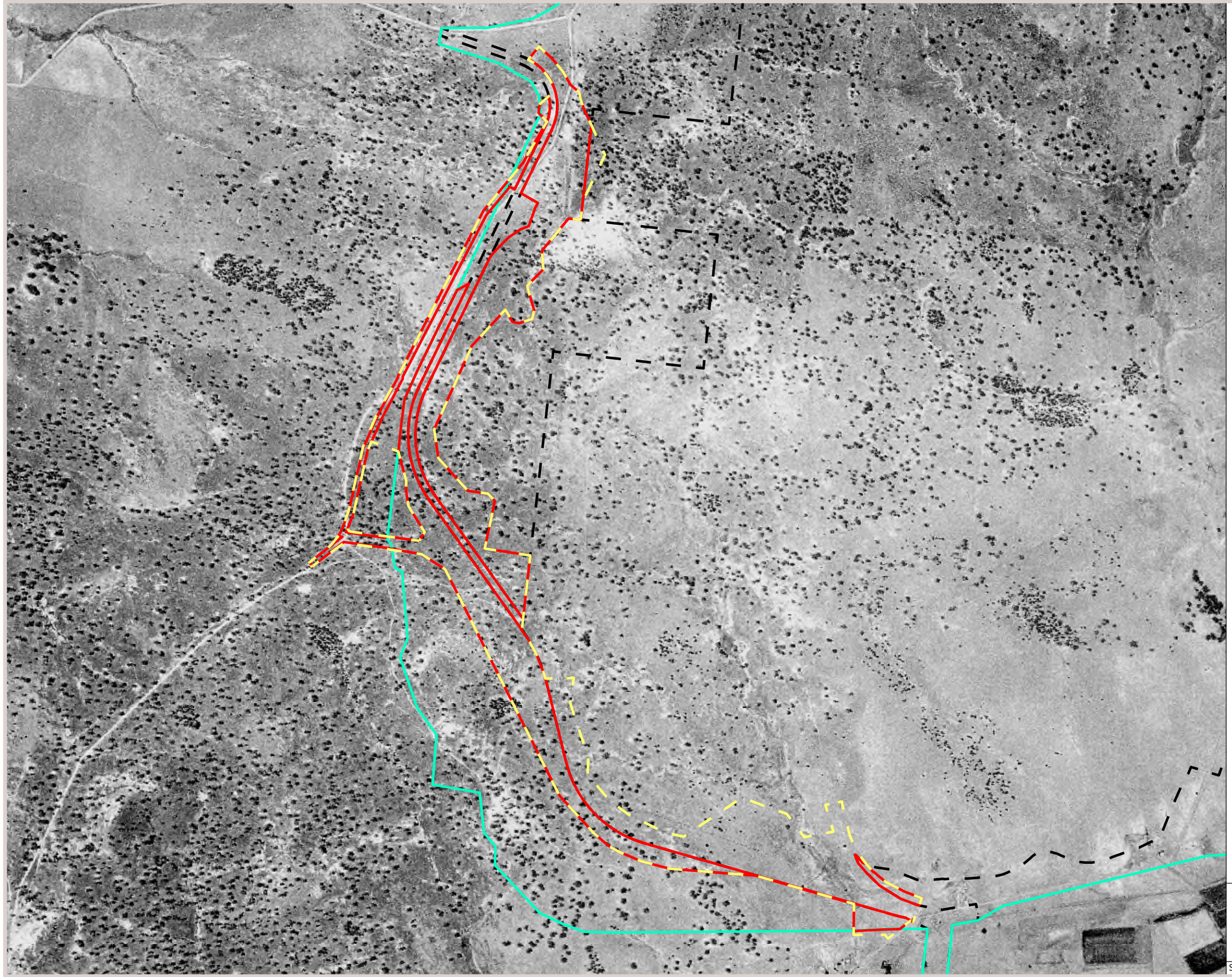
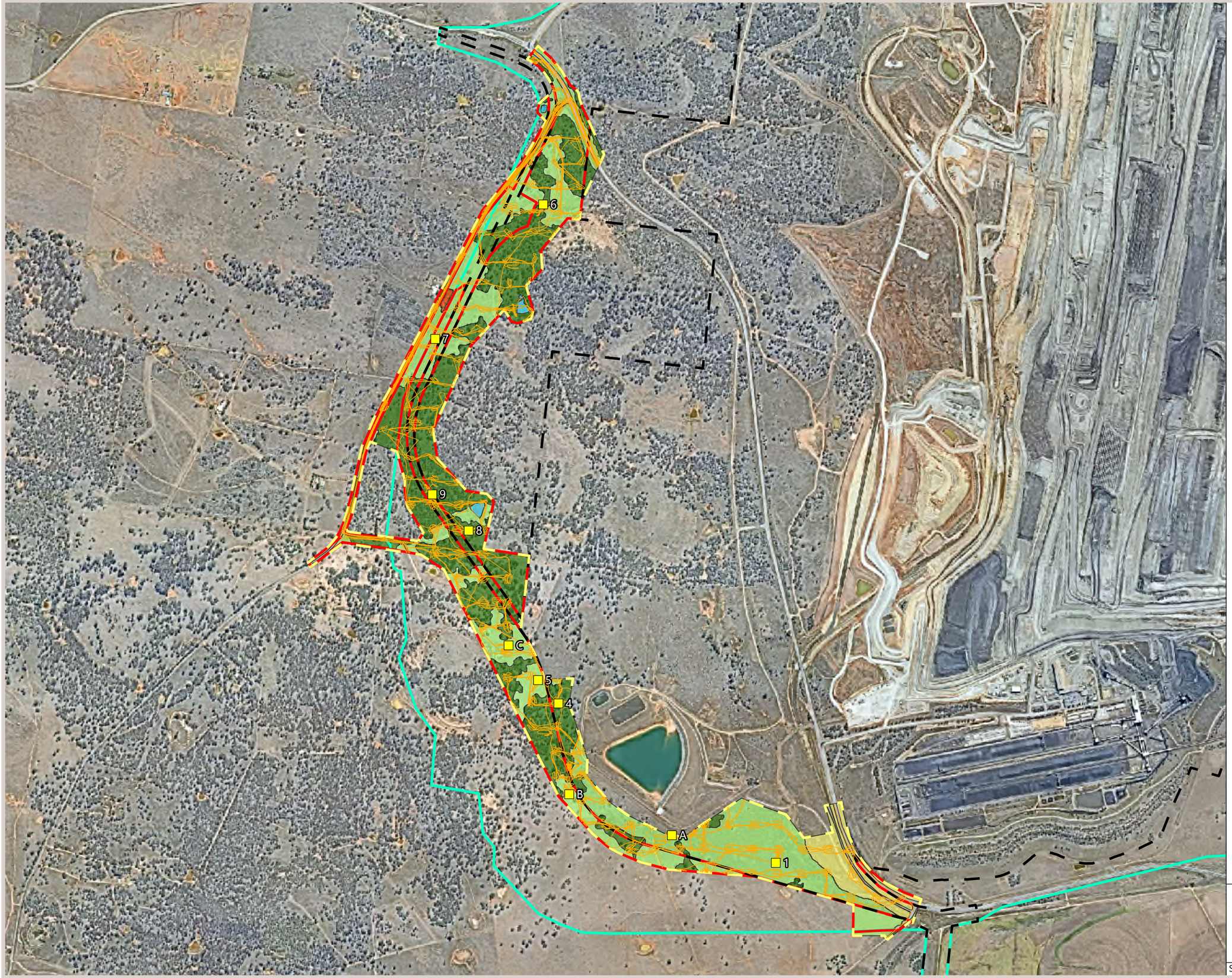


Figure 4. Historical imagery (1958)



Figure 5. Historical imagery (1989)



Legend

- Subject Land
- Study Area
- Bengalla Project Boundary
- Bengalla Approved Disturbance Boundary
- Flora Survey Tracks
- BAM Plot Location

Plant Community Type

- 3431 Central Hunter Ironbark Grassy Woodland
- 3431 Central Hunter Ironbark Grassy Woodland (Derived Native Grassland)

Other Map Unit

- Planted Native Vegetation
- Exotic Dominated Grassland
- Dams
- Cleared Land

Image Source: Nearmap © (2024) Dated: 06/03/2024
Data Source: Sixmaps Clip & Ship, DCS Spatial Services
NSW Department of Customer Services

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Spatial Reference: GDA 1994 MGA Zone 56

0 100 200 400 600 800 m

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Figure 6. Flora survey locations – BAM Plots

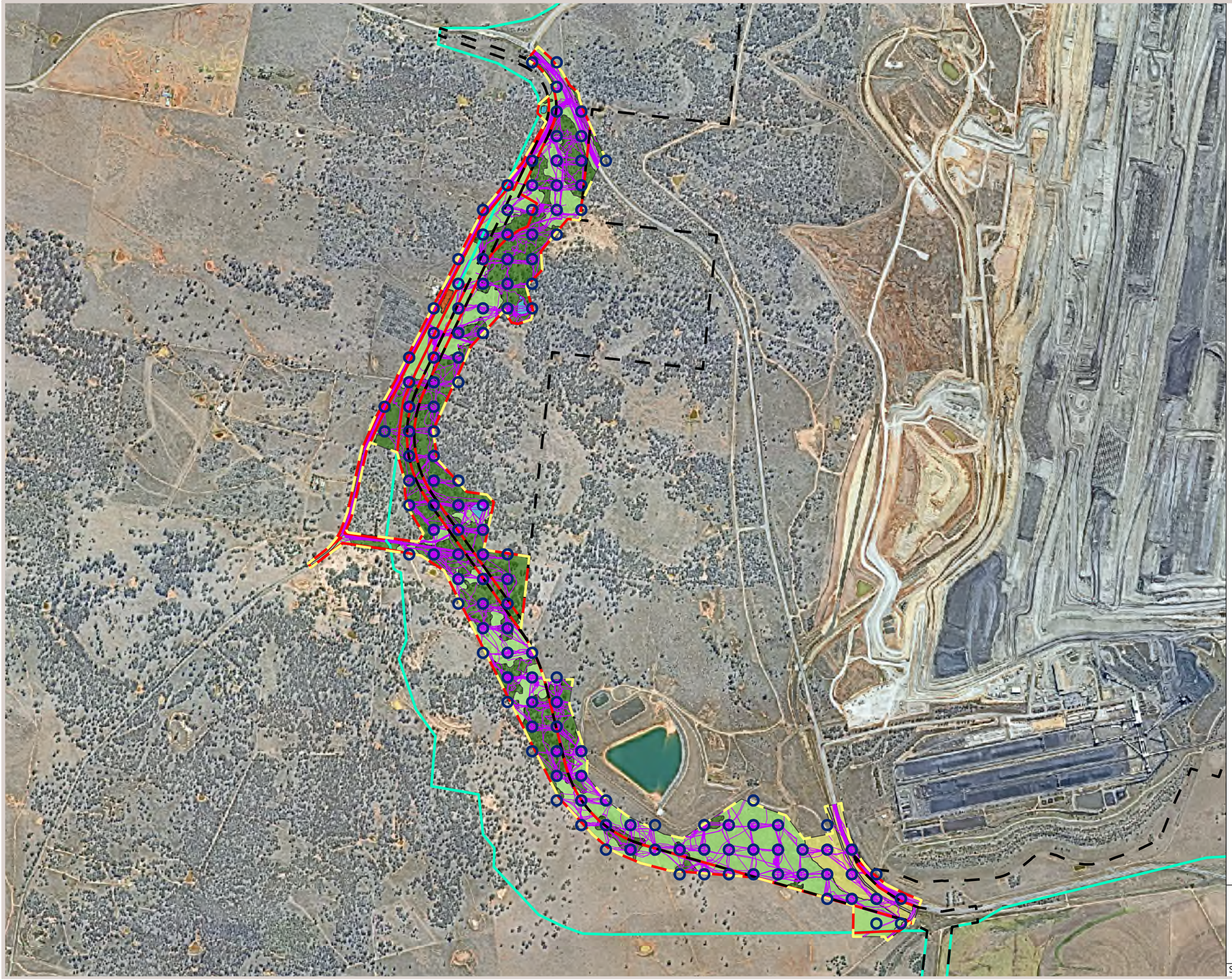


Figure 7. Flora survey locations – vegetation mapping and targeted threatened flora searches



Figure 8. Fauna survey locations

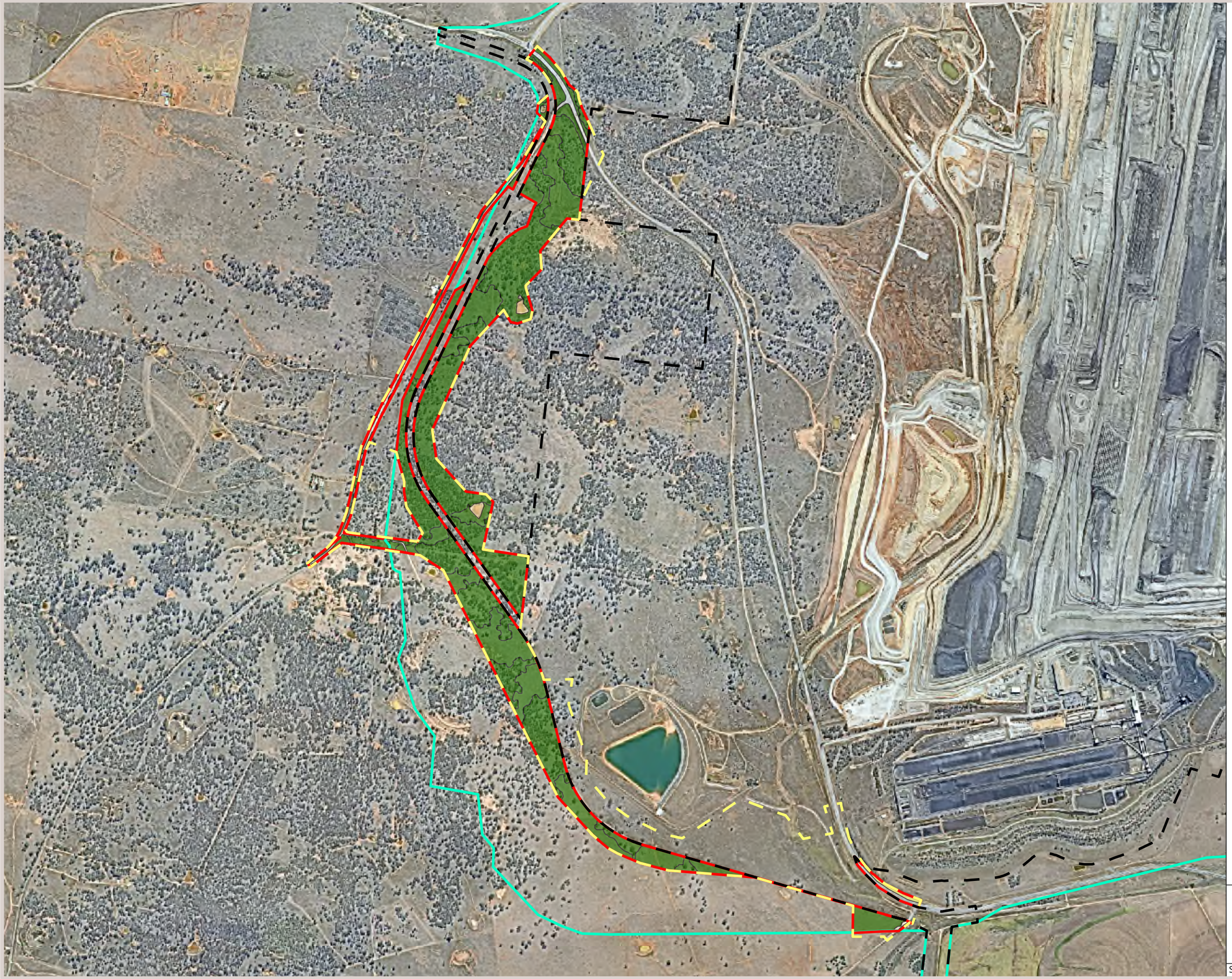


Figure 9. Native vegetation extent within the subject land

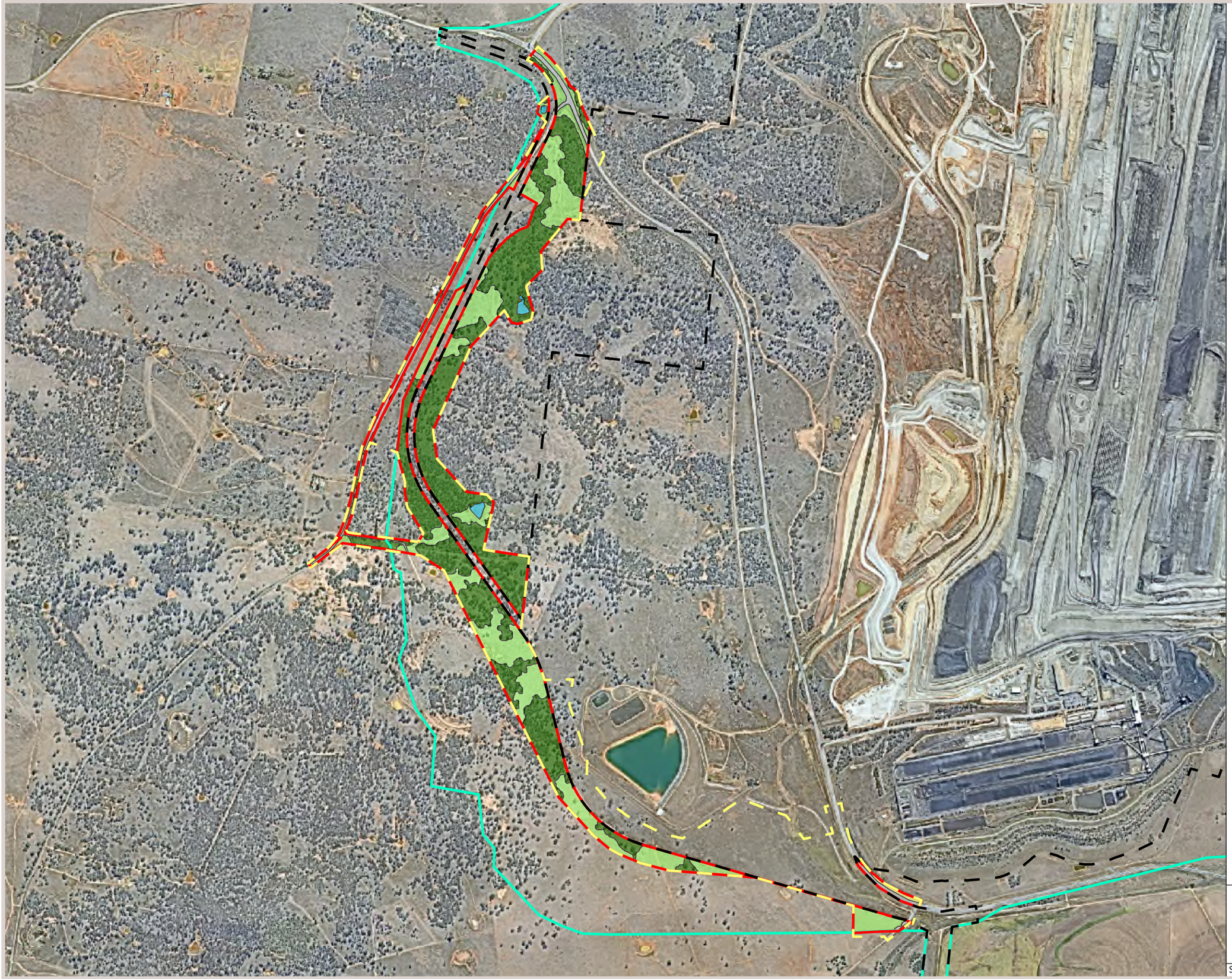
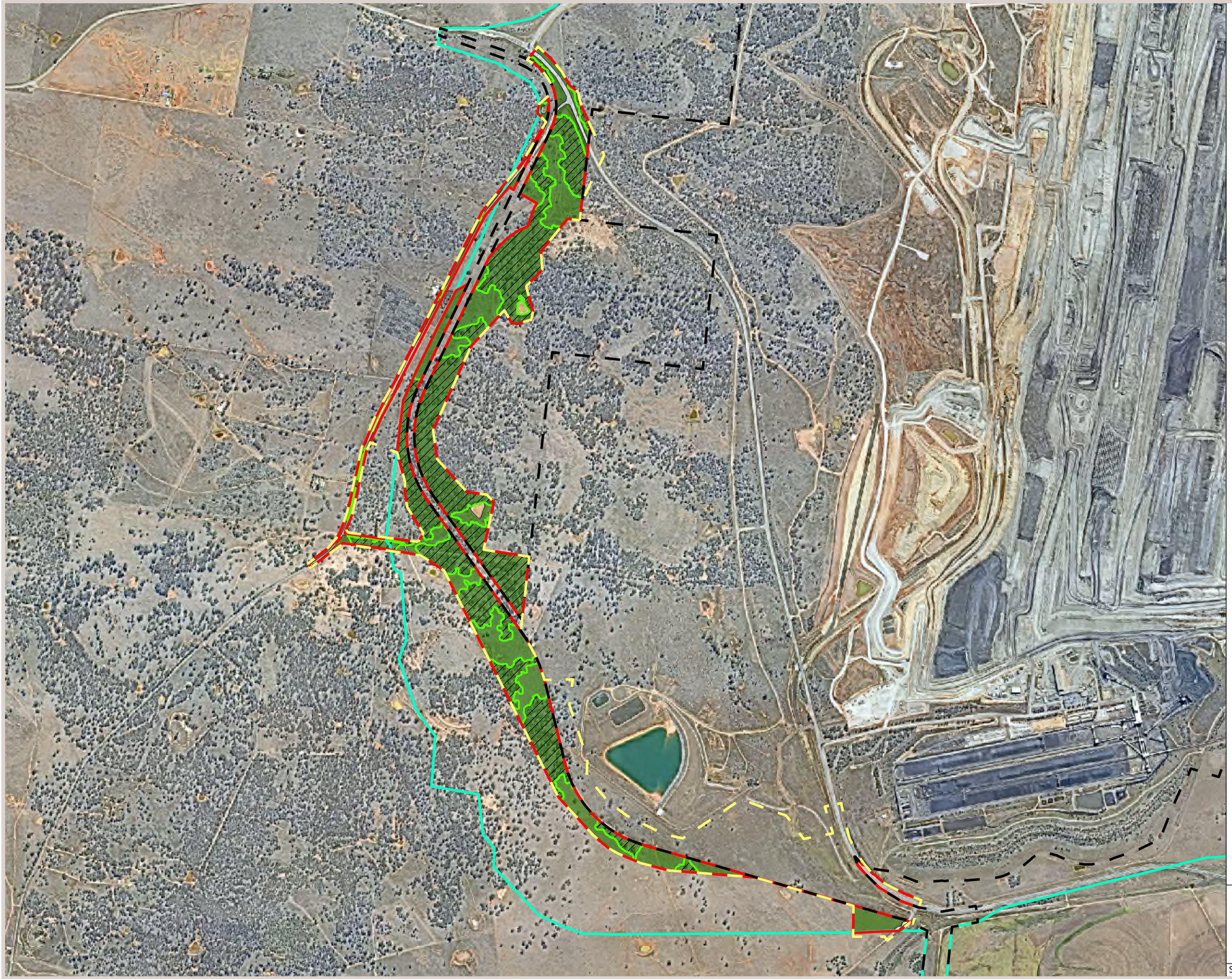


Figure 10. Plant community types within the subject land



Legend

- Subject Land
- Study Area
- Bengalla Project Boundary
- Bengalla Approved Disturbance Boundary

EPCT Act Listed TEC

- Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions

BC Act Listed TEC

- Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions

Image Source: Nearmap © (2024) Dated: 06/03/2024
Data Source: Sixmaps Clip & Ship, DCS Spatial Services NSW Department of Customer Services

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Spatial Reference: GDA 1994 MGA Zone 56

0 100 200 400 600 800 m

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Figure 11. Threatened ecological communities within the subject land

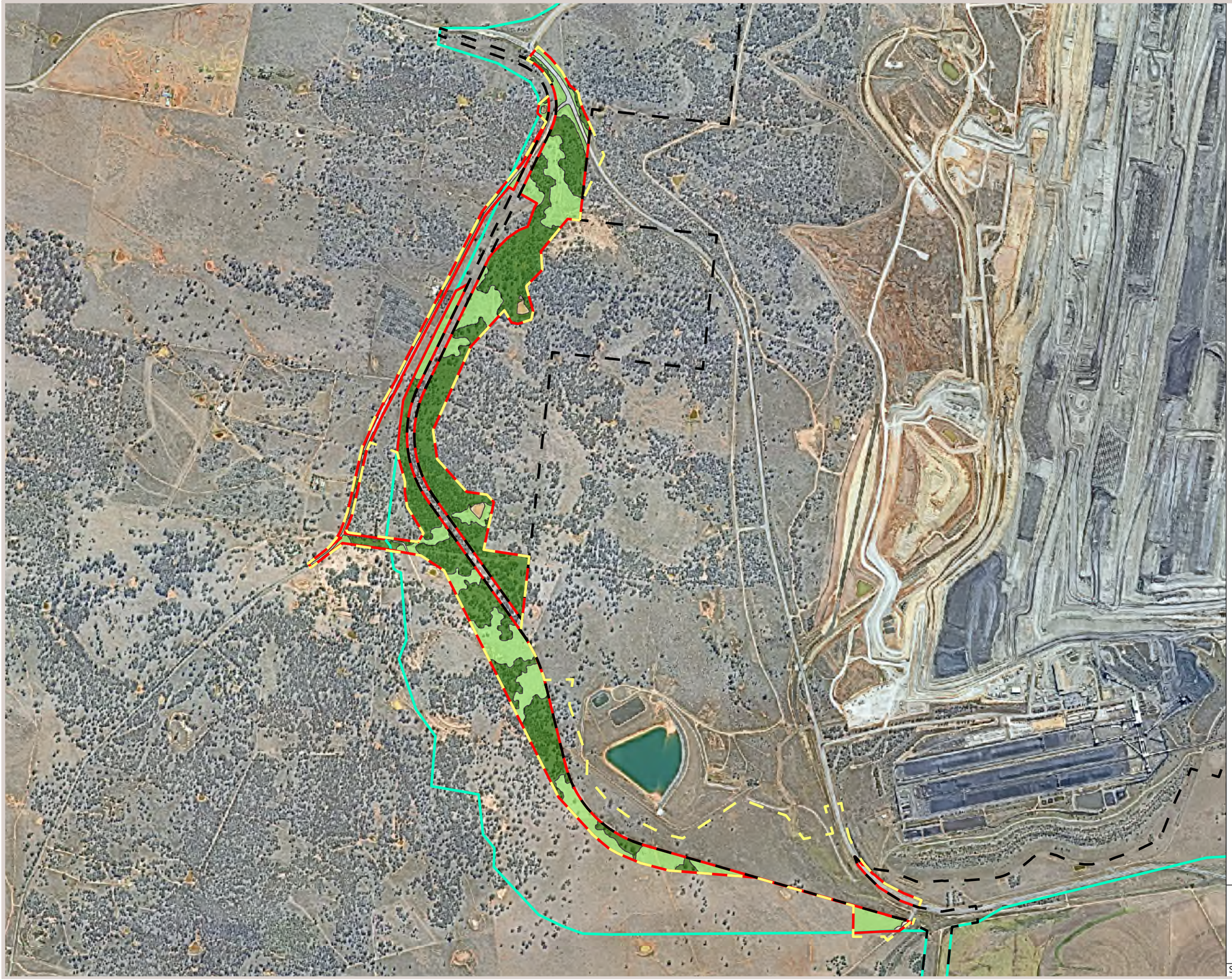


Figure 12. Vegetation zones within the subject land

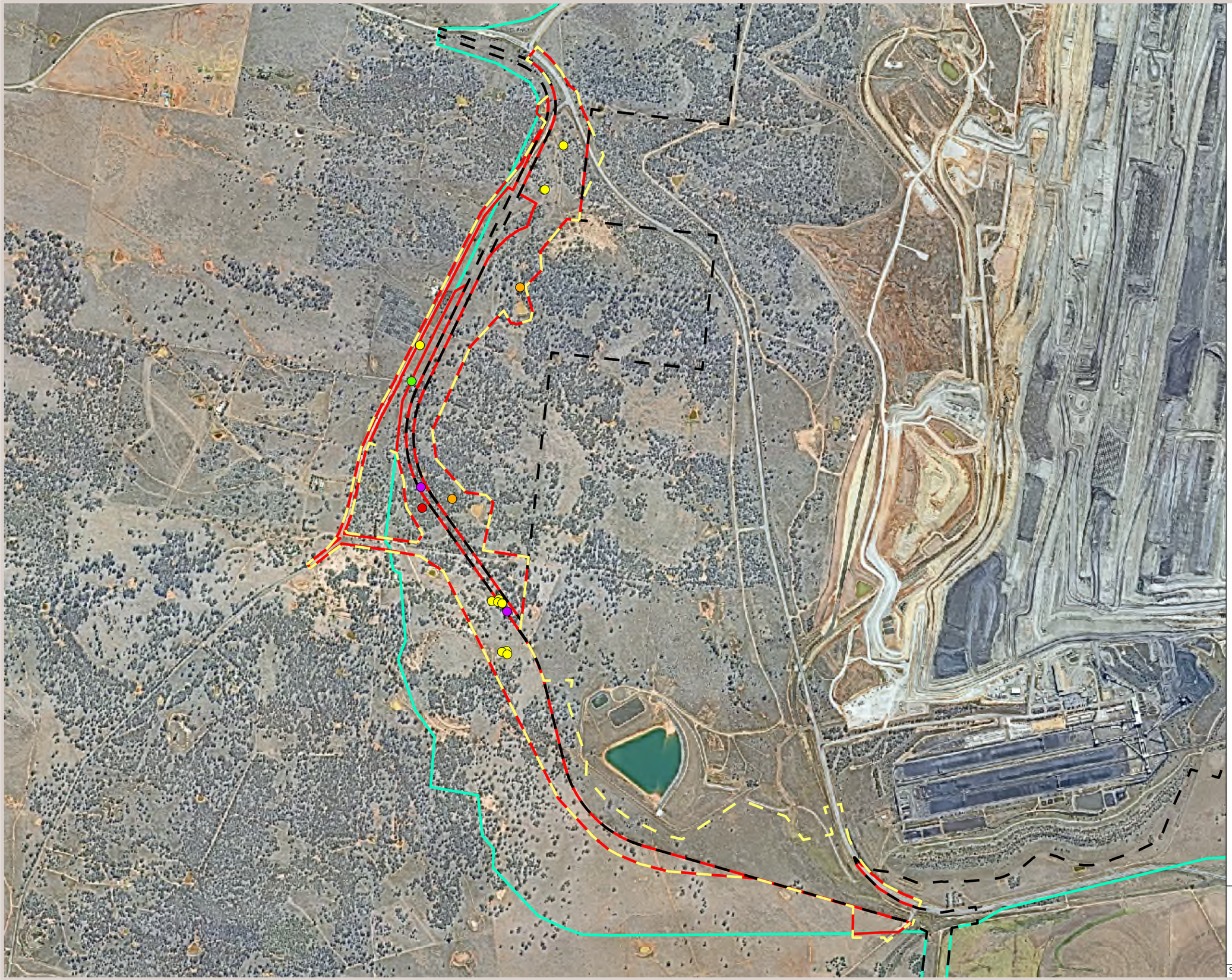


Figure 13. Threatened species recorded within the study area

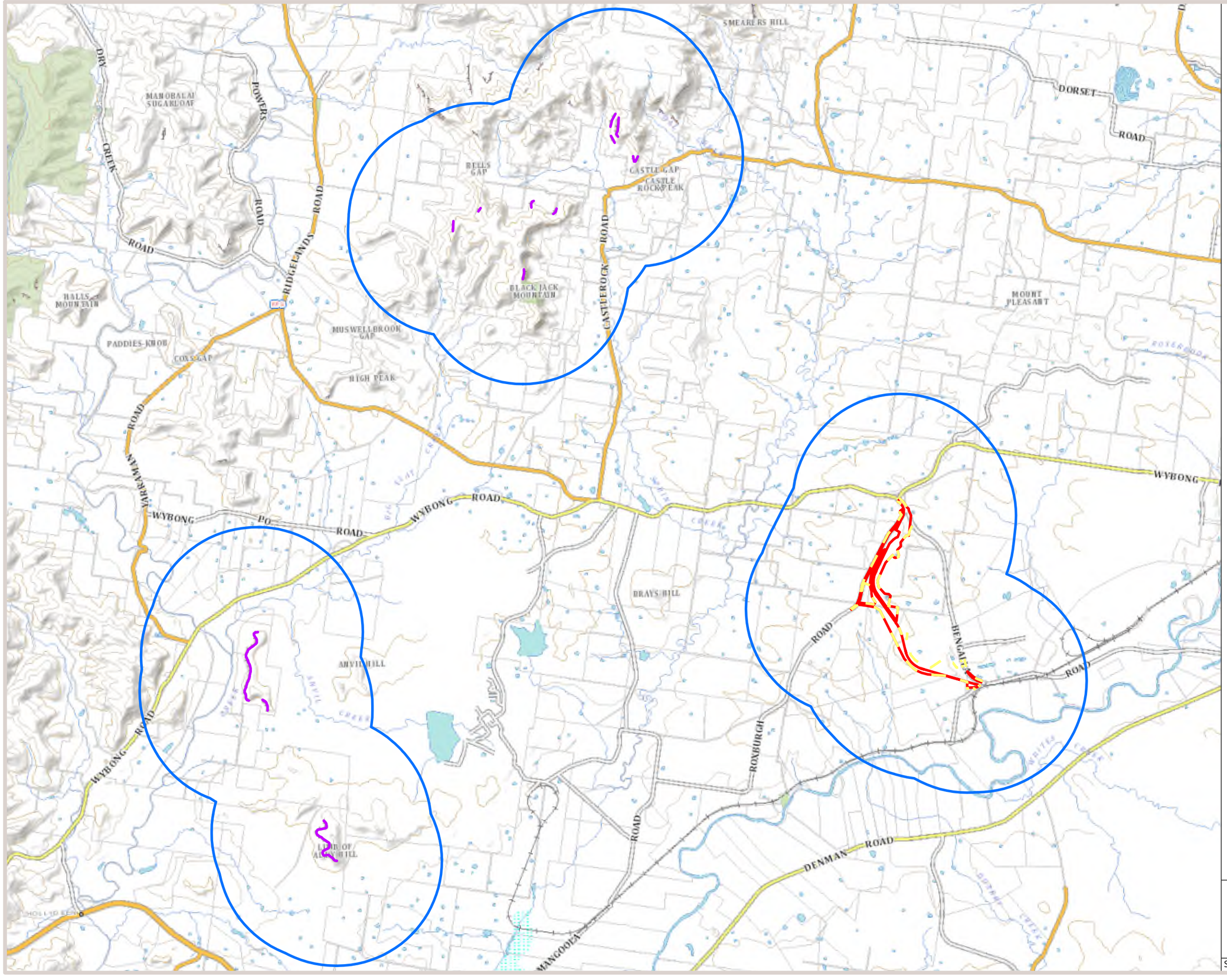


Figure 14. Closest cliffs/caves to the subject land

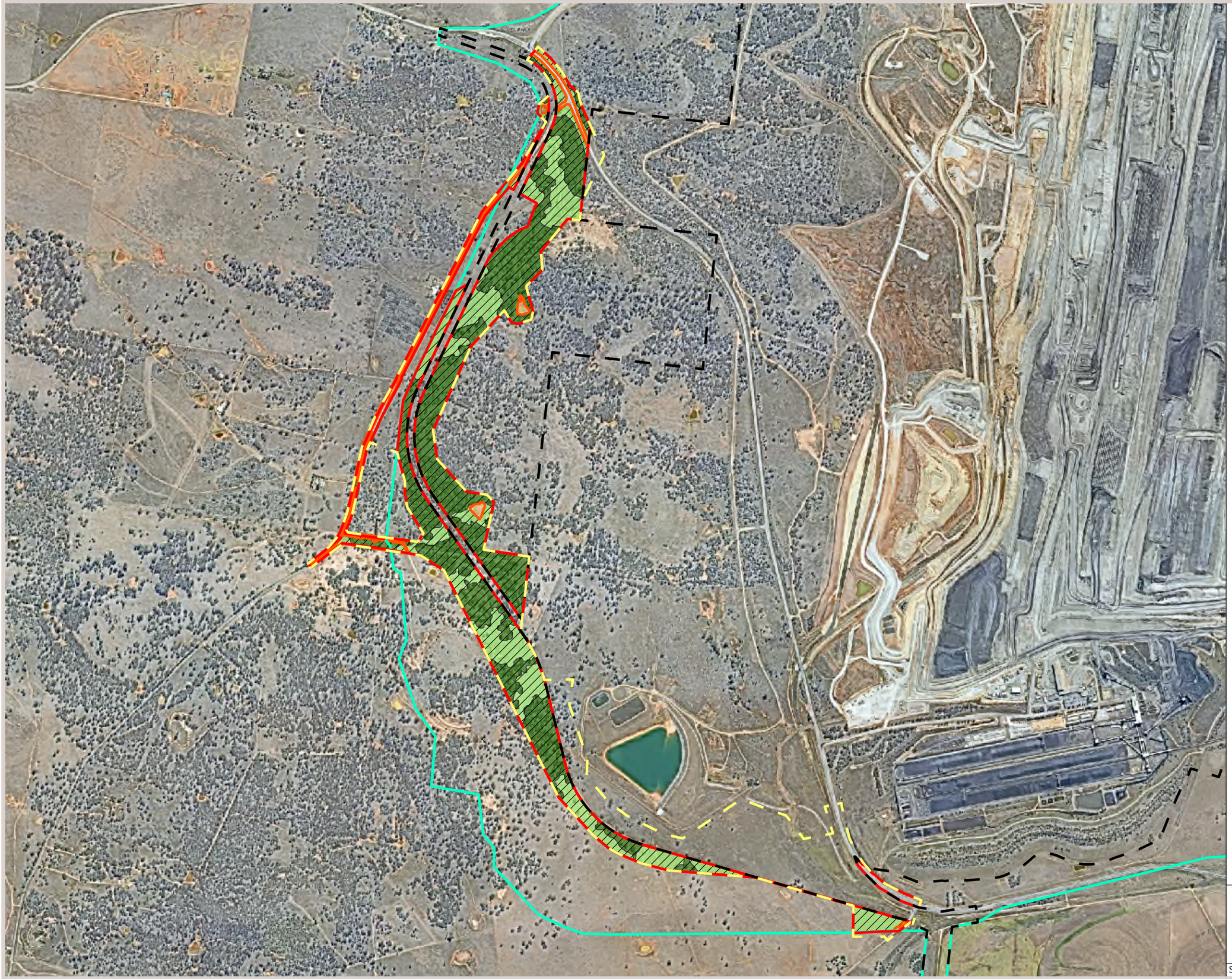


Figure 15. Species polygon – Hunter Valley Delma

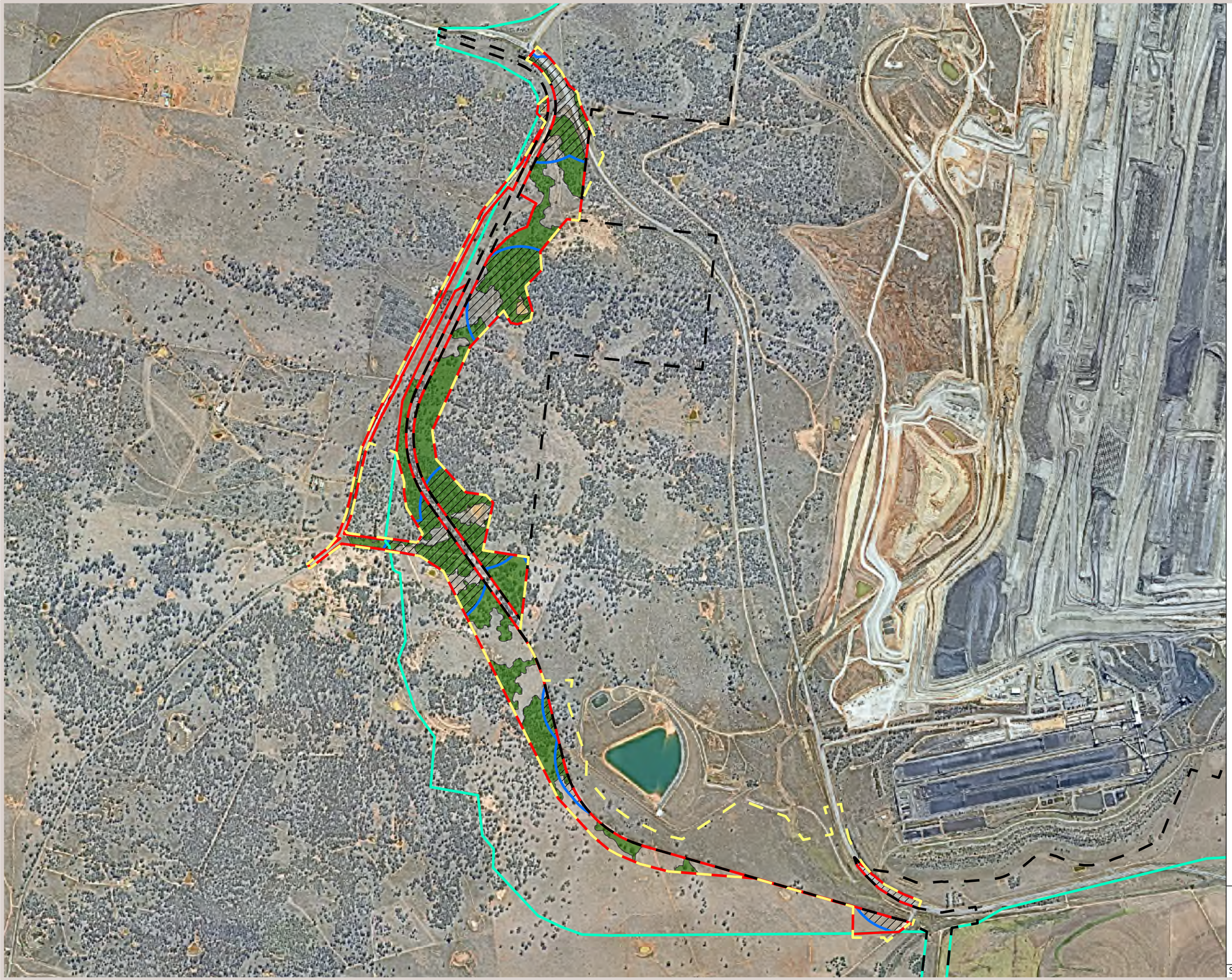
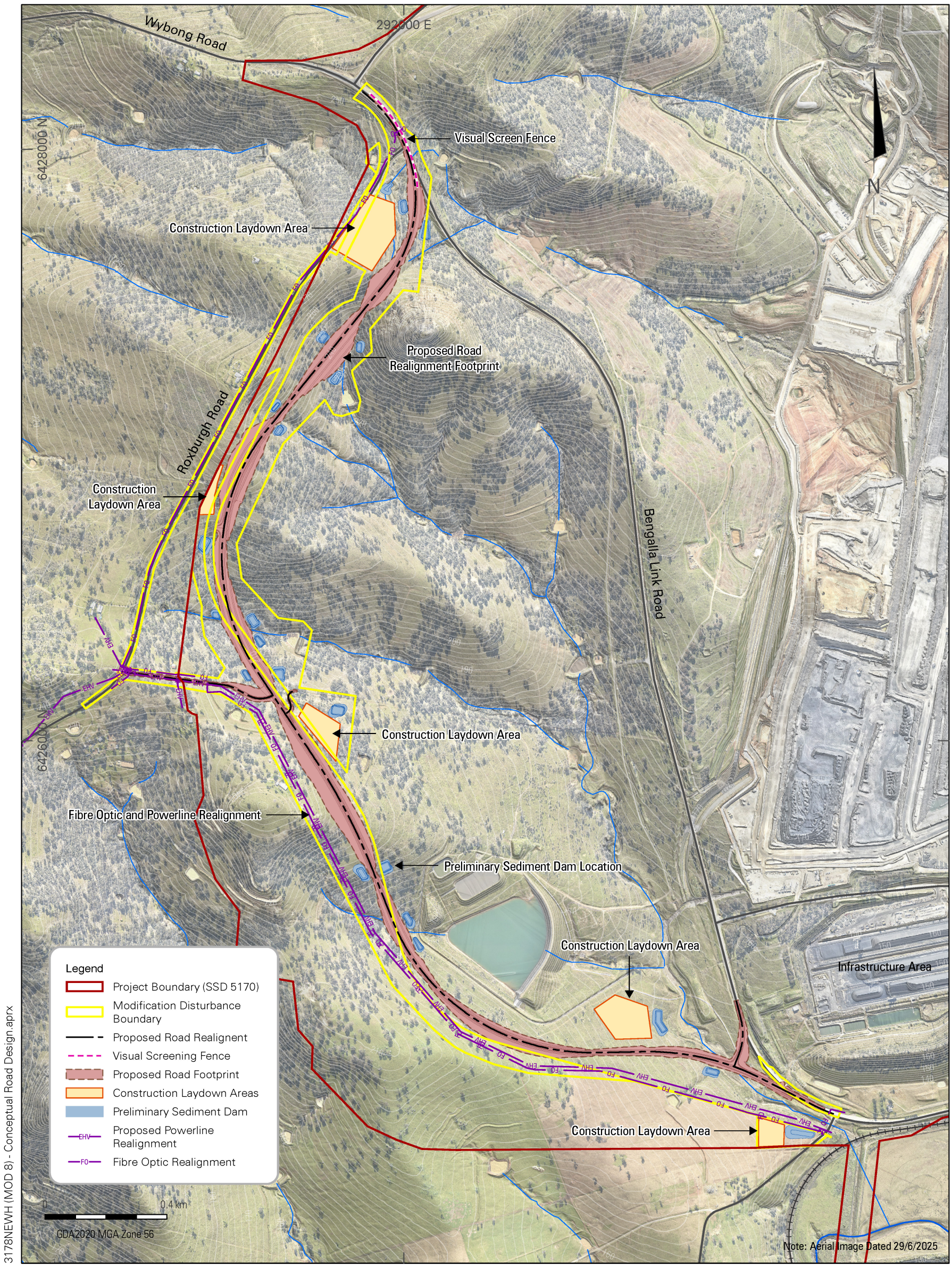


Figure 16. Species polygon – Southern Myotis



BENGALLA MINE MOD 8

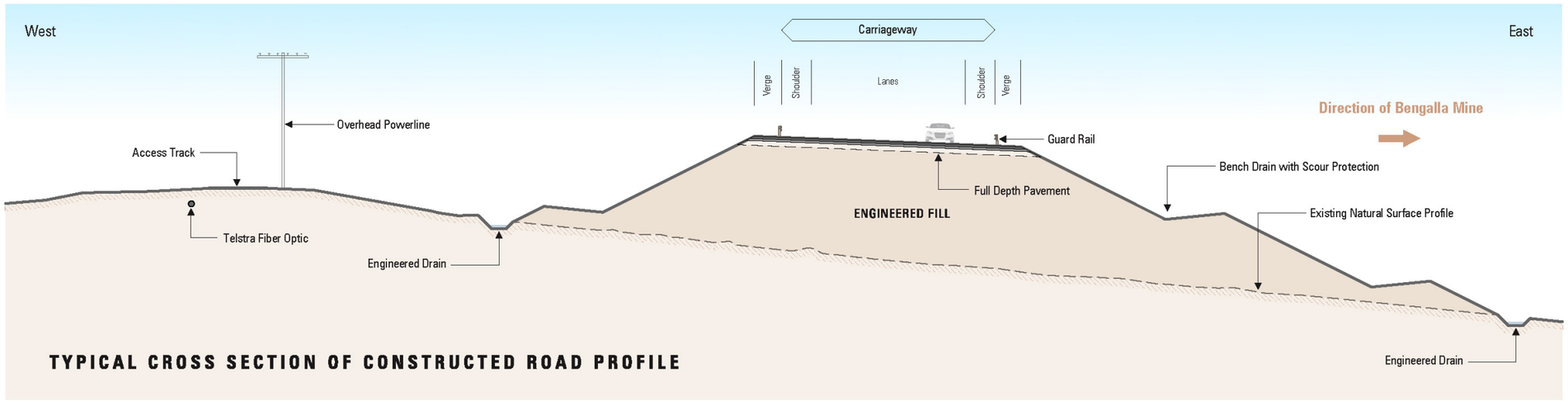
Proposed Bengalla Link Road Relocation

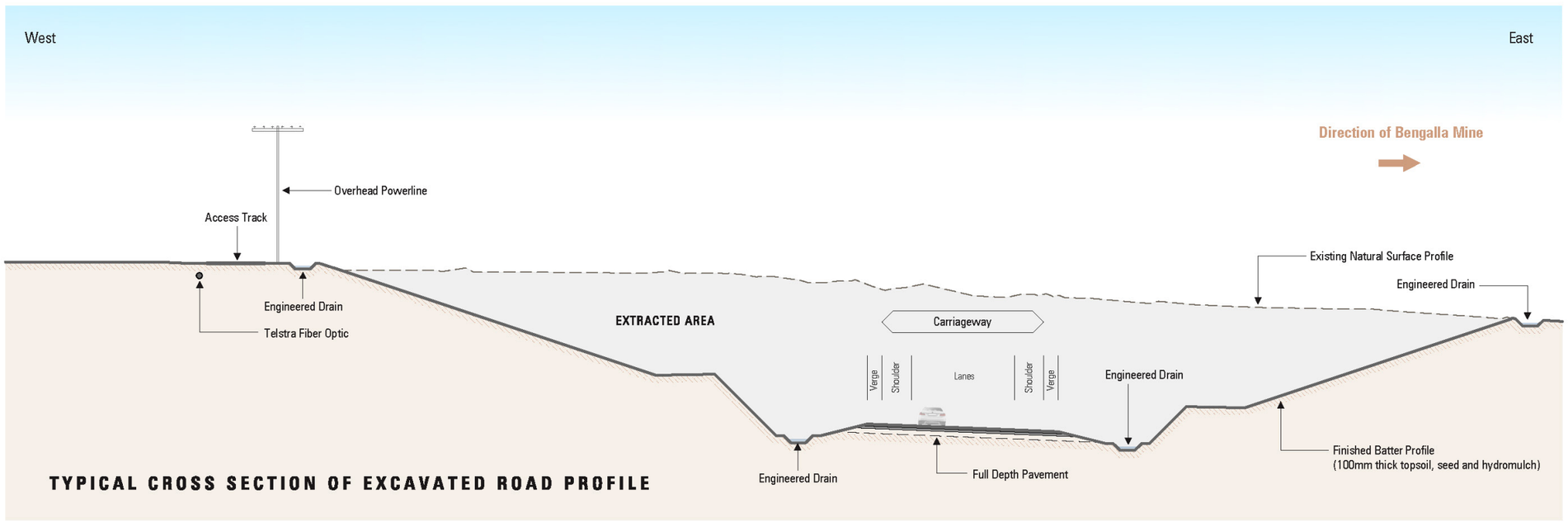
FIGURE 1

Image Source: Xenith (2025)

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Figure 17. Bengalla Link Road Conceptual Road Design





BENGALLA MINE MOD 8

Bengalla Link Road Realignment
Cross Sections

Filename : 3178NEWH (MOD 8) - Indicative Road Cross Sections | Figure 1
Date : 31-Oct-25 | Projection: | Drawn : PC | Revision : A

Image Source: Xenith (2025)

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Figure 18. Bengalla Link Road Realignment Cross Sections

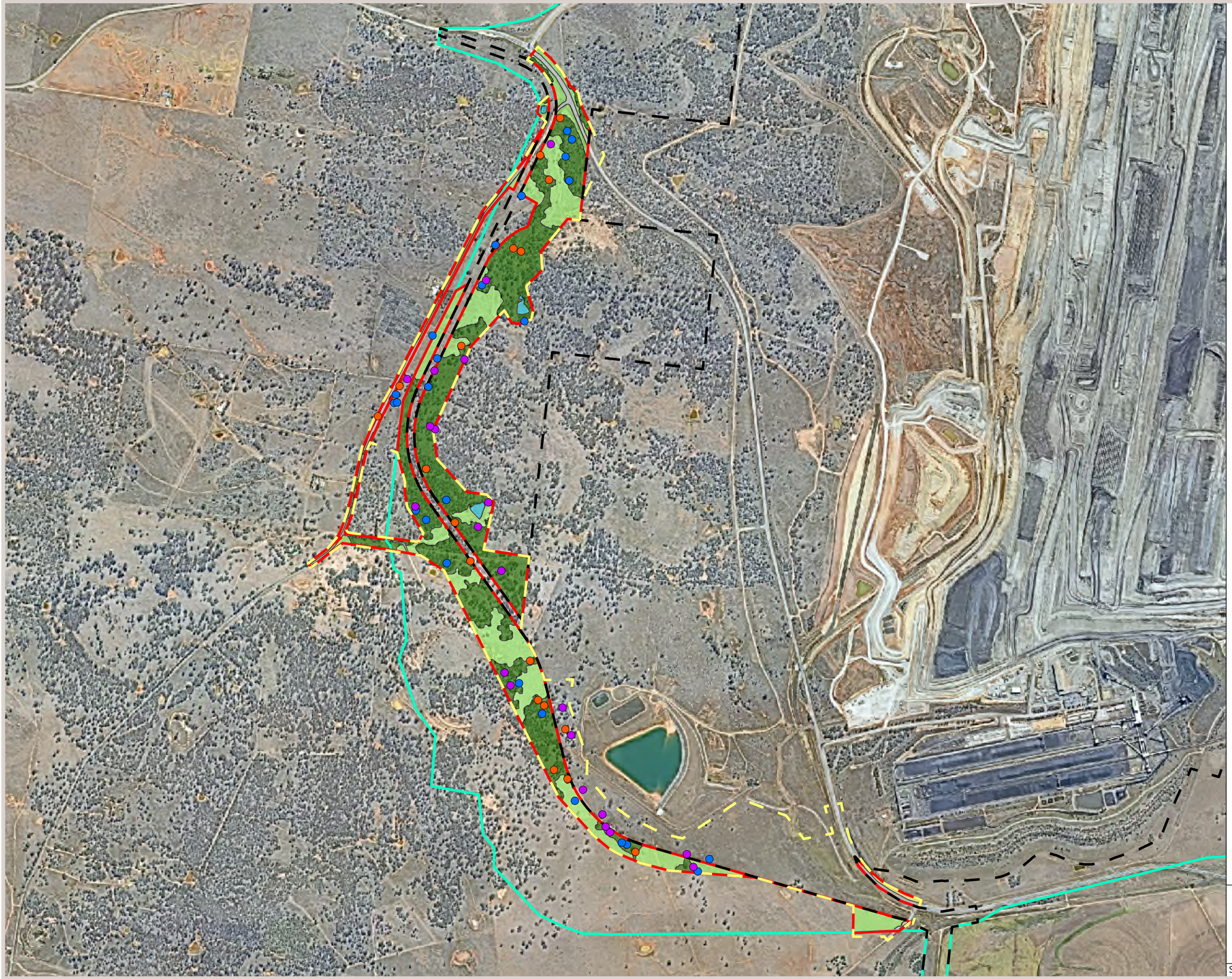


Figure 19. Hollow-bearing trees within the subject land

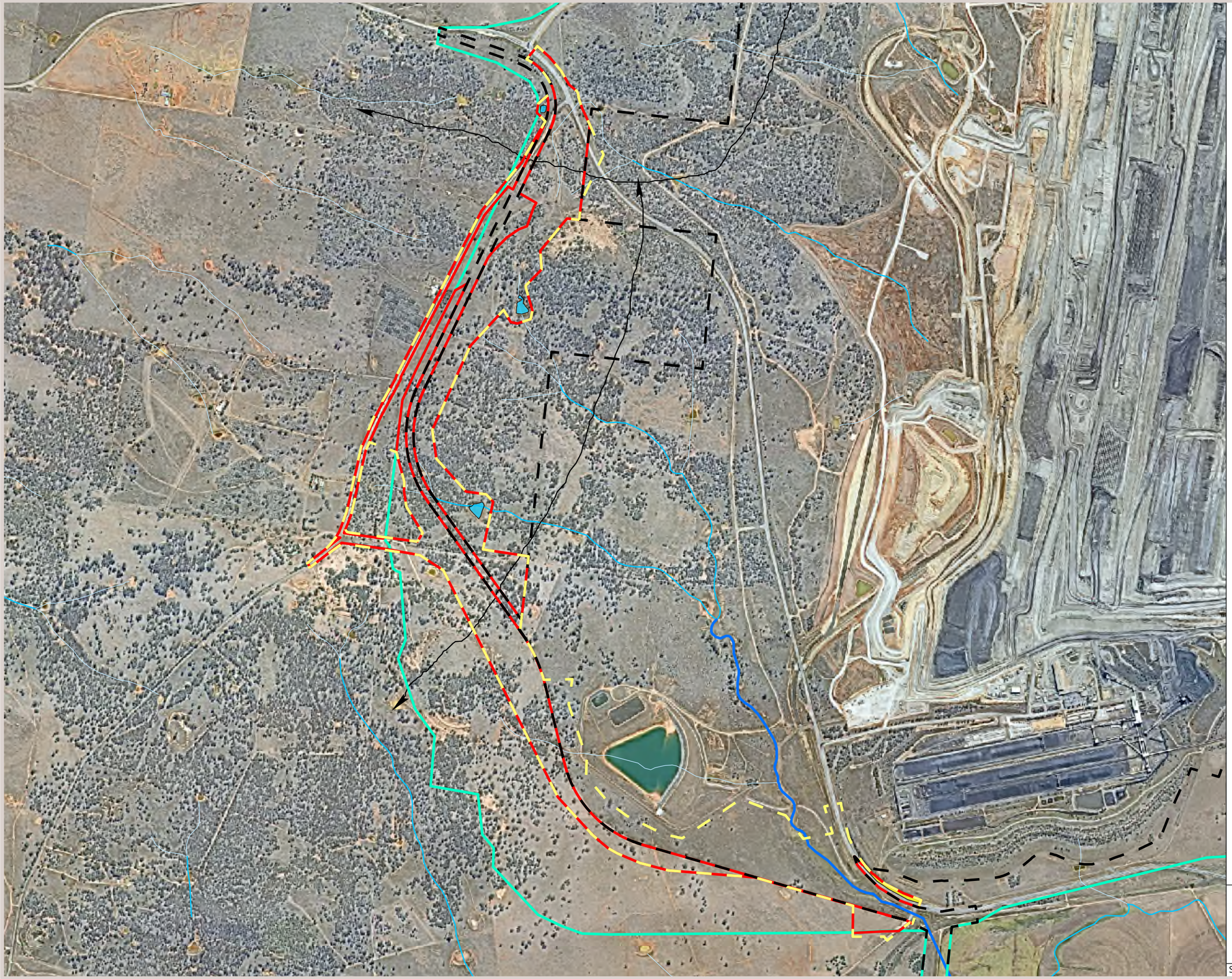


Figure 20. Extent of prescribed impacts within the subject land

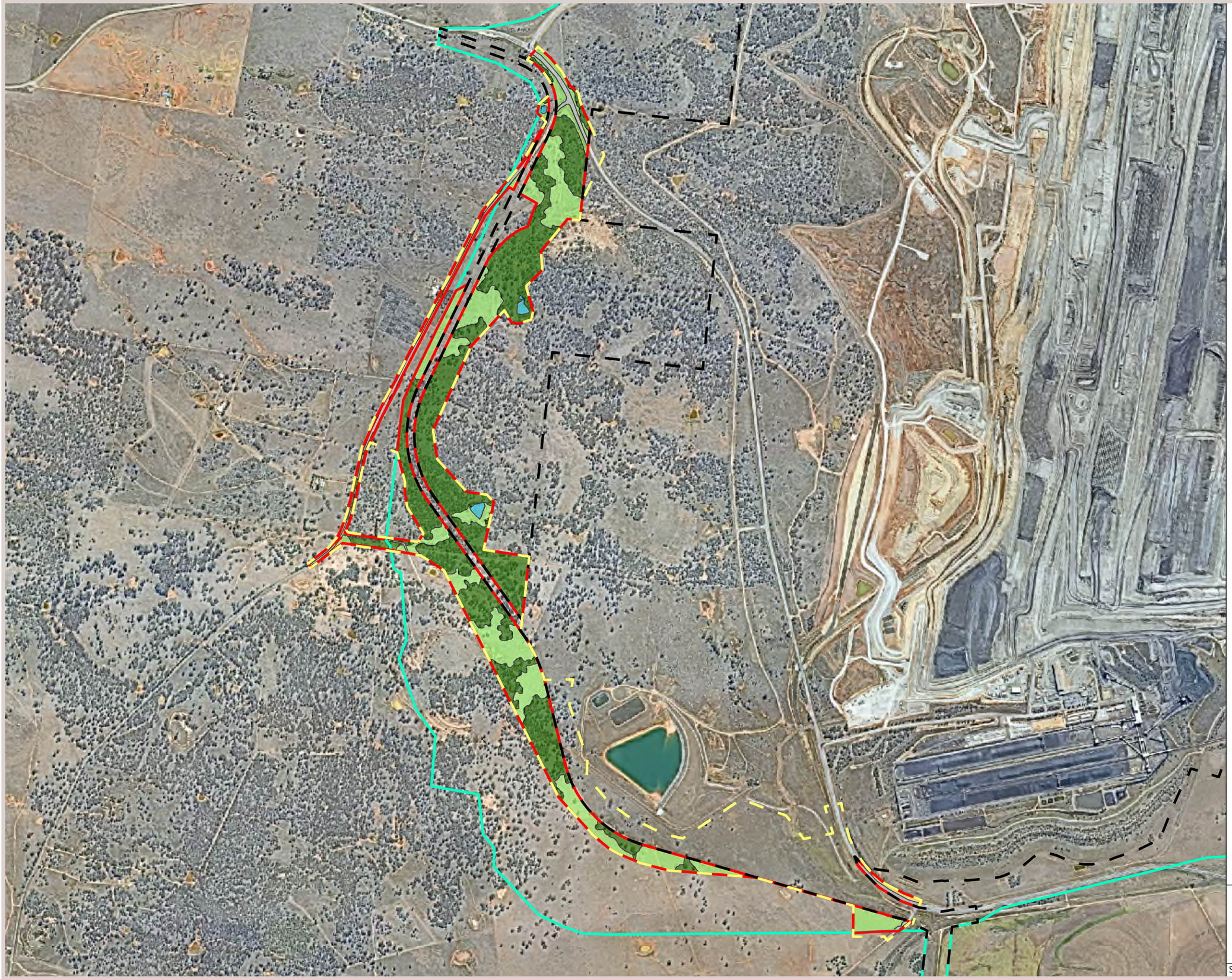


Figure 21. Thresholds for assessment

Appendix E
Visual Review

Bengalla Mine Modification 8 Visual Review

Visual Review
Bengalla Mining Company Pty Limited
October 2025

Contents

1. Introduction 3
   - 1.1 Overview 3
   - 1.2 Background 3
   - 1.3 Modification Overview 5
   - 1.4 Document Purpose 5
   - 1.5 Methodology 5
2. Existing Environment 7
   - 2.1 Environment Setting 7
   - 2.2 Land Ownership 7
3. Primary Visual Catchment 9
4. Visual Sensitivity 9
5. Visual Effect 14
6. Impact Assessment 14
7. Mitigation 15
8. References 17
9. Abbreviations 18

Figures

Figure 1 Regional Locality 4
Figure 2 Conceptual Modification Layout 6
Figure 3 Land Ownership 8
Figure 4 Visual Character Units 10
Figure 5 Viewshed Setting – Proposed Bengalla Link Road Realignment 11
Figure 6 Visual Cross Section 12
Figure 7 Viewshed Analysis – Proposed Bengalla Link Road Realignment 13

Document issue approval			
Title	Bengalla Mine Modification 8 Visual Review		
Client	Bengalla Mining Company Pty Limited		
Status	Final	**Project/document no.**	3178NEWH
Date	October 2025	**Revision no.**	1

	Approvals			
	Name	**Position**	**Signature**	**Date**
Prepared by	Lily Webster	Principal Environmental Scientist		09/09/25
Reviewed by	Sarah Moore	Principal Environmental Scientist		27/09/25
Approved by	Dorian Walsh	Principal Environmental Scientist		29/10/25

Distributions				
Organisation	**Attention**	**Hard copies**	**Electric copies**	**Actioned**
Bengalla Mining Company Pty Ltd	John Campbell	-	1	LW
Bengalla Mining Company Pty Ltd	Hayley Frazer	-	1	LW

To be initialled and dated by the person who actions the issue of the documents.

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We do not accept responsibility or liability for losses arising from the assessment and determination of the Project, or if approved, the reliance on this document for any other purpose.

Any operating or capital cost estimation (as relevant) is current as at the date of estimation only. The estimation assessed herein may change significantly and unexpectedly over a relatively short period (including as a result of general market movements and factors specific to the particular mine, project or deposit). We do not accept responsibility or liability for losses arising from such subsequent changes in cost.

1. Introduction

This section introduces the proposed Modification and describes the purpose and structure of this report.

1.1 Overview

Xenith Consulting Pty Ltd (Xenith) has been engaged by Bengalla Mining Company Pty Limited (BMC) to undertake a Visual Review of the proposed adjustments to the disturbance footprint for the realignment of Bengalla Link Road (BLR) (the Modification). This report will support an application for a modification to State Significant Development (SSD) 5170 under Section 4.55 of the *Environmental Planning & Assessment Act 1979* (EP&A Act).

1.2 Background

BMC operates the Bengalla Mine (Bengalla) in the Upper Hunter Valley of NSW. Bengalla is located approximately 130 kilometres (km) north-west of Newcastle and 4 km west of Muswellbrook (see **Figure 1**).

Bengalla is managed in accordance with SSD-5170 granted under the then Division 4.1 of Part 4 of the EP&A Act. SSD-5170 (as modified) enables the continuation of open cut coal mining and associated activities at Bengalla until 28 February 2039.

A VIA for Bengalla was undertaken as part of the '*Continuation of Bengalla Mine Environmental Impact Statement*' (Hansen Bailey, 2013) (Bengalla EIS) titled '*Continuation of Bengalla Mine Project Visual Impact Assessment*' (JVP Visual Planning and Design, 2013) (2013 EIS VIA). Six modifications to SSD-5170 have been approved to date of which the majority did not propose any material changes to the visual character of the Bengalla.

The '*Bengalla Development Consent Modification 2 Statement of Environmental Effects Visual Impact Assessment*' (VPA Visual Planning & Assessment, 2016) (2016 MOD2 VIA) was undertaken to support the '*Bengalla Mine Development Consent Modification Statement of Environmental Effects*' (Hansen Bailey, 2016a) (MOD2 SEE). The 2016 MOD2 VIA quantified the visual impacts associated with changes to the main Overburden Emplacement Area (OEA), which was designed to incorporate two Visual Relief Areas.

The visual impacts associated with the expanded ROM stockpiles were also considered as part of the '*Bengalla Mine Development Consent Modification 4 Statement of Environmental Effects*' (Hansen Bailey, 2017) (2017 MOD4 SEE). It was concluded that the infrastructure changes would not result in material additional visual impacts beyond those previously approved for Bengalla.

The '*Bengalla Mine Modification 5 Submission Report*' (James Bailey & Associates, 2022a) confirmed the existing visual bund, topography, tree screens and viewing distance would screen any sensitive views to proposed infrastructure upgrades. A '*Visual Screening Constraints Review*' (James Bailey & Associates, 2022b) was also completed to support flexibility in relation to the required visual tree screens and enable alternate measures to be implemented where reasonable and feasible to enhance visual screening of Bengalla for road users.

A '*Modification 7 Visual Impact Assessment*' (James Bailey Associates, 2025) (2025 MOD7 VIA) was undertaken to assess any potential visual impacts associated with the construction of a Temporary Overburden Emplacement Area (TOEA) within the approved OEA. The purpose of the 2025 MOD7 VIA was to identify the character of the existing surrounding visual landscape and to quantify any additional visual impacts when considered against the existing approved visual character of Bengalla. It was determined that the TOEAs would not result in any additional material impact on the surrounding visual landscape at any viewing location. As such, no additional visual mitigations beyond the existing Bengalla EIS and SSD-5170 measures were required.



JBA 2422 Bengalla - (MOD 8) Regional Locality (30/05/2025)

BENGALLA MINE MOD 8

Regional Locality

FIGURE 1

1.3 Modification Overview

BMC is seeking a Modification to adjust the disturbance footprint for the realignment of BLR as described the Bengalla EIS to facilitate construction activities. The revised BLR alignment will require the disturbance of approximately 67.5 hectares (ha) of vegetation in addition to that approved under SSD-5170. The conceptual layout of the proposed Modification is shown in **Figure 2**.

The proposed design of the BLR realignment:

- Reflects contemporary road safety design guidelines and requirements for intersections with the local road network, including Wybong Road and Roxburgh Road;
- Considers the current road network including other third party upgrades to the BLR / Wybong Road intersection, such that a 100 km / hour (hr) speed limit now applies;
- Considers the current and future utility of the road in the context of other major project works including for use by Over Size, Over Mass vehicles associated with the NSW Renewable Energy Zone projects;
- Facilitates construction works, including required erosion and sediment control measures, water management infrastructure and design cut/fill requirements;
- Allows for the relocation of existing third party infrastructure including communications and power infrastructure; and
- Avoids mining authorities held by other parties.

In accordance with Schedule 3, Condition 41 of SSD-5170, BMC is required to provide tree screens or some other visual screening measure along the proposed BLR realignment. Proposed tree screening measures have been updated to consider the detailed design changes, landform constraints, visibility of Bengalla and feasibility of planting tree screens prior to construction.

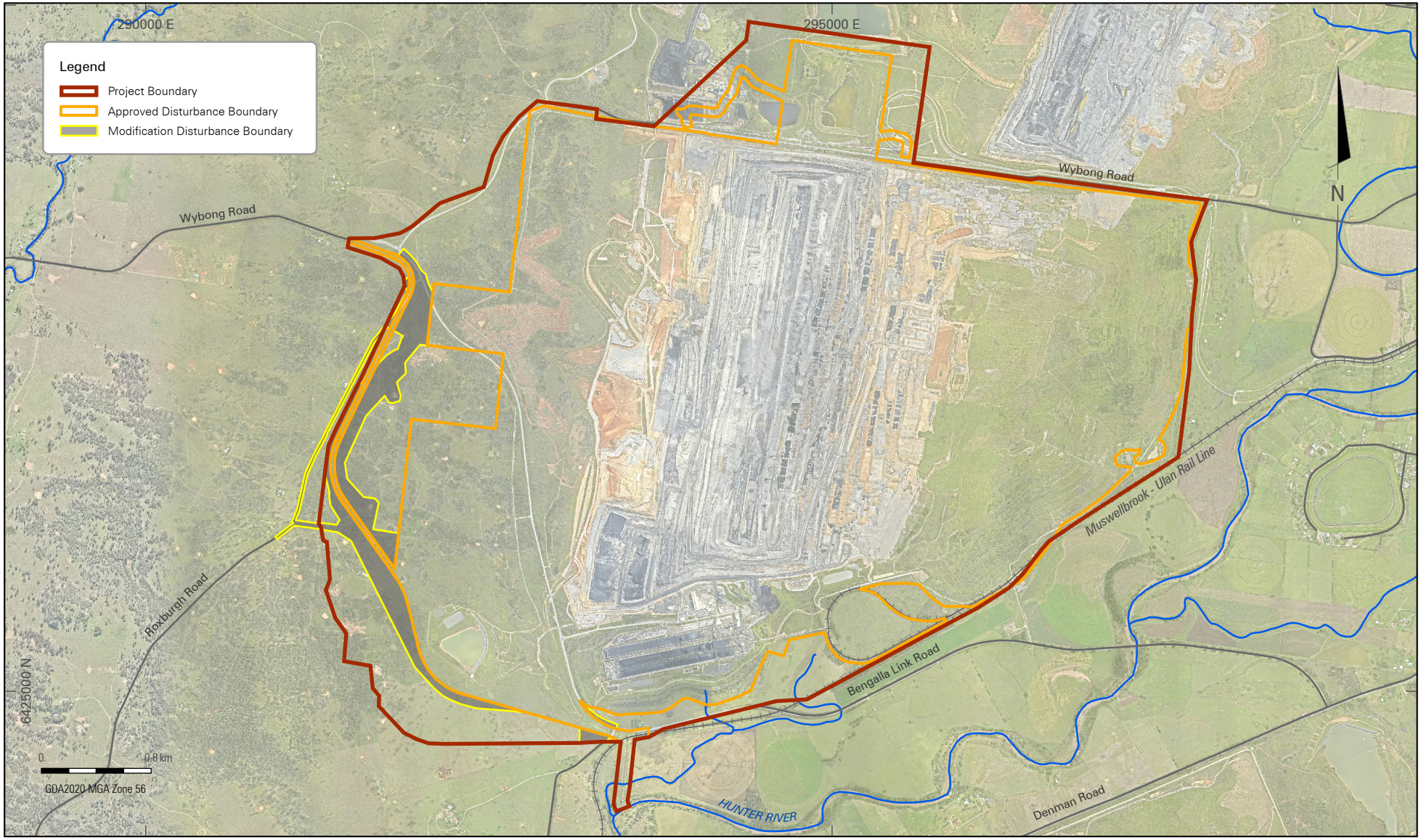
1.4 Document Purpose

The Bengalla EIS assessed the visual landscape of the area and determined the impacts of Bengalla (including the approved BLR realignment) on the character of the landscape within and adjacent to the SSD-5170 Project Boundary (see **Figure 2**). This Visual Review provides an assessment of any potential visual impacts to the contemporary landscape values as a result of the Modification beyond those approved for Bengalla (as modified). The review also describes mitigation strategies and screening measures for consideration along the proposed realignment of BLR.

1.5 Methodology

The methodology to determine the level of visual impact of the Modification and feasible mitigation measures involves four stages as follows:

1. Consideration of the existing environment, including the natural environment, land ownership and landuse relevant to the BLR realignment;
2. An assessment of the visual elements of the BLR realignment to determine:
    a. Visual sensitivity - a measure of how critically a change to the BLR alignment is viewed by people from different landuse areas in the vicinity of Bengalla;
    b. Visual effect - visual properties of the Modification against the approved operations;
3. An overall assessment of the impact on the visual landscape and road users; and
4. A review of the existing screening measures, constraints and proposed mitigation strategies and screening measures required along the realigned BLR.



BENGALLA MINE MOD 8

Conceptual Modification Layout

FIGURE 2

2. Existing Environment

This section discusses the topography, natural features, landuse and land ownership of the existing environment for Bengalla. It also describes changes that have taken place since the preparation of the 2013 EIS VIA, 2016 MOD2 VIA, 2017 MOD4 SEE and 2025 MOD7 VIA.

2.1 Environment Setting

Bengalla is located in the Upper Hunter Valley of NSW, approximately 130 km north-west of Newcastle and 4 km west of Muswellbrook. The major community in the locality is the township of Muswellbrook, located approximately 4 km east of Bengalla. The smaller community of Denman is located 15 km to the south-west (see **Figure 1**). Land within the SSD-5170 Project Boundary not occupied by mining activity is generally undulating and slopes downwards towards the Hunter River to the south.

The edges of the Hunter Valley are defined by steep, heavily vegetated mountain ranges to the east and west, with significant elevation above the valley and foothills. While these ranges are located at a significant distance from Bengalla, they create a background to valley views over existing mining operations.

Much of Bengalla's immediate locality consists of industry, farmland and remnant vegetation. The area within the Project Boundary not occupied by mining activity has been previously subject to land clearing and is comprised of a patchwork of remnant native vegetation and grassland areas. Fauna habitat largely includes Derived Native Grasslands and to a lesser extent, regenerating woodland and open forest that have been partially thinned or cleared in the past.

The key natural feature in the vicinity of Bengalla is the Hunter River, which has a catchment of approximately 4,300 km^2 to Muswellbrook. The Hunter River alluvial flats are situated within the eastern and southern extents of the Project Boundary. The main channel of the Hunter River meanders to the south of Bengalla and a small portion of its floodplain is located within the Project Boundary.

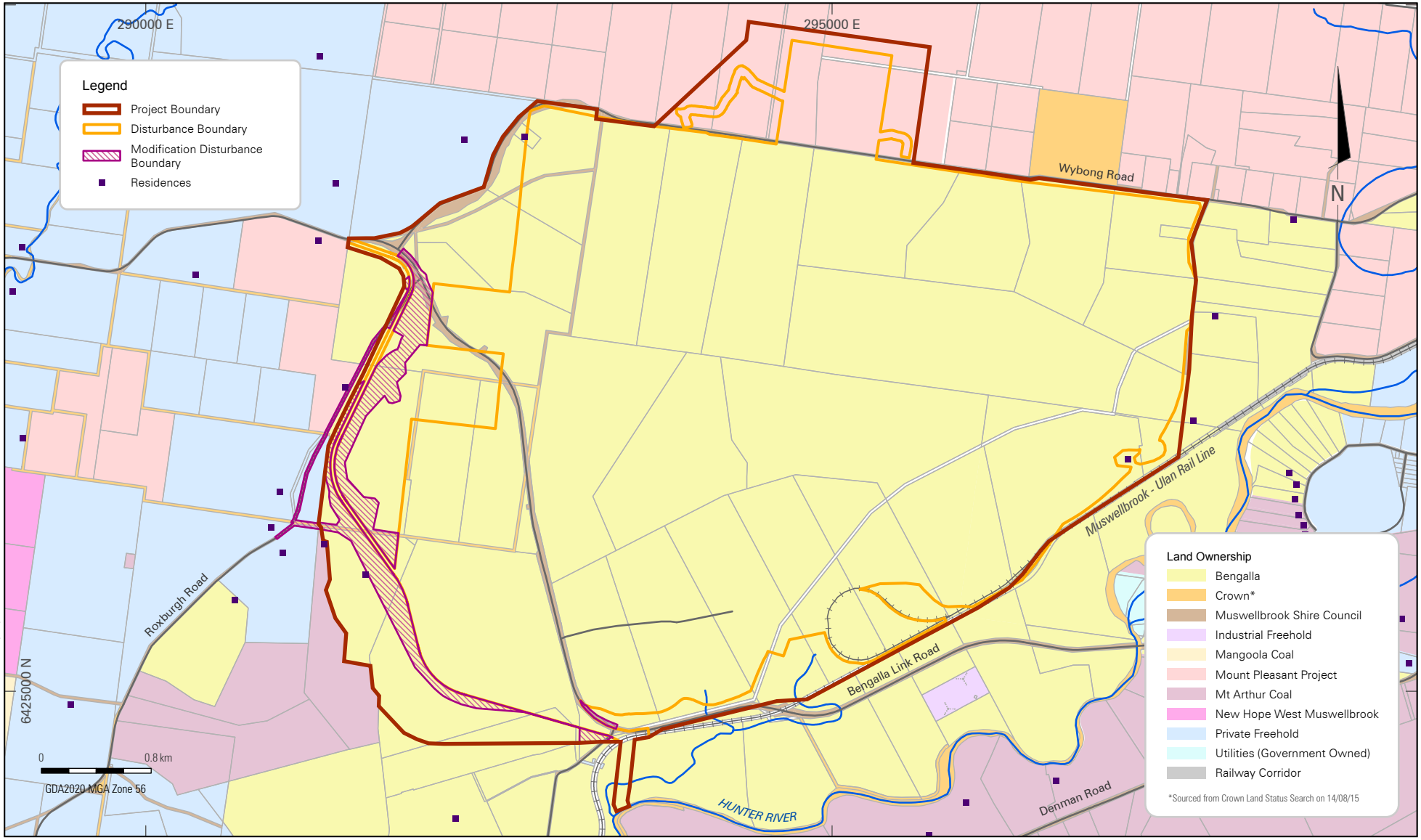
Dry Creek is a third-order order stream that flowed in a southward direction through the centre of the Project Boundary. Dry Creek is an ephemeral tributary of the Hunter River and has a total catchment area of approximately 18 km^2. SSD-5170 authorises the temporary diversion of Dry Creek during mining operations. The temporary diversion has been completed and consists of a clean water dam (CW1) and pump and pipeline system to capture and circulate clean runoff around the Bengalla mining area. Dry Creek will be re-instated within the rehabilitated landform during the later years of the mine progression.

2.2 Land Ownership

The ownership of land in the vicinity of Bengalla is illustrated **Figure 3**. BJV/BMC owns all the freehold land within the Project Boundary except for some parcels north of Wybong Road which are owned by MACH Energy Australia Pty Limited (MACH). BMC holds Mining Lease (ML) 1711 in respect of its infrastructure in this area. Bengalla is adjoined to the north by the Mount Pleasant Mine (operated by MACH). The Mt Arthur Coal Mine (operated by Hunter Valley Energy Coal Pty Ltd (HVEC)) is located to the south-east. Several privately owned rural-residential properties are located immediately to the west of Bengalla.

The Modification is situated predominantly on freehold land owned by the BJV in their respective shares. The proposed BLR realignment includes a stub road within HVEC freehold land and what is currently a Crown Road. It is proposed that the Crown Road be transferred to Muswellbrook Shire Council (MSC) in connection with dedication of the new section of BLR as a public road.

The major road in the region is the New England Highway. Regional roads include Wybong Road, the existing BLR and Denman Road, in addition to smaller local roads.



BENGALLA MINE MOD 8

Landownership

FIGURE 3

3. Primary Visual Catchment

The Primary Visual Catchment (PVC) represents the area within which the majority of critical views of Bengalla are obtained. The PVC for Bengalla was identified and described within the 2013 EIS VIA, 2016 MOD2 VIA and 2025 MOD7 VIA. It includes the area from within which the majority of potential critical views of Bengalla would be able to be experienced, based on distance and a consideration of topography alone as a screening element. As illustrated in **Figure 4**, the PVC is encompassed by the ranges to the north and west, the townships of Muswellbrook and Aberdeen to the east and existing mining operations surrounding the site.

The Modification includes an adjustment to the approved disturbance footprint for the realignment of BLR to facilitate construction. The alignment of the BLR remains consistent with that originally authorised by SSD 5170.

Some additional disturbance outside the Project Boundary will be required to facilitate the construction of the stub road and installation of third party infrastructure along Roxburgh Road. As such, the PVC will not measurably change compared to that described in the previous assessments.

4. Visual Sensitivity

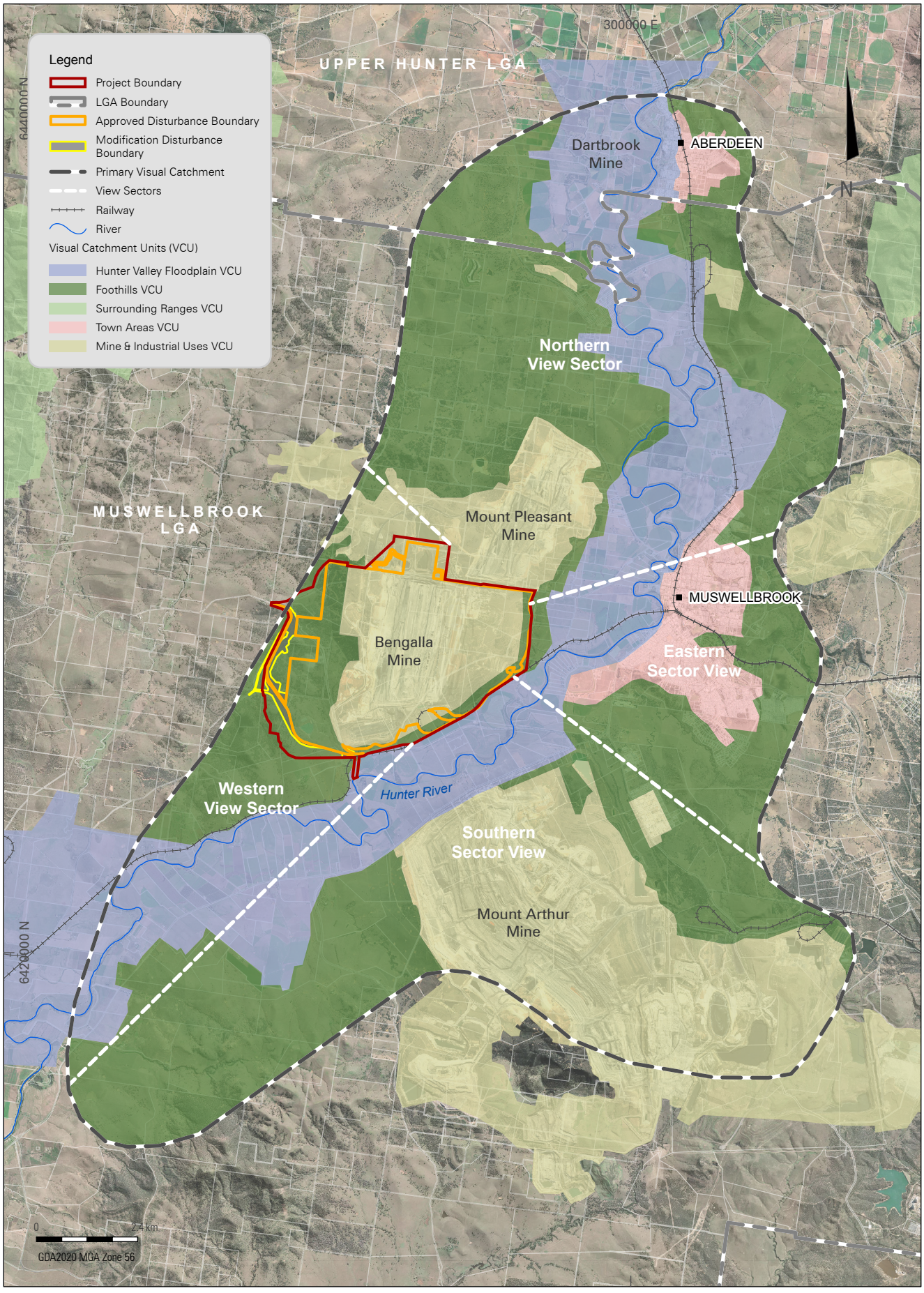
The Modification is located in the Western View Sector, typically associated with views from Roxburgh Road, the existing BLR, parts of Wybong and Denman Roads and the rural residences along them (see **Figure 4**). Views are interrupted by vegetation and topographic features typical of the Foothills Visual Character Unit (VCU). Views from Roxburgh Road to Bengalla are generally limited by topographic features. Potential views are confined to the more elevated parts of the road for approximately the first 1 km from the intersection between Roxburgh Road and Wybong Road, as well as from elevated parts of Wybong Road itself before the intersection. Where feasible, BMC has undertaken tube stock planting adjacent to Roxburgh Road on land owned by the BJV.

Views from the existing BLR are dominated by rural lands including improved pasture cropping and grazing along the river flood plains. Visual impacts of Bengalla are reduced as a result of the natural topography and vegetation, well established tree screens and visual bunds constructed around the Bengalla Infrastructure Envelope (**Figure 5**).

The Modification has the potential to slightly alter viewing locations for road users within the Western View Sector, when compared to those from the approved BLR realignment. This change is considered minor as the revised BLR design follows the same general positioning as the realignment authorised under SSD-5170. Any additional disturbance associated with the construction of the realigned BLR is considered temporary and will be rehabilitated as soon as practicable. As part of the detailed design process, strategic cut/fill placement within the BLR realignment corridor will have the added benefit of enhancing topographic screening beyond what was assessed for the approved realignment.

Topographic contours were reviewed to assess the visibility of Bengalla operations from the proposed BLR realignment. A topographic cross-section has been developed at a location on Roxburgh Road identified as having potential views of the Bengalla operations. The cross-section location is identified on **Figure 5**. As shown in **Figure 6** and supported by a viewshed analysis on **Figure 7**, receptors driving on the realigned BLR may have intermittent views of the unrehabilitated face of the OEA. However, the current Bengalla mining area will not be visible.

Based on this analysis, the Modification will not increase potential viewing locations of Bengalla. Furthermore, the sensitivity of residential receptors to views of Bengalla from the west will remain unchanged by the Modification. Previous assessments have determined that sensitivity is generally low due to existing views of approved mining operations, viewing distance, and intervening topography which reduces visibility.

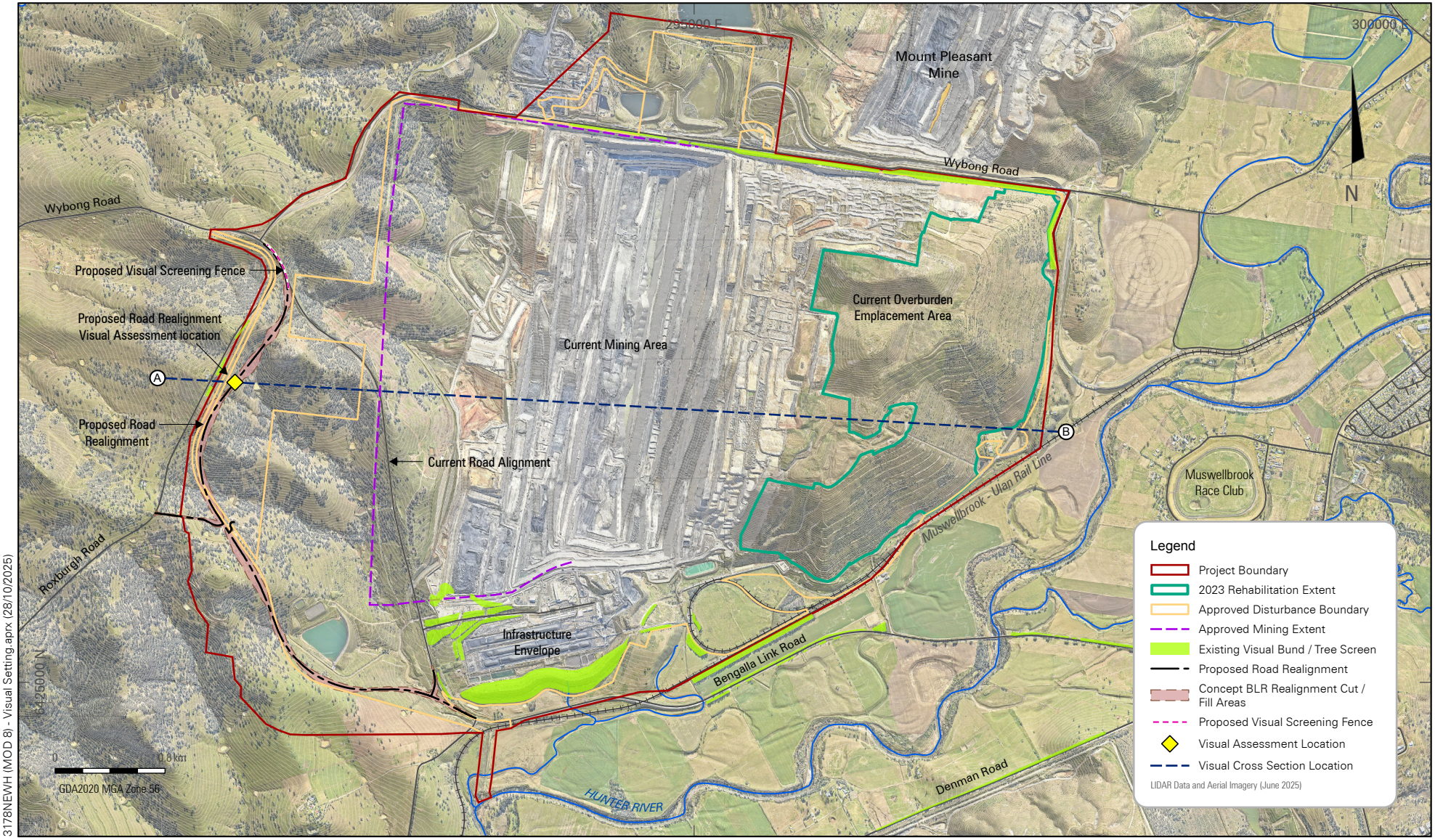


3178NEWH (MOD 8) - Visual Character Units.aprx (28/10/2025)

BENGALLA MINE MOD 8

Visual Character Units

FIGURE 4



3178NEWH (MOD 8) - Visual Setting aprx (28/10/2025)

BENGALLA MINE MOD 8

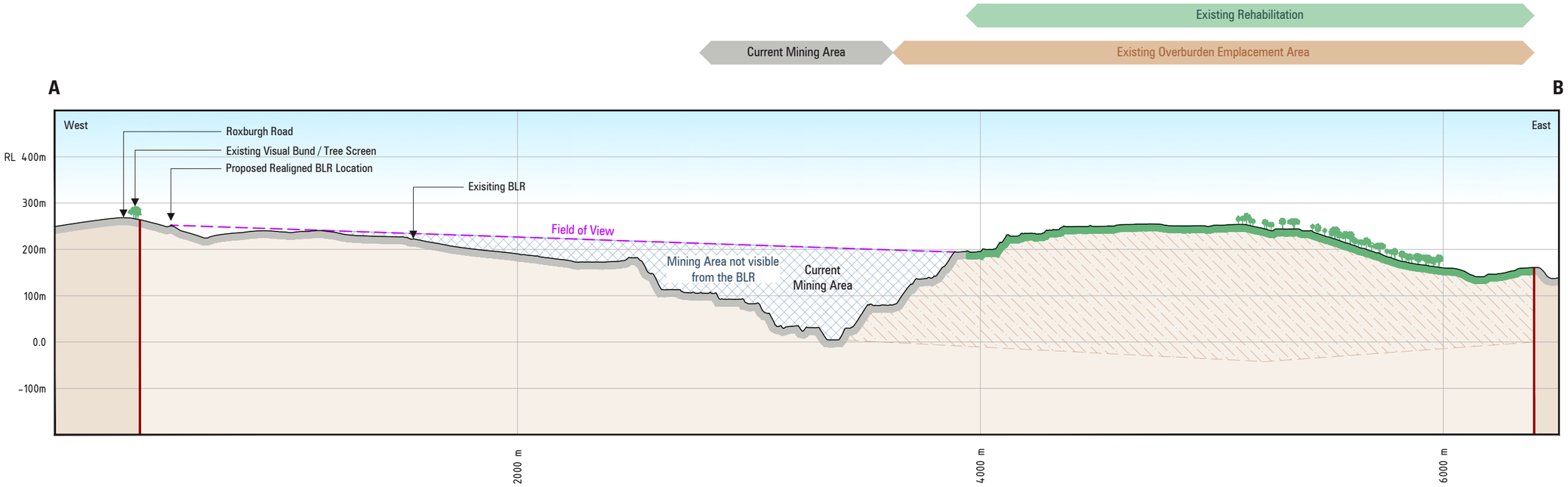
BENGALLA

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Viewshed Setting - Proposed Bengalla Link Road Realignment

FIGURE 5

VISUAL CROSS SECTION



0 600 Horizontal Scale

0 300 Vertical Scale

Horizontal / Vertical Scale = 1/2

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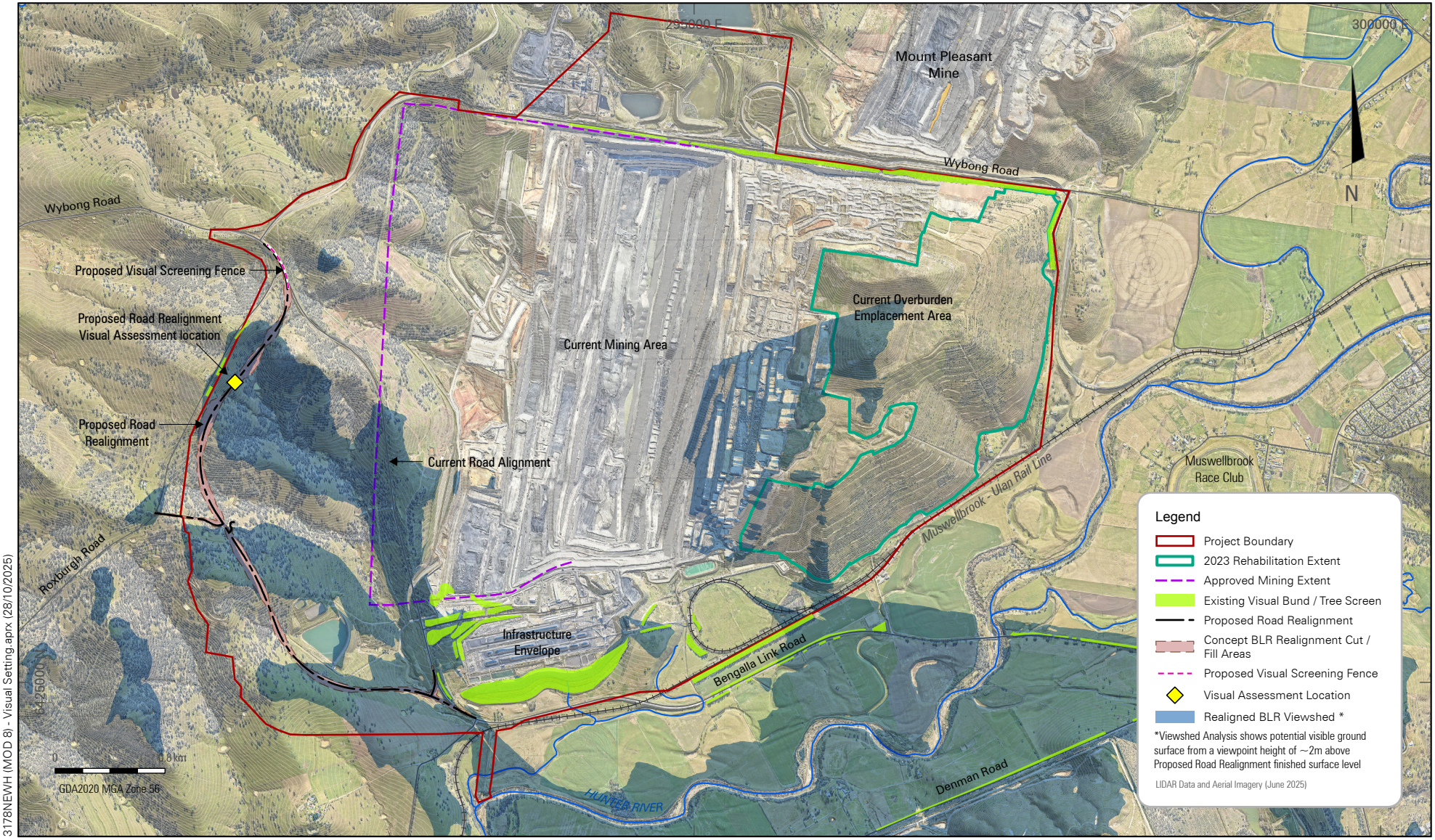
BENGALLA MINE MOD 8

Visual Cross Section

Filename : 3178NEWH (MOD 8) - Visual Cross Section

Date : 28-Oct-25 | Projection: | Drawn : PC | Revision : A

Figure 6



3178NEWH (MOD 8) - Visual Setting aprx (28/10/2025)

BENGALLA MINE MOD 8

BENGALLA

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Viewshed Analysis - Proposed Bengalla Link Road Realignment

FIGURE 7

5. Visual Effect

This section describes the proposed Modification and assesses the changes to the approved operations at Bengalla. It describes the visual effect of the Modification on the existing visual setting.

The visual effects of Bengalla have already been identified in previous studies including the 2013 EIS VIA, 2016 MOD2 VIA, 2017 MOD4 SEE and 2025 MOD7 VIA. The degree to which the Modification contrasts with the existing visual landscape will determine the type of visual effect. The visual effect is assessed as a combination of the visual properties of the Modification against approved Bengalla operations, with consideration of the proportion of the view occupied by the changes proposed. For any type of visual properties, the lower the proportion of the view that is occupied by the development, the lower the level of visual effect.

The BLR realignment includes associated civil and services works and requires additional disturbance beyond the approved Disturbance Boundary. The approved BLR realignment was determined to have the following visual effect in the Bengalla EIS:

> *"…will create a new line in the landscape with minor form and shape elements being created by road cut and fill batters. The road will replace 6 km of the existing road and have similar visual effects. The road will have little effect on external sensitive views and have a low visual effect when seen from external view locations."*

As the revised BLR design maintains the same general positioning as the approved alignment, there is a negligible change to the visual effect of Bengalla associated with the Modification.

6. Impact Assessment

This section defines the visual impact that is predicted from various viewing locations around the Modification.

The visual impact is dependent on the visual effect of the Modification (**Section 5**), its visibility and the visual sensitivity of areas from which it is seen (**Section 4**). The potential sensitive viewing locations (receivers) around Bengalla relevant to the Modification including rural residences, roads users and tourist locations have been defined above in terms of visibility.

The only potential viewing locations relevant to the Modification are located in the Western View Sector (see **Figure 4**). The visual impacts associated with the Modification are considered negligible and remain consistent with the existing impacts from approved BLR for the following reasons:

- Design consistency – The revised design follows the same general positioning as the approved realignment;
- Temporal disturbance – Additional disturbance associated with the road construction is considered temporary and will be rehabilitated as soon as practicable;
- Enhanced visual screening – The detailed design incorporates additional topographic screening through strategic cut/fill placement. This provides improved visual mitigation compared to the approved design.

Topographic analysis has been completed to assess the visibility of Bengalla from the proposed BLR realignment. The Modification will not increase the potential viewing locations from the Western View Sector. Residential visual sensitivity and visual effect remains unchanged, with impacts continuing to be assessed as low due to existing views of approved mining operations, viewing distance and intervening topography which reduces visibility.

Current design plans indicate the existing screening vegetation east of Roxburgh Road from the highest viewpoint will be retained and continue to screen potential views of the operational areas. The proposed

realignment is located to the west of the existing BLR location. The BLR realignment predominantly directs road users' primary sight lines away from Bengalla, with the natural forward-facing viewing direction of vehicular traffic oriented perpendicular to potential mine views, further minimising visual exposure. A small northern section of the realignment where potential views may occur will be mitigated through a proposed screening fence (refer to **Figure 5** and **Section 7**).

7. Mitigation

This section describes mitigation measures proposed for the Modification.

The Modification will not result in any additional material impact on the surrounding visual landscape at any viewing location beyond those outlined in the Bengalla EIS and SSD-5170. In accordance with Schedule 3, Condition 41 of SSD-5170, BMC is required to provide tree screens or some other visual screening measure along the proposed BLR realignment:

> *"41. At least two years prior to construction of the Bengalla Link Road realignment, the Applicant must plant tree screening, or provide some other visual screening measure (e.g. visual bunding), along the proposed Bengalla Link Road realignment. This screening (or alternative measure) must be undertaken in consultation with Council and maintained to the satisfaction of the Secretary.*
>
> *41A. Tree screening (or alternative measures) may not be required along all of the sections of Denman Road, Roxburgh Road, Wybong Road and Bengalla Link Road that will have direct views of mining operations, as required under conditions 40 and 41, where the Applicant can demonstrate, to the satisfaction of the Secretary, that the screening works are not possible due to constraints.*
>
> *Note: The planting of tree screening in areas of constructed fill embankments associated with the road realignment must be undertaken as soon as practicable after completion of the constructed landform"*

BMC has implemented a range of existing management measures to mitigate the visual impacts of Bengalla. Relevant to this Modification, BMC will continue to maintain existing tree screen plantings and feasible visual screening measures along roads.

During the detailed design phase, multiple physical constraints were identified that constrained the feasibility of establishing additional tree screens prior to construction of the realigned BLR. These constraints will need to be re-considered through development of a post-construction screening design, in consultation with the relevant stakeholders and utility asset owners. This post-construction assessment will consider:

- Services infrastructure limitations – available locations for pre-construction tree screening were constrained by existing and proposed third-party infrastructure locations including telecommunications and electrical utilities. Effective screening requires sufficient design flexibility to accommodate future infrastructure relocation requirements. Any screening measures need to be designed in consultation with relevant service providers and comply with the *Tree Safety Management Plan* (Ausgrid, 2023) and other applicable utility guidelines. As such, pre-construction implementation was considered impractical without confirmed infrastructure arrangements;
- Narrow road verge – The approved SSD-5170 Disturbance Boundary provided a narrow corridor for the BLR realignment, with insufficient space to allow the cut/fill needed to satisfy current road safety design requirements. Pre-construction tree screening within or adjacent to the approved BLR realignment

corridor would have potentially impacted construction requirements and the future road safety requirements;

- Regulatory approvals - Any tree screens proposed within the road reserve are subject to a Section 138 approval process under the *Roads Act 1993* and the issue of a Road Occupancy Licence on terms acceptable to BMC. The uncertainty and timing of these approval processes would have created project delivery risks if pursued prior to construction of the realigned BLR, particularly given the potential for vegetation establishment failure if subsequently impacted by construction activities; and
- Adaptive management approach - A number of measures have already been applied to screen views of approved Bengalla operations, including the bunds and tree screens illustrated on **Figure 5**. Post-construction screening assessment will enable precise identification of actual visual exposure points and the implementation of targeted, effective mitigation measures based on final road geometry and demonstrated sight line impacts. This adaptive approach will ensure optimal screening outcomes can be achieved, while avoiding premature vegetation establishment in areas potentially affected by construction activities.

As soon as practicable after completion of construction of the landform for the realigned BLR, BMC will conduct a further visual review and determine the need for additional screening measures. Where road alignment geometry results in vehicular sight lines being directly oriented toward Bengalla operations, mitigation will be implemented accordingly. As illustrated on **Figure 5**, a 1.8 metre (m) Colorbond fence will be installed on the eastern side of the realigned BLR in the north where the potential for direct views of Bengalla operations has been identified. Where sight lines for road users are directed away from Bengalla operations, existing visual screening effects are considered adequate and no further mitigation is required.

8. References

- Ausgrid (2023). *Tree Safety Management Plan*.
- Bengalla (2024). *Rehabilitation Management Plan*.
- JVP Visual Planning and Design (2013). *Continuation of Bengalla Mine Project Visual Impact Assessment.*
- Hansen Bailey (2013). *Continuation of Bengalla Mine Environmental Impact Statement.*
- Hansen Bailey (2016a). *Bengalla Mine Development Consent Modification Statement of Environmental Effects*.
- Hansen Bailey (2016b). *Bengalla Development Consent Modification 2 Statement of Environmental Effects Visual Impact Assessment.*
- Hansen Bailey (2017). *Bengalla Mine Development Consent Modification 4 Statement of Environmental Effects.*
- James Bailey Associates (2021). *Bengalla Mine Development Consent SSD-5170 Modification 5 Modification Report*.
- James Bailey Associates (2022a). *Bengalla Mine Development Consent Modification 5 Submissions Response*.
- James Bailey Associates (2022b). *Visual Screening Constraints Review*.
- James Bailey Associates (2025). *Modification 7 Visual Impact Assessment*.

9. Abbreviations

Abbreviation	Meaning
Bengalla EIS	*Continuation of Bengalla Mine Environmental Impact Statement'* (Hansen Bailey, 2013)
BLR	Bengalla Link Road
BMC	Bengalla Mining Company Pty Limited
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning & Assessment Act 1979*
ha	Hectare
HVEC	Hunter Valley Energy Coal Pty Ltd
m	metres
MACH	Mach Energy Australia Pty Limited
ML	Mining Lease
MSC	Muswellbrook Shire Council
NSW	New South Wales
OEA	Overburden Emplacement Area
Project Boundary	SSD-5170 Project Boundary
PVC	Primary Visual Catchment
TOEA	Temporary Overburden Emplacement Area
SEE	Statement of Environmental Effects, now called a Modification Report for State Significant Development Modification Applications.
SSD	State Significant Development
VCU	Visual Character Unit
VIA	Visual Impact Assessment
2013 EIS VIA	*'Continuation of Bengalla Mine Project Visual Impact Assessment'* (JVP Visual Planning and Design, 2013)
2016 MOD2 VIA	*'Bengalla Development Consent Modification 2 Statement of Environmental Effects Visual Impact Assessment'* (VPA Visual Planning & Assessment, 2016)
2017 MOD4 SEE	*Bengalla Mine Development Consent Modification 4 Statement of Environmental Effects* (Hansen Bailey, 2017)
2025 MOD7 VIA	*Modification 7 Visual Impact Assessment* (James Bailey Associates, 2025)



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Appendix F
Aboriginal Cultural Heritage Assessment Report



A retouched mudstone blade recorded at the study area.

ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT

BENGALLA MINE MODIFICATION 8

MUSWELLBROOK LOCAL GOVERNMENT AREA, NSW

OCTOBER 2025

This report is redacted and is suitable for public exhibition

Report prepared by

OzArk Environment & Heritage

for Bengalla Mining Company

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Environment & Heritage

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Heritage NSW



ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT COVER SHEET

Report Title	Aboriginal Cultural Heritage Assessment Report: Bengalla Mine Modification 8, Muswellbrook Local Government Area.
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Author(s)' Organisation Name (if applicable)	OzArk Environment & Heritage
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Address of Subject Area	Address: Bengalla Mining Company Pty. Ltd. Bengalla Road, Muswellbrook NSW 2333 Australia Local Government Area: Muswellbrook LGA
Report prepared for	Company Name: Bengalla Mining Company Pty Limited (BMC) Contact Person: Hayley Frazer Address: Bengalla Road, Muswellbrook NSW 2333 Australia Email: Hayley.Frazer@newhopegroup.com.au Phone: (02) 65 429 500
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Harrison Rochford, OzArk Environment & Heritage, Senior Archaeologist

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DOCUMENT CONTROLS

Proponent	Bengalla Mining Company Pty Limited (BMC)
Client	Xenith Consulting
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Enquiries should be addressed to OzArk Environment & Heritage.

Acknowledgement

OzArk acknowledge the traditional custodians of the area on which this assessment took place and pay respect to their beliefs, cultural heritage, and continuing connection with the land. We also acknowledge and pay respect to the post-contact experiences of Aboriginal people with attachment to the area and to the Elders, past and present, as the next generation of role models and vessels for memories, traditions, culture and hopes of local Aboriginal people.

ABBREVIATIONS AND GLOSSARY

ACHAR	Aboriginal Cultural Heritage Assessment Report. As set out in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*, all developments where harm to Aboriginal objects is likely must be assessed in an ACHAR.
ACHCRs	*Aboriginal Cultural Heritage Consultation Requirements for Proponents.* Guidelines for conducting Aboriginal community consultation for developments where harm to Aboriginal objects is likely.
AHIMS	Aboriginal Heritage Information Management System. Administered by the DCCEEW, AHIMS is the central register of all Aboriginal sites within NSW.
AHIP	Aboriginal Heritage Impact Permit. Issued by Heritage NSW to allow harm to Aboriginal objects.
Assemblage	All artefacts recorded at a location. In this report, assemblage refers to stone artefacts as this was the only artefact class recorded.
ATSIHP Act	*Aboriginal and Torres Strait Islander Heritage Protection Act 1984*. Commonwealth legislation concerning the preservation and protection of areas and objects of significance to Aboriginal people.
Bengalla	Bengalla Mine
BMC	Bengalla Mining Company Pty Limited
Code of Practice	*Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* under Part 6 NPW Act. Issued by DECCW in 2010, the Code of Practice is a set of guidelines that allows limited test excavation without the need to apply for an AHIP.
DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water. DCCEEW contains the Environment and Heritage Group including Heritage NSW.
DPHI	NSW Department of Planning, Housing and Infrastructure. DPHI contains the Planning agency.
EIS	Environmental Impact Statement. A required document for major projects documenting all potential impacts to the environment, including heritage, that may arise due to the development.
GSE	Ground surface exposure. A measure of factors that may reveal surface artefacts such as erosion scalds.

GSV	Ground surface visibility. A measure of factors that may obscure the detection of surface artefacts such as leaf litter.
Heritage NSW	Government department tasked with ensuring compliance with the NPW Act. Heritage NSW is advised by the Aboriginal Cultural Heritage Advisory Committee (ACHAC).
Holocene	Geological epoch which lasted from around 12,000 years ago (10,000 BCE) to the present. This period is generally warmer and wetter than the preceding Pleistocene period.
IMT	Indurated mudstone/tuff
NPW Act	*National Parks and Wildlife Act 1974*. Primary legislation governing Aboriginal cultural heritage within NSW.
PAD	Potential archaeological deposit. Indicates that a particular location has potential to contain subsurface archaeological deposits, although no Aboriginal objects are visible.
RAP	Registered Aboriginal Party. An individual or group who have indicated through the ACHCR process that they wish to be consulted regarding the project.
Study area	Area surveyed and assessed for the Modification
The Modification	Proposed SSD-5170 Modification 8

EXECUTIVE SUMMARY

OzArk Environment & Heritage (OzArk) has been engaged by Xenith Consulting on behalf of Bengalla Mining Company Pty Limited (BMC, the proponent) to complete an *Aboriginal Cultural Heritage Assessment Report* (ACHAR) to support an application for Modification 8 (the Modification) to the existing Development Consent (State Significant Development [SSD]-5170) for Bengalla Mine (Bengalla).

Bengalla is an open cut coal mine located approximately 4 kilometres (km) west of Muswellbrook in the Upper Hunter Valley. Bengalla operations commenced in 1998 and have been approved under SSD-5170 since 3 March 2015.

BMC is proposing to lodge an application to modify SSD-5170 under Section 4.55(2) of the EP&A Act to adjust the approved disturbance footprint for the realignment of Bengalla Link Road (BLR) as described in the *Continuation of Bengalla Mine Environmental Impact Statement* (Bengalla EIS) (Hansen Bailey, 2013) to facilitate construction activites. The revised BLR alignment will require the disturbance of approximately 67.5 ha of vegetation in addition to that approved under SSD-5170.

The study area for the Modification comprises of sloping landforms that have mostly been cleared and used for agricultural purposes.

The survey of the study area was completed over two days (12 and 13 February 2025) by OzArk and representatives of the Registered Aboriginal Parties (RAPs). Four previously unrecorded Aboriginal sites were identified, comprising one low-density artefact scatter and three isolated finds. Four existing site recordings within the study area were also inspected.

The recorded sites within the study area have a low scientific value due to low artefact density and poor site condition, which both lead to a limited potential for the sites to contribute to key questions concerning the archaeology and Aboriginal use of the Hunter Valley.

The assessment has concluded that eight Aboriginal sites will be impacted by the Modification. The recommendations regarding the Modification are:

1. The Modification may proceed with without further archaeological investigation provided that all impacts remain within the Modification Disturbance Boundary. If impacts are required outside the boundary assessed by this report, further investigation may be required.
2. Following any granting of development consent for the Modification, the proponent will update the current Bengalla Aboriginal Cultural Heritage Management Plan (ACHMP). The ACHMP updates will specify:

a. The surface community collection program for the eight sites within the proposed Modification Disturbance Boundary following the methodology proposed in **Section 9.2.1**.

b. Procedures to be followed if unanticipated finds or suspected human remains are encountered during work. The current procedures in the Bengalla ACHMP are provided in **Appendix 4** and **Appendix 5**, respectively.

c. The long-term management of Aboriginal objects recovered from the salvage program. It is recommended that these objects be held with the other objects salvaged over the life of Bengalla as per Section 6.6 of the current Bengalla ACHMP.

d. Relevant BMC employees and contractors will undertake Aboriginal cultural heritage awareness training to ensure they have a general awareness and understanding of Aboriginal culture, and how Aboriginal sites are protected under the *National Parks and Wildlife Act 1974*.

FOREWORD



BMC operate Bengalla located 4 km west of Muswellbrook and are proposing to modify their current approval SSD-5170 to adjust the disturbance footprint for realigning the BLR.

The study area for this assessment includes the area that would be disturbed by the activities in the proposed modification, that are outside the approved SSD-5170 Disturbance Boundary. The study area mostly consists of gentle to moderately sloping hills to the north of the Hunter River and its floodplains. The study area is currently used for agricultural purposes and has been mostly cleared in the past, although vegetation has regrown in places and some mature trees have remained. There are no named waterways within the study area.

There are four previously recorded sites within the study area (low-density artefact scatters and isolated finds).

The Modification study area was surveyed over two days in February 2025 by OzArk archaeologist Harrison Rochford with David Horton (Gomery Cultural Consultants) and Les Atkinson (Wanaruah Local Aboriginal Land Council) representing the RAPs. Four Aboriginal sites (a low-density scatter and three isolated finds) were identified, and five previously recorded sites were inspected.

The Modification will impact eight sites within the study area, including six isolated finds and two artefact scatters (i.e. sites comprising five artefacts or fewer). It has been recommended that the eight sites within the study area be salvaged prior to works and the objects be held in a secure location at the mine.

CONTENTS

ABBREVIATIONS AND GLOSSARY IV
EXECUTIVE SUMMARY VI
FOREWORD VIII
1 INTRODUCTION 1
1.1 Description of the Modification 1
1.2 Background 1
1.3 Proposed work 2
1.4 Study area 2
2 THE ABORIGINAL CULTURAL HERITAGE ASSESSMENT 5
2.1 Relevant legislation 5
2.1.1 Commonwealth legislation 5
2.1.1.1 Environment Protection and Biodiversity Conservation Act 1999 5
2.1.1.2 Aboriginal and Torres Strait Islander Heritage Protection Act 1984 5
2.1.2 State legislation 6
2.1.2.1 Environmental Planning and Assessment Act 1979 6
2.1.2.2 National Parks and Wildlife Act 1974 7
2.2 Assessment approach 8
2.3 Purpose and objectives 8
2.4 Report compliance with the Code of Practice 8
2.5 Date of archaeological assessment 9
2.6 OzArk involvement 9
2.6.1 Field survey 9
2.6.2 Reporting 9
3 ABORIGINAL COMMUNITY CONSULTATION 11
3.1 Introduction to cultural values 11
3.2 Aboriginal community consultation 11
3.2.1 ACHCRs Stage 1 12
3.2.2 ACHCRs Stage 2 12
3.2.3 ACHCRs Stage 3 13
3.2.4 ACHCRs Stage 4 13
3.3 Cultural values identified throughout the ACHCR process 14
4 LANDSCAPE CONTEXT 15
4.1 Topography and hydrology 15

4.1.1 Survey units 17
4.2 Geology and soils 20
4.3 Vegetation 20
4.4 Land use history and existing levels of disturbance 20
4.5 Conclusion 22
5 ARCHAEOLOGICAL CONTEXT 23
5.1 Ethno-historic sources of regional Aboriginal culture 23
5.2 Regional archaeological context 23
5.3 Local archaeological context 25
5.3.1 Desktop database searches conducted 25
5.3.1.1 AHIMS search results 25
Previous studies in or near the study area 29
5.3.1.2 Studies at the main Bengalla site 29
5.3.1.3 Studies within the study area 29
5.4 Predictive model for site location 30
5.4.1 Site types in the region of the study area 30
5.4.2 Landform modelling of archaeological potential 31
5.4.3 Conclusion 31
5.5 Research questions 32
6 RESULTS OF ABORIGINAL ARCHAEOLOGICAL ASSESSMENT 34
6.1 Sampling strategy and field methods 34
6.2 Effective survey coverage 34
6.3 Aboriginal sites recorded 37
37-2-6708 (Bengalla Link Road Realignment OS1) 38
37-2-6709 (Bengalla Link Road Realignment IF1) 39
37-2-6710 (Bengalla Link Road Realignment IF2) 40
37-2-6711 (Bengalla Link Road Realignment IF3) 41
6.4 Previously recorded Aboriginal sites located 42
6.5 Summary of survey results 45
6.5.1 Discussion 45
6.5.2 Subsurface potential 45
6.5.3 Responses to the research questions 45
7 SIGNIFICANCE ASSESSMENT 47
7.1 Introduction to significance assessment 47

7.1.1 Identifying cultural significance 47
7.1.1.1 Social or cultural value 47
7.1.1.2 Scientific (archaeological) value 48
7.1.1.3 Aesthetic value 48
7.1.1.4 Historic value 48
7.2 Assessed significance of the recorded sites 49
7.2.1 Statement of significance 50
8 ASSESSING HARM 51
8.1 Avoiding and minimising harm 51
8.1.1 Conserving significant Aboriginal cultural heritage 51
8.1.2 Opportunities to conserve Aboriginal cultural heritage values 51
8.2 Likely impacts to Aboriginal heritage from the Modification 51
8.3 Ecologically sustainable development principles 54
8.3.1 Intergenerational equity 54
8.3.2 The precautionary principle 54
8.3.3 Principle of Integration 54
8.3.4 Applicability to the Modification 55
9 MANAGEMENT OF ABORIGINAL CULTURAL HERITAGE SITES 56
9.1 General management principles 56
9.2 Management and mitigation of recorded Aboriginal sites 56
9.2.1 Community collection 56
9.2.2 Procedure for previously unrecorded Aboriginal objects and / or suspected skeletal remains 57
9.2.3 Long term management of salvaged Aboriginal objects 57
10 RECOMMENDATIONS 58
REFERENCES 59
APPENDIX 1: COMMUNITY CONSULTATION 61
APPENDIX 2: ASSESSMENT METHODOLOGY 79
APPENDIX 3: AHIMS SEARCH RESULTS 105
APPENDIX 4: UNANTICIPATED FINDS PROTOCOLS (HANSEN BAILEY 2017) 110
APPENDIX 5: UNANTICIPATED SKELETAL REMAINS PROTOCOL (HANSEN BAILEY 2017 SECTION 7.3) 112

APPENDIX FIGURES

Appendix 1 Figure 1: Aboriginal Consultation Log. 61
Appendix 1 Figure 2: Advertisement placed in the Singleton Argus. 68
Appendix 1 Figure 3: Stage 1 Letter to agencies (sample). 69
Appendix 1 Figure 4: Stage 1 Example letter sent to Aboriginal community groups. 71
Appendix 1 Figure 5: Stage 2: Cover letter and Assessment Methodology sent to RAPs. 73
Appendix 1 Figure 6: RAP responses to assessment methodology. 74
Appendix 1 Figure 7: RAP responses to the draft ACHAR 77

FIGURES

Figure 1-1: Map showing the location of the study area for the Modification. 1
Figure 1-2: Aerial showing the study area. 3
Figure 1-3: Modification Disturbance Boundary 4
Figure 4-1: Topography and hydrology of the study area. 16
Figure 4-2: Survey units of the study area 18
Figure 4-3: Aerial of the study area showing the location of survey units. 19
Figure 4-4: 1974 aerial imagery of study area. 21
Figure 5-1: Occupation model for the Central Lowlands and Lower Hunter Valley (Kuskie and Kamminga 2000) 24
Figure 5-2: Location of previously recorded AHIMS sites in relation to the study area 27
Figure 5-3: AHIMS sites within the study area. 28
Figure 6-1: Survey coverage across the study area. 36
Figure 6-2: Location of the sites recorded within the study area. 37
Figure 6-3: Bengalla Link Road Realignment OS1. View of site and selection of recorded artefacts. 39
Figure 6-4: Bengalla Link Road Realignment IF1. View of site and the artefact. 40
Figure 6-5: Bengalla Link Road Realignment IF2. View of site and the artefact. 41
Figure 6-6: Bengalla Link Road Realignment IF3. View of site and artefact. 42
Figure 8-1: Sites in relation to the proposed Modification Disturbance Boundary. 53

TABLES

Table 2-1: Report compliance with the Code of Practice. 8
Table 3-1: List of RAPs for the Modification. 12
Table 3-2: Aboriginal community involvement in the fieldwork. 13
Table 5-1: Aboriginal cultural heritage: desktop-database search results. 25

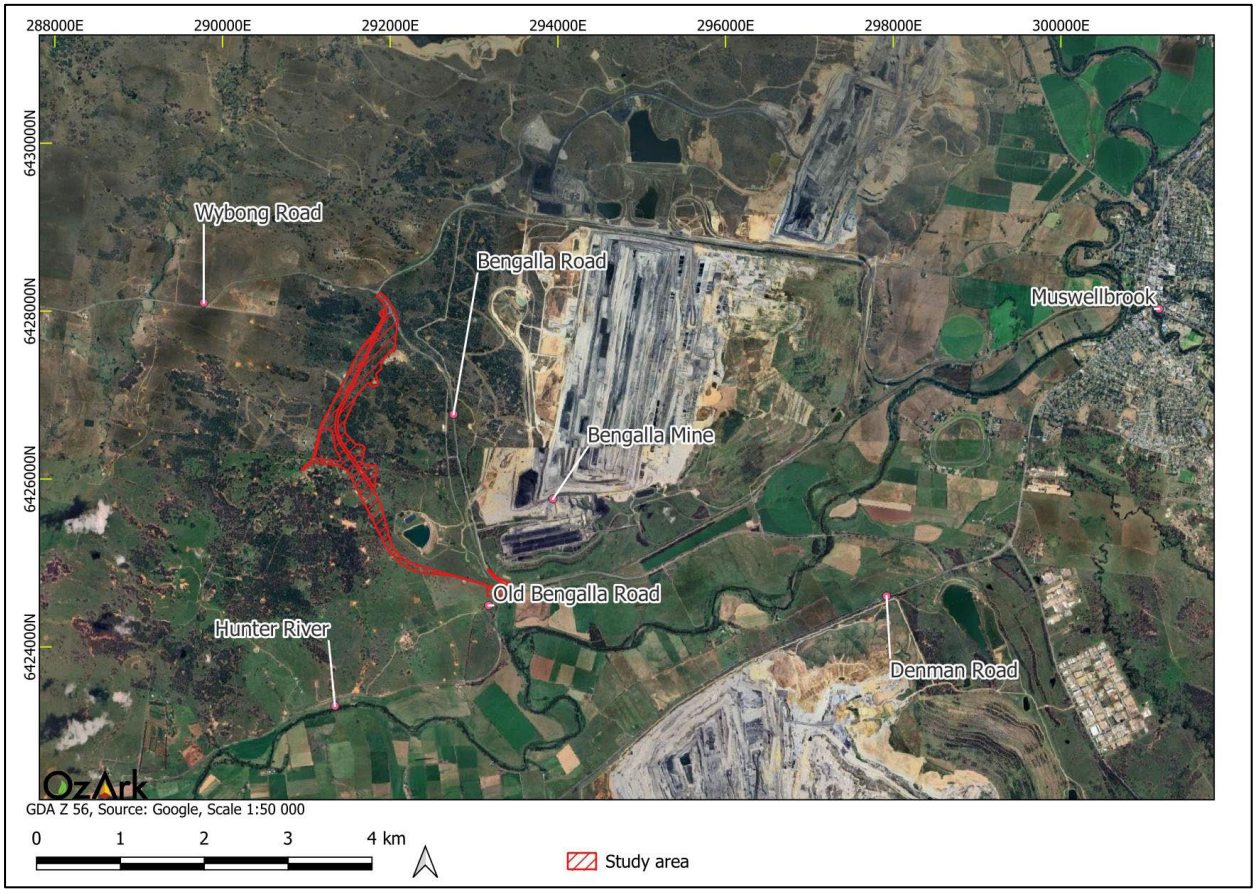
Table 5-2: Site types and frequencies of AHIMS sites near the study area. 26
Table 5-3: AHIMS sites located within study area. 26
Table 5-4: Site types recorded in the region of the study area. 30
Table 5-5: Likelihood of landforms within the study area to contain Aboriginal objects. 32
Table 5-6: Likelihood of certain site types being present in the study area. 32
Table 6-1: Effective survey coverage within the study area. 35
Table 6-2: Effective survey coverage and incidences of site recording. 35
Table 6-3: Aboriginal cultural heritage sites recorded during the survey. 38
Table 6-4: Bengalla Link Road Realignment OS1 artefact attributes. 38
Table 6-5: Bengalla Link Road Realignment IF1 artefact attributes. 39
Table 6-6: Bengalla Link Road Realignment IF2 artefact attributes. 40
Table 6-7: Bengalla Link Road Realignment IF3 artefact attributes. 41
Table 6-8: Previously recorded sites visited during the survey. 43
Table 7-1: Aboriginal cultural heritage: significance assessment. 50
Table 8-1: Aboriginal cultural heritage: impact assessment. 52
Table 8-2: Application of ESD principles to the Modification. 55

1 INTRODUCTION

1.1 DESCRIPTION OF THE MODIFICATION

OzArk Environment & Heritage (OzArk) has been engaged by Xenith Consulting on behalf of Bengalla Mining Company Pty Limited (BMC, the proponent) to complete an *Aboriginal Cultural Heritage Assessment Report* (ACHAR) to support an application for Modification 8 (the Modification) to State Significant Development [SSD]-5170 for Bengalla Mine (Bengalla). The Modification is in the Muswellbrook Local Government Area (LGA) (**Figure 1-1**).

Figure 1-1: Map showing the location of the study area for the Modification.



1.2 BACKGROUND

Bengalla is an open cut coal mine located approximately 4 kilometres (km) west of Muswellbrook in the Upper Hunter Valley of New South Wales (NSW).

BMC has operated since 1998 and is currently authorised under SSD-5170 granted on 3 March 2015. SSD-5170 has been since been modified on five occasions. SSD-5170 (as modified) authorises the continuation of open cut coal mining and associated activities at Bengalla until 28 February 2039.

1.3 PROPOSED WORK

The Modification proposes adjustments to the disturbance footprint for the realignment of BLR as described in the Bengalla EIS, resulting in approximately 67.5 ha of additional disturbance. The proposed design of the BLR:

- Reflects contemporary road safety design guidelines and requirements for intersections with the local road network, including Wybong Road and Roxburgh Road;
- Considers the current road network including other third party upgrades to the BLR / Wybong Road intersection, such that a 100 km / hour (hr) speed limit now applies;
- Considers the current and future utility of the road in the context of other major project works including for use by Over Size, Over Mass (OSOM) vehicles associated with the NSW Renewable Energy Zone (REZ) projects;
- Facilitates construction works, including required erosion and sediment control measures, water management infrastructure and design cut/fill requirements;
- Allows for the relocation of existing third party infrastructure including communications and power infrastructure; and
- Avoids mining authorities held by other parties.

1.4 STUDY AREA

The study area describes the area that will be included in the current assessment. The study area is situated on property owned by BMC and the Crown to the west of the current mine site, approximately 10 km west of Muswellbrook. An aerial showing the study area is presented as **Figure 1-2**.

The Modification Disturbance Boundary was reduced slightly after the completion of the survey for the Modification, resulting in some small sections that are included in the study area for this assessment but do not form part of the final Modification Disturbance Boundary. The Modification Disturbance Boundary is shown on **Figure 1-3**.

Figure 1-2: Aerial showing the study area.

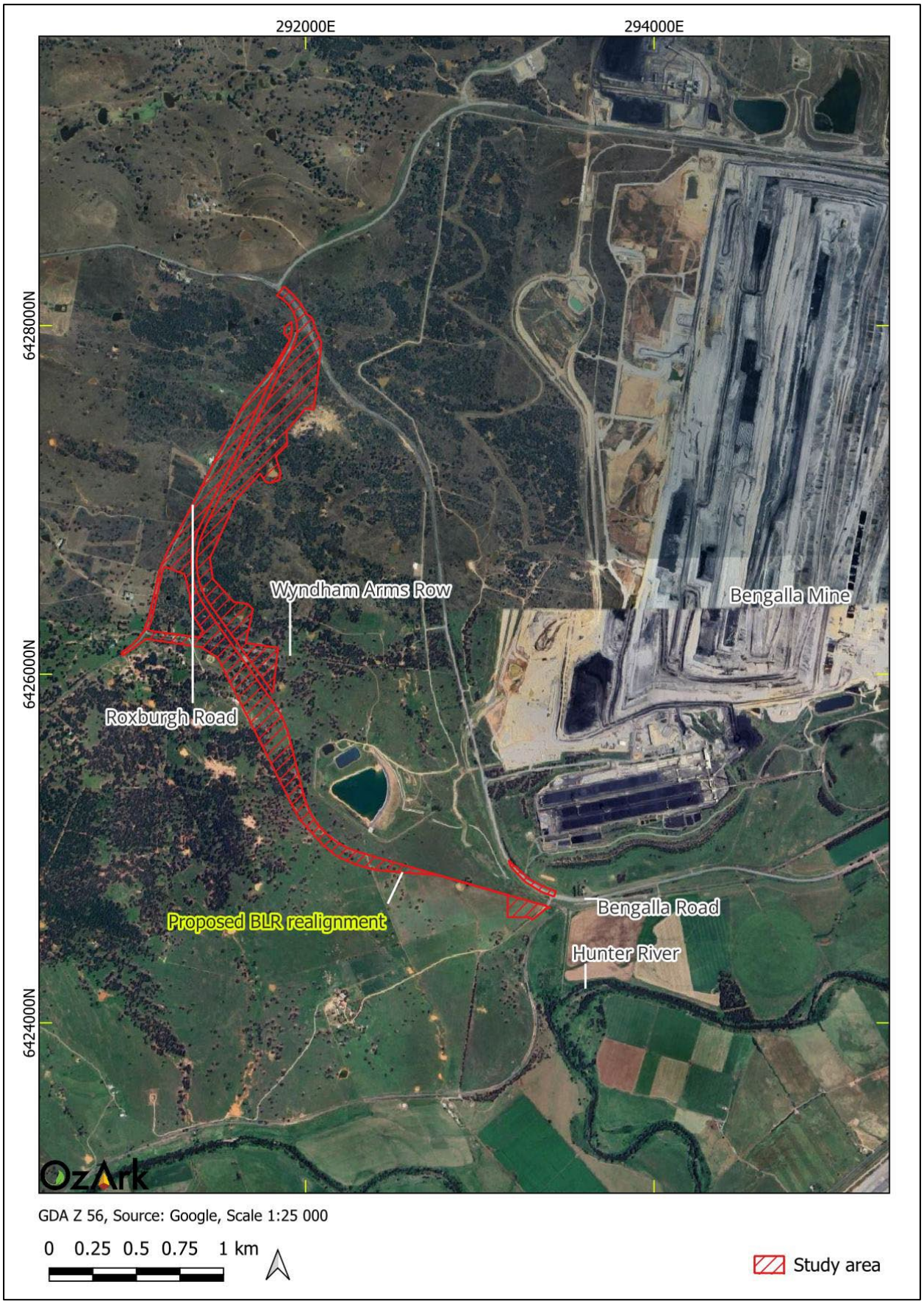


Figure 1-3: Modification Disturbance Boundary



2 THE ABORIGINAL CULTURAL HERITAGE ASSESSMENT

2.1 RELEVANT LEGISLATION

Cultural heritage is managed by several NSW and national Acts. Baseline principles for the conservation of heritage places and relics can be found in the *Burra Charter* (Burra Charter). The *Burra Charter* has become the standard of best practice in the conservation of heritage places in Australia, and heritage organisations and local government authorities have incorporated the inherent principles and logic into guidelines and other conservation planning documents. The *Burra Charter* generally advocates a cautious approach to changing places of heritage significance. This conservative notion embodies the basic premise behind legislation designed to protect our heritage, which operates primarily at a state level.

Several Acts of parliament provide for the protection of heritage at various levels of government.

2.1.1 Commonwealth legislation

2.1.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water, provides a framework to protect nationally significant flora, fauna, ecological communities, and heritage places. The EPBC Act establishes both a National Heritage List and Commonwealth Heritage List of protected places. These lists may include Aboriginal cultural sites or sites in which Aboriginal people have interests. The assessment and permitting processes of the EPBC Act are triggered when a proposed activity or development could potentially have an impact on one of the matters of national environment significance listed by the Act. Ministerial approval is required under the EPBC Act for Modifications involving significant impacts to national/commonwealth heritage places.

2.1.1.2 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (ATSIHP Act) is aimed at the protection from injury and desecration of areas and objects that are of significance to Aboriginal Australians. This legislation has usually been invoked in emergency and conflicted situations.

Applicability to the Modification

It is noted there are no Commonwealth or National heritage listed places within the study area, and as such, the heritage provisions of the EPBC Act do not apply.

There is an application under Section 10 of the ATSIHP Act that overlaps with portions of the study area, referred to as *Notice of an application for the protection of a specified area, being the*

area known as the Mount Pleasant Operation mine and The Pocket, near Muswellbrook, New South Wales. The cultural values ascribed to the specified area are recognised but no information is available to suggest the relevant cultural values are tied to the study area.

2.1.2 State legislation

2.1.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) established requirements relating to land use and planning. The main parts of the EP&A Act that relate to development assessment and approval are Part 4 (development assessment) and Part 5 (environmental assessment). The purpose of the Part 5 assessment system is to ensure public authorities fully consider environmental issues before they undertake or approve activities that do not require development consent from a council or the Minister. The Minister responsible for the Act is the Minister for Planning.

The EP&A Act currently provides the primary legislative basis for planning and environmental assessment in NSW. The objectives of the EP&A Act include encouragement of:

- The proper management, development, and conservation of natural resources;
- The provision and coordination of the orderly and economic use and development of land;
- Protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats; and
- Ecologically sustainable development.

The objectives of the EP&A Act also provide for increased opportunity for public involvement and participation in environmental planning and assessment.

The EP&A Act includes provisions to ensure that the potential environmental impacts of a development or activity are rigorously assessed and considered in the decision-making process.

The framework governing environmental and heritage assessment in NSW is contained within the following parts of the EP&A Act:

- Part 4: Local government development assessments, including heritage. May include schedules of heritage items
    - Section 4.55(2) outlines the procedures to be undertaken for modifications to the consent of State Significant Developments.

Applicability to the Modification

The current Modification will be assessed under Section 4.55(2) of the EP&A Act.

As a modification to SSD-5170, if approved, Section 4.41 of the EP&A Act would apply and therefore an Aboriginal Heritage Impact Permit (AHIP) under section 90 of the *National Parks and Wildlife Act 1974* (NPW Act) to harm Aboriginal objects would not be required. Instead, all management related to Aboriginal cultural heritage within the study area would be governed by the policies within an approved ACHMP.

2.1.2.2 National Parks and Wildlife Act 1974

The NPW Act provides for the protection of Aboriginal objects (sites, objects, and cultural material) and Aboriginal places. Under the Act (Part 6), an Aboriginal object is defined as: any deposit, object, or material evidence (not being a handicraft for sale) relating to Aboriginal habitation of the area that comprises NSW, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction and includes Aboriginal remains.

An Aboriginal place is defined under the NPW Act as an area which has been declared by the Minister administering the Act as a place of special significance for Aboriginal culture. It may or may not contain physical Aboriginal objects.

It is an offence under Section 86 of the NPW Act to 'harm or desecrate an object the person knows is an Aboriginal object'. It is also a strict liability offence to 'harm an Aboriginal object' or to 'harm or desecrate an Aboriginal place', whether knowingly or unknowingly. Section 87 of the Act provides a series of defences against the offences listed in Section 86, such as:

- The harm was authorised by and conducted in accordance with the requirements of an AHIP under Section 90 of the Act;
- The defendant exercised 'due diligence' to determine whether the action would harm an Aboriginal object; and
- The harm to the Aboriginal object occurred during the undertaking of a 'low impact activity' (as defined in the regulations).

Under Section 89A of the Act, it is a requirement to notify the Secretary of the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) of the location of an Aboriginal object. Identified Aboriginal items and sites are registered on Aboriginal Heritage Information Management System (AHIMS) that is administered by Heritage NSW.

Applicability to the Modification

Any Aboriginal sites within the study area are afforded legislative protection under the NPW Act.

The Secretary of DCCEEW will be notified of the location of an Aboriginal object recorded by sending the relevant details to the AHIMS register.

2.2 ASSESSMENT APPROACH

The archaeological assessment followed the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (Code of Practice; DECCW 2010a).

The Aboriginal cultural heritage assessment followed the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (the Guide; OEH 2011) and the *Aboriginal cultural heritage consultation requirements for proponents* (ACHCRs) (DECCW 2010b).

2.3 PURPOSE AND OBJECTIVES

The purpose of this study is to identify and assess heritage constraints relevant to the proposed works.

The study has applied the Code of Practice, the Guide, and the ACHCRs in the completion of the Aboriginal cultural heritage assessment to meet the following objectives:

Objective One: Undertake background research on the study area to formulate a predicative model for site location within the study area;

Objective Two: Identify and record Aboriginal cultural heritage values within the study area. This includes intangible cultural values, Aboriginal objects, and any landforms likely to contain further archaeological deposits;

Objective Three: To assess the significance of any recorded Aboriginal cultural values, Aboriginal objects, or sites in consultation with RAPs; and

Objective Four: Assess the likely impacts of the proposed work to Aboriginal cultural heritage values and provide management recommendations.

2.4 REPORT COMPLIANCE WITH THE CODE OF PRACTICE

The Code of Practice establishes requirements that should be followed by all archaeological investigations where harm to Aboriginal objects may be possible. **Table 2-1** tabulates the compliance of this report with the requirements established by the Code of Practice.

Table 2-1: Report compliance with the Code of Practice.

Code of Practice Requirement	Context of the Requirement	Concordance in this report
Requirement 1a	Review previous archaeological work	**Section 5**
Requirement 1b	Review AHIMS searches	**Section 5.3.1**
Requirement 2	Review the landscape context	**Section 4**
Requirement 3	Summarise and discuss the local and regional character of Aboriginal land use and its material traces	**Section 5**
Requirement 4a	Develop predictive model	**Section 5.4.2**
Requirement 4b	Present predictive model results	**Section 5.4.3**
Requirement 5a	Archaeological survey sampling strategy	**Section 6.1**

Code of Practice Requirement	Context of the Requirement	Concordance in this report
Requirement 5b	Archaeological survey requirements	This Requirement was fulfilled during the undertaking of the survey
Requirement 5c	Archaeological survey units	**Section 6.2**
Requirement 6	Site definition	**Section 5.4.1**
Requirement 7a	Site recording information to be recorded	**Section 6.3**
Requirement 7b	Site recording: scales for photography	All artefact photographs employed a centimetre scale bar.
Requirement 8a	Geospatial information	All artefact locations were logged using a non-differential handheld GPS.
Requirement 8b	Datum and grid coordinates	All coordinates are provided in GDA (2020) Zone 56
Requirement 9	Record survey coverage data	**Section 6.2**
Requirement 10	Analyse survey coverage	**Section 6.2**
Requirement 11	Archaeological Report content and format	This report adheres to this Requirement.
Requirement 12	Records	OzArk undertakes to maintain all survey records for at least five years.
Requirement 13a	Notifying Heritage NSW of breaches	Not applicable
Requirement 13b	Providing Heritage NSW with information	Not applicable
Requirement 14	Test excavation which is not excluded from the definition of harm	The test excavation did not take place in any of the landforms identified in Requirement 14.
Requirement 15a	Consultation regarding test excavation	Not applicable
Requirement 15b	Developing a test excavation sampling strategy	A test excavation methodology was not required
Requirement 15c	Providing Heritage NSW with notification of the test excavation	Not applicable
Requirement 16a	Test excavation that can be carried out in accordance with the Code of Practice	Not applicable
Requirement 16b	Objects recovered during test excavations	Not applicable
Requirement 17	When to stop test excavations	Not applicable
Requirement 18–20	Artefact recording	The procedures for artefact recording were adhered to during the investigation.

2.5 DATE OF ARCHAEOLOGICAL ASSESSMENT

The field survey was undertaken by OzArk on the 12–13 February 2025.

2.6 OZARK INVOLVEMENT

2.6.1 Field survey

The fieldwork survey director was Harrison Rochford (OzArk Archaeologist, B Lib Studies [Hons] and M Phil [Arts and Social Science], University of Sydney).

2.6.2 Reporting

The reporting component of the heritage assessment was undertaken by:

- Report author: Harrison Rochford

- Contributor: Will Marris (OzArk Graduate Archaeologist, B Archaeological Practice Australian National University)
- Reviewer: Stephanie Rusden (OzArk Senior Archaeologist, BS University of Wollongong, BA University of New England).

3 ABORIGINAL COMMUNITY CONSULTATION

3.1 INTRODUCTION TO CULTURAL VALUES

No matter who you are, we all have culture. Each person's culture is important; it's part of what makes us who we are.

australianstogether.org.au

Many Aboriginal people in Australia have a unique view of the world that's distinct from the mainstream. Land, family, law, ceremony, and language are five key interconnected elements of Aboriginal culture. For example, families are connected to the land through the kinship system, and this connection to land comes with specific roles and responsibilities which are enshrined in the law and observed through ceremony. In this way, the five elements combine to create a way of seeing and being in the world that is distinctly Aboriginal.

Aboriginal and Torres Strait Islander peoples are connected to Country through lines of descent (paternal and maternal), as well as clan and language groups. Territory is defined by spiritual as well as physical links. Landforms have deep meaning, recorded in art, stories, songs, and dance. Songlines or Dreaming Tracks as well as kinship structures link Aboriginal peoples to the territories of other groups. In the past, these links were also used for trade.

Living on this land for more than 50,000 years, Aboriginal and Torres Strait Islanders established effective ways to use and sustain resources. One important aspect is the right of certain people to control the use of resources in a particular area, as well as cultural and spiritual values like totemism that were fundamental in resource management. There was a wide range of traditional methods for gathering food including fish traps, subsistence agriculture, hunting and harvesting a wide range of natural fruits and vegetables. Some groups of people would stay in one place, while others moved around the land according to the seasons, to ensure sustainable and rich food supplies, and to fulfil their spiritual and cultural obligations.

In much of eastern Australia, Aboriginal communities live their lives like most Australians. However, in certain crucial areas, particularly associated with family, leadership roles and caring for Country, Aboriginal lore continues, even in the most urbanised communities.

3.2 ABORIGINAL COMMUNITY CONSULTATION

A major aim of this assessment is to identify any cultural values within the landscape in which the Modification is located so that those values can be recognised and incorporated into the Modification's management recommendations.

The Aboriginal cultural heritage assessment of the Modification has followed the ACHCRs (DECCW 2010b). A log and copies of correspondence with Aboriginal community stakeholders is presented in **Appendix 1**.

The ACHCRs include four main stages, as detailed in the following sections.

3.2.1 ACHCRs Stage 1

Due to the time elapsed between consultation with the RAPs associated with prior assessments at Bengalla, the completion of the ACHCRs was started from Stage 1. Stage 1 aims to identify Aboriginal stakeholders who wish to be involved with consultation for the Modification.

An advertisement was placed in the *Singleton Argus* on 28 November 2024 to solicit expressions of interest (**Appendix 1 Figure 2**).

A letter seeking information from various agencies was sent on 12 December 2024 (**Appendix 1 Figure 3**). These agencies were: Heritage NSW; the Wanaruah Local Aboriginal Land Council (LALC); the Office of The Registrar, *Aboriginal Land Rights Act 1983*; the National Native Title Tribunal; Native Title Services Corporation Limited (NTSCORP); the Muswellbrook Shire Council; and Hunter Tablelands Local Land Services (**Appendix 1 Figure 3**).

Letters were sent to individuals and groups whose contact details had been provided by the government agencies (**Appendix 1 Figure 4**).

By the closing date for registration concerning this Modification, the following groups and individuals registered to be consulted as RAPs (**Table 3-1**).

Table 3-1: List of RAPs for the Modification.

Registered Aboriginal Parties	
D F T V Enterprises	Nunawanna Aboriginal Corporation
Didge Ngunawal Clan	Raiwyn Towney
Girragirra Murun Aboriginal Corporation	Stephen Matthews
Gomeroi Applicant	Steve Talbott
Gomery Cultural Consultants	Upper Hunter Wanaruah Council
Hunter Valley Aboriginal Corporation	Wallangan Cultural Services
Kawul Pty Ltd trading as Wonn1 Sites	Wanaruah LALC
Konanggo Aboriginal Cultural Heritage Services	Widescope Indigenous Group Pty Ltd
Mura Gadi Aboriginal Corporation	Wingarra Wilay Aboriginal Corporation
Murra Bidgee Mullangari Aboriginal Corporation	Yarrawalk Pty Ltd.
A1 Indigenous Services (late registration)	Muswellbrook Cultural Consultants (late registration)

3.2.2 ACHCRs Stage 2

The aim of Stage 2 is to provide information about the Modification proposal to the RAPs.

Detailed information on the Modification was provided in the assessment methodology that was issued to all RAPs for their consideration on 7 January 2025 (**Appendix 2**).

3.2.3 ACHCRs Stage 3

The aim of Stage 3 is to acquire information regarding Aboriginal cultural values associated with the Modification through RAP consultation and fieldwork.

To inform the RAPs of the assessment, an assessment methodology was issued to all RAPs for their consideration on 7 January 2025 (**Appendix 1 Figure 5**). This document provided the archaeological context of the study area, a description of the proposed survey, and asked whether there were any cultural values that should be considered in the assessment.

RAPs were provided the stipulated 28 days in which to review and comment on the assessment methodology as per Stage 3 of the ACHCRs. The closing date for comment was 5 February 2025.

Responses to the methodology were received from was received from Murra Bidgee Mullangari Aboriginal Corporation, Stephen Matthews, Mura Gadi Aboriginal Corporation, Andew Horton, A1 Indigenous Services, and Yarrawalk. These responses are provided in full in **Appendix 1 Figure 6**, with the exception of Yarrawalk, who requested that their response remain confidential. Responses from Mura Bidgee Mullangari Aboriginal Corporation, Stephen Mathews, Mura Gadi Aboriginal Corporation, Andrew Horton, and A1 Indigenous Services indicated support for the assessment methodology.

The field survey as per Stage 3 of the ACHCRs was undertaken with the assistance of RAP representatives over two days from 12 February 2025 to 13 February 2025.

Table 3-2 provides a log of the RAPs and their representatives who participated in fieldwork. Two representatives from the RAP groups were invited to participate each day in fieldwork. Invitations to participate in the assessment were extended to two other groups (Yarrawalk Pty Ltd and the Gomeroi Native Title Applicant), but they were unable to supply a site officer at the time of the survey.

Table 3-2: Aboriginal community involvement in the fieldwork.

Individual/group	Site officer	Day of participation
Kawul Pty Ltd trading as Wonn1 Sites	David Horton	12/2/25
Gomery Cultural Consultants	David Horton	13/2/25
Wanaruah LALC	Les Atkinson	13/2/25

3.2.4 ACHCRs Stage 4

Stage 4 involves the production of a draft ACHAR that is issued to all RAPs for their consideration. The ACHAR will document the results of the assessment, outline opportunities for the conservation of Aboriginal cultural values, and suggest recommendations for the management of Aboriginal objects should impacts to these objects be unavoidable.

A draft version of this ACHAR was distributed to the RAPs on 17 April 2025 with a closing date for feedback on 21 May 2025.

Mura Bidgee Mullangari Aboriginal Corporation provided endorsement for the report and its recommendation.

Gomery Cultural Consultants expressed that test excavation should be undertaken at the study area. OzArk called Gomery Cultural Consultants on 25 July 2025 to discuss their request for test excavation. Following the discussion on the need for test excavation in the study area discussed in **Section 6.5.2**, Gomery Cultural Consultants accepted that test excavation was not warranted in this instance and stated that they were happy with the draft ACHAR. The responses are provided as **Appendix 1 Figure 7**.

3.3 CULTURAL VALUES IDENTIFIED THROUGHOUT THE ACHCR PROCESS

No specific cultural values have been identified by the RAPs regarding the study area to date, however, the strong cultural values of Aboriginal communities towards landscapes and cultural heritage sites are recognised. This includes acknowledgement of the cultural values associated with the specified area of the Section 10 application under the ATSIHP Act that are identified in the vicinity of the study area.

If further input into the cultural values relevant to the study area are received in the Stage 4 consultation period, it will be added here.

4 LANDSCAPE CONTEXT

An understanding of the environmental context of a study area is requisite in any Aboriginal archaeological investigation (DECCW 2010a). It is a particularly important consideration in the development and implementation of survey strategies for the detection of archaeological sites. In addition, natural geomorphic processes of erosion and/or deposition, as well as human-activated landscape processes, influence the degree to which the remains of material culture are retained in the landscape as archaeological sites; and the degree to which they are preserved, revealed and/or conserved in present environmental settings.

4.1 TOPOGRAPHY AND HYDROLOGY

As characterised by Mitchell (2002) the study area is situated in the Central Hunter Foothills landscape unit, which is defined by its undulating lowlands, rounded to steep hills with rock outcrops on ridges of Permian lithic sandstone, conglomerate, shale and coal. The landscape unit has a general elevation of 40 to 300 metres (m) with a few higher peaks.

A small section of the study area is in the Upper Hunter Channels and Floodplain landscape unit, which is characterised by floodplains, channels and terraces with similar elevations of between 100 to 200 m (Mitchell 2022).

The topography of the study area is mostly slopes of a moderate gradient, with the highest point being 270 m Australian Height Datum (AHD) at the north of the study area, descending to 150 m AHD at the easternmost section of the study area (**Figure 4-1**).

There are no named or permanent waterways within study area (**Figure 4-1**). The nearest permanent waterway is the Hunter River, which is approximately 500 m south of the study area. There are several ephemeral drainage lines that intersect the study area.

Figure 4-1: Topography and hydrology of the study area.



4.1.1 Survey units

Based on the topography of the study area, survey units were identified to capture the major topographical features of the study area. The designation of survey units will allow a comparison of the archaeological potential of each major topographical feature within the study area to understand whether certain landform types are more likely to contain Aboriginal objects than others. Following the completion of the survey, the descriptions of the survey units were updated to more accurately reflect the landforms of the study area, as follows:

- Survey unit 1: Moderate slopes across most of the study area;
- Survey unit 2: Landforms within 50 m of the ephemeral drainage lines at the study area; and
- Unsurveyed area: Disturbed land in the existing road corridors of Bengalla Road, Roxburgh Road and Wyndham Arms Row.

Views of the survey units are shown on **Figure 4-2** and mapped on **Figure 4-3**.

Figure 4-2: Survey units of the study area



1. View west across a moderate slope at the north of the study area within survey unit 1.



2. View of an eroded gully within the drainage landform (survey unit 3).



3. View east along Wyndham Arms Row, an example of disturbed land within the study area.

Figure 4-3: Aerial of the study area showing the location of survey units.



4.2 GEOLOGY AND SOILS

Geology within the Hunter subregion of the Sydney Basin bioregion consists of a complex of Permian shales, sandstones, conglomerates, volcanics and coal measures (NPWS 2003). The subregion is bounded on the north by the Hunter thrust fault and on the south by cliffs of Narrabeen sandstone. Within the region, silcrete and mudstone are the primary source of stone tool materials (see **Section 5.2**). One known silcrete quarry location (site B10) is located 2.5 km to the east of the study area. The characteristics of this site are presented in **Section 5.3.1.2**.

Soil analysis has important ramifications for archaeological research through the potential impact of different soils on human activity (such as agricultural exploitation) and the impact of the soils on archaeological evidence (such as post-depositional movement).

Soils are comprised of a variety of harsh texture contrast soils on slopes and deep sandy loam alluvium on the valley floors. Soil salinity is common on some bedrocks in the upper catchment. Harsh texture contrast soil profiles are characterised by an abrupt change between the topsoil and subsoil, which can impact the movement of archaeological deposits through depositional processes (AECOM 2013:20-23). Roots and water infiltration can move archaeological materials, if present, from the upper layers of soil onto the denser B horizon earths.

4.3 VEGETATION

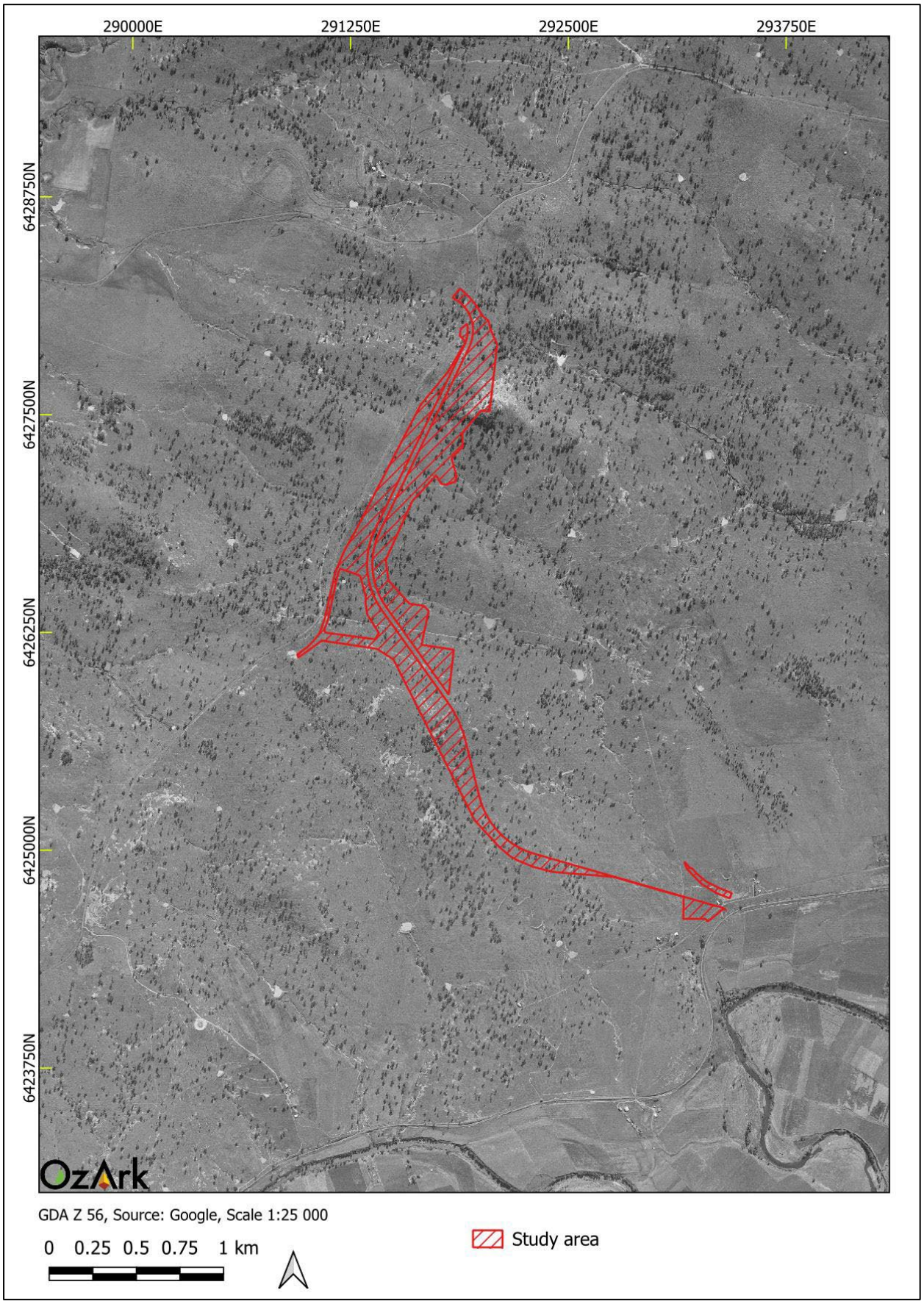
Vegetation within the Hunter subregion is comprised of forest and open woodland of white box, forest red gum, narrow-leaved ironbark, grey box and grey gum spotted gum, rough-barked apple and extensive of stands of swamp oak in the upper reaches and foothills (Mitchell 2002: 112). While there has been vegetation clearance, there are scattered trees across the study area.

4.4 LAND USE HISTORY AND EXISTING LEVELS OF DISTURBANCE

Within the study area, there a few locations that have been subject to observable agricultural and/or mining disturbances, with the exception of paddocks at the south of the study area that have been cultivated. Sections of the study area have been disturbed through the construction of Bengalla Road and Wyndham Arms Row.

Aerial imagery (see **Figure 4-4**) shows that most of the remnant vegetation was cleared prior to 1974, likely for pastoral land use. Most of the scattered trees in the study area are regrowth, although some isolated mature trees may be present.

Figure 4-4: 1974 aerial imagery of study area.



4.5 CONCLUSION

The review of the environmental factors associated with the study area allows the following conclusions to be drawn in terms past Aboriginal occupation:

- Topography and hydrology: the undulating landforms of the study area would not have presented an obstacle to habitation by Aboriginal people, however, there are limited resources available within the study area that would have encouraged long-term habitation. The absence of reliable waterways from the study area would have been a barrier to the establishment of long-term or large-scale campsites. As such, study area may have acted as a transit route between the Hunter River and other habitation locations nearer to reliable waterways at the margins of the valley.

- Geology and soils: The geology of most of the study area suggests that soft stone such as shale and sandstone are the most likely rock to be present across the study area, materials which are not durable to be used for stone tool manufacture. However, the study area 2.5 km west of the known silcrete source site B10 (see **Section 0**), indicating that sites associated with raw material procurement within the study area are more likely at this location. The erosional qualities of the soils present across the sloping landforms will have reduced the likelihood of any *in situ* archaeological deposits being present across the study area. Furthermore, the agricultural land use history of the study area is likely to have promoted soil erosion.

- Vegetation: the study area would have once supported an open woodland which would have provided some resources for Aboriginal subsistence in the past. However, resources likely to have supported a large population of people would have been present closer to the banks of more permanent water sources including the Hunter River. The broad-scale vegetation clearance which has taken place across the study area for agricultural purposes reduces the likelihood that any culturally modified trees remain present, however, should mature native vegetation remain, culturally modified trees may be present.

- Land use: ground surface disturbances such as vegetation clearance, cultivation, grazing and road construction are present within the study area. These activities have led to a consistent, even if minor in scale, disturbance to the artefact-bearing topsoil that have displaced Aboriginal objects and are likely to have reduced the potential for subsurface archaeological material. However, disturbance at a given location does not necessarily mean that there will be no cultural material present, as often a disturbed context will reveal objects which may have previously been subsurface.

5 ARCHAEOLOGICAL CONTEXT

5.1 ETHNO-HISTORIC SOURCES OF REGIONAL ABORIGINAL CULTURE

The ethnographic studies of Tindale (1974) and predecessors such as Howitt, Mathews and Fawcett place the study area within the traditional lands of the Wonnarua people. The Wonnarua language group is understood to have spanned the area between Maitland and the Great Dividing Range, although the boundaries between the Wonnarua and their neighbouring groups, the Gomeroi (west), Worimi and Awabakal (east), and Darkinjung (south) are likely to involved seasonal change and areas which multiple language groups occupied for economic and cultural exchange.

The Wonnarua people lived in an environment rich in food resources. Freshwater fish, shellfish, reptiles, mammals, birds and plant food provide a diverse diet (see Brayshaw 1981). Brayshaw (1986: 82) suggests that inland groups visited the coast during the summer when marine resources were plentiful, and coastal groups travelled inland to participate in the winter kangaroo hunts. Trade and/or exchange also occurred between the coastal and inland groups including visiting by coastal and inland groups for initiations and ceremonies seemed to occur. These were conducted within earthen circles. Carved trees were associated with these sites (Brayshaw 1981: 12). Reed spears and shells were traded inland for possum skin rugs and fur cord (Brayshaw 1986: 41).

5.2 REGIONAL ARCHAEOLOGICAL CONTEXT

There have been a significant number of Aboriginal archaeological investigations of the Upper Hunter region. An accepted occupation model for the region was developed following extensive archaeological investigation related to the *Salvage of Aboriginal archaeological sites in relation to the F3 Freeway near Lenegans Drive, Black Hill, New South Wales* (Kuskie and Kamminga 2000). Their model applies to the Central Lowlands region of the Hunter Valley in which the study area is situated (see also ERM 2004:12). The model is shown on **Figure 5-1**.

The landscape of the study area applies to the first three expected occupations patterns: transit, hunting, and small group camps. In terms of the archaeological sites that might be expected to remain from these activities, the archaeological profile of the Central Lowlands region of the Upper Hunter Valley (ERM 2004: 52–4) indicates that:

- Archaeological sites that are not artefact scatters or isolated finds (e.g. quarries, scared trees, art sites) are rare.
- Open artefact sites (over 98% of the compiled data set) are concentrated along major creeks and the Hunter River, contexts which are more likely to contain sites than slopes and ridges.

- The predominant materials noted in artefact assemblages are silcrete and indurated mudstone/tuff (IMT).

Figure 5-1: Occupation model for the Central Lowlands and Lower Hunter Valley (Kuskie and Kamminga 2000).

Occupation pattern	Activity location	Proximity to water	Proximity to food resources	Archaeological expectations
Transitory movement	All landscape zones, but frequently on ridge and spur crests, watercourses and valley flats	Not important	Not important	Assemblages of low density and diversity Evidence of tool maintenance and repair Knapping
Hunting and/or gathering without camping	All landscape zones	Not important	Near food source	Assemblages of low density and diversity Evidence of tool maintenance and repair High frequency of used tools discarded Knapping
Camping by small parties	Frequently associated with permanent or temporary water	Nearby	Near food source	Assemblages of low-moderate density and diversity Evidence of tool maintenance and repair Hearths
Nuclear family base camp	Level or gently undulating ground	Nearby reliable source	Near food source	Assemblages of high density and diversity Evidence of tool manufacture and casual knapping Facilities such as heat treatment pits and stone lined ovens Grindstones present
Community base camp	Level or gently undulating ground	Nearby reliable source	Near food source	Assemblages of high density and diversity Evidence of tool manufacture and casual knapping Facilities such as hearths and stone lined ovens Grindstones and ochre present Evidence of heat treatment unlikely Large area >100 m^2 with isolated campsites

5.3 LOCAL ARCHAEOLOGICAL CONTEXT

5.3.1 Desktop database searches conducted

A desktop search was conducted on the following databases to identify any previously recorded heritage within the study area. The results of this search are summarised in **Table 5-1** and presented in detail in **Appendix 3**.

Table 5-1: Aboriginal cultural heritage: desktop-database search results.

Name of Database Searched	Date of Search	Type of Search	Comment
Commonwealth Heritage Listings	12/12/24	Muswellbrook LGA	No places listed on either the National or Commonwealth heritage lists are located within the study area.
National Native Title Claims Search	12/12/24	NSW	Sections of the study area are within the Gomeroi People native title claim area (NC2011/006, NSD37/2019).
AHIMS	12/12/24	Two searches covering a 1.5 x 1.5 km area centred on the study area.	29 valid and partially destroyed sites within the search area, five sites within the study area.
Local Environmental Plan (LEP)	12/12/24	Muswellbrook LEP of 2009	None of the Aboriginal places noted occur near the study area.
Federal Register of Legislation	7/1/2025	ATSIHP Act	There is an application under Section 10 of the ATSIHP Act 1984 that overlaps part of the study area: *Notice of an application for the protection of a specified area, being the area known as the Mount Pleasant Operation mine and The Pocket, near Muswellbrook, New South Wales.*

5.3.1.1 AHIMS search results

Two searches of the Heritage NSW administered AHIMS database on 12 December 2024 returned 137 results for Aboriginal sites within approximately 1.5 km of the study area (GDA 2020 Zone 56 Eastings: 293448–2961350, Northings: 6424651–6427058 and Datum GDA Zone 56, Eastings: 290884–293549, Northings: 6424565–6428337). **Table 5-2** presents site types and frequencies of the search results.

The AHIMS results reflect the very high level of archaeological assessment that has taken place surrounding the study area at Bengalla. All the sites within the search area include surface artefact manifestations, as scatters of undefined quantity or isolated finds. The quarry site (B10, 37-2-0579) is the only other site type present within the search area.

Of the 137 sites within the search area, only 29 remain valid or partially destroyed. **Figure 5-2** shows the distribution of all sites in relation to the study area. Site B10 (37-2-0579) is visible as the blue triangle **Figure 5-2**, which also shows a valid site in an area of high disturbance.

Table 5-2: Site types and frequencies of AHIMS sites near the study area.

Site Type	Number	% Frequency
Artefact site	106	77.37%
Isolated find	29	21.17%
Not a site	1	0.73%
Quarry and artefact site	1	0.73%
Total	**137**	**100**

There are five AHIMS sites within the study area, listed in **Table 5-3**. The AHIMS sites within the study area are shown on **Figure 5-3**.

Table 5-3: AHIMS sites located within study area.

AHIMS ID	Site name	Status
37-2-2092	BMRA6	Destroyed
37-2-4452	BM-AS 20-12	Valid
37-2-4472	BM - IA 14-12	Valid
37-2-4473	BM - IA 15-12	Valid
37-2-6578	Wyndham Arms Row IF-01	Valid

Figure 5-2: Location of previously recorded AHIMS sites in relation to the study area.

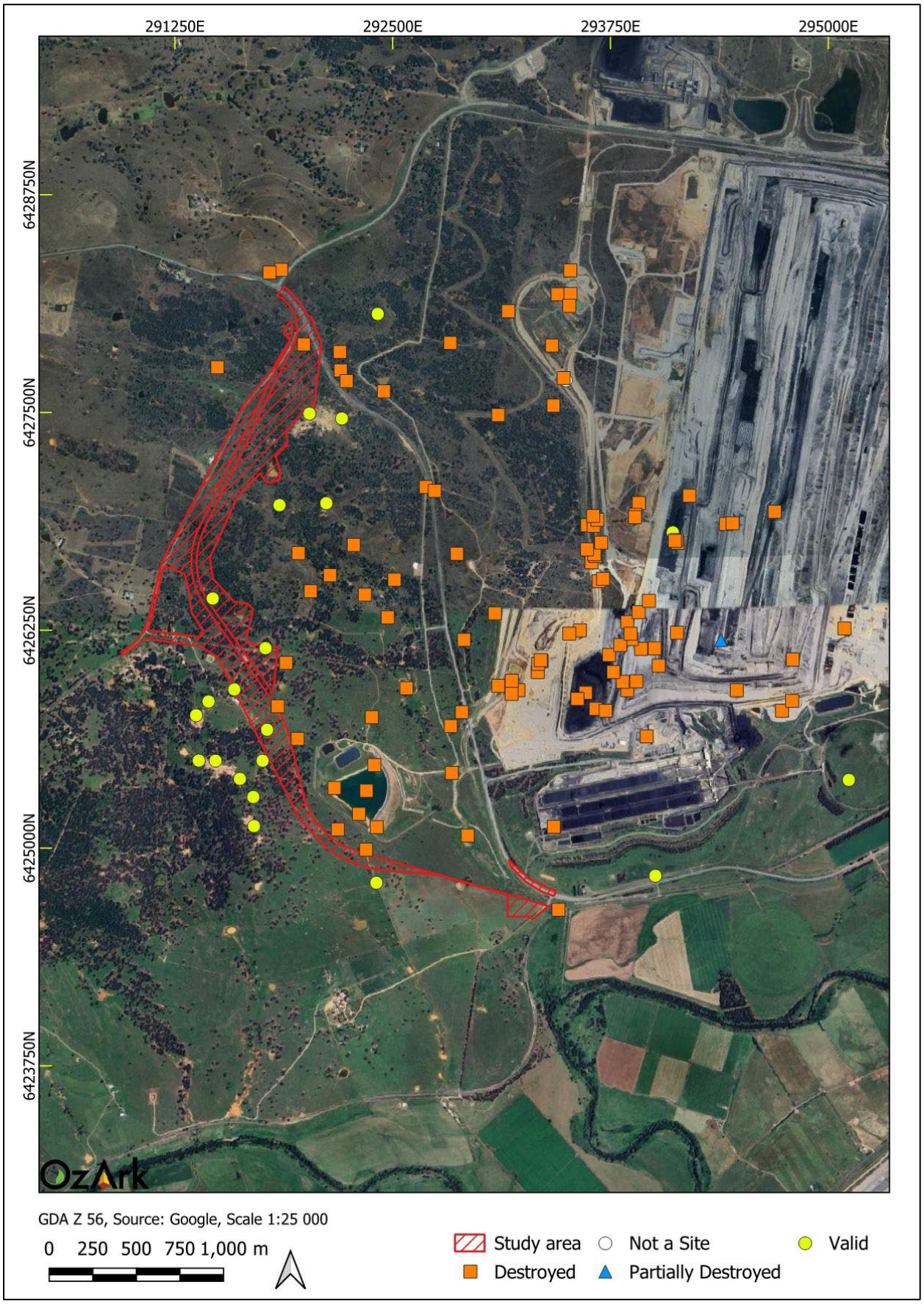
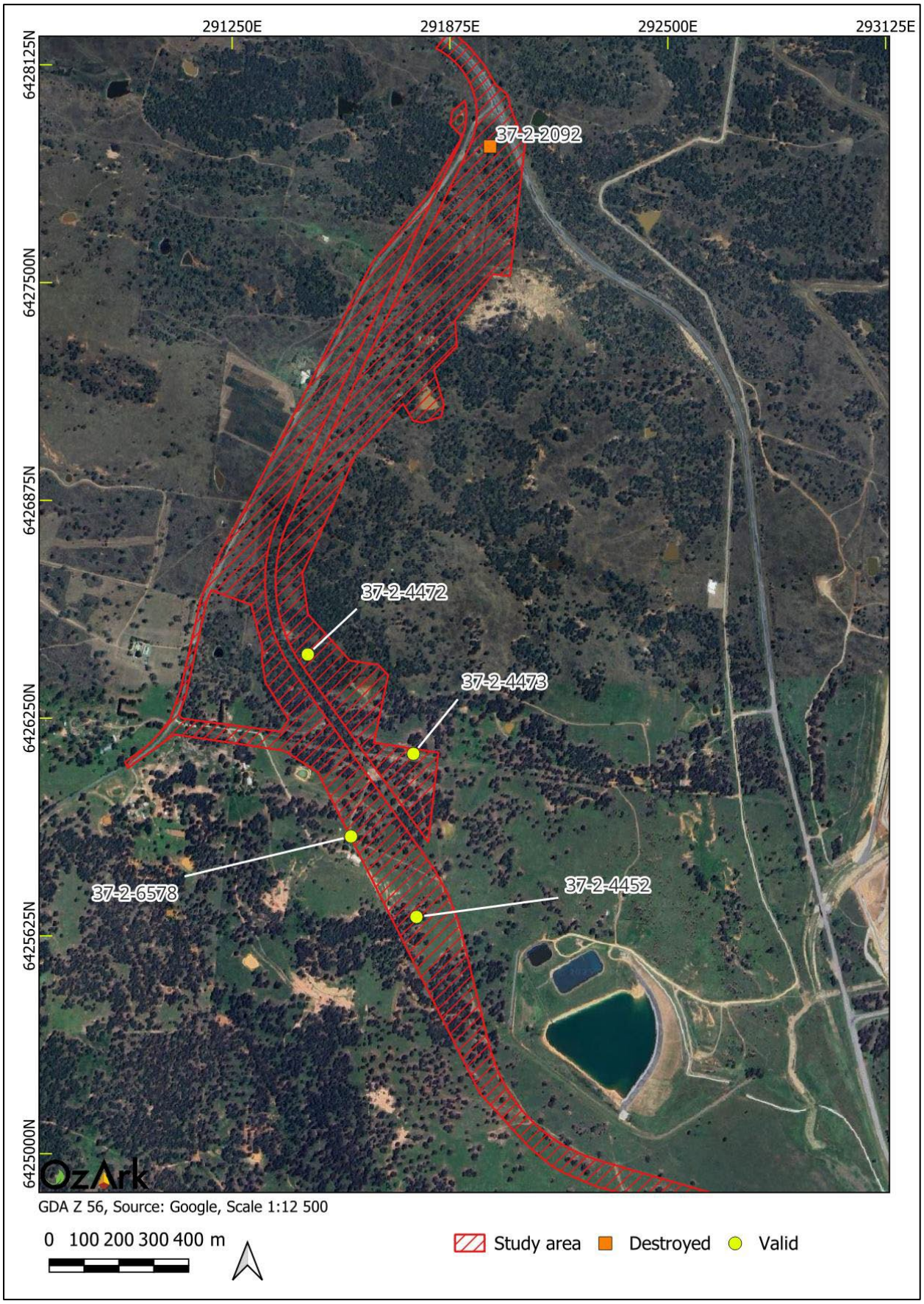


Figure 5-3: AHIMS sites within the study area.



Previous studies in or near the study area

The study area has been subject to archaeological assessment in the past. The assessment initially undertaken for Bengalla and the construction of Bengalla Road by Rich (1993) covered sections of the study area and led to further investigations (White 1998 and AECOM 2015), although no key areas of these investigations are within the current study area. The AECOM (2013) assessment for the Continuation of Bengalla Mine included the current study area.

5.3.1.2 Studies at the main Bengalla site

Rich (1993) assessed the pre-2013 project boundary for Bengalla, extending from Wybong Road in the north to the rail line in the south, in addition to the current alignment of BLR. A total of 56 sites were recorded across all the landform types in the assessment area. The sites comprised 39 artefact scatters and 17 isolated finds. One of the scatters, site B10 (37-2-0579), was also associated with a silcrete quarry and a substantial subsurface deposit, which was further investigated by White (1998) and test excavations at the site recovered 4,454 artefacts. The assemblage featured large source flakes of the tertiary silcrete gravels present alone the ridgeline and demonstrated features of quarrying, as well as isolated knapping events of other stone or petrified wood materials. This central section of the B10 site was destroyed under AHIP 2621, which also established a conservation area to the north which became known as the Northern Exclusion Zone (NEZ).

The NEZ section of site B10, was situated on low hills and creek flats associated with Dry Creek, approximately 2.5 km east of the study area. Approximately 115 square metres (m^2) of the NEZ was excavated (AECOM 2016), recording 48 artefacts. The results were interpreted as a background scatter of artefacts associated with the central area of B10 and no evidence of quarrying or intact knapping events was observed (AECOM 2016).

The southern section of the large B10 site extent has not been impacted by mining operations at Bengalla and remains a conservation area under the ACHMP (Hansen Bailey 2017).

5.3.1.3 Studies within the study area

The main section of the study area was surveyed in 2013 for the continuation of operations at Bengalla (AECOM 2013). The AECOM (2013) assessment recorded 54 previously unrecorded sites, which were compiled with previously recorded sites at Bengalla to form a total of 289 sites within their assessment area. Artefact sites comprise 98% of the 289 sites analysed for the assessment (145 artefact scatters and 139 isolated finds). No sites at the western section of the study area were recorded with potential for subsurface deposits.

AECOM (2013) analysed the spatial distribution of Aboriginal occupation across the landscape by plotting individual artefact locations (rather than grouping artefacts into ‘sites’). It was found that 87% of objects (n=962) were identified within 100 m of a creek line and that 74.8% of these

objects were within 50 m. Most objects (81%, n= 885) were situated on lower slope landforms, with only 6% (n=70) recorded on hilltop, ridge, and crest landforms. No modified trees were identified by AECOM (2013) and one previously investigated quarry site was revisited.

While the results support the assumption that Aboriginal habitation and use of the landscape includes most landform types, it was concluded that areas of repeated or larger-scale usage show a strong tendency to be close to water (within 100 m) (AECOM 2013: 67–8).

5.4 PREDICTIVE MODEL FOR SITE LOCATION

Across Australia, numerous archaeological studies in widely varying environmental zones and contexts have demonstrated a high correlation between the permanence of a water source and the permanence and/or complexity of Aboriginal occupation. Site location is also affected by the availability of and/or accessibility to a range of other natural resources including plant and animal foods, stone and ochre resources and rock shelters, as well as by their general proximity to other sites/places of cultural/mythological significance. Consequently, sites tend to be found along permanent and ephemeral water sources, along access or trade routes, or in areas that have good flora/fauna resources and appropriate shelter.

In formulating a predictive model for Aboriginal archaeological site location within any landscape it is also necessary to consider post-depositional influences on Aboriginal material culture. In all but the best preservation conditions very little of the organic material culture remains of ancestral Aboriginal communities survives to the present. Generally, it is the more durable materials such as stone artefacts, stone hearths, shells, and some bones that remain preserved in the current landscape. Even these, however, may not be found in their original depositional context since these may be subject to either (a) the effects of wind and water erosion/transport, both over short- and long-time scales, or (b) the historical impacts associated with the introduction of European farming practices including grazing and cropping, land degradation, and farm related infrastructure. Scarred trees, due to their nature, may survive for up to several hundred years but rarely beyond.

5.4.1 Site types in the region of the study area

The site types listed in **Table 5-4** are present in the region of the study area. The likelihood of these sites being present in the study area is discussed in **Section 5.4.3**.

Table 5-4: Site types recorded in the region of the study area.

Site type	Site description
Isolated finds	May be indicative of random loss or deliberate discard of a single artefact, the remnant of a now dispersed and disturbed artefact scatter, or an otherwise obscured or subsurface artefact scatter. They may occur anywhere within the landscape but are more likely to occur in topographies where open artefact scatters typically occur.
Open artefact scatters	Artefact scatters are defined as two or more artefacts, not located within a rock shelter, and located no more than 50 metres away from any other constituent artefact. This site type may occur almost anywhere that Aboriginal people have travelled and may be associated with hunting and gathering

Site type	Site description
	activities, short- or long-term camps, and the manufacture and maintenance of stone tools. Artefact scatters typically consist of surface scatters or sub-surface distributions of flaked stone discarded during the manufacture of tools but may also include other artefactual rock types such as hearth and anvil stones. Less commonly, artefact scatters may include archaeological stratigraphic features such as hearths and artefact concentrations which relate to activity areas. Artefact density can vary considerably between and across individual sites. Small ground exposures revealing low density scatters may be indicative of a background scatter rather than a spatially or temporally distinct artefact assemblage. These sites are classed as 'open', that is, occurring on the land surface unprotected by rock overhangs, and are sometimes referred to as 'open camp sites'. Artefact scatters are most likely to occur on level or low gradient contexts, along the crests of ridgelines and spurs, and elevated areas fringing watercourses or wetlands. Larger sites may be expected in association with permanent water sources. Topographies which afford effective through-access across, and relative to, the surrounding landscape, such as the open basal valley slopes and the valleys of creeks, will tend to contain more and larger sites, mostly camp sites evidenced by open artefact scatters.
Culturally modified trees	Aboriginal scarred trees contain evidence of the removal of bark (and sometimes wood) in the past by Aboriginal people, in the form of a scar. Bark was removed from trees for a wide range of reasons. It was a raw material used in the manufacture of various tools, vessels, and commodities such as string, water containers, roofing for shelters, shields and canoes. Bark was also removed because of gathering food, such as collecting wood boring grubs or creating footholds to climb a tree for possum hunting. Due to the multiplicity of uses and the continuous process of occlusion (or healing) following removal, it is difficult to accurately determine the intended purpose for any example of bark removal. Scarred trees may occur anywhere old growth trees survive. The identification of scars as Aboriginal cultural heritage items can be problematical because some forms of natural trauma and European bark extraction create similar scars. Many remaining scarred trees probably date to the historic period when bark was removed by Aboriginal people for both their own purposes and for roofing on early European houses. Consequently, the distinction between European and Aboriginal scarred trees may not be clear.
Quarry sites	Typically consist of exposures of stone material where evidence for human collection, extraction and/or preliminary processing has survived. Typically, these involve the extraction of siliceous or fine grained igneous and meta-sedimentary rock types for the manufacture of artefacts. The presence of quarry/extraction sites is dependent on the availability of suitable rock formations.

5.4.2 Landform modelling of archaeological potential

The large number of archaeological studies undertaken within the vicinity of the study area provides information to obtain a sound understanding of the nature and distribution of archaeological sites within the area. Although there is some conjecture about the relationship between stream order, site numbers and densities, the general pattern is that most sites are present close to watercourse (Kuskie and Kamminga 2000).

As the study area is intersected by ephemeral drainage lines, there is potential that artefact sites could be associated with these features despite high levels of erosion across the landscape. However, it is noted that the study area has been surveyed before, and it the results indicate that the sites associated with these ephemeral drainage lines are generally low-density artefact scatters and isolated finds.

5.4.3 Conclusion

Based on knowledge of the environmental contexts of the study area and a desktop review of the known local and regional archaeological record, the following predictions are made concerning the probability of landforms within the study area to contain Aboriginal objects (**Table 5-5**). **Table 5-4** provides the site definitions for sites recorded near the study area and **Table 5-6** assesses the likelihood of them being present within the study area.

Table 5-5: Likelihood of landforms within the study area to contain Aboriginal objects.

Survey Unit	Landform type	Likelihood to contain Aboriginal objects
1	Moderate slopes	Moderate slopes are a degrading landform, especially in the study area where vegetation removal has accelerated soil loss. These landforms are not suited to large-scale or repeated occupation and Aboriginal objects recorded in such landforms are likely to be in a secondary context. The exception is in localised flat benches or sections of gentle slopes, if they are present, where occupation may have been more suitable.
2	Drainage	Landforms immediately adjacent to waterways generally have increased archaeological potential as they provide reliable access to water. While the ephemeral waterways of the study area are not expected to have provided consistent access to water in the past, the presence of water in some environmental conditions may have attracted habitation or game for hunting.

Table 5-6: Likelihood of certain site types being present in the study area.

Site type	Likelihood of being present in the study area
Isolated finds	As isolated finds can occur anywhere, particularly within disturbed contexts, it is predicted that this site type could be recorded within the study area.
Open artefact scatters	As most of the study area is within moderately sloping landforms distant to permanent water, this site type is not predicted to be common. However, in flat or ridge landforms this site type is possible although the moderate degree of disturbance in the study area will probably mean that the scatter has become displaced. It is likely that any sites associated with such landforms are likely to have a low artefact density and a low complexity of tool types as the sites are either one-off events or only infrequently used. It is noted that the study area already has recorded artefact scatters. and this raises the possibility that the area contains further sites of this type.
Modified trees	Modified trees are possible wherever mature vegetation remains. There is little mature vegetation remaining within the study area and there are no modified tree recordings in the vicinity of the study area, suggesting that the likelihood of this site type being present is low.
Quarries	As a known site complex with quarry features is present near 2.5 km east of the study area this site type could be present if there is outcropping rock. It is considered unlikely in the study area which is distant to site B10.

The regional archaeological context presented in **Section 5.2** states that artefacts, specifically open scatters are the most common site type within the region and are most likely to be found along major creeks and the Hunter River. Artefact densities are most likely to be found near water and tend to be comprised of assemblages of silcrete and indurated mudstone/tuff (IMT).

Previous research from the study area indicates that stone artefact site types are the most likely site type and all other site types are unlikely. Sites are more likely to be present within the moderate to gentle slope and drainage landforms than steep slopes landforms, in accordance with the results of Rich (1993) and AECOM (2013).

5.5 RESEARCH QUESTIONS

Several research questions can meaningfully be applied to the investigation of the study area. These research questions include:

- What resources were available to the Aboriginal people using the land within the study area (food, stone and water) and what resources were transported to the area?
- What tasks were Aboriginal people undertaking at the sites?
- Are there outcropping rock materials present suitable for stone tool procurement and manufacture?

- Is there evidence to suggest that Aboriginal people were using the area earlier than the mid to late Holocene? Can dates be obtained for the Aboriginal use of the area?
- Establish how the findings within the study area (if any) accord with the regional archaeological context examined in **Section 5.2**?
- Do the survey results support the predictive model outline in **Section 5.4**?

6 RESULTS OF ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

6.1 SAMPLING STRATEGY AND FIELD METHODS

The survey of the study area was completed over two days (12 and 13 February 2025). Standard archaeological field survey and recording methods were employed in this study (Burke & Smith 2004). As outlined in the assessment methodology for the Modification (**Appendix 2**), full pedestrian survey was completed across all landforms not subject to high levels of disturbance. The coverage of the survey team is shown on **Figure 6-1**.

6.2 EFFECTIVE SURVEY COVERAGE

Two of the key factors influencing the effectiveness of archaeological survey are ground surface visibility (GSV) and ground surface exposure (GSE). These factors are quantified to ensure that the survey data provides adequate evidence for the evaluation of the archaeological materials across the landscape. For the purposes of the current assessment, these terms are used in accordance with the definitions provided in the Code of Practice.

GSV is defined as:

> *… the amount of bare ground (or visibility) on the exposures which might reveal artefacts or other archaeological materials. It is important to note that visibility, on its own, is not a reliable indicator of the detectability of buried archaeological material. Things like vegetation, plant or leaf litter, loose sand, stone ground or introduced materials will affect the visibility. Put another way, visibility refers to 'what conceals'* (DECCW 2010: 39).

GSE is defined as:

> *… different to visibility because it estimates the area with a likelihood of revealing buried artefacts or deposits rather than just being an observation of the amount of bare ground. It is the percentage of land for which erosion and exposure was sufficient to reveal archaeological evidence on the surface of the ground. Put another way, exposure refers to 'what reveals'* (DECCW 2010: 37).

Table 6-1 calculates the effective survey coverage within the study area. In general, **Table 6-1** presents an approximation of the amount of ground surface able to be seen at any location within specific landform units. Across all survey units, exposure of the ground surface was generally low, restricted to tracks, some erosion scalds and around the base of trees. Within the moderate and steep slopes survey units, visibility within the exposures was limited by leaf litter and natural shale gravels. Within the drainage survey unit, however, exposures were often in more extensive erosion scalds or disturbances (dams and contour banks), which provided higher levels of GSV.

Table 6-1: Effective survey coverage within the study area.

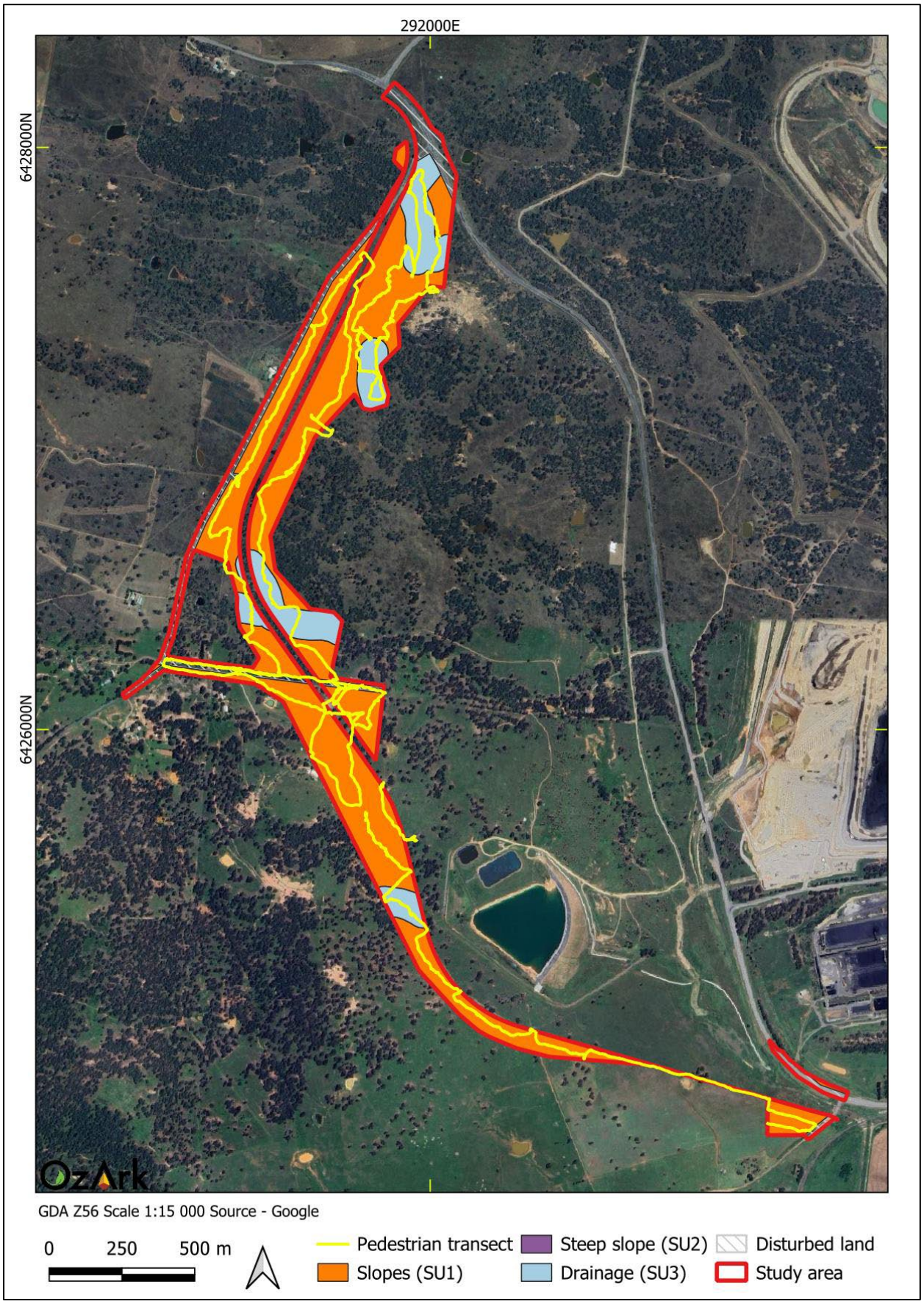
Survey Unit	Landform	Survey Unit Area (sq m)	Exposure %	Visibility %	Effective Coverage Area (sq m)	Effective Coverage %
1	Moderate slopes	54 6095	5	30	8191.425	1.5
2	Drainage	12 7674	5	60	3830.22	3

Table 6-2 analyses how effective survey coverage is related to the identification of Aboriginal sites. Three Aboriginal sites were identified in the moderate slopes survey unit, and one was identified within the drainage survey unit. As the levels of effective survey coverage across survey unit 1 and 2 are similar, the discrepancy between the number of sites identified is more likely to be a function of the larger area of the survey unit 1.

Table 6-2: Effective survey coverage and incidences of site recording.

Survey u\Unit	Landform	Landform area (sq m)	Area Effectively Surveyed	% of Landform Effectively Surveyed	Number of Sites	Number of Artefacts or Features
1	Moderate slopes	54 6095	8 191.43	1.5	3	7
2	Drainage	12 7674	3 830.22	3	1	1

Figure 6-1: Survey coverage across the study area.



6.3 ABORIGINAL SITES RECORDED

Four previously unrecorded Aboriginal sites were identified during the assessment, comprising one artefact scatter and three isolated finds. The location of the sites is shown on **Figure 6-2**.

Figure 6-2: Location of the sites recorded within the study area.

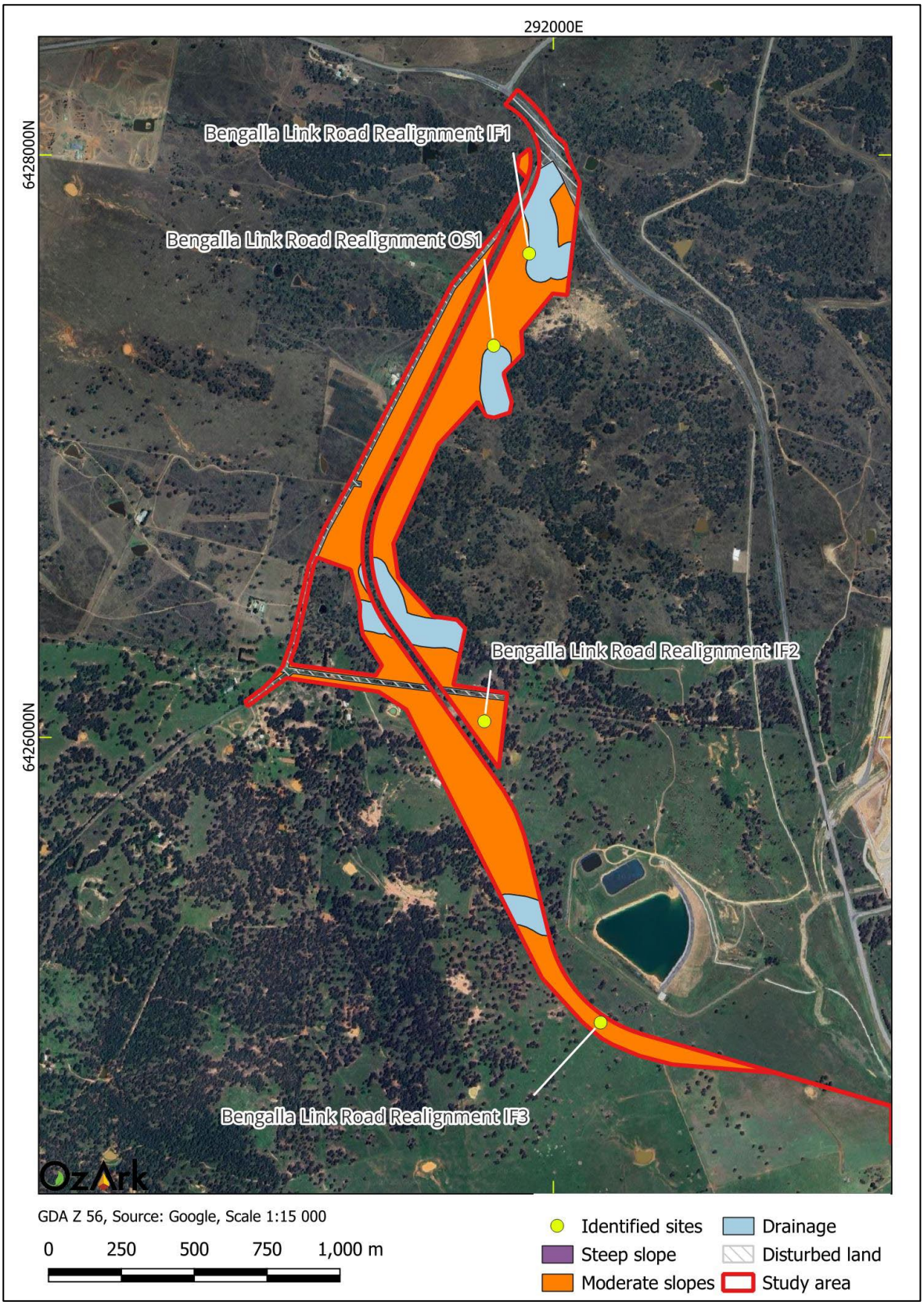


Table 6-3 summarises the four sites recorded. Further details on each site follows.

Table 6-3: Aboriginal cultural heritage sites recorded during the survey.

AHIMS ID	Site name	Site type	Coordinates (GDA Zone 56) East	Coordinates (GDA Zone 56) North	Survey Unit
37-2-6708	Bengalla Link Road Realignment OS1	Artefact scatter	291795	6427344	1
37-2-6709	Bengalla Link Road Realignment IF1	Isolated find	291917	6427661	3
37-2-6710	Bengalla Link Road Realignment IF2	Isolated find	291763	6426055	11
37-2-6711	Bengalla Link Road Realignment IF3	Isolated find	292162	6425020	1

37-2-6708 (Bengalla Link Road Realignment OS1)

Site type: Artefact scatter

GPS coordinates: GDA 2020 Zone 56 291795E 6427344N

Location of site: The site is located 680 m south of the intersection of Roxburgh Road and Bengalla Road, 9.3 km west of Muswellbrook. The location of the site is shown on **Figure 6-2**.

Description of site: Bengalla Link Road Realignment OS1 is located across an erosion scald that spans an undulating slope landform and small eroded gully. The site is 12 x 7 m and consists of five artefacts, all manufactured from mudstone. The objects include three flakes, a piece of angular shatter and a blade. The details of the artefacts are provided in **Table 6-4**.

GSV at the site was low outside the exposure (approximately 5%) but moderate within the exposure at 60%. Vegetation at the site comprises scattered trees with an understory of low grasses and weeds. The potential for subsurface deposits associated with the site is low due to the sloping landform, high levels of erosion and the distance from reliable water.

Table 6-4: Bengalla Link Road Realignment OS1 artefact attributes.

Artefact type	Raw material	Artefact integrity	Stage of reduction	Size (LxWxD) mm
Blade	Mudstone	Distal fragment	Tertiary	16x7x3
Flake	Mudstone	Proximal fragment	Secondary	27x25x9
Flake	Mudstone	Complete	Tertiary	8x7x3
Flake	Mudstone	Proximal fragment	Tertiary	22x12x9
Angular shatter	Mudstone	Not applicable	Tertiary	55x25x11

Figure 6-3: Bengalla Link Road Realignment OS1. View of site and selection of recorded artefacts.



1. View west across of Bengalla Link Road Realignment OS1.



2. A selection of artefacts from Bengalla Link Road Realignment OS1.

37-2-6709 (Bengalla Link Road Realignment IF1)

Site type: Isolated find

GPS coordinates: GDA 2020 Zone 56 291917E 6427661N

Location of site: The site is located 300 m south of the intersection of Roxburgh Road and Bengalla Road, 9.3 km west of Muswellbrook. The location of the site is shown on **Figure 6-2**.

Description of site: Bengalla Link Road Realignment IF1 is located on a sloping landform adjacent to an ephemeral drainage line. The site consists of a large silcrete flake. The details of the artefact are provided in **Table 6-5**.

GSV at the site was low outside the small exposure on which the object was recorded (5%). Vegetation at the site comprises scattered trees with an understory of low grasses and weeds. The potential for subsurface deposits associated with the site is low due to the sloping landform and its shallow, stony soil profile.

Table 6-5: Bengalla Link Road Realignment IF1 artefact attributes.

Artefact type	Raw material	Artefact integrity	Stage of reduction	Size (LxWxD) mm
Flake	Silcrete	Complete	Secondary	65x53x17

Figure 6-4: Bengalla Link Road Realignment IF1. View of site and the artefact.



1. View south to the location of Bengalla Link Road Realignment IF1.



2. The silcrete flake at Bengalla Link Road Realignment IF1.

37-2-6710 (Bengalla Link Road Realignment IF2)

Site type: Isolated find

GPS coordinates: GDA 2020 Zone 291763E 6426055N

Location of site: The site is located 700 m east of the intersection of Roxburgh Road and Wyndham Arms Row, 9.3 km west of Muswellbrook. The site is shown on **Figure 6-2**.

Description of site: Bengalla Link Road Realignment IF2 is located on a contour bank across a gentle slope landform. The site consists of a broken mudstone flake (**Table 6-6**).

GSV at the site was low outside of the area disturbed by the past contour bank earthworks the exposure (5%). Vegetation at the site is clear but the site is surrounded by ironbark regrowth. The potential for subsurface deposits associated with the site is low due to the high levels of disturbance at the site location.

Table 6-6: Bengalla Link Road Realignment IF2 artefact attributes.

Artefact type	Raw material	Artefact integrity	Stage of reduction	Size (LxWxD) mm
Flake	Mudstone	Proximal fragment	Secondary	25x21x9

Figure 6-5: Bengalla Link Road Realignment IF2. View of site and the artefact.



1. View southeast across of Bengalla Link Road Realignment IF2 showing the excavated depression and the contour bank (left of frame).



2. The recorded flake at Bengalla Link Road Realignment IF2.

37-2-6711 (Bengalla Link Road Realignment IF3)

Site type: Artefact scatter

GPS coordinates: GDA 2020 Zone 56 292162E 6425020N

Location of site: The site is located 1.2 km west of the intersection of Old Bengalla Road and Bengalla Road, 9.3 km west of Muswellbrook. The location of the site is shown on **Figure 6-2**.

Description of site: Bengalla Link Road Realignment IF3 is located on a small erosion scald approximately 30 m south of an unsealed track along a gently sloping landform. The site consists of the proximal end of a retouched mudstone blade (**Table 6-7**).

GSV at the site was moderate with multiple scalds across the landform offering exposure (approximately 10%) with moderate visibility within the exposures (30%). Vegetation at the site comprises scattered trees with an understory of low grasses and weeds. The potential for subsurface deposits associated with the site is low due to high levels of erosion and the distance of the site from reliable water.

Table 6-7: Bengalla Link Road Realignment IF3 artefact attributes.

Artefact type	Raw material	Artefact integrity	Stage of reduction	Size (LxWxD) mm
Blade	Mudstone	Proximal fragment	Tertiary	26x14x11

Figure 6-6: Bengalla Link Road Realignment IF3. View of site and artefact.

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>1. View south at Bengalla Link Road Realignment IF3.</td><td>2. View of the blade at Bengalla Link Road Realignment IF3.</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>3. Detail of the retouched margin of the blade</td><td>4. View of the dorsal surface shown retouch along the margin (left)</td></tr>
</table>

6.4 PREVIOUSLY RECORDED ABORIGINAL SITES LOCATED

The locations of four previously recorded sites were inspected to groundtruth their coordinates and conditions within the study area. **Table 6-8** summarises the previously recorded sites.

Table 6-8: Previously recorded sites visited during the survey.

Site ID	Site Name	GDA 2020 Zone 56 Easting	GDA 2020 Zone 56 Northing	Site type	Comment	Photo (2025)
37-2-4452	BM-AS 20-12	291779	6425680	Artefact scatter	The site consists of a small artefact scatter (three artefacts, mudstone and silcrete) at the centre of the study area. No artefacts were visible despite decent GSV (20%). Exclusion fencing is intact.	 View south to the site 37-2-4452 exclusion zone.
37-2-4472	BM - IA 14-12	291467	6426433	Isolated find	The site consists of a single silcrete core located adjacent to an ephemeral drainage line at the centre of the study area. The object was not visible within its exclusion fencing during the survey, but the location information is accurate.	 View south to the site 37-2-4472 exclusion zone.

Site ID	Site Name	GDA 2020 Zone 56 Easting	GDA 2020 Zone 56 Northing	Site type	Comment	Photo (2025)
37-2-4473	BM - IA 15-12	291770	6426148	Isolated find	The site consists of a mudstone/tuff flake located on a track at the centre of the study area. The object was not visible within its exclusion fencing during the survey, but the location information is accurate.	 View east at the location of site 37-2-4473
37-2-6578	Wyndham Arms Row IF-01	291591	6425911	Isolated find	The site consists of a silcrete flake located adjacent to a track at the centre of the study area. The object was not visible within its exclusion fencing during the survey, but the location information is accurate.	 View south to the 37-2-6578 exclusion zone.

6.5 SUMMARY OF SURVEY RESULTS

Four previously unrecorded Aboriginal sites (an artefact scatter and three isolated finds) were identified during the assessment of the study area. A further four previously recorded sites relevant to the study area were visited by the survey team. The previously recorded sites consist of three isolated finds and an artefact scatter.

6.5.1 Discussion

The results of the survey conform to the well-tested predictive model for the Central Lowlands section of the Hunter Valley and Bengalla, in particular. The predictive model anticipated that large sites were unlikely to be present within the study area due to the absence of reliable waterways. The identification of a low-density artefact scatter and isolated finds conforms to this expectation.

More sites were identified within the moderate slopes survey unit than the drainage survey unit, which was not anticipated in the predictive model. This unexpected result can be attributed to the larger area of survey unit 1 (slopes). The raw materials of the recorded artefacts (mudstone and silcrete) are consistent with the expected site characteristics typical of the region. Most identified artefacts had been broken in some way, with this low level of artefact integrity reflecting the expected agricultural impacts to the landscape within the study area.

6.5.2 Subsurface potential

The sites identified within the study area are located on sloping landforms distant to reliable water that have been significantly affected by erosion and soil loss. In the study area, the sites and landforms have low potential to be associated with intact archaeological deposits of conservation value.

6.5.3 Responses to the research questions

In **Section 5.5**, several research questions were advanced to guide the survey of the study area. Following the survey, responses to these research questions are set out below.

- What resources were available to the Aboriginal people using the land within the study area (food, stone and water) and what resources were transported to the area?
    - The study area does not appear to have provided reliable access to water resources in most conditions in the past, suggesting that the available resources at the study area are likely to have been limited to game and plant-based food and medicine.
    - While there is no evidence of stone tool procurement sites within the study area, the known silcrete quarry complex at B10 is 2.5 km east.
- What tasks were Aboriginal people undertaking at the sites?

  - The habitation model for the Central Lowlands of the Upper Hunter Valley indicates the low-density artefact sites and isolated finds of the study area are consistent with transit and resource gathering activities that have left a disperse archaeological footprint.

- Are there outcropping rock materials present suitable for stone tool procurement and manufacture?
  - Outcropping rock noted at the study area was observed to be brittle shale or sandstone, materials not suitable for tool manufacture. However, the proximity to quarry complex B10 consisting of silcrete, 2.5 km to the east of the study area is noted.

- Is there evidence to suggest that Aboriginal people were using the area earlier than the mid to late Holocene? Can dates be obtained for the Aboriginal use of the area?
  - No datable evidence was identified during the assessment.

- Establish how the findings within the study area (if any) accord with the regional archaeological context examined in **Section 5.2**.
  - The findings of the assessment are consistent with habitation model for the region that expected low-density artefact sites indicative of transit or resource gathering-type activities.

- Do the survey results support the predictive model outline in **Section 5.4**.
  - Yes, although it should be noted that the identified sites are relatively evenly distributed across the survey units, rather than any concentration along the ephemeral drainage lines of the study area being recorded.

7 SIGNIFICANCE ASSESSMENT

7.1 INTRODUCTION TO SIGNIFICANCE ASSESSMENT

7.1.1 Identifying cultural significance

The concept of cultural significance is used in Australian heritage practice and legislation to encompass all the cultural values and meanings that might be recognised in a place. The Burra Charter's definition of cultural significance is broad and encompasses places that are significant to Indigenous cultures.

The Burra Charter definition of 'place' is also broad and encompasses Indigenous places of cultural significance. 'Place' includes locations that embody spiritual value (such as Dreaming places, sacred landscapes, and stone arrangements), social and historical value (such as massacre sites), as well as scientific value (such as archaeological sites). In fact, one place may be all these things or may embody all these values at the same time.

In some cases, the find-spot of a single artefact may constitute a 'place'. Equally, a suite of related locations may together comprise a single 'place', such as the many individual elements that make up a Songline. These more complex places are sometimes called a cultural landscape or cultural route.

The Guide notes that cultural significance is comprised of an assessment of social values, scientific values, aesthetic values, and historic values. These values are described below.

7.1.1.1 Social or cultural value

Social or cultural value refers to the spiritual, traditional, historical, or contemporary associations and attachments the place or area has for Aboriginal people. Social or cultural value is how people express their connection with a place and the meaning that place has for them (Articles 1.1, 1.2, 1.12, 5, and 8–11: Burra Charter).

Places of social or cultural value have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods, or events. Communities can experience a sense of loss should a place of social or cultural value be damaged or destroyed.

There is not always consensus about a place's social or cultural value. Because people experience places and events differently, expressions of social or cultural value do vary and, in some instances, will be in direct conflict. When identifying values, it is not necessary to agree with or acknowledge the validity of each other's values, but it is necessary to document the range of values identified.

Social or cultural value can only be identified through consultation with Aboriginal people. This could involve a range of methodologies, such as cultural mapping, oral histories, archival

documentation, and specific information provided by Aboriginal people specifically for the investigation.

Cultural value involves both traditional links with specific areas, as well as an overall concern by Aboriginal people for their sites generally and the continued protection of these. This type of value may not be in accord with interpretations made by the archaeologist: a site may have low archaeological value but high social value, or vice versa.

7.1.1.2 Scientific (archaeological) value

This refers to the importance of a landscape, area, place or object because of its rarity, representativeness, and the extent to which it may contribute to further understanding and information (Articles 1.2, 5, and 8: Burra Charter).

Assessing a site in this context involves placing it into a broader regional framework, as well as assessing the site's individual merits in view of current archaeological discourse. This type of value relates to the ability of a site to answer current research questions and is also based on a site's condition (integrity), content and representativeness.

The overriding aim of cultural heritage management is to preserve a representative sample of the archaeological resource. This will ensure that future research within the discipline can be based on a valid sample of the past. Establishing whether a site can contribute to current research also involves defining 'research potential'. Questions regularly asked when determining significance are: can this site contribute information that no other site can? Is this site representative of other sites in the region?

Information about scientific values will be gathered through any archaeological investigation undertaken. Archaeological investigations must be carried out according to Heritage NSW’s Code of Practice.

Often scientific values are informed by social values that allow a contemporary understanding of the archaeological data to be understood.

7.1.1.3 Aesthetic value

This refers to the sensory, scenic, architectural, and creative aspects of the place (Articles 1.12 and 8: Burra Charter). It is often closely linked with the social values. It may consider form, scale, colour, texture and material of the fabric or landscape, and the smell and sounds associated with the place and its use.

7.1.1.4 Historic value

Historic value refers to the associations of a place with a historically important person, event, phase, or activity in an Aboriginal community. Historic places do not always have physical

evidence of their historical importance (such as structures, planted vegetation or landscape modifications). They may have 'shared' historic values with other (non-Aboriginal) communities (Articles 1.12–1.16: Burra Charter).

Places of post-contact Aboriginal history have generally been poorly recognised in investigations of Aboriginal heritage. Consequently, the Aboriginal involvement and contribution to important regional historical themes is often missing from accepted historical narratives. This means it is often necessary to collect oral histories along with archival or documentary research to gain enough understanding of historic values.

7.2 ASSESSED SIGNIFICANCE OF THE RECORDED SITES

Table 7-1 presents a summary of the significance assessment of Aboriginal cultural heritage sites recorded during this assessment. Further details of each of the assessment criteria are provided below.

Social or Cultural Value

The social and cultural value of Aboriginal sites is generally determined through consultation with Aboriginal people. Generally, the Aboriginal community regard all sites as having high cultural significance. No specific comments describing the social or cultural value of the identified sites within the study area was supplied by the RAP site officers present during the survey or the Stage 4 consultation window. However, the significance of all sites is understood to be high and that all artefacts contribute to the cultural landscape.

Archaeological/Scientific Value

In general, the archaeological value of the sites within the study area has been significantly affected by disturbances to the landscape. The condition of most sites is poor due to erosion, and soil conservation and water retention earthworks, which have compromised the distribution of both artefacts within sites and of sites across the landscape.

Aesthetic Value

No sites within the study area present elements that meet the threshold for significant aesthetic value. The study area has been modified by agricultural activities and borders large-scale mining areas. No individual artefacts have been assessed as having aesthetic significance as the skills involved in their manufacture are not appreciable by a layperson, even the items of higher technical quality such as the retouched blade at Bengalla Link Road Realignment IF3.

Historic Value

The identified Aboriginal sites within the study area do not have known associations with significant historical values.

Table 7-1: Aboriginal cultural heritage: significance assessment.

AHIMS ID	Site Name	Social or Cultural Value	Archaeological / Scientific Value	Aesthetic Value	Historic Value
37-2-6708	Bengalla Link Road Realignment OS1	High	Low	Low	None
37-2-6709	Bengalla Link Road Realignment IF1	High	Low	Low	None
37-2-6710	Bengalla Link Road Realignment IF2	High	Low	Low	None
37-2-6711	Bengalla Link Road Realignment IF3	High	Low	Low	None
37-2-4452	BM-AS 20-12	High	Low	Low	None
37-2-4472	BM - IA 14-12	High	Low	Low	None
37-2-4473	BM - IA 15-12	High	Low	Low	None
37-2-6578	Wyndham Arms Row IF-01	High	Low	Low	None

7.2.1 Statement of significance

The intangible Aboriginal cultural values across the Hunter Valley wider district relate to several important places and themes associated with non-archaeological cultural values. These places relate to spiritual and ceremonial connections across the broader landscape that may encompass areas of culturally significant geographical features, such as the Hunter River and songlines following prominent peaks along the ranges at the margins of the valley.

There may be places with intangible cultural significance within the study area, although no specific locations have so far been identified by the Aboriginal community.

The recorded sites within the study area have a low scientific value due to low artefact density and poor site condition, which both lead to a limited potential for the sites to contribute to key questions concerning the archaeology and Aboriginal use of the Hunter Valley.

There are no places within the study area with significant aesthetic or historical values.

8 ASSESSING HARM

8.1 AVOIDING AND MINIMISING HARM

8.1.1 Conserving significant Aboriginal cultural heritage

An object of the NPW Act is the '*conservation of objects places and features… of cultural value within the landscape, including… places, objects and features of significance to Aboriginal people*' (s.2A(1(b)(i)).

As heritage professionals, OzArk, strives for good conservation outcomes. In particular, OzArk is primarily concerned with the conservation and protection of Aboriginal cultural heritage that is of significance to Aboriginal people.

Two primary objectives when managing harm to an Aboriginal object are:

- Impacts to significant Aboriginal objects and places should always be avoided wherever possible; and
- Where impacts to Aboriginal objects and places cannot be avoided, Modifications should be amended to reduce the extent and severity of impacts to significant Aboriginal objects and places using reasonable and feasible measures.

8.1.2 Opportunities to conserve Aboriginal cultural heritage values

It is anticipated that eight sites within the study area will be impacted by the Modification. Conservation of Aboriginal cultural heritage values will be pursued through the mitigation of the likely harm in consultation with the RAPs for the Modification.

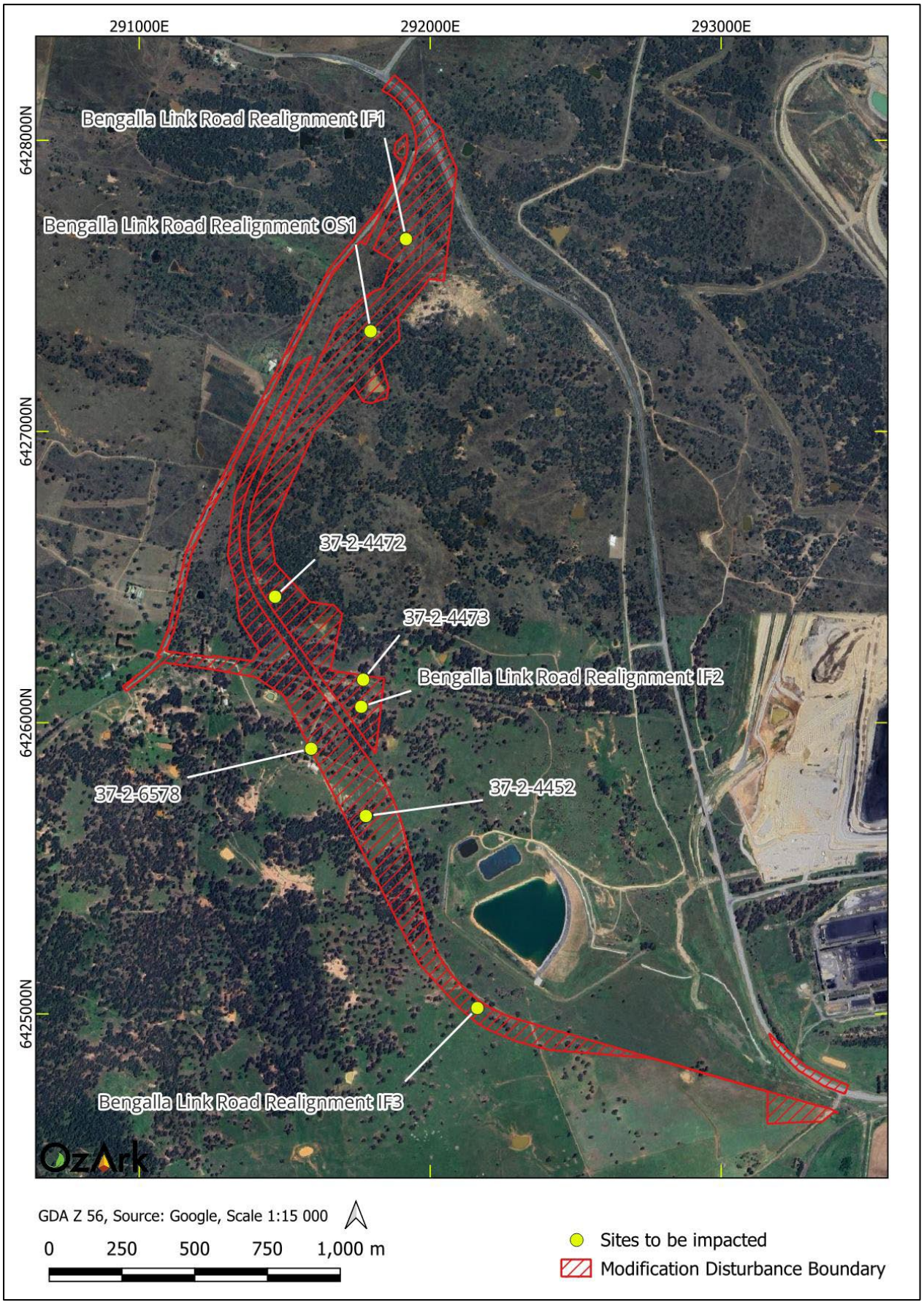
8.2 LIKELY IMPACTS TO ABORIGINAL HERITAGE FROM THE MODIFICATION

Table 8-1 presents a summary of potential impacts to Aboriginal cultural heritage associated with the Modification. The location of the sites in relation to the proposed disturbance area for the Modification is shown on **Figure 8-1**.

Table 8-1: Aboriginal cultural heritage: impact assessment.

AHIMS	Site Name	Type of Harm (Direct/Indirect / None)	Degree of Harm (Total/Partial / None)	Consequence of Harm (Total/Partial/No Loss of Value)
37-2-6708	Bengalla Link Road Realignment OS1	Direct	Total	Total
37-2-6709	Bengalla Link Road Realignment IF1	Direct	Total	Total
37-2-6710	Bengalla Link Road Realignment IF2	Direct	Total	Total
37-2-6711	Bengalla Link Road Realignment IF3	Direct	Total	Total
37-2-4452	BM-AS 20-12	Direct	Total	Total
37-2-4472	BM - IA 14-12	Direct	Total	Total
37-2-4473	BM - IA 15-12	Direct	Total	Total
37-2-6578	Wyndham Arms Row IF-01	Direct	Total	Total

Figure 8-1: Sites in relation to the proposed Modification Disturbance Boundary.



8.3 ECOLOGICALLY SUSTAINABLE DEVELOPMENT PRINCIPLES

Ecologically sustainable development principles (ESD) (defined in s.6 of the *Protection of the Environment Administration Act 1991*) requires the integration of economic and environmental considerations (including cultural heritage) in the decision-making process. Regarding Aboriginal cultural heritage, ESD can be achieved by applying the principle of intergenerational equity and the precautionary principle.

8.3.1 Intergenerational equity

Intergenerational equity is the principle whereby the present generation should ensure the health, diversity, and productivity of the environment for the benefit of future generations.

In terms of Aboriginal heritage, intergenerational equity can be considered in terms of the cumulative impacts to Aboriginal objects and places in a region. If few Aboriginal objects and places remain in a region (for example, because of impacts under previous permits), fewer opportunities remain for future generations of Aboriginal people to enjoy the cultural benefits of those Aboriginal objects and places.

Information about the integrity, rarity or representativeness of the Aboriginal objects and places proposed to be impacted, and how they illustrate the occupation and use of land by Aboriginal people across the region, will be relevant to the consideration of intergenerational equity and the understanding of the cumulative impacts of the Modification.

Where there is uncertainty, the precautionary principle should also be followed.

8.3.2 The precautionary principle

The precautionary principle states that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

In relation to Aboriginal cultural heritage values, the precautionary principle should be applied if:

- The Modification involves a risk of serious or irreversible damage to Aboriginal objects or places or to the value of those objects or places; and
- There is uncertainty about the Aboriginal cultural heritage values or scientific or archaeological values, including in relation to the integrity, rarity or representativeness of the Aboriginal objects or places proposed to be impacted.

8.3.3 Principle of Integration

The Plan of Implementation of the World Summit on Sustainable Development held in Johannesburg, 2002, noted the need to "*promote the integration of the three components of sustainable development- economic development, social development and environmental protection- as interdependent and mutually reinforcing pillars*".

The principle of integration ensures mutual respect and reciprocity between economic and environmental considerations:

- Environmental considerations are to be integrated into economic and other development plans, programs, and projects; and
- Development needs are to be considered in applying environmental objectives.

8.3.4 Applicability to the Modification

There is a low impact to Aboriginal cultural heritage values as very few Aboriginal sites were recorded, and no intangible heritage values have been identified within the study area. The results of the surface survey indicate that sites of significant archaeological value will not be harmed within the study area.

Table 8-2 examines the application of ESD principles to the Modification.

Table 8-2: Application of ESD principles to the Modification.

ESD principle	Response
Avoiding and minimising harm	**Section 9** sets out mechanisms by which to avoid and minimise harm.
The integration principle	The Modification has considered the environmental impact of the development. While there will be harm to the Aboriginal cultural values of the study area, no sites with high scientific value will be harmed. The loss of cultural values will be mitigated through appropriate management of the sites in consultation with the RAPs.
The precautionary principle	The Aboriginal cultural heritage investigation has followed the precautionary principle though undertaking a robust Aboriginal cultural heritage assessment to ensure that harm to Aboriginal objects and values is minimised. The survey adopted a precautionary principle when it came to describing and assessing landforms within the survey areas.
The intergenerational equity principle	The Modification will result in a minor contribution to the diminution of the archaeological record of Aboriginal use of the landscape within the study area. While the loss of sites in the landscape removes their potential to be present for future cultural or educational use, a salvage program will take place to ensure as much information is gained prior to sites being harmed and that the artefacts themselves will be available for future use by the Aboriginal community, should they so wish.

9 MANAGEMENT OF ABORIGINAL CULTURAL HERITAGE SITES

9.1 GENERAL MANAGEMENT PRINCIPLES

Appropriate management of cultural heritage items is primarily determined based on their assessed significance as well as the likely impacts of the Modification. **Section 7.2** and **Section 8.2** describe, respectively, the significance / potential of the recorded sites and the likely impacts of the Modification. The following management options are general principles, in terms of best practice and desired outcomes, rather than mitigation measures against individual site disturbance.

- Avoid impact by altering the Modification to avoid impact to a recorded Aboriginal site. If this can be done, then a suitable curtilage around the site must be provided to ensure its protection both during the short-term construction phase of development and in the long-term use of the area. If plans are altered, care must be taken to ensure that impacts do not occur to areas not previously assessed.

- If impact is unavoidable then approval to disturb sites following the policies of an approved ACHMP must be sought from DPHI under the SSD approval relevant for the Modification.

9.2 MANAGEMENT AND MITIGATION OF RECORDED ABORIGINAL SITES

It is proposed that the anticipated harm to eight Aboriginal sites within the Modification Disturbance Boundary be mitigated through the completion of a community collection program prior to the impacts related to the Modification.

Section 6 of the current ACHMP for the Bengalla outlines appropriate procedures for surface salvage of archaeological sites. However, a standard methodology is presented here as the ACHMP specifically refers to the sites that have since been previously salvaged under the conditions of the ACHMP.

9.2.1 Community collection

It is recommended that the eight sites within the study area be salvaged through the recording and collection of the surface artefacts, prior to construction works proceeding. This recommendation is made due to:

- The cultural value of these sites and their importance to the Aboriginal community;
- The nature of the impacted sites (low-density artefact scatters and isolated finds);
- The sites being in landforms with high levels of previous disturbance low subsurface potential;
- The low archaeological value assigned to the sites precludes more intensive archaeological investigations; and

- Sites such as these have a limited ability to further inform the community about the history and culture of the area. While any potential research questions are limited, some information can nevertheless be gained.

The recommended methodology for the salvage will be finalised after the approvals process, but will include the following measures:

1. The visible artefacts will be flagged in the field;
2. The site will be photographed after flagging and before recording;
3. The following artefact information will be recorded for each artefact:
    - Location
    - Artefact class
    - Artefact type
    - Size
    - Reduction level
    - Raw material.
4. A selection of artefacts, particularly any formal tool types, will be photographed;
5. A salvage report will be completed within 12 months of the salvage to record the results of the salvage; and
6. An Aboriginal Site Impact Recording Form (ASIRF) will be submitted by the archaeologist to the AHIMS database detailing the salvage process at the site.

9.2.2 Procedure for previously unrecorded Aboriginal objects and / or suspected skeletal remains

The procedures to be followed in the event of previously unrecorded Aboriginal objects or suspected human skeletal remains being encountered within the study area are outlined in Section 7 of the Bengalla ACHMP. These policies are provided in **Appendix 4** and **Appendix 5**, respectively.

9.2.3 Long term management of salvaged Aboriginal objects

Objects from previous salvage programs at Bengalla are held on site in a secure location. It is proposed that the objects recovered from the salvage associated with the Modification also be retained on site. Section 6.6 of the ACHMP also provides allowance for RAPs to access the objects for appropriate cultural purposes.

10 RECOMMENDATIONS

Recommendations concerning Aboriginal cultural values within the study area are as follows:

1. The Modification may proceed with without further archaeological investigation provided that all impacts remain within the Modification Disturbance Boundary.
2. Following the granting of development consent for the Modification, the proponent will update the current Bengalla ACHMP. The ACHMP updates will specify:
    a. The surface community collection program completed for the eight sites within the proposed disturbance area following the methodology proposed in **Section 9.2.1**.
    b. Procedures to be followed if unanticipated finds or suspected human remains are encountered during work. The current procedures in the Bengalla ACHMP are provided in **Appendix 4** and **Appendix 5**, respectively.
    c. The long-term management of Aboriginal objects recovered from the salvage program. It is recommended that these objects be held with the other objects salvaged over the life of Bengalla as per Section 6.6 of the current Bengalla ACHMP.
    d. Relevant BMC employees and contractors will undertake Aboriginal cultural heritage awareness training to ensure they have a general awareness and understanding of Aboriginal culture, and how Aboriginal sites are protected under the NPW Act.

REFERENCES

AECOM 2013 — AECOM Australia Pty Ltd. 2013. *Bengalla Continuation of Mining Project: Aboriginal Archaeological and Cultural Heritage Impact Assessment.* A report prepared for the Bengalla Mining Company.

AECOM 2016 — AECOM Australia Pty Ltd. 2016. *Bengalla Continuation of Mining Project: Aboriginal Archaeological Salvage Program*. Report to Bengalla Mining Company.

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DECCW 2010a — *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. Department of Environment, Climate Change and Water 2010.

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Kuskie and Kamminga 2000 — Kuskie, P. and Kamminga, J. 2000. *Salvage of Aboriginal archaeological sites in relation to the F3 Freeway near Lenegans Drive, Black Hill, New South Wales.* Report to the Roads & Traffic Authority, NSW.

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Rich 1993 — Rich, E. 1993. *Proposed Bengalla Coal Mine, Muswellbrook NSW: Archaeological Survey for Aboriginal Sites.* Report to Wayne Perry and Associates.

White 1998 White, E. (1998). *Archaeological Salvage of Site B10 & B33 Bengalla Mine, Hunter Valley, NSW.* Unpublished report for Bengalla Mining Company.

APPENDIX 1: COMMUNITY CONSULTATION

Appendix 1 Figure 1: Aboriginal Consultation Log.

Date	Organisation	Comment	Method
22.11.24	Singleton Argus	Catherine Burrowes (CB) Emailed - newspaper is printed on a Thursday… will be published on 28.11.24 - Closing Date 12.12.24"	Phone/email
28.11.24	Heritage NSW	CB sent stage 1 agency letter requesting potential stakeholders. Closing Date 12.12.24	Email
28.11.24	Wanaruh LALC	CB sent stage 1 agency letter requesting potential stakeholders. Closing Date 12.12.24	Email
28.11.24	Office of The Registrar, ALRA	CB sent stage 1 agency letter requesting potential stakeholders. Closing Date 12.12.24	Email
28.11.24	National Native Title Tribunal	CB sent stage 1 agency letter requesting potential stakeholders. Closing Date 12.12.24	Email
28.11.24	NTSCORP	CB sent stage 1 agency letter requesting potential stakeholders. Closing Date 12.12.24	Email
28.11.24	Muswellbrook Shire Council	CB sent stage 1 agency letter requesting potential stakeholders. Closing Date 12.12.24	Email
28.11.24	The Hunter Local Land Services	CB sent stage 1 agency letter requesting potential stakeholders. Closing Date 12.12.24	Email
29.11.24	Upper Hunter Wannarua Council	Eleanore Martin (EM) received call registering for the project	Phone
1.12.24	Wanaruah LALC	CB received email registering for the project	Email
1.12.24	Wanaruah LALC	CB replied with thanks	Email
5.12.24	Gomeroi Applicant	CB received email registering for the project	Email
5.12.24	Gomeroi Applicant	CB replied with thanks	Email
13.12.24	A1 Indigenous Services	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Aboriginal Native Title Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	AGA Services	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Aliera French Trading	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Bathurst Local Aboriginal Land Council	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Cacatua Culture Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Corroboree Aboriginal Corporation	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Culturally Aware	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	D F T V Enterprises	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Deslee Talbott Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Didge Ngunawal Clan	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Gidawaa Walang & Barkuma Neighbourhood Centre Inc.	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Gilay Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email

Date	Organisation	Comment	Method
13.12.24	Glen Morris	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Gomery Cultural Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Hunter Traditional Owner	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Hunter Valley Aboriginal Corporation	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Hunters & Collectors	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Indigenous Learning	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Jarban & Mugrebea	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Jumbunna Traffic Management Group Pty Ltd	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Kamilaroi Yankuntjatjara Working Group	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Kawul Pty Ltd trading as Wonn1 Sites	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Kevin Duncan	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Konanggo Aboriginal Cultural Heritage Services	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Lower Hunter Aboriginal Incorporated	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Lower Hunter Wonnarua Cultural Services	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Murra Bidgee Mullangari Aboriginal Corporation	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Myland Cultural & Heritage Group	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Nunawanna Aboriginal Corporation	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Robert Syron	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Steve Talbott	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	The Men's Shack Indigenous Corporations	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Thomas Dahlstrom	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Scott Franks on the behalf of the Wonnarua PBC	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Yarrawalk Pty Ltd	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Warragil Cultural Services	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	WATTAKA Pty Ltd	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Widescope Indigenous Group	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Wonnarua Nation Aboriginal Corporation	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email

Date	Organisation	Comment	Method
13.12.24	Wurrumay Culture Heritage Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Girragirra Murun Aboriginal Corporation	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Wingarra Wilay Aboriginal Corporation	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Gali Heritage Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Long Gully Cultural Services	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Guthers Aboriginal Corporation	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Mura Gadi Aboriginal Corporation	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Stephen Matthews	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Ngagga Ngagga	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Cindy Foley	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Aliera French Trading	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Bawurra Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Cacatua Cultural Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	D F T V Enterprises	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Deslee Talbott Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Gidawaa Walang Cultural Heritage Consultancy	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Hunter Valley Aboriginal Corporation	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Kauwul (trading as Wonn1 Contracting)	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Myland Cultural & Heritage Group	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Ungooroo Aboriginal Corporation	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Wallangan Cultural Services	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Wanaruah Local Aboriginal Land Council	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Warragil Cultural Services	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Wattaka Wonnarua Culture Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Widescope Indigenous Group Pty Ltd	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Yinarr Cultural Services	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Email
13.12.24	Crimson-Rosie	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Lower Wonnaruah Tribal Consultancy Pty Ltd	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post

Date	Organisation	Comment	Method
13.12.24	Wonnarua Culture Heritage	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Wonnarua Elders Council	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Aboriginal T/O Surveys	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Breeza Plains Culture and Heritage Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Bunda Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Hunter Valley Cultural Surveying	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Indigenous Outcomes	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Kawul Cultural Services	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Roger Noel Matthews Consultancy	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	T & G Culture Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Upper Hunter Heritage Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Upper Hunter Wonnarua Council	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Waabi Gabinya Cultural Consultancy	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Warul Consultants	CB sent stage 1 Community letter requesting potential stakeholders. Closing Date 3.1.25	Post
13.12.24	Gomery Cultural Consultants	CB received email registering for the project	Email
13.12.24	Nunawanna Aboriginal Corporation	CB received email registering for the project	Email
13.12.24	Stephen Matthews	CB received email registering for the project	Email
13.12.24	Yarrawalk Pty Ltd	CB received email registering for the project	Email
13.12.24	Wallangan Cultural Services	CB received email registering for the project	Email
13.12.24	Didge Ngunawal Clan	CB received email registering for the project	Email
13.12.24	Wingarra Wilay Aboriginal Corporation	CB received email registering for the project	Email
13.12.24	Kawul Pty Ltd trading as Wonn1 Sites	CB received email registering for the project	Email
13.12.24	Girragirra Murun Aboriginal Corporation	CB received email registering for the project	Email
14.12.24	D F T V Enterprises	CB received email registering for the project	Email
14.12.24	Murra Bidgee Mullangari Aboriginal Corporation	CB received email registering for the project	Email
14.12.24	Widescope Indigenous Group Pty Ltd	CB received email registering for the project	Email
15.12.24	Konanggo Aboriginal Cultural Heritage Services	CB received email registering for the project	Email
16.12.24	Long Gully Cultural Services	CB received email registering for the project	Email
16.12.24	Steve Talbott	CB received phone call register for the project	Phone
16.12.24	Gomery Cultural Consultants	CB responded with thanks	Email

Date	Organisation	Comment	Method
16.12.24	Nunawanna Aboriginal Corporation	CB responded with thanks	Email
16.12.24	Stephen Matthews	CB responded with thanks	Email
16.12.24	Yarrawalk Pty Ltd	CB responded with thanks	Email
16.12.24	Wallangan Cultural Services	CB responded with thanks	Email
16.12.24	Didge Ngunawal Clan	CB responded with thanks	Email
16.12.24	Wingarra Wilay Aboriginal Corporation	CB responded with thanks	Email
16.12.24	Kawul Pty Ltd trading as Wonn1 Sites	CB responded with thanks	Email
16.12.24	Girragirra Murun Aboriginal Corporation	CB responded with thanks	Email
16.12.24	D F T V Enterprises	CB responded with thanks	Email
16.12.24	Murra Bidgee Mullangari Aboriginal Corporation	CB responded with thanks	Email
16.12.24	Widescope Indigenous Group Pty Ltd	CB responded with thanks	Email
16.12.24	Konanggo Aboriginal Cultural Heritage Services	CB responded with thanks	Email
16.12.24	Long Gully Cultural Services	CB responded with thanks	Email
16.12.24	Steve Talbott	CB responded with thanks	Phone
16.12.24	Hunter Valley Aboriginal Corporation	CB received email registering for the project	Phone
16.12.24	Hunter Valley Aboriginal Corporation	CB responded with thanks	Phone
17.12.24	Mura Gadi Aboriginal Corporation	CB received email registering for the project	Email
17.12.24	Mura Gadi Aboriginal Corporation	CB responded with thanks	Email
19.12.24	Raiwyn Towney	CB received email registering for the project	Email
19.12.24	Raiwyn Towney	CB responded with thanks	Email
2.1.25	AGA Services	CB received email registering for the project	Email
6.1.25	AGA Services	CB responded with thanks	Email
7.1.25	D F T V Enterprises	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Didge Ngunawal Clan	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Girragirra Murun Aboriginal Corporation	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Gomeroi Applicant	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Gomery Cultural Consultants	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Hunter Valley Aboriginal Corporation	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Kawul Pty Ltd trading as Wonn1 Sites	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Konanggo Aboriginal Cultural Heritage Services	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Mura Gadi Aboriginal Corporation	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email

Date	Organisation	Comment	Method
7.1.25	Murra Bidgee Mullangari Aboriginal Corporation	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Nunawanna Aboriginal Corporation	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Raiwyn Towney	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Stephen Matthews	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Steve Talbott	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Upper Hunter Wanaruah Council	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Wallangan Cultural Services	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Wanaruah LALC	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Widescope Indigenous Group Pty Ltd	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Wingarra Wilay Aboriginal Corporation	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Yarrawalk Pty Ltd	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	AGA Services	CB sent stage 2/3 draft assessment methodology. Closing date 5.2.25	Email
7.1.25	Yarrawalk Pty Ltd	CB received email - details in folder	Email
7.1.25	Stephen Matthews	CB received email - Thanks for the Info	Email
8.1.25	Kawul Cultural Services	CB received return to sender mail	Post
8.1.25	A1 Indigenous Services	CB received late registration	email
8.1.25	A1 Indigenous Services	CB replied with thanks and provided Stage 2/3 draft methodology - closing date 5.2.25	email
8.1.25	Murra Bidgee Mullangari Aboriginal Corporation	CB received email - *I have read the project information and draft methodology for the above project, I endorse the recommendations.*	Email
9.1.25	Murra Bidgee Mullangari Aboriginal Corporation	CB replied with thanks	Email
7.1.25	Mura Gadi Aboriginal Corporation	CB received email - *report looks good no feedback at this time*	Email
7.1.25	Mura Gadi Aboriginal Corporation	CB replied with thanks	Email
14.1.25	Muswellbrook Cultural Consultants	CB received late registration	email
14.1.25	Muswellbrook Cultural Consultants	CB replied with thanks and provided Stage 2/3 draft methodology - closing date 5.2.25	email
19.1.25	A1 Indigenous Services	CB received email - *I have reviewed the document and fully support the Information and Methodology*	email
21.1.25	A1 Indigenous Services	CB replied with thanks	email
19.2.25	Gomeroi Applicant/NTSCORP	CB received email - *Unfortunately, the Gomeroi Applicant were unable to put forward a nominee on this occasion. We look forward to receiving future expressions of interest for works on Gomeroi Country.*	Email
20.2.25	Gomeroi Applicant/NTSCORP	CB replied with thanks for the email update	Email
17.4.25	D F T V Enterprises	Ryan Zanker (RZ) sent Stage 4 ACHAR for Feedback	Email
17.4.25	Didge Ngunawal Clan	RZ sent Stage 4 ACHAR for Feedback	Email

Date	Organisation	Comment	Method
17.4.25	Girragirra Murun Aboriginal Corporation	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Gomeroi Applicant	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Gomery Cultural Consultants	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Hunter Valley Aboriginal Corporation	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Kawul Pty Ltd trading as Wonn1 Sites	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Konanggo Aboriginal Cultural Heritage Services	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Mura Gadi Aboriginal Corporation	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Murra Bidgee Mullangari Aboriginal Corporation	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Nunawanna Aboriginal Corporation	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Raiwyn Towney	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Stephen Matthews	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Steve Talbott	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Upper Hunter Wanaruah Council	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Wallangan Cultural Services	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Wanaruah LALC	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Widescope Indigenous Group Pty Ltd	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Wingarra Wilay Aboriginal Corporation	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Yarrawalk Pty Ltd	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	AGA Services	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	A1 Indigenous Services	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Muswellbrook cultural consultants	RZ sent Stage 4 ACHAR for Feedback	Email
17.4.25	Gomery Cultural Consultants	*Hi Ryan,it's David Horton gomery cultural consultants with the modification in mind,the sites that are within the boundaries, there should be test excavation following by community collection of artifacts.*	Email
28.4.25	Murra Bidgee Mullangari Aboriginal Corporation	*Hi Ryan* *I have read the project information and ACHAR methodology for the above project, I endorse the recommendations.* *Kind regards* *Darleen*	Email
25/7/25	Gomery Cultural Consultants	Harrison Rochford called David Horton to discuss their request for test excavation. Gomery Cultural Consultants accepted OzArk's view that test excavation is not warranted and said they were happy with the draft ACHAR.	Phone

Appendix 1 Figure 2: Advertisement placed in the Singleton Argus.

Expression of Interest
Cultural Heritage Management

OzArk Environment & Heritage has been engaged by Bengalla Mining Company Pty Limited (the proponent) to complete an Aboriginal cultural heritage assessment for the Bengalla Mine SSD-5170 Modification 8, located approximately 5 km southwest of the town of Muswellbrook in the Upper Hunter Valley within the Muswellbrook Local Government Area. The Modification will primarily involve the realignment of the Bengalla Link Road, resulting in additional disturbance of up to 77 hectares. These activities may result in impacts to Aboriginal cultural heritage.

OzArk is seeking Aboriginal persons and / groups who wish to be consulted about the project. This consultation group will assist OzArk and the proponent in the preparation of an Aboriginal Cultural Heritage Assessment Report, and to assist Heritage NSW and the Department of Planning, Housing and Infrastructure in their consideration and determination of the Modification.

If you hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects or places in the project area, please register your interest to be consulted.

Registrations can be made by post: OzArk PO Box 2069 Dubbo NSW 2830; email: catherine@ozarkehm.com.au or by phoning OzArk on 02 6882 0118. All submissions should be received no later than **12 December 2024**

Appendix 1 Figure 3: Stage 1 Letter to agencies (sample).

OzArk Environment & Heritage
Dubbo | Queanbeyan
Wollongong | Newcastle
Katoomba
T: 02 6882 0118
enquiry@ozarkehm.com.au
www.ozarkehm.com.au
ABN 29 675 720 564
145 Wingewarra St
PO Box 2069
DUBBO NSW 2830

28 November 2024

ABORIGINAL CULTURAL HERITAGE ASSESSMENT
BENGALLA SSD-5170 MODIFICATION 8

Dear Sir/Madam,

OzArk Environment & Heritage (OzArk) has been engaged by Xenith on behalf of Bengalla Mining Company Pty Limited (the proponent) to undertake Aboriginal community consultation as per the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010).

The Bengalla Mine SSD-5170 Modification 8 (the Modification) is located approximately 5 km southwest of the town of Muswellbrook in the upper Hunter Valley within the Muswellbrook Shire Local Government Area.

The Modification will involve the realignment of the Bengalla Link Road, resulting in additional disturbance of approximately 76 hectares (ha), and a ROM coal pad extension involving approximately 1 ha of additional disturbance. The Modification will also include the installation of gas drainage infrastructure and optimisation of the approved final landform located within the currently approved SSD-5170 disturbance footprint. Landforms within the approved disturbance footprint have been subject to previous surveys and will not require re-assessment. As such, only the realignment of the Bengalla Link Road and the ROM coal pad extension areas (approximately 77 ha) will require a heritage assessment (the Study Areas shown on **Figure1**). These activities may result in harm to Aboriginal cultural heritage.

We are therefore seeking Expressions of Interest from relevant Aboriginal stakeholder groups and individuals in the area who hold cultural knowledge relevant to determining the significance of Aboriginal objects or places within the Upper Hunter Valley area.

This consultation group will assist OzArk in preparing the Aboriginal Cultural Heritage Assessment Report (ACHAR) and to assist Heritage NSW and the Department of Planning, Housing and Infrastructure in their consideration and determination of the Modification.

If your organisation can recommend and provide contact details for any known Aboriginal groups or individuals with cultural knowledge relevant to determining the impacts to the cultural significance of the above-mentioned project, please advise our office.

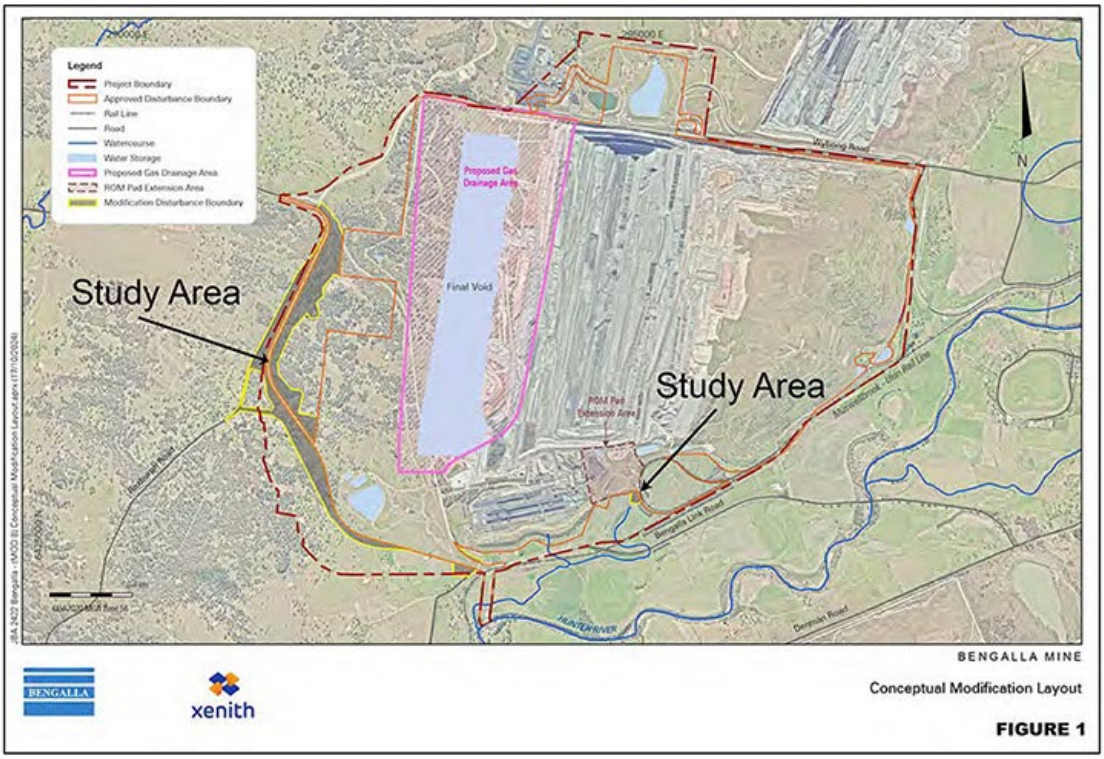
We would appreciate it if you could provide any feedback, by responding to this email catherine@ozarkehm.com.au, regarding these Aboriginal stakeholder groups by 12 December 2024, or sooner if possible.

OzArk Environment & Heritage

Kind regards,

Catherine Burrowes
Office Manager/ Community Liaison

Figure 1: Map showing the Study Area.



Appendix 1 Figure 4: Stage 1 Example letter sent to Aboriginal community groups.

OzArk Environment & Heritage
Dubbo | Queanbeyan
Wollongong | Newcastle
Katoomba
T: 02 6882 0118
enquiry@ozarkehm.com.au
www.ozarkehm.com.au
ABN 29 675 720 564
145 Wingewarra St
PO Box 2069
DUBBO NSW 2830

13 December 2024

[redacted]

ABORIGINAL CULTURAL HERITAGE ASSESSMENT
BENGALLA SSD-5170 MODIFICATION 8

Dear Sir/Madam,

OzArk Environment & Heritage (OzArk) has been engaged by Xenith on behalf of Bengalla Mining Company Pty Limited (the proponent) to undertake Aboriginal community consultation as per the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010).

The Bengalla Mine SSD-5170 Modification 8 (the Modification) is located approximately 5 km southwest of the town of Muswellbrook in the upper Hunter Valley within the Muswellbrook Shire Local Government Area.

The Modification will involve the realignment of the Bengalla Link Road, resulting in additional disturbance of approximately 76 hectares (ha), and a ROM coal pad extension involving approximately 1 ha of additional disturbance. The Modification will also include the installation of gas drainage infrastructure and optimisation of the approved final landform located within the currently approved SSD-5170 disturbance footprint. Landforms within the approved disturbance footprint have been subject to previous surveys and will not require re-assessment. As such, only the realignment of the Bengalla Link Road and the ROM coal pad extension areas (approximately 77 ha) will require a heritage assessment (the Study Areas shown on **Figure 1**).

These activities may result in harm to Aboriginal cultural heritage.

Accordingly, we are seeking Expressions of Interest from relevant Aboriginal groups and individuals in the Singleton area, to form a consultation group. This consultation group will assist OzArk in preparing the Aboriginal Cultural Heritage Assessment Report (ACHAR) to assist Heritage NSW and the Department of Planning, Housing and Infrastructure in their consideration and determination of the project.

If you hold cultural knowledge relevant to determining the impacts to the cultural significance of this project area, should you wish to register for the project please provide the following information:

- Group or individual name
- Contact name (if registering as a group)
- Email or postal address
- Contact number

Please do this by contacting our office on (02) 6882 0118 or responding to this email catherine@ozarkehm.com.au. The closing date for expressions of interest is 3 January 2025.

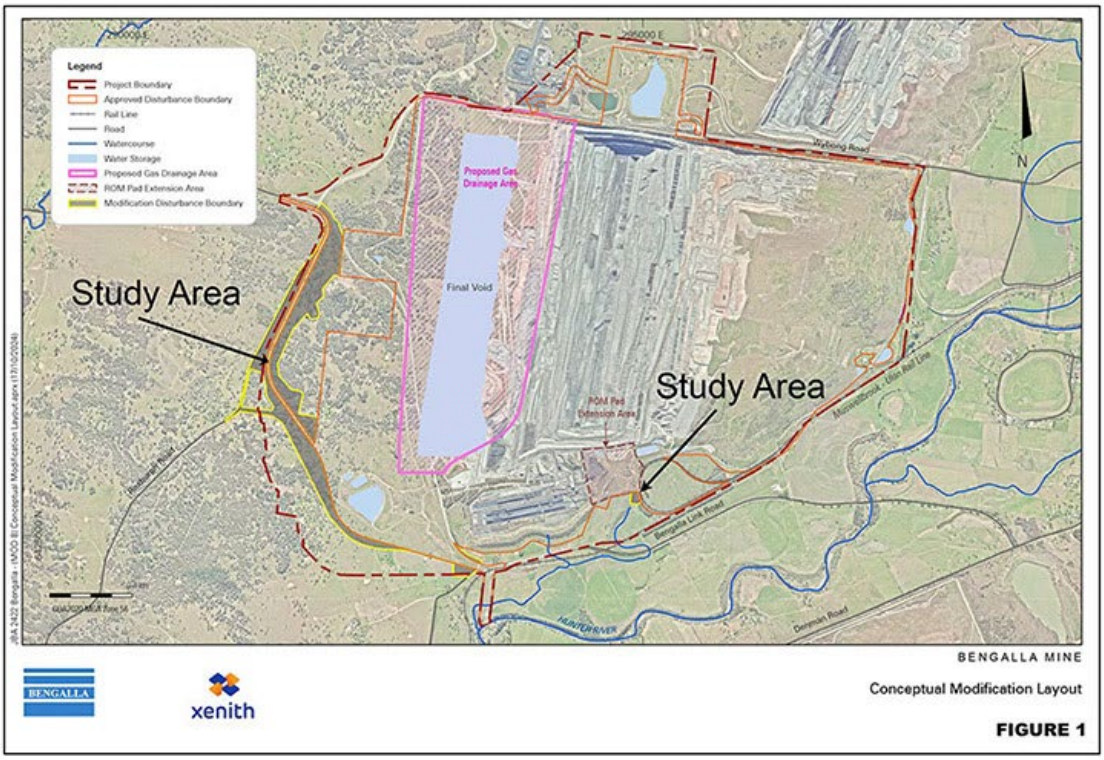
OzArk Environment & Heritage

If you wish to register interest it is noteworthy that as per the Heritage NSW guidelines, we are required to provide your details to Heritage NSW and the Local Aboriginal Lands Council unless we are advised that you do not wish your details to be released.

Kind regards,

Catherine Burrowes
Office Manager/ Community Liaison

Figure 1: Map showing the Study Areas.



Appendix 1 Figure 5: Stage 2: Cover letter and Assessment Methodology sent to RAPs.

OzArk Environment & Heritage
Dubbo | Queanbeyan
Wollongong | Newcastle
Katoomba
T: 02 6882 0118
enquiry@ozarkehm.com.au
www.ozarkehm.com.au
ABN 29 675 720 564
145 Wingewarra St
PO Box 2069
DUBBO NSW 2830

7 January 2025

ABORIGINAL CULTURAL HERITAGE ASSESSMENT FOR THE BENGALLA MINE MODIFICATION 8

Dear Members,

Thank-you for your registration of interest to become a Registered Aboriginal Party (RAP) to be consulted for the proposed Bengalla Mine Modification 8 Project. OzArk are currently undertaking an Aboriginal Cultural Heritage Assessment (ACHA) for Xenith, on behalf of Bengalla Mining Company (BMC) The project is to be assessed as State Significant Development (SSD) under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of the ACHA is to determine any impacts the proposed development will have on Aboriginal heritage values present within the study area and to assist in developing/modifying designs in order to minimise the impacts on Aboriginal heritage values.

The following project information and assessment methodology has been provided in accordance with section 4.2 and section 4.3 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a). The aim of this letter is to invite you to comment on the enclosed draft methodology for the Aboriginal Cultural Heritage Assessment Methodology.

In addition to comments on the draft report, if you can share any Aboriginal cultural heritage knowledge relevant to the proposed study area, we welcome this input to improve our assessment outcomes and to ensure Aboriginal cultural values are considered. OzArk is required to give you 28 days to supply feedback on the attached documents. **This period closes 5pm on Wednesday 5 February 2025.**

If you need any help supplying feedback or have any queries in relation to the enclosed information, please do not hesitate to contact our office.

Kind regards,

Catherine Burrowes
Customer Liaison

Appendix 1 Figure 6: RAP responses to assessment methodology.

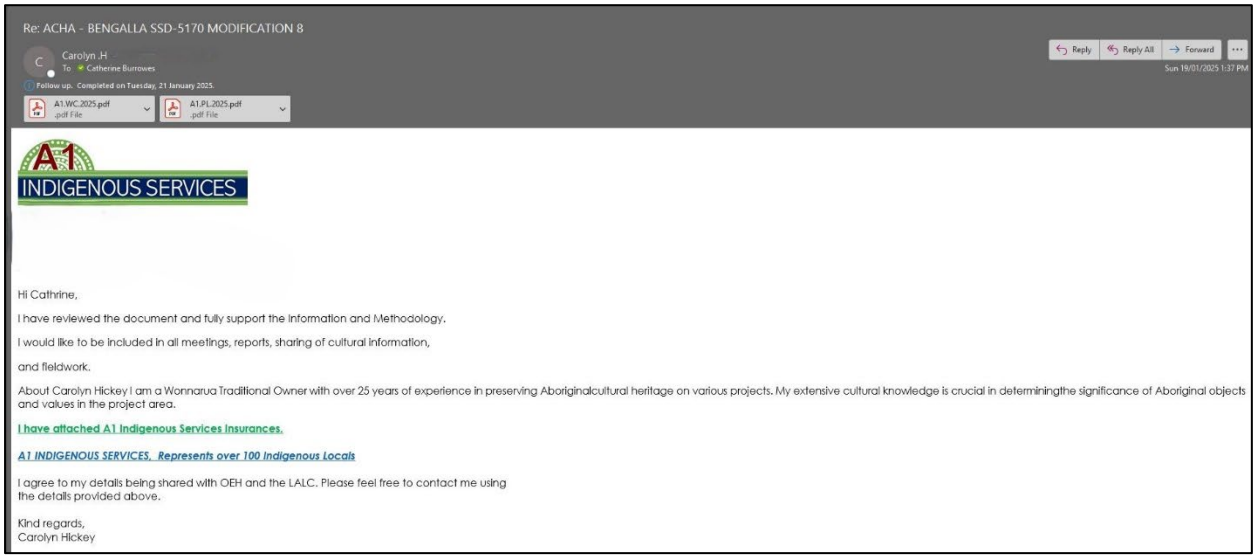
From: Scott Franks
To: Catherine Burrowes; info@environment.nsw.gov.au; Louise Nichols
Subject: Re: Stage 2-3 Draft Methodology - Bengalla Mine Modification 8
Date: Tuesday, 7 January 2025 12:44:26 PM
Attachments: Stage 2 Cover Letter SSD.docx
Draft_Aboriginal Cultural Heritage Assessment Methodology_Bengalla MOD8_2025.pdf

Catherine,

[redacted]

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Re: ACHA - BENGALLA SSD-5170 MODIFICATION 8

Carolyn .H
To Catherine Burrowes

Follow up. Completed on Tuesday, 21 January 2025.

A1.WC.2025.pdf .pdf File
A1.PL.2025.pdf .pdf File

Reply | Reply All | Forward
Sun 19/01/2025 1:37 PM

A1 INDIGENOUS SERVICES

Hi Cathrine,

I have reviewed the document and fully support the information and Methodology.

I would like to be included in all meetings, reports, sharing of cultural information,

and fieldwork.

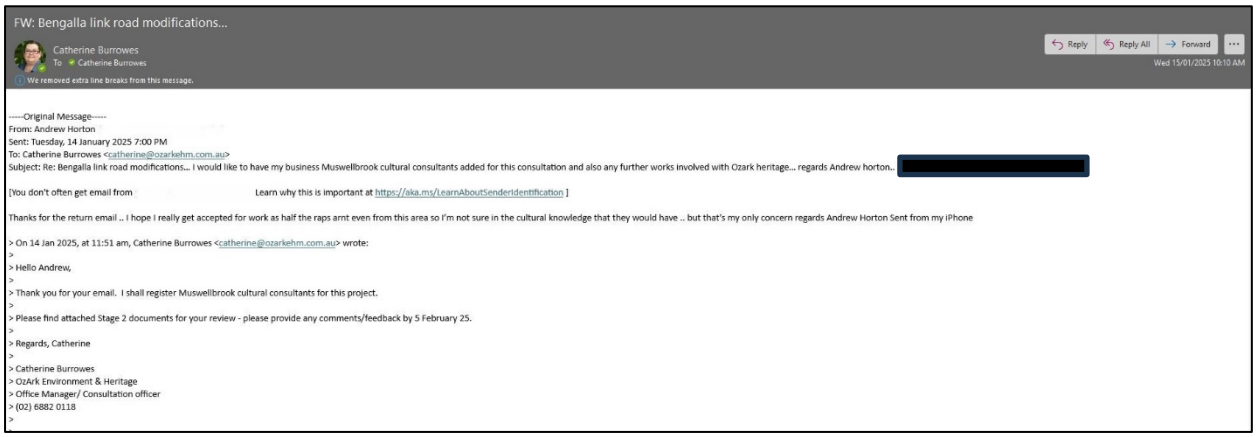
About Carolyn Hickey I am a Wonnarua Traditional Owner with over 25 years of experience in preserving Aboriginalcultural heritage on various projects. My extensive cultural knowledge is crucial in determiningthe significance of Aboriginal objects and values in the project area.

I have attached A1 Indigenous Services Insurances.

A1 INDIGENOUS SERVICES. Represents over 100 Indigenous Locals

I agree to my details being shared with OEH and the LALC. Please feel free to contact me using the details provided above.

Kind regards,
Carolyn Hickey



FW: Bengalla link road modifications...

Catherine Burrowes
To Catherine Burrowes

We removed extra line breaks from this message.

Reply | Reply All | Forward
Wed 15/01/2025 10:10 AM

-----Original Message-----
From: Andrew Horton
Sent: Tuesday, 14 January 2025 7:00 PM
To: Catherine Burrowes <catherine@ozarkehm.com.au>
Subject: Re: Bengalla link road modifications... I would like to have my business Muswellbrook cultural consultants added for this consultation and also any further works involved with Ozark heritage... regards Andrew horton..

[You don't often get email from Learn why this is important at https://aka.ms/LearnAboutSenderIdentification]

Thanks for the return email .. I hope I really get accepted for work as half the raps arnt even from this area so I'm not sure in the cultural knowledge that they would have .. but that's my only concern regards Andrew Horton Sent from my iPhone

> On 14 Jan 2025, at 11:51 am, Catherine Burrowes <catherine@ozarkehm.com.au> wrote:
>
> Hello Andrew,
>
> Thank you for your email. I shall register Muswellbrook cultural consultants for this project.
>
> Please find attached Stage 2 documents for your review - please provide any comments/feedback by 5 February 25.
>
> Regards, Catherine
>
> Catherine Burrowes
> OzArk Environment & Heritage
> Office Manager/ Consultation officer
> (02) 6882 0118
>



Re: Stage 2-3 Draft Methodology - Bengalla Mine Modification 8

TB
Tiarna Bird
To Catherine Burrowes

Reply | Reply All | Forward
Fri 10/01/2025 4:12 PM

IMG_5769.jpeg .jpeg File
IMG_5770.jpeg .jpeg File
IMG_7208.jpeg .jpeg File
IMG_7857.jpeg .jpeg File

Hi, report looks good no feedback at this time, I've attached certificate of currencies for insurances if you would like to consider us for fieldwork.
Thank you

Tiarna Bird
Director
Mura Gadi Aboriginal Corporation



Re: Stage 2-3 Draft Methodology - Bengalla Mine Modification 8

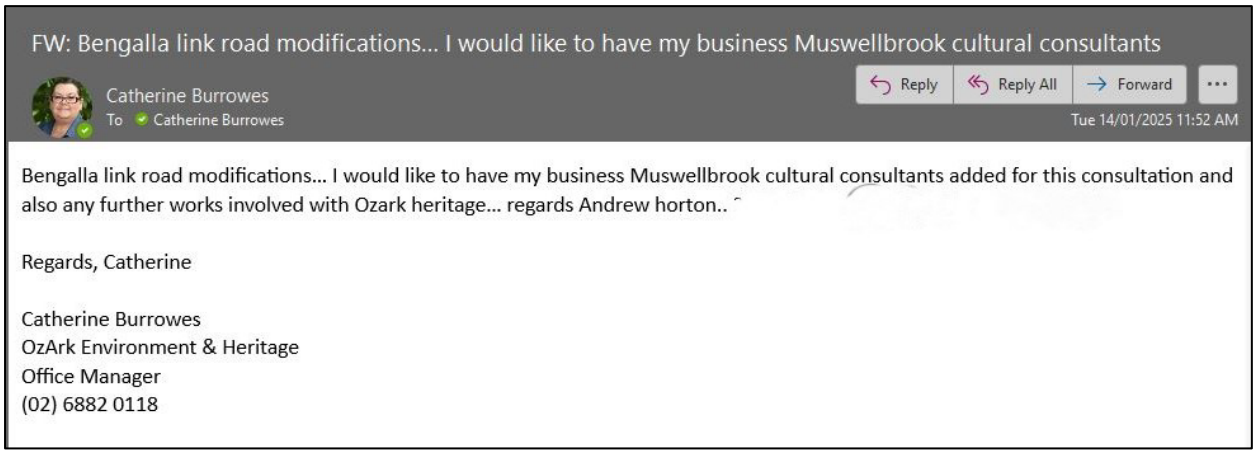
DJ Darleen Johnson
To Catherine Burrowes

Reply | Reply All | Forward | ...
Wed 8/01/2025 5:00 PM

Follow up. Completed on Thursday, 9 January 2025.
You replied to this message on 9/01/2025 3:30 PM.

Hi Catherine
I have read the project information and draft methodology for the above project, I endorse the recommendations.
Kind regards
Darleen

On Tuesday 7 January 2025 at 11:54:43 am AEDT, Catherine Burrowes <catherine@ozarkehm.com.au> wrote:



FW: Bengalla link road modifications... I would like to have my business Muswellbrook cultural consultants

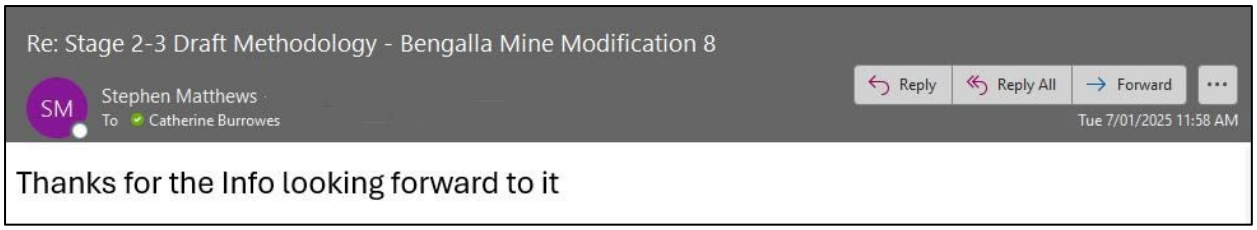
Catherine Burrowes
To Catherine Burrowes

Reply | Reply All | Forward | ...
Tue 14/01/2025 11:52 AM

Bengalla link road modifications... I would like to have my business Muswellbrook cultural consultants added for this consultation and also any further works involved with Ozark heritage... regards Andrew horton..

Regards, Catherine

Catherine Burrowes
OzArk Environment & Heritage
Office Manager
(02) 6882 0118



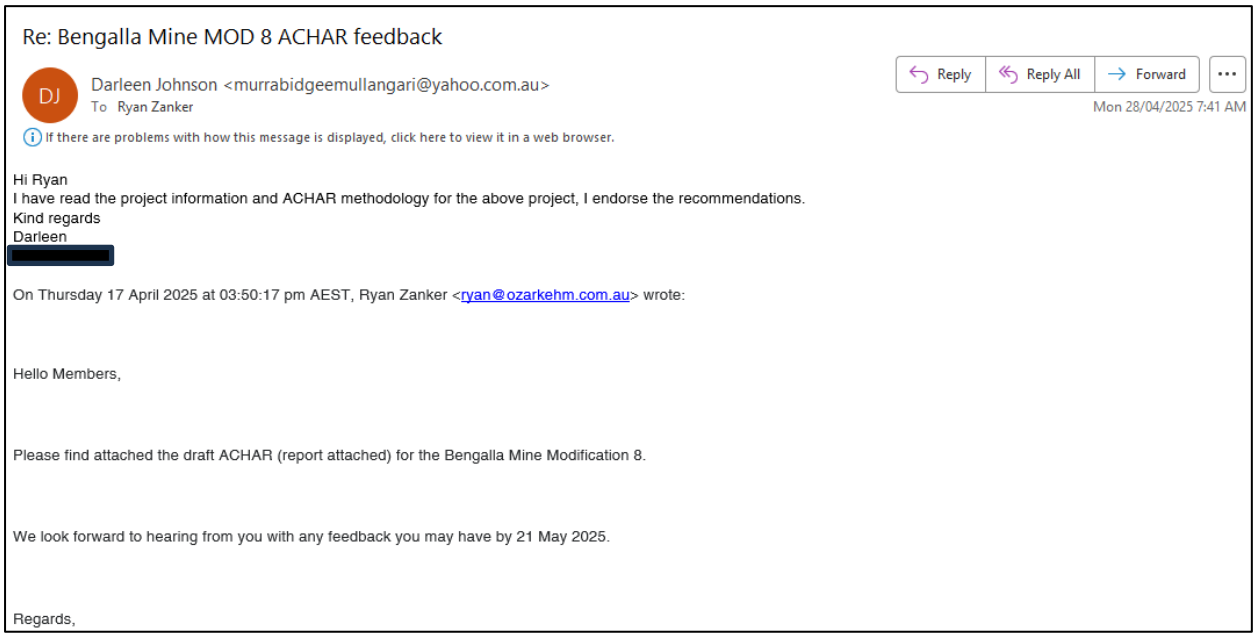
Re: Stage 2-3 Draft Methodology - Bengalla Mine Modification 8

SM Stephen Matthews
To Catherine Burrowes

Reply | Reply All | Forward | ...
Tue 7/01/2025 11:58 AM

Thanks for the Info looking forward to it

Appendix 1 Figure 7: RAP responses to the draft ACHAR



Re: Bengalla Mine MOD 8 ACHAR feedback

DJ

Darleen Johnson <murrabidgeemullangari@yahoo.com.au>
To Ryan Zanker

Reply | Reply All | Forward | ...

Mon 28/04/2025 7:41 AM

If there are problems with how this message is displayed, click here to view it in a web browser.

Hi Ryan
I have read the project information and ACHAR methodology for the above project, I endorse the recommendations.
Kind regards
Darleen
[redacted]

On Thursday 17 April 2025 at 03:50:17 pm AEST, Ryan Zanker <ryan@ozarkehm.com.au> wrote:

Hello Members,

Please find attached the draft ACHAR (report attached) for the Bengalla Mine Modification 8.

We look forward to hearing from you with any feedback you may have by 21 May 2025.

Regards,

From: David Horton
To: Ryan Zanker
Subject: Re: Bengalla Mine MOD 8 ACHAR feedback
Date: Thursday, 17 April 2025 7:26:13 PM
Attachments: image001.png
image002.png
image003.png
image004.png
image005.png
image004.png
image002.png
image001.png
image005.png
image003.png

Hi Ryan,it's David Horton gomery cultural consultants with the modification in mind,the sites that are within the boundaries, there should be test excavation following by community collection of artifacts.

On Thu, 17 Apr. 2025, 3:50 pm Ryan Zanker, <Ryan@ozarkehm.com.au> wrote:

> Hello Members,
>
> Please find attached the draft ACHAR (report attached) for the Bengalla Mine Modification 8.
>
> We look forward to hearing from you with any feedback you may have by 21 May 2025.
>
> Regards,
>
> **Ryan Zanker**
>
> **Archaeologist**

APPENDIX 2: ASSESSMENT METHODOLOGY



View east across the landscape at the north of the study area near Roxburgh Road.

ABORIGINAL CULTURAL HERITAGE ASSESSMENT METHODOLOGY

BENGALLA MINE MODIFICATION 8

MUSWELLBROOK LOCAL GOVERNMENT AREA, NSW

FEBRUARY 2025

Report prepared by

OzArk Environment & Heritage

for Bengalla Mining Company

OzArk
Environment & Heritage

145 Wingewarra St
(PO Box 2069)
Dubbo NSW 2830

Phone: (02) 6882 0118
Fax: (02) 6882 0630
enquiry@ozarkehm.com.au
www.ozarkehm.com.au

OzArk Environment & Heritage

DOCUMENT CONTROLS

Proponent	Bengalla Mining Company (BMC)
Client	Xenith
Document Description	Aboriginal Cultural Heritage Assessment Methodology: Bengalla Modification 8
File Location	OzArk Job No.
S:\OzArk EHM Data\Clients\Xenith	4597

Document Status: V3.0 Final	Date: 7 February 2025
Draft V1: OzArk internal edits	V1.0 HR author 12 December 2024 V1.1 BC Edit 13/12/24
Draft V2: OzArk and client edits	V2.0 to client 13/12/2024 V2.2: BC incorporates client comments 6/1/25 V3.0 final 7/2/25
Final V3: Final document	
Prepared for	Prepared by
Dorian Walsh Principal Environmental Scientist Xenith	Harrison Rochford Archaeologist OzArk Environment & Heritage 145 Wingewarra Street (PO Box 2069) Dubbo NSW 2830 P: 02 6882 0118 harrison@ozarkehm.com.au

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Enquiries should be addressed to OzArk Environment & Heritage.

OzArk Environment & Heritage

Acknowledgement

OzArk acknowledge the traditional custodians of the area on which this assessment will take place and pay respect to their beliefs, cultural heritage, and continuing connection with the land. We also acknowledge and pay respect to the post-contact experiences of Aboriginal people with attachment to the area and to the Elders, past and present, as the next generation of role models and vessels for memories, traditions, culture and hopes of local Aboriginal people.

OzArk Environment & Heritage

CONTENTS

1 INTRODUCTION 1

1.1 Project overview 1

1.2 Study area 1

2 CULTURAL VALUES 5

2.1 Introduction to cultural values 5

2.1.1 Connection to Country 5

2.1.2 Managing Country 5

2.1.3 Recognising lore 6

2.2 Identifying cultural values 6

2.2.1 Use of information collected 6

2.2.2 Public / confidential information 6

2.2.3 Copyright 6

2.3 Consultation on this methodology 7

3 ARCHAEOLOGICAL CONTEXT 8

3.1 Aboriginal people of the study area 8

3.2 Regional archaeological context 8

3.3 Local archaeological context 9

3.3.1 Archaeological investigations at the study area 13

4 PREDICTIVE MODEL 14

4.1 Landform modelling 14

4.2 Predictive model for the study area 16

4.3 Research questions 16

5 SURVEY METHODOLOGY 17

5.1 Assessment approach 17

5.2 Survey aims 17

5.3 Survey methodology 17

5.4 Test excavation 18

REFERENCES 19

OzArk Environment & Heritage

FIGURES

Figure 1-1: Location of the study area. 2
Figure 1-2. Aerial of the study area. 3
Figure 1-3. Elevation and drainage at the study area. 4
Figure 2-1: Occupation model for the Central Lowlands and Lower Hunter Valley (Kuskie and Kamminga 2000). 9
Figure 2-2. AHIMS sites in relation to the study area 11
Figure 2-3. AHIMS sites within the study area. 12
Figure 3-1: Survey units of the study area. 15

TABLES

Table 2-1: AHIMS site types and frequencies 10
Table 2-2: AHIMS sites located within study area. 10
Table 3-1: Likelihood of landforms within the study area to contain Aboriginal objects. 16

OzArk Environment & Heritage

1 INTRODUCTION

OzArk Environment & Heritage (OzArk) has been engaged by Bengalla Mining Company Pty Limited (BMC, the proponent) to prepare an assessment methodology for the proposed Modification 8 (the Modification) to the existing Development Consent for Bengalla Mine (SSD-5170).

Bengalla Mine (Bengalla) is located approximately 10 kilometres (km) west of Muswellbrook in the Muswellbrook Local Government Area (**Figure 1-1**).

This methodology is in accordance with Stage 3 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (ACHCRs; DECCW 2010a). The project information provided here also complies with Stage 2 of the ACHCRs.

This methodology outlines the proposed assessment to identify Aboriginal cultural values, both tangible and intangible, that exist in the study area. The results of this investigation will be presented in an *Aboriginal Cultural Heritage Assessment Report* (ACHAR).

1.1 PROJECT OVERVIEW

The Modification proposes to alter the approved realignment of Bengalla Link Road (BLR) between Old Bengalla Road in the south and Wybong Road in the north. The proposed realignment will involve the disturbance of approximately 76 hectares (ha) of land outside of the current approved disturbance boundary for Bengalla. The key components of the Modification include:

- Realignment of the BLR
- Installation of gas drainage wells and methane flaring infrastructure located within the approved mine disturbance footprint
- A run-of-mine (ROM) coal pad extension and associated infrastructure, including a new ROM dam. Approximately 1 hectare of additional disturbance to account for erosion and sediment controls during construction.
- Changes to the not yet rehabilitated approved final landform.

1.2 STUDY AREA

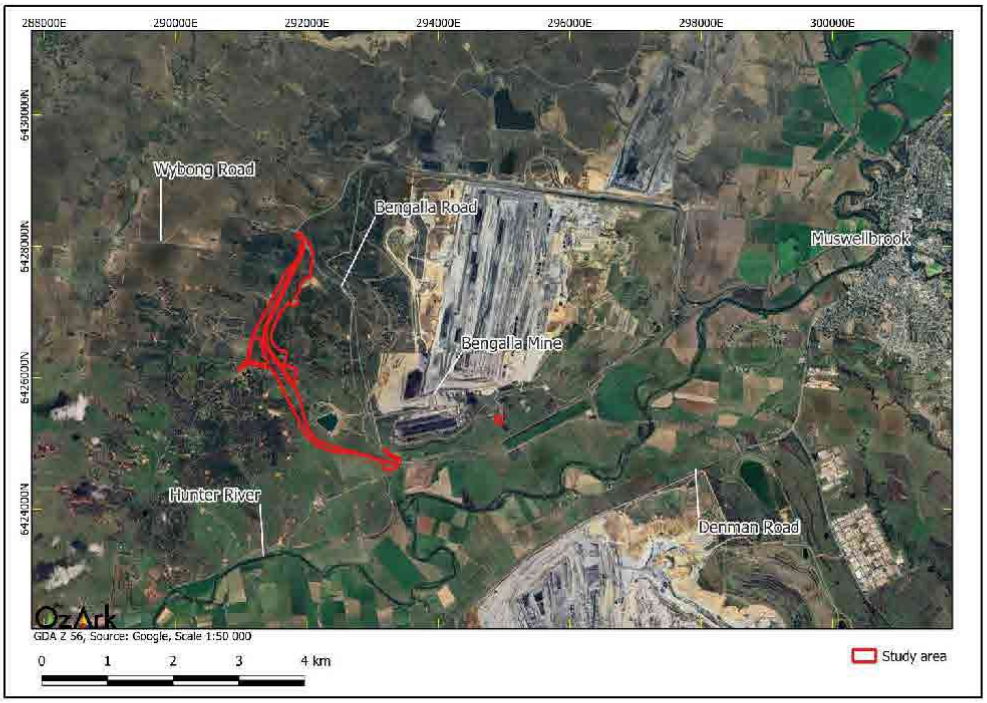
The study area describes the area that will be included in the current assessment. An aerial showing the study area is presented as **Figure 1-2**. Some elements of the Modification are within the approved disturbance footprint for the mine and do not require further heritage assessment.

The study area is situated on gentle slopes adjacent to the Hunter River floodplains in the south and rolling hills in the north (**Figure 1-3**). There are no named or permanent waterways within study area. There are scattered trees across most of the study area and there are few locations

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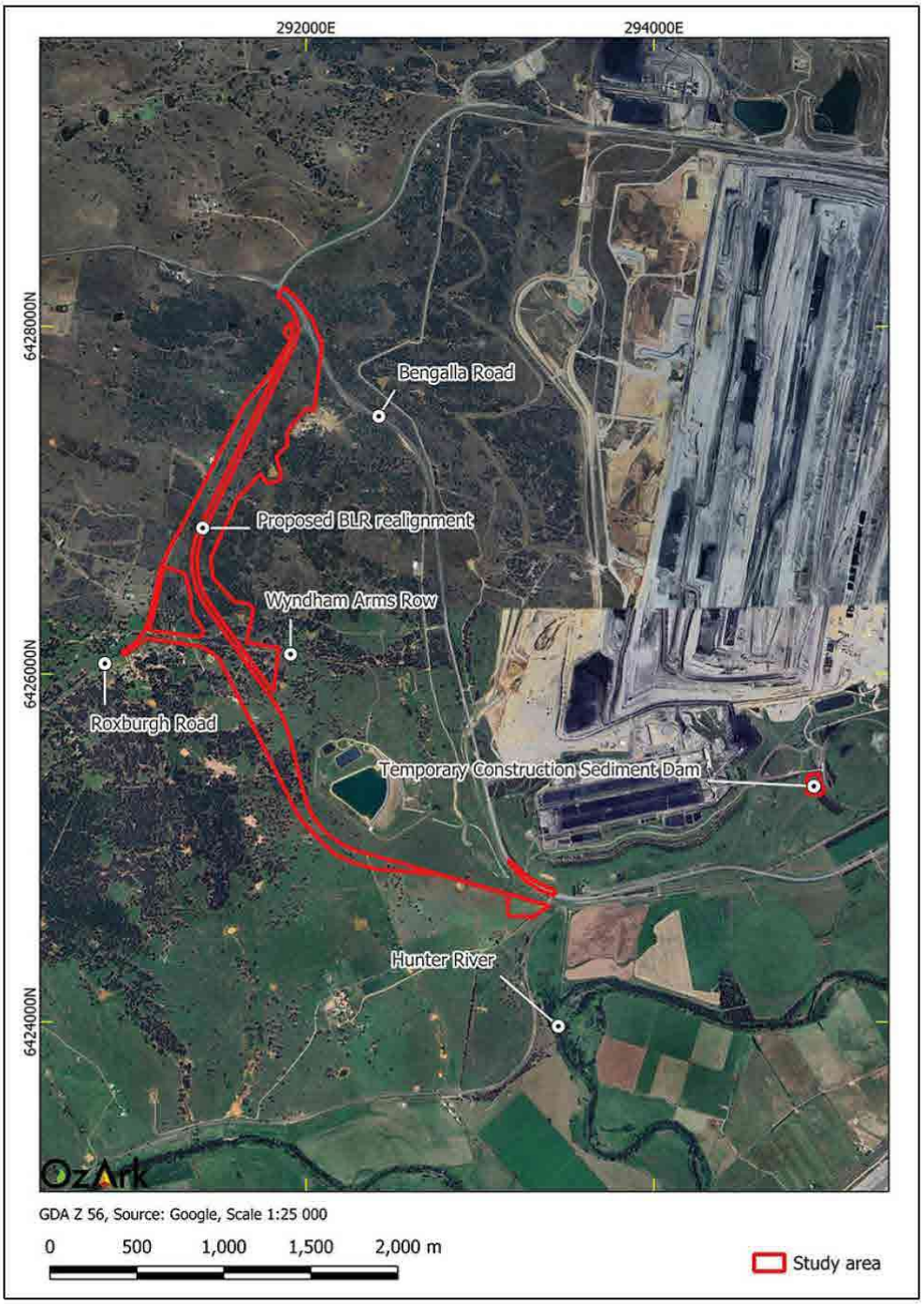
that have been subject to observable agricultural and/or mining disturbances. Some sections of the existing Bengalla Road and Wyndham Arms Row are within the study area.

Figure 1-1: Location of the study area.



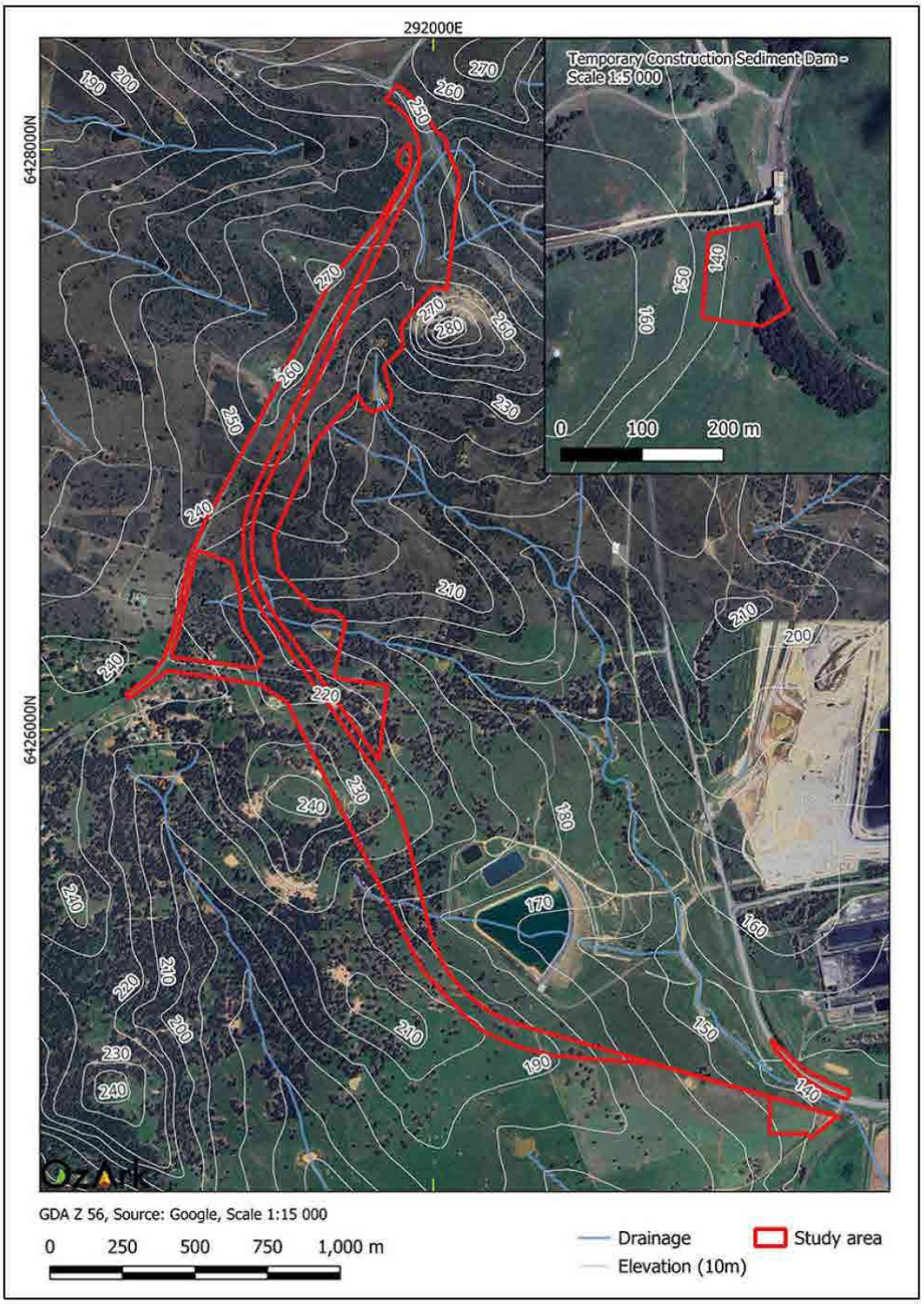
OzArk Environment & Heritage

Figure 1-2. Aerial of the study area.



OzArk Environment & Heritage

Figure 1-3. Elevation and drainage at the study area.



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2 CULTURAL VALUES

2.1 INTRODUCTION TO CULTURAL VALUES

Fundamentally, culture is living and is not static:

- Culture is acquired - we learn about culture from others in our community, including our parents
- Culture is shared - culture does not exist in a vacuum, it is shared amongst a group of people
- Culture defines core values - because we have been taught our culture and share it with our cultural group, we tend to form the same core values
- Cultures resist change but are not static - culture does and can change, but change is usually slow and gradual.

2.1.1 Connection to Country

Aboriginal and Torres Strait Islander peoples are connected to Country through lines of descent (paternal and maternal), as well as clan and language groups.

Territory is defined by spiritual as well as physical links. Landforms have deep meaning, recorded in art, stories, songs, and dance. Songlines or Dreaming Tracks as well as kinship structures link Aboriginal peoples to the territories of other groups. In the past, these links were also used for trade.

> *"When we say Country we might mean homeland, or tribal or clan area and in saying so we may mean something more than just a place; somewhere on the map. We are not necessarily referring to place in a geographical sense. But we are talking about the whole of the landscape, not just the places on it."*
>
> Professor Mick Dodson AM, August 2007

2.1.2 Managing Country

Living on this land for around 50,000 years, Aboriginal and Torres Strait Islanders established effective ways to use and sustain resources. One important aspect is the right of certain people to control the use of resources in a particular area. Aboriginal and Torres Strait Islander people don't see themselves as 'owning' land, animals, plants, or nature, but rather belonging with these things as equal parts of creation.

The rights of different groups to live in and manage certain areas of land are clear and recorded through art, stories, songs, and dance.

2.1.3 Recognising lore

In much of eastern Australia, Aboriginal communities live their lives like most Australians. However, in certain crucial areas, particularly associated with family, leadership roles and caring for Country, Aboriginal lore continues, even in the most urbanised communities.

2.2 IDENTIFYING CULTURAL VALUES

A major aim of this assessment is to identify any cultural values within the landscape in which the Modification is located so that those values can be recognised and incorporated into the ACHAR's management recommendations.

Any cultural values relating to the study area will be captured by the OzArk archaeologists (if such information is provided by RAPs during the survey) and included in the ACHAR.

Understanding cultural landscapes can only come from the views of a particular community, in this case, the Aboriginal community. Unless informed, OzArk will not know of the community's feelings towards the cultural landscape in which the Modification will be located. Should any RAPs have knowledge of cultural values regarding the study area that they wish to share or that may affect the survey methodology set out in **Section 5**, OzArk invites them to contact us so that these values can be recorded and/or responded to in the methodology.

2.2.1 Use of information collected

An ACHAR will be prepared for the project which articulates Aboriginal cultural values and associated conservation methods across the study area, as identified during the consultations. The ACHAR will be circulated to all RAPs for comment as is set out in the ACHCRs. The ACHAR will be available to Heritage NSW for their consideration of the proposal and the report will be publicly available.

2.2.2 Public / confidential information

Information will be treated in accordance with instructions received by whoever provides the information. Information described as confidential (culturally sensitive) will not be detailed in the publicly available report. Confidential information should be made available to the proponent, its heritage consultants, and Heritage NSW so that significant cultural values can be conserved. On advice from the provider of the information, a redacted ACHAR would be made available to the wider public where any sensitive cultural information is removed.

2.2.3 Copyright

Information collected for this assessment remains the property of the person who provided the information. Without written permission from the provider, information may not be used for purposes other than those outlined above.

OzArk Environment & Heritage

2.3 CONSULTATION ON THIS METHODOLOGY

Consultation for this proposal has followed the guidelines established in the ACHCRs (DECCW 2010b) whereby an advertisement was placed in the local press and relevant agencies were contacted to ascertain if they were aware of groups or individuals who may have cultural knowledge of the region containing the project.

On 28 November 2024 an advertisement was placed in the *Singleton Argus* requesting expressions of interest in being consulted about the Modification. In addition, the following agencies were contacted to identify potential stakeholders for the area: Heritage NSW; the Wanaruah Local Aboriginal Land Council (LALC); the Office of The Registrar, *Aboriginal Land Rights Act 1983*; the National Native Title Tribunal; Native Title Services Corporation Limited (NTSCORP); the Muswellbrook Regional Council; and Hunter Tablelands Local Land Services.

All RAPs already registered for Bengalla were contacted to see if they wished to be consulted regarding the Modification.

As a result, the following individuals/groups registered to be consulted about the Modification:

Registered Aboriginal Party	
D F T V Enterprises	Nunawanna Aboriginal Corporation
Didge Ngunawal Clan	Raiwyn Towney
Girragirra Murun Aboriginal Corporation	Stephen Matthews
Gomeroi Applicant	Steve Talbott
Gomery Cultural Consultants	Upper Hunter Wanaruah Council
Hunter Valley Aboriginal Corporation	Wallangan Cultural Services
Kawul Pty Ltd trading as Wonn1 Sites	Wanaruah Local Aboriginal Land Council
Konanggo Aboriginal Cultural Heritage Services	Widescope Indigenous Group Pty Ltd
Mura Gadi Aboriginal Corporation	Wingarra Wiiay Aboriginal Corporation
Murra Bidgee Mullangari Aboriginal Corporation	Yarrawalk Pty Ltd.

These individuals/groups constitute the Registered Aboriginal Parties (RAPs) for the Modification. This RAP list regards the Modification only and does not affect the existing Bengalla RAP list.

OzArk Environment & Heritage

3 ARCHAEOLOGICAL CONTEXT

3.1 ABORIGINAL PEOPLE OF THE STUDY AREA

The ethnographic studies of Tindale (1974) and predecessors such as Howitt, Mathews and Fawcett place the study area within the traditional lands of the Wonnarua people. The Wonnarua language group is understood to have spanned the area between Maitland and the Great Dividing Range, although the boundaries between the Wonnarua and their neighbouring groups, the Gomeroi (west), Worimi and Awabakal (east), and Darkinjung (south) are likely to involved seasonal change and areas which multiple language groups occupied for economic and cultural exchange.

3.2 REGIONAL ARCHAEOLOGICAL CONTEXT

There have been a significant number of Aboriginal archaeological investigations of the Upper Hunter region. An accepted occupation model for the region was developed following extensive archaeological investigation related to the *Salvage of Aboriginal archaeological sites in relation to the F3 Freeway near Lenegans Drive, Black Hill, New South Wales* (Kuskie and Kamminga 2000). Their model apples to the Central Lowlands region of the Hunter Valley in which the study area is situated (see also ERM 2004:12). The model is shown on **Figure 3-1**.

The landscape of the study area applies to the first three expected occupations patterns: transit, hunting, and small group camps. In terms of the archaeological sites that might be expected to remain from these activities, the archaeological profile of the Central Lowlands region of the Upper Hunter Valley (ERM 2004: 52–4) indicates that:

- Archaeological sites that are not artefact scatters or isolated finds (e.g. quarries, scared trees, art sites) are rare.
- Open artefact sites (over 98% of the compiled data set) are concentrated along major creeks and the Hunter River, contexts which are more likely to contain sites than slopes and ridges.
- The predominant materials noted in artefact assemblages are silcrete and indurated mudstone/tuff (IMT).

Figure 3-1: Occupation model for the Central Lowlands and Lower Hunter Valley (Kuskie and Kamminga 2000).

Occupation pattern	Activity location	Proximity to water	Proximity to food resources	Archaeological expectations
Transitory movement	All landscape zones, but frequently on ridge and spur crests, watercourses and valley flats	Not important	Not important	Assemblages of low density and diversity Evidence of tool maintenance and repair Knapping
Hunting and/or gathering without camping	All landscape zones	Not important	Near food source	Assemblages of low density and diversity Evidence of tool maintenance and repair High frequency of used tools discarded Knapping
Camping by small parties	Frequently associated with permanent or temporary water	Nearby	Near food source	Assemblages of low-moderate density and diversity Evidence of tool maintenance and repair Hearths
Nuclear family base camp	Level or gently undulating ground	Nearby reliable source	Near food source	Assemblages of high density and diversity Evidence of tool manufacture and casual knapping Facilities such as heat treatment pits and stone lined ovens Grindstones present
Community base camp	Level or gently undulating ground	Nearby reliable source	Near food source	Assemblages of high density and diversity Evidence of tool manufacture and casual knapping Facilities such as hearths and stone lined ovens Grindstones and ochre present Evidence of heat treatment unlikely Large area >100 m^2 with isolated campsites

3.3 LOCAL ARCHAEOLOGICAL CONTEXT

Two searches of the Heritage NSW administered Aboriginal Heritage Information Management System (AHIMS) database on 12 December 2024 returned 137 results for Aboriginal sites within approximately 1.5 km of the study area (GDA Zone 56 Eastings: 293448–2961350, Northings: 6424651–6427058 and Datum GDA Zone 56, Eastings: 290884–293549, Northings: 6424565–6428337). **Table 3-1** presents the site types and frequencies of the search results.

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The AHIMS results reflect the very high level of archaeological assessment that has taken place surrounding the study area at Bengalla. All of the sites within the search area include surface artefact manifestations, as scatters of undefined quantity or isolated finds. The quarry site (B10, Site 37-2-0579) is the only other site type present within the search area.

Of the 137 sites within the search area, only 29 remain valid or partially destroyed. **Figure 3-2** shows the distribution of all sites in relation to the search area.

Table 3-1: AHIMS site types and frequencies.

Site Type	Number	% Frequency
Artefact site	106	77.37%
Isolated find	29	21.17%
Not a site	1	0.73%
Quarry and artefact site	1	0.73%
Total	**137**	**100**

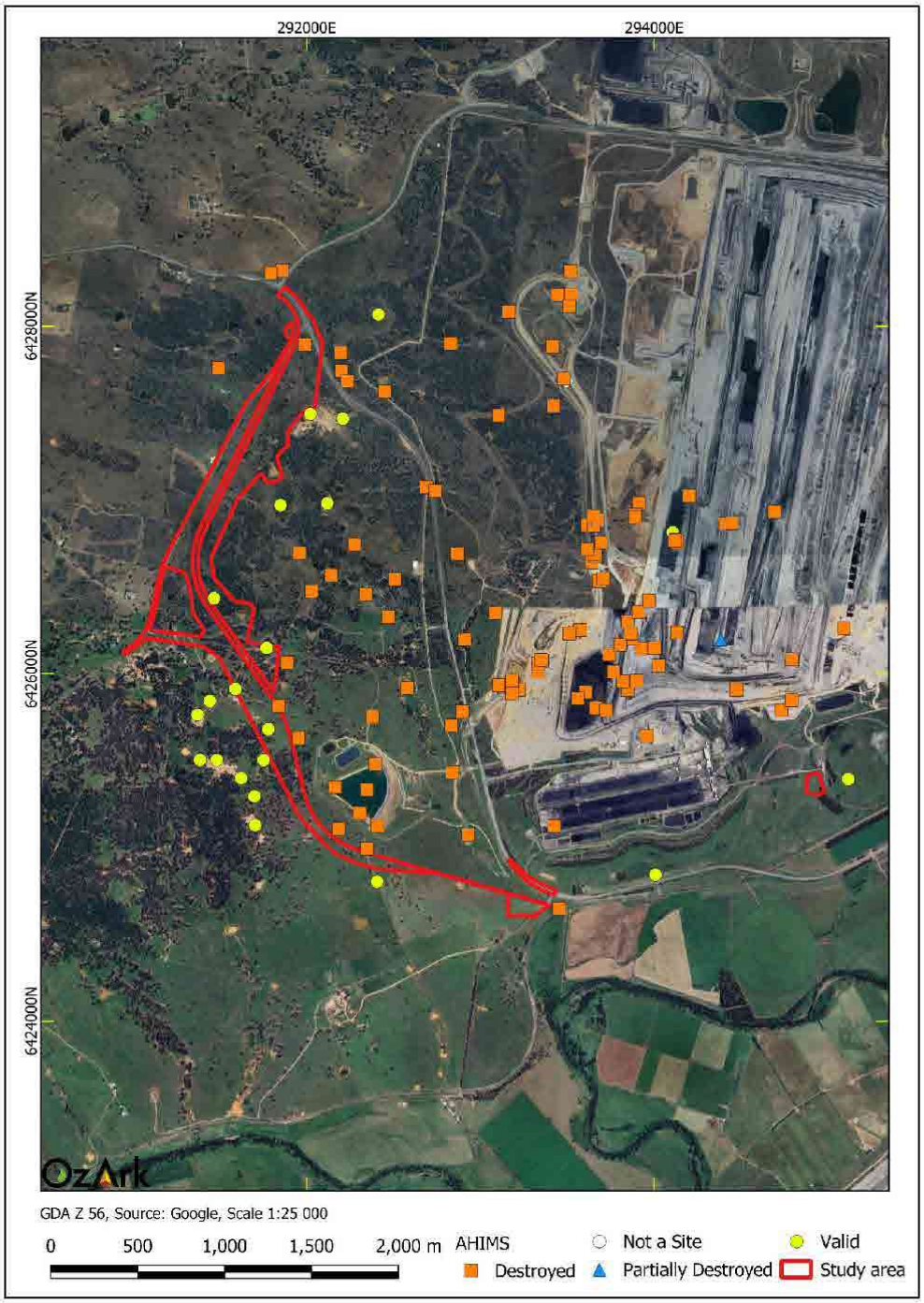
There are five AHIMS sites within the study area, listed in **Table 3-2**. The sites within the study area are shown on **Figure 3-3**.

Table 3-2: AHIMS sites located within study area.

AHIMS ID	Site name	Status
37-2-2092	BMRA6	Destroyed
37-2-4452	BM-AS 20-12	Valid
37-2-4472	BM - IA 14-12	Valid
37-2-4473	BM - IA 15-12	Valid
37-2-6578	Wyndham Arms Row IF-01	Valid

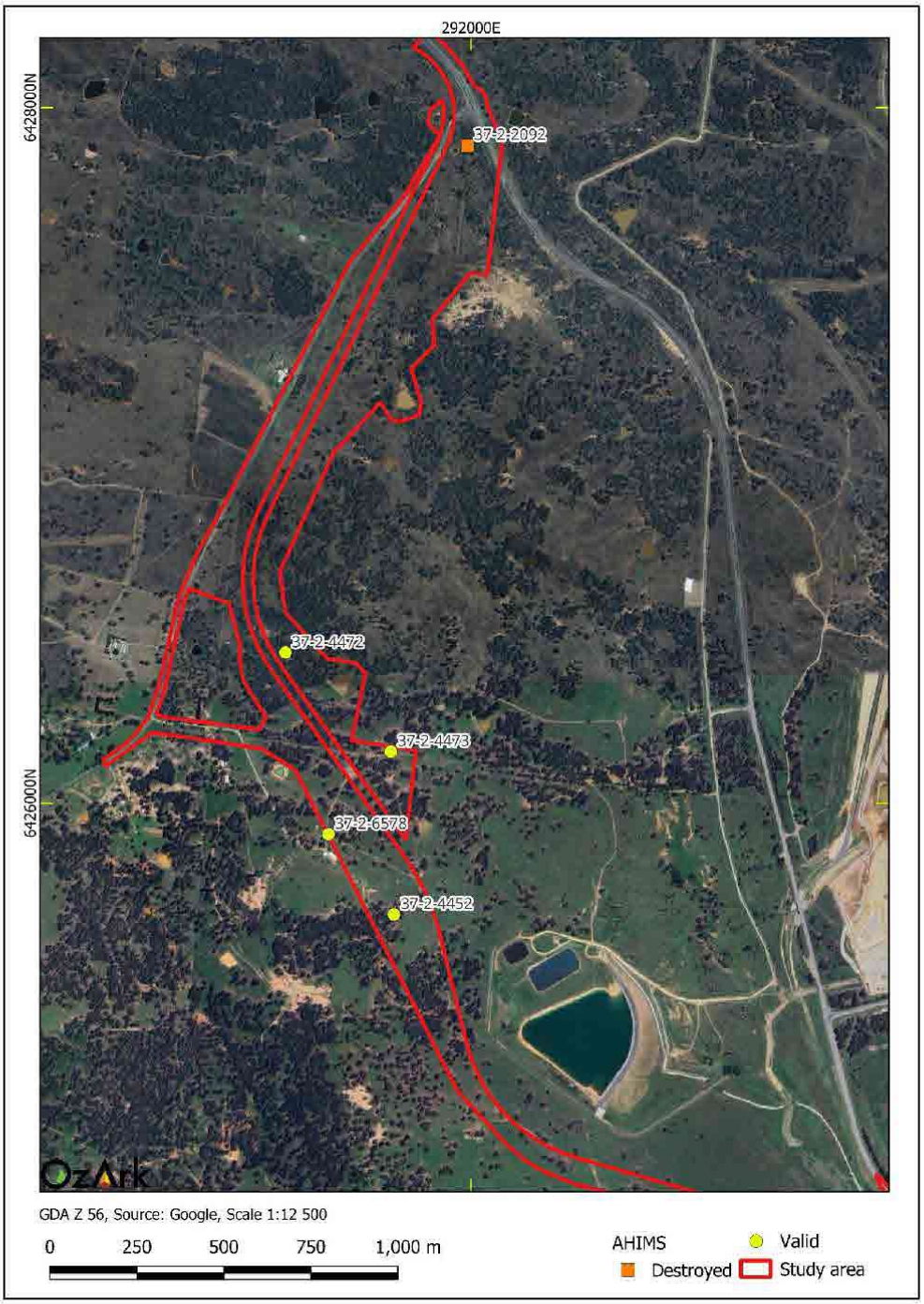
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Figure 3-2. AHIMS sites in relation to the study area.



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Figure 3-3. AHIMS sites within the study area.



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3.3.1 Archaeological investigations at the study area

The study area has been subject to archaeological assessment in the past. The assessment by Rich (1993) for the opening of Bengalla and the construction of Bengalla Road covered sections of the study area. The AECOM (2013) assessment for the continuation of Bengalla included the study area.

Rich (1993) assessed the pre-2013 project boundary for Bengalla, extending from Wybong Road in the north to the rail line in the south, in addition to the current alignment of BLR. A total of 56 sites were recorded across all of the landform types in the assessment area. The sites comprised 39 artefact scatters and 17 isolated finds. One of the scatters, site B10, was also associated with a silcrete quarry and a substantial subsurface deposit, which was investigated by White (1998) and recovered 4,454 artefacts. This site, which has subsequently been destroyed, was located on low hills 1 km to the north of the study area at its closest point.

The AECOM assessment recorded 54 previously unrecorded sites, which were compiled with previously recorded sites at Bengalla to form a total of 289 sites within their assessment area. Artefact sites comprise 98% of the 289 sites analysed for the assessment (145 artefact scatters and 139 isolated finds). Only the sites associated with Dry Creek (1.2 km north of the study area at the closest point) were determined to have potential for subsurface deposits.

AECOM analysed the spatial distribution of Aboriginal occupation across the landscape by plotting individual artefact locations (rather than grouping artefacts into 'sites'). It was found that 87% of objects (n=962) were identified within 100 metres (m) of a creek line and that 74.8% of these objects were within 50 m. Most objects (81%, n= 885) were situated on lower slope landforms, with only 6% (n=70) recorded on hilltop, ridge, and crest landforms. No modified trees were identified by AECOM (2013) and one previously investigated quarry site was revisited.

While the results support the assumption that Aboriginal habitation and use of the landscape includes most landform types, it was concluded that areas of repeated or larger-scale usage show a strong tendency to be close to water (within 100 m) (AECOM 2013: 67–8).

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4 PREDICTIVE MODEL

4.1 LANDFORM MODELLING

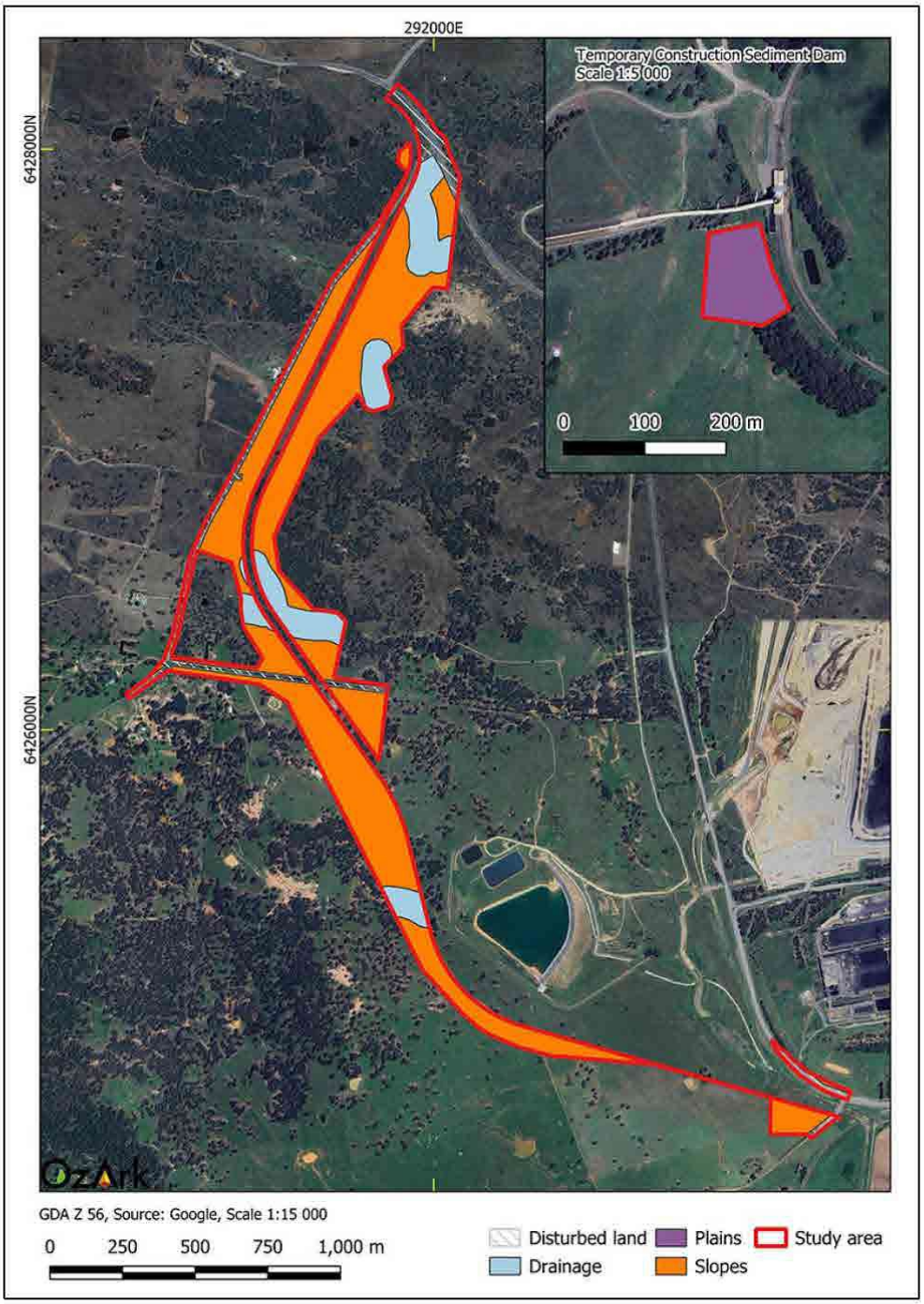
The topography of the study area is mostly slopes of a moderate gradient, with the highest point being 270 m Australian Height Datum (AHD) at the north of the study area, descending to 150 m AHD at the easternmost section of the study area (**Figure 1-3**).

Preliminary landform mapping within the study area indicates there are three main landform types (**Figure 4-1**):

- Moderate slopes across most of the study area (survey unit 1)
- Level plains at the small ROM pad area at the east of the study area (survey unit 2)
- Landforms within 50 m of the ephemeral drainage lines at the study area (survey unit 3)
- Disturbed land in the existing road corridors of Bengalla Road, Roxburgh Road and Wyndham Arms Row.

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Figure 4-1: Survey units of the study area.



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4.2 PREDICTIVE MODEL FOR THE STUDY AREA

Based on knowledge of the environmental contexts of the study area and a desktop review of the known local and regional archaeological record, the following predictions are made concerning the probability of landforms within the study area to contain Aboriginal objects (**Table 4-1**), and what types of sites may be present within the study area (**Table 4-1**).

Table 4-1: Likelihood of landforms within the study area to contain Aboriginal objects.

Survey Unit	Landform type	Likelihood to contain Aboriginal objects
1	Slopes	Slopes are a degrading landform, especially in the study area where vegetation removal has accelerated soil loss. These landforms are not suited to large-scale or repeated occupation and Aboriginal objects recorded in such landforms are likely to be in a secondary context. The exception is in localised flat benches or sections of gentle slopes, if they are present, where occupation may have been more suitable.
2	Plains	Plains are an aggrading environment that are impacted by flooding and channel migration. While floodplains would have provided resources to encourage occupation and use in the past, their geomorphic nature makes them poor preservers of archaeological deposits and any objects in such landforms are likely to be in a secondary context.
3	Drainage	Landforms immediately adjacent to waterways generally have high archaeological potential as they provide reliable access to water. While the ephemeral waterways of the study area are not expected to have provided consistent access to water in the past, the presence of water in some environmental conditions may have attracted habitation or game for hunting.

The results of previous surveys across the study area and its immediate surrounds indicate that stone artefact sites are the most likely site type to be present and that all other site types are unlikely. Sites are more likely to be present within the slopes and drainage landforms than the plains landforms, in accordance with the results of Rich (1993) and AECOM (2013).

4.3 RESEARCH QUESTIONS

A number of research questions can meaningfully be applied to the investigation of the study area. These research questions include:

- What resources were available to the Aboriginal people using the land within the study area (food, stone and water) and what resources were transported to the area?
- What tasks were Aboriginal people undertaking at the sites?
- Are there outcropping rock materials present suitable for stone tool procurement and manufacture?
- Is there evidence to suggest that Aboriginal people were using the area earlier than the mid to late Holocene? Can dates be obtained for the Aboriginal use of the area?
- Do the findings within the study area (if any) accord with the regional archaeological context examined in **Section 3**?
- Do the survey results support the predictive model set out in **Section 4**?

The survey methodology set out in **Section 5** will be framed to help answer these questions; should sites of sufficient archaeological significance be encountered.

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5 SURVEY METHODOLOGY

5.1 ASSESSMENT APPROACH

The Aboriginal cultural heritage assessment of the study area will follow the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (Code of Practice; DECCW 2010b). The field inspection will follow the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (The Guide, OEH 2011).

Survey for Aboriginal cultural heritage values will concentrate on the study area where project impacts will be located.

5.2 SURVEY AIMS

The aim of any archaeological survey is not to locate each artefact in a landscape but to undertake investigations so that the archaeological potential and archaeological characteristics of all landforms within the study area are known. Therefore, the aims of the survey will be to:

- Inspect all landform types in the study area so that their archaeological potential can be determined
- Evaluate whether the predictive model set out in **Section 4** is valid
- Determine if the research questions set out in **Section 4.3** can be answered
- Determine if any landforms of the study area require test excavation to understand the archaeological potential at a particular location
- Undertake sufficient assessment to satisfy Sections 2.2, 2.4, 2.5, 2.6, and 2.7 in the Guide
- Collect sufficient data so that the results can be presented in an ACHAR as set out in Section 3 in the Guide
- Undertake survey and record keeping satisfying Requirements 1–13 of the Code of Practice.

5.3 SURVEY METHODOLOGY

Standard archaeological field survey and recording methods will be employed in this assessment (Burke & Smith 2004) and will follow the Code of Practice.

Given the modest size of the study area, the field assessment will complete full pedestrian survey across the survey units. It is anticipated that the survey will be completed in one to two days.

Areas of high disturbance will not be surveyed, unless areas are identified to have archaeological potential by the field team. All trees deemed to be of sufficient maturity to contain cultural modification will be inspected, as well as any areas with outcropping rock. Some areas may not be physically surveyed if the RAPs and OzArk staff agree they are too disturbed or possess a very low likelihood of Aboriginal objects.

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In the field, OzArk staff will identify, record and evaluate physical (i.e., archaeological) evidence. Site recording will capture all the information required to complete current AHIMS site recording forms (e.g., site location, site boundary, site plan, representative photographs, artefact recording and feature recording). RAPs will participate in the survey, identifying Aboriginal objects, determining the cultural significance of Aboriginal objects, and identifying cultural places or non-physical site types within the study area. OzArk staff understand that cultural knowledge may not be provided in some instances due to cultural sensitivities (e.g., men's and/or women's places). Under these circumstances, to assess the potential impacts, OzArk staff will need to be told, only in general terms, why a particular place is important, and what the significance of the impact will be. OzArk staff will liaise with RAPs on a case-by-case basis to determine how to record the location in a culturally sensitive manner.

5.4 TEST EXCAVATION

It is possible that the survey may identify landforms where test excavation under the Code of Practice (Requirements 14–17) is required. Should such landforms be identified during the survey, the test excavation methodology will be prepared as a separate document that will be circulated to all RAPs for review and comment.

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AECOM 2013 — AECOM Australia Pty Ltd. 2013. *Bengalla Continuation of Mining Project: Aboriginal Archaeological and Cultural Heritage Impact Assessment*. A report prepared for the Bengalla Mining Company.

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ERM 2004 — ERM 2004. *Upper Hunter Valley Aboriginal Baseline Study*. Report for the Upper Hunter Aboriginal Heritage Trust.

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Rich 1993 — Rich, E. 1993. *Proposed Bengalla Coal Mine, Muswellbrook NSW: Archaeological Survey for Aboriginal Sites*. Report to Wayne Perry and Associates.

White 1998 — White, E. 1998. *Archaeological Salvage of site B10 and B33 Bengalla Mine, Hunter Valley NSW*. Report to Bengalla Mining Company.

APPENDIX 3: AHIMS SEARCH RESULTS

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : BMC 8
Client Service ID : 959918

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-2-3156	MTP-577	GDA	56	293494	6427685	Open site	Not a Site	Modified Tree (Carved or Scarred) : -		103689,103690
	Contact	Recorders	Mr.Lennard Roberts					Permits	4005	
37-2-4061	MTP-1413	GDA	56	293422	6427540	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Ms.Helen Selimiotis					Permits		
37-2-4444	BM-AS 12-12	GDA	56	292510	6426541	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-2087	BMRA1	AGD	56	292790	6425589	Open site	Destroyed	Artefact : 1		100765,101517
	Contact Searle	Recorders	Miss.Nicola Roche					Permits	4005	
37-2-2628	BMRA7	GDA	56	291494	6427760	Open site	Destroyed	Artefact : 1		101517
	Contact	Recorders	ERM Australia Pty Ltd- Sydney CBD					Permits		
37-2-2630	BMRA9	GDA	56	291793	6428304	Open site	Destroyed	Artefact : 1		101517
	Contact	Recorders	ERM Australia Pty Ltd- Sydney CBD					Permits		
37-2-4468	BM - IA 10-12	GDA	56	292119	6426980	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4472	BM - IA 14-12	GDA	56	291467	6426433	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4479	BM - IA 21-12	GDA	56	292185	6425108	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4450	BM-AS 18-12	GDA	56	292839	6425432	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits	4005	
37-2-2091	BMRA5	AGD	56	292094	6427550	Open site	Destroyed	Artefact : 1		100765,101517
	Contact Searle	Recorders	Miss.Nicola Roche					Permits	4005	
37-2-4455	BM-AS 23-12	GDA	56	291704	6425127	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4456	BM-AS 24-12	GDA	56	292165	6425346	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4477	BM - IA 19-12	GDA	56	291700	6425294	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-6578	Wyndham Arms Row IF-01	GDA	56	291591	6425911	Open site	Valid	Artefact : -		
	Contact	Recorders	OzArk Environmental and Heritage Management - Dubbo,Mr.Harrison Rochford					Permits		
37-2-4441	BM-AS 09-12	GDA	56	292022	6427494	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-2088	BMRA2	AGD	56	292802	6426004	Open site	Destroyed	Artefact : 1		100765,101517

Report generated by AHIMS Web Service on 12/12/2024 for Harrison Rochford for the following area at Datum :GDA, Zone : 56, Eastings : 290884.0 - 293549.0, Northings : 6424565.0 - 6428337.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 77

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Page 1 of 5

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : BMC 8
Client Service ID : 959918

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact Searle	Recorders	Miss.Nicola Roche					Permits	4005	
37-2-6016	BM-IA2-20	GDA	56	291372	6425763	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-3123	MTP-544	GDA	56	293163	6428082	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-3546	MTP-968	GDA	56	293355	6426073	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-4466	BM - IA 08-12	GDA	56	292235	6427681	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits	4005	
37-2-4469	BM - IA 11-12	GDA	56	291959	6426694	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4481	BM - IA 23-12	GDA	56	292406	6424802	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4440	BM-AS 08-12	GDA	56	292208	6427466	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4445	BM-AS 13-12	GDA	56	292471	6426325	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-6015	BM-IA1-20	GDA	56	291387	6425503	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-3109	MTP-530	GDA	56	293519	6428316	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-3549	MTP-971	GDA	56	293105	6425932	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-3550	MTP-972	GDA	56	293183	6425961	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-3551	MTP-973	GDA	56	293334	6426058	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-3552	MTP-974	GDA	56	293349	6426079	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-4474	BM - IA 16-12	GDA	56	291840	6425815	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
33-2-0022	Bengalla	AGD	56	293317	6424931	Open site	Destroyed	Artefact : 1		
	Contact T Russell	Recorders	Miss.Cheryl Kitchener					Permits	2621	
37-2-4439	BM-AS 07-12	GDA	56	292197	6427848	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits	4005	
37-2-4443	BM-AS 11-12	GDA	56	292276	6426741	Open site	Destroyed	Artefact : 1		

Report generated by AHIMS Web Service on 12/12/2024 for Harrison Rochford for the following area at Datum :GDA, Zone : 56, Eastings : 290884.0 - 293549.0, Northings : 6424565.0 - 6428337.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 77

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Page 2 of 5

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : BMC 8
Client Service ID : 959918

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4448	BM-AS 16-12	GDA	56	292579	6425918	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4452	BM-AS 20-12	GDA	56	291779	6425680	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-3111	MTP-532	GDA	56	293520	6428181	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-3122	MTP-543	GDA	56	293513	6428113	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-4470	BM - IA 12-12	GDA	56	292340	6426455	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4475	BM - IA 17-12	GDA	56	292380	6425752	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-2112	Area 3 B 1	AGD	56	293317	6424931	Open site	Destroyed	Artefact : 1		100765
	Contact Searle	Recorders	Indigenous Outcomes - Cheryl Kitchener					Permits	2621	
37-2-3157	MTP-578	GDA	56	293481	6427698	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-4437	BM-AS 05-12	GDA	56	292029	6426475	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-5570	Bengalla Road Isolated Artefact	GDA	56	293451	6424647	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Extent Heritage Pty Ltd - Pyrmont - Individual users,Mr.Matthew Harris					Permits		
37-2-2089	BMRA3	AGD	56	292761	6426498	Open site	Destroyed	Artefact : 1		100765,101517
	Contact	Recorders	Miss.Nicola Roche					Permits	4005	
37-2-2090	BMRA4	AGD	56	292583	6426881	Open site	Destroyed	Artefact : 1		100765,101517
	Contact Searle	Recorders	Miss.Nicola Roche					Permits	4005	
37-2-0583	B14;	AGD	56	293225	6425819	Open site	Destroyed	Artefact : -	Open Camp Site	2687,100681,100765
	Contact	Recorders	Elizabeth Rich					Permits	4005	
37-2-4454	BM-AS 22-12	GDA	56	291623	6425398	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4457	BM-AS 25-12	GDA	56	292349	6425330	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4461	BM-IA 03-12	GDA	56	292741	6427051	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4062	MTP-1460	GDA	56	293513	6426231	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Ms.Helen Selimiotis					Permits		

Report generated by AHIMS Web Service on 12/12/2024 for Harrison Rochford for the following area at Datum :GDA, Zone : 56, Eastings : 290884.0 - 293549.0, Northings : 6424565.0 - 6428337.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 77

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Page 3 of 5

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : BMC 8
Client Service ID : 959918

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-2-4438	BM-AS 06-12	GDA	56	292394	6425477	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4447	BM-AS 15-12	GDA	56	291443	6425842	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4451	BM-AS 19-12	GDA	56	292930	6425073	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-2629	BMRA8	GDA	56	291860	6428319	Open site	Destroyed	Artefact : 1		101517
	Contact	Recorders	ERM Australia Pty Ltd- Sydney CBD					Permits		
37-2-5426	BM-IA24-14	GDA	56	292408	6425121	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-3110	MTP-531	GDA	56	293446	6428179	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-3548	MTP-970	GDA	56	293182	6425886	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-4460	BM-IA 02-12	GDA	56	293105	6427486	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits	4005	
37-2-4462	BM-IA 04-12	GDA	56	293086	6426348	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits	4005	
37-2-4471	BM - IA 13-12	GDA	56	292140	6426567	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4473	BM - IA 15-12	GDA	56	291770	6426148	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4476	BM - IA 18-12	GDA	56	291954	6425628	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4478	BM - IA 20-12	GDA	56	292306	6425197	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4480	BM - IA 22-12	GDA	56	292347	6424992	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4482	MTP-AS01-12	GDA	56	293414	6427885	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits	4005	
37-2-4442	BM-AS 10-12	GDA	56	291850	6426969	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4446	BM-AS 14-12	GDA	56	291888	6426064	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-4449	BM-AS 17-12	GDA	56	292833	6425701	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits	4005	

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Page 4 of 5

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : BMC 8
Client Service ID : 959918

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-2-2092	BMRA6	AGD	56	291883	6427699	Open site	Destroyed	Artefact : 1		100765,101517
	Contact: Searle	Recorders: Miss.Nicola Roche						Permits:		
37-2-3547	MTP-969	GDA	56	293221	6425907	Open site	Destroyed	Artefact : -		
	Contact	Recorders: Mr.Geordie Oakes,Mr.Lennard Roberts						Permits:	4005	
37-2-4453	BM-AS 21-12	GDA	56	291753	6425502	Open site	Valid	Artefact : 1		
	Contact	Recorders: Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney						Permits:		
37-2-4458	BM-AS 26-12	GDA	56	291483	6425502	Open site	Valid	Artefact : 1		
	Contact	Recorders: Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney						Permits:		
37-2-4463	BM - IA 05-12	GDA	56	292830	6427900	Open site	Destroyed	Artefact : 1		
	Contact	Recorders: Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney						Permits:		
37-2-4464	BM - IA 06-12	GDA	56	292414	6428066	Open site	Valid	Artefact : 1		
	Contact	Recorders: Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney						Permits:		
37-2-4465	BM - IA 07-12	GDA	56	292449	6427622	Open site	Destroyed	Artefact : 1		
	Contact	Recorders: Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney						Permits:	4005	

** Site Status
Valid - The site has been recorded and accepted onto the system as valid
Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.
Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground
Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 12/12/2024 for Harrison Rochford for the following area at Datum :GDA, Zone : 56, Eastings : 290884.0 - 293549.0, Northings : 6424565.0 - 6428337.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 77

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Page 5 of 5

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : BMC 8 3
Client Service ID : 959905

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-2-2122	Area 2 B 16	AGD	56	293699	6425974	Open site	Destroyed	Artefact : 1		100765
	Contact: Searle	Recorders: Indigenous Outcomes - Cheryl Kitchener						Permits:	2621	
37-2-4063	MTP-1462	GDA	56	293615	6426715	Open site	Destroyed	Artefact : -		
	Contact	Recorders: Mr.Geordie Oakes,Ms.Helen Selimiotis						Permits:		
37-2-2102	B11_	AGD	56	293804	6426163	Open site	Destroyed	Artefact : 1		
	Contact: Searle	Recorders: Miss.Cheryl Kitchener						Permits:		
37-2-3540	MTP-962	GDA	56	293657	6426687	Open site	Destroyed	Artefact : -		
	Contact	Recorders: Mr.Geordie Oakes,Mr.Lennard Roberts						Permits:	4005	
37-2-3545	MTP-967	GDA	56	293574	6426250	Open site	Destroyed	Artefact : -		
	Contact	Recorders: Mr.Geordie Oakes,Mr.Lennard Roberts						Permits:	4005	
37-2-2115	Area 2 B 9	AGD	56	293615	6425597	Open site	Destroyed	Artefact : 1		100765
	Contact: Searle	Recorders: Indigenous Outcomes - Cheryl Kitchener						Permits:	2621	
37-2-2116	Area 2 B 10	AGD	56	293739	6425715	Open site	Destroyed	Artefact : 1		100765
	Contact: Searle	Recorders: Indigenous Outcomes - Cheryl Kitchener						Permits:	2621	
37-2-2121	Area 2 B 15	AGD	56	293634	6425917	Open site	Destroyed	Artefact : 1		100765
	Contact: Searle	Recorders: Indigenous Outcomes - Cheryl Kitchener						Permits:	2621	
37-2-2127	Area 1 B 21	AGD	56	294685	6425654	Open site	Destroyed	Artefact : 1		100765
	Contact: Searle	Recorders: Indigenous Outcomes - Cheryl Kitchener						Permits:	2621	
37-2-2094	B 3	AGD	56	293558	6425608	Open site	Destroyed	Artefact : 7		
	Contact: Searle	Recorders: Miss.Cheryl Kitchener						Permits:	2621	
37-2-2099	B8	AGD	56	293764	6426008	Open site	Destroyed	Artefact : 1		
	Contact: Searle	Recorders: Miss.Cheryl Kitchener						Permits:		
37-2-2100	B9_	AGD	56	294024	6426045	Open site	Destroyed	Artefact : 1		
	Contact: Searle	Recorders: Miss.Cheryl Kitchener						Permits:		
37-2-2101	B10_	AGD	56	293739	6426106	Open site	Destroyed	Artefact : 1		
	Contact: Searle	Recorders: Miss.Cheryl Kitchener						Permits:		
37-2-2107	B16_	AGD	56	294685	6425654	Open site	Valid	Artefact : 1		
	Contact: Searle	Recorders: Miss.Cheryl Kitchener						Permits:		
37-2-3539	MTP-961	GDA	56	293663	6426676	Open site	Destroyed	Artefact : -		
	Contact	Recorders: Mr.Geordie Oakes,Mr.Lennard Roberts						Permits:	4005	
37-2-3542	MTP-964	GDA	56	293653	6426850	Open site	Destroyed	Artefact : -		
	Contact	Recorders: Mr.Geordie Oakes,Mr.Lennard Roberts						Permits:	4005	
37-2-2114	Area 2 B 8	AGD	56	293558	6425608	Open site	Destroyed	Artefact : 1		100765
	Contact: Searle	Recorders: Indigenous Outcomes - Cheryl Kitchener						Permits:	2621	
37-2-0580	B11; - Bengala Mine	AGD	56	293850	6425450	Open site	Destroyed	Artefact : -	Open Camp Site	2687,100681,100765,100995
	Contact	Recorders: Bobbie Oakley						Permits:	851,2621	

Report generated by AHIMS Web Service on 12/12/2024 for Harrison Rochford for the following area at Datum :GDA, Zone : 56, Eastings : 293448.0 - 296135.0, Northings : 6424651.0 - 6427058.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 61

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Page 1 of 4

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : BMC 8 3
Client Service ID : 959905

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-2-4435	BM-AS 03-12	GDA	56	294202	6427023	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-2093	B 2	AGD	56	293453	6425665	Open site	Destroyed	Artefact : 6		
	Contact Searle	Recorders	Miss.Cheryl Kitchener					Permits	4005	
37-2-2095	B4	AGD	56	293615	6425597	Open site	Valid	Artefact : 1		
	Contact Searle	Recorders	Miss.Cheryl Kitchener					Permits		
37-2-2096	B5	AGD	56	293739	6425715	Open site	Valid	Artefact : 1		
	Contact Searle	Recorders	Miss.Cheryl Kitchener					Permits		
37-2-2109	BEF2 - Bengalla Mining Company	AGD	56	294028	6426561	Open site	Destroyed	Artefact : 1		100765,100995
	Contact Searle	Recorders	ERM - Thornton					Permits	2621	
37-2-0581	B12;	AGD	56	293900	6424650	Open site	Valid	Artefact : -	Open Camp Site	2687,100681,100765
	Contact	Recorders	Elizabeth Rich,Barry French					Permits	851,4005	
37-2-0605	B36;	AGD	56	295010	6425200	Open site	Valid	Artefact : -	Open Camp Site	2687,100681,100765
	Contact	Recorders	Ms.Laila Haglund					Permits	851	
37-2-0606	B37;	AGD	56	295400	6425000	Open site	Valid	Artefact : -	Open Camp Site	2687,100681,100765
	Contact	Recorders	Elizabeth Rich					Permits		
37-2-5995	BM-IA3-20	GDA	56	293890	6426900	Open site	Destroyed	Artefact : -		
	Contact	Recorders	AECOM Australia Pty Ltd - Sydney,Doctor.Andrew Peter Mclaren					Permits		
37-2-2119	Area 2 B 13	AGD	56	293659	6425819	Open site	Destroyed	Artefact : 1		100765
	Contact Searle	Recorders	Indigenous Outcomes - Cheryl Kitchener					Permits	2621	
37-2-2086	BEF1	GDA	56	293682	6426532	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	RPS AAP Consulting Pty Ltd - Hamilton,Miss.Nicola Roche,Ms.Jo Nelson					Permits	4005	
37-2-2097	B6	AGD	56	293896	6425955	Open site	Destroyed	Artefact : 1		
	Contact Searle	Recorders	Miss.Cheryl Kitchener					Permits		
37-2-2103	B12_	AGD	56	293863	6426228	Open site	Destroyed	Artefact : 1		
	Contact Searle	Recorders	Miss.Cheryl Kitchener					Permits		
37-2-2104	B13_	AGD	56	294688	6425891	Open site	Valid	Artefact : 1		
	Contact Searle	Recorders	Miss.Cheryl Kitchener					Permits		
37-2-0577	B8 ;	AGD	56	294985	6426069	Open site	Destroyed	Artefact : -	Open Camp Site	2687,100681,100765
	Contact	Recorders	Ms.Laila Haglund					Permits	851	
37-2-0579	B10 ;	GDA	56	294383	6426195	Open site	Partially Destroyed	Stone Quarry : -, Artefact : -	Quarry	2687,100681,100765,100995
	Contact	Recorders	Mr.Geordie Oakes,Ms.Laila Haglund					Permits	851,2621	

Report generated by AHIMS Web Service on 12/12/2024 for Harrison Rochford for the following area at Datum :GDA, Zone : 56, Eastings : 293448.0 - 296135.0, Northings : 6424651.0 - 6427058.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 61

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Page 2 of 4

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : BMC 8 3
Client Service ID : 959905

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-2-0585	B16 ;	AGD	56	293805	6426789	Open site	Destroyed	Artefact : -	Open Camp Site	2687,100681,100765
	Contact	Recorders	Elizabeth Rich,Barry French					Permits		
37-2-2118	Area 2 B 12	AGD	56	293713	6425763	Open site	Destroyed	Artefact : 1		100765
	Contact Searle	Recorders	Indigenous Outcomes - Cheryl Kitchener					Permits	2621	
37-2-2125	Area 1 B 19	AGD	56	294367	6425715	Open site	Destroyed	Artefact : 1		100765
	Contact Searle	Recorders	Indigenous Outcomes - Cheryl Kitchener					Permits	2621	
37-2-3538	MTP-960	GDA	56	293707	6426546	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-2106	B15_	AGD	56	294627	6425597	Open site	Valid	Artefact : 1		
	Contact Searle	Recorders	Miss.Cheryl Kitchener					Permits		
37-2-3537	MTP-959	GDA	56	293641	6426641	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-0588	B19;	AGD	56	294000	6426620	Open site	Valid	Artefact : -	Open Camp Site	2687,100681,100765
	Contact	Recorders	Elizabeth Rich,Ms.Laila Haglund					Permits		
37-2-3544	MTP-966	GDA	56	293650	6426907	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-2126	Area 1 B 20	AGD	56	294627	6425597	Open site	Destroyed	Artefact : 1		100765
	Contact Searle	Recorders	Indigenous Outcomes - Cheryl Kitchener					Permits	2621	
37-2-3536	MTP-958	GDA	56	293616	6426854	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-2098	B7_	AGD	56	293818	6425952	Open site	Destroyed	Artefact : 1		
	Contact Searle	Recorders	Miss.Cheryl Kitchener					Permits		
37-2-3541	MTP-963	GDA	56	293696	6426754	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-4062	MTP-1460	GDA	56	293513	6426231	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Ms.Helen Selimiotis					Permits		
37-2-4436	BM-AS 04-12	GDA	56	294450	6426865	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Mr.Geordie Oakes,AECOM Australia Pty Ltd - Sydney					Permits		
37-2-2108	BEF1 - Bengalla Mining Company	AGD	56	293785	6426722	Open site	Destroyed	Artefact : 1		100765,100995
	Contact Searle	Recorders	ERM - Thornton					Permits	2621	
37-2-2105	B14_	AGD	56	294367	6425715	Open site	Valid	Artefact : 1		
	Contact Searle	Recorders	Miss.Cheryl Kitchener					Permits		
37-2-2110	BEF3 - Bengalla Mining Company	AGD	56	294021	6426577	Open site	Destroyed	Artefact : 1		100765,100995
	Contact Searle	Recorders	ERM - Thornton					Permits	2621	

Report generated by AHIMS Web Service on 12/12/2024 for Harrison Rochford for the following area at Datum :GDA, Zone : 56, Eastings : 293448.0 - 296135.0, Northings : 6424651.0 - 6427058.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 61

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Page 3 of 4

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : BMC 8 3
Client Service ID : 959905

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
37-2-0578	B9;	AGD	56	294585	6426739	Open site	Destroyed	Artefact : -	Open Camp Site	2687,100681,100765
	Contact	Recorders	Ms.Laila Haglund					Permits	851	
37-2-0582	B13; - Bengalla Mine	AGD	56	293500	6425700	Open site	Destroyed	Artefact : -	Open Camp Site	2687,100681,100765,100995
	Contact	Recorders	Elizabeth Rich,Barry French					Permits	851,2621	
37-2-0584	B15 ;	AGD	56	294305	6426669	Open site	Destroyed	Artefact : -	Open Camp Site	2687,100681,100765
	Contact	Recorders	Bobbie Oakley,Ms.Laila Haglund					Permits		
37-2-3543	MTP-965	GDA	56	293674	6426885	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.Geordie Oakes,Mr.Lennard Roberts					Permits	4005	
37-2-2111	BEF4 - Bengalla Mining Company	AGD	56	294012	6426572	Open site	Destroyed	Artefact : 1		100765,100995
	Contact Searle	Recorders	ERM - Thornton					Permits	2621	
37-2-2113	Area 2 B2, 3,4,5,6,7	AGD	56	293453	6425665	Open site	Destroyed	Artefact : 1		100765
	Contact Searle	Recorders	Indigenous Outcomes - Cheryl Kitchener					Permits	2621	
37-2-2117	Area 2 B 11	AGD	56	293791	6425766	Open site	Destroyed	Artefact : 1		100765
	Contact Searle	Recorders	Indigenous Outcomes - Cheryl Kitchener					Permits	2621	
37-2-2120	Area 2 B 14	AGD	56	293919	6425856	Open site	Destroyed	Artefact : 1		100765
	Contact Searle	Recorders	Indigenous Outcomes - Cheryl Kitchener					Permits	2621	
37-2-2123	Area 2 B 17	AGD	56	293758	6426039	Open site	Destroyed	Artefact : 1		100765
	Contact Searle	Recorders	Indigenous Outcomes - Cheryl Kitchener					Permits	2621	
37-2-2124	Area 1 B 18	AGD	56	294688	6425891	Open site	Destroyed	Artefact : 1		100765
	Contact Searle	Recorders	Indigenous Outcomes - Cheryl Kitchener					Permits	2621	

**** Site Status**
Valid - The site has been recorded and accepted onto the system as valid
Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.
Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground
Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 12/12/2024 for Harrison Rochford for the following area at Datum :GDA, Zone : 56, Eastings : 293448.0 - 296135.0, Northings : 6424651.0 - 6427058.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 61

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Page 4 of 4

APPENDIX 4: UNANTICIPATED FINDS PROTOCOLS (HANSEN BAILEY 2017)

7 PROCEDURE FOR PREVIOUSLY UNRECORDED ABORIGINAL OBJECTS

This section outlines the procedure to be implemented in the event that a previously unrecorded site is discovered during construction or operational activities at Bengalla.

7.1 Open Artefact Sites

In the event that previously unidentified Aboriginal objects are identified through the construction and operational phases of Bengalla, the following procedure will apply:

1. Works will cease in the area to prevent further impact to the object(s);
2. BMC Management is to be notified;
3. BMC will notify DP&E and OEH as soon as possible;
4. A qualified archaeologist and RAP representative must be engaged to determine the nature, extent and scientific significance of the object(s);
5. If the site is within the Disturbance Boundary and it is determined that:
    a. The nature and significance of the site is consistent with sites assessed as of low or moderate significance within the ACHMP and recommended for salvage by the appropriate archaeologist, it will be subject to surface collection (see **Section 6.1**). As soon as practicable, the site database will be updated.
    b. The nature and significance of the site is consistent with sites assessed as of high significance, it will be subject to surface collection and potentially other mitigation measures such as excavation, as determined by discussions with BMC Management, DP&E, OEH, an archaeologist and RAPs. As soon as practicable, the site database will be updated.
6. If the site is outside the Disturbance Boundary but within the Project Boundary it is to be managed (where possible) in accordance with the procedures outlined in **Section 5**. In addition, the BMC Sites Database is to be updated and an AHIMS site card completed and submitted to DP&E and OEH.

7.2 Scarred Trees

In the event that a potential Aboriginal scarred tree is identified within the Disturbance Boundary, the following procedure will be implemented:

1. Works will cease in the area to prevent any further impacts to the object(s);
2. BMC Management is to be notified;
3. A qualified archaeologist, RAP representative and arborist must be engaged to determine validity of the scarred tree;
4. Should it be determined that the scarring is not Aboriginal in origin, works can recommence;

5. Should it be determined that the scarring is likely Aboriginal in origin and within the Disturbance Boundary, the tree will be removed according to the procedure outlined in **Section 6.3**; and
6. Should it be determined that the tree is outside the Disturbance Boundary but within the Project Boundary, it is to be conserved or managed in accordance with procedure outlined in **Section 5.** The BMC Sites Database will be updated and an AHIMS site card completed and submitted to OEH.

APPENDIX 5: UNANTICIPATED SKELETAL REMAINS PROTOCOL (HANSEN BAILEY 2017 SECTION 7.3)

7.3 Human Skeletal Remains

In the event that human skeletal remains are identified, the following procedure will be adopted:

1. When suspected human remains are identified, all work in the near vicinity will cease;
2. BMC Management is to be notified;
3. BMC Management is to notify the Police;
4. BMC will notify DP&E and OEH as soon as possible;
5. BMC Management is to contact OEH's Environment line on 131 555 to notify that possible skeletal remains have been discovered and that the police have been notified. OEH will provide details on the current processes involved for managing archaeological skeletal remains (both Aboriginal & historic);
6. Under the instructions of the Police, an appropriate area is to be cordoned off using temporary fencing (or similar) around the exposed suspected human remains site. On agreement between the Police and BMC Management, work may continue outside of this area;
7. If the remains are determined to be Aboriginal remains, then under the advice of OEH, consult with the RAPs; and
8. Do not recommence work at the location until requirements of BMC, the Police, DP&E, OEH and the RAPs have been adequately addressed.

Appendix G
Historic Heritage Impact Assessment



View of Bengalla Homestead (source: New Hope Group).

HISTORIC HERITAGE IMPACT ASSESSMENT

BENGALLA MINE MODIFICATION 8

MUSWELLBROOK LOCAL GOVERNMENT AREA, NSW

OCTOBER 2025

Report prepared by

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Enquiries should be addressed to OzArk Environment & Heritage.

Acknowledgement

OzArk acknowledge the Wonnarua people, the traditional custodians of the area on which this assessment took place and pay respect to their beliefs, cultural heritage, and continuing connection with the land. We also acknowledge and pay respect to the post-contact experiences of Aboriginal people with attachment to the area and to the Elders, past and present, as the next generation of role models and vessels for memories, traditions, culture and hopes of local Aboriginal people.

CONTENTS

ABBREVIATIONS AND GLOSSARY IV
EXECUTIVE SUMMARY V
1 INTRODUCTION 1
1.1 Background 1
1.2 Proposed work 1
1.3 Study area 1
1.4 Purpose and structure of this report 2
2 HISTORIC HERITAGE ASSESSMENT: INTRODUCTION 3
2.1 Relevant legislation 3
2.1.1 Commonwealth legislation 3
2.1.2 State legislation 3
2.1.3 *Heritage Act 1977* 4
2.1.1 Local legislation 5
2.2 Assessment approach 5
2.3 Historic heritage assessment objectives 5
2.3.1 Reporting 6
3 HISTORIC HERITAGE ASSESSMENT: BACKGROUND 7
3.1 Environmental context 7
3.2 Brief history of Muswellbrook and surrounds 7
3.3 Previous heritage assessments near the study area 8
3.4 Desktop database searches conducted 8
3.5 Registered Heritage items in proximity to the study area 11
3.5.1 Dalmar Stud (LEP #I9) 11
3.5.2 Edinglassie (SHR #00170, LEP #I84) 13
3.5.3 Rous Lench (SHR #00211, LEP #I85) 15
3.5.4 Bengalla Homestead (LEP #I8) 16
3.5.5 Keys Family Private Cemetery (LEP #I7) 18
4 HERITAGE IMPACT ASSESSMENT 21
4.1 Field survey 21
4.2 Archaeological assessment 21
4.3 Likely impacts to historic heritage from the Modification 24
4.3.1 Impact assessments 24
4.4 Discussion 27

5 MANAGEMENT AND MITIGATION 28
5.1 General principles for the management of historic items 28
5.2 Management measures for the study area 28
5.2.1 Visual impact mitigation 28
5.2.2 Unanticipated finds 28
6 SUMMARY AND RECOMMENDATIONS 30
REFERENCES 31

FIGURES

Figure 1-1: Map showing the study area. 0
Figure 1-2: Proposed Modification Disturbance Boundary 1
Figure 3-1: Location of heritage listed items near the study area. 10
Figure 3-2: Aerial showing Dalmar Stud curtilage in relation to study area. 11
Figure 3-3: 1996 photograph of Dalmar Stud (EJE Group 1996a). 12
Figure 3-4: Aerial showing the curtilages of the Edinglassie listings in relation to study area. 13
Figure 3-5: Photograph of Edinglassie Homestead (EJE Group 1996b). 14
Figure 3-6: Aerial showing Rous Lench cottage curtilage in relation to the study area. 15
Figure 3-7: Photograph of Rous Lench (EJE Group 1996c). 16
Figure 3-8: Aerial showing Bengalla Homestead in relation to the study area. 17
Figure 3-9: Photograph of Bengalla Homestead (EJE Group 1996d). 18
Figure 3-10: Aerial showing Keys Family Private Cemetery in relation to the study area. 19
Figure 3-11: Photograph of Keys Family Private Cemetery (EJE Group 1996d). 20
Figure 4-1: 1958 Aerial showing heritage items and current study area. 22
Figure 4-2: 1958 Aerial showing the study area. 23

TABLES

Table 3-1: Historic heritage: desktop-database search results. 8
Table 4-1: Historic heritage: impact assessment. 24

ABBREVIATIONS AND GLOSSARY

DCCEEW (Cth)	Commonwealth Department of Climate Change, Energy, the Environment and Water. Department responsible for administering the EPBC Act.
DCCEEW (NSW)	NSW Department of Climate Change, Energy, the Environment and Water. DCCEEW contains the Environment and Heritage Group which, in turn, contains Heritage NSW and AHIMS.
DPHI	NSW Department of Planning, Housing and Infrastructure. DPHI contains the Planning agency.
EIS	Environmental Impact Statement. A required document for major projects documenting all potential impacts to the environment, including heritage, that may arise due to the development.
Heritage Act	*Heritage Act 1977*. Primary legislation governing historic cultural heritage within NSW.
Heritage NSW	Government department tasked with ensuring compliance with the NPW Act.
Heritage Council	Government body established under the Heritage Act that advises the Minister for Environment and Heritage on heritage matters in NSW and makes recommendations for the listing of items on the State Heritage Register.
HHIA	Historic Heritage Impact Assessment
HHMP	Historic Heritage Management Plan
LEP	*Local Environmental Plan*. Outlines development controls with an LGA.
LGA	Local Government Area
SEARs	Secretary's Environmental Assessment Requirements issued by DPHI.
SHI	State Heritage Inventory. Includes locally significant items either listed in LEPs or on state agency Heritage and Conservation Registers, including the SHR.
SHR	State Heritage Register. Heritage list maintained by Heritage NSW that lists all state significant places. Is part of the SHI.
SSD	State Significant Development
Study area	Area surveyed and assessed for the Modification
The Modification	Proposed SSD-5170 Modification 8

EXECUTIVE SUMMARY

OzArk Environment & Heritage (OzArk) has been engaged by Xenith Consulting on behalf of Bengalla Mining Company Pty Limited (BMC, the proponent) to complete a *Historic Heritage Impact Assessment* for the proposed Bengalla Mine Modification 8 (the Modification) to the existing Development Consent (State Significant Development [SSD]-5170) for Bengalla Mine (Bengalla).

Bengalla is an open cut coal mine located approximately 4 kilometres (km) west of Muswellbrook in the Upper Hunter Valley. Bengalla operations commenced in 1998 and have been approved under SSD-5170 since 3 March 2015.

BMC is proposing to lodge an application to modify SSD-5170 under Section 4.55(2) of the EP&A Act to adjust the approved disturbance footprint for the realignment of Bengalla Link Road (BLR) as described in the *Continuation of Bengalla Mine Environmental Impact Statement* (Bengalla EIS) (Hansen Bailey, 2013) to facilitate construction activites. The revised BLR alignment will require the disturbance of approximately 67.5 ha of vegetation in addition to that approved under SSD-5170.

The study area for the Modification comprises sloping landforms that have mostly been cleared and used for agricultural purposes. The study area was surveyed concurrently for the Aboriginal Cultural Heritage Assessment Report for the Modification. No previously unrecorded items with heritage values were identified during the assessment of the study area.

There are five heritage items listed on the State Heritage Register (SHR) and/or a Local Environmental Plan (LEP), in proximity to the study area. These items are Dalmar Stud, Edinglassie, Rous Lench, Bengalla Homestead, and the Keys Family Private Cemetery. Dalmar Stud is the closest of these to the study area (within 35 metres).

This assessment has identified that there will be an inconsequential impact on the heritage items near the study area and as such, no mitigation or management measures are required.

Recommendations and actions concerning the historic values within the study area are as follows:

1. All the proposed works must remain within the study area as shown on **Figure 1-1**. If the project design changes, additional assessment may be required.
2. The Bengalla Historic Heritage Management Plan (HHMP) should be updated following the approval of the Modification. The current policies regarding visual impact mitigation and the unanticipated finds procedure are relevant to the Modification.
3. This report has not identified significant historical archaeological deposits within the study area. In the unlikely event that archaeological deposits or features are encountered during works, the archaeological unanticipated finds procedure within the HHMP will be followed.

4. Relevant BMC employees and contractors will undertake training to ensure they have a general awareness and understanding of the potential for historic heritage items within the study area and the procedures of the HHMP.

1 INTRODUCTION

OzArk Environment & Heritage (OzArk) has been engaged by Xenith Consulting on behalf of Bengalla Mining Company Pty Limited (BMC, the proponent) to complete a *Historic Heritage Impact Assessment* (HHIA) for the proposed Modification 8 (the Modification) to the existing Development Consent for Bengalla Mine (State Significant Development [SSD]-5170).

1.1 BACKGROUND

Bengalla Mine (hereinafter referred to as Bengalla) is an open cut coal mine located approximately 4 kilometres (km) west of Muswellbrook in the Upper Hunter Valley of New South Wales (NSW).

Bengalla has operated since 1998 and is currently authorised under SSD-5170 granted on 3 March 2015. SSD-5170 has since been modified on five occasions. SSD-5170 (as modified) authorises the continuation of open cut coal mining and associated activities at Bengalla until 28 February 2039.

1.2 PROPOSED WORK

The Modification proposes adjustments to the disturbance footprint for the realignment of BLR as described in the Bengalla EIS to facilitate construction, resulting in approximately 67.5 ha of additional disturbance. The proposed design of the BLR:

- Reflects contemporary road safety design guidelines and requirements for intersections with the local road network, including Wybong Road and Roxburgh Road;
- Considers the current road network including other third party upgrades to the BLR / Wybong Road intersection, such that a 100 km / hour (hr) speed limit now applies;
- Considers the current and future utility of the road in the context of other major project works including for use by Over Size, Over Mass (OSOM) vehicles associated with the NSW Renewable Energy Zone (REZ) projects;
- Facilitates construction works, including required erosion and sediment control measures, water management infrastructure and design cut/fill requirements;
- Allows for the relocation of existing third party infrastructure including communications and power infrastructure; and
- Avoids mining authorities held by other parties.

1.3 STUDY AREA

The study area describes the area that will be included in the current assessment. The study area is situated predominantly on freehold land owned by BMC. The proposed BLR realignment, includes a stub road partially within HVEC freehold land and what is currently a Crown road (which is proposed to be transferred to MSC in connection with dedication of the realigned section of

BLR as a public road). An aerial showing the study area is presented as **Figure 1-1**. The proposed Modification Disturbance Boundary is shown on **Figure 1-2**.

Figure 1-1: Map showing the study area.

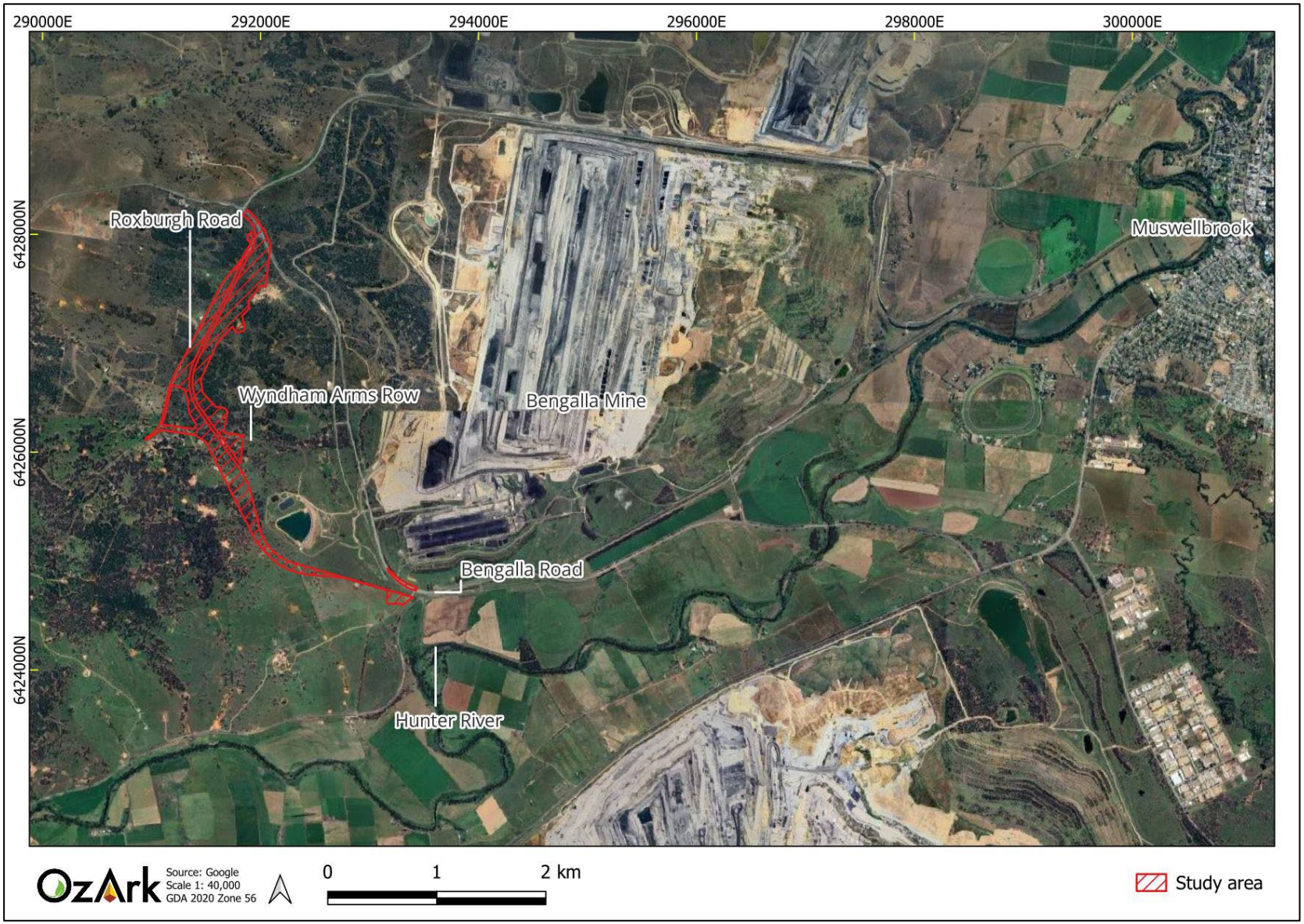


Figure 1-2: Proposed Modification Disturbance Boundary



1.4 PURPOSE AND STRUCTURE OF THIS REPORT

This report has been prepared by OzArk as part of the Modification application.

The purpose of this report is to assess potential historic heritage issues from the construction and operation of the Modification, and where required, identify feasible and reasonable mitigation and management measures.

The report is structured as follows:

- **Section 1**– introduces the proposal and the assessment;
- **Section 2** – describes the methodology for the assessment;
- **Section 3** – describes the existing conditions;
- **Section 4** – assesses the impacts of the construction and operation of the Modification;
- **Section 5** – provides mitigation measures for the impacts identified; and
- **Section 6** – conclusion and recommendations.

2 HISTORIC HERITAGE ASSESSMENT: INTRODUCTION

2.1 RELEVANT LEGISLATION

2.1.1 Commonwealth legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water, provides a framework to protect nationally significant flora, fauna, ecological communities, and heritage places. The EPBC Act establishes both a National Heritage List and Commonwealth Heritage List of protected places. These lists may include Aboriginal cultural sites or sites in which Aboriginal people have interests. The assessment and permitting processes of the EPBC Act are triggered when a proposed activity or development could potentially have an impact on one of the matters of national environment significance listed by the Act. Ministerial approval is required under the EPBC Act for proposals involving significant impacts to national/commonwealth heritage places.

Applicability to the Modification

It is noted that there are no Commonwealth or National heritage listed places within the study area, and as such, the heritage provisions of the EPBC Act do not apply.

2.1.2 State legislation

2.1.2.1 *Environmental Planning and Assessment Act 1979*

The *Environmental Planning and Assessment Act 1979* (EP&A Act) established requirements relating to land use and planning. The main parts of the EP&A Act that relate to development assessment and approval are Part 4 (development assessment) and Part 5 (environmental assessment). The purpose of the Part 5 assessment system is to ensure public authorities fully consider environmental issues before they undertake or approve activities that do not require development consent from a council or the Minister. The Minister responsible for the Act is the Minister for Planning and Public Spaces.

The EP&A Act currently provides the primary legislative basis for planning and environmental assessment in NSW. The objectives of the EP&A Act include encouragement of:

- The proper management, development, and conservation of natural resources;
- The provision and coordination of the orderly and economic use and development of land;
- Protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities and their habitats; and
- Ecologically sustainable development.

The objectives of the EP&A Act also provide for increased opportunity for public involvement and participation in environmental planning and assessment.

The EP&A Act includes provisions to ensure that the potential environmental impacts of a development or activity are rigorously assessed and considered in the decision-making process.

The framework governing environmental and heritage assessment in NSW for the Modification is contained within the following parts of the EP&A Act:

- Part 4: Local government development assessments, including heritage. May include schedules of heritage items
    - Section 4.55(2) outlines the procedures to be undertaken for modifications to the consent of State Significant Developments.

Applicability to the Modification

The current Modification will be assessed under Section 4.55(2) of the EP&A Act.

2.1.3 *Heritage Act 1977*

The *Heritage Act 1977* (Heritage Act) is applicable to the current assessment. This Act established the Heritage Council of NSW. The Heritage Council's role is to advise the government on the protection of heritage assets, make listing recommendations to the Minister in relation to the State Heritage Register (SHR), and assess/approve/decline proposals involving modification to heritage items or places listed on the SHR. Most proposals involving modification are assessed under Section 60 of the Heritage Act.

Automatic protection is afforded to 'relics', defined as 'any deposit or material evidence relating to the settlement of the area that comprised NSW, not being Aboriginal settlement, and which holds state or local significance' (note: formerly the Act protected any 'relic' that was more than 50 years old. Now the age determination has been dropped from the Act and relics are protected according to their heritage significance assessment rather than purely on their age). Excavation of land on which it is known or where there is reasonable cause to suspect that 'relics' will be exposed, moved, destroyed, discovered, or damaged is prohibited unless ordered under an excavation permit.

Applicability to the Modification

There are five historic heritage items listed on the State Heritage Register (SHR) and/or a Local Environmental Plan (LEP) in proximity to the study area. The details of these items are presented in **Section 3.5**.

2.1.1 Local legislation

2.1.1.1 *Local Environmental Plans*

Land use within the study area is controlled by the *Muswellbrook Local Environmental Plan 2009* (LEP).

The LEP includes a schedule of heritage conservation areas and items that require either development consent or exemptions for projects that may impact conservation outcomes (Section 5.10). The objectives set out in Section 5.10 of the LEP states:

a) To conserve the environmental heritage of the Muswellbrook Shire Council area;

b) To conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings, and views;

c) To conserve archaeological sites; and

d) To conserve Aboriginal objects and Aboriginal places of heritage significance.

Section 5.10(3)(a) (i) and (ii) set out the circumstances when a Development Application is not required when there is an impact to heritage items. Exemptions to consent are related to works that are of a minor nature or works that will not adversely impact the heritage values of a place.

Applicability to the Modification

Items of local heritage significance that are listed in LEPs are protected by the conditions set out in Section 5.10 of the LEP. The details of the items relevant to the study area are presented in **Section 3.5**.

2.2 ASSESSMENT APPROACH

The inspection and assessment of heritage significance follows the:

1. *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* (Burra Charter; International Council on Monuments and Sites 2013);
2. *Guidelines for preparing a statement of heritage impact* (SOHI Guideline; DPE 2023a); and
3. *Assessing heritage significance. Guidelines for assessing places and objects against the Heritage Council of NSW criteria* (DPE 2023b).

2.3 HISTORIC HERITAGE ASSESSMENT OBJECTIVES

The current assessment will apply the *Guidelines for preparing a statement of heritage impact* (DPE 2023a).

The HHIA, including field investigations, will meet the following objectives:

Objective One: To assess the significance of any recorded historical heritage items or areas;

Objective Two: Determine whether the modification is likely to cause harm to recorded historical heritage items or areas; and

Objective Three: Provide management recommendations and options for mitigating impacts.

2.3.1 Reporting

The reporting component of the heritage assessment was undertaken by:

- Report author: Ryan Zanker (OzArk Archaeologist, BA Flinders University);
- Report contributor: Harrison Rochford (OzArk Project Archaeologist, B Lib Studies [Hons] and M Phil, University of Sydney); and
- Reviewer: Dr. Bernadette Drabsch (OzArk Heritage Consultant; BA [hons], and PhD, University of Newcastle.

3 HISTORIC HERITAGE ASSESSMENT: BACKGROUND

3.1 ENVIRONMENTAL CONTEXT

The study area is generally characterised by undulating lowlands, rounded to steep hills with rock outcrops on ridges, with a general elevation of 40 to 300 metres (m) with a few higher peaks. The topography of the study area would not have hindered colonial settlement which is suitable for agricultural and grazing activities. Soils around the study area are comprised of a variety of harsh texture contrast soils on slopes and deep sandy loam alluvium on the valley floors. The alluvial soils of the flood plains and proximity of the Hunter River facilitated irrigation for cropping and encouraged permanent settlement. Prior to colonial land clearing, vegetation within the Hunter subregion would have featured open woodlands of white box, forest red gum, narrow-leaved ironbark, grey box and grey gum spotted gum, rough-barked apple and extensive stands of swamp oak in the upper reaches and foothills (Mitchell 2002: 112). The trees were likely cut to construct residences and sheds for colonial occupants, and used in the construction of fencing and shelters. Land use within and around the study area is varied, with generally high levels of disturbance predominately associated with vegetation clearance, cultivation, grazing and road construction.

3.2 BRIEF HISTORY OF MUSWELLBROOK AND SURROUNDS

According to Horton (1996), the study area is situated within the area of the Wonnarua tribal/language group. The ethnographic studies of Tindale (1974) and predecessors such as Howitt, Mathews and Fawcett place the study area within the traditional lands of the Wonnarua people. The Wonnarua language group is understood to have spanned the area between Maitland and the Great Dividing Range, although the boundaries between the Wonnarua and their neighbouring groups, the Gomeroi (west), Worimi and Awabakal (east), and Darkinjung (south) are likely to have involved seasonal change and areas that multiple language groups occupied for economic and cultural exchange.

The Hunter Valley area was one of the first large stretches of suitable pastoral land found early in the colony of NSW. After the region was opened to free settlement in 1820, it was quickly occupied by colonial settlers. By 1825, 360,000 acres of the Hunter Valley land had been granted as grazing leases, and by 1828, there were approximately 50,000 sheep and 11,000 cattle grazing throughout the region (DECCW 2025).

By the 1840s, Muswellbrook had become an urban centre, with 215 people living in the town and a post office being established. Muswellbrook served chiefly as a roadside town and an official centre for magistrates, mounted police and government functions (DECCW 2025). However, compared to other nearby towns in the region such as Singleton, Muswellbrook did not have the growth potential as it was mainly surrounded by large estates. By the 1890s, changes to dairy technology meant that nearly one fifth of the Hunter Valley was suitable for dairying, ultimately

beginning the process of subdivision and letting of these large estates that had come to dominate the region (DECCW 2025).

3.3 PREVIOUS HERITAGE ASSESSMENTS NEAR THE STUDY AREA

In 2013, AECOM prepared a Statement of Heritage Impact as part of an Environmental Impact Statement (EIS) that was being prepared by Hansen Bailey to support a SSD application to facilitate the continuation and development of Bengalla.

Their study area encompassed the current study area and identified several historic heritage items within the region, including Bengalla Homestead, the Keys Family Cemetery, Dalmar Stud, Edinglassie, Rous Lench, and others. The impact to these listed heritage items was assessed and AECOM concluded that these items of local significance would not be impacted by the Modification. They concluded that while there was potential for indirect visual and vibration blasting impacts, an assessment determined that the Modification was unlikely to exceed the relevant ground vibration and overpressure criteria, and all further residual impacts would be managed through the existing (now superseded) European Heritage Management Plan (EHMP) (AECOM 2013).

3.4 DESKTOP DATABASE SEARCHES CONDUCTED

A desktop search was conducted on the following databases to identify any potential previously recorded heritage within the study area. The results of this search are summarised in **Table 3-1**.

Table 3-1: Historic heritage: desktop-database search results.

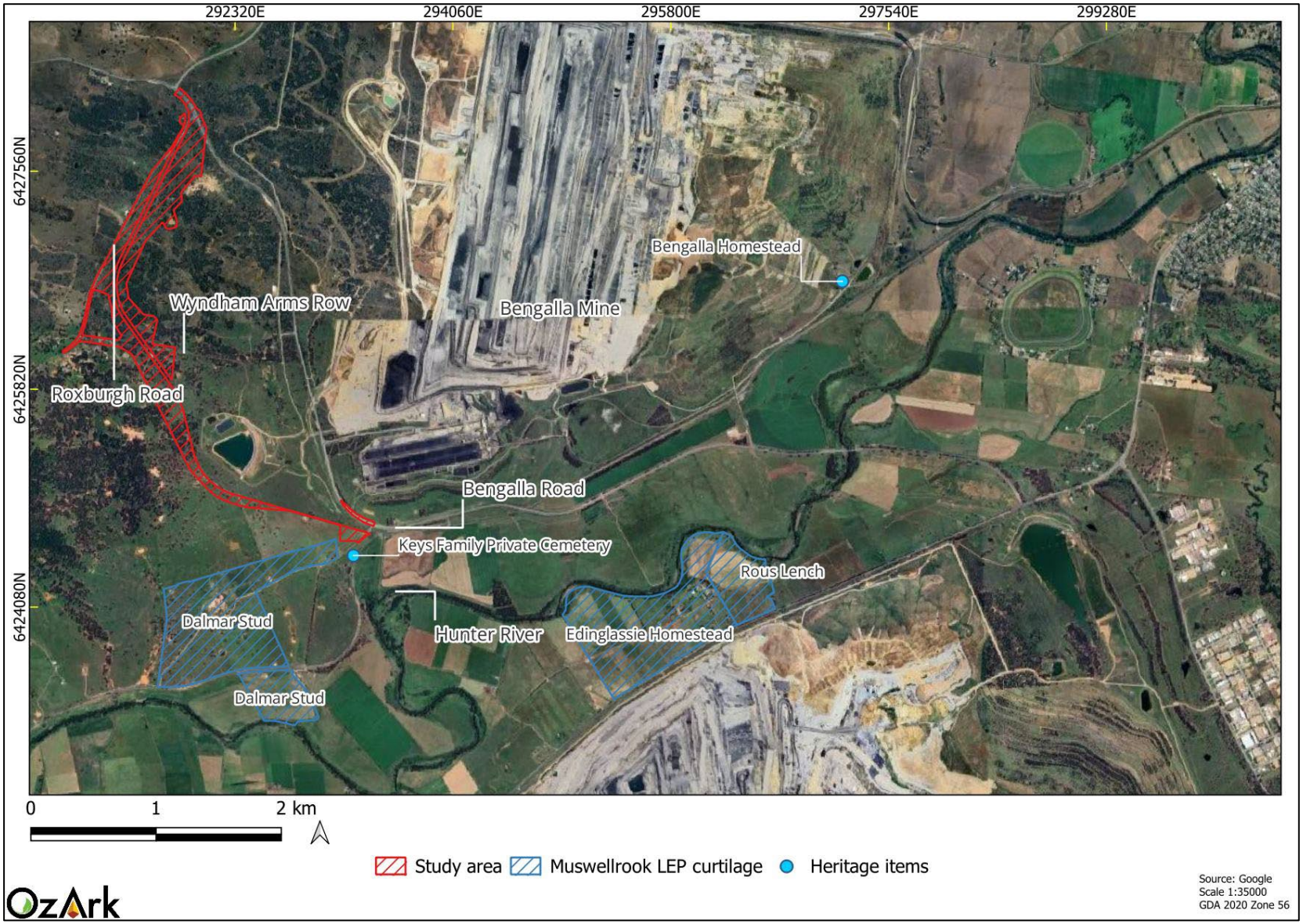
Name of database searched	Date of search	Type of search	Comment
National and Commonwealth Heritage Lists	28/3/2025	Muswellbrook LGA	No places listed on either the National or Commonwealth heritage lists are located within or in close proximity to the study area.
State Heritage Register	28/3/2025	Muswellbrook LGA	There are two items listed on the SHR in close proximity to the study area: Edinglassie (SHR #00170) and Rous Lench (SHR #00211).
State Heritage Inventory (Local Environmental Plans/state agency registers)	28/3/2025	Muswellbrook LEP 2009	There are five LEP listed items close to the study area; Dalmar Stud (LEP #I9), Edinglassie (LEP #I84), Rous Lench (LEP #I85), Bengalla Homestead (LEP #I8), and Keys Family Private Cemetery (LEP #I7).

A search of the national, state, and local heritage databases, including the Muswellbrook LEP, returned five recordings for historical heritage sites near to the study area, Dalmar Stud (LEP #I9), Edinglassie (SHR #00170 LEP #I84), Rous Lench (SHR #00211 LEP #I85), Bengalla Homestead (LEP #I8), and the Keys Family Private Cemetery (LEP #I7).

The heritage maps of the Muswellbrook LEP have inaccuracies in relation to the curtilage of the Bengalla Homestead and the Keys Family Private Cemetery heritage listings. The inaccurate curtilage has been excluded from the mapping of the heritage items shown on **Figure 3-1.**

Section 4.3 addresses the potential for the heritage values of the items to be affected by the Modification.

Figure 3-1: Location of heritage listed items near the study area.



3.5 REGISTERED HERITAGE ITEMS IN PROXIMITY TO THE STUDY AREA

The following descriptions and assessments of significance are from the SHI listings and the Muswellbrook LEP 2009.

3.5.1 Dalmar Stud (LEP #I9)

Dalmar Stud is located 35 m west of the southern section of the study area. Accessible via Old Bengalla Road, the Dalmar Stud listing consists of a historic shearing shed, and surrounding property registered on the Muswellbrook LEP. The location of Dalmar Stud is shown on **Figure 3-2** and an image of the item is shown on **Figure 3-3**.

Figure 3-2: Aerial showing Dalmar Stud curtilage in relation to study area.



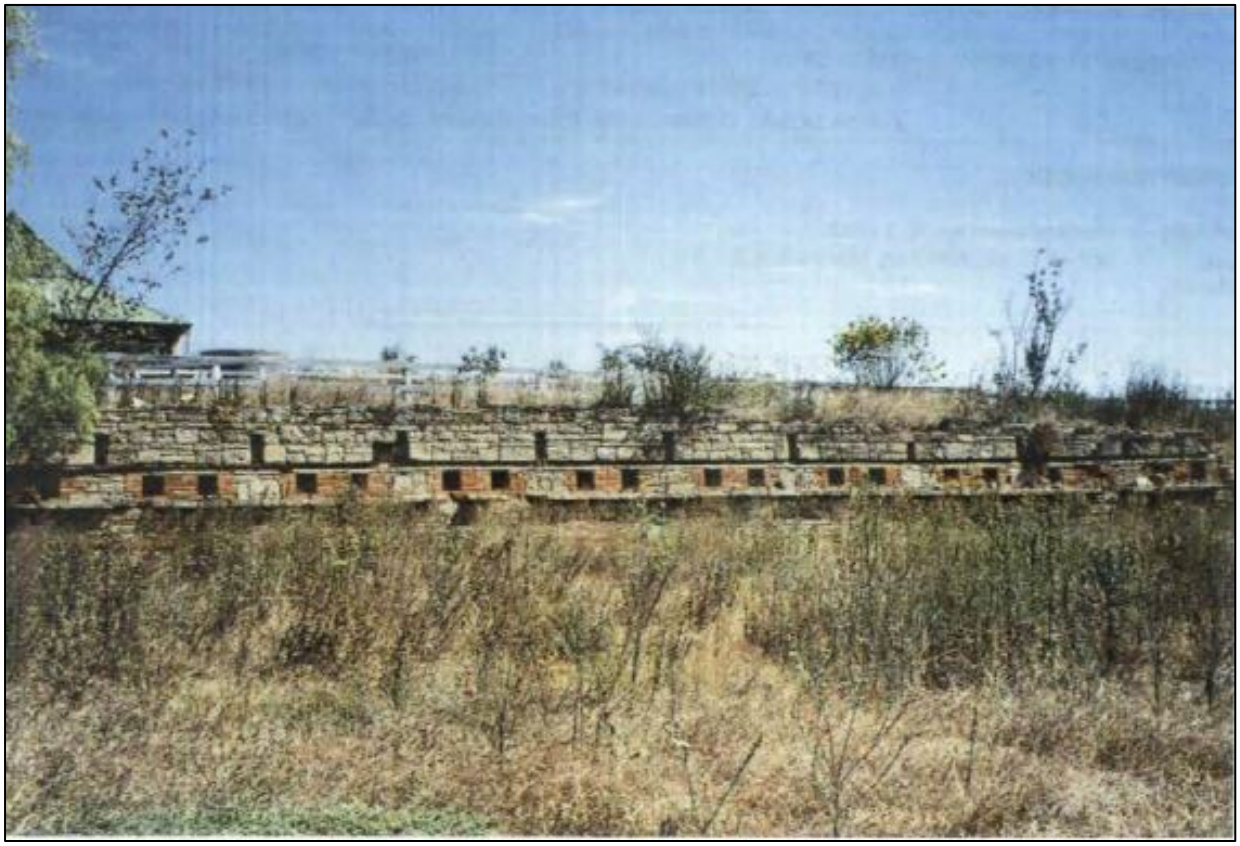
3.5.1.1 *History and Significance*

According to the SHI listing, the remaining shearing shed was constructed sometime prior to 1832-1847 and is of regional significance to the Muswellbrook region. Dalmar Stud was part of the holdings of Captain S. Wright, a celebrated soldier at the Battle of Waterloo. Captain Wright was granted the land which would go on to become Dalmar Stud after his arrival to Australia in 1822. Within 10 years, Captain Wright had accumulated approximately 14,000 acres throughout the area.

On this land holding, he built a 'stately mansion' which developed into the Old Bengalla Homestead complex, as discussed below (**Section 3.5.4**) (EJE Group 1996a). Dalmar Stud was part of one of the earliest pastoral developments and is socially significant for this reason. The property was sold by auction in April 1853 to the Keys family, who were the largest landowners in the area by the 1850s and pioneers in irrigation and live cattle export (see **Section 3.5.5**).

The remains of the shearing shed on Dalmar Stud are of regional historic significance due to the scale and quality of the construction. The structure is also of regional social significance due to its association with Captain Wright and the pioneering Keys family, who have lived in the Muswellbrook region for 150 years. Dalmar Stud remains of scientific significance for its potential to reveal information about the scale of operations of one of the earliest and grandest developed properties of the region in the early to mid-19th century.

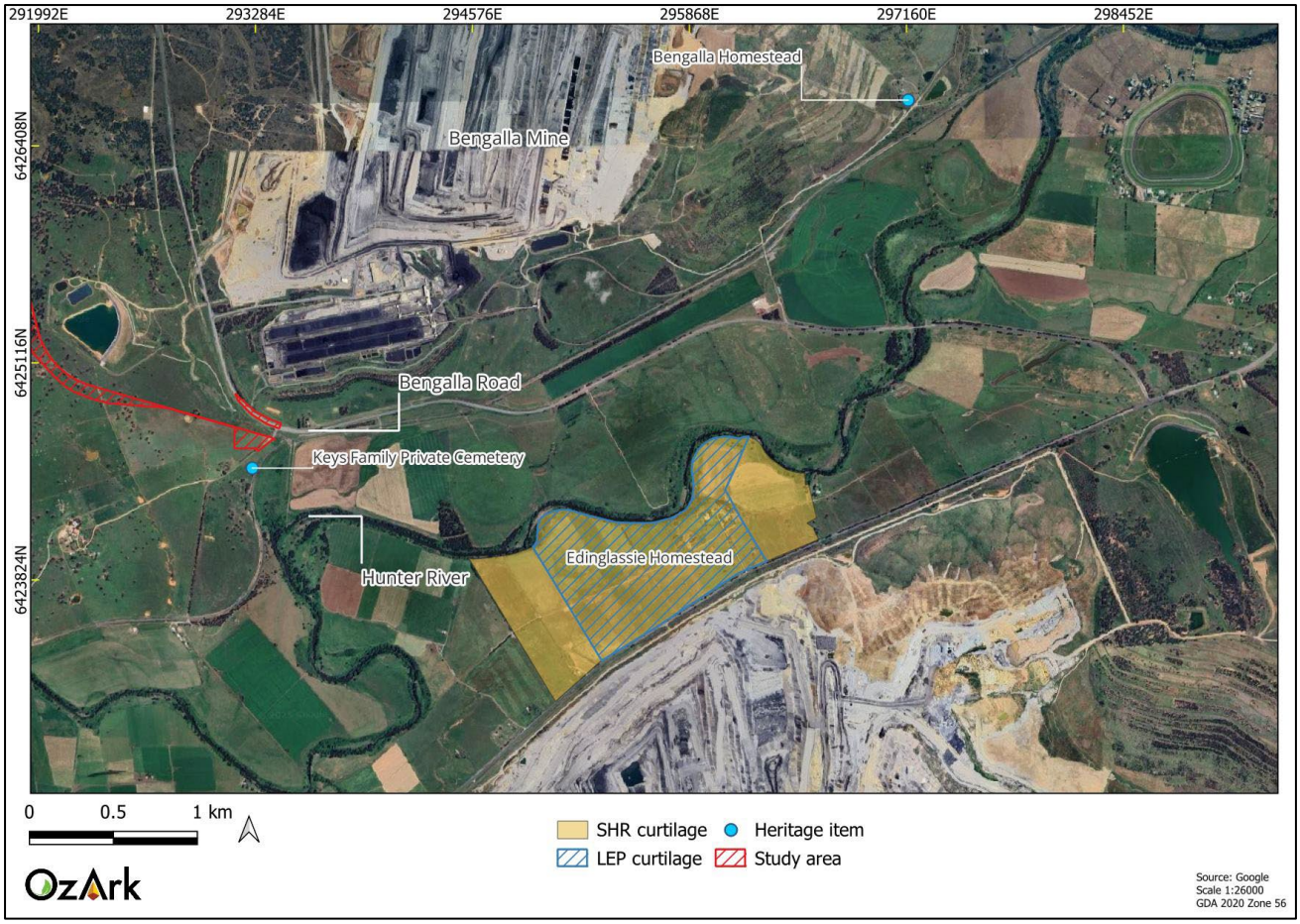
Figure 3-3: 1996 photograph of Dalmar Stud (EJE Group 1996a).



3.5.2 Edinglassie (SHR #00170, LEP #I84)

The Edinglassie property including the Edinglassie homestead is located at 710 Denman Road, Muswellbrook, 7 km southwest of the town of Muswellbrook and approximately 1.5 km south of the study area Edinglassie is closely associated with the Rous Lench property (see **Section 3.5.3**). The location of the item is shown on **Figure 3-4** and in image of the homestead is provided as **Figure 3-5**.

Figure 3-4: Aerial showing the curtilages of the Edinglassie listings in relation to study area.



3.5.2.1 *History and significance*

According to the SHI, the Edinglassie homestead and the Rous Lench cottage were constructed between 1880 and 1895. It has been assessed as having of state significance as it represents early colonial occupation of the area and was one of the earliest land grants of the initial settlement of the Hunter Valley.

Edinglassie was initially granted to George Forbes in 1826, brother to Chief Justice of NSW Francis Forbes. Edinglassie then passed to the White family, a leading pastoral dynasty, who are synonymous with the opening and development of the region (ADB 2006a). After James White died in 1842, his three sons, Francis, George, and James, managed the estate. They became

well-known for rearing cattle, and they acquired a great deal of land throughout the region over the next 20 years (ADB 2006b).

The Edinglassie homestead has been assessed as having State heritage values due to its association with the early European occupation of the area and its demonstration of the wealth and design preferences of leading pastoral families in the Hunter Valley (**Figure 3-5**).

The Edinglassie property remains significantly intact as a group of buildings and structures representative of several layers of development from 1825 to the present. The main two storey stone homestead is the centrepiece of the property, and is surrounded by outbuildings and farming structures, additional dwellings, a tennis court, swimming pool, and substantial gardens. The earliest remaining structure on the site – a former gardener's cottage – is believed to date to the 1860s. There is significant potential for archaeological remains dating to the earliest occupation of the site. The cultural heritage significance of Edinglassie property extends to historical, aesthetic, social and scientific values, on a State level.

Maintenance of Edinglassie is managed through the Edinglassie and Rous Lench Property Conservation Management Plan, prepared by Heritas Heritage & Conservation (2012).

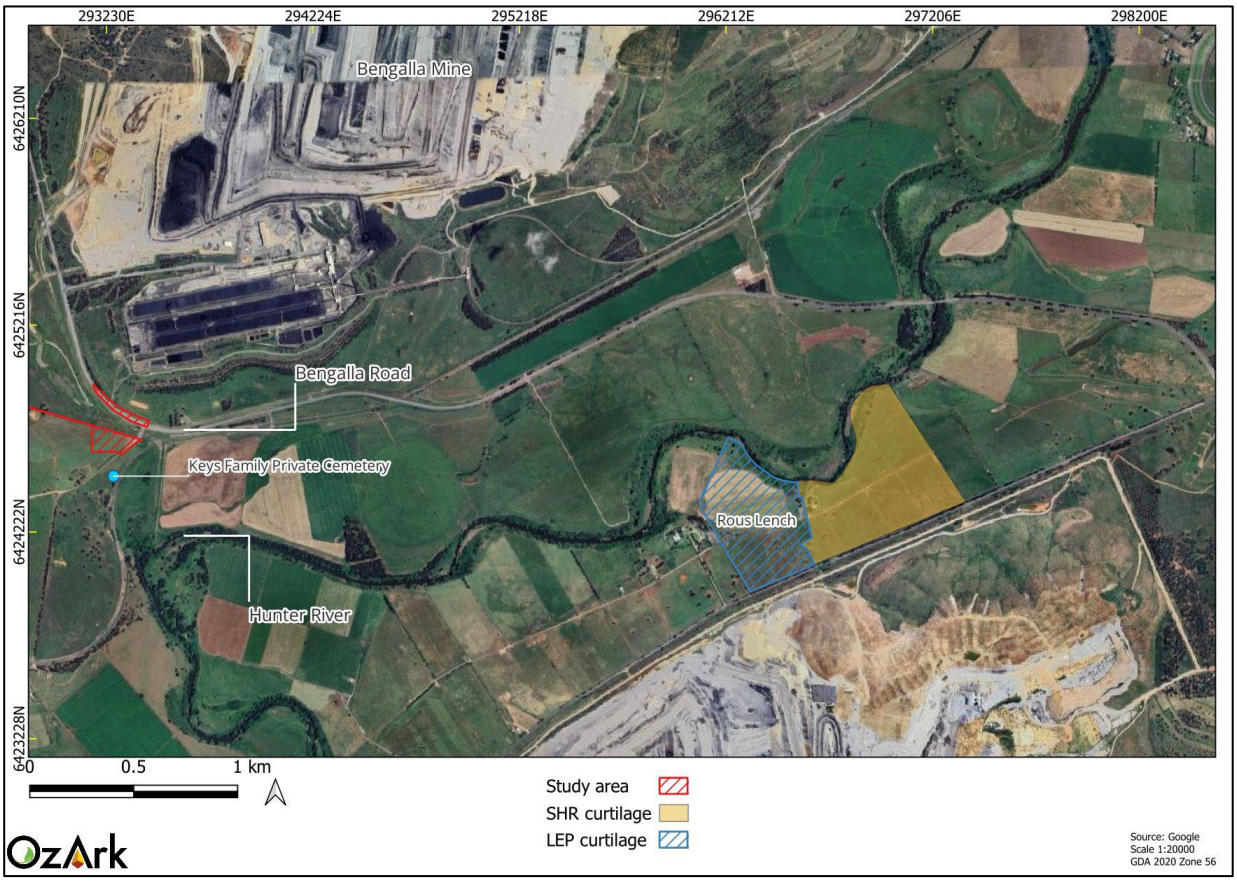
Figure 3-5: Photograph of Edinglassie Homestead (EJE Group 1996b).



3.5.3 Rous Lench (SHR #00211, LEP #I85)

The Rous Lench cottage is located adjacent to the Edinglassie Homestead property, at 183 Bengalla Road, approximately 7 km southwest of the town of Muswellbrook and approximately 2.7 km southeast of the study area (**Figure 3-6**). An image of Rous Lench is shown on **Figure 3-7**.

Figure 3-6: Aerial showing Rous Lench cottage curtilage in relation to the study area.



3.5.3.1 *History and Significance*

According to the SHI, Rous Lench cottage was closely associated with the Edinglassie homestead and property. It was designed by significant Australian architect, John Horbury Hunt and constructed between 1875 and 1895. Rous Lench cottage has been assessed as having state significance due to its close association with some of the earliest occupation of the area.

Being part of the original portion of land issued to George Forbes in 1839, the significance of Rous Lench is closely tied to that of the Edinglassie property. Rous Lench is recorded as being a low cottage of Italianate style, constructed of rendered brick, sandstone and corrugated iron. It is possible that an original hipped roof house at Rous Lench, which was recorded in a photograph in the 1880s was demolished and the current structure completed c 1895 (EJE Group 1996c).

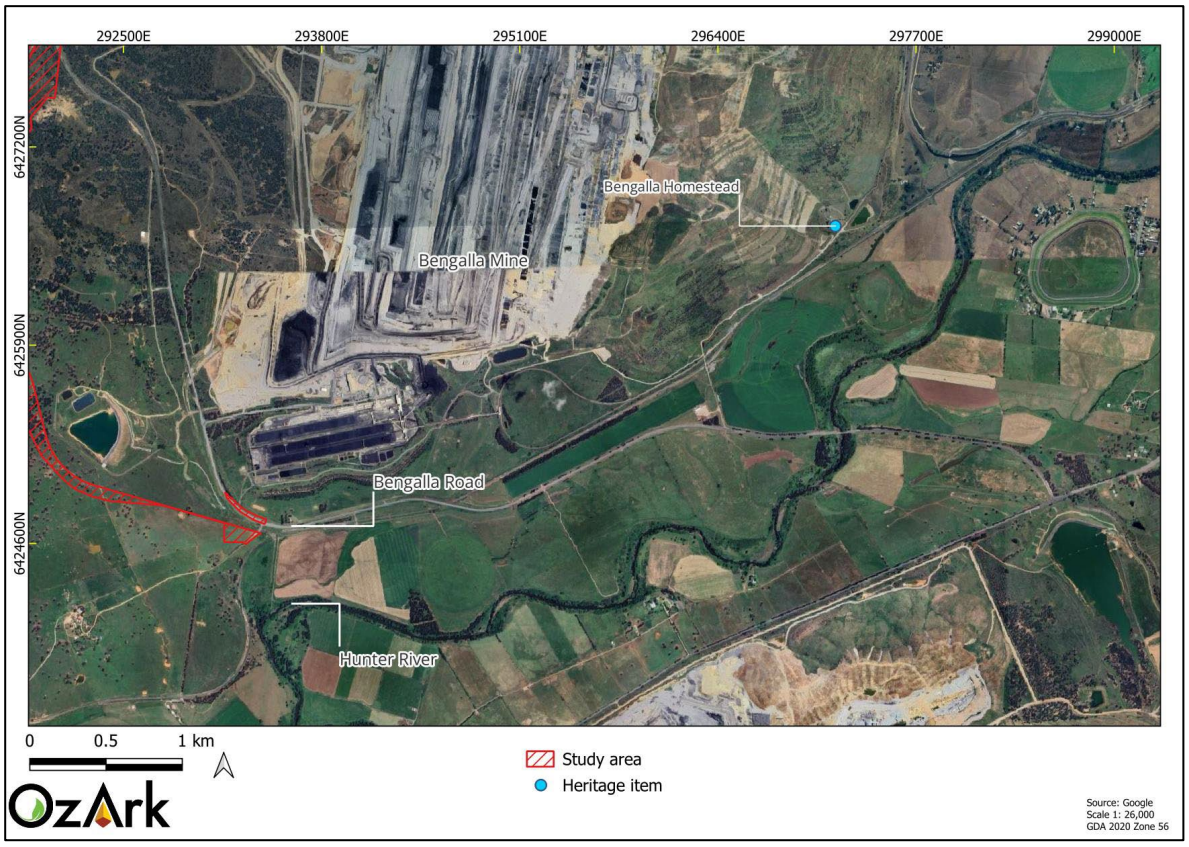
Figure 3-7: Photograph of Rous Lench (EJE Group 1996c).



3.5.4 Bengalla Homestead (LEP #I8)

Bengalla Homestead and the associated property, is located at 183 Bengalla Road, approximately 4.2 km northeast of the study area and 4 km west of Muswellbrook (**Figure 3-8**). A view of the Bengalla Homestead is shown on **Figure 3-9**.

Figure 3-8: Aerial showing Bengalla Homestead in relation to the study area.



3.5.4.1 *History and Significance*

According to the SHI, Bengalla Homestead is of significance to the Muswellbrook region due to its role in the development of the area, particularly in relation to the development and use of sophisticated mixed farming techniques.

The current Bengalla Homestead was constructed in 1877, after the demolition of 'Old Bengalla House'. The structure has French doors, bay windows, alternating colour brickwork, and ornate chimneys. Further modifications have been made to the Homestead since the time of its original construction. More recently in 1985, an eastern wing was constructed consisting of 5 new rooms, a laundry block, and a garage.

After changing hands several times, the Bengalla property passed to the Keys family in 1850, where the family's descendants have lived for approximately 150 years. The Keys accumulated an estate of approximately 20,000 acres throughout the area, utilising the land for mixed farming, cattle grazing and dairying, and pioneering irrigation. The Keys family owned two homesteads at the property, Old Bengalla house, which has since been demolished, and the current Bengalla House, built in 1877, which is still extant today.

Bengalla Homestead is listed as significant for multiple reasons according to its SHI listing. It has social significance due to the contributions made to the development of more sophisticated mixed farming techniques associated with the Keys family and the Bengalla Homestead. Although the

scientific contribution of the Keys family was recognised in the assessment, it is noted that the homestead listing does not exemplify these values (EJE Group 1996d). The scientific significance associated with the Bengalla Homestead have reportedly been lost due to the site's history of intensive use for a mix of agricultural activities since late last century. However, the property is still considered to possess further information and insight regarding these activities and their features.

Figure 3-9: Photograph of Bengalla Homestead (EJE Group 1996d).

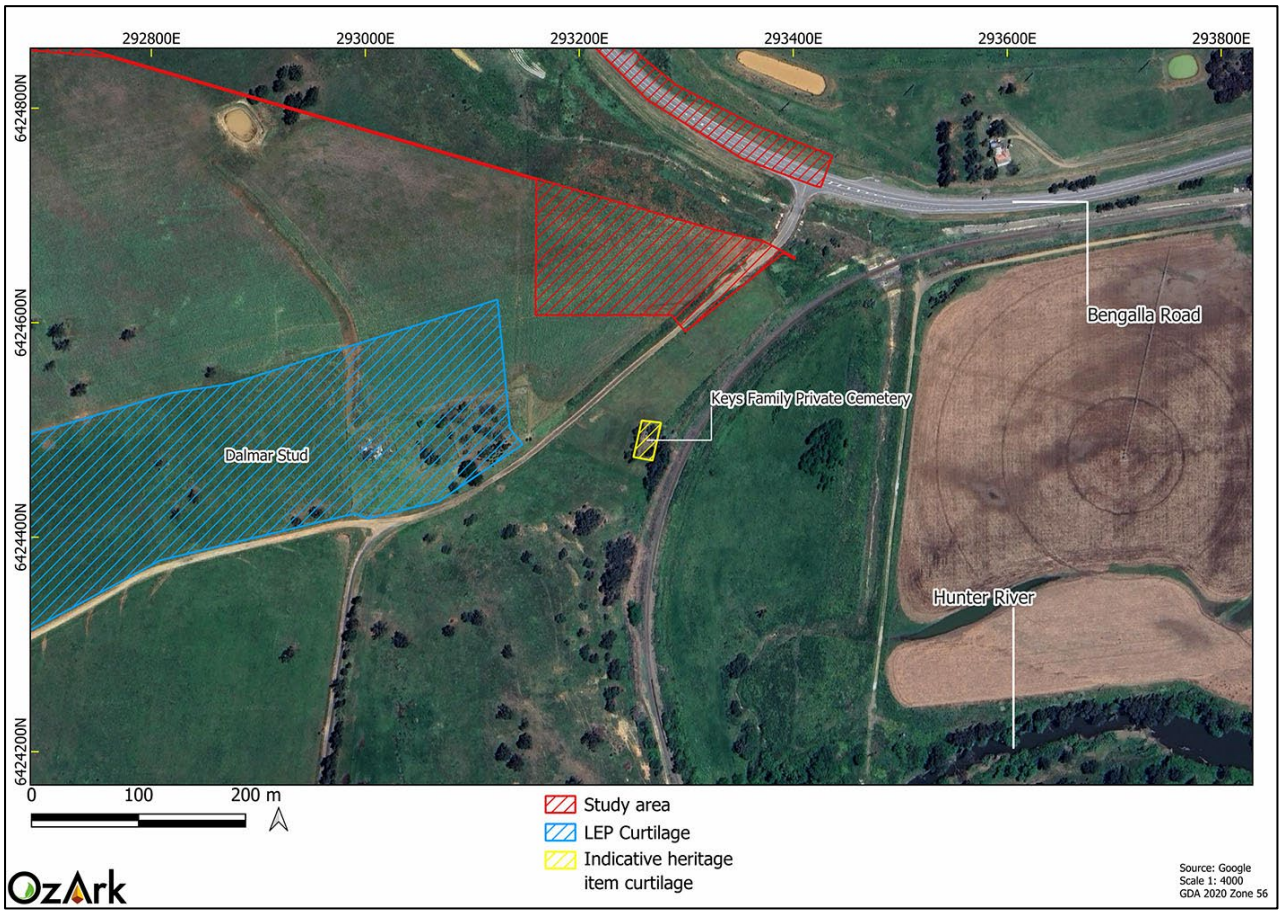


3.5.5 Keys Family Private Cemetery (LEP #I7)

3.5.5.1 *History and Significance*

The Keys Family Private Cemetery complex is located on Bengalla Road, adjacent to the Bengalla Homestead property on Bengalla Road, approximately 110 m east of the study area and 4 km west of the town of Muswellbrook (**Figure 3-10**). A view of the Keys Family Cemetery is provided as **Figure 3-11**. An estimation of the appropriate curtilage for the heritage item based on its listed Lot and DP is also depicted.

Figure 3-10: Aerial showing Keys Family Private Cemetery in relation to the study area.



According to the SHI, the Keys Family Private Cemetery is regionally significant for several reasons. The Private Family Cemetery is of significant social value to the eminent Keys family who have lived in Muswellbrook for some 150 years, providing a tangible link to their ancestors. The cemetery complex, which commemorates at least 18 individuals, also helps to provide insight into the history of prominent figures associated with the development of the Hunter Valley.

The SHI lists the Keys Family Private Cemetery as having regional significance owing to the large scale of the complex as, historically, private cemeteries of this size are relatively rare in the region of the Upper Hunter (EJE Group 1996e).

Figure 3-11: Photograph of Keys Family Private Cemetery (EJE Group 1996d).



Established in 1860, the Family Cemetery has since been well maintained and is currently enclosed by undergrowth, pepper trees, gums and a large grey agave plant. The cemetery features a range of stone altar types, including sandstone and marble headstones and obelisks, and is situated on a gentle slope with views east across agricultural flats towards Muswellbrook (EJE Group 1996e).

4 HERITAGE IMPACT ASSESSMENT

4.1 FIELD SURVEY

The field survey was undertaken by Harrison Rochford (OzArk Project Archaeologist) on 12–13 February 2025. No items or structures of potential heritage significance were observed across the study area. The mostly cleared rural landscape of the study area was assessed as having low potential for archaeological remains of heritage significance. If present, it is anticipated that subsurface deposits, would be material associated with the 20th century agricultural operations within the study area.

4.2 ARCHAEOLOGICAL ASSESSMENT

The five heritage items in proximity to the study area are situated within the Central Hunter Foothills landscape unit, as characterised by Mitchell (2002), which is defined by its undulating lowlands and rounded to steep hills with rocky outcrops. The region has been subject to widespread agricultural and mining activity, and as such, much of the area in relation to these heritage items has been previously cleared.

Figure 4-1 shows the study area and the surrounding heritage items in 1958, indicating the level of clearing and intensive agriculture associated with these items.

Figure 4-2 shows the study area overlayed on an aerial image from 1958. The figure indicates that there were no visible structures present within the study area at that time. The absence of structures in and around the study area suggests that the possibility of historic archaeological deposits low.

Figure 4-1: 1958 Aerial showing heritage items and current study area.

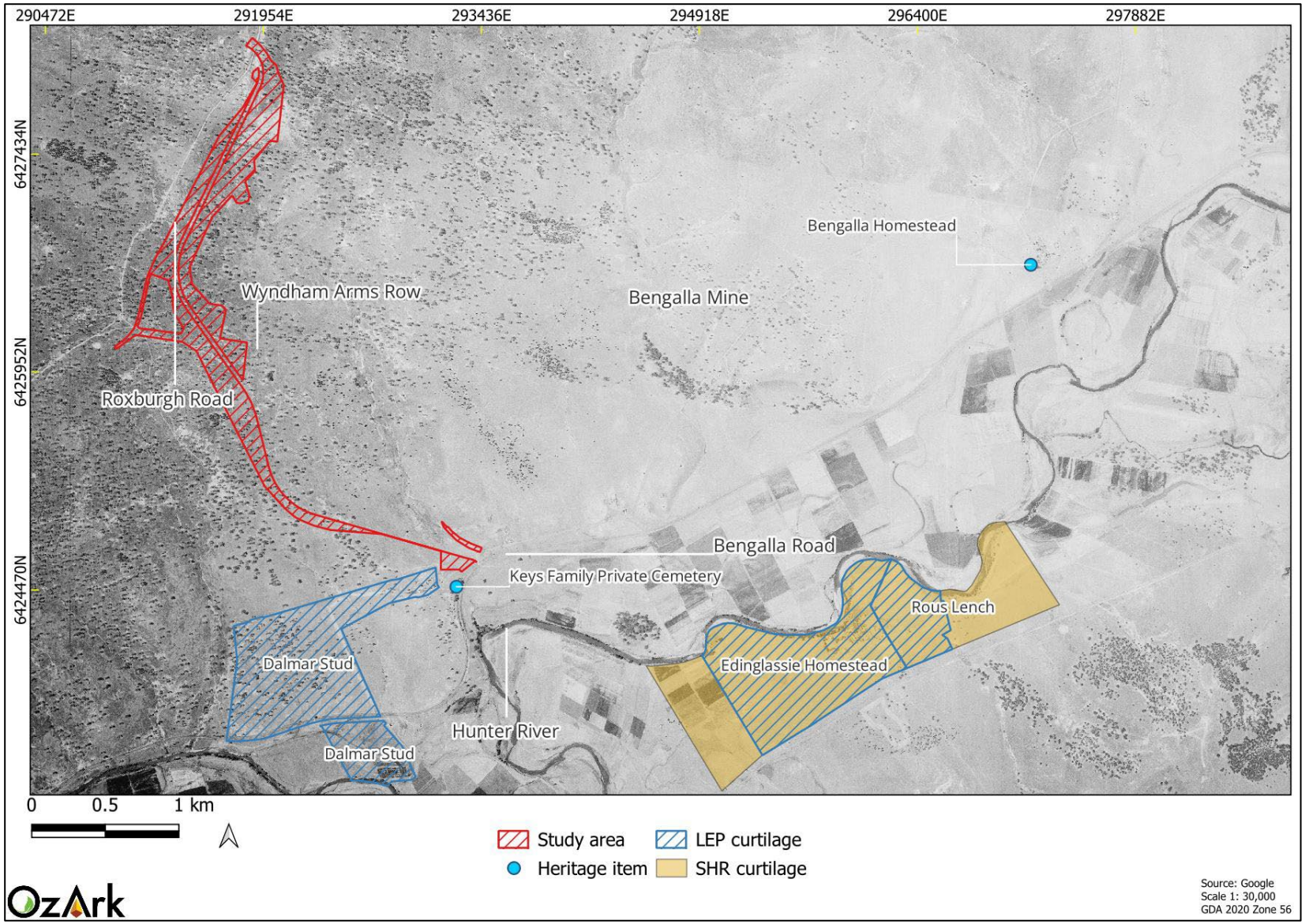


Figure 4-2: 1958 Aerial showing the study area.



4.3 LIKELY IMPACTS TO HISTORIC HERITAGE FROM THE MODIFICATION

Table 4-1 details the anticipated impacts to historic heritage of identified nearby heritage items. All items are sufficiently far from the study area that they will not be directly impacted. However, some closer items will be able to view the Modification.

Table 4-1: Historic heritage: impact assessment.

Item	Location in relation to the study area	Likely impact
Dalmar Stud (LEP #I9)	Approximately 35 m west of the study area. The property boundary is in proximity to the study area, however, the structure associated with the heritage curtilage is 1.1 km west of the study area.	No direct impact. Inconsequential visual impacts
Edinglassie (SHR #00170, LEP #I84)	Approximately 1.5 km south of the study area. The heritage item is at a distance to the Modification impacts.	No direct impact. Inconsequential visual impacts.
Rous Lench (SHR #00211, LEP #I85)	Approximately 2.7 km southeast of the study area. The heritage item is at a distance to the Modification impacts.	No direct impact. Inconsequential visual impacts.
Bengalla Homestead (LEP #I8)	Approximately 4.2 km northeast of the study area. The heritage item is at a distance to the Modification impacts.	No direct impact. Inconsequential visual impacts
Keys Family Private Cemetery (LEP #I7)	Approximately 110 m south of the study area. The heritage item is at a distance to the Modification impacts.	No direct impact. Inconsequential visual impacts

4.3.1 Impact assessments

The following assessments relate to the possible impacts to the heritage items; Dalmar Study (LEP #I9), Edinglassie (SHR #00170, LEP #I84), Rous Lench (SHR #00211, LEP #I85), Bengalla Homestead (LEP #I8), and the Keys Family Private Cemetery (LEP #I7), as assessed by the SOHI Guideline criteria.

4.3.1.1 *Dalmar Stud (LEP #I9)*

Will the proposed works affect the heritage significance of the adjacent heritage item or the heritage conservation area?

The heritage significance of Dalmar Stud is attributed to its to historical values, particularly its association with some of the earliest settlements of the area by Captain S. Wright and then the prominent Keys Family. The Modification will be constructing new road infrastructure in proximity to the heritage item curtilage; however, it is assessed that this will have an inconsequential impact on the heritage item.

Will the proposed works affect views to, and from, the heritage item? If yes, how will the impact be mitigated?

The road infrastructure relating to the Modification will be visible from close distance, however, the works generally consist of a realignment of the existing Bengalla Road. As such, the

alterations to the views to and from the item will not be impacted to a degree which will require mitigation.

Will the proposed works impact on the integrity or the streetscape of the heritage conservation area?

It is assessed that the Modification will not have a negative impact on the integrity of the streetscape as the item is not situated in a heritage conservation area with streetscape values.

4.3.1.2 *Edinglassie (SHR #00170, LEP #I84)*

Will the proposed works affect the heritage significance of the adjacent heritage item or the heritage conservation area?

The heritage significance of Edinglassie is largely attributed to its social and historic values and its association with the Forbes family. The Modification will be constructing new road infrastructure in proximity to the heritage item curtilage; however, it is assessed that the heritage item is sufficiently far from the Modification that the construction of the road infrastructure will not affect the heritage significance of Edinglassie.

Will the proposed works affect views to, and from, the heritage item? If yes, how will the impact be mitigated?

The road infrastructure being constructed as part of the Modification may be visible at certain views to the item but the realignment of Bengalla Road is not considered to be a large change to the rural, transport corridor and mining landscape currently surrounding the item. Views to and from Edinglassie will not be impacted to a degree which will require mitigation.

Will the proposed works impact on the integrity or the streetscape of the heritage conservation area?

It is assessed that the Modification will not have a negative impact on the integrity of the streetscape as the item is not situated in a heritage conservation area with streetscape values.

4.3.1.3 *Rous Lench (SHR #00211, LEP #I85)*

Will the proposed works affect the heritage significance of the adjacent heritage item or the heritage conservation area?

The heritage significance of Rous Lench is closely intertwined with that of Edinglassie and is largely attributed to its association with some of the earliest occupation of the area, representing some of the earliest land grants of the initial settlement of the Hunter Valley. The Modification will be constructing new road infrastructure in proximity to the heritage item; however, it is assessed that due to its distance from this heritage item, the new infrastructure will not have any effect on the heritage significance of Rous Lench.

Will the proposed works affect views to, and from, the heritage item? If yes, how will the impact be mitigated?

The infrastructure relating to the Modification will not be visible from Rous Lench. As such, it is assessed that the views to and from Rous Lench will not be impacted to a degree which will require mitigation.

Will the proposed works impact on the integrity or the streetscape of the heritage conservation area?

It is assessed that the Modification will not have a negative impact on the integrity of the streetscape as the Modification will not impact this aspect of the item.

4.3.1.4 *Bengalla Homestead (LEP #I8)*

Will the proposed works affect the heritage significance of the adjacent heritage item or the heritage conservation area?

The heritage significance of Bengalla Homestead is due to its association with the early pioneering Keys family. The Modification will be constructing new road infrastructure in proximity to the curtilage of Bengalla Homestead; however, it is assessed that the homestead will not be negatively affected by the modification due to its distance from the proposed works.

Will the proposed works affect views to, and from, the heritage item? If yes, how will the impact be mitigated?

The road infrastructure relating to the Modification will not be visible from Bengalla Homestead. As such, it is assessed that the views to and from the Bengalla Homestead will not be impacted to a degree which will require mitigation.

Will the proposed works impact on the integrity or the streetscape of the heritage conservation area?

It is assessed that the Modification will not have a negative impact on the integrity of the streetscape as the Modification will not impact this aspect of the item.

4.3.1.5 *Keys Family Private Cemetery (LEP #I7)*

Will the proposed works affect the heritage significance of the adjacent heritage item or the heritage conservation area?

The heritage significance of the Keys Family Private Cemetery is largely attributed to its association with the early pioneering Keys family. The Modification will be introducing new infrastructure in proximity to the Cemetery complex; however, it is considered sufficiently far from the proposed works that it is unlikely that the heritage item will be impacted by the Modification.

Will the proposed works affect views to, and from, the heritage item? If yes, how will the impact be mitigated?

The road infrastructure relating to the Modification may be visible from sections of the Keys Family Private Cemetery. However, it is assessed that views to and from the Keys Family Private Cemetery will not be affected to a degree which will require any mitigation.

Will the proposed works impact on the integrity or the streetscape of the heritage conservation area?

It is assessed that the Modification will not have a negative impact the integrity of the streetscape as the Modification will not impact this aspect of the item.

4.4 DISCUSSION

Five registered historic heritage items have been identified in proximity to the study area; however, the heritage items that have been specifically addressed within this report have been assessed as being unlikely to be affected by the Modification to a degree that requires any mitigation. The assessment above demonstrates that the Modification will have inconsequential impacts on the heritage values of the five items.

No further historic items were identified during the field assessment, and it has been assessed there is a low likelihood of any archaeological deposits of potential heritage significance within the study area.

5 MANAGEMENT AND MITIGATION

5.1 GENERAL PRINCIPLES FOR THE MANAGEMENT OF HISTORIC ITEMS

Appropriate management of heritage items is primarily determined based on their assessed significance as well as the likely impacts of the proposed development.

In terms of best practice and desired outcomes, avoiding any impact to historical items is the preferred outcome, however, where a historical site has been assessed as having no heritage value, impacts to these items does not require any legislated mitigation.

5.2 MANAGEMENT MEASURES FOR THE STUDY AREA

The assessment has concluded that there are no items of heritage significance within the study area and the Modification will not have a significant impact on the heritage values of the items near the study area. The relevant heritage management measures for the Modification are limited to the establishment of visual screening (if requested) and an unanticipated finds procedure to be followed during works within the study area.

5.2.1 Visual impact mitigation

Although the assessment has not concluded that visual impact mitigation is required for the Modification, Section 6.2.1 of the *Bengalla Historic Heritage Management Plan* (HHMP) outlines procedures and policies for the establishment of screening related to Edinglassie and Rous Lench items. The HHMP provides the commitment that BMC would establish screening vegetation on the Edinglassie and Rous Lench properties if requested by the landholders. This policy should be carried over to the Modification.

5.2.2 Unanticipated finds

Section 6.6 of the HHMP provides an appropriate procedure to be followed for the study area if items of suspected heritage significance are identified. In an update to the HHMP, the references to assessing heritage significance should be updated to the current DPE guidelines (e.g. *Assessing heritage significance. Guidelines for assessing places and objects against the Heritage Council of NSW criteria.* [DPE 2023b]). The unanticipated finds procedure is:

- *All work in the area will cease immediately;*
- *Alert the Environmental Specialist of the find;*
- *If necessary, protect the area with fencing; Engage a suitably qualified archaeologist to undertake an assessment of the finds;*
- *The assessment should be undertaken using the guidelines Assessing Significance for Historical Archaeological Sites and 'Relics' (Heritage Council NSW, 2009);*

- *On the advice of the archaeologist, if necessary, prepare an Impact Assessment and Research design and methodology to submit to the Heritage Council of NSW for a Section 139 excavation permit;*
- *Undertake the archaeological mitigation in accordance with the prepared documents and the excavation permit or exception issued by the Heritage Council of NSW; and*
- *Once the site has been mitigated to the satisfaction of the archaeologist and the Heritage Council of NSW, works may resume in the area.*

6 SUMMARY AND RECOMMENDATIONS

This assessment has concluded that the study area does not intersect with or contain any listed heritage items. The Modification is within 50 m of Dalmar Stud (LEP #I9).

The Modification is located within a landscape that has been significantly disturbed, primarily by agricultural and mining related activities over many decades. The five listed heritage items near the study area retain their social and historic significance, with items such as the Keys Family Private Cemetery also retaining the aesthetic value associated with the views from the cemetery east towards Muswellbrook.

This assessment concludes that the Modification will not affect the physical fabric of any of the nearby listed heritage items. While the Modification will involve the construction of new road infrastructure within the broader landscape, the impacts of this on the heritage significance of the listed items near the study area has been assessed as inconsequential.

Recommendations and actions concerning the historic values within the study area are as follows.

1. All the proposed works must remain within the study area as shown on **Figure 1-1**. In the event that the project design changes, additional assessment may be required.
2. The HHMP should be updated following the approval of the Modification. The current policies regarding visual impact mitigation and the unanticipated finds procedure are relevant to the Modification.
3. This report has assessed that the modification will not impact significant historical archaeological deposits within the study area. In the unlikely event that archaeological deposits or features are encountered during works, the archaeological anticipated finds procedure within the HHMP will be followed.
4. Relevant BMC employees and contractors will undertake training to ensure they have a general awareness and understanding of the potential for historic heritage items within the study area and the procedures of the HHMP.

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Appendix H
Bengalla Link Road Design Summary Report

Bengalla Mining Company

Bengalla Link Road Relocation

Design summary report

JULY 2025



Question today
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Bengalla Link Road Relocation
Design summary report

Bengalla Mining Company

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REV	DATE	DETAILS
A	30/6/2025	Original
B	10/07/2025	Revised

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Reviewed by:	Andrew Russell	10/07/2025	
Approved by:	Kade Miller	10/07/2025	

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Table of contents

1 Introduction 1

2 Design standards 2

3 Design criteria and development 3

3.1 Design criteria 3

3.2 Geotechnical investigation 3

3.3 Pavement Design 4

3.3.1 Design traffic 4

3.4 Geometry 5

3.4.1 Horizontal alignment 5
3.4.2 Vertical alignment 5
3.4.3 Cross section 5
3.4.4 Superelevation 5

3.5 Intersections and side roads 5

3.5.1 Access at CH125 5
3.5.2 Mine Access Road 6
3.5.3 Access at CH2390 6
3.5.4 Stub connection between Bengalla Link Road and Roxburgh Road 6

3.6 Intersection Design 6

3.7 Drainage infrastructure 8

3.7.1 Culverts 8
3.7.2 Pavement drainage, aquaplaning, sub surface drainage 8
3.7.3 Catch drains and bench drains 8

3.8 Road furniture 9

3.9 Safety in Design 9

List of appendices

Appendix A Design drawing

1 Introduction

Bengalla Mining Company (Bengalla) are proposing to undertake infrastructure relocations ahead of the open cut at Bengalla Mine. This includes a section of the existing Bengalla Link Road. The section to be relocated is generally along the alignment approved for the relocation as part of State Significant Development (SSD) 5170. WSP, then Parsons Brinckerhoff, were engaged by Bengalla to develop options for 100m wide corridor for the road to be designed within. Option 3 of that exercise was selected by Bengalla and included in SSD 5170.

In 2019 Bengalla identified that given the approved road alignment did not take into consideration Mount Pleasant Mine's rail loop that was constructed in 2018, and Bengalla engaged WSP to review the approved alignment to assist internal Bengalla long term planning. As part of this study an alternative design that increased the design speed of the curve that tied into the existing road at the north was investigated. The alternative also had the advantage of tying into the existing road to the south of the existing Bengalla Link Road and Wybong Road intersection thereby reducing the extent of works and interruption to the road network required. The design was then advanced through a prefeasibility level design (2021) and feasibility study (2021) to improve the granularity of the design and carry out geotechnical investigations to inform pavement and earthworks formation design.

The purpose of this document is to outline the design criteria, assumptions and design development for the Bengalla Road relocation.

2 Design standards

The design standards used to inform the detailed design and assessment the Bengalla link road relocation include:

- Austroads Guide to Road Design Part 3 – Geometric Design
- Austroads Guide to Road Design Part 4 – Intersections and Crossings
- Austroads Guide to Road Design Part 4A – Unsignalized and Signalised Intersections
- Austroads Guide to Road Design Part 5 – Drainage Road Surface Networks, Basins and Subsurface
- Austroads Guide to Road Design Part 5B – Drainage, Open Channels, Culverts and Floodway Crossings
- Austroads Guide to Road Design Part 6 – Roadside Design Safety and Barriers
- TfNSW Guidelines Delineation Section 16 - Guide Posts and Delineation of Safety Barriers
- TfNSW Guidelines Delineation Section 15 – Raised Pavement Markers
- 'Managing Urban Stormwater – Soils and Construction (Blue Book)', Landcom, March 2004
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3 Design criteria and development

This section summarises the key features of the detailed design. The general arrangement of the detailed design is shown on WSP drawing PS132822-CIV-FIG-1000 Rev A included in Appendix A.

3.1 Design criteria

The design criteria adopted from the previous standards is as follows:

- single carriageway with road width comprising of 2 x 3.5 m lane widths and 2 m shoulders
- default cut batters of 3H:1V in soil
- default fill batters of 4H:1V to reduce the need for guardrails or barriers
- pavement surfacing to comprises of asphalt on new intersections and two coat seal for the remainder of the road alignment
- design vehicle is based on 19 m B-Double truck
- posted speed of 100km/hr and design speed of 110 km/hr with the exception of the north tie in which is design speed 100km/hr (which is described further in Section 3.4.1)
- cross drainage designed to convey the peak flow associated with the 2% (1 in 50 year) Annual Exceedance Probability (AEP) rainfall event

3.2 Geotechnical investigation

A geotechnical investigation was undertaken by WSP in September and October 2022 as a part of the detailed design. The geotechnical investigation comprised of the drilling of four boreholes and seven pavement cores, along with the excavation of 12 test pits.

A geotechnical investigation was also conducted as part of the feasibility study in 2020 which comprised drilling a total of five boreholes along the alignment.

The objective of the investigations was to assess subsurface conditions and provide recommendations on:

- Soil and rock depths within the cuttings.
- Suitable batter angles to aid with civil pre-feasibility design of the road footprint and earthworks quantities
- Site conditions and preparation
- Excavation conditions, cut batter slope angles and earthworks
- Pavement design
- Re-use of onsite materials for pavement design & embankment construction

As a result of the investigation works the following was generally adopted as part of the design:

- when in deep cuts greater than 6m, 4m wide benches were adopted when the slope height exceeded 7m high
- permanent cut batters in low to medium strength rock were steepened to 1 Horizontal to 1 Vertical
- permanent embankment batters include 4m wide benches when slope heights are greater than 7m high.

3.3 Pavement Design

In 2007 and 2008, WSP completed a feasibility and detailed design for the Bengalla Link Road Extension Project which included a geotechnical investigations and pavement design. The Link Road Extension Project was from the intersection of Bengalla Link Road and the Bengalla mine access road to the intersection with Wybong Road. In 2020, the pavement design was revisited as part of the prefeasibility study and a new geotechnical investigation was completed. The pavement design was subsequently revised based on new design standards and design traffic. The outcomes of that work informed the pavement design adopted for this study.

The adopted pavement design options are shown in Table 3.1 below and are consistent in composition with the pavement constructed in 2008 for the Bengalla Link Road Extension.

Table 3.1 Recommended pavement thickness designs

	SOILS ACROSS MAJORITY OF THE SITE	**SUITABLE ROCK SUBGRADE**
Seal	Two (2) coat seal or 45 mm asphalt	Two (2) coat seal or 45 mm asphalt
Basecourse DGB20	150 mm (CBR 80)	150 mm (CBR 80)
Sub-base DGS40	150 mm (CBR 30)	150 mm (CBR 30)
Select or Sub-base	320 mm (Min CBR8)	200 mm (Min CBR 15)
Total Pavement[1]	620 mm	500 mm
Design Subgrade CBR	3%	4.5%
Subgrade material	Natural soil, engineered fill, extremely weak rock in cuts	Suitable weathered rock in cuts

(1) No construction tolerance has been included.

3.3.1 Design traffic

The design traffic that informed the pavement design was calculated based on the following assumptions:

- Design period; 30 years
- Average Annual Daily Traffic (AADT); 2975
  - The design traffic adopted as part of the road design is based on the traffic estimates from the MACH Energy Road Transport Assessment (01037404-012 Appendix J) which was then supplemented with Bengalla Mine contributions in peak conditions.
- Percentage heavy vehicles; 16%
- Average number of axles per heavy vehicle; 2.8
- Equivalent Standard Axles (ESA's) per HVAG; 1.0
- Direction factor; 0.5
- Lane distribution factor; 1.0

Based on the above information, a design traffic of 7.3 x 10^6 ESAs was adopted.

3.4 Geometry

3.4.1 Horizontal alignment

The horizontal alignment is designed in accordance with Austroads guidelines with the exception of the northern tie in.

The northern tie in radius was selected to match the existing curve of approximately 460m. This radius does not meet requirements for a design speed of 110km/hr, however does meet the requirements for 100km/hr. To comply with the 110km/hr requirement the entire existing curve would require realignment which would result in issues with both tie ins with Wybong Road (west bound and east bound) and significantly increase the extent of works and scope of the project.

3.4.2 Vertical alignment

The vertical alignment is designed in accordance with Austroads guidelines. The achieved longitudinal grades are between 0.5% and 6%.

3.4.3 Cross section

The typical section for the Bengalla Link Road was developed in accordance with AustRoads guidelines using the nominated design speed, design vehicles and traffic parameters. The following details were applied to the typical cross section for the Bengalla Link Road:

- 3.5 metre lane width
- 2 metre shoulder width
- 1.0 metre verge width, increased to 1.85 m where barrier is present.
- 3% two-way crossfall with superelevation as required.
- Batter slopes
    - Fill batters generally 4 Horizontal:1 Vertical to 6Horizontal:1 Vertical.
    - Fill batters 2 Horizontal:1Vertical with guardrail. Where 2H:1V slopes exceed 7 m in height, a 4 m wide bench is included.
    - Cut batters 3 Horizontal:1Vertical, or 1 Horizontal:1Vertical in suitable rock and with benching.
- Table drain
    - 3 metre-wide base
    - Minimum 0.8 metre depth

3.4.4 Superelevation

Superelevation and lane widening has been applied accordance with Austroads guidelines.

3.5 Intersections and side roads

Intersections and side roads included as part of the project are described in the sections below

3.5.1 Access at CH125

An existing access into Bengalla Mine has been maintained. This access rarely used, is locked and was designed as a private property access.

3.5.2 Mine Access Road

A new intersection is provided to allow access to the existing mine access road for Bengalla Mine. This intersection will include intersection lighting.

3.5.3 Access at CH2390

An intersection is provided for future potential access to the Mt Pleasant discharge point or Bengalla infrastructure.

3.5.4 Stub connection between Bengalla Link Road and Roxburgh Road

Several options were investigated for the tie-in to Roxburgh Road from the relocated Bengalla Road. The preferred option is a stub road at CH2465 which runs along the Wyndham Arms ROW Crown land corridor. This stub then turns left to join in with the existing Roxburgh Road alignment. The design is such that the main through road for vehicles heading north on Roxburgh Road is to then head east along the Wyndham stub to Bengalla Road, and road geometry has been selected to cater for that.

A driveway is included at CH500 which ties into the northern section of Roxburgh Road. This is to provide access to a single property further north. Another separate driveway access comes of this driveway to replace an existing driveway that is no longer accessible due to the altered road geometry.

The section of Roxburgh Road that is north of the connection from Roxburgh Road to Bengalla Link is proposed to not be maintained by Muswellbrook Shire Council to avoid duplication of roads. The remaining section will be left in-situ to allow access to an existing property but closed at the northern end before meeting the existing Bengalla Link Road.

Two other property assesses are included along the Wyndham Arms ROW, one of which provides access to an Ausgrid easement and access track.

3.6 Intersection Design

The intersection turning treatment designs were developed based on mimicking existing intersection arrangements at the relocated positions and Austroads guidelines. The type of intersection treatment for left and hand right turning movements listed in the table below and typical layouts shown on the following figures.

Table 3.2 Intersection treatment with Bengalla Link Road (BLR)

Intersection	Treatment type	
	Right turn off BLR	Left turn off BLR
Mine Access Road	Channelised right turn (CHR)	Rural auxiliary left turn (AUL)
Access at Ch2390	No specific treatment	Basic left (BAL)
Stub connection between Bengalla Link Road and Roxburgh Road	Channelised right turn (CHR)	Rural auxiliary left turn (AUL)

Figures 3.1 to 3.3 provide the templates for the intersection treatments included in Table 3.2.

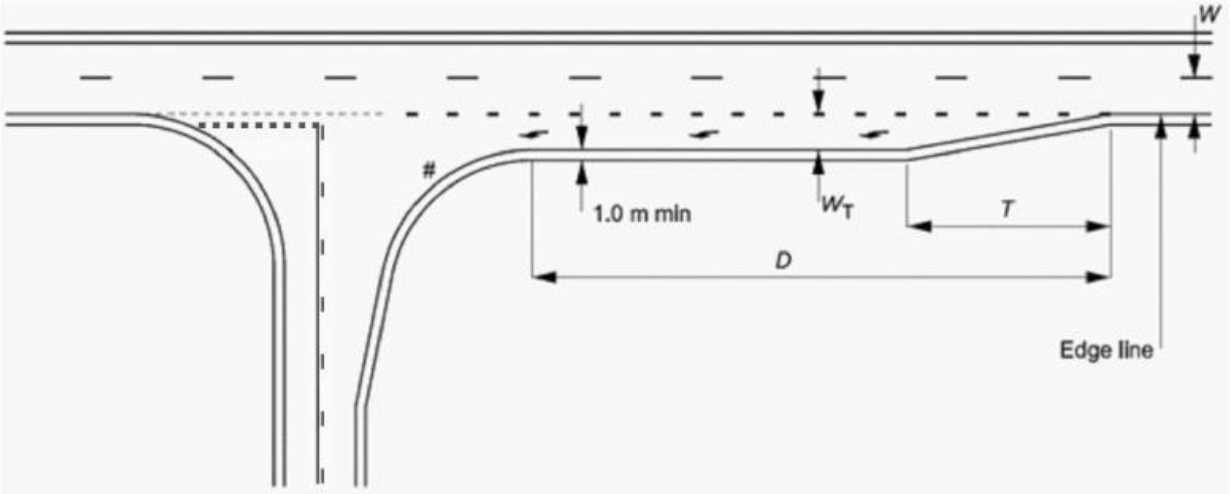


Figure3-1 Auxiliary Left-Turn Treatment (AUL) - (Austroads Guide to Road Design Part 4A - Unsignalised and signalised Intersections

Figure 8.2: Rural basic left-turn treatment (BAL)

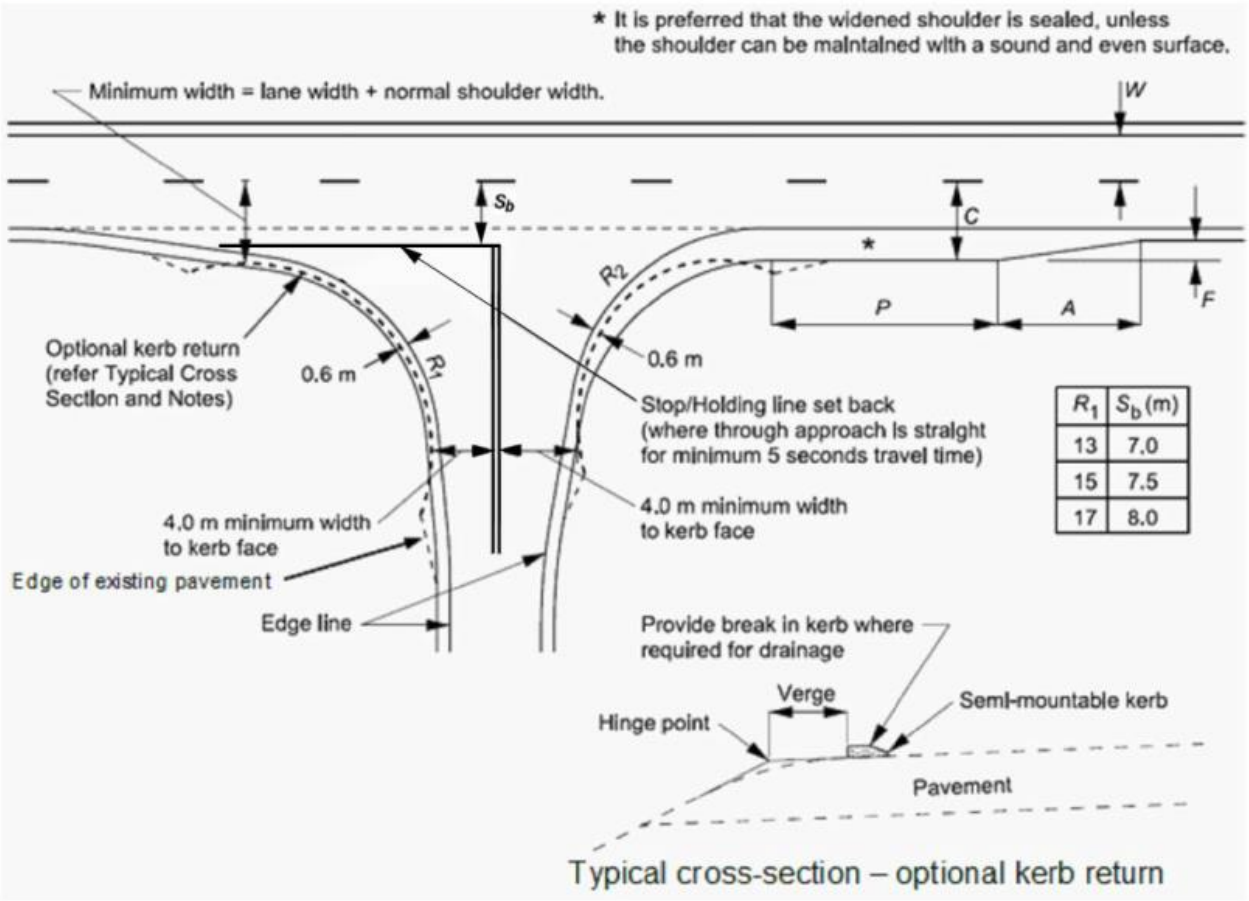


Figure 3-2 Rural basic left-turn treatment (BAL) – (Austroads Guide to Road Design Part 4A – Unsignalised and signalised Intersections)

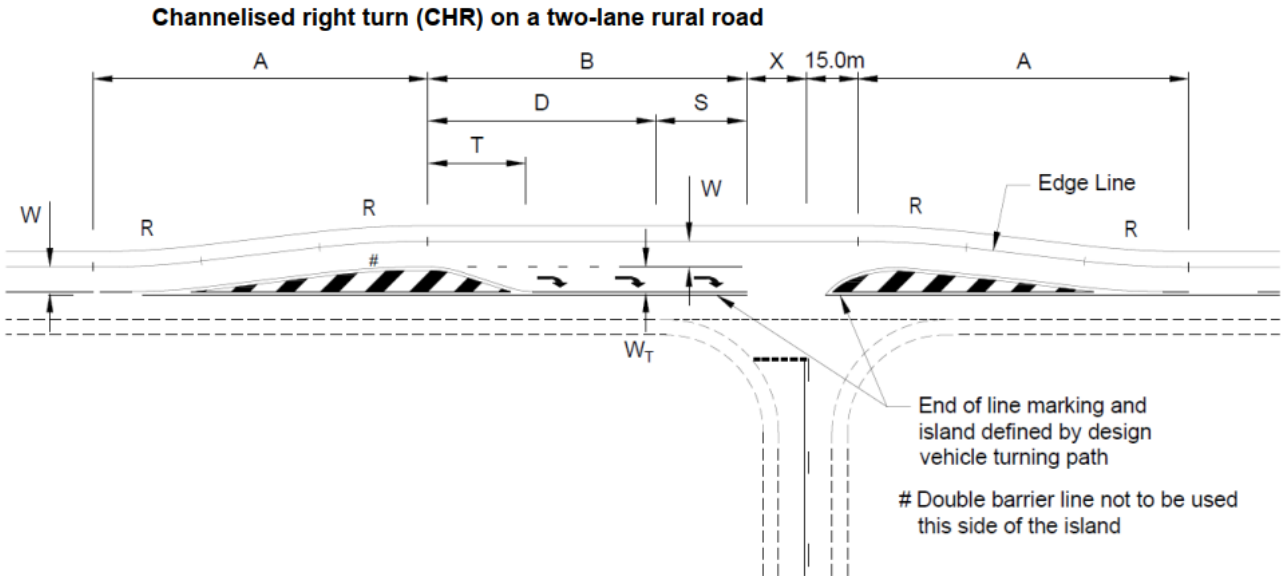


Figure 3-3 Channelised Right-turn treatment (CHR) – (Austroads Guide to Road Design Part 4A – Unsignalised and signalised Intersections)

3.7 Drainage infrastructure

3.7.1 Culverts

Cross drainage is provided at creek lines and potential areas of inundation from flooding to allow for continuation of flow in a controlled way. Cross drainage has been designed to convey the 2% AEP (1 in 50 year ARI) event. Discharge flows from two dams approved to discharge as part of the Hunter River Salinity Trading Scheme were included in calculations where those flows pass under the relocated road.

Scour protection is located at culvert inlets and outlets where estimated velocities are expected to exceed 2.0 m/s for the 5% AEP (1 in 20 ARI) peak flow.

3.7.2 Pavement drainage, aquaplaning, sub surface drainage

Cross fall and superelevation applied to the design surface assist in providing adequate drainage of surface water runoff. Based on AustRoads guidelines the maximum allowable depth of surface water runoff may not exceed 4 mm. The depth of surface water runoff was checked during the detailed design using the Aquaplaning Risk Assessment Function in 12D design software.

The cross fall and superelevation were applied to all pavement layers to allow for subsurface drainage of the pavement. In areas of fill, surface water runoff and drainage from pavement layers is discharged directly over fill batters. In areas of cut, table drains with an invert level lower than the lowest pavement layer were included to capture surface water runoff and allow for drainage of lower pavement levels. Where constrained by boundaries along Wyndham Arms ROW, kerb and gutter and subsoil drains are included along the southern side of the alignment to drain pavement layers

Sub-surface drains were included at select interfaces between new pavements and existing pavements. Some areas such as super transitions were not treated with subsurface drainage as there was either a risk of introducing more moisture into the pavement by including a drain or daylighting the drain was not feasible.

3.7.3 Catch drains and bench drains

Permanent catch drains and bench drains are included to assist with managing water around and over the cut batters.

3.8 Road furniture

Select use of safety barriers is warranted on sections of Bengalla Link Road to provide adequate protection from hazards including culvert headwalls, vegetation, and steep batters. The location of safety barriers was assessed using the Australian Road Design Guide Part 6 Edition 4.0 (June 2022). As a result of the assessment, EzyGUARD safety barriers with ET-SS TL3 terminals have been incorporated into the design at various locations along the alignment.

Signage, guideposts, pavement markers and line marking are provided within the detailed drawings, compliant to TfNSW Delineation guidelines with Australian Standards.

3.9 Safety in Design

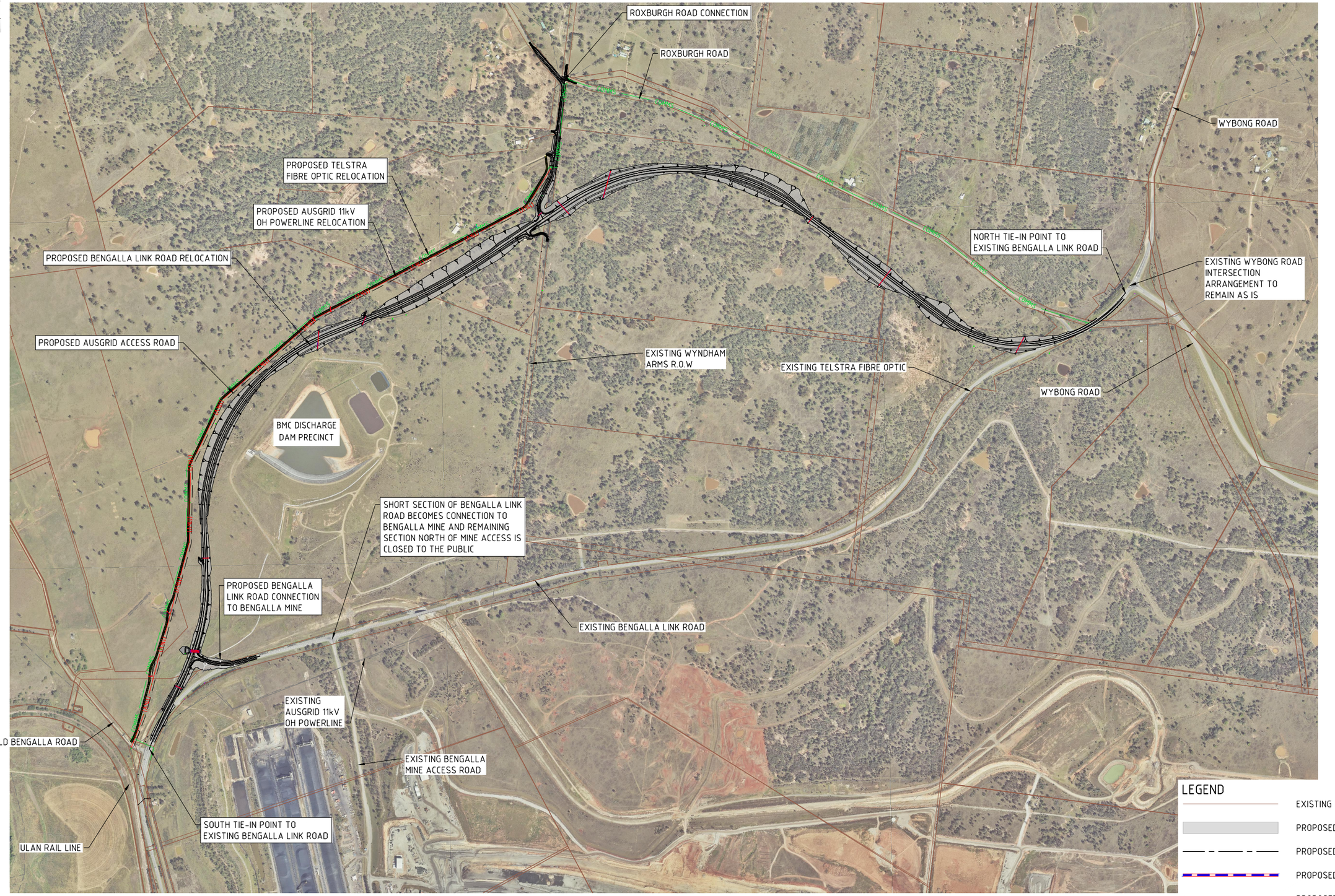
A safety in design review was completed as part of the feasibility study stage.

Another safety in design review will be completed with Muswellbrook Shire Council at a time to be arranged.

Appendix A

Design drawing

PS132822-CIV-FIG-1000



LEGEND

- EXISTING PROPERTY BOUNDARY
- PROPOSED EXTENT OF WORKS
- PROPOSED ROAD SETOUT ALIGNMENT
- PROPOSED CULVERT
- (11kV) PROPOSED AUSGRID 11kV OH POWERLINE
- COMMS PROPOSED TELSTRA FIBRE OPTIC
- AERIAL IMAGE DATED 16.03.2023

PLAN
NOT TO SCALE

REV	DATE	BY	DESCRIPTION	CHK	APPD
A	07.07.25	DD	ISSUED FOR INFORMATION	AR	KM

REFERENCE COORDINATION DRAWINGS

DESCRIPTION	DRAWING NO.	REV	CHK

SURVEY DATUM

HORIZONTAL DATUM:	VERTICAL DATUM:
GDA 2020	AHD

SCALES: NOT TO SCALE

A1 ORIGINAL
DO NOT SCALE THIS DRAWING

APPROVED
SIGNED:
DATE: RPEQ:

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CLIENT: BENGALLA

PROJECT: BENGALLA LINK ROAD RELOCATION DETAILED DESIGN

TITLE: GENERAL ARRANGEMENT

DRAWING STATUS: ISSUED FOR INFORMATION

DESIGNED:	CHECKED:	APPROVED:
H.ARCHIBALD	A.RUSSELL	K.MILLER
PROJECT No:	DRAWN:	DATE:
PS132822	D.DESPOTOVIC	07.07.25

DRAWING No: PS132822-CIV-FIG-1000 REV: A

File name \\CORP.PBWAN.NET\AN2\PROJECTS\AU\PS132XX\PS132822_BENGALLA_LINK_ROA\4_WIP\BIM\DRAWINGS\SKETCHES\PS132822-CIV-FIG-1000.DWG, printed on Thursday, 10 July 2025 1:40:28 PM, by McShane, Ryan

Appendix I
Schedule of Land

Table I-1 Modified SSD-5170 Schedule of Land

Lot	DP	Owner
9	39345	Bengalla Mining Company Limited
1	189134	Bengalla Mining Company Limited
1	236668	Bengalla Mining Company Limited
3	236668	Bengalla Mining Company Limited
6	236668	Bengalla Mining Company Limited
7	236668	Bengalla Mining Company Limited
10	236668	Bengalla Mining Company Limited
112	551930	Bengalla Mining Company Limited
110	556761	Bengalla Mining Company Limited
111	556761	Bengalla Mining Company Limited
2	561117	Bengalla Mining Company Limited
19	563495	Bengalla Mining Company Limited
1	570070	Bengalla Mining Company Limited
2	570070	Bengalla Mining Company Limited
91	620639	Bengalla Mining Company Limited
71	626353	Bengalla Mining Company Limited
72	626353	Bengalla Mining Company Limited
20	706045	Bengalla Mining Company Limited
505	711996	Bengalla Mining Company Limited
1	718834	Bengalla Mining Company Limited
1	735667	Bengalla Mining Company Limited
2	735667	Bengalla Mining Company Limited
21	776758	Bengalla Mining Company Limited
22	776758	Bengalla Mining Company Limited

Lot	DP	Owner
41	792447	Bengalla Mining Company Limited
43	792447	Bengalla Mining Company Limited
5	801249	Bengalla Mining Company Limited
8	821183	Bengalla Mining Company Limited
20	1072668	Bengalla Mining Company Limited
22	1072668	Bengalla Mining Company Limited
24	1072668	Bengalla Mining Company Limited
25	1072668	Bengalla Mining Company Limited
26	1072668	Bengalla Mining Company Limited
27	1072668	Bengalla Mining Company Limited
100	1148907	Bengalla Mining Company Limited
101	1148907	Bengalla Mining Company Limited
102	1148907	Bengalla Mining Company Limited
103	1148907	Bengalla Mining Company Limited
104	1148907	Bengalla Mining Company Limited
105	1148907	Bengalla Mining Company Limited
106	1148907	Bengalla Mining Company Limited
274	750926	Coal & Allied Operations Pty Limited
4	801249	Coal & Allied Operations Pty Limited
6	821183	Coal & Allied Operations Pty Limited
2*	801249	Coal & Allied Operations Pty Limited
10	1184928	Coal & Allied Operations Pty Limited
11	1184928	Bengalla Mining Company Limited
3	998477	Coal & Allied Operations Pty Limited
56**	750919	NJ & RY Ellis

Lot	DP	Owner
5**	113738	NJ & RY Ellis
2**	718834	Hunter Valley Energy Coal Pty Ltd
Sections of various Council roads		
Sections of Crown roads		
Sections of Muswellbrook-Ulan Rail Line		

* Associated with MOD1 and SEE (MOD1), August 2015

** Associated with MOD8 and Modification Report (MOD8), November 2025



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