Boggabri Coal Mine Modification 10

MODIFICATION REPORT
Boggabri Coal Operations Pty Ltd
May 2025

Contents

Executive Summary x

1. INTRODUCTION 1
   - 1.1 Background 1
   - 1.2 Approvals History 7
   - 1.3 Modification Overview 8
     - 1.3.1 Description of the Modification 8
     - 1.3.2 Objectives of the Modification 8
     - 1.3.3 Feasible Alternatives 8
   - 1.4 Applicant 9
   - 1.5 Document Purpose 9
   - 1.6 Document Structure 9
2. STRATEGIC CONTEXT 10
   - 2.1 Environmental Context 10
     - 2.1.1 Natural Features 10
     - 2.1.2 Land Ownership 10
     - 2.1.3 Land Use 12
     - 2.1.4 Vegetation Corridor 12
   - 2.2 Planning Constraints 12
     - 2.2.1 Flood Prone Land 12
     - 2.2.2 Bushfire Prone Land 13
     - 2.2.3 Mine Subsidence Districts 13
     - 2.2.4 Other Matters 14
   - 2.3 Government Strategies, Policies and Plans 14
     - 2.3.1 New England North West Regional Plan 2041 14
     - 2.3.2 Dark Sky Planning Guideline 15
     - 2.3.3 Climate Change Policy 15
     - 2.3.4 Climate Change (Net Zero Future) Act 2023 16
     - 2.3.5 Safeguard Mechanism 17
   - 2.4 Cumulative Impacts 17
   - 2.5 Planning Agreements 17

3. MODIFICATION DESCRIPTION 18
3.1 Overview 18
3.2 Mining Operations 32
3.2.1 Mining Schedule and Methods 32
3.3 Coal Handling and Transportation 38
3.4 Workforce and Hours of Operation 38
3.5 Final Landform and Final Land Use 38
3.5.1 Final Landform 38
3.5.2 Final Land Use 39
3.5.3 Rehabilitation Objectives 42
3.6 Water Management 43
3.7 Alternatives Considered 43
3.7.1 Do Nothing 43
3.7.2 Increasing the Currently Approved Production Rate 44
3.7.3 Vegetation Corridor 44
3.7.4 Conceptual Final Landform Options 45
3.7.5 Preferred Option - MOD 10 45
4. STATUTORY CONTEXT 47
4.1 Overview 47
4.2 Environmental Planning and Assessment Act 1979 50
4.2.1 Objects of the EP&A Act 50
4.3 Key Regulatory Matters 50
4.3.1 Power to Modify 50
4.3.2 Permissibility 52
4.3.3 State Environmental Planning Policy (Resources and Energy) 2021 52
4.3.4 Heritage 53
4.3.5 Earthworks 53
4.3.6 Dark Sky Planning Guideline 54
4.4 Other Legislative Considerations 54
4.4.1 Mining Act 1992 54
4.4.2 Protection of the Environment Operations Act 1997 54
4.4.3 Biodiversity Conservation Act 2016 54

4.4.4 National Parks and Wildlife Act 1974 55
4.4.5 Water Management Act 2000 55
4.4.6 Environment Protection and Biodiversity Conservation Act 1999 56
4.4.7 Forestry Act 2012 57
5. STAKEHOLDER ENGAGEMENT 58
5.1 Methods of Engagement 58
5.1.1 Regulatory Consultation 58
5.1.2 Community Consultation 60
6. IMPACTS, MANAGEMENT AND MITIGATION 61
6.1 AIR QUALITY AND GREENHOUSE GAS 61
6.1.1 Background 61
6.1.2 Methodology 61
6.1.3 Assessment of Impacts 64
6.1.4 Mitigation and Management 72
6.2 NOISE AND BLASTING 74
6.2.1 Background 74
6.2.2 Methodology 74
6.2.3 Assessment of Impacts 78
6.2.4 Mitigation and Management 83
6.3 BIODIVERSITY 84
6.3.1 Background 84
6.3.2 Methodology 85
6.3.3 Assessment of Impacts 88
6.3.4 Mitigation and Management 98
6.4 GROUNDWATER 102
6.4.1 Background 102
6.4.2 Methodology 107
6.4.3 Assessment of Impacts 110
6.4.4 Mitigation and Management 118
6.5 SURFACE WATER 118
6.5.1 Background 118
6.5.2 Methodology 119

6.5.3 Assessment of Impacts 120
6.5.4 Mitigation and Management 125
6.6 ABORIGINAL CULTURAL HERITAGE 127
6.6.1 Background 127
6.6.2 Methodology 127
6.6.3 Assessment of Impacts 129
6.6.4 Mitigation and Management 131
6.7 HISTORIC HERITAGE 132
6.7.1 Background 132
6.7.2 Methodology 132
6.7.3 Assessment of Impacts 133
6.7.4 Mitigation and Management 133
6.8 GEOCHEMISTRY 133
6.8.1 Background 133
6.8.2 Methodology 133
6.8.3 Assessment of Impacts 134
6.8.4 Mitigation and Management 136
6.9 LAND RESOURCES, REHABILITATION AND FINAL LAND USE 136
6.9.1 Background 136
6.9.2 Methodology 136
6.9.3 Assessment of Impacts 137
6.9.4 Mitigation and Management 143
6.10 VISUAL AMENITY 144
6.10.1 Background 144
6.10.2 Methodology 144
6.10.3 Assessment of Impacts 147
6.10.4 Mitigation and Management 153
6.11 SOCIAL 153
6.11.1 Background 153
6.11.2 Methodology 153
6.11.3 Assessment of Impacts 156
6.11.4 Assessment of Significance 158
6.11.5 Mitigation and Management 159
6.12 ECONOMICS 159

6.12.1 Background 159
6.12.2 Methodology 159
6.12.3 Assessment of Impacts 161
6.12.4 Mitigation and Management 165
6.13 OTHER ENVIRONMENTAL CONSIDERATIONS 165
7. EVALUATION 166
7.1 Ecological Sustainable Development 166
7.2 Merit Evaluation 167
8. REFERENCES 170
9. ABBREVIATIONS 173

Tables

Table 1 BCM Approved Operations 3
Table 2 Comparison of Key Modification Components 22
Table 3 BCM Rehabilitation Targets for MOD 10 Conceptual Final Landform 42
Table 4 BCM General Rehabilitation Objectives 42
Table 5 Relevant Legislative Provisions 47
Table 6 BCM Water Access Licenses 56
Table 7 Stakeholder Engagement and Consultation 58
Table 8 EPA Air Quality Assessment Criteria 63
Table 9 Estimated GHG Emissions from BCM 70
Table 10 Air Quality and Greenhouse Gas Impact Comparison 71
Table 11 Maximum predicted noise levels dB(A) 76
Table 12 Noise Impact Assessment Criteria dB(A) 76
Table 13 Cumulative Noise Criteria dB(A) 76
Table 14 Blasting Criteria 76
Table 15 Characterisation of Noise Impacts and Potential Treatments 77
Table 16 Operational Noise Predictions - LAeq,15minute dB 81
Table 17 Noise and Blasting Impact Comparison 82
Table 18 PCTs identified within the Modification Disturbance Footprint 88

Table 19	Determining presence of candidate flora species credit species in the Modification Disturbance Footprint	91
Table 20	Presence of Candidate Flora Species Credit Species in the Modification Disturbance Footprint	93
Table 21	Threatened ecological communities known to occur in the regional study area	97
Table 22	Biodiversity Impact Comparison	98
Table 23	Impacts that Require an Offset - Ecosystem Credits	100
Table 24	Impacts that Require an Offset - Species Credits	100
Table 25	'BEP' groundwater monitoring bores	106
Table 26	Estimated Peak Water Take and Water Licenses	112
Table 27	Groundwater Impact Comparison	116
Table 28	BCM MOD 10 Summary of Median Predicted Water Balance	120
Table 29	Surface Water Impact Comparison	124
Table 30	BCM MOD 10 Water Licensing Requirements	126
Table 31	Aboriginal Cultural and Historic Heritage Impact Comparisons	131
Table 32	Geochemistry Impact Comparison	135
Table 33	Final Landform Impact Comparison	142
Table 34	Visual Impact Methodology	147
Table 35	Summary of the Visual Impact of the Modification	147
Table 36	Visual Impact Comparison	152
Table 37	Perceived Modification Benefits	157
Table 38	Perceived Modification Impacts	157
Table 39	Social Impact Comparison	159
Table 40	Cost Benefit Analysis Framework	160
Table 41	MOD 10 Potential Incremental Economic Costs and Benefits	161
Table 42	Summary of Average and Incremental Annual Effects on Local Community	163
Table 43	Economic Impact Comparison	164
Table 44	Principles of Ecologically Sustainable Development	166

Figures

Figure 1	Regional Locality	2
Figure 2	Approved Operations	6
Figure 3	Land Ownership	11
Figure 4	Conceptual Modification Layout	19
Figure 5	Conceptual Modification Layout (Cross Sections)	20
Figure 6	Conceptual Mine Plan (Year 2025)	33
Figure 7	Conceptual Mine Plan (Year 2028)	34
Figure 8	Conceptual Mine Plan (Year 2031)	35
Figure 9	Conceptual Mine Plan (Year 2034)	36
Figure 10	Conceptual Mine Plan (Year 2036)	37
Figure 11	Conceptual Final Landform Design	40
Figure 12	Conceptual Final Landform Vegetation Communities	41
Figure 13	Indicative Air Quality Contours Year 2025	66
Figure 14	Indicative Air Quality Contours Year 2028	67
Figure 15	Indicative Air Quality Contours Year 2036	68
Figure 16	Indicative Noise Contours Year 2028, Max all Periods (LAeq, 15minute dB)	79
Figure 17	Indicative Noise Contours Year 2034, Max all Periods (LAeq, 15minute dB)	80
Figure 18	Vegetation Communities and Listed Species Records	90
Figure 19	Surface Geology and Groundwater Monitoring Locations	105
Figure 20	Aboriginal Cultural Heritage Sites	130
Figure 21	Conceptual Cumulative Final Landform	140
Figure 22	Indicative Cumulative Final Landform Cross Section	141
Figure 23	Indicative View Sectors	146
Figure 24	Visual Cross Section VP 1 – Years 2031 and 2036	150
Figure 25	Visual Cross Section VP 3 – Years 2031 and 3036	151
Figure 26	Social Locality	155

Appendices

Appendix A	Modified Project Description
Appendix B	DPHI Assessment Requirements
Appendix C	Controlled Action Decision Notice
Appendix D	EPBC SEARs
Appendix E	Air Quality and Greenhouse Gas Assessment
Appendix F	Noise and Blasting Impact Assessment
Appendix G	Biodiversity Development Assessment Report
Appendix H	Groundwater Dependent Ecosystem Assessment
Appendix I	Groundwater Impact Assessment
Appendix J	Surface Water Impact Assessment
Appendix K	Aboriginal Cultural Heritage Assessment
Appendix L	Historic Heritage Assessment
Appendix M	Geochemical Assessment
Appendix N	Visual Impact Assessment
Appendix O	Social Impact Assessment
Appendix P	Economics Assessment

Document issue approval			
Title	Boggabri Coal Mine Modification 10		
Client	Boggabri Coal Operations Pty Ltd		
Status	FINAL	**Project/document no.**	3115IDEM
Date	May 2025	**Revision no.**	02

Approvals				
	Name	**Position**	**Signature**	**Date**
Prepared by	Alexander Holz	Environmental Scientist		30/05/2025
Reviewed by	Nathan Cooper	Principal Environmental Scientist		30/05/2025
Approved by	Nathan Cooper	Principal Environmental Scientist		30/05/2025

Distributions				
Organisation	**Attention**	**Hard copies**	**Electronic copies**	**Actioned**
Idemitsu Australia	Amanda O'Kane	-	01	NC

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

DISCLAIMER

Xenith Consulting Pty Ltd makes no representation, undertakes no duty, and accepts no responsibility to any third party who may use or rely upon this document, or the drawings, information and data recorded in this document.

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.

Executive Summary

Introduction

Boggabri Coal Operations Pty Ltd (BCOPL) operates the Boggabri Coal Mine on behalf of the joint venture participants; which at the date of this application are Boggabri Coal Pty Ltd (BCPL) (a wholly owned subsidiary of Idemitsu Australia Pty Ltd), NS Boggabri Pty Limited (NSB) and Chugoku Electric Power Australia Resources Pty Ltd (CEPAR)[1].

Boggabri Coal Mine is an open cut mine located approximately 15 kilometres north-east of the township of Boggabri in the north-west region of NSW. Boggabri Coal Mine is located wholly within the Narrabri Local Government Area and is part of the Leard Forest Mining Precinct which also includes the immediately adjacent Tarrawonga Coal Mine to the south and the Maules Creek Coal Mine to the north. Boggabri Coal Mine has been in operation since 2006.

The Boggabri Coal Mine operates in accordance with State Significant Development Approval (SSD) 09_0182 (as modified) which permits the extraction of up to 8.6 Million tonnes per annum of Run of Mine coal from site until 31 December 2036. SSD 09_0182 is supported by the '*Continuation of Boggabri Coal Mine Environmental Assessment*' (Hansen Bailey, 2010) and subsequent modification applications.

BCOPL (on behalf of the joint venture participants) is seeking a modification to SSD 09_0182 under section 4.55 (2) of the *Environmental Planning and Assessment Act 1979* (MOD 10). MOD 10 seeks to progress mining operations towards the north-west of the currently approved development for the purpose of mining additional known coal resource. Mining will extend to the north-west beyond the approved Mine Disturbance Boundary and into the Modification Disturbance Footprint, remaining entirely within the Boggabri Coal Mine Project Boundary, Coal Lease 368 and Mining Lease 1883. The proposed additional mining would involve the following:

- An additional 85 hectares of disturbance within the Modification Disturbance Footprint;
- Recovery of an additional 30 Million tonnes of Run of Mine coal, yielding 25 Million tonnes of additional product coal; and
- An additional four (4) years of mining activities extending the approved mine life until the end of 2040.

Mining down to the Templemore Coal Seam was approved as part of Modification 8 to SSD 09_0182. MOD 10 does not seek to increase the approved depth of mining at the Boggabri Coal Mine, albeit recovering additional coal resources down to Templemore Coal Seam within the approved Mine Disturbance Boundary and Modification Disturbance Footprint.

MOD 10 does not propose to alter the following aspects of the approved development:

- Maximum annual ROM or product coal production rates;
- Ancillary surface infrastructure (i.e. no additional disturbance for infrastructure);
- Coal extraction, processing and transportation methods;
- Operating hours; or
- Workforce numbers.

MOD 10 does not propose any disturbance within the 500 m wide Vegetation Corridor maintained between Boggabri Coal Mine and Maules Creek Coal Mine.

[1] On 30 January 2025, CEPAR and BCPL entered into a sale and purchase agreement (SPA), pursuant to which CEPAR agreed to sell and BCPL agreed to buy CEPAR's 10% interest in the BCM. The SPA is subject to conditions precedent with completion expected to occur by approximately 31 July 2025. Once the sale has been completed, CEPAR will no longer hold an interest in the BCM. Post completion, the joint venture participants in the BCM will be BCPL and NSB.

In May 2024, the Department of Planning, Housing and Infrastructure confirmed that the appropriate approval pathway for the application is via an application to modify SSD 09_0182 under Section 4.55(2) of the *Environmental Planning and Assessment Act 1979*.

On 23 July 2024, BCOPL referred MOD 10 to the Commonwealth Department of Climate Change, Energy, the Environment and Water to determine whether the proposed changes to mining operations would be deemed a 'Controlled Action' and therefore require additional assessment requirements for approval under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999*. On 22 August 2024, MOD 10 was deemed a Controlled Action under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999*.

Xenith Consulting Pty Ltd has prepared this Modification Report on behalf of BCOPL in support of the application to modify SSD 09_0182, including to address the assessment requirements under the bilateral agreement between the Commonwealth and NSW Governments.

Stakeholder Engagement

BCOPL has engaged with a range of regulatory and community stakeholders throughout the preparation of this Modification Report to ensure that any issues and concerns have been adequately addressed.

Stakeholder consultation occurred with the Boggabri Coal Mine Community Consultative Committee, Registered Aboriginal Parties, near neighbours and the broader community, regulatory authorities (including local, state and Commonwealth government agencies), industry stakeholders and others.

BCOPL will continue to consult with stakeholders throughout the Government review and assessment process for MOD 10.

Impacts, Management and Mitigation

This Modification Report includes an assessment of the potential environmental, social and economic impacts of MOD 10 in accordance with applicable legislative requirements and relevant Government guidelines and policies.

Where appropriate, the environmental assessments completed for this Modification Report have identified any further management and mitigation measures required to be implemented for the development. The minimal changes to mining operations and identified impacts for MOD 10 generally means that the measures currently described within existing Boggabri Coal Mine environmental management plans and programs will continue to remain appropriate.

The following provides a summary of the key findings from the environmental assessments undertaken for MOD 10.

Acoustics

A Noise and Blasting Impact Assessment was undertaken by EMM Consulting Pty Ltd to assess the potential noise and blasting impacts associated with MOD 10.

Operational noise modelling for the representative mine plans for MOD 10 indicated that noise from the Boggabri Coal Mine will continue to comply with the relevant noise criteria at all neighbouring privately owned receivers.

The assessment of operational noise impacts across privately owned landholdings confirmed there are no private landholdings where more than 25% of the land will experience noise levels greater than the relevant Voluntary Land Acquisition and Mitigation Policy criteria.

The low frequency noise assessment indicates that noise levels will remain below the low frequency thresholds at all privately owned receivers and thus the low frequency noise modifying factor adjustment was not applicable for the modelling scenarios.

Sleep disturbance impacts are predicted unlikely to occur as a result of MOD 10.

A cumulative noise assessment was completed in relation to the operations proposed for MOD 10 in conjunction with activities at the neighbouring Maules Creek Coal Mine and Tarrawonga Coal Mine. The cumulative noise assessment indicated that noise levels will remain well below the relevant criteria at all neighbouring privately owned receivers.

The assessment of blasting impacts was assessed based on the maximum range of historically recorded maximum instantaneous charge (MIC) values. The assessment of blasting impacts indicated that ground vibration and overpressure levels would remain be well below the relevant SSD 09_0182 criteria at the nearest privately owned receivers.

BCOPL will continue to monitor and manage noise impacts from the Boggabri Coal Mine in accordance with the Noise Management Plan. Modelling for MOD 10 indicated that operations may need to be adjusted during adverse weather conditions to ensure that noise emissions remain within the relevant criteria. This is consistent with the measures described within the Noise Management Plan.

Air Quality and Greenhouse Gas

An Air Quality and Greenhouse Gas Impact Assessment was undertaken by Airen Consulting to assess the potential air quality and greenhouse gas impacts associated with MOD 10. The Air Quality Impact Assessment was completed in accordance with the *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2022). The assessment included air quality dispersion modelling, a CALPUFF model and representative staged mine plans for MOD 10 to predict particulate matter concentrations at privately owned receivers in the vicinity of the Boggabri Coal Mine.

The Greenhouse Gas Impact Assessment was undertaken with regard to the *NSW EPA Guide for Large Emitters*: *Guidance on how to prepare a greenhouse gas assessment as part of NSW environmental planning processes* (EPA, 2025) and its earlier draft version (EPA, 2024). The greenhouse gas emissions for MOD 10 were calculated in accordance with the principles of the Greenhouse Gas Protocol and the *Technical Guidelines for the Estimation of Greenhouse Gas Emissions by Facilities in Australia* (DEE, 2017).

The Air Quality Impact Assessment concluded that MOD 10 is unlikely to affect air quality beyond the range of historically measured fluctuations of key air quality indicators around the region. Accordingly, modelling indicated that the proposed activities would not result in changes to air quality that would cause exceedances of relevant criteria at the nearest private sensitive receptors. The only potential for exceedance of the relevant criteria was identified in the modelling of number of days above 50 µg/m^3 (cumulative). Three (3) private sensitive receptors are expected to experience in the order of one day above the relevant criteria. This result is within the range of historically measured days when PM_{10} concentrations have exceeded 50 µg/m^3, except for extraordinary years (e.g. due to dust storms and bushfires).

BCOPL will continue to manage impacts to the regional air quality in accordance with its Air Quality and Greenhouse Gas Management Plan. This includes (but is not limited to) the implementation of mitigation and management measures such as watering of haul roads, utilisation of a Trigger Action Response Plan in conjunction with real-time air quality monitoring results to proactively manage operations and the advancement of progressive mine rehabilitation activities.

MOD 10 will result in more than 25,000 tonnes of Scope 1 and Scope 2 greenhouse gas emissions for at least one financial year and therefore meets the Environment Protection Authorities definition for "large emitters".

The estimated greenhouse gas emissions due to activities associated with the Boggabri Coal Mine indicates that the direct annual emissions are estimated to be 0.05 Million tonnes of CO_2-e per year, on average.

Total additional Scope 1 emissions between 2025 and 2040 for MOD 10 are estimated to be approximately 0.77 Million tonnes CO_2-e. The estimated highest annual incremental increase in Scope 1 emissions is 0.21 Million tonnes of CO_2-e (in 2036), which represents approximately 0.05% of Australia's emissions for 2022 (being the latest year of estimate available). Given that projected annual emissions of the Boggabri Coal Mine (including with MOD 10) are also likely to exceed the facility emission threshold, BCOPL will continue to have an obligation to report emissions from this facility under the *National Greenhouse and Energy Reporting Act 2007*.

BCOPL is committed to the ongoing investigation (and eventual implementation) of short, medium and long-term initiatives to reduce greenhouse gas emissions form its operations. This includes:

- The ongoing contribution to climate change solutions and investment into research and development initiatives to reduce greenhouse gas emissions throughout the coal chain;
- Continuing to monitor and report on its direct greenhouse gas emissions and compare against the forecast emissions from the Air Quality and Greenhouse Gas Assessment;
- Continuing to investigate and monitor emerging measures and assess these for potential future implementation to achieve further reductions to greenhouse gas emissions;
- Construction of a solar farm near the Boggabri Coal Mine which will reduce the total electricity required to be sourced from the national grid by approximately 47%. The operation is investigating the inclusion of solar farm battery storage to further reduce the electricity sourced from the national grid;
- Regenerative agriculture and reforestation of locally owned and operated land holdings to produce Australian Carbon Credit Unit's; and
- Continue to develop and maintain the biodiversity offsets and mine rehabilitation areas which will establish a significant native vegetation corridor which in turn results in the creation of a future carbon sink.

BCOPL will continue to monitor and manage its greenhouse gas emissions from the Boggabri Coal Mine in accordance with the measures described within its Air Quality and Greenhouse Gas Management Plan.

Groundwater

A Groundwater Impact Assessment was undertaken by Australasian Groundwater and Environmental Consultants to assess the potential impacts and environmental risks to the regional groundwater regime as a result of the mine plan changes proposed by MOD 10.

The assessment entailed the use of the recently updated regional groundwater numerical model prepared for the Boggabri, Tarrawonga and Maules Creek mining complex. This groundwater numerical model has been subject to regular recalibration and review and was updated in line with the scheduled update that is undertaken every three (3) years in accordance with the consent conditions for the Boggabri Coal Mine (and neighbouring mines).

The regional groundwater regime generally comprises four (4) hydrological systems: the two (2) Quaternary alluvial groundwater systems associated with the Namoi River and its tributaries, the Permian groundwater system which is primarily associated with the coal seam aquifers and the basement Boggabri Volcanics.

Water quality within the Quaternary alluvial aquifers is highly variable. Fresh groundwater is generally limited to bores near surface water sources, including the Namoi River, Barbers Lagoon and Maules Creek. High extraction generally occurs in irrigation areas on the Namoi River floodplain. Groundwater within the Permian coal seams and interburden of the Maules Creek Formation is generally brackish to moderately saline. The quality, depth and yield of water from the Permian constrain the use of this water for agricultural or other beneficial uses.

Groundwater modelling completed for MOD 10 identified that groundwater inflow to the Boggabri Coal Mine for the approved and proposed modelling scenarios is generally consistent, with key differences attributable to the ongoing mine progression. From years 2037 to 2040, the maximum incremental annual groundwater inflow is predicted to be 189 Megalitres per year in 2040.

Predicted changes to the water table remains predominantly confined to the bedrock ridge area of the Leard State Forest. Predicted cumulative drawdown within the surrounding alluvium for both the approved and proposed mining scenarios is generally less than 2 metres, with the greatest drawdown predicted within the Goonbri/Bollol Creek alluvial plains immediately to the south of the Tarrawonga Coal Mine. A small area at the fringes of the Nagero Creek alluvium closest to mining at Boggabri Coal Mine is predicted to experience a cumulative drawdown of up to 5.1 metres. However, this is restricted to the very fringes of the alluvial tongue where it extends into the approved Mine Disturbance Boundary.

Maximum drawdown due to Boggabri Coal Mine (including MOD 10) alone indicates that drawdown (i.e. loss of saturated thickness) within the alluvium is confined to a portion of the Nagero Creek alluvial tongue where drawdown reaches a maximum of 1.3 metres (consistent with the drawdown for the currently approved operations). As such, MOD 10 is not predicted to result in any incremental change to the Nagero Creek alluvium.

Cumulative drawdown in the Nagero Creek alluvium is generally less than 2 metres. However, cumulative drawdown predictions within the Nagero Creek alluvium is 3.8 metres below Groundwater Dependent Ecosystems which are regionally mapped within the relevant Water Sharing Plan. This is consistent with the previous assessments for Boggabri Coal Mine, where up to 5 metres of drawdown has been considered below these vegetation communities.

Predicted takes from all groundwater water sources indicates that water entitlements held for the Boggabri Coal Mine are generally sufficient. The exception is the predicted water takes from Zone 11 of the Namoi River alluvial water source (Maules Creek water source) which is anticipated to exceed the existing entitlements by 2 Megalitres per year in 2040. BCOPL will secure additional water access licences to account for this predicted water take prior to it occurring.

Drawdown is not predicted to exceed the Level 1 Aquifer Interference Policy minimal impact considerations threshold of 2 metres within the highly productive alluvium at the location of any known water supply bore.

BCOPL will continue to manage its impacts to groundwater in accordance with its approved Water Management Plan and associated Groundwater Management Plan. The Water Management Plan and Groundwater Management Plan will be reviewed and updated (as required) to include additional measures specific to MOD 10.

Surface Water

A Surface Water Impact Assessment was undertaken by EMM Consulting Pty Ltd to assess the potential impacts of MOD 10 to the existing surface water environment.

MOD 10 will mine through the upper reaches of several ephemeral watercourses in the Back Creek and Nagero Creek catchments. The impacted watercourses collectively drain an area of approximately 85 hectares, which represents the additional disturbance area for MOD 10. The respective disturbance to the Nagero Creek and Back Creek catchments is assessed to be negligible in comparison to total catchment area and the approved Boggabri Coal Mine (between 0.1% to 1% of total catchment area) and thus no additional impacts to streamflow of these catchments are predicted for MOD 10.

MOD 10 does not propose significant changes to the design criteria of the approved existing water management system which will continue to capture and manage rainfall runoff and groundwater inflows as per the approved Boggabri Coal Mine. No offsite discharges from dirty water storages are expected under median conditions. Discharges from dirty water storages are predicted to occur during periods of significant rainfall.

The frequency and volume of discharges predicted for MOD 10 is comparable with the approved operations at Boggabri Coal Mine. Residual water quality impacts associated with dirty water overflows are comparable to approved Boggabri Coal Mine impacts, albeit the extension of operations by four (4) years.

Negligible impacts are anticipated to surrounding watercourses and therefore the potential for impacts to flow regimes are considered to be consistent with approved operations.

Site storage volumes have been assessed to have adequate capacity to contain the potential maximum site water inventory under most conditions. During periods of significant rainfall or extended wet weather, water may be stored in the pit when mining activities are not feasible.

Water balance modelling completed for MOD 10 indicates that the requirement for external water supplies will increase by around 11%, with up to 2,040 Megalitres per year of external water supply required for the remaining Life of Mine. This is generally as a result of an approximate 7% in dust suppression demand due to increased haul road lengths. The combined surface water and groundwater Water Access Licenses required to meet this external water supply are approximately 1,350 Megalitres per year. Given the significant number of entitlements available and active water market, it is anticipated that BCOPL will be able to continue using temporary trade as a viable option to secure additional water entitlements when required.

Modelling of licensable water take from local catchment runoff estimates that 329 Megalitres of entitlement is generally sufficient to meet licensing requirements for the Bluevale Water Source over the Life of Mine. BCOPL currently hold 93 Megalitres of entitlement in the Bluevale Water Source which is predicted to be sufficient to cover licensing requirements during dry years. BCOPL would need to obtain an additional 236 unit-shares to achieve the predicted 329 Megalitres per year licensable water take from the Bluevale Water Source during wet conditions.

Impacts to downstream watercourses and users due to the extended period of mining operations are considered minor and manageable with existing and proposed management measures in place. The potential for changes to downstream water users is limited to the additional four (4) year operational period with potential impacts considered minor compared to the approved Boggabri Coal Mine. The potential for changes to downstream flooding regimes and watercourse stability are considered negligible, and consistent with approved Boggabri Coal Mine impacts.

The potential impacts of MOD 10 will continue to be managed in accordance with the Boggabri Coal Mine Water Management Plan and associated Surface Water Management Plan.

Biodiversity

WSP prepared a Biodiversity Development Assessment Report in relation to the extension of mining operations into the Modification Disturbance Footprint for MOD 10.

Native vegetation within the Modification Disturbance Footprint has been assigned to five (5) Plant Community Types representing two (2) vegetation formations and two (2) vegetation classes, all occurring within the Brigalow Belt South Interim Biogeographic Regionalisation for Australia bioregion and Liverpool Plains Interim Biogeographic Regionalisation for Australia subregion. The assigned Plant Community Types within the Modification Disturbance Footprint include:

- Plant Community Type 462 – Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion;
- Plant Community Type 531 – Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion;
- Plant Community Type 588 – White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion;
- Plant Community Type 592 – Narrow-leaved Ironbark – cypress pine – White Box shrubby open forests in the Brigalow Belt South Bioregion and Nandewar Bioregion; and

- Plant Community Type 594 – Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion.

None of the identified Plant Community Types conform to Threatened Ecological Community listed under the NSW *Biodiversity Conservation Act 2016* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Targeted surveys identified two (2) candidate flora species, being *Tylophora linearis* and *Pomaderris queenslandica*, within the Modification Disturbance Footprint. A total of 30 stems of *Tylophora linearis* were recorded within the Modification Disturbance Footprint, resulting in a species polygon of 1.29 hectares. Similarly, a small clump of *Pomaderris queenslandica* was recorded within the Modification Disturbance Footprint, resulting in a species polygon of 0.5 hectares.

Three (3) candidate fauna species, including the Koala, Pale-headed Snake and Squirrel Glider were assumed present within the Modification Disturbance Footprint given their historical occurrence within the Leard State Forest and the wider locality. The species polygons for each of these candidate species includes the total area of native vegetation within the Modification Disturbance Footprint (approximately 85 hectares).

An additional 10 threatened ecosystem credit species (including foraging components of dual credit species) were recorded within the Modification Disturbance Footprint, all of which are listed as 'Vulnerable' under the NSW *Biodiversity Conservation Act 2016*. These species include:

- Corben's Long-eared Bat (*Nyctophilus corbeni*);
- Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*);
- Eastern Cave Bat (*Vespadelus troughtoni*);
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*);
- Dusky Woodswallow (*Artamus cyanopterus*);
- Speckled Warbler (*Chthonicola sagittata*);
- Varied Sittella (*Daphoenositta chrysoptera*);
- Little Lorikeet (*Glassopsitta pusilla*);
- Little Eagle (*Hieraaetus morphnoides*); and
- Turquoise Parrot (*Neophema pulchella*).

Two (2) of the recorded species, Corben's Long-eared Bat and *Tylophora linearis*, are also listed as Vulnerable and Endangered respectively under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Accordingly, an assessment of significant impact criteria for Matters of National Environmental Significance was completed for MOD 10. The assessments of significance completed for these species concluded that MOD 10 is likely to have significant impact on the following Matters of National Environmental Significance:

- Corben's Long-eared Bat (*Nyctophilus corbeni*);
- Regent Honeyeater (*Anthochaera phygia*); and
- Swift Parrot (*Lathamus discolor*).

MOD 10 has been deemed a Controlled Action and requires assessment and approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. MOD 10 will therefore be assessed in accordance with the bilateral assessment pathway between the New South Wales state government and Australian Federal government.

The Biodiversity Development Assessment Report and supporting calculations identified a total of 2,043 ecosystem credits and 9,209 species credits are required to offset the biodiversity impacts resulting from MOD 10. The pathway for securing these credits will be determined in accordance with SSD 09_0182. The Boggabri Coal Mine Biodiversity Offset Strategy will be reviewed and updated to address any further requirements for MOD 10 (as required).

WSP completed an assessment of the potential impacts to Groundwater Dependent Ecosystems as a result of the mine plan changes proposed by MOD 10. The assessment relied on an array of existing information and assessments completed as part of previous approvals for the Boggabri Coal Mine.

One vegetation community (Plant Community Type 101 Poplar Box – Yellow Box – Western Grey Box grassy woodland) was identified and considered to be at least partially reliant on access to groundwater. An assessment of significance completed by WSP concluded that the predicted groundwater drawdown impacts as a result of MOD 10 alone (which are negligible) is unlikely to result in significant impacts on this vegetation community.

Cumulative drawdown predicted in the Nagero Creek alluvium below the identified groundwater dependent ecosystem was also determined not likely to result in substantial impacts to this vegetation. The assessment of significance found cumulative impacts on the ecological community located over the area of predicted cumulative alluvial groundwater drawdown is likely to be negligible and not result in a significant impact on this community.

Aboriginal Cultural Heritage

An Aboriginal Cultural Heritage Assessment was completed by OzArk Environment and Heritage to assess the potential impacts of MOD 10 on items of Aboriginal cultural value.

Archaeological assessments were completed in accordance with the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010). The Aboriginal Cultural Heritage Assessment followed the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011) and the *Aboriginal Cultural Heritage Consultation Requirement for Proponents* (DECCW, 2010b). These works were undertaken in consultation with Registered Aboriginal Parties for the Boggabri Coal Mine.

The Modification Disturbance Footprint is assessed as having low archaeological potential with no previously unrecorded Aboriginal sites being identified during the field surveys. Furthermore, no landforms within the Modification Disturbance Footprint were identified as having the potential for subsurface archaeological deposits of a significant or conservable nature.

One previously recorded site, LFVN11 (an isolated find), has been previously recorded within the Modification Disturbance Footprint. This site cannot be avoided and will be salvaged through appropriate recording and collection works. Aboriginal cultural heritage values will continue to be managed in accordance with the Boggabri Coal Mine Cultural Heritage Management Plan which will be revised and updated for MOD 10 as required.

Historic Heritage

A Historic Heritage Assessment was completed by OzArk Environment and Heritage to assess the potential impacts of MOD 10 on Historic Heritage values.

The inspection and assessment of heritage significance was completed in accordance with the Burra Charter, *Investigating Heritage Significance. A Guide to Identifying and Examining Heritage Items in NSW* (Heritage Council of NSW, 2021) and *Assessing Heritage Significance. Guidelines for Assessing Places and Objects Against the Heritage Council of NSW Criteria* (DPE, 2023).

No historic heritage items were recorded during the field surveys of the Modification Disturbance Footprint. There is a low potential for archaeological deposits within the Modification Disturbance Footprint. Given that no items of historic heritage significance were identified within the Modification Disturbance Footprint, no additional management measures are required.

Social

A Social Impact Assessment was conducted by Xenith Consulting Pty Ltd to assess the potential changes to social impacts and benefits resulting from MOD 10.

Social Impact Assessment engagement for MOD 10 occurred over the period July 2024 to March 2025. This consultation included the distribution of community newsletter(s) to key stakeholders and groups as well as six (6) telephone and three (3) in-person interviews/surveys. Various electronic survey proformas were also completed, including a workforce survey, with a total of 403 persons responding.

Socio-economic impacts of MOD 10 are generally associated with a lack of support and healthcare facilities, early education institutions, housing availability and affordability. Perceived opportunities are identified as being related to economic benefits, increases in community resulting from prolonged employment, and the opportunity to develop further housing and infrastructure within the Narrabri Local Government Area.

These impacts have been assessed to be low to moderate, noting minimal impacts to surrounding amenity and no predicted notable change to the social and economic profile of the community (albeit the continued employment and funding to the local and state government).

Visual

A Visual Impact Assessment was undertaken by Xenith Consulting Pty Ltd to assess the potential impacts of MOD 10 within the contemporary landscape.

The visual impacts of the proposed mining activities were assessed from viewpoint locations consistent with those used in previous assessments for the Boggabri Coal Mine. These locations are representative of sensitive receivers and public viewpoints which have the potential to be impacted by the mine plan changes sought by MOD 10. These viewing locations remain consistent with those adopted for Modification 8 to SSD 09_0182.

Views of existing mining activities and the proposed progression of mining at the Boggabri Coal Mine from locations to the north, east and west will continue to be generally screened by topographic elements provided by the Willow Tree Range and the associated vegetated ridgelines of the surrounding area and the adjacent mining operations in the locality. Accordingly, no visual impacts are anticipated to receivers located within these view sectors.

Views of the Boggabri Coal Mine from private residences in the south-east are generally limited due to distance and / or are partially screened by the eastern portions of the Willow Tree Range and the existing southern face of the Tarrawonga Coal Mine Overburden Emplacement Area. As such, views are anticipated to be generally limited by ongoing emplacement activities (and therefore subsequent rehabilitation) and the southern extents of the Willow Tree Range. The establishment and progression of rehabilitation on the southern facing emplacement areas will further limit visual impacts from locations in the south-eastern view sector.

Views from locations in the south-western view sector are anticipated to be generally screened by topographic elements of Barber's Pinnacle, Merriown Mountain and the Leard State Forest. Limited views of the existing Boggabri Coal Mine are experienced from view locations in this sector; however, these views are generally limited due to distance and the presence of woodland vegetation alongside the Namoi River which effectively screens mining operations from open views. Views from this sector are therefore anticipated to be obscured by foreground vegetation and ridges as well as the foothills adjacent to the Boggabri Coal Mine Project Boundary.

MOD 10 is not anticipated to exacerbate the predicted night lighting impacts to those of the currently approved development, albeit the continuation of impacts associated with the additional four (4) years of mining. Operations at the Boggabri Coal Mine will continue to be managed in accordance with the relevant conditions of SSD 09_0182.

Given that no material additional visual impacts are anticipated for this Modification, no additional mitigation or management measures beyond those currently implemented at Boggabri Coal Mine are proposed.

Economics

An Economic Impact Assessment of MOD 10 has been prepared by Gillespie Economics which entailed the completion of a Cost Benefit Analysis and Local Effects Analysis.

The Cost Benefit Analysis confirmed MOD 10 will have a global net production benefit of $964 Million (present value), with a minimum of $421 Million (present value) of these net production benefits accruing to Australia and $279 Million (present value) accruing to New South Wales.

These net production benefits are in the form of Company tax to the Commonwealth (and apportioned to the New South Wales Government) and New South Wales Government royalties.

The environmental and social costs which are not internalised into production costs include the opportunity costs of the existing Water Access Licences held by BCOPL and the cost of securing additional Water Access Licences (~$3 Million present value) and the additional Greenhouse Gas costs resulting from MOD 10 (~$0.1 Million present value). With consideration of the above external costs, MOD 10 is estimated to have net social benefits to both Australia and New South Wales of $418 Million (present value) and $276 Million (present value) respectively.

MOD 10 will facilitate direct economic activity, including jobs, to the local economy, and indirect economic activity to the local area via both wage and non-wage expenditure, while having no material adverse impacts. MOD 10 will result in incremental increases to the net income and net employment for the regional economy (relative to the base case), averaging at $40 Million in additional net income and a further 284 Full Time Equivalent jobs between years 2025 and 2040.

Land Resources, Rehabilitation and Final Landform

A review of previous soil and land resources assessments completed in relation to the land within the Boggabri Coal Mine Project Boundary (within which the Modification Disturbance Footprint is proposed) was undertaken to identify the land resources which will be impacted by the additional mining operations proposed by MOD 10.

The former *Soil and Land Resource Assessment* (GSS Environmental, 2010) mapped the soils within the area covered by the Modification Mining Area as Light Brown Uniform Gravelly Sand soils. These soils are well-draining soils, ranging from moderately acidic to strong acidic at depth, are generally non-saline, and consist of poor fertility characteristics. The topsoil and subsoil are also non-sodic. Standard erosion and sediment controls are recommended for these soils given the limited erosion risks. Despite the stone content within these soils, the topsoil and subsoil materials represents a valued soil resource to be stripped for use in rehabilitation activities onsite. The Conceptual Final Landform for MOD 10 generally retains similar landform characteristics to that presented in the *Boggabri Coal Mine Environmental Assessment* (Hansen Bailey, 2010) and modified as part of the Modification 8 to SSD 09_0182. Accordingly, the final landform for Boggabri Coal Mine will continue to comprise a partially infilled final void which is developed to a level higher than the pre-mining groundwater pressures and ensures that the final void will retain no surface water (i.e. no pit lake).

The Conceptual Final Landform for MOD 10 results in the partially infilled final void to extend further to the north in line with the increased mining footprint. The MOD 10 Conceptual Final Landform will continue to be established to maintain a free draining landform consistent with that currently approved. The lower lying sections of the partially filled final void will continue to capture surface water drainage from its catchment. Modelling completed as part of the Surface Water Impact Assessment confirms that water will temporarily pool within the partially infilled final void following extreme rainfall events. This pooling of water has been assessed to be temporary in nature, as this water will be lost to evaporation and infiltration through the base of the partially infilled final void to the underlying groundwater table.

Whilst the Conceptual Final Landform for MOD 10 will remain generally consistent with the currently approved final landform for Boggabri Coal Mine, the revised landform will entail the emplacement of overburden materials against the northern highwall. The emplacement of overburden materials against the northern highwall at the end of mining operations will facilitate the revegetation of this portion of the landform which will substantially improve the amenity, stability and contribute to the biodiversity values on the post mining landform.

Further review and assessment of the Conceptual Final Landform design will be completed as part of the work program to be completed as part of the Final Void and Mine Closure Plan, which is required under Schedule 3, Condition 74 of SSD 09_0182. In consultation with the NSW Department of Planning Housing and Infrastructure and the Department of Primary Industries and Regional Development – NSW Resources - NSW Resources Regulator, it is anticipated that the timing of this work will be adjusted to enable the work to be completed in relation to the MOD 10 Conceptual Final Landform design.

Geochemistry

RGS Environmental completed a geochemical assessment to assess the interburden and potential coal reject material that would be encountered during the progression of mining operations at Boggabri Coal Mine towards the north-west associated with MOD 10.

Static geochemical tests indicated that the majority of overburden, and coal seam roof and floor materials are Non-acid forming exhibiting low sulfur content with excess Acid Neutralizing Capacity. However, some coal seam roof and floor materials associated with the Herndale and Onavale coal seams were assessed to have elevated sulfur content and are classified as Uncertain or Potentially Acid Forming. Notwithstanding, the total amount of these materials represents a small fraction of the total Non-Acid Forming overburden, interburden and coal seam roof and floor materials material with excess Acid Neutralizing Capacity. The majority of samples tested had excess Acid Neutralizing Capacity and therefore are likely to provide a significant buffering to any unexpected acidity of mining materials should they arise during operations.

Risks of water quality impacts from Non-acid Forming coal and mining waste material was assessed to be low with Static and Kinetic Leach Column testing indicating that surface runoff/seepage is expected to be pH neutral to slightly alkaline with a low level of salinity. The concentration of dissolved trace metals/metalloids in leachate from bulk Non-acid forming overburden, interburden and coal seam roof and floor materials are likely to be to be low and below applied water quality guideline limits.

Overburden, interburden, and coal seam roof and floor materials are not expected to present any environmental issues associated with metal/metalloid concentrations for revegetation and rehabilitation. Geochemical testing indicates that interburden materials are unlikely to be sodic or dispersive and therefore, overburden and interburden materials may be suitable for use in site infrastructure, revegetation and rehabilitation activities.

BCOPL will continue operational sampling and geochemical testing of mining waste, consistent with best practice and will bury coal rejects and coal seam materials deep in the open pit profile and (covered with Non-acid forming spoil) in accordance with current practice at the Boggabri Coal Mine. Additionally, the water quality parameters as described in the geochemical report will be included in the water quality monitoring program as part of the Boggabri Coal Mine approved Water Management Plan.

Other Environmental Impacts

MOD 10 will not result in any material changes to the traffic, bushfire and waste impacts of the currently approved development, albeit the extension of impacts associated with the additional four (4) years of operation. Current management and mitigation strategies will continue to be implemented for the additional mine life.

Valuation of Merits

The approval of MOD 10 will increase Boggabri Coal Mine's coal reserve base within the Project Boundary and result in significant social and economic benefits to society.

MOD 10 is seeking changes to the following aspects of the approved operations at the Boggabri Coal Mine:

- Extension of mining to the north-west beyond the approved Mine Disturbance Boundary, however remaining within the existing Project Boundary. This will result in an additional 85 hectares (approximate) of disturbance;
- Amendments to the Conceptual Final Landform to accommodate for the progression of additional mining; and
- The extension of mine life by an additional four (4) years.

Mining activities will extract coal down to the Templemore Coal Seam within the existing Mine Disturbance Boundary recovering up to 15.4 Million tonnes (approximate) of additional Run of Mine coal resource. The progression of mining into the Modification Disturbance Footprint (i.e. the additional approximate 85 hectares of disturbance) will enable the recovery of an additional 14.5 Million tonnes of Run of Mine coal down to the Templemore Seam. MOD 10 does not propose any changes to the Project Boundary, open cut mining methods, existing mine infrastructure and site access, the annual Run of Mine coal extraction rate of 8.6 Million tonnes per annum or coal processing and transportation.

BCOPL has consulted with relevant regulatory and community stakeholders over the Modification Application and have considered all feedback in the preparation of this Modification Report.

The environmental assessments completed as part of this Modification Report have not identified any material additional environmental, social or economic impacts which will result from this Modification beyond those currently approved by SSD 09_0182. Key changes to environmental impacts for the Boggabri Coal Mine associated with MOD 10 include:

- Approximately 0.77 Million tonnes of CO2-e of additional scope 1 greenhouse gas emissions associated with the continued mining operations for four (4) years at similar annual rate of emissions for the currently approved operations (on top of the additional 0.86 Mt pf CO2-e of greenhouse gas emissions approved under Modification 8 to SSD 09_0182);
- Increase in the predicted take of water from the Maules Creek alluvial water source as a result of the revised numerical groundwater modelling;
- Predicted increase in demand on the groundwater borefield (and other external supplies) to supplement the water management system during dry climatic conditions, consistent with the current approach at Boggabri Coal Mine;
- Disturbance to the additional 85 hectares of native vegetation, which comprises similar biodiversity attributes to those approved to be impacted by mining operations at Boggabri Coal Mine which will be appropriately offset in accordance with regulatory requirements; and
- Continued environmental impacts currently approved for the Boggabri Coal Mine for an additional four (4) years of mining operations proposed for MOD 10.

Whilst some additional environmental impacts will occur as a result of the mine plan changes proposed by MOD 10, these additional impacts (in conjunction with the impacts approved for Modifications 8, 9 and 11 to SSD 09_0182) will not result in substantial changes to the approved Boggabri Coal Mine. Accordingly, it is anticipated that the changes proposed by MOD 10 will not result in significantly different environmental impacts which would limit the fact that Boggabri Coal Mine, including the changes proposed by MOD 10 will be substantially the same as those originally approved (for Modification 7 to SSD 09_0182).

MOD 10 is predicted to deliver net social benefits (that is, considering the social costs in relation to net production benefits) to both Australia and New South Wales of $418 Million (present value) and $276 Million (present value), respectively. These net social benefits will generally be distributed as Royalties to the New South Wales Government ($213 Million, present value) and as Company tax ($208 Million, present value to Australian Government and $66 Million, present value apportioned to New South Wales) whilst also accounting for the opportunity costs of the existing Water Access Licences held and those to be secured by BCOPL (~$3 Million present value) and the additional Greenhouse Gas costs resulting from the Project (~$0.1 Million present value). MOD 10 will continue to provide significant annual direct and indirect benefits to the local area.

Ultimately, MOD 10 will not result in material environmental impacts beyond those currently approved and will result in the delivery of material direct and indirect economic activity to the local, State and National economies. Accordingly, MOD 10 is justified on environmental, social and economic grounds and is in the public interest.

1. INTRODUCTION

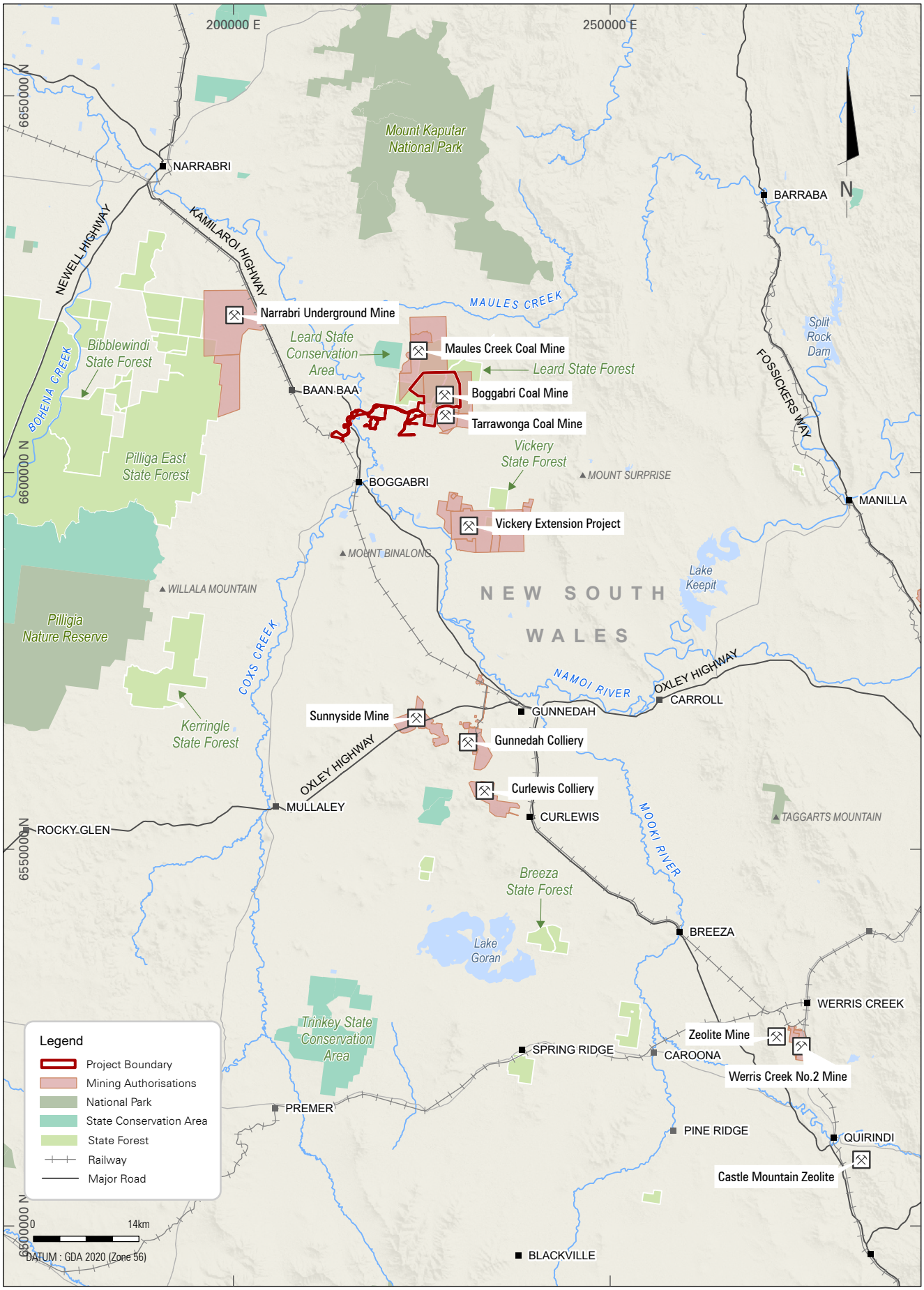
This Modification Report has been prepared by Xenith Consulting Pty Ltd (Xenith Consulting) on behalf of Boggabri Coal Operations Pty Ltd (BCOPL) in relation to the Boggabri Coal Mine (BCM) Modification 10 application.

1.1 Background

BCOPL operates the BCM on behalf of the joint venture participants; which at the date of this application are Boggabri Coal Pty Ltd (BCPL) (a wholly owned subsidiary of Idemitsu Australia Pty Ltd), NS Boggabri Pty Limited (NSB) and Chugoku Electric Power Australia Resources Pty Ltd (CEPAR)[2]. The BCM is an open cut mine located approximately 15 kilometres (km) north-east of the township of Boggabri in the North West Region of New South Wales (NSW), wholly within the Narrabri Local Government Area (LGA). BCM is within the Leard Mining Precinct, being located immediately adjacent to the Tarrawonga Coal Mine (TCM) to the south and Maules Creek Coal Mine (MCCM) to the north (see **Figure 1**). BCM is part of the Boggabri, Tarrawonga, Maules Creek Coal Mining Complex (BTM Complex). TCM is operated by Tarrawonga Coal Pty Limited (TCPL) and MCCM is operated by Maules Creek Coal Pty Limited (MCCPL). Both of which are subsidiaries of Whitehaven Coal Limited (WHC).

The BCM was originally granted approvals under the *Environmental Planning and Assessment Act 1979* (EP&A Act) (Development Application (DA) 36/88) in 1989 to facilitate the production of 5 Million tonnes per annum (Mtpa) of export quality product coal using open cut mining methods for a period of 21 years from the grant of the required mining lease (i.e. until 14 November 2011). Coal production at the BCM did not commence until 2006. DA 36/88 was modified on three (3) separate occasions. The first modification facilitates the development of additional water infrastructure. The second modification allowed an increase in the approved height of the Overburden Emplacement Area (OEA). The third modification facilitated the increase in mine life by a further 2 years (i.e. until December 2013) to enable continued mining operations pending the determination of a new application.

[2] On 30 January 2025, CEPAR and BCPL entered into a sale and purchase agreement (SPA), pursuant to which CEPAR agreed to sell and BCPL agreed to buy CEPAR's 10% interest in the BCM. The SPA is subject to conditions precedent with completion expected to occur by approximately 31 July 2025. Once the sale has been completed, CEPAR will no longer hold an interest in the BCM. Post completion, the joint venture participants in the BCM will be BCPL and NSB.



(3115IDEM) BCM MOD10 - Regional Locality.aprx

BOGGABRI COAL MINE MODIFICATION

Regional Locality

FIGURE 1

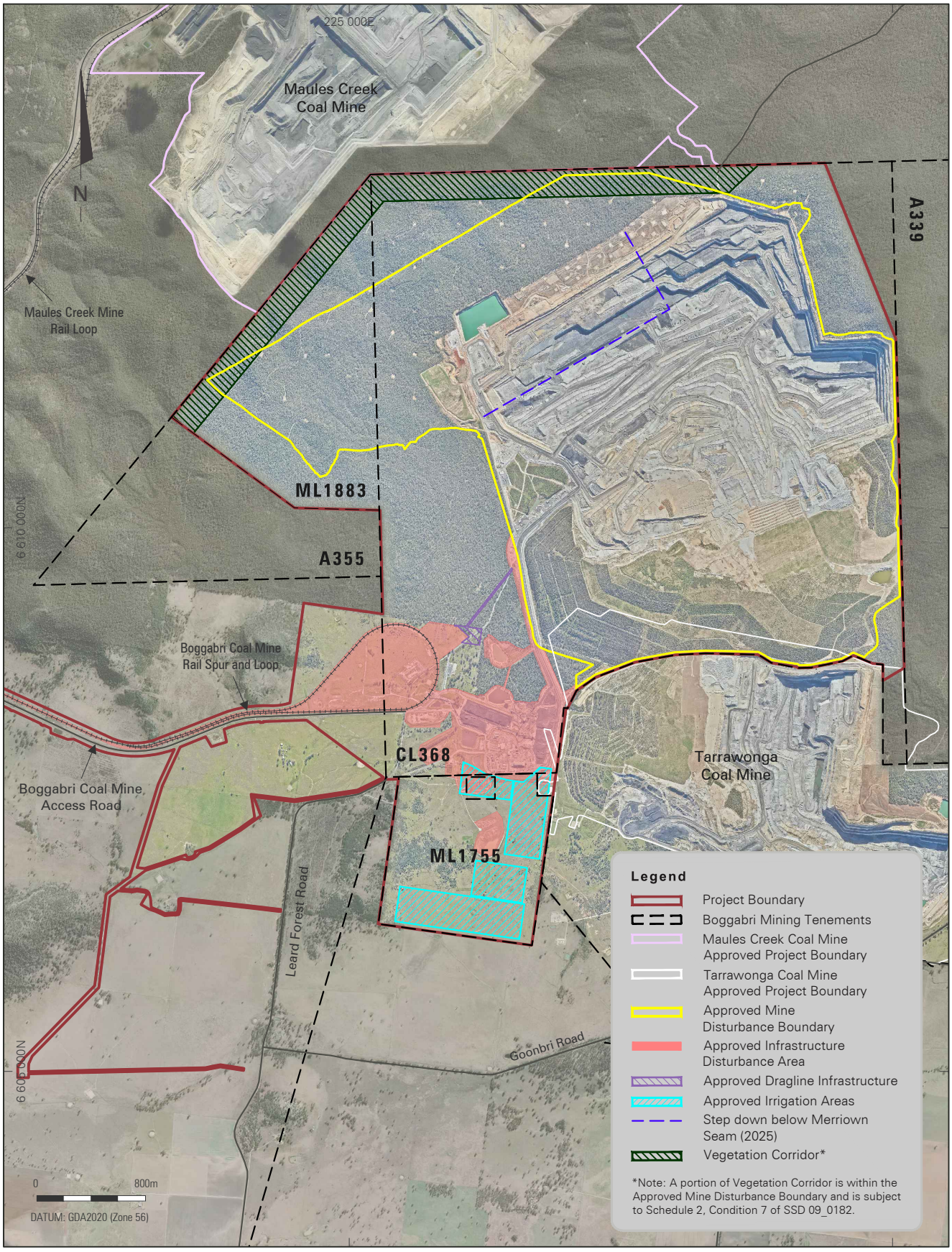
Table 1 provides a summary of the currently approved operations at BCM (as modified). **Figure 2** illustrates the layout of the currently approved operations at BCM.

Table 1 BCM Approved Operations

Component	Current Approval SSD 09_0182 (MOD 11 Granted on 19 July 2024)
Approved Mine Life	Mining operations until 31 December 2036.
Project Disturbance	2,047 hectares (ha).
Annual Production	Peak Run of Mine (ROM) coal production rate up to 8.6 Mtpa.
Coal Resources	Total coal resource estimate of 173.1 Million tonnes (Mt) of ROM coal. › Target coal seams are from Herndale to the Templemore Seam. › Depth of mining approved to 380 metres (m).
Coal Processing	Up to 4.2 Mt of ROM coal to be processed in the Coal Handling and Preparation Plant (CHPP) in any calendar year.
Saleable Product	159 Mt of product coal.
Operational Hours	24 hours per day, seven (7) days per week.
Full Time Equivalent (FTE) Employees	An average of 740 FTE employees for the period from 2023 to 2036 with a peak number of 876 FTE employees.
Mining Method – Overburden	Overburden extraction, transport and emplacement using shovel, truck and excavator. Up to 73.3 Million bank cubic metres (Mbcm) of overburden handled in the peak year modelled (i.e. 2027).
Mining Method – Coal	Coal recovery using truck and shovel/ loaders.
Rejects/Tailings Management	Co-disposal of approximately 8.7 Mt of reject material in pit for the period 2025 to 2036 (a total of 17.1 Mt over the life of SSD 09_0182).
Infrastructure	Mine Infrastructure Area (MIA) (as upgraded) including bath house and administration offices, fuel farm, vehicle wash bay, a two-bay and six-bay workshops, stores building, compound and laydown areas. Ancillary infrastructure (e.g. explosive magazines, oily water separator, crib huts, laydown pads, etc.). Power and communications infrastructure, including substation to transform the supply power voltage from 132 kilovolt (kV) to 11 kV. CHPP: › For selective washing of ROM coal to meet market demands. › Feed surge bin to convey crushed coal to the CHPP at up to 500 tonnes per hour (tph). › Heavy medium cyclone module and spirals technology with capacity up to 500 tph. › Rejects bin (receives coarse and fine reject materials).

Component	Current Approval SSD 09_0182 (MOD 11 Granted on 19 July 2024)
	› 600,000 tonnes (t) of product coal stockpiles with associated underground reclaim system (with an additional stockpile capacity approved to receive ROM coal from TCM (subject to commercial agreement) that can be used by BCM). Train Loading: › Rail spur, loop and train loading facilities. Operation of a mobile crushing plant within the approved Mine Disturbance Boundary. Pre-Shift Start-up Infrastructure.
Water Management	Water management system which separates clean, dirty and contaminated water streams. Reuse of dirty and contaminated water to supplement dust suppression and other demands. Offsite water from Namoi River and associated alluvial aquifer utilised to meet water demands. Final Landform that is self-draining to the natural environment with drainage design objectives consistent with the original *Continuation of Boggabri Coal Mine Environmental Assessment (Hansen Bailey, 2010)* (2010 EA).
Site Access and Roads	Access via Kamilaroi Highway and the BCM mine access road. Access to the Pre-shift Start-up Infrastructure via the existing BCM mine access road and southern portion of the former Leard Forest Road.
Coal Transport	Up to 8.6 Mtpa of product coal transported via rail to market from BCM. Up to 3 Mtpa of product coal from TCM (subject to commercial arrangement). Maximum total of 10 Mtpa of coal railed via the Boggabri Rail Spur and loop. Up to 11 trains per day. Transport minor quantities (200 t per year) of coal by road for testing or marketing purposes.
Rehabilitation and Final Landform	Final landform that drains to the natural environment. Integrate mine planning with adjoining mines to minimise environmental impacts. Maximum height of the OEA of 400 m, which incorporates macro relief elements. Partially infilled mining void, minimising the size and depth of the final void which retains no surface water (i.e. no pit lake). Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems, including: › Local native plant species; › A landform consistent with the surrounding environment; and › Ensure public safety.
Noise	Private receivers which were predicted to receive noise levels greater than Intrusive Criteria within the 2010 EA are identified with acquisition rights within SSD 09_0182. Noise monitored and managed in accordance with measures detailed within the *BCOPL Noise Management Plan* (NMP).

Component	Current Approval SSD 09_0182 (MOD 11 Granted on 19 July 2024)
Blasting	Blasting 9 am to 5 pm Monday to Saturday only, excluding public holidays. One blast per day, maximum of 4 blasts per week.
Interactions with other operations	Approvals are held to handle, process and transport coal from TCM (subject to commercial arrangement). Common boundary landform design in accordance with the Common Boundary Agreement. Joint rail spur with MCCM. BTM Complex Strategies, Plans and Programs.
Vegetation Corridor	250 m of land on the southern side (BCM side) of the joint boundary with neighbouring MCCM (to achieve a total of 500 m of native woodland vegetation between the mining areas).



3115IDEM (BCM MOD10)_Approved Operations (23/05/2025)

BOGGABRI COAL MINE MODIFICATION

Approved Operations

FIGURE 2

1.2 Approvals History

Open cut mining at BCM commenced within the Leard State Forest in 2006 in accordance with DA 36/88 which was originally granted in 1989.

On 18 July 2012, the Independent Planning Commission (IPC) granted Project Approval (PA) 09_0182 for the continuation of mining project under the former Part 3A of the EP&A Act. The Project Approval application was supported by the 2010 EA. PA 09_0182 (as modified) enables mining operations to recover up to 8.6 Mtpa of ROM coal until the end of December 2036. On 20 June 2019, a delegate of the Minister for Planning declared PA 09_0182, as modified, to be "*State Significant Development*" (SSD) under Clause 6 of Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017*, for the purposes of the EP&A Act. Accordingly, from 20 June 2019 PA 09_0182 (as declared to be SSD) has been referred to as SSD 09_0182.

BCOPL is currently operating under SSD 09_0182 (as modified) which was granted in July 2012 and permits the continuation of open cut mining operations and the extraction of up to 8.6 Mtpa of ROM coal at BCM until the end of 2036. SSD 09_0182 has been modified on nine (9) separate occasions to date. These modifications are as follows:

- MOD 1 – sought approval for emergency trucking operations, however, this application was subsequently withdrawn;
- MOD 2 – facilitated the processing and associated transport of up to 3 Mtpa of ROM coal from the adjacent TCM as approved in February 2015;
- MOD 3 – enabled construction of a permanent mine access road, use of overburden as a base material for the rail spur embankment, use of an offsite laydown area and use of in-pit fuel storage facilities. MOD 3 was approved in March 2014;
- MOD 4 – included adjustment of the project boundary, alterations to existing infrastructure within the mine, facilitated the construction of a security fence and firebreak as well as use of additional portable fuel storages within the operational area. MOD 4 was approved in March 2015;
- MOD 5 – enabled the construction of six (6) water bores, two (2) that would supply water for use in the coal preparation process and mining operations and four (4) contingency production bores that would supply water for use at the mine. MOD 5 included ancillary infrastructure required for the bores, such as powerlines, access tracks and water transfer pipelines. MOD 5 was approved in August 2016;
- MOD 6 – facilitated a minor administrative amendment to Schedule 2, Condition 12 of SSD 09_0182 to address the current underutilisation of the Boggabri Rail Spur Line. MOD 6 was approved in July 2017;
- MOD 7 – approved in May 2019 allows:
  - The realignment of a small section of the BCM Project Boundary with TCM;
  - The transport of small tonnages of coal by road for testing and marketing purposes;
  - Exploration activities within the approved Mine Disturbance Boundary;
  - Use of an approved stockpile previously approved for coal from TCM for its own product coal; and
  - Biodiversity offsets to be secured through alternative mechanisms.;
- MOD 8 (as amended) – approved on the 22 January 2024, amended the mine plan to step below the Merriown Coal Seam from 2025 to recover an additional 28.1 Mt of ROM coal, extended the mine life by three (3) years (until the end of 2036) and increased in the peak workforce at BCM to be 876 FTE employees, as well as variations to the previously approved Final Landform Design;
- MOD 9 - was granted on 2 March 2023 and facilitates the construction of a new Pre-Shift Infrastructure Facility at a location closer to the active mining area, the use of a mobile rock crushing facility within the approved Mine Disturbance Boundary and for minor administrative changes; and

- MOD 11 – facilitated the extension and construction of new infrastructure within the MIA including an additional two-bays at the existing four (4) bay workshop, the extension of the stores building and associated concrete unloading pads, minor adjustments to hardstand areas and the subsequent realignment of the light vehicle access road to account for changes to the MIA layout. MOD 11 was granted on 19 July 2024.

1.3 Modification Overview

1.3.1 Description of the Modification

BCOPL is seeking a Modification to SSD 09_0182 under Section 4.55(2) of the EP&A Act to extend mining operations for an additional four (4) years and to progress mining activities towards the north-west and outside of the approved Mine Disturbance Boundary, however remaining within the BCM Project Boundary (MOD 10).

1.3.2 Objectives of the Modification

MOD 10 will facilitate the recovery of approximately 30 Mt of additional ROM coal within the existing BCM Project Boundary and mining leases (CL 368 and ML 1883). This additional mining will lead to an increase in mine life by four (4) years (i.e. out to 2040). The additional four (4) years of mining associated with MOD 10 will enable the continued employment of up to 876 FTE employees (including direct employees and mine contractors) as well as the realisation of the economic benefits offered by the mining of the known coal resources within existing mining leases for BCM (see **Section 1.3.3**). The revisions to the Conceptual Final Landform Design that are proposed for MOD 10 (e.g. emplacement of overburden against the final void highwall) will result in material improvements to the landform to remain within the landscapes.

MOD 10 will not result in any changes to the currently approved mining methods, annual ROM coal extraction rate of up to 8.6 Mtpa, the operational workforce, nor the coal seams approved to be mined at the BCM. Additionally, MOD 10 does not seek to change the approved operational hours at the BCM, any mining related infrastructure, coal handling and processing activities, or transport methods and rates of access to the BCM.

Proceeding with MOD 10 will enable the recovery of additional known coal resources from within areas originally envisaged within the 2010 EA. MOD 10 will provide access to these additional resources whilst remaining within the approved Project Boundary and not encroaching on the Vegetation Corridor.

1.3.3 Feasible Alternatives

Failure to proceed with MOD 10 will result in the sterilisation of a known coal resource that is able to be efficiently recovered from the existing mining leases at the BCM. This will result in the failure to realise the economic benefits within the local area and NSW State government as per the objects of the *Mining Act 1992*. Failure to proceed with MOD 10 would also result in material challenges to achieving an appropriate final landform. Other alternative mine plans and approaches for MOD 10 that have been considered by BCOPL are detailed in **Section 3.7**. The benefits associated with MOD 10 will be achievable at the cost of minimal socio-economic and environmental impacts that are not anticipated to materially exceed those currently approved in SSD 09_0182. Environmental assessments and impacts associated with MOD 10 are detailed in **Section 6**.

1.4 Applicant

The applicant is Boggabri Coal Operations Pty Ltd on behalf of its joint venture participants.

The contact details for BCOPL are:

Boggabri Coal Operations Pty Ltd
PO Box 12
BOGGABRI NSW 2382

Phone: (02) 6749 6000
Email: bclbgi-environmental@boggabricoal.com.au
Website: https://www.idemitsu.com.au/

1.5 Document Purpose

This Modification Report supports an application to modify SSD 09_0182 under Section 4.55(2) of the EP&A Act. Clause 99 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation) provides that a modification application for SSD must (relevantly) include particulars of the nature of the proposed modification and be prepared having regard to the '*State Significant Development Guidelines*' (DPHI, 2024) (prepared by the Secretary as in force from time to time and available on the Department of Planning, Housing and Infrastructure (DPHI) website) (SSD Guidelines).

This Modification Report has been prepared in accordance with Clause 99 of the EP&A Regulation and with regard to the SSD Guidelines, including the associated Appendix E titled '*State Significant Development Guidelines – Preparing a Modification Report*' (DPIE, 2022).

1.6 Document Structure

The Modification Report is structured as follows:

- **Section 1** introduces MOD 10 and outlines the background and purpose of this Modification Report;
- **Section 2** provides the strategic context of MOD 10;
- **Section 3** provides the description of MOD 10;
- **Section 4** outlines the statutory context for the Modification Application;
- **Section 5** summarises the stakeholder engagement completed for MOD 10 as part of this Modification Report;
- **Section 6** describes the environmental impacts that have been identified for MOD 10 and the proposed management and mitigation measures to be implemented; and
- **Section 7** provides a summary of the merits of MOD 10 and evaluates it against the approved BCM under SSD 09_0182.

2. STRATEGIC CONTEXT

This section outlines the environmental and planning context that is relevant to MOD 10. It identifies the surrounding environmental features, key planning considerations and relevant government policies. This section also discusses the alternatives considered for MOD 10.

2.1 Environmental Context

2.1.1 Natural Features

The topography surrounding BCM is dominated by the Willow Tree Range which wraps around the north, east and western sides of the mining area. The Willow Tree Range includes steep slopes and crests (up to a maximum elevation of 430 m Australian Height Datum (AHD)) and forms a broad south-west facing basin. The lower lying floodplains associated with the Namoi River and its tributaries are located to the south and south-west of the BCM.

Goonbri Mountain (543 m AHD) is located approximately 3 km east of the BCM Project Boundary and is an isolated mountain located on the western extremity of the Nandewar Range. The Nandewar Range lies approximately 10 km to the north-east of the BCM Project Boundary.

The major watercourse in the region is the Namoi River. It has a catchment area of approximately 4,200,000 (ha) and forms part of the Murray Darling Basin (MDB). The Namoi River catchment is bounded by the Great Dividing Range in the east, the Liverpool Ranges and Warrumbungle Ranges in the south and the Nandewar Ranges to the north. The catchment area upstream of the Boggabri township is approximately 2,200,000 ha and yields a mean annual streamflow of 906,470 Megalitres per year (ML/year).

The Namoi River is regulated by Keepit Dam on its main channel as well as Split Rock Dam on the Manilla River (a tributary of the Namoi River). These dams facilitate the provision of flows for downstream water users.

BCM is located within the catchments of Nagero Creek and Bollol Creek, both of which are tributaries of the Namoi River.

2.1.2 Land Ownership

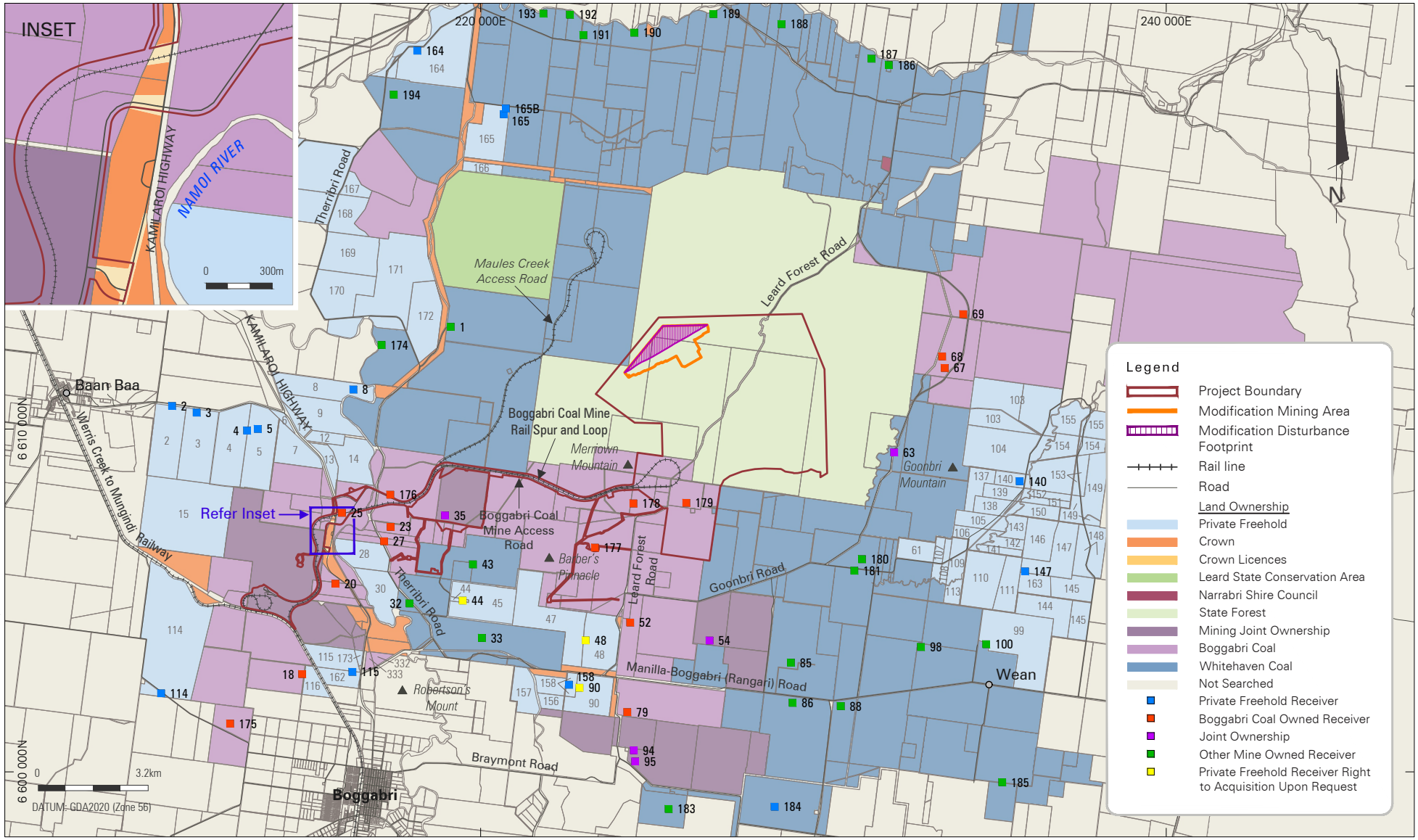
The BCM is located within the Leard State Forest, which is Crown land. The land within the Leard State Forest is managed by the Forestry Corporation of NSW (Forestry Corporation) on behalf of the Crown.

BCOPL owns the land on which the MIA, CHPP and rail loop and spur are located, apart from those parts of the rail spur which are located on land jointly owned with WHC and small parcels of Crown land and local roads.

WHC has significant landholdings to the north, west and south of Leard State Forest. These landholdings are associated with its MCCM and TCM. Due to the extensive landholdings of BCOPL and WHC, there is a significant buffer from the BCM mining operations to the nearest private freehold land.

The mining operations associated with BCM (including those proposed by MOD 10) are generally undertaken on Crown land (Leard State Forest) and a small area of land owned by WHC. The ownership of the land in the vicinity of BCM is illustrated in **Figure 3**.

There are currently three (3) private residences provided acquisition rights under SSD 09_0182. These include location property identification (ID) 44, 48 and 90. All other residences previously nominated with acquisition rights under SSD 09_0182 are either owned by BCOPL, WHC or are jointly owned with WHC.



(3115IDEM) BCM MOD10 - Land Ownership (10/04/2025)

BOGGABRI COAL MINE MODIFICATION

Land Ownership

FIGURE 3

2.1.3 Land Use

The major land uses in the vicinity of BCM are agriculture, coal mining and forestry.

Agriculture is the dominant land use in the North West Region of NSW. Historically, agricultural enterprises in the region included grazing and dry land pasture improvement. The construction of Keepit Dam and Split Rock Dam, however, ensures a more reliable water supply during prolonged dry periods. As a result, these dams facilitated the introduction of intensive cropping to the region.

The alluvial floodplain of the Namoi River supports highly productive agricultural land. The floodplain supports both dry land and irrigated cropping, as well as pasture establishment enterprises. The land surrounding the floodplain is primarily used for grazing, including sheep and cattle grazing.

Coal mining is a relatively recent land use in the Gunnedah Basin. BCM is adjacent to MCCM to the north and TCM to the south. The three (3) mines are collectively referred to as the BTM Complex (or the Leard Forest Mining Precinct). Several other small to medium sized coal mines are present in the region including Narrabri Mine, Rocglen Mine, Sunnyside Mine, Vickery Mine and Werris Creek Mine. BCOPL has also formerly operated the Forest View Quarry to the east of BCM which is accessed by Goonbri Road. BCOPL surrendered Environment Protection Licence (EPL) 20404 for this site in December 2018.

The Leard State Conservation Area is located approximately 5 km north-west of the Project Boundary and covers an area of 1,176 ha. Mount Kaputar National Park is located approximately 25 km to the north of the BCM Project Boundary. Mount Kaputar National Park covers an area of approximately 36,817 ha and possesses significant recreational value.

The Leard State Forest is approximately 8,134 ha in size and consists predominantly of native vegetation communities dominated by Ironbark, White Box, Blakely's Red Gum and White Cyprus Pine. Selective logging activities have been undertaken in the past, but the Leard State Forest remains in a generally forested state where mining has not been undertaken. The parts of the state forest that are not reserved for mining remain available for recreation purposes.

2.1.4 Vegetation Corridor

In accordance with SSD 09_0182 granted in 2010, a 250 metre (m) buffer stipulating no vegetation disturbance was implemented for the region adjacent to the shared mining lease boundary with MCCM. MCCM holds a similar condition in which requires no vegetation disturbance within the 250 m buffer region from the common mining lease boundary. Accordingly, this 500 m region either side of the common mining lease boundary for the MCCM and BCM is referred to as the Vegetation Corridor.

MOD 10 proposes to extend mining operations to immediately to the south of the Vegetation Corridor. MOD 10 will not result in any disturbance to vegetation within the Vegetation Corridor.

2.2 Planning Constraints

2.2.1 Flood Prone Land

Section 5.21 of the *Narrabri Local Environment Plan 2012* (Narrabri LEP) (NSW Government, 2012) provides details relating to objectives for flood planning within the Narrabri LGA, including:

- To minimise the flood risk to life and property associated with the use of land;
- To allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change;
- To avoid adverse or cumulative impacts on flood behaviour and the environment; and
- To enable the safe occupation and efficient evacuation of people in the event of a flood.

Section 5.21 also states that a development consent must not be granted to development on land the consent authority considers to be within the 'flood planning area' unless otherwise it meets the satisfaction of the consent authority.

The Narrabri Shire Council (NSC) commissioned WRM (2016) to prepare the '*Narrabri Flood Study'.* This study encompassed the first stage of the Floodplain Risk Management process and assessed the risk of regional flooding associated with the Namoi River and local flooding from its tributaries. The primary objectives of the study were to:

- Determine the flood behaviour including the design flood levels over the full range of folding up to and including Probable Maximum Flood (PMF) from both the Namoi River and the local tributaries;
- Provide a model that can establish the effects on flood behaviour of future development;
- Assess the sensitivity of flood behaviour to potential climate change effects such as increases in rainfall intensity; and
- Assess the provisional hydraulic categories and undertake mapping of provisional hazard, preliminary emergency response planning classifications, and preliminary flood planning extent areas.

The Narrabri Flood Study was supplemented with contemporary works completed for the *Narrabri Floodplain Risk Management Strategy and Plan* (FRMP) (WRM, 2023). The FRMP considers the existing flood risks confronting the Narrabri study area and potential management and mitigation options available to reduce future flood risk. Such measures consider the environmental, social, economic, planning and emergency management issues and constraints within the study area.

2.2.2 Bushfire Prone Land

BCM is located entirely within the Leard State Forest which is dominated by dry eucalypt woodlands and open forests. Given the relatively low rainfall and dry nature of the landscape, combined with the build-up of high fuel loads (i.e. leaf litter and timber) over time, a significant bushfire risk occasionally presents itself within this region.

Notwithstanding, the BCM Biodiversity Management Plan (BCOPL, 2018), and Biodiversity Offset Strategy (WSP, 2018) prescribe bushfire management strategies that are implemented by BCOPL for the BCM (including rehabilitation of post-mine landforms) and the biodiversity offset areas within the region.

BCOPL manages bushfire risk at BCM through the monitoring and maintenance of bushfire hazards including:

- Monitoring and maintaining equipment and areas where bushfire hazards are present to prevent and minimise the potential outbreak of bushfire;
- Regular monitoring of fuel loads adjacent to mining areas and within the mining lease area portion of Leard State Forest;
- Maintaining access tracks and fire breaks around the mining lease;
- Prohibition of burning any material on-site;
- Maintaining appropriate firefighting equipment in consultation with the NSW Rural Fire Service and maintaining a fire control and emergency system in accordance with the *Work Health and Safety (Mines and Petroleum Sites) Act 2013*; and
- Assessing contractor safety plans to adequately address fire controls and response.

BCOPL has historically worked closely with the NSW Rural Fire Service and Forestry Corporation, and will continue to do so, to ensure that bushfire risks on-site are actively identified and managed.

2.2.3 Mine Subsidence Districts

The BCM is not located within a mine subsidence district and no underground mining activities are proposed to occur under SSD 09_0182. Accordingly, mine subsidence management is not relevant to the BCM.

2.2.4 Other Matters

The NSW Environment Protection Authority (EPA) maintains a register of contaminated land in NSW. BCM is not located on or near a notified contaminated site. The activities that are proposed to be undertaken for MOD 10 will be entirely on land within the Leard State Forest, within the existing BCM Project Boundary and mining leases that are held for currently approved mining operations. Therefore, the risk of land contamination due to previous land uses is not applicable for MOD 10.

BCM is not located on or near any land mapped as a landslide risk area.

2.3 Government Strategies, Policies and Plans

2.3.1 New England North West Regional Plan 2041

BCM is located within the New England North West (NENW) Region of NSW. The *New England North West Regional Plan 2041* (Regional Plan) (DPE, 2022) provides the main strategic planning document for the NENW Region of NSW.

The Regional Plan provides an overarching framework to guide detailed land use plans, development proposals and infrastructure funding decisions in the NENW Region. The Regional Plan is effectively a tool to guide the NSW Government's land use planning priorities and decisions over a 20-year period.

The vision for the NENW Region is healthy and thriving communities, supported by a vibrant and dynamic economy that builds on the regions strength. The vision for the NENW Region is articulated in five (5) parts. BCOPL's contribution to these goals include:

- Part 1: Growth, change and opportunity – BCM is located within the Leard Forest Mining Precinct, an area reserved for coal mining. BCOPL promotes opportunities for employment, business development and quality of life;
- Part 2: Productive and innovative – BCOPL provides employment and procurement opportunities and benefits, whilst also focussing on its local spend. BCOPL encourages a strong regional economy and employs a locally based workforce which in turn supports population stability and contributes to community strength. BCOPL also protects the viability and integrity of the rural communities. BCOPL responsibly manages the recovery of the coal resource through its mine scheduling and rehabilitation activities which seek to return the site to an appropriate post-mining land use and ecological function (Objective 2 and Objective 4);
- Part 3: Sustainable and resilient – the potential environmental impacts of the BCM are minimised through project design, compliance with regulatory requirements and through the implementation of several environmental management plans. BCOPL is committed to addressing the effects of climate change to its operations as well as minimising the potential impacts from its operations through the application of various management and mitigation measures such as addressing fuel inefficiencies and assessing opportunities for renewable energy supplies and diesel alternatives, reviewing technology to reduce electricity consumption and developing a decarbonisation strategy (Objective 8 and Objective 9). BCOPL is committed to the sustainable use of water resources within its operations (Objective 11) as well as the conservation of biodiversity values in the surrounding landscape (Objective 12). Various environmental management and mitigation measures are implemented in accordance with the relevant BCOPL environmental management plans. The assessment, mitigation and management of potential environmental and socio-economic impacts from MOD 10 are discussed in **Section 6**;
- Part 4: Housing and place – BCOPL has previously supported improvements in social infrastructure across the local area through the delivery of the Boggabri Early Learning Facility, the progression towards the fulfilment of its Boggabri Housing Commitment and investments facilitated by the BCM Voluntary Planning Agreement (VPA) and BCOPL community sponsorships and donations, which would continue for MOD 10.

BCOPL is committed to enhancing the diversity and strength of the Boggabri township and greater Narrabri LGA through its community spend and funding of local businesses and organisations (Objective 5). The potential socio-economic impacts of MOD 10 are discussed in **Section 6**; and

- Part 5: Connected and accessible – the BCM VPA and BCOPL's community investments support the development of infrastructure in the local community including contributions towards roads and associated transport infrastructure.

2.3.2 Dark Sky Planning Guideline

The *Dark Sky Planning Guideline* (Dark Sky Guideline) (DPE,2023) was published to protect the Dark Sky region surrounding the Siding Spring Observatory. The Dark Sky Guideline provides technical information and guidance to the state and local government, community, and professionals about the management of light in the Dark Sky region. The Dark Sky Guideline:

- Sets out the planning controls for development near the Siding Springs Observatory; and
- Provides advice on how to minimise light pollution and details good lighting design principles.

Schedule 3, Condition 65 of SSD 09_0182 specifies operational measures to be applied to BCM's operations to minimise lighting and visual effects from its operations. This includes the requirement for all external lighting to comply with *Australian Standard (AS)4282 (INT) 2023 – Control of Obtrusive Effects of Outdoor Lighting* (AS 4282) and to ensure lighting is directed below the horizontal. These requirements are entirely consistent with the lighting and design principles described within the Dark Sky Guideline and will continue to be implemented for MOD 10.

BCOPL consulted with the Director of the Siding Spring Observatory on 15 April 2025 to provide an overview of MOD 10. Consultation outcomes with the Siding Spring Observatory have been considered in the preparation of relevant technical assessments for MOD 10. As discussed in **Section 6.10.3.6**, MOD 10 is predicted result in minor additional night lighting impacts as mining operations progress into the Modification Mining Area. However, these impacts are anticipated to materially decrease in magnitude as the depth of mining increases. Accordingly, the potential increases in night lighting impacts associated with MOD 10 are predicted to be negligible in consideration of impacts to the Siding Springs Observatory.

The Dark Sky Guideline applies to BCM for the reasons outlined in **Section 4.3.6**. The requirements of the Dark Sky Guideline have been considered in relevant assessments completed for MOD 10.

2.3.3 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 emissions (GHG) 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 MOD 10 (particularly for the extended mine life) will exceed the threshold criteria within the GHG Guide and is therefore considered to be a large emitter. Accordingly, the requirements within the GHG Guide has been considered within the GHG assessment for MOD 10 (see **Section 6.1**).

2.3.3.1 Greenhouse Gas Assessment Guide

In January 2025, the EPA published the GHG Guide which outlines climate change assessment requirements for 'large emitters'. The GHG Guide applies to proposed developments that satisfy the following criteria:

- The project proposal requires development assessment and approval under the EP&A Act;
- The project involves one or more scheduled activities under Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act) and/or will be carried out at an existing licensed premises; and
- The project is likely to emit 25,000 tonnes (t) or more of Scope 1 and 2 GHG emissions (CO_2-e) in any financial year during the operational life of the project (based on planned operational throughput and as designed).

The GHG Guide applies to proposed modifications of existing developments, as well as new projects. In the case of modifications, the threshold refers to an additional 25,000 t or more of scope 1 and 2 emissions (CO_2-e) in any financial year when the modification project becomes operational, over and above emissions from the existing licensed premises. It is necessary to define a 'GHG assessment boundary' as not all existing activities need to be considered. The GHG assessment boundary is limited to the sources that may increase or decrease as a result of the proposed modification. The 25,000 t CO_2-e in any financial year threshold is only applied to the GHG assessment boundary rather than the entire operation.

MOD 10 seeks the extension of the mining operations for an additional four (4) years (i.e. out to 2040) to enable the recovery of additional coal resources from within the BCM mining leases. MOD 10 is likely to result in more than 25,000 t of scope 1 and scope 2 emissions (CO_2-e) for at least one financial year and therefore meets the definition of a 'large emitter'.

For projects and modifications that meet the criteria for a large emitter, the GHG Guide recommends the following assessment process:

- Step 1 – describe the GHG assessment boundary and emissions scenarios;
- Step 2 – identify and prioritise sources of GHG emissions;
- Step 3 – select measures to avoid and reduce emissions;
- Step 4 – estimate GHG emissions (all scopes) assuming the implementation of mitigation measures;
- Step 5 – benchmark the predicted GHG emissions against the relevant obligations (including the Safeguard Mechanism);
- Step 6 – Develop an offset strategy;
- Step 7 – peer review of the emissions calculations, mitigation measures and proposed offset strategy (for projects that exceed 100,000 t CO_2-e of emissions in any single financial year); and
- Step 8 – preparation of a GHG Assessment Report.

The GHG Assessment Report prepared in consideration of the GHG Guide is summarised in **Section 6.1**.

2.3.4 Climate Change (Net Zero Future) Act 2023

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

The objects of the 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 IPC. 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.

2.3.5 Safeguard Mechanism

The Australian Government employs numerous policies and legislative requirements that aim to achieve a reduction in GHG emissions over time. The Commonwealth Department of Climate Change, Energy, the Environment and Water Safeguard Mechanism is the Australian Government's scheme for reducing emissions from large industrial facilities within Australia. Established under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act), the policy requires facilities that emit upwards of 100,000 t of CO2-e of Scope 1 GHG emissions (in a financial year), to keep their net emission levels at or below its predetermined baseline. The BCM exceeds this threshold and is considered to be a facility for which the Safeguard Mechanism applies. The BCM has a predetermined baseline and will be required to reduce emissions in accordance with the Safeguard Mechanism's emissions reduction targets. The Safeguard Mechanism have been considered in the preparation of the GHG assessment completed for MOD 10 (refer to **Section 6.1**).

2.4 Cumulative Impacts

The BCM is part of the Leard Forest Mining Precinct (also known as the BTM Complex) along with TCM to the south and MCCM to the north.

Cumulative impacts resulting from the mining operations within the Leard Forest Mining Precinct have been previously considered as part of the environmental assessments completed for the BCM (including for the 2010 EA and subsequent modifications to SSD 09_0182) and neighbouring mines. Environmental strategies have been developed for the BTM Complex to manage these cumulative impacts across the three (3) mining operations. The environmental assessments completed for MOD 10 have similarly considered the potential for cumulative impacts in accordance with the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE, 2022) (see **Section 6**).

2.5 Planning Agreements

BCOPL has entered into a VPA with the NSC as required by Schedule 2, Condition 23 of SSD 09_0182. The general terms of the VPA are consistent with Appendix 3 of SSD 09_0182. MOD 10 will not result in any additional impacts on public infrastructure or services. As such, no variations to the existing VPA are required, albeit the extension of mine life by four (4) years. A number of meeting updates were held with NSC to discuss MOD 10, including the various impact assessments that have been completed for this Modification Report.

3. MODIFICATION DESCRIPTION

This section provides a detailed description of MOD 10 for which approval is sought. It also provides a justification for MOD 10 and discussion on the alternatives considered.

*A modified project description, including the changes proposed by MOD 10 along with previous modifications, is provided in **Appendix A**. The modified project description aims to provide an overview of the currently approved operations for BCM under SSD 09_0182, along with the changes sought by MOD 10. It should be read in the context that it does not attempt to modify or replace the extensive environmental approvals documentation supporting SSD 09_0182.*

3.1 Overview

BCOPL (on behalf its joint venture participants) is seeking a modification to SSD 09_0182 under Section 4.55(2) of the EP&A Act to facilitate the natural progression of mining operations at BCM towards the north-west beyond the currently approved Mine Disturbance Boundary originally envisaged within the 2010 EA. MOD 10 proposes the progression of mining operations into the Modification Mining Area which is situated wholly within the existing BCM Project Boundary, Coal Lease 368 (CL368) and Mining Lease 1883 (ML1883).The Modification Mining Area includes the area within the approved Mine Disturbance Boundary as well as an area to the north-west outside of the approved Mine Disturbance Boundary (see **Figure 4**). **Figure 5** provides cross sections of the Modification Mining Area, showing the areas for the recovery of additional ROM coal beyond those currently proposed to be mined at BCM.

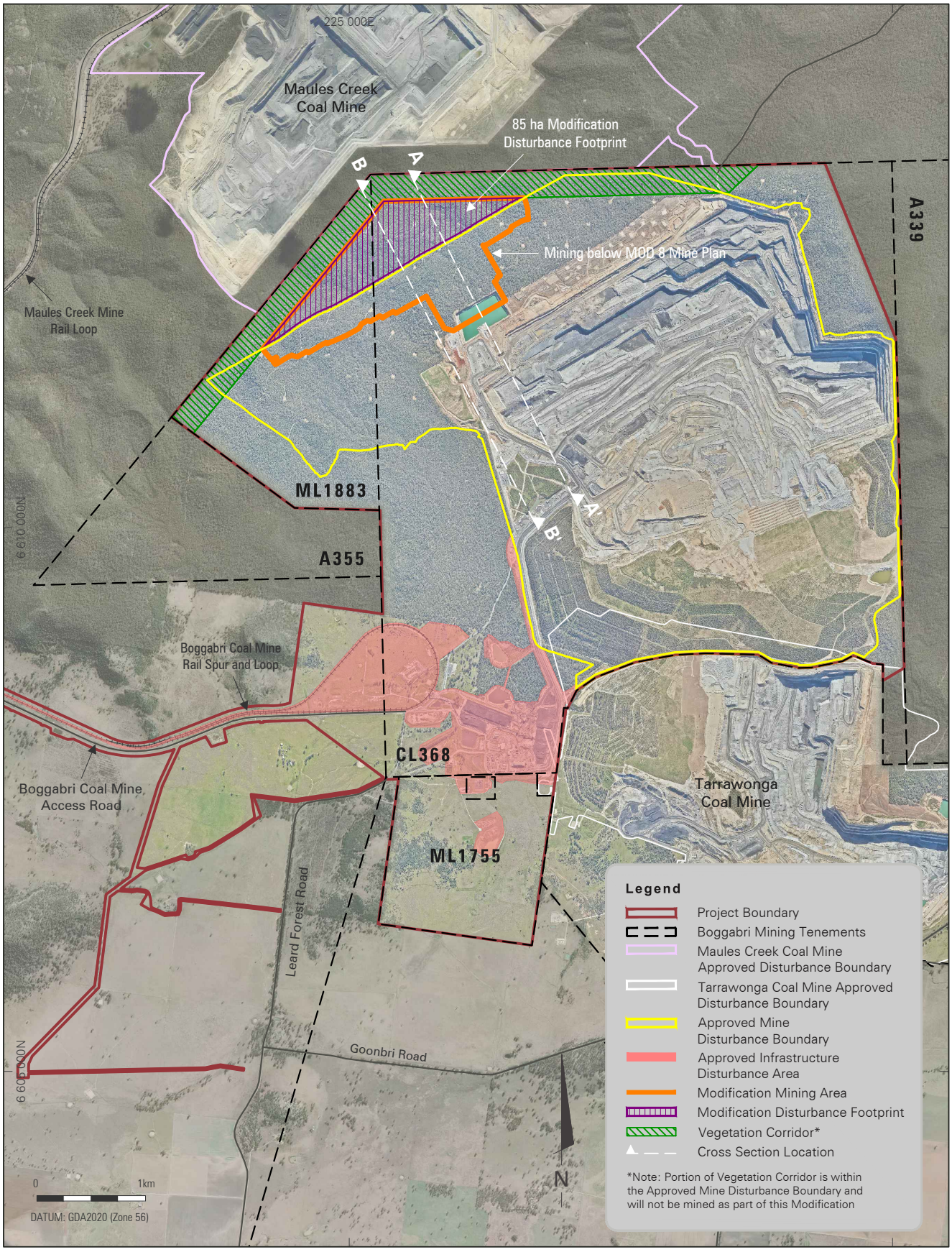
MOD 10 does not propose to extend mining operations or any disturbance into the vegetation corridor between BCM and the MCCM which will remain in place in accordance with Schedule 2, Condition 7 of SSD 09_0182. MOD 10 to SSD 09_0182 involves the following:

- An additional 85 ha of disturbance within the Modification Disturbance Footprint which is located within the existing Project Boundary and beyond the approved Mine Disturbance Boundary. The existing Vegetation Corridor will be maintained as conditioned in SSD 09_0182;
- Mining will continue to recover coal down to the Templemore Coal Seam within the approved Mine Disturbance Boundary recovering up to approximately 15.4 Mt of additional ROM coal resource;
- Mining within the Modification Disturbance Footprint will recover an additional 14.5 Mt of ROM coal down to the Templemore Coal Seam;
- An additional four (4) years of mining activities until the end of 2040; and
- Changes to the conceptual final landform design (for MOD 8 and changes proposed for MOD 10) to reflect the additional overburden materials to be mined and the increase in mining area.

There are no proposed changes to the following aspects of the BCM:

- The currently approved annual ROM coal extraction rate of up to 8.6 Mtpa;
- The approved method of coal extraction;
- The approved rate of ROM coal processing and product railed from site; and
- Other various aspects including the approved Project Boundary, operational hours, mining related infrastructure, water management systems, coal handling, processing and transport methods, and access to the mine site.

The proposed changes to mining operations will remain within the currently approved Project Boundary. Additional biodiversity offsetting is proposed to account for the additional 85 ha of disturbance of vegetation within the Modification Disturbance Footprint (see **Section 6.3**). MOD 10 does not propose any land disturbance within the 500 m wide Vegetation Corridor between BCM and MCCM.

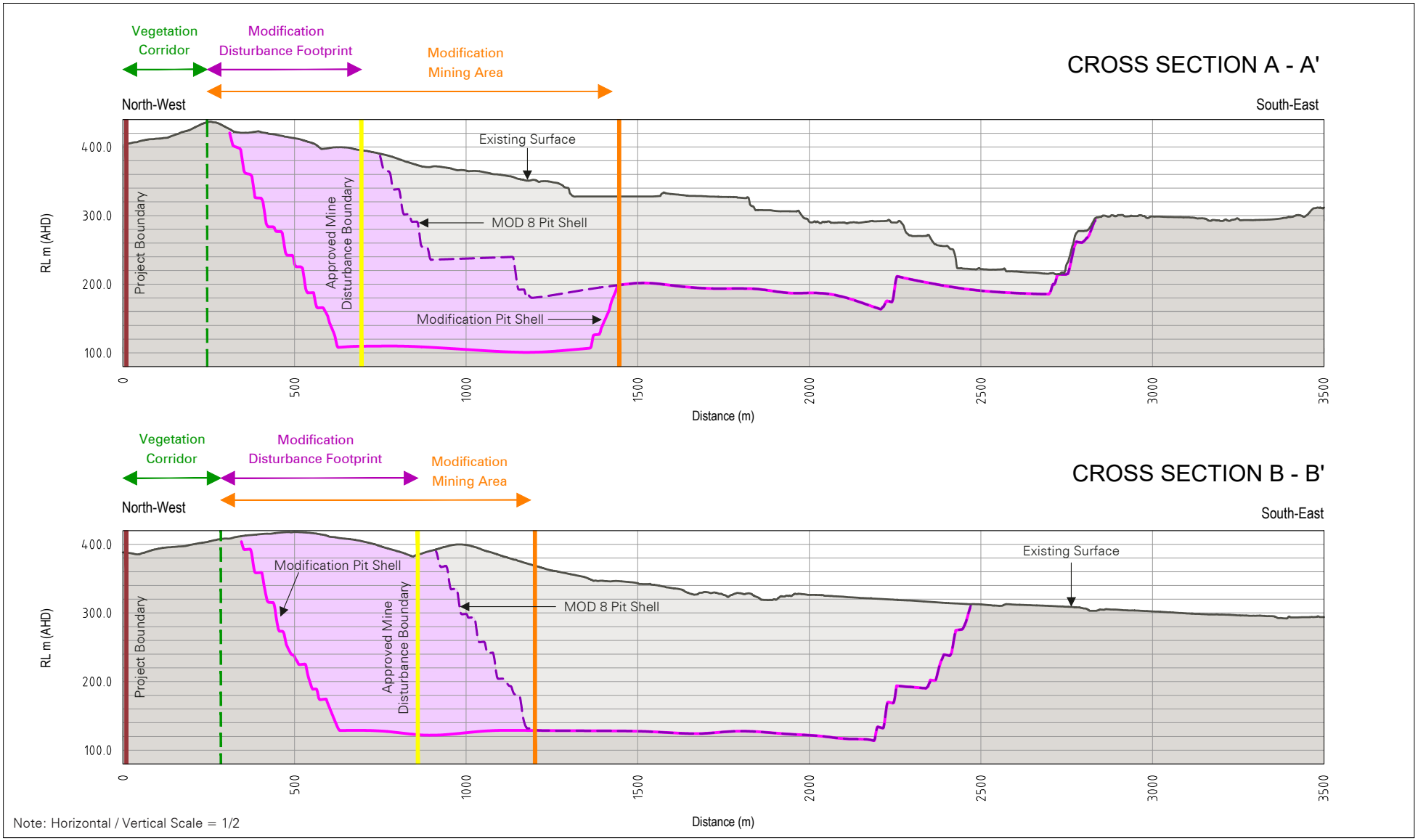


3115IDEM (BCM MOD10)_Conceptual Layout (16/05/2025)

BOGGABRI COAL MINE MODIFICATION

Conceptual Modification Layout

FIGURE 4



(3115IDEM) BCM MOD10 - Cross Sections (10/04/2025)

BOGGABRI COAL MINE MODIFICATION

Conceptual Modification Layout (Cross Sections)

FIGURE 5

Table 2 provides an overview of the key components of MOD 10 (along with changes approved under MOD 11 (currently approved)) in comparison with MOD 7.

The rationale for this comparison is due to the previous considerations of the BCM as a "transitional Part 3A project". The former Part 3A and the associated Section 75W of the EP&A Act (i.e. the modification provision for Part 3A Projects) was discontinued in March 2018. Despite this, all previous modifications approved under this provision were deemed to be part of the authorised development. After March 2018, the provisions of Section 4.55 of the EP&A Act apply.

The Boggabri Coal Project (PA 09_0182) was ultimately declared to be an SSD on 20 June 2019. For a proposal to constitute a modification (rather than a new development), it must satisfy the test of being "substantially the same development" as that which was originally granted. Ordinarily, the comparison is made between the proposed development and the original development (i.e. prior to any modifications), as outlined in Section 4.55(2)(a) of the EP&A Act. However, given that the declaration that SSD 09_0182 (as modified) was given subsequent to the grant of MOD 7, the comparison for the "substantially the same development" test is between any new Modification proposal (together with any Modifications made under Section 4.55 of the EP&A Act) and the development as approved as a State Significant Development (i.e. as approved with MOD 7).

Clause 3BA(6) of Schedule 2 of the *Environmental Planning and assessment (Savings, Transitional and Other Provisions) Regulation 2017* relevantly states:

> *(6) "In the application of Section 4.55(1A) or (2) or 4.56(1) of the Act to the following development, the consent authority need only be satisfied that the development to which the consent as modified relates is substantially the same development as the development authorised by the consent (as last modified under Section 75W):*
>
> *(a) development that was previously a transitional Part 3A project whose approval was modified under Section 75W".*

Accordingly, this has been considered in the preparation of this application to modify SSD 09_0182.

Table 2 Comparison of Key Modification Components

Component	Original Approval (MOD 7)	Currently Approved (MOD 11), including Incremental Changes from MOD 7) (SSD 09_0182)	MOD 10 (Incremental Changes from MOD 11 as Currently Approved)	Cumulative Changes from MOD 7 (Including MOD 10)
Mine Life	› Mining operations until 31 December 2033.	› Three (3) year increase to mine life from 31 December 2033 (MOD 7) until 31 December 2036 (including allowance for wet weather delays) (MOD 8).	› Four (4) year increase to the approved mine life from 31 December 2036 (MOD 8) until 31 December 2040.	› Seven (7) year increase to the approved mine life from 31 December 2033 (MOD 7) until 31 December 2040 (MOD 10).
Project Disturbance	› 2,047 ha.	› No change.	› Additional 85 ha of disturbance.	› Additional 85 ha of disturbance to 2,132 ha (4% increase from MOD 7).
Annual Production (peak rate)	› Up to 8.6 Mtpa ROM coal.	› No change.	› No change.	› No change.
Coal Seams	› Target coal seams are from Herndale to the Merriown Seam.	› Targeting additional coal seams from Merriown down to and including the Templemore Seam (MOD 8).	› Targeting coal seams from Herndale down to and including the Templemore Seam within the Modification Mining Area.	› Targeting coal seams from Herndale down to and including the Templemore Seam within the Mine Disturbance Boundary and Modification Mining Area.

Component	Original Approval (MOD 7)	Currently Approved (MOD 11), including Incremental Changes from MOD 7) (SSD 09_0182)	MOD 10 (Incremental Changes from MOD 11 as Currently Approved)	Cumulative Changes from MOD 7 (Including MOD 10)
Depth of Mining	› Depth of mining approved to 180 m.	› Depth of mining to increase from a maximum of 180 m to 240 m (Reduced Level (RL) 110 m) (MOD 8).	› Increase to a maximum depth of mining of approximately RL 90 m (or 305 m below surface where operations are planned to mine the deepest section of the Templemore Coal Seam to the north).	› Increased depth of mining from 180m (MOD 7) to 305 m below land surface (approximately RL 90 m where mining operations are planned to mine the deepest section of the Templemore Coal Seam).
ROM Coal	› Total coal resource estimate of 145 Mt of ROM coal.	› Increase of 28.1 Mt of ROM coal to 173.1 Mt (MOD 8).	› Increase of 30 Mt of ROM coal	› Increase of 58.1 Mt of ROM coal to a total of 203 Mt (40% increase from MOD 7).
Saleable Product	› 135 Mt of product coal.	› Increase of 24 Mt of product coal.	› Increase of 25 Mt product coal.	› Increase of 49 Mt of product coal to a total 184 Mt (36% increase from MOD 7).
Operational Hours	› 24 hours per day, seven (7) days per week.	› No change.	› No change.	› No change.
FTEs	› 500 FTEs in the 2010 EA, however this figure did not include workers which are now included in current FTE calculation.	› An average of 740 FTEs for 2023 to 2036 with a peak number of 876 FTE (MOD 8).	› Use of approved workforce for an additional four (4) years.	› Increase to an average workforce of 740 FTEs with a peak of 876 FTEs for an additional seven (7) years.

Component	Original Approval (MOD 7)	Currently Approved (MOD 11), including Incremental Changes from MOD 7) (SSD 09_0182)	MOD 10 (Incremental Changes from MOD 11 as Currently Approved)	Cumulative Changes from MOD 7 (Including MOD 10)
	› 750 FTEs in June 2020 (BCOPL, 2020).			
Mining Method – Overburden	› Open cut mining using electric shovel, truck and excavator (dragline option). › Up to 59.9 Mbcm of overburden handled in the peak year modelled.	› Up to 73.3 Mbcm of overburden handled in the peak year modelled (i.e. 2027), averaging 59.1 Mbcm over life of MOD 8 (MOD 8). › Increase in equipment fleet to include 10 excavators and 73 trucks (MOD 8).	› No change.	› A peak of 73.3 Mbcm of overburden handled in peak year. › Increase to the equipment fleet at BCM to include 10 excavators and 73 trucks.
Mining Method – Coal	› Coal recovery using truck and shovel/ loaders.	› No change.	› No change.	› No change.
Rejects/Tailings Management	› Co-disposal of approximately 10 Mt of coarse and fine reject materials in pit over the life of the mine.	› Co-disposal of approximately 8.7 Mt of reject material in pit for the period 2025 to 2036 (a total of 17.1 Mt over the life of SSD 09_0182) (MOD 8).	› Co-disposal of an 17.5 Mt (including MOD 8 and MOD 10) which equates to an additional 6.9 Mt) of reject material in pit for the period 2025 to 2040.	› Co-disposal of an additional 14 Mt of reject material (i.e. a total of 24 Mt) over the life of SSD 09_0182.
Infrastructure	› Ancillary infrastructure (e.g. explosive magazines, oily water separator, crib huts, laydown pads, etc.).	› Operation of a mobile crushing plant (supported with existing mobile equipment) within the existing approved Mine	› No change.	› Operation of a mobile crushing plant within the existing approved Mine

Component	Original Approval (MOD 7)	Currently Approved (MOD 11), including Incremental Changes from MOD 7) (SSD 09_0182)	MOD 10 (Incremental Changes from MOD 11 as Currently Approved)	Cumulative Changes from MOD 7 (Including MOD 10)
	› Continued use of the MIA (with some upgrades) including bath house and administration offices, fuel farm, vehicle wash bay, a six-bay workshop, stores compound and laydown areas. › Power and communications infrastructure, including substation to transform the supply power voltage from 132 kV to 11 kV. › CHPP: ▪ For selective washing of ROM coal to meet market demands. ▪ Feed surge bin to convey crushed coal to CHPP at up to 500 tph. ▪ Heavy medium cyclone module and spirals technology with capacity up to 500 tph.	Disturbance Boundary at BCM (MOD 9). › Relocation of the Pre-Shift Start-up Infrastructure (PSI) to a location which is closer to active mining operations (MOD 9). › Construction and use of an additional two (2) workshop bays within the MIA at BCM (MOD 11). › The extension of store areas (MOD 11). › Minor adjustments to the hardstand areas around the workshop (MOD 11). Minor realignment of the existing light vehicle access route and associated earthen embankment changes (MOD 11).		Disturbance Boundary at BCM. › Relocation of the Pre-Shift Start-up Infrastructure. › Construction and use of an additional two (2) workshop bays within the MIA. › Stores extension and minor adjustments to the hardstand areas around the workshop. › Minor realignment of the existing light vehicle access route and associated earthen embankment changes.

Component	Original Approval (MOD 7)	Currently Approved (MOD 11), including Incremental Changes from MOD 7) (SSD 09_0182)	MOD 10 (Incremental Changes from MOD 11 as Currently Approved)	Cumulative Changes from MOD 7 (Including MOD 10)
	▪ Rejects bin (receives coarse and fine reject materials). ▪ 600,000 t product coal stockpile with associated underground reclaim system (with an additional stockpile capacity approved to receive Tarrawonga Mine). › Train Loading: ▪ Rail spur, loop and train loading facilities.			
Water Management	› Water management system manages water as separate clean, dirty and contaminated water streams. › Dirty and contaminated water is reused onsite to supplement dust suppression and other demands.	› Consistent water management objectives to that currently implemented onsite (MOD 8). › Marginal increase in water demand for dust suppression purposes, but no other additional water demand is anticipated e.g. for CHPP (MOD 8). › Increase in annual groundwater inflows predicted (MOD 8).	› Increase in water demand for dust suppression purposes.	› Increase in water demand due to increase in dust suppression. › Increase in predicted annual groundwater inflows.

Component	Original Approval (MOD 7)	Currently Approved (MOD 11), including Incremental Changes from MOD 7) (SSD 09_0182)	MOD 10 (Incremental Changes from MOD 11 as Currently Approved)	Cumulative Changes from MOD 7 (Including MOD 10)
	› Offsite water from Namoi River and associated alluvial aquifer utilised to meet water demands. › Final Landform to be self-draining to the natural environment.	› Final landform drainage design objectives consistent with that presented within the 2010 EA (MOD 8).		
Site Access and Roads	› Access via Kamilaroi Highway and the Boggabri Coal private road.	› Access to the PSI Site via the existing BCM Access Road and the southern portion of the closed Leard Forest Road. › Minor realignment of the internal light vehicle access route and associated embankment for workshop extension.	› No change.	› Access to the PSI site via the existing BCM Access Road. › Realignment of the internal light vehicle access road for workshop extension.
Coal Transport	› Up to 8.6 Mtpa of product coal transported to market from BCM. › Up to 3 Mtpa of product coal from TCM (subject to commercial arrangement).	› Change to consider the continued coal transport for an additional three (3) years.	› Change to consider the continued coal transport for an additional four (4) years.	› Change to consider the continued coal transport for an additional seven (7) years.

Component	Original Approval (MOD 7)	Currently Approved (MOD 11), including Incremental Changes from MOD 7) (SSD 09_0182)	MOD 10 (Incremental Changes from MOD 11 as Currently Approved)	Cumulative Changes from MOD 7 (Including MOD 10)
	› Total tonnage of coal railed from the Boggabri Rail Spur must not exceed 10 Mtpa. › Up to 11 trains per day. › Approval to transport minor quantities (200 t) of coal by road for testing or marketing purposes.			
Rehabilitation and Final Landform	› Final landform to drain to the natural environment. › Minimise the size and depth of the final void and retains no surface water (i.e. no pit lake). › Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems, including: › Local native plant species. › A landform consistent with the surrounding environment.	› No change to the rehabilitation objectives outlined within Schedule 3, Condition 69 of SSD 09_0182 (MOD 8). › MOD 8 Conceptual Final Landform is assessed to be generally consistent with that conceptually shown within the 2010 EA for Project Year 21, with following changes (MOD 8): ▪ Increase the maximum height of the approved OEA from 395 to 400 m which will incorporate macro relief elements; ▪ Reduced catchment for partially infilled mining void; and	› Relocation of final void to north due to additional mining for MOD 10. › Minor amendments to the Conceptual Final Landform to incorporate the additional mining area. › Emplacement of overburden material against the northern highwall to improve revegetation potential.	› Conceptual Final Landform to reman generally consistent with that assessed in the 2010 EA for Project Year 28. › Increase to the maximum height of the approved OEA from 395m to 400m to incorporate macro relief elements. › Relocated final void whilst reduces catchment of the partially infilled final void.

Component	Original Approval (MOD 7)	Currently Approved (MOD 11), including Incremental Changes from MOD 7) (SSD 09_0182)	MOD 10 (Incremental Changes from MOD 11 as Currently Approved)	Cumulative Changes from MOD 7 (Including MOD 10)
	› Ensure public safety. › Integrate mine planning with adjoining mines to minimise environmental impacts.	▪ Minimised size and depth of the final void to a level greater than the modelled post mining groundwater equilibrium level and is designed to not retain surface water (i.e. no pit lake) (MOD 8). › Final landform integrated with adjoining TCM mining area (MOD 8).		› Emplacement of overburden against northern highwall to improve revegetation potential. › Final Landform to be integrated with the adjoining TCM landform.
Noise	› Private receivers which were predicted to receive noise levels greater than Intrusive Criteria were identified with acquisition rights within SSD 09_0182. › All new trucks, dozers, drills and excavators are required to be noise suppressed (or attenuated) units to deliver sound power levels identified in the 2010 EA.	› Schedule 3, Condition 14 of SSD 09_0182 removed relating to noise attenuation requirements for new equipment, based on existing noise management practices and monitoring demonstrating ongoing compliance with relevant noise limits within SSD 09_0182 (MOD 8).	› No change.	› Schedule 3, Condition 14 of SSD 09_0182 removed relating to noise attenuation requirements for new equipment.

Component	Original Approval (MOD 7)	Currently Approved (MOD 11), including Incremental Changes from MOD 7) (SSD 09_0182)	MOD 10 (Incremental Changes from MOD 11 as Currently Approved)	Cumulative Changes from MOD 7 (Including MOD 10)
	› Noise monitored and managed in accordance with measures detailed within the Noise Management Plan (NMP).			
Blasting	› Blasting 9 am to 5 pm Monday to Saturday only, excluding public holidays. › Up to one blast per day, maximum of 4 blasts per week.	› No change.	› No change.	› No change.
Interactions with other operations	› Approvals held to handle and transport coal from TCM. › Joint rail spur with MCCM. › BTM Complex Strategies, Plans and Programs.	› No change.	› Incorporate agreed landform which better integrates the Conceptual Final Landform with the adjacent TCM.	› Incorporate agreed landform which better integrates the Conceptual Final Landform with the adjacent TCM.

Component	Original Approval (MOD 7)	Currently Approved (MOD 11), including Incremental Changes from MOD 7) (SSD 09_0182)	MOD 10 (Incremental Changes from MOD 11 as Currently Approved)	Cumulative Changes from MOD 7 (Including MOD 10)
Vegetation Corridor	› 250 m of land on the southern side of the joint boundary with MCCM (to achieve 500 m of native woodland vegetation between the mining areas).	› No change.	› No change.	› No change.

3.2 Mining Operations

Mining at BCM is currently undertaken to recover coal from the Herndale Coal Seam down to the Templemore Coal Seam within the Mine Disturbance Boundary as approved in MOD 8 to SSD 09_0182 (as amended) and the associated Commonwealth approval (EPBC 2021/8875). Exploration and mine planning investigations that have been undertaken since the 2010 EA have identified the value of recovering the coal resource to the north-west of the approved Mine Disturbance Boundary (i.e. into the Modification Disturbance Footprint).

The recovery of coal by open cut mining methods down to the Templemore Coal Seam was previously considered in the 2010 EA (i.e. Option 3). This option was not progressed at that time due to the limited understanding of geological resources and the lack of detailed mine planning for this option. There have also been considerable improvements to mining equipment since 2010 which has led to the viability of mining the deeper strata at BCM. MOD 8 and EPBC 2021/8875 were granted in 2024 to facilitate mining down to the Templemore Coal Seam within the approved Mine Disturbance Boundary at BCM.

Increasing the mining footprint to recover coal from the Modification Disturbance Footprint was also considered within the option to mine coal out the common lease with MCCM as part of the 2010 EA (i.e. Option 5). This option was not progressed at the time as this option would have been for more than 21 years which was beyond the timeframes typically granted for mining approvals at the time. It was described within the 2010 EA that approval for the recovery of this known coal resource would be applied for in the future.

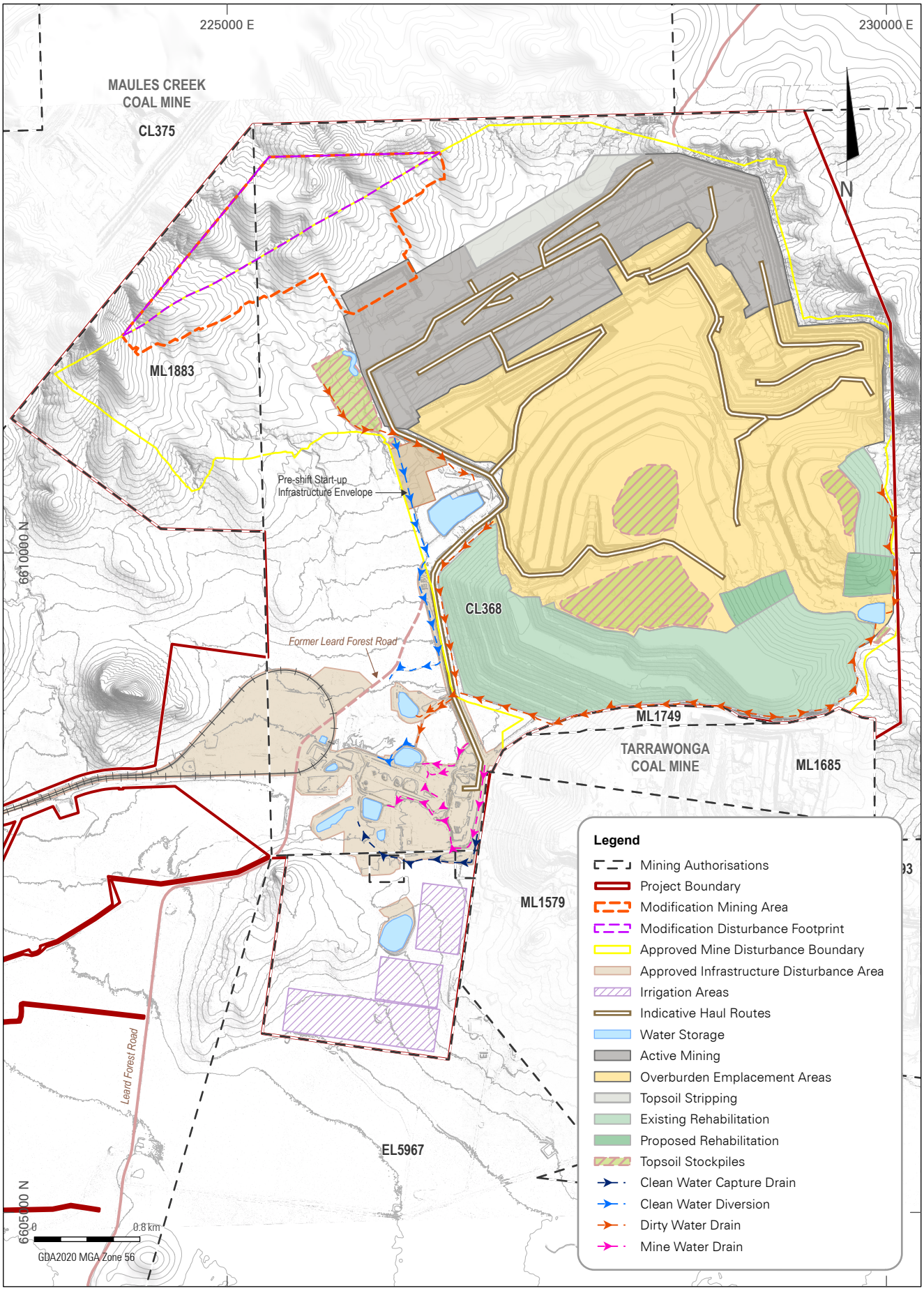
The recovery of the coal resource within the north-western portion of the mining authorities as proposed by MOD 10 is consistent with that originally envisaged within the 2010 EA. Mining technologies and BCOPL's improved understanding of the coal resource within these areas over time has substantially improved since the preparation of the 2010 EA and has identified the value in recovering the coal resource down to the Templemore Coal Seam. Accordingly, MOD 10 seeks approval to recover up to an additional 30 Mt of ROM coal by progressing mining operations toward the north-west of the approved Mine Disturbance Boundary but within the existing Project Boundary. MOD 10 will facilitate the recovery of known coal resources down to the Templemore coal seam within the Modification Mining Area. The additional mining proposed by MOD 10 will result in an increase to the approved mine life by four (4) years (to the end of 2040).

3.2.1 Mining Schedule and Methods

Approved mining operations at BCM are scheduled to recover coal down to the Templemore Coal Seam within the approved Mine Disturbance Boundary until the end of December 2036. The additional 30 Mt of ROM coal to be recovered by MOD 10, within the approved annual ROM coal extraction rates will extend the mine life of BCM by four (4) years until the end of December 2040.

Conceptual mine plans representative of the proposed mining progression for MOD 10 in years 2025, 2028, 2031, 2034, and 2036 are illustrated in **Figure 6** to **Figure 10**, respectively. Mining is scheduled to advance generally consistent with the mine plans approved for MOD 8, albeit the intention to recover the additional coal within the Modification Mining Area from around 2029 and advance into the Modification Disturbance Footprint.

Mining operations at BCM will continue to utilise a conventional truck, shovel and excavator fleet. Recovered ROM coal will be transported by haul truck to the ROM coal stockpiles prior to being delivered to the CHPP and the downstream coal handling and transport facilities. The progression of mining operations at BCM has the potential to vary from that conceptually shown within the above mine plans due to unforeseen factors including localised geological features, the coal market, mining economics and ongoing detailed engineering design.

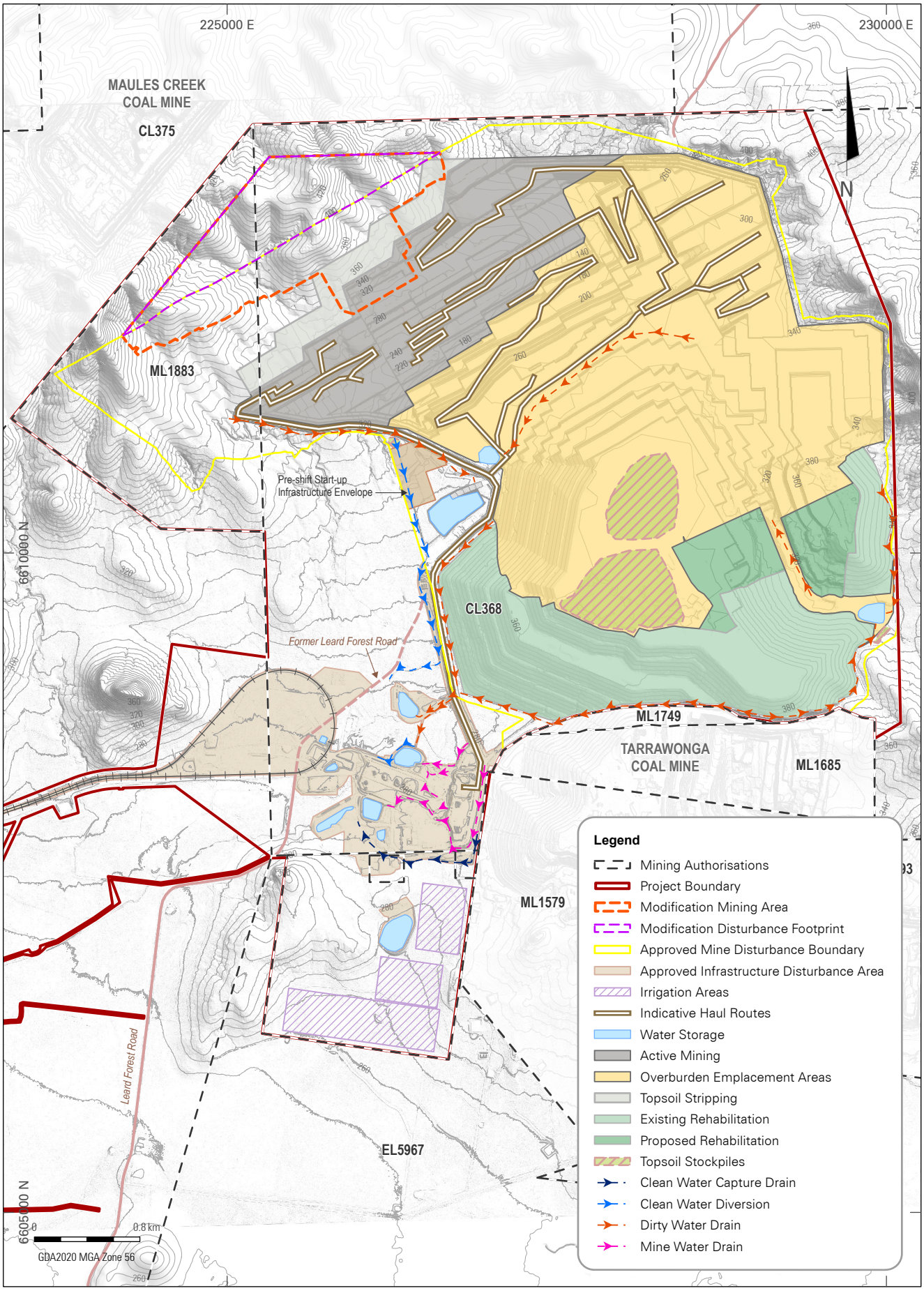


3115\DEM (BCM MOD10)_Mine Stages.aprx (16/05/2025)

BOGGABRI COAL MINE MODIFICATION

Conceptual Mine Plan (Year 2025)

FIGURE 6

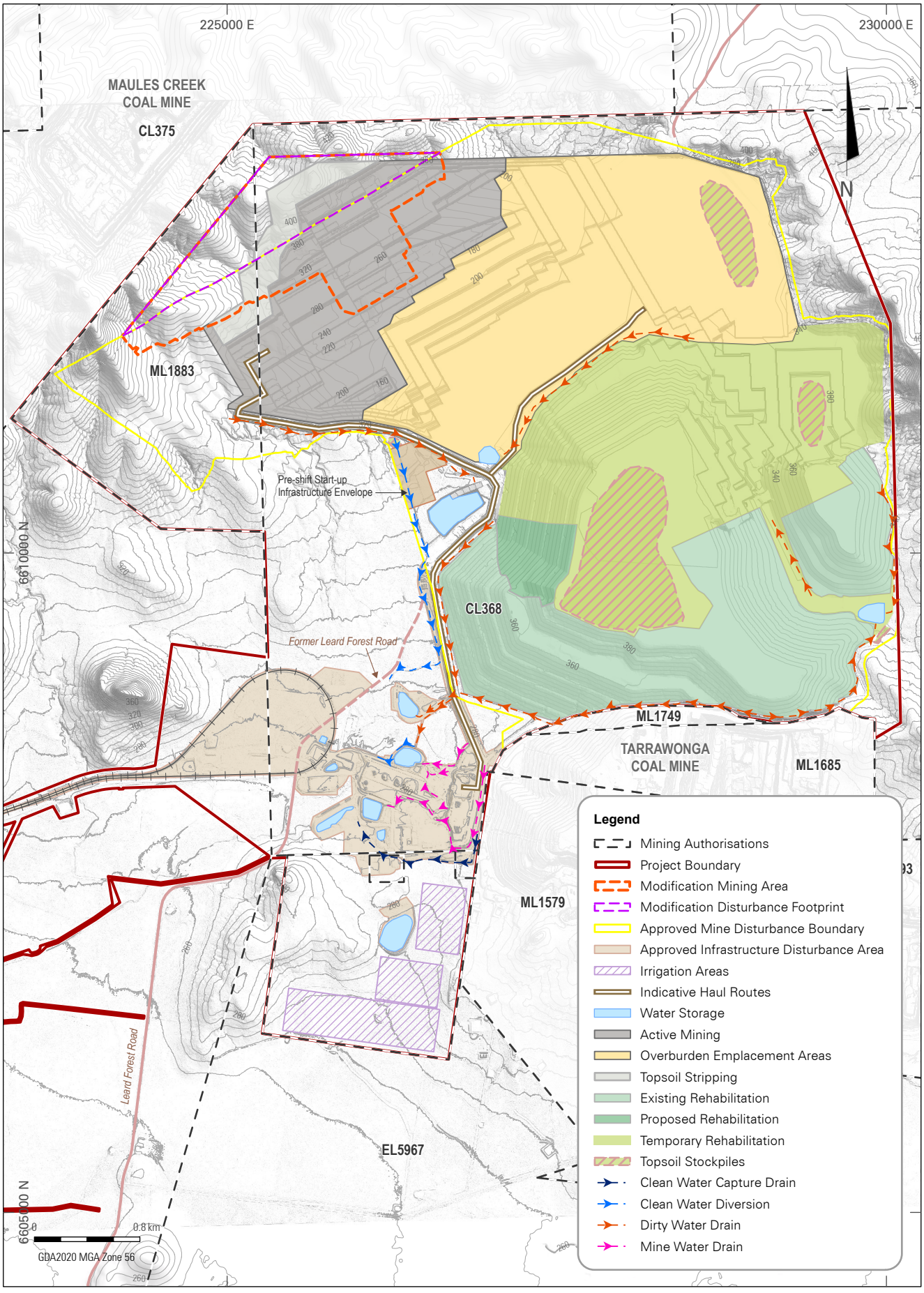


3115\DEM (BCM MOD10)_Mine Stages.aprx (16/05/2025)

BOGGABRI COAL MINE MODIFICATION

Conceptual Mine Plan (Year 2028)

FIGURE 7

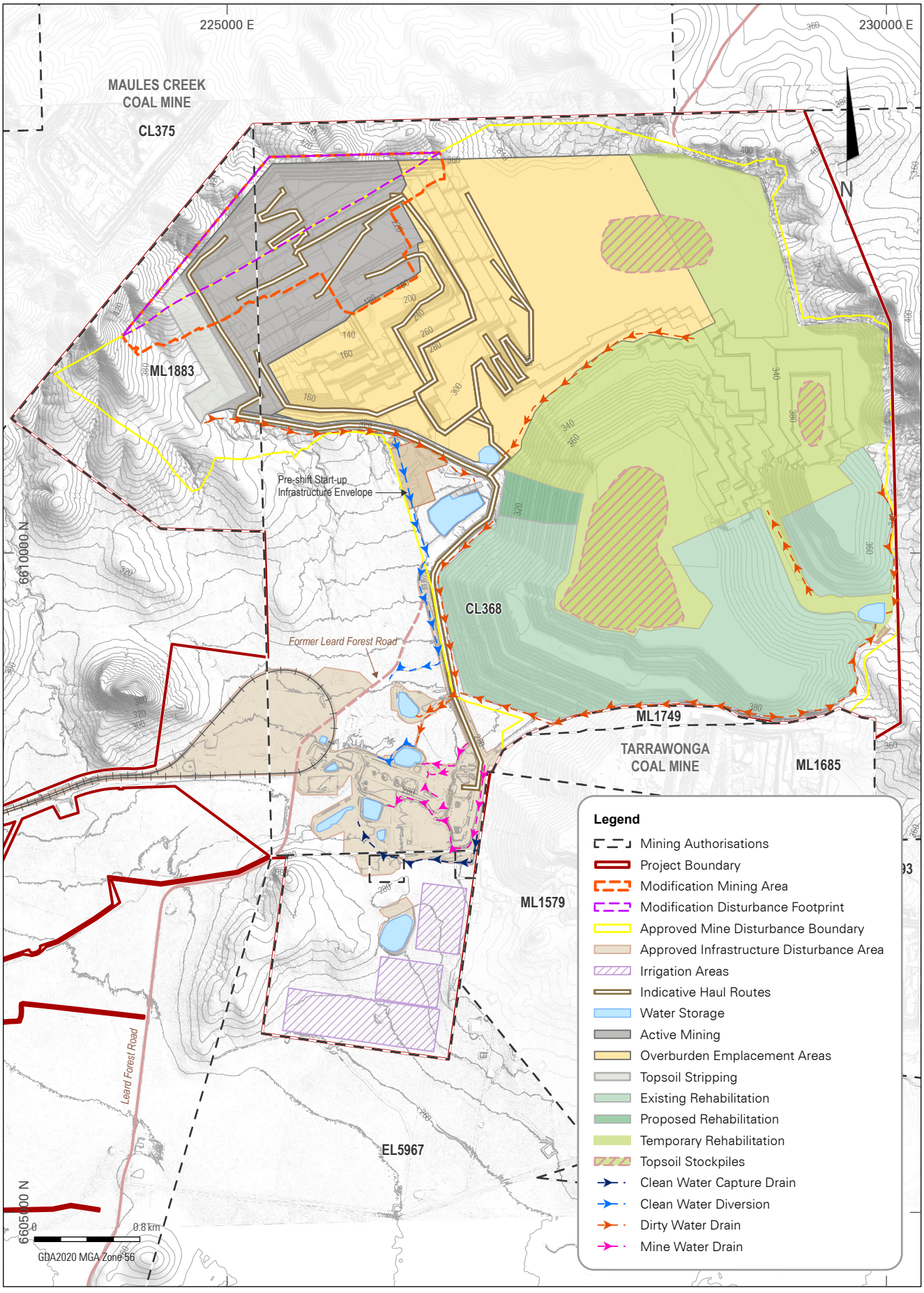


3115\DEM (BCM MOD10)_Mine Stages.aprx (16/05/2025)

BOGGABRI COAL MINE MODIFICATION

Conceptual Mine Plan (Year 2031)

FIGURE 8

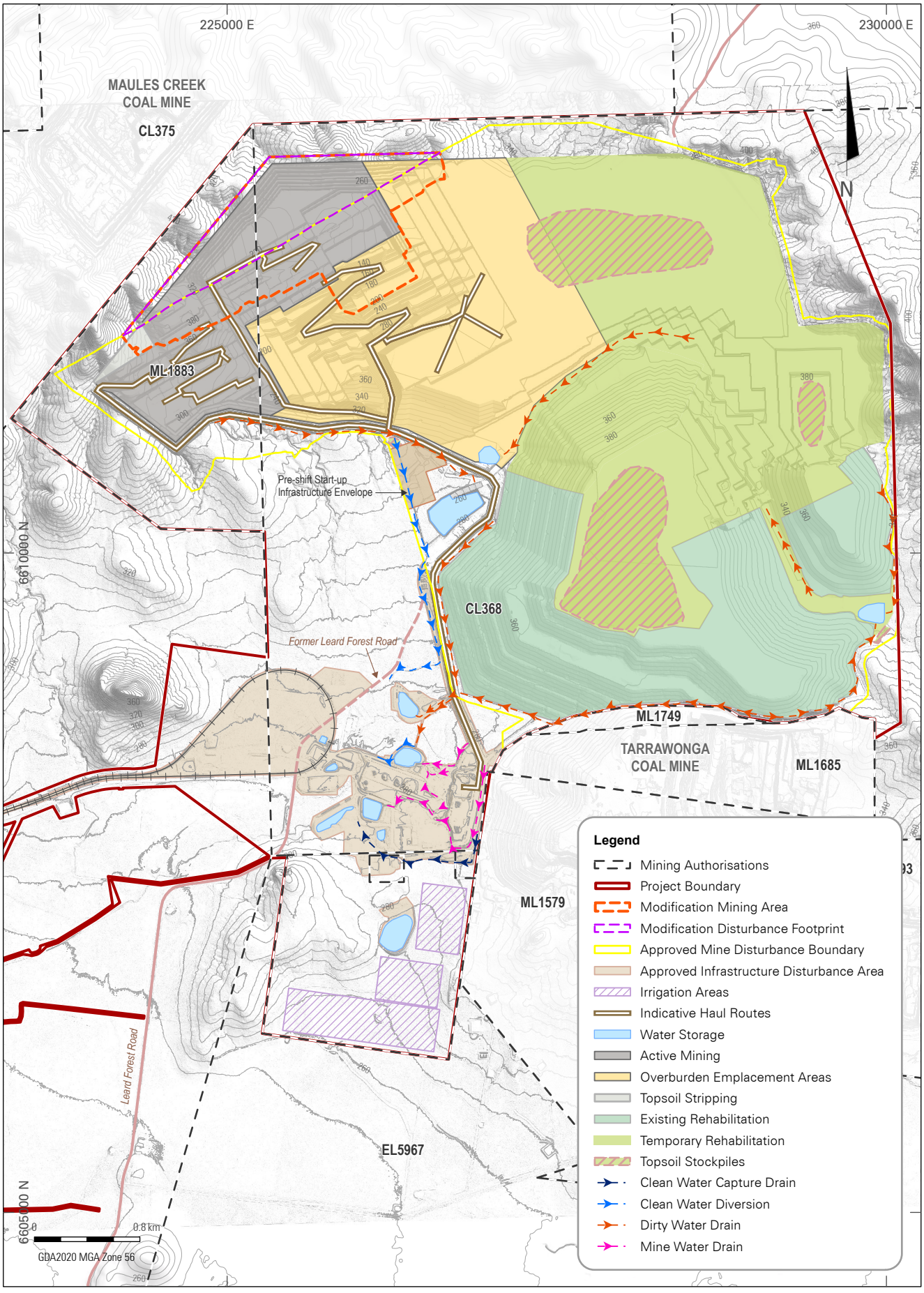


3115\DEM (BCM MOD10)_Mine Stages.aprx (16/05/2025)

BOGGABRI COAL MINE MODIFICATION

Conceptual Mine Plan (Year 2034)

FIGURE 9



3115\DEM (BCM MOD10)_Mine Stages.aprx (16/05/2025)

BOGGABRI COAL MINE MODIFICATION

Conceptual Mine Plan (Year 2036)

FIGURE 10

Indicative production schedules for the above mine plans for years 2025 to 2040 has been utilised within the relevant impact assessments supporting this Modification Report. Similarly, these indicative production schedules may vary from time to time due to factors as identified above. For the purposes of the noise assessment, years 2028 and 2034 were selected as representative years for the reasonable worst-case scenario of operations considering scheduled production rates, haulage distances and peaks in equipment fleet for these years. Years 2025, 2028 and 2036 were chosen for air quality modelling to represent the years of peak production rates, material movements and haulage distances. Further details on the noise and air quality assessments are provided in **Section 6**.

3.3 Coal Handling and Transportation

MOD 10 does not seek to change the approved methods of ROM coal handling, processing and product coal transport. Up to 4.2 Mtpa of ROM coal will continue to be processed via the BCM CHPP facility, with the remaining ROM coal bypassing the CHPP.

Up to 8.6 Mtpa of BCM product coal will continue to be transported from the site via the BCM Rail Spur for sale to the export market.

3.4 Workforce and Hours of Operation

Mining operations are approved to be conducted 24 hours per day, 7 days per week under SSD 09_0182. Blasting can be undertaken on-site between 9 am and 5 pm Monday to Saturday inclusive. No blasting activities are permitted on Sundays, public holidays or at any other time without written approval of the Secretary.

SSD 09_0182 allows for a peak operational workforce at BCM of 876 FTE employees including direct employees and mine contractors. MOD 10 does not propose any increase in the BCM workforce. However, MOD 10 will facilitate the continued employment of the BCM workforce for a further four (4) years until the end of 2040. The BCM workforce is controlled under the provisions of the BCM Social Impact Management Plan (SIMP) (BCOPL, 2023). The SIMP is routinely updated every three (3) years, with the most recent iteration submitted to DPHI in 2024. This iteration of the SIMP provides consistent workforce number in accordance with the relevant conditions of SSD 09_0182 which will remain unchanged for MOD 10.

MOD 10 does not seek to change the approved operational hours, blasting hours or blasting frequency at the BCM as specified under the currently approved SSD 09_0182.

3.5 Final Landform and Final Land Use

3.5.1 Final Landform

The primary objective of rehabilitation at the BCM is to revegetate the mined landform to promote biodiversity values and establish habitat for threatened species.

The 2010 EA provided a Conceptual Final Landform design for both Year 21 and Year 28 of the development with acknowledgment of the coal resources within the mining authorities held for BCM. Whilst additional known coal resources were known to exist within the mining tenements held for BCM beyond the 21-year mining limit (i.e. the approved Mine Disturbance Boundary), the Year 21 conceptual final landform was provided in the event that future approvals for the continuation of mining operations were not obtained. The 2010 EA discussed that the final void will be backfilled to a level (i.e. to RL 285 m) higher than the modelled groundwater recovery level to ensure that surface water could drain to the natural environment (i.e. no pit lake).

MOD 8 to SSD 09_0182 retained the same rehabilitation objectives as those described within the 2010 EA, albeit the revised Conceptual Final Landform entails the partially infilled final void within the north-western portion of the approved Mine Disturbance Boundary (rather than along the northern portion of this area as included within the original Conceptual Final Landform design). The approved Conceptual Final Landform design for BCM was described within Section 3.6 of the MOD 8 Amendment Report (JBA, 2022). It was intended that the highwall within the Conceptual Final Landform would be "*reshaped to ensure that the landform is safe, stable, non-erosive and will be revegetated as practical*".

The additional mining operations proposed by MOD 10 will extend the footprint of mining operations to the north-west and will result in the handling of additional overburden materials which will be utilised to develop a revised Conceptual Final Landform design. The BCM rehabilitation objectives listed within Table 16 of Schedule 3, Condition 69 of SSD 09_0182 specifies the requirement for the final landform to be developed to minimise the size and depth of the final void where reasonable and feasible. The Conceptual Final Landform design for MOD 10 (see **Figure 11**) has been developed to generally align with the same rehabilitation objectives as well as the approved Conceptual Final Landform Design described in the MOD 8 (as amended) to ensure the partially infilled final void remains above the modelled post-mining groundwater levels. To better address the safe, stable and non-polluting rehabilitation objectives, BCOPL is seeking to emplace overburden against the remaining highwall and shape this material down to establish a concave landform. This will materially improve the stability and safety of the Conceptual Final Landform design.

The Conceptual Final Landform for MOD 10 has also been refined to ensure that it meets the agreed landform design that is being developed by TCM to ensure that integrates with the TCM landform design in accordance with the Common Boundary Agreement in place with WHC.

3.5.2 Final Land Use

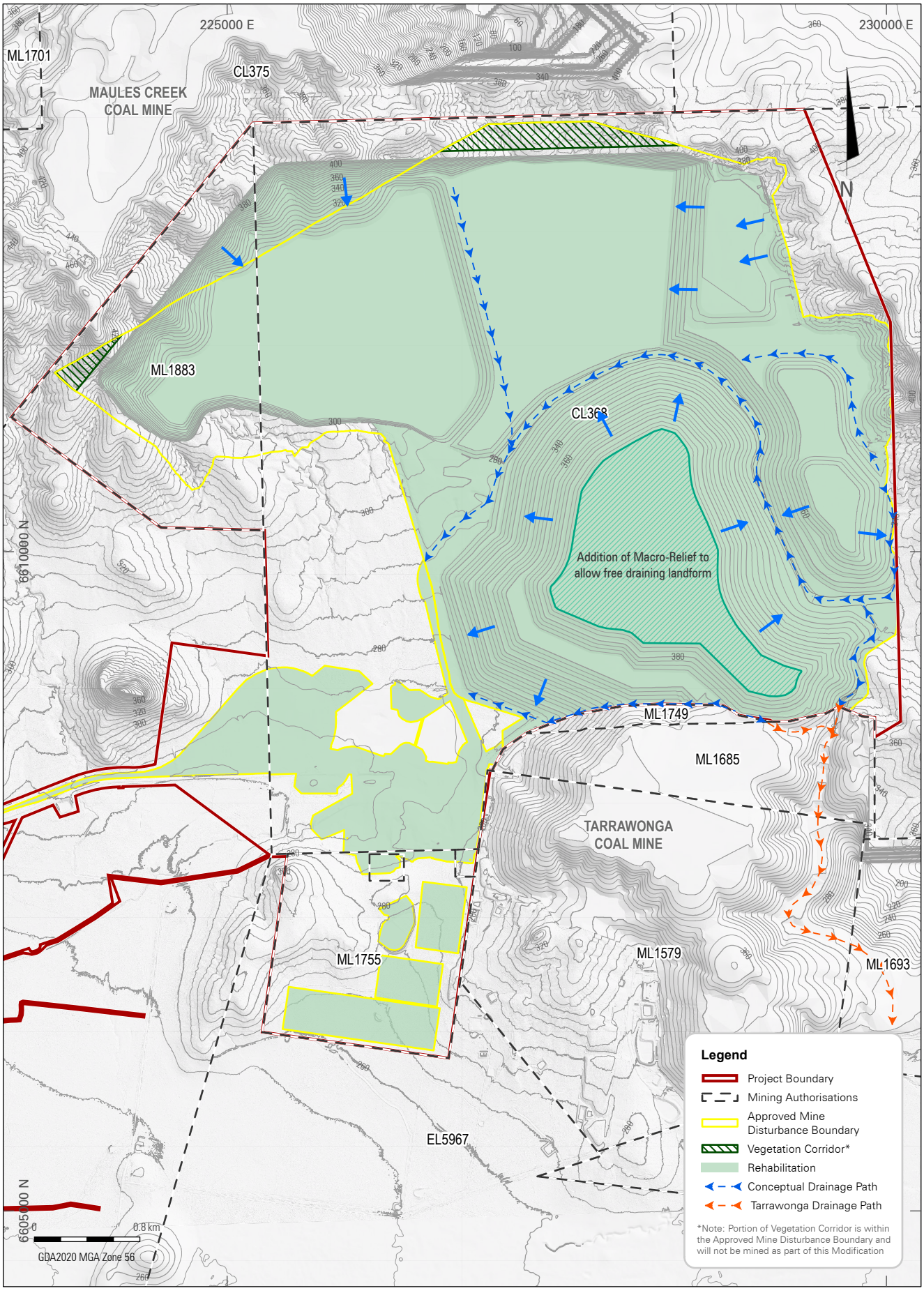
The proposed final land use domains on the Conceptual Final Landform are shown in **Figure 12**.

Section 8.16.3 of the 2010 EA described the final land use of the rehabilitated site as similar to the pre-mining landscape use including biodiversity, pastoral, forestry and recreational purposes. Accordingly, rehabilitation activities on the Conceptual Final Landform will promote native vegetation communities for conservation and forestry purposes to align with that outlined in the 2010 EA.

MOD 8 refined the location of the vegetation communities based on the revised Conceptual Final Landform design. The approved final land uses for BCM were described within Section 3.6 of the MOD 8 Amendment Report (JBA, 2022). The additional mining operations proposed by MOD 10 and the generation of a revised Conceptual Final Landform design has resulted in revised final land uses. Consistent with the MOD 8 landform, the following vegetation communities have been included on the revised Conceptual Final Landform design for MOD 10:

- Shrubby Woodland / Forest on Skeletal Soils on sloping lands;
- Shrubby Woodland / Forest on Skeletal Soils on sloping lands (2008 Tree Trial);
- Grassy Woodland on Fertile Soils on the flatter land;
- Riverine Woodland within the drainage lines; and
- Grasslands and pasture for grazing purposes.

The above includes an additional category of post mining land use. An area of the rehabilitated landform which was established as part of the 2008 Tree Trial, contains alternate woodland species compared to the broader Shrubby Woodland Forest rehabilitation. While some of these woodland species differ from those in other Shrubby Woodland rehabilitation areas, this patch of rehabilitation is progressing well. Monitoring has shown this area is tracking similar to other rehabilitation areas at BCM which have been identified to provide suitable habitat for the range of threatened fauna species known to occur in the region. **Table 3** summarises the proposed vegetation communities to be established on the rehabilitated Conceptual Final Landform in comparison to the areas outlined in the approved 2010 EA.

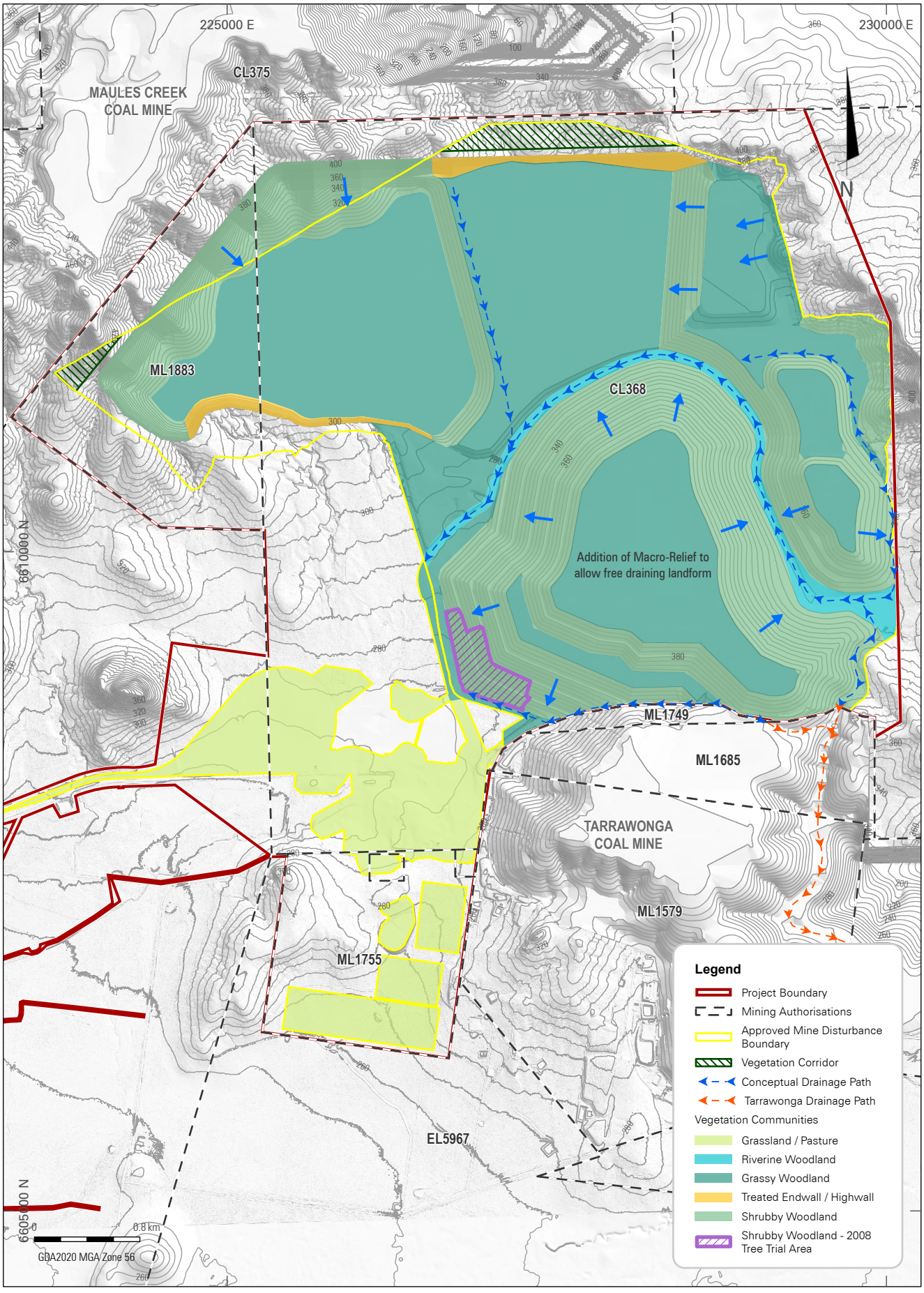


3115\DEM (BCM MOD10)_Conceptual Final Landform.aprx

BOGGABRI COAL MINE MODIFICATION

Conceptual Final Landform Design

FIGURE 11



3115\DEM (BCM MOD10)_Final Landform Vegetation.aprx

BOGGABRI COAL MINE MODIFICATION

Conceptual Final Landform
Vegetation Communities

FIGURE 12

Table 3 BCM Rehabilitation Targets for MOD 10 Conceptual Final Landform

Rehabilitation Target Vegetation Communities	EA Year 21 (2033) (ha)	MOD 8 Year 24 (2036) (ha)	MOD 10 Year 28 (2040) (ha)
Cumulative Rehabilitation	1,166	1,635*	1,741
Shrubby Woodland	437	653	727
Shrubby Woodland (2008 Tree Trial)	-	-	21
Grassy Woodland	1,019	931	938
Riverine Woodland	52	51	54

** Excludes pasture and grassland rehabilitation and highwall treatment areas.*

3.5.3 Rehabilitation Objectives

Table 4 summarises the rehabilitation objectives for the BCM in accordance with Table 16 of Schedule 3, Condition 69 of SSD 09_0182. MOD 10 does not propose any changes to the currently approved rehabilitation objectives. The Conceptual Final Landform Design for MOD 10 has incorporated a partially infilled final void with a minimum fill level of RL 285 m. This fill level will remain above the modelled post-mining groundwater levels within this area to ensure that no surface water is retained (i.e. no pit lake).

Consistent with current practice at BCM, the slopes of the OEA for the Conceptual Final Landform have been designed to manage landform stability and to sustain the proposed woody vegetation communities.

As mentioned above, the proposed Conceptual Final Landform for MOD 10 has adopted a strategy to infill overburden materials against the final northern highwall to generate a safe, stable and non-polluting final landform. The emplacement of these materials against the highwall will both assist in the remaining landform to be safer and more stable, but will also improve the ability of this landform to be revegetated.

Table 4 BCM General Rehabilitation Objectives

Location	General Rehabilitation Objective
Mine site (as a whole), including the final void	› Safe, stable and non-polluting. › Minimise the size and depth of the final void as far as is reasonable and feasible and ensure that the void contains no retained surface water (i.e. no pit lake). › Constructed landforms drain to the natural environment.
Surface Infrastructure	› To be decommissioned and removed, unless the Resources Regulator agrees otherwise.
Woodland areas	› Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems compromised if local native plant species.
Grassland / pasture area	› Establish pastures for agricultural use.
Community	› Ensure public safety. › Minimise the adverse socio-economic effects associated with mine closure.

3.6 Water Management

Water management at BCM is undertaken in accordance with the approved *Water Management Plan* (WMP) (BCOPL, 2017) which has been prepared in accordance with SSD 09_0182. The existing water management system will form the basis of the mine water management approach over the remaining life-of-mine (LOM). The water management system currently in place at the BCM is based on the following principles:

- Rainfall runoff from undisturbed catchments (i.e. clean water) will be diverted away from disturbed areas using diversion drains and catch dams where possible;
- Water that has potentially come into contact with carbonaceous material (i.e. mine water) will be captured and contained in mine water dams; and
- Water from disturbed areas will be reused on site and if not, captured and treated in sediment dams.

The BCM water management system is refined (as required) and managed to meet these principles.

Mining operations for MOD 10 seek to increase the surface footprint of approved mining operations to the north-west only. No new diversion drains or clean water dams to the north of the active mining area are expected to be constructed as a result of MOD 10. However, the establishment of sediment dams and structures may be required to capture and treat runoff from topsoil stripping activities as mining activities progress to the north-west. These sediment dams (if constructed) will be temporary and decommissioned as mining advances through these structures.

Water management infrastructure associated with MOD 10 are conceptually shown on mine plans in **Figure 6** to **Figure 10**. Impacts associated with MOD 10 to the existing water management regime are discussed in **Section 6**.

3.7 Alternatives Considered

3.7.1 Do Nothing

In the event that the changes sought by MOD 10 are not granted, BCM would proceed with mining operations as currently approved.

Failure to proceed with MOD 10 would result in the sterilisation of the identified 30 Mt of ROM coal from within the Modification Mining Area within the currently approved Project Boundary and the BCM mining tenements. The retrieval of this additional coal resource is anticipated to deliver similar coal products as currently produced at BCM.

The sterilisation of the 30 Mt of ROM coal would result in reduced socio-economic benefits including:

- A reduction of $200 Million (present value) in royalties to NSW between 2025 and 2040;
- Reduced company taxes (estimated at $192 Million (present value) to the Federal government (or $61 Million (present value) to the NSW government)) between 2025 and 2040; and
- Cessation of continued employment and flow on benefits to the local community which would otherwise be associated with the additional four (4) years of mining operations at BCM.

Failure to proceed with MOD 10 would also result in achieving a less-than-optimal final landform outcome for the BCM compared to that proposed by MOD 10 (as discussed in **Section 3.5**). The Conceptual Final Landform as described in this Modification Report ensures that the final void landform contains a treated highwall and an improved integration of the landform with that being developed by the adjacent TCM.

3.7.2 Increasing the Currently Approved Production Rate

Previous investigations to optimise mining operations at BCM have considered potential increases to the approved peak production rates of 8.6 Mtpa of ROM coal. These investigations have indicated that mining at increased production rates would result in additional environmental impacts (i.e. greater noise, air quality and greenhouse gas) beyond those currently approved whilst also leading to greater capital requirements.

Potential mining at an increased production rate would ultimately recover the available resource in a quicker manner compared to that of the base case. This would effectively reduce the proposed four (4) year extension to the mine life of BCM as sought by MOD 10.

Progressing with this scenario would result in the final rehabilitation across the site being achieved earlier than the base case at the cost of short-term environmental impacts which are anticipated to marginally increase during periods of increased mining intensity.

The mining of these additional coal reserves at this increased rate could result in a mine life extension of a further two (2) years compared to four (4) years under the currently approved production rates.

Mining operations at an increased peak production rate would also require the purchase of additional mining equipment and increases to the existing BCM workforce to accommodate for the changes to production rates. It should be noted also that the increased mining rates could only be achieved during a short number of years to recover the known coal resource which results in this approach being impractical and inefficient.

3.7.3 Vegetation Corridor

SSD 09_0182 stipulates the requirement for a 250 m buffer on either side of the shared mining lease boundary with MCCM would be required to allow for the movement of fauna across the landscape. This buffer zone is not to be disturbed and is to be retained as a vegetation corridor. Schedule 2 Condition 7 of SSD 09_0182 states:

> *"The Proponent must not clear native vegetation from any land within 250 metres of the adjoining Maules Creek Coal Mine mining lease boundary, except with the approval of the Secretary, following endorsement of BCS."*

Figure 4 illustrates the vegetation corridor on the southern side of the common mining lease boundary. This condition is provided with a clause that allows the clearance of vegetation should an alternative 500 m corridor be found:

> *"Consequently, with the endorsement of BCS, the Secretary may approve substitution of an alternative native vegetation corridor of at least 500 metres width and equivalent or better ecosystem value, within the general vicinity of the lease boundary"*

Feasibility studies have been completed to determine the feasibility of mining through the vegetation corridor since the provision of the 2010 EA. Options for relocation of the vegetation corridor have been considered in consultation with WHC. Mining into the vegetation corridor (including areas within the approved Mine Disturbance Boundary) would grant access to more than 100 Mt of ROM coal and would extend the LOM a number of years beyond 2040 (i.e. the LOM sought by MOD 10).

BCOPL has not proceeded with this option in response to previous community concern raised during the consultation undertaken in 2016 associated with the relocation of the vegetation corridor. Extensive consultation and regulatory signoff would be required in accordance with the SSD 09_0182 conditions of approval ahead of planning application to facilitate the mining of the coal resource within the existing vegetation corridor. The mine schedule for this option would require the progression of operations into this area in the coming years, as such it was considered that in addition to the earlier decision not to proceed there is insufficient time available to obtain the necessary approvals to facilitate this mine plan option.

No changes to the vegetation corridor as conditioned in SSD 09_0182 are sought for MOD 10.

3.7.4 Conceptual Final Landform Options

BCOPL has undertaken investigations in relation to the arrangement of the Conceptual Final Landform for MOD 10 to reflect the mining conditions encountered to the north-west beyond the approved Mine Disturbance Boundary.

As part of these investigations, BCOPL has considered the arrangement of the final void and associated highwall. Consideration has been given as to whether a partially infilled final void will result in an optimal outcome post mining or whether an alternative arrangement would be more appropriate.

The currently approved Conceptual Final Landform for MOD 8 reflected a consistent outcome as the landform developed within the 2010 EA (i.e. partial infilling of the final void). This approach was identified to accumulate surface water runoff from its catchment in the lowest portion of the mine following intensive rainfall events. This has the potential to impact any vegetation communities from rehabilitation of these lower lying landforms.

An option to completely fill the final void area at the end of mining operations was considered impractical and unfeasible. To achieve this result, a significant amount of rehandling of overburden materials would be required from currently developed overburden emplacement areas. This would require an extensive amount of time and effort which will result in additional environmental and economic impacts which renders this option unfeasible.

The retention of an open final void was also considered for the BCM. This option would result in ongoing take of groundwater from the surrounding Permian coal seam aquifers and lead to the development of a pit lake within the final void. Over time, as groundwater inflows into the void and water evaporates from the pit lake surface, the concentration of salts within the water within the final void would increase generating a salty lake. In light of BCOPL's previous commitment to establish a final landform at BCM with a partially infilled final void, MOD 10 proposes to continue with this proposed approach.

Finally in considering the design of the Conceptual Final Landform for MOD 10, BCOPL considered options to improve the overall stability of the highwall in the final landform. MOD 8 proposed to shape and stabilise the highwall using appropriate treatments to ensure that it was safe and long term stable. BCOPL has considered a number of options to create a landform which provides stability into the longer term. This has involved the consideration of options which optimises the final rehabilitation costs, whilst also providing a landform which is able to be demonstrated to be stable into the long term and is potentially capable of being rehabilitated with suitable woodland communities. As the preferred option, the Conceptual Final Landform design for MOD 10 therefore proposes the emplacement of overburden materials against the highwall for shaping down into a concave landform.

3.7.5 Preferred Option - MOD 10

MOD 10 seeks to increase the recovery of coal from the existing BCM mining authorities within the BCM Project Boundary. MOD 10 will facilitate the additional and efficient recovery of approximately 30 Mt of ROM coal at the approved peak ROM coal production rate of 8.6 Mtpa (supporting the peak 876 FTE employees and indirect regional employment, whilst also maintaining the existing infrastructure capacity at the BCM), with minimal community and environmental impacts to those currently approved under SSD 09_0182. An additional 85 ha of vegetation clearance will be required to achieve the proposed recovery of additional coal resources. This exists as a minor increase (approximately 4%) to the vegetation disturbance currently approved for BCM. the additional disturbance required for MOD 10 will not directly impact on the Vegetation Corridor situated along the northern boundary of the BCM Project Boundary. The revision and associated improvements to the Conceptual Final Landform Design proposed for the MOD 10 will provide environmental benefits for the BCM and surrounding landscapes.

The extension of operations by an additional four (4) years and recovery of additional coal resources will provide ongoing economic benefits to the local area and the NSW state government for a further four (4) years by way of community spend and investment, and payment of royalties for the additional coal recovered.

The recovery of an additional 30 Mt ROM coal will enable to continued supply high energy, low ash premium quality thermal, semi-soft coking and PCI coal products to its international clients for power and steel production.

This option (which is the MOD 10 scenario) is anticipated to provide the following economic benefits:

- A reduction of $213 Million, present value in royalties to NSW between 2025 and 2040;
- Reduced company taxes (estimated at $208 Million, present value to the Federal government (or $66 Million, present value to the NSW government)) between 2025 and 2040; and
- Cessation of continued employment and flow on benefits to the local community which would otherwise be associated with the additional four (4) years of mining operations at BCM.

These benefits will be achievable at the cost of minimal socio-economic and environmental impacts that are generally not anticipated to exceed those currently approved in SSD 09_0182 and will remain acceptable and appropriately mitigated. The disturbance to additional native vegetation that provides habitat for a range of threatened fauna species will be appropriately compensated with the development of a robust biodiversity offset strategy for MOD 10. **Section 6** details the environmental and socio-economic impacts associated with MOD 10.

4. STATUTORY CONTEXT

This section identifies the relevant statutory requirements for assessing and evaluating MOD 10.

4.1 Overview

The regulatory framework relevant to MOD 10 is summarised in **Table 5**. The aspects of the regulatory framework that warrant further explanation are discussed in the following sections.

Table 5 Relevant Legislative Provisions

Aspect	Relevant Provisions	Applicability to MOD 10
Power to modify approval	Section 4.55 of the EP&A Act	Under this section, 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 (see **Section 4.3.1**). In accordance with the provisions of the EP&A Act, Section 4.55(2) considerations applicable to MOD 10 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 original 2010 EA.
Permissibility	*Narrabri Local Environmental Plan 2012* (Narrabri LEP) Land Use Table in the Narrabri LEP Section 2.9 of *State Environmental Planning Policy (Resources and Energy) 2021* (Resources SEPP)	BCM is located on land zoned as RU1 (Primary Production) and RU3 (Forestry). Mining on this land is permissible pursuant to Section 2.9 of the Resources SEPP (see **Section 4.3.2**). MOD 10 is located entirely within the BCM Project Boundary and is accordingly a permissible land use.
Gateway process	Section 103of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation) Section 2.24 of the Resources SEPP	MOD 10 does not fall within the definition of 'mining or petroleum development' as no new / additional mining leases are required for the activities proposed by MOD 10.

Aspect	Relevant Provisions	Applicability to MOD 10
		ML 1883 which was required for the progression of mining into Authorisation (A) 355 was granted in September 2024. Accordingly, the gateway process does not apply to MOD 10.
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 MOD 10. 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**.
Other approvals	Section 5 of the *Mining Act 1992* (Mining Act)	MOD 10 falls within the operational areas of the existing mining leases held by BCOPL and its joint venture participants for the BCM.
	Part 2 of *Water Management Act 2000* (WM Act)	The surface water and groundwater sources in the vicinity of BCM are all the subject of Water Sharing Plans. Additional water requirements associated with MOD 10 are discussed in **Section 6.4** and **Section 6.5**.
	Sections 89, 90 and 91 of WM Act Section 4.41 of EP&A Act	Water use approvals, water management work approvals and activity approvals under the WM Act are discussed in **Section 6.4** and **Section 6.5**.
	Section 48 of the POEO Act and Schedule 1	Environment Protection Licence (EPL) 12407 is held in respect of the operations at BCM which permits an annual coal handling capacity of >5,000,000 t, an annual processing capacity of >500,000 – 2,000,000 t, and an annual production capacity of >5,000,000 t. MOD 10 proposes to continue mining operations within the existing BCM Project Boundary which relates to the EPL premises boundary. The EPL will be reviewed and updated as required to address any changes necessary for MOD 10.

Aspect	Relevant Provisions	Applicability to MOD 10
	Section 68 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Section 7.17 of the *Biodiversity Conservation Act 2016* (BC Act)	MOD 10 proposes the disturbance to approximately 85 ha of additional native vegetation at BCM. MOD 10 has the potential to have significant impact on protected Matters of National Environmental Significance (MNES). A referral under Section 68 of the EPBC Act was lodged for MOD 10. MOD 10 was deemed a controlled Action on 20 August 2024 for potential impacts to Biodiversity and Water Resources. 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. Relevant EPBC Act matters have also been addressed within the BDAR (refer to **Section 6.3**).
	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 Impact Assessment for MOD 10 (refer to **Section 4.4.4**) provides further information over the Aboriginal heritage items within the Modification Disturbance Footprint.
	Heritage Act 1977	Heritage assessments completed for MOD 10 did not identify any additional Aboriginal heritage and / or Historical Heritage sites within the Modification Disturbance Footprint beyond those previously identified. Accordingly, the provisions of the *Heritage Act 1977* do not apply to MOD 10 (refer to **Section 4.3.4**).

Aspect	Relevant Provisions	Applicability to MOD 10
	Forestry Act 2012	An existing Compensation Agreement and Access Agreement is held with the Forestry Corporation to allow mining operations within the portion of Leard State Forest covered by CL 368. Similar agreements have yet to be finalised for the area of land covered by ML 1883 (refer to **Section 4.4.7**).

4.2 Environmental Planning and Assessment Act 1979

4.2.1 Objects of the EP&A Act

Environmental impact assessments completed for MOD 10 indicate that the associated impacts are generally consistent with those currently approved under SSD 09_0182.

The disturbance of an additional 85 ha of native vegetation that provides habitat for a number of threatened fauna species will be appropriately compensated by the extensive biodiversity offset strategy that is proposed for MOD 10.

With BCM achieving the mandated GHG emission reduction targets, whilst providing a high quality thermal and coking coal product to the international coal market, the incremental impacts of MOD 10 on climate change will be mitigated.

No material additional environmental or socio-economic impacts are anticipated.

Accordingly, the overall impacts from the BCM will generally remain within the relevant regulatory criteria. MOD 10 therefore represents the proper development of natural resources and is therefore consistent with the objects of the EP&A Act.

4.3 Key Regulatory Matters

4.3.1 Power to Modify

As described in **Section 1.2** and **Section 3.1**, PA 09_0182 was declared an SSD on 20 June 2019 for the purposes of the EP&A Act. Applications to modify SSD 09_0182 therefore need to be made pursuant to Section 4.55 of the EP&A Act. Section 4.55(2) of the EP&A Act states:

> *(2) "**Other modifications** A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:*
>
> *a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all) …"*

For a proposal to constitute a modification (rather than a new development), it must satisfy the test of being "substantially the same development". Ordinarily, the comparison is made between the proposed development and the original development (i.e. prior to any modifications), as outlined in Section 4.55(2)(a) of the EP&A Act.

Given that the declaration that SSD 09_0182 (as modified) was given subsequent to the grant of MOD 7, the comparison for the "substantially the same development" test is between any new Modification proposal (together with any Modifications made under Section 4.55, including MOD 8, MOD 9 and MOD 11) and the current approved State Significant Development (i.e. as approved with MOD 7).

Clause 3BA (6) of Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017* relevantly states:

> *(6) "In the application of section 4.55(1A) or (2) or 4.56(1) of the Act to the following development, the consent authority need only be satisfied that the development to which the consent as modified relates is substantially the same development as the development authorised by the consent (as last modified under section 75W):*
>
> *a) development that was previously a transitional Part 3A project and whose approval was modified under section 75W"*

A Modification Application under Section 4.55(2) of the EP&A Act is to be supported by a Modification Report.

The proposed changes sought by MOD 10 in comparison with the original approval (MOD 7) and the existing approved operations is discussed in **Table 2**.

Environmental assessments completed for MOD 10 (see **Section 6**) have not identified any material additional environmental, social or economic impacts beyond those currently approved for the BCM under SSD 09_0182. Key changes to the environmental and socio-economic impacts relative to MOD 7 are identified in **Section 6**. Key changes to environmental impacts for the BCM associated with MOD 10 include:

- Approximately 0.77 Mt of CO2-e of additional scope 1 greenhouse gas emissions associated with the continued mining operations for four (4) years at similar annual rate of emissions for the currently approved operations (on top of the additional 0.86 Mt pf CO2-e of greenhouse gas emissions approved under MOD 8 to SSD 09_0182);
- Increase in the predicted take of water from the Maules Creek alluvial water source as a result of the revised numerical groundwater modelling;
- Predicted increase in demand on the groundwater borefield (and other external supplies) to supplement the water management system for dust suppression purposes during dry climatic conditions, consistent with the current approach at BCM;
- Disturbance to the additional 85 ha of native vegetation, which comprises similar biodiversity attributes to those approved to be impacted by mining operations at BCM which will be appropriately offset in accordance with regulatory requirements; and
- Continued environmental impacts currently approved for the BCM for an additional four (4) years of mining operations proposed for MOD 10.

Whilst some additional environmental impacts will occur as a result of the mine plan changes proposed by MOD 10, these additional impacts (in conjunction with the impacts approved for MODs 8, 9 and 11 to SSD 09_0182) will not result in substantial changes to the approved BCM. Accordingly, it is anticipated that the changes proposed by MOD 10 will not result in significantly different environmental impacts which would limit the fact that BCM, including the changes proposed by MOD 10 will be substantially the same as those originally approved (for Modification 7 to SSD 09_0182).

Given that the development as modified will remain generally consistent with that the currently approved operations under SSD 09_0182 (albeit the extension of mining operations to the north-west and LOM by four (4) years), it is reasonable for the consent authority to form the view that MOD 10 will remain substantially the same as the development originally approved (MOD 7) and can be assessed under Section 4.55(2) of the EP&A Act.

BCOPL consulted with DPHI on 29 April 2024 to discuss the proposed approvals approach, operative changes and environmental assessments required for MOD 10. DPHI confirmed the application approvals process, and the content required for consideration in this Modification Report and the associated technical studies on 23 May 2025. A copy of this correspondence is provided in **Appendix B**. Additional Commonwealth assessment requirements were received on 27 September 2024 considering that MOD 10 has been deemed a Controlled Action under the EPBC Act. A copy of this correspondence is provided in **Appendix C**. The Commonwealth EPBC Secretary's Environmental Assessment Requirements (SEARs) is provided in **Appendix D**.

4.3.2 Permissibility

The permissibility of developments in NSW is primarily governed by the EP&A Act and the relevant Environmental Planning Instruments (EPIs) enacted pursuant to that Act. EPIs include Local Environmental Plans (LEPs) and State Environmental Planning Policies (SEPPs).

Section 2.9(1)(b) of Resources SEPP states that mining is permissible with development consent where it is proposed to be carried out:

> *(i) "on land where development for the purposes of agriculture or industry may be carried out (with or without development consent), or*
>
> *(ii) on land that is, immediately before the commencement of this clause, the subject of a mining lease under the Mining Act 1992 or a mining licence under the Offshore Minerals Act 1999…"*

The BCM Project Boundary is located wholly within the area to which the Narrabri LEP applies. Under the Narrabri LEP, the whole of the land on which MOD 10 is proposed to be carried out is zoned RU3 (Forestry). All current administration, workshop, coal handling and processing and transport infrastructure associated with the BCM is located on land zoned RU1 (Primary Production).Accordingly, pursuant to Section 2.9(1)(b)(i) of the Resources SEPP, mining is permissible with development consent on RU3 Forestry and RU1 Primary Production land under the Narrabri LEP at the BCM.

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.

In accordance with Schedule 1, Section 5(3) of the *State Environmental Planning Policy (Planning Systems) 2021* (Planning SEPP), if the proposed changes sought by MOD 10 were being sought under a new consent, they would be considered to be SSD as they are considered to fall within the definition of 'mining related works'. As MOD 10 is seeking approval for changes to an existing SSD, these changes are also considered SSD and the most appropriate approach is an application to modify SSD 09_0182 under Section 4.55(2) of the EP&A Act.

Section 2.16 of the Resources SEPP identifies non-discretionary development standards. The assessments completed for MOD 10 have demonstrated that associated impacts will comply generally with the relevant development standards.

Sections 2.17 and 2.19 of the Resources SEPP outline the requirements to ensure the mining development is compatible with the existing land use. MOD 10 does not seek to change the approved rehabilitation objectives as specified in SSD 09_0182. Consistent with the current approach for BCM, 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, pastoral, forestry and recreation. Accordingly, the changes sought by MOD 10 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 MOD 10 to the surrounding environment of which has been assessed to be generally consistent with those environmental impacts previously approved under SSD 09_0182. Accordingly, it is considered that the existing conditions of consent remain adequate to ensure that BCM continue to operate in an environmentally safe and responsible manner.

Section 2.22 of the Resources SEPP relates to the limiting of transport of coal on public roads. MOD 10 does not seek to alter the current approvals for transportation of coal on public roads as conditioned in SSD 09_0182. As such, product coal will continue to be transported via the BCM Rail Spur.

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. An assessment of the Conceptual Final Landform and associated rehabilitation requirements has been considered for MOD 10 (see **Section 6.9**). No changes to rehabilitation objectives and final land uses are proposed for MOD 10. Accordingly, the existing conditions as outlined in SSD 09_0182 remain appropriate.

4.3.4 Heritage

Schedule 5 of the Narrabri LEP lists heritage items that are located within the Narrabri LGA. No items listed in Schedule 5 are located within the BCM Project Boundary, including the area which will be subject to additional disturbance by MOD 10. One artefact has been previously identified within the Modification Disturbance Footprint and will be impacted by MOD 10. Heritage assessments (both Aboriginal and Historic) have been completed for MOD 10 of which did not identify any additional Aboriginal heritage and / or Historical Heritage sites within the Modification Disturbance Footprint beyond those previously identified (see **Section 6.6** and **Section 6.7**).

4.3.5 Earthworks

MOD 10 will predominantly be located on forestry land. Accordingly, an assessment of rehabilitation and the Conceptual Final Landform has been completed for MOD 10 (see **Section 6.9**). MOD 10 proposes an additional 85 ha of disturbance within the Modification Disturbance Footprint. This additional disturbance represents an increase to the approved disturbance area at BCM (i.e. 2,047 ha) of approximately 4% which is considered minor. As such, the activities proposed as part of MOD 10 are not considered to adversely affect future land uses, when compared to the currently approved activities.

4.3.6 Dark Sky Planning Guideline

Section 61(3)(b) of the EP&A Regulation requires consideration of the Dark Sky Guideline for certain developments located near the Siding Spring Observatory. Section 61(3)(b) of the EP&A Regulation states:

> *"In determining a development application for development on the following land, the consent authority must consider the Dark Sky Planning Guideline –*
>
> *(b) land less than 200 kilometres from the Siding Spring Observatory, if the development is –*
>
> *(i) State significant development, or*
>
> *(ii) designated development, or*
>
> *(iii) development specified in State Environmental Planning Policy (Planning Systems) 2021, Schedule 6."*

Given that BCM is located within a 200 km radius from the Siding Spring Observatory, consideration of the Dark Sky Guideline is required. The applicability of the Dark Sky Guideline to MOD 10 is discussed in **Section 2.3.2** and an assessment of the potential visual and lighting impacts is provided in **Section 6.10**.

4.4 Other Legislative Considerations

4.4.1 Mining Act 1992

The mining of coal in NSW is regulated by the Mining Act. Section 5 of the Mining Act states that mining can only be conducted in accordance with the conditions imposed on a Mining Lease (ML). The approved mining and prospecting activities under SSD 09_0182 are located within the boundaries of CL 368 and ML 1883. With the grant of ML 1883 in September 2024, no further ML is required to enable MOD 10 (if approved) to proceed.

4.4.2 Protection of the Environment Operations Act 1997

The POEO Act provides for licensing of scheduled activities by the NSW EPA which administers the POEO Act. The effect of section 48 of the POEO Act is that an EPL is required in respect of premises at which any "… scheduled activity is carried on …".

BCOPL holds EPL 12407 in respect to its currently approved mining operations for SSD 09_0182 (as modified) which authorises activities including coal works; crushing, grinding or separating and mining for coal. Should the consent authority grant approval for MOD 10, EPL 12407 will be reviewed to confirm whether a variation should be sought under the POEO Act to align the EPL with the proposed 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*. Part 7 of the BC Act imposes a framework for the assessment of impacts to listed threatened species and ecological communities.

MOD 10 proposes the additional disturbance to approximately 85 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 MOD 10 to address the requirements under the BC Act (see **Section 6.3**). Biodiversity impacts from MOD 10 will require offsetting in accordance with the requirements of the BC Act (see **Section 6.3.4.1.2**).

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 AHIP issued under Section 90.

No additional Aboriginal heritage objects and / or items were identified within the Modification Disturbance Footprint (see **Section 6.6**). Accordingly, the additional disturbance proposed by MOD 10 has a low risk for potential impacts to Aboriginal Cultural Heritage values.

4.4.5 Water Management Act 2000

The provisions of the WM Act apply to water sources that are subject to a Water Sharing Plan (WSP). BCM is located within the area that is subject to the following WSPs:

- *Water Sharing Plan for the Namoi and Peel Unregulated River Water Sources 2020* (Namoi Unregulated WSP);
- *Water Sharing Plan for the Upper Namoi and Lower Namoi Regulated River Water Sources 2016* (Namoi Regulated River WSP);
- *Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020* (Namoi Groundwater WSP); and
- *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources Order 2020* (MDB Porous Rock WSP).

Under Section 60A of the WM Act, Water Access Licences (WALs) are required to account for any water taken from a water source that is the subject of a WSP. **Table 6** outlines the WALs held by BCOPL to access water within each of the water sources for its current operations. The anticipated water licensing requirements for MOD 10 are discussed in **Section 6.4**.

Section 4.41(1)(g) of the EP&A Act provides those approvals under Sections 89, 90 and 91 of the WM Act (other than an aquifer interference approval) are not required for an SSD that is authorised by a Development Consent.

Table 6 BCM Water Access Licenses

Water Access Licence (WAL) No.	Water Source and Water Sharing Plan (WSP)	Allocation (Units)	Expiry / Duration
15037 12767 24103 12691 36547 37519	Upper Namoi Zone 4 Namoi Valley (Keepit Dam to Gin's Leap), Upper and Lower Namoi Groundwater Sources WSP.	947	Perpetuity
29473	Gunnedah Oxley Basin Murray Darling Basin Groundwater Source, Gunnedah Oxley Basin Murray Darling Basin (other) Management Zone.	142	Continuous
29562	Gunnedah Oxley Basin Murray Darling Basin Groundwater Source, Gunnedah Oxley Basin Murray Darling Basin (other) Management Zone.	700	Perpetuity
44134	Bluevale Water Source, Namoi and Peel Unregulated Rivers Water Sources 2012.	93	Perpetuity
2571 2572 2595 2596	Lower Namoi Regulated River, Upper Namoi and Lower Namoi Regulated River WSP.	226.1	Perpetuity
37067	Upper Namoi Regulated River, Upper Namoi and Lower Namoi Regulated River WSP	128	Perpetuity
42234	Upper Namoi Zone 11 Maule's Creek	20	Perpetuity

Accordingly, should the consent authority consider it appropriate to grant approval for MOD 10, the activities will be exempt from the requirements for any water use approvals (Section 89), water management work approvals (Section 90) and activity approvals (Section 91) (other than an Aquifer Interference Approval) which may be required.

4.4.6 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 MOD 10 was submitted to the Federal Minister for the Environment on 27 May 2024 under Section 68 of the EPBC Act and was deemed a controlled action in regard to the potential significant impacts to listed threatened species and communities and water resources. The Commonwealth Government confirmed the EPBC approval will be assessed in accordance with the bilateral assessment agreement between the Australian (Federal) and NSW (State) governments. **Section 6** provides discussion on the environmental assessments completed to meet the state and federal assessment requirements.

4.4.7 Forestry Act 2012

MOD 10 proposes additional disturbance to 85 ha of additional land within the Leard State Forest. BCOPL has an existing Compensation Agreement and Access Agreement with the Forestry Corporation to allow mining operations within the portion of Leard State Forest covered by CL 368. Similar agreements are yet to be finalised for the area of land covered by ML 1883.

5. STAKEHOLDER ENGAGEMENT

5.1 Methods of Engagement

5.1.1 Regulatory Consultation

Table 7 outlines the regulatory consultation undertaken for MOD 10 up to the submission of this Modification Report. BCOPL has consulted with the NSW DPHI, NSW DCCEEW Biodiversity Conservation and Science (BCS) and Water (DCCEEW Water) Divisions, the EPA, the NSW Resources Regulator and local government representatives (Gunnedah Shire Council (GSC) and NSC). The general objectives of consultation were to provide stakeholders with information about the proposed changes to operations at BCM and to seek feedback on the assessments being completed.

Table 7 Stakeholder Engagement and Consultation

Stakeholder	Method of Consultation	Purpose and Outcome of Consultation
DPHI	Meeting on 29 April 2024	Meeting held to confirm the appropriate approvals pathway under the provisions of the EP&A Act and to confirm the scope of environmental assessments. DPHI confirmed that the appropriate approvals process for MOD 10 is by way of a modification under Section 4.55(2) of the EP&A Act. DPHI also confirmed the assessment requirements and agreed on the content required to be addressed in this Modification Report and the associated technical studies.
	Scoping letter dated 17 May 2024	BCOPL submitted a scoping letter to DPHI on 17 May 2024 providing an overview of MOD 10 and the environmental considerations which were proposed to be undertaken as part of the approvals process. The Modification Description as provided on 17 May 2024 remains consistent.
	MOD 10 update on 18 March 2024	MOD 10 updates provided as part of general BCOPL updates.
	MOD 10 update on 17 April 2024	MOD 10 updates provided as part of general BCOPL updates.
	MOD 10 update on 4 December 2024	MOD 10 updates provided as part of general BCOPL updates.
NSW DCCEEW – BCS	Meeting on 17 July 2024	Meeting held to provide an overview of MOD 10 and to seek feedback and any additional considerations for the BDAR. The outcome of discussions with BCS has been considered in the development of the BDAR for MOD 10 (see **Section 6.3**).

Stakeholder	Method of Consultation	Purpose and Outcome of Consultation
NSW DCCEEW – Water	Meeting on 30 July 2024	Meeting to provide an overview of the proposed MOD 10 and to seek any additional feedback necessary to be considered in the surface water and groundwater assessments being completed for MOD 10. Feedback has been considered in the preparation of the MOD 10 surface water and groundwater assessments (see **Section 6.4** and **Section 6.5**).
EPA	Meeting on 3 December 2024	Meeting to provide an overview of MOD 10 and describe assessments being completed for Air Quality and Greenhouse Gas, Noise and Surface Water and to seek any further considerations required for assessment. Discussions with the EPA has been considered in the preparation of relevant assessments for MOD 10 (see **Section 6**).
NSC	Meeting on 2 September 2024	Meeting held with NSC representatives on 2 September 2024 to provide an update on MOD 10 and to begin discussions regarding the BCOPL housing commitment.
	Meeting on 10 February 2025	Meeting to provide NSC with update in relation to the status of MOD 10 Modification Report and BCM activities.
	Meeting on 2 April 2025	Meeting to provide NSC with update in relation to the status of MOD 10 Modification Report and BCM activities.
GSC	Meeting held on 1 March 2024	Meeting held with the GSC on 1 March 2024 to discuss the Social Impact Management Plan (SIMP) and to discuss the possibility for future agreements and assistance with community investment projects in the region.
	Meeting held on 20 November 2024	Meeting held with the GSC to discuss MOD 10 and proposed impact assessments to be completed.
Resources Regulator	Meeting yet to be held	Proposed meeting with Resources Regulator to discuss the proposed mining operations and rehabilitation aspects of MOD 10.
Mining Exploration and Geoscience	Meeting held on 19 February 2025	Meeting held with MEG on 19 February 2025 to brief them over MOD 10 and other projects at BCM.

5.1.2 Community Consultation

The local community was consulted during the preparation of the Modification Report for MOD 10 via the following engagement methods:

- Meetings with the BCM Community Consultative Committee (CCC) on 16 May 2024, 29 August 2024, 14 November 2024 and 13 February 2025;
- Distribution of a community newsletter in May 2024, which provided an overview of the proposed MOD 10 and detailed the associated technical assessments being completed to assess any potential environmental and socio-economic impacts.
- An additional community newsletter was prepared in December 2024 for the purpose of providing an update on the technical assessments being completed for MOD 10, including the Social Impact Assessment (SIA). An on-line QR code was also included in the newsletter for an on-line survey to seek feedback from recipients over the proposed Modification. This newsletter was uploaded to the BCOPL website and distributed to attendees at the BCM CCC meeting held on 13 February 2025; and
- Distribution of survey proformas from July 2024 to BCM employees and mine contractors, key services and organisations in the local area, and the BCM CCC.

Further information regarding community consultation and the SIA survey outcomes is provided in **Section 6.11**.

6. IMPACTS, MANAGEMENT AND MITIGATION

The potential environmental impacts of MOD 10 have been assessed as part of this Modification Report. This section presents the results of the environmental assessments completed in respect of MOD 10 and outlines the measures that will be implemented to manage and mitigate potential impacts.

6.1 AIR QUALITY AND GREENHOUSE GAS

6.1.1 Background

An Air Quality and Greenhouse Gas (GHG) Assessment has been undertaken by Airen Consulting to determine the likely air quality impacts and the GHG emissions arising from MOD 10.

Appendix E provides a copy of the Air Quality and GHG Assessment and a summary is provided in the following sections.

6.1.2 Methodology

6.1.2.1 Approach to Assessment

The assessment of air quality impacts for MOD 10 was completed in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) (EPA, 2022). The Approved Methods include guidelines for the preparation and analysis of meteorological data, reporting requirements and air quality assessment criteria to assess the significance of impacts.

The assessment entailed:

- Estimating emissions for all dust generating activities associated with the BCM, including the operational changes sought by MOD 10 (i.e. development of emissions inventories for years that are representative of the worst-case operation of BCM, including MOD 10);
- Dispersion modelling using a regulatory approved dispersion model to predict ground level concentrations for key pollutants at surrounding sensitive receivers; and
- An assessment of cumulative impacts, considering the combined effect of existing baseline air quality conditions and other local mining projects.

The production schedule and forecast vehicle movements which was prepared by BCOPL was used to identify the potential future operational years representing the worst-case operation of BCM from air quality impact perspective. The highest intensity operational years of MOD 10 (i.e. years in which air emissions are expected to peak) were determined to be in years 2025, 2028 and 2036. All three (3) mine plan scenarios were evaluated to assess the air quality impacts for MOD 10 in consideration of periods of anticipated peak material handling, maximum haulage distances, varying proximities of operations to nearby receivers, and the cumulative effects with other existing or approved operations.

Further detail on the methods used to assess air quality impacts as a result of MOD 10 is provided in **Appendix E**.

The GHG assessment was completed with regard to the GHG Guide and its draft version which was finalised in January 2025. Legislation and Policy considered in the GHG assessment included the *Climate Change (Net Zero Future) Act 2023*, Net Zero Plan Stage 1: 2020-2030 (DPHI, 2020), *Protection of the Environment Administration Act 1991*, POEO Act, and other relevant legislation and policies including NGER and Safeguard Mechanism requirements.

Given that MOD 10 will result in more than 25,000 tonnes (t) per year of Scope 1 and Scope 2 GHG emissions (Carbon Dioxide equivalent (CO_2-e)), MOD 10 is considered to meet the definition as a 'Large Emitter' and assessment requirements within the GHG Guide are applicable for this assessment.

An assessment boundary was developed in consideration of all significant Scope 1, 2 and 3 GHG emissions for MOD 10. This included the dominant GHG emissions sources from coal mining operations that are typically targeted by mitigation measures and are an area of interest to stakeholders.

The GHG emissions of the following scenarios were calculated to determine the incremental emissions resulting from MOD 10 to the approved operations:

- MOD 10 scenario, including the additional four (4) years of mining operations from 2037 until 2040 (inclusive); and
- Business as usual case (i.e. with no MOD 10) scenario.

The GHG inventories prepared for the Air Quality and GHG Assessment were calculated in accordance with the principles of the GHG Protocol (WRI and WBCSD, 2025) and the *Technical Guidelines for the Estimation of Greenhouse Gas Emissions by Facilities in Australia* (DEE, 2017). Current GHG emissions associated with the BCM are well understood given the operational status of the mine. However, for the purpose of determining additional GHG emissions from the development (including both with and without the changes sought by MOD 10), future projections of production, fuel usage and electricity usage were identified using production information provided by BCOPL. The associated estimated emissions are conservative as the likelihood of increased renewable energy usage or potential future improvements to vehicle efficiency were not considered in the calculations.

Further detail on the methodologies used for the GHG assessment is provided in **Appendix E**.

6.1.2.2 Air Quality Impact Assessment Criteria

The Approved Methods specify the air quality impact assessment criteria relevant for assessing the air quality impacts of a development. These criteria are generally based on the total pollutant loads in the environment. As such, new sources of pollutants must be added to the existing background environmental levels for assessment purposes.

The Approved Methods also prescribe nuisance-based goals for dust deposition, which relate to amenity type impacts such as soiling of exposed surfaces. The impact assessment criteria from the Approved Methods for the relevant air quality criteria set by the EPA are summarised in **Table 8**. MOD 10 has been assessed in terms of its ability to comply with these criteria.

The NSW *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (VLAMP) (DPIE, 2018) describes the approach to address dust (and noise) impacts where modelling predictions exceed the relevant impact assessment criterion, despite the implementation of all reasonable and feasible avoidance or mitigation measures. As described in the VLAMP, voluntary mitigation rights may apply where, even with best practice management, the development contributes to exceedances above relevant criteria which the consent authority considers the consequences being unreasonably deleterious. The VLAMP criteria is generally consistent with the criteria within the Approved Methods. However, the short term 24-hour impact assessment criteria for PM_{10} and $PM_{2.5}$ under the VLAMP relates to the incremental impacts of the particular development only, and not on a cumulative basis with other sources (as per the criteria from the Approved Methods). The VLAMP also includes a supplementary impact criterion where more than 25% of a contiguous property has been predicted to exceed the relevant criteria.

6.1.2.3 Mining Dust

The air dispersion modelling conducted for this assessment utilised the CALPUFF model. This modelling platform is specifically listed in the Approved Methods and was selected to predict ground-level particulate matter concentrations and deposition levels for the mine plan scenarios representing the worst-case operating scenarios for MOD 10.

Table 8 EPA Air Quality Assessment Criteria

Air Quality Indicator	Averaging Time	Criterion	Application
Particulate Matter (PM_{10})	24-hour	50 µg/m^3	Cumulative, at sensitive receptors
	Annual	25 µg/m^3	Cumulative, at sensitive receptors
Particulate Matter ($PM_{2.5}$)	24-hour	25 µg/m^3	Cumulative, at sensitive receptors
	Annual	8 µg/m^3	Cumulative, at sensitive receptors
Total Suspended Particulate Matter (TSP)	Annual	90 µg/m^3	Cumulative, at sensitive receptors
Dust Deposition	Annual (maximum increase)	2 g/m^2/month	Incremental, at sensitive receptors
	Annual (maximum total)	4 g/m^2/month	Cumulative, at sensitive receptors
Nitrogen Dioxide (NO_2)	1-hour	164 µg/m^3	Cumulative, at sensitive receptors
	Annual	31 µg/m^3	Cumulative, at sensitive receptors

Source: EPA, 2022

Total dust emissions have been estimated for the selected operational scenarios using the material handling schedule, equipment listing and mine plans with emission factors from:

- *Emission Estimation Technique Manual for Mining* (NPI, 2012); and
- AP 42 (US EPA 1985 and updates).

As described in **Section 6.1.2**, years 2025, 2028 and 2036 were reasonable worst-case scenarios for the purposes of this assessment. A scenario for a historical year (2017) was also developed to quantify recent contributions of the three (3) mining operations to air quality and to establish background levels. Predictions of particulate matter emissions were made across the model domain, including at sensitive receivers relevant to the BCM. These predictions were then compared against the EPA air quality assessment criteria.

6.1.2.4 Diesel Exhaust

Operational dust modelling considered emission factors for the contribution from both wheel-generated particulates and exhaust particulates. The emission factors were based on measured emissions including diesel particulates in the form of both PM_{10} and $PM_{2.5}$, from the EPA's 2008 Air Emissions Inventory (EPA, 2012).

A conservative approach was taken for calculations, as the assessment did not consider the potential reduction to emissions in the future as BCOPL potentially transitions to electrification (or other fuels) for its equipment fleet. The Oxides of Nitrogen (NO_x) emissions estimates were modelled to provide an indication of the off-site NO_2 concentrations due to diesel exhaust emissions.

6.1.2.5 Post Blast Fume

Blasting activities have the potential to result in fume and particulate matter emissions. Blasts were modelled as a single volume source in a location indicative of the centre of BCM. Emissions were assumed to occur every hour between 9 am and 5pm, with blasting modelled to occur on any day of the week. This was a conservative assumption as blasting is not permitted at BCM to occur on Sundays or public holidays, unless written approval is obtained from the Secretary (in accordance with SSD 09_0182). Model results for post-blast fume were compared to applicable EPA air quality criterion for NO_2 (i.e. 164 µg/m^3 as a 1-hour average), taking background levels into account.

6.1.2.6 Cumulative Impacts

Cumulative air quality impacts have been assessed as part of the AQGHG Assessment by combining the contribution from the proposed operations at BCM associated with MOD 10 with the existing ambient air quality environment. The cumulative model for MOD 10 also includes the following operations or proposed operations within the local region:

- BCM, including the proposed changes for MOD 10;
- Approved operations at MCCM; and
- Approved operations for the TCM.

6.1.3 Assessment of Impacts

6.1.3.1 Air Quality

6.1.3.1.1 Particulate Matter (PM_{10})

The EPA does not prescribe project only criteria for 24-hour average PM_{10}. However, the VLAMP refers to a criterion of 50 µg/m^3 for purposes of determining land acquisition and mitigation rights. As such, the maximum 24-hour average PM_{10} concentrations resulting from MOD 10 were modelled in consideration of the criteria specified in the VLAMP.

Modelling results indicate that the short term 24-hour average PM_{10} 50 µg/m^3 criterion would not be exceeded at any private sensitive receptor as a result of BCM (including MOD 10) operations alone. Further to this, the predicted extent of the 24-hour average PM_{10} air quality emissions from BCM will continue to remain within the extent of the 50 µg/m^3 contour (based on historical modelling), with the exception of a potential increase on Crown Land to the north / north-east of the BCM.

Modelling for the number of days above 50 µg/m^3 resulting from MOD 10, surrounding operations and other sources of PM_{10} indicated that for a representative year, three (3) private sensitive receptors (140, 147 and 165) are expected to experience in the order of one day when PM_{10} concentrations exceed 50 µg/m^3. These results are within the range of historically measured days when PM_{10} concentrations have exceeded 50 µg/m^3, except for extraordinary years (e.g. due to dust storms and bushfires).

Most locations around Boggabri, and NSW, have historically recorded one or more days each year when the 24-hour average PM_{10} concentration exceeded 50 µg/m^3.

A "Level 2" assessment has been completed for MOD 10 as specified within the Approved Methods to examine the contemporaneous background and mining contributions for each day in the modelling year where these predicted exceedances were experienced.

The assessment indicated that concentrations are projected to be well below 50 µg/m^3 for most days of the year at the three (3) closest private sensitive receptors to the BCM (140, 158 and 165). The only potential for MOD 10 to exceed this criterion is anticipated at location 140, however this is only when background levels are already approaching the 50 µg/m^3 criterion. As such, the modelling suggests a significantly small contribution from the BCM (i.e. < 3 µg/m^3) which could be managed by existing management measures.

Modelled annual average PM_{10} concentrations for MOD 10 and other sources suggests that the BCM (including MOD 10) will operate in compliance with the EPA's assessment criterion for annual average PM_{10} (25 µg/m^3) at all private sensitive receptors. The modelled annual average PM_{10} 25 µg/m^3 contour remains within the approved maximum extent based on historical modelling for BCM.

The air quality contours against the relevant criteria (including those relating to PM_{10}) for each representative year are shown in **Figure 13** to **Figure 15**.

6.1.3.1.2 Particulate Matter ($PM_{2.5}$)

Similar to PM_{10}, the EPA does not prescribe a project only criteria for 24-hour average $PM_{2.5}$. However, the VLAMP indicates 25 µg/m^3 criteria for project along for the purposes of determining land acquisition and mitigation requirements. Accordingly, the maximum 24-hour average $PM_{2.5}$ concentrations for MOD 10 alone was modelled relative to the criteria specified under the VLAMP, indicating that no exceedances are likely to occur at any private sensitive receptor.

The modelled number of days above 25 µg/m^3 resulting from MOD 10 including other sources demonstrated that for a representative year, the nearest private sensitive receptors are not expected to experience $PM_{2.5}$ concentrations greater than 25 µg/m^3. However, based on historical monitoring data, it is possible that $PM_{2.5}$ concentrations will exceed 25 µg/m^3 at times when dust storms, bushfires and droughts occur.

Despite there being no applicable project only criteria, the modelled $PM_{2.5}$ concentrations for MOD 10 is predicted to contribute no more than 1 µg/m^3 at the nearest private sensitive receptors including receptors 140, 147, 158 and 165 (including 165b).

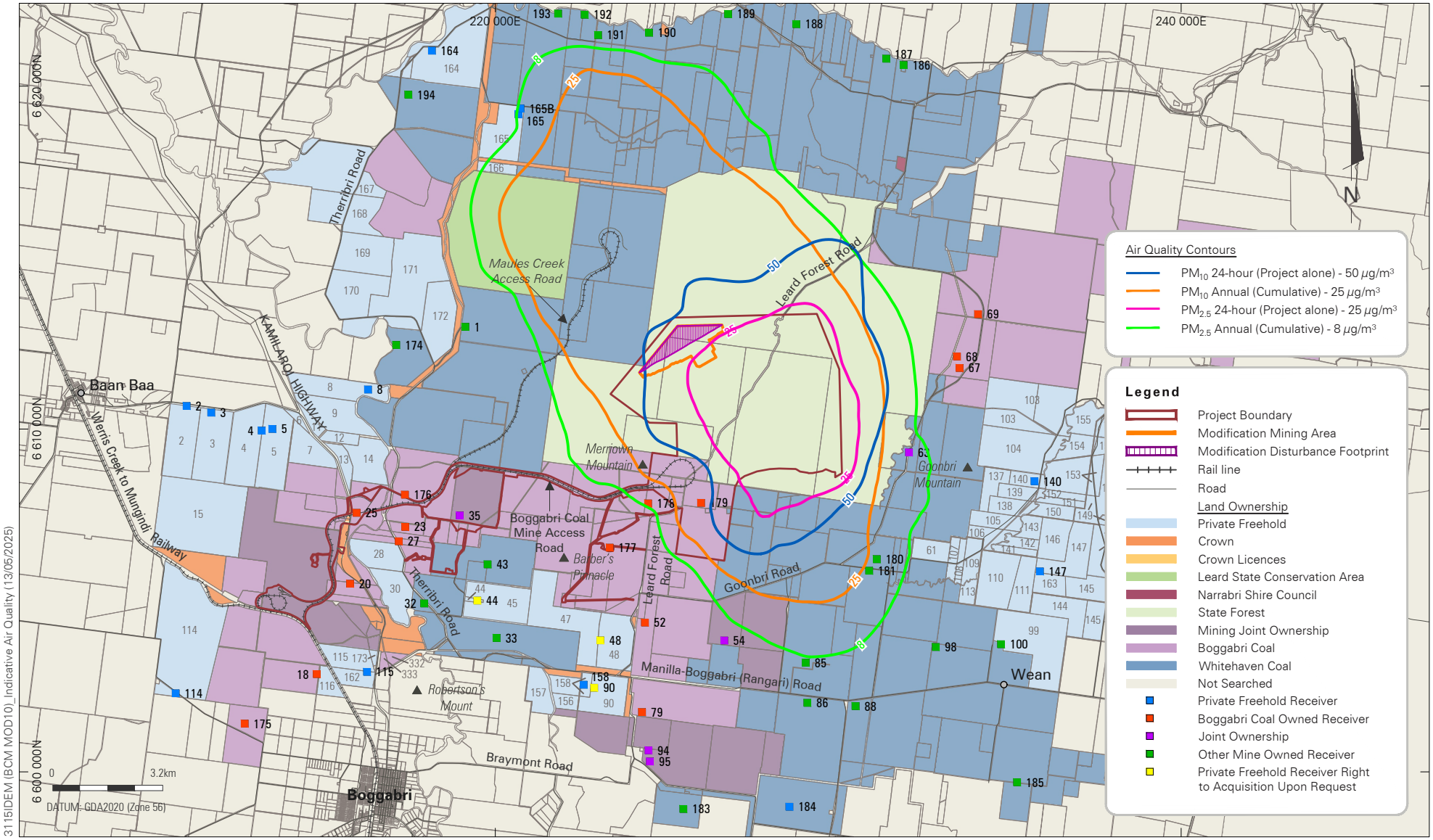
The modelled annual average $PM_{2.5}$ concentrations for MOD 10 and other sources indicate that the EPA's assessment criterion for annual average $PM_{2.5}$ (8 µg/m^3) will not be exceeded at private sensitive receptors including properties 140, 147, 158 and 165.

6.1.3.1.3 Particulate Matter (TSP)

No applicable project only criteria exist for annual average TSP concentrations. Notwithstanding, the modelled concentrations for MOD 10 predicted a contribution of < 1 µg/m^3 at the nearest private sensitive receptors. Modelled annual average TSP concentrations for MOD 10, other mining operations and other sources of TSP also indicated that the EPA's assessment criterion for annual average TSP (90 µg/m^3) will not be exceeded at any private sensitive receptors.

6.1.3.1.4 Deposited Dust

Annual average deposited dust levels for MOD 10 were assessed against the EPA's assessment criteria of 2 g/m^2/month (incremental). The results indicated a compliance with the EPA's criteria at all private sensitive receptors. Annual average deposited dust levels for MOD 10 and other sources were modelled in accordance with the EPA's criteria of 4 g/m^2/month (cumulative). The results indicated compliance against the EPA's assessment criteria at all private sensitive receptors.

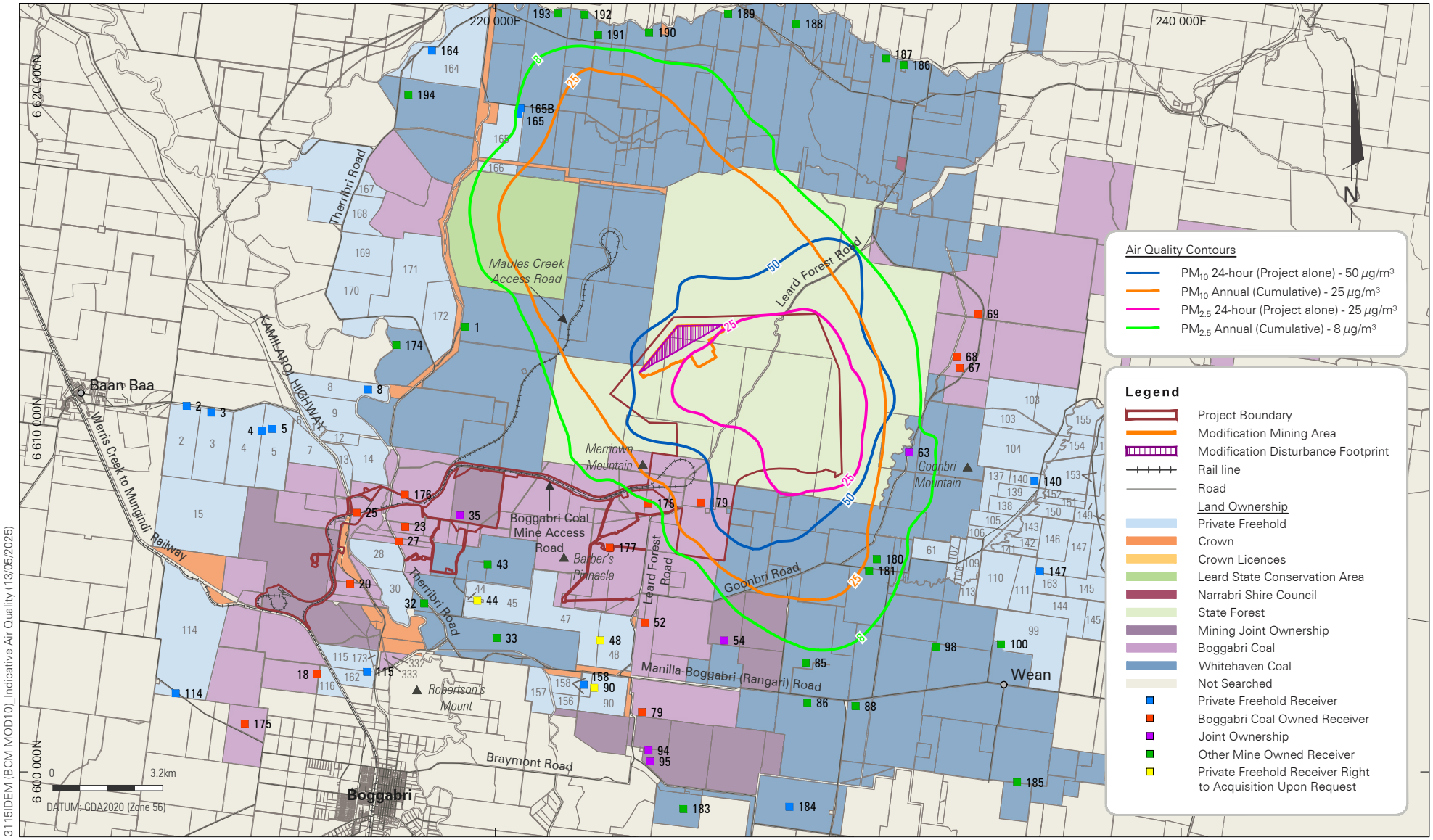


3115IDEM (BCM MOD10)_Indicative Air Quality (13/05/2025)

BOGGABRI COAL MINE MODIFICATION

Indicative Air Quality Contours Year 2025

FIGURE 13

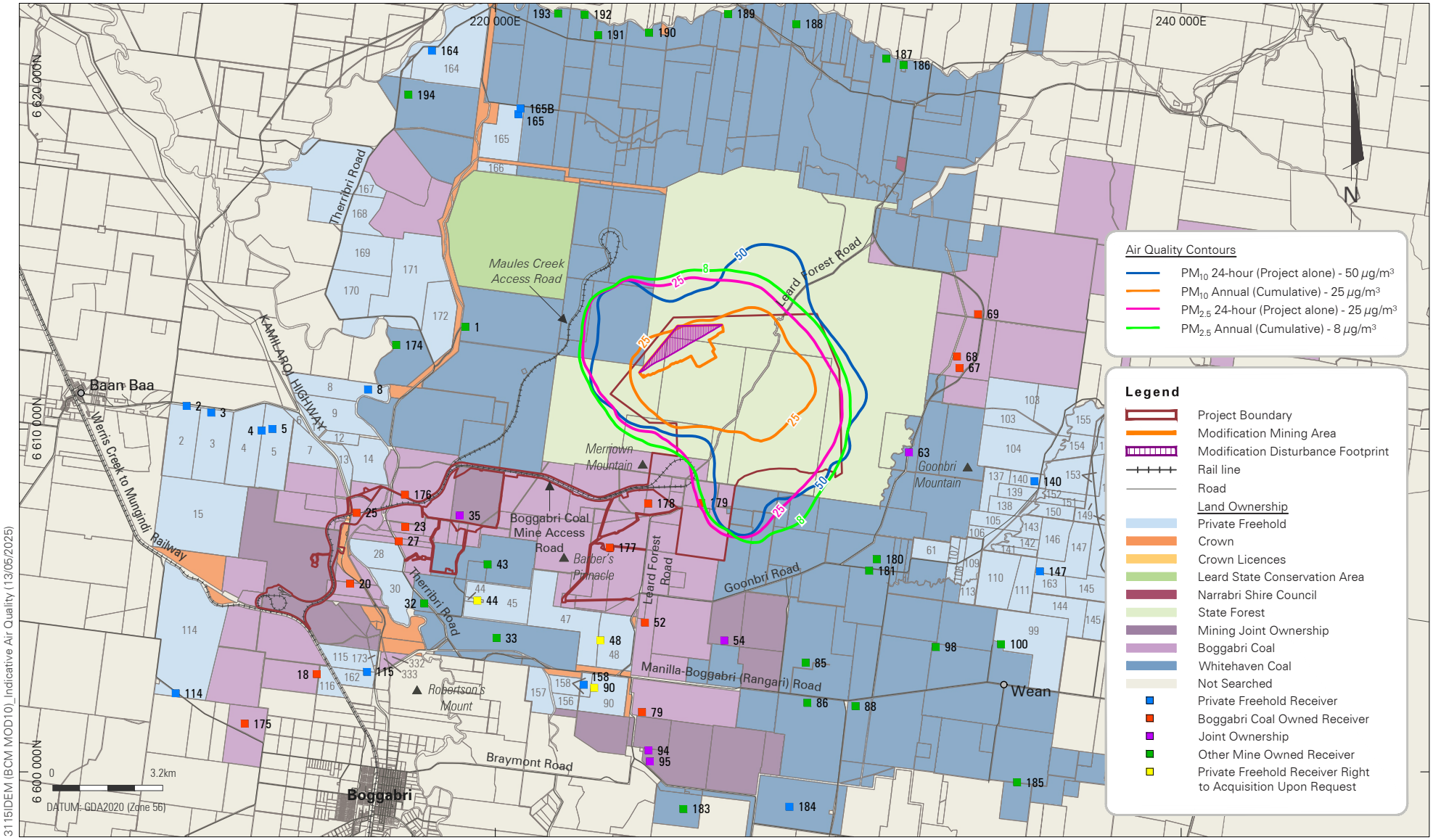


3115IDEM (BCM MOD10)_Indicative Air Quality (13/05/2025)

BOGGABRI COAL MINE MODIFICATION

Indicative Air Quality Contours Year 2028

FIGURE 14



3115IDEM (BCM MOD10)_Indicative Air Quality (13/05/2025)

BOGGABRI COAL MINE MODIFICATION

Indicative Air Quality Contours Year 2036

FIGURE 15

6.1.3.1.5 Diesel Exhaust

Typical emissions from diesel exhausts are products of combustion including carbon monoxide (CO), NO_2, PM_{10} and $PM_{2.5}$. DPHI monitoring data has previously indicated that CO concentrations have not exceeded relevant air quality criteria at rural or urban monitoring stations across NSW (including in proximity to busy road networks). Accordingly, it was determined that CO will not be an issue for vehicle movements associated with the BCM or MOD 10.

The modelled maximum 1-hour average NO_2 concentrations due to diesel exhaust emissions at the BCM and other sources indicates that compliance with the EPA's assessment criteria (164 µg/m^3) is expected at all private sensitive receptors. Modelled annual average NO_2 concentrations resulting from diesel exhaust emissions at the BCM and other sources indicates that compliance with the EPA's assessment criteria (31 µg/m^3) is expected at all private sensitive receptors.

6.1.3.1.6 Post Blast Fumes

Modelled maximum 1-hour average NO_2 concentrations resulting from post-blast fumes at the BCM (of which included maximum background levels) indicates that under worst-case meteorological conditions with a rated 2 fume zone with blasting occurring every day between 9 am and 5 pm, the maximum 1-hour average NO_2 concentrations would not exceed the EPA criterion (164 µg/m^3) at any off-site sensitive receptor.

6.1.3.2 Greenhouse Gas Impacts

Table 9 presents the GHG emissions that have been calculated in respect of all identified GHG generating activities associated with BCM (with and without MOD 10). The direct annual GHG emissions (Scope 1) as a result of MOD 10 alone are estimated to be 0.05 Mt CO_2-e/annum, on average over the life of BCM.

Total additional Scope 1 emissions for MOD 10 are estimated to be 0.77 Mt CO_2-e. This is additional to the 0.79 Mt CO_2-e of total direct GHG emissions that were approved in relation to MOD 8 to SSD 09_0182 (i.e. cumulative 1.56 Mt CO_2-e additional to the emissions for the development as approved by MOD 7).

The highest incremental annual emission estimate as a result of MOD 10 (0.21 Mt CO_2-e) represents approximately 0.05% of Australia's estimated emissions (that is 432.62 Mt CO_2-e for 2022, the latest year of estimates available).

The development of a 6.5 Megawatt peak (MWp) /4.95 Megavolt Ampere (MVA) solar farm near the BCM will reduce the total electricity required to be sourced from the national grid from approximately 26,000 Megawatt-hour (MWh) (peak year) to approximately 14,000 MWh. This will reduce the total Scope 2 emissions (2025 to 2040) from 59,058 t CO_2-e to 31,305 t CO_2-e. That is, a reduction of approximately 47%. The operation is investigating the inclusion of solar farm battery storage to further reduce electricity sourced from the national grid by approximately another 13% (approximate total of 60% reduction). The reduction in GHG emissions due to the solar farm has been quantified in the Scope 2 emissions increment of MOD 10 (see **Table 9**).

Given that MOD 10 is likely to exceed the facility emissions threshold, BCOPL will continue to have an obligation to report emissions from BCM under the NGER Act.

Table 9 **Estimated GHG Emissions from BCM**

Year	Annual Emission (Mt CO_2-e)								
	BCM (as Approved)			BCM (with MOD 10)			Increment of MOD 10		
	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3
2025	0.23	0.01	20.3	0.23	0.01	18.2	0.01	0.00	-2.1
2026	0.24	0.01	21.1	0.22	0.01	20.3	-0.01	0.00	-0.7
2027	0.26	0.01	20.4	0.21	0.01	19.9	-0.05	0.00	-0.5
2028	0.23	0.01	19.5	0.24	0.01	19.5	0.01	0.00	-0.1
2029	0.23	0.01	20.6	0.24	0.01	19.6	0.00	0.00	-1.0
2030	0.23	0.00	20.2	0.24	0.00	19.4	0.02	0.00	-0.8
2031	0.23	0.00	20.3	0.22	0.00	19.1	-0.01	0.00	-1.2
2032	0.22	0.00	17.1	0.23	0.00	19.7	0.01	0.00	2.6
2033	0.21	0.00	16.7	0.22	0.00	19.5	0.01	0.00	2.8
2034	0.19	0.00	15.0	0.22	0.00	19.6	0.04	0.00	4.5
2035	0.07	0.00	8.6	0.21	0.00	18.4	0.13	0.00	9.7
2036	-	-	-	0.21	0.00	17.7	0.21	0.00	17.7
2037	-	-	-	0.16	0.00	13.9	0.16	0.00	13.9
2038	-	-	-	0.15	0.00	13.8	0.15	0.00	13.8
2039	-	-	-	0.08	0.00	5.9	0.08	0.00	5.9
2040	-	-	-	0.02	0.00	3.6	0.02	0.00	3.6
Maximum	**0.26**	**0.01**	**21.09**	**0.24**	**0.01**	**20.35**	**0.21**	**0.00**	**17.75**
Average	**0.21**	**0.00**	**18.18**	**0.19**	**0.00**	**16.75**	**0.05**	**0.00**	**4.25**
Total	**2.33**	**0.05**	**200.00**	**3.10**	**0.06**	**268.05**	**0.77**	**0.00**	**68.05**

6.1.3.3 Air Quality and Greenhouse Gas Impact Comparison

Table 10 presents the Air Quality and GHG impacts associated with MOD 10 in comparison to MOD 7 (being the original SSD approval) and the currently approved operations under SSD 09_0182 (i.e. the incremental impacts approved under MOD 8, MOD 9 and MOD 11).

Table 10 Air Quality and Greenhouse Gas Impact Comparison

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
Air Quality	› Potential for exceedance of the PM_{10} 24-hr project alone criterion at private receivers (now mine owned). › Potential exceedance of the annual average PM_{10} criterion at private receivers (now mine owned). › Potential for the ambient criterion of 50 µg/m^3 to be exceeded at two (2) additional privately owned residences (now mine owned) as a result of cumulative impacts.	› Potential contribution to an increase in the number of days where cumulative air quality exceeds the 24-hour PM_{10} criteria of 50 µg/m^3 (MOD 8).	› No change.
GHG emissions (t CO_2-e)	› Minor sulphur dioxide and NO_x emissions. › Average fugitive methane emissions from the coal seam of 0.31 Mt CO_2-e. › Average diesel use of 0.13 Mt CO_2-e. › Other residual emissions (electricity use and blasting) of 0.1 Mt CO_2-e.	› Additional 0.86 Mt of total CO_2-e of Scope 1 and Scope 2 emissions. › Additional 61.73 Mt of CO_2-e of Scope 3 emissions. › Direct emissions intensity over period from 2025 to 2036 of 0.027 t CO_2-e.	› Incremental change of 0.77 Mt CO_2-e (Scope 1 and Scope 2 GHG emissions) are predicted for MOD 10 (additional 1.63 Mt CO_2-e compared to MOD 7). › Incremental change of 68.05 Mt CO_2-e (Scope 3 GHG emissions) are predicted for MOD 10 (additional 129.78 Mt CO_2-e compared to MOD 7). › Direct emissions intensity over period from 2025 to 2040 of 0.027 t CO_2-e, consistent with MOD 8. › No exceedance of the EPA's assessment criteria for maximum 1-hour average NO_2 concentrations (164 µg/m^3), or annual average NO_2 concentrations (cumulative) (31 µg/m^3) is predicted.

Table 10 above demonstrates that the incremental change in air quality impacts will remain generally consistent with those currently approved and for the original approval (MOD 7). Similarly, the GHG emissions are shown to be generally consistent with those as approved at MOD 8, albeit for a further four (4) years.

6.1.4 Mitigation and Management

BCOPL currently manages air quality impacts at BCM in accordance with the approved *Air Quality and Greenhouse Gas Management Plan* (AQGGMP) (BCOPL, 2024) and the BTM Complex *Air Quality Management Strategy* (Parsons Brinkerhoff, 2017).

The existing management measures outlined in these approved documents will continue to be implemented on-site for MOD 10, along with the currently implemented Trigger Action Response Plan (TARP). The TARP identifies specific meteorological conditions that upon measurement, require action for managing dust.

The relevant existing management measures include:

- Optimising road haulage of overburden and coal;
- The use of water sprays;
- Watering of all active haul roads (such as those within the MIA to be used during construction);
- Closed conveyor systems with automatically triggered dust suppression sprays;
- Progressive mine rehabilitation; and
- Applying speed limits on internal unsealed access roads to minimise potential for wheel generated dust.

6.1.4.1 Air Quality

Modelling completed for MOD 10 indicates that the air quality impacts would generally be within the approved extent of impacts for the BCM (as modified) and that concentration levels would not exceed the relevant EPA assessment criteria at the nearest private sensitive receptors. However, some potential minor increases in BCMs air quality contributions were predicted on Crown Land to the north of the Project Boundary.

As no further impacts to private receivers are anticipated by MOD 10, no additional dust emission mitigation measures beyond those currently employed at the BCM, as outlined in the existing AQGGMP, the TARP and BTM Complex Strategy are proposed for MOD 10. Furthermore, as modelling indicated that MOD 10 would not lead to any exceedances at private sensitive receptors, the current monitoring regime is considered appropriate and hence no changes to the monitoring network are proposed.

BCOPL remains committed to the implementation of operational controls currently in place at BCM and will continue to operate in accordance with relevant criteria specified under SSD 09_0182 and relevant management plans.

6.1.4.2 Greenhouse Gas

BCOPL's business planning processes considers mitigation measures and offset strategies relevant to the management and reduction of GHG emissions from BCM activities. As such, annual business planning processes involves the forecasting of GHG emissions, the assessment of the feasibility of mitigation measures and the development of offset strategies (where emissions are not feasible to abate).

BCOPL is committed to the implementation of reasonable and feasible measures to minimise GHG emissions from the BCM. GHG emissions from BCM are primarily associated with diesel combustion and the consumption of purchased electricity. Accordingly, BCOPL will continue to implement the following practices at the BCM to minimise emissions from the combustion of diesel and electricity consumption over the life of mining operations:

- Procurement and use of equipment incorporating best-practice emissions reduction technologies (e.g. high efficiency motors);
- Pre-start inspections at each shift on mobile plant and vehicles;
- Maintaining equipment in good operating order (e.g. routine servicing);
- Minimise engine idle time;

- Optimise the design of roads to minimise the distance travelled by construction equipment. Tracking electricity bills and fuel usage; and
- Install energy-efficient electrical equipment where possible (e.g. lighting).

Furthermore, BCOPL has conducted extensive revegetation works within biodiversity offset and mine rehabilitation areas. In accordance with the conditions of SSD 09_0182, BCOPL has finalised the registration of more than 7,500 ha of land within Conservation Agreements (CA's)with the NSW Biodiversity Conservation Trust Division.

MOD 10 does not propose to disturb any native vegetation within the Vegetation Corridor that is located along the northern boundary of the BCM mining lease boundary, adjacent to the Modification Disturbance Footprint.

BCOPL has also continued to investigate and implement feasible improvements and innovations to reduce GHG emissions from its operations. These include short and mid-term strategies that have been developed since 2022 and are reviewed quarterly for progression and relevance to BCM operations and legislative obligations.

Short-term initiatives (2025-2027) that have been identified include:

- Site-wide fuel consumption tracking to measure and monitor:
  - Fuel efficiencies in production, including hierarchy road rules and engine control card upgrades.
  - Fuel burn per base cubic metre of material moved.
  - Fuel burn for the 930E truck fleet.
  - Total fuel consumption across the site.
- Construction of the Boggabri Solar Farm which aims to provide enough energy to support all day time operations at the BCM. This initiative will result in a significant decrease in BCM's electricity consumption from the grid;
- Hydrogen injection trial being completed on haul trucks to decrease diesel usage. If successful, it is estimated to decrease diesel emissions by 1-5%;
- Commitments to fleet optimisations. Installation of upgraded engine control cards for the Komatsu 930 fleet has been completed, with subsequent reviews for this trial to be completed in quarter three 2025. BCOPL is committed to reviewing investments in additional fleet numbers (e.g. Cummins engine fleet) following the cessation of this trial;
- Regenerative agriculture and restoration of which field studies have been completed and BCOPL is progressing with the registration of a project anticipated to commence implementation in Horizon 2 2025. The local projects are predicted to produce up to approximately 12,900 Australian Carbon Credit Units (ACCU) per year over a 25 year period using approved Clean Energy Regulator (CER) ACCU Scheme Methods. If emission reductions are unable to be achieved through mitigation activities, the generated ACCU's will be used to offset residual emissions; and
- Continual review and improvement of:
  - Available technologies to reduce electricity consumption.
  - Available technologies to reduce diesel usage/replace diesel motors.
  - Encouraging staff to car-pool to and from work.
  - Light vehicle replacement strategy.
  - A business carbon management policy and roadmap that will form part of the IA decarbonisation strategy.

BCOPL has identified the following longer term initiatives (2027+):

- Further investigation into alternative renewable energy supplies;
- Assessing opportunities for variable speed drive units;
- Further assessment of opportunities for diesel fuel alternatives; and

- Further assessment of opportunities for diesel motor alternatives.

BCOPL also contributes to climate change solutions and invests in research and development initiative to seek strategies to reduce GHG throughout the coal chain. These initiatives include the regular review of emerging technologies and abatement measures to reduce GHG emissions.

The projected annual emissions of the BCM (including with MOD 10) are likely to exceed the facility emission threshold. Accordingly, BCOPL will continue to report emissions from the BCM as a facility under the NGER Act. BCM is also considered to be a Safeguard Facility and therefore is required to reduce its emissions from the BCM in accordance with the Commonwealth Safeguard Mechanisms declining baseline. As such, BCOPL will continue to consider and assess the feasibility of mitigation measures to meet its compliance position under the SGM or alternatively generate Safeguard Mechanism Credits. If any additional offsets are required for residual emissions, they will be purchased through registered CER ACCU generation projects using approved ACCU Scheme Methods, with a focus on these coming from NSW.

6.2 NOISE AND BLASTING

6.2.1 Background

A Noise and Blasting Impact Assessment (NBIA) has been prepared by EMM Consulting Pty Ltd (EMM) to determine the likely noise and blasting impacts for MOD 10.

The primary objective of the NBIA was to evaluate whether BCM (including the changes sought by MOD 10) can continue to operate in accordance with the approved noise and blasting criteria, as described in SSD 09_0182.

The NBIA is provided as **Appendix F**, with a summary in the following sections.

6.2.2 Methodology

6.2.2.1 Assessment Approach

This NBIA has been prepared generally in accordance with the methods adopted in the *Boggabri Coal Mine Modification 8 Noise and Blasting Impact Assessment* (EMM, 2022) (being the latest major NBIA undertaken for the BCM).

The following assessments were completed as part of the NBIA for MOD 10:

- Operational noise;
- Private land area assessment;
- Maximum noise level event assessment;
- Low frequency noise;
- Cumulative noise; and
- Blasting assessment.

The technical policies and guidelines considered within the NBIA include:

- *Noise Policy for Industry* (NPfI) (EPA, 2017);
- *Interim Construction Nose Guideline* (ICNG) (DECCW, 2009);
- VLAMP (NSW Government, 2018);
- *Road Noise Policy* (RNP) (DECCW, 2011);
- *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013);
- *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZEC, 1990);

- *AS 2187.2-2006 'Explosives – Storage and use – Part 2: Use of explosives'* (Standards Australia, 2006); and
- *Imperial Chemical Industries (ICI) Explosives Blasting Guide* (ICI Technical Services, 1995).

6.2.2.2 Prevailing Weather Conditions

Under various wind and temperature gradient conditions, noise may be increased or decreased compared with still-isothermal conditions – that is, no wind or temperature gradient. Atmospheric conditions that most affect noise propagation are temperature and wind velocity gradients. They can both enhance or reduce noise propagation from source to receiver due to refraction of sound propagating through the atmosphere, brought about by a change in sound speed with height.

Noise levels are increased when the wind blows from source to receiver or under temperature inversion conditions (both of which are sometimes referred to as 'noise enhancing weather conditions') and decreased when the wind blows from receiver to the source or under temperature lapse conditions.

Neutral and prevailing meteorological conditions included in the noise assessment are consistent with meteorological conditions utilised within the previous MOD 8 noise impact assessment and are detailed within **Appendix F**.

6.2.2.3 Assessment Methodology

Operational noise levels were predicted using RTA Technology's Environmental Noise Model (ENM). The ENM is approved by DPHI and the EPA as a suitable software for predicting industrial noise involving large propagation distances. The ENM is currently the industry standard for NBIA of this nature.

Two (2) indicative operational scenarios were selected for modelling within the NBIA to represent the reasonable worst-case mining operations over the proposed life of mine. Each stage modelled represents the worst case operating configuration for operations at BCM. The stages used for the purposes of this NBIA included Years 2028 and 2034 (subject to date of approval). Operating configurations assessed for each scenario were consistent across day, evening and night periods.

Sound powers for the CHPP and open cut equipment used in modelling were based on measured in-service levels of equipment currently operating at the BCM, or anticipated levels for future equipment use. Accordingly, the mining equipment and associated sound power levels (SPLs) are representative of a typical mining equipment fleet proposed for use at the BCM, representing the current or anticipated fleet average SPLs.

Operational intrusive noise, cumulative noise, low frequency noise modifying factor adjustments, potential sleep disturbance impact and a private land assessment associated with each mining stage was assessed in accordance with the relevant criteria.

A further analysis of blasting records was undertaken with indicative vibration levels precited in accordance with AS2187 and the ICI Explosives Blasting Guide.

Further details of the noise assessment methods is provided within the NBIA in **Appendix F**.

6.2.2.4 Noise Impact Assessment Criteria

The noise criteria from SSD 09_0182 have been applied to the assessment for MOD 10 within the NBIA. The maximum predicted noise levels for privately owned assessment locations with acquisition rights as per Schedule 3, Condition 4 of SSD 09_0182 are reproduced in **Table 11**. Further to the this, SSD 09_0182 provides Noise Impact Assessment Criteria for all other privately owned residences. Accordingly, the noise impact criteria applicable for residences on other privately owned land is reproduced below in **Table 12**.

Cumulative noise criteria (including operational noise generated by BCM and other surrounding mines within the BTM Complex) and the corresponding criteria as specified in Schedule 3, Condition 7 of SSD 09_0182 are reproduced in **Table 13**.

Blasting at BCM is managed in accordance with the approved BCM Blast Management Plan and the relevant criteria specific in SSD 09_0182. The blasting criteria applicable for residences on privately owned land and public infrastructure as listed in Schedule 3, Condition 15 of SSD 09_0182 is reproduced in **Table 14**.

Table 11 Maximum predicted noise levels dB(A)

Location Property / ID	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
44	35	35	36	45
48	35	38	39	48
90	35	35	36	45

Table 12 Noise Impact Assessment Criteria dB(A)

Location Property / ID	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$	Night $L_{A1,1minute}$
158	35	36	36	45
All other privately owned residences	35	35	35	45

Table 13 Cumulative Noise Criteria dB(A)

Location	Day $L_{Aeq,\ period}$	Evening $L_{Aeq,\ period}$	Night $L_{Aeq,\ period}$
All privately owned land	40	40	40

Table 14 Blasting Criteria

Location	Blast Components	EPL Limits	Allowable Exceedances
Residence on privately owned land	Airblast overpressure	115 dB(L)	5% of the total number of blasts over a period of 12 months.
		120 dB(L)	0%
	Ground Vibration	PPV 5 mm/s	5% of the total number of blasts over a period of 12 months.

Location	Blast Components	EPL Limits	Allowable Exceedances
		PPV 10 mm/s	0%
All public infrastructure	Airblast overpressure	-	0%
	Ground Vibration	PPV 50 mm/s or alternatively a specific limit determined to the satisfaction of the Secretary by the structural design methodology in AS 2187.2-2006, or its latest version.	0%

The NSW Government published the VLAMP in September 2018. This document describes the NSW Government's policy for voluntary mitigation and land acquisition to address noise impacts from state significant mining, petroleum, and extractive industry developments.

Table 15 summarises the VLAMP mitigation and acquisition criteria for noise impacts from mining developments, and outlines the procedures required for characterising noise impact and associated receptor-based treatments that have the potential to mitigate residual noise impacts.

Table 15 Characterisation of Noise Impacts and Potential Treatments

If the predicted noise level minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Characterisation of impacts:	Potential treatment:
All time periods 0-2 dB(A)	Not applicable	Impacts are considered to be **negligible.**	The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls.
All time periods 3-5 dB(A)	› ≤ recommended amenity noise level in Table 2.2 of the NPfI; or › > recommended amenity noise level in Table 2.2 of the NPfI, but the increase in total cumulative industrial noise level resulting from the development is ≤1 decibel (dB).	Impacts are considered to be **marginal.**	Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.

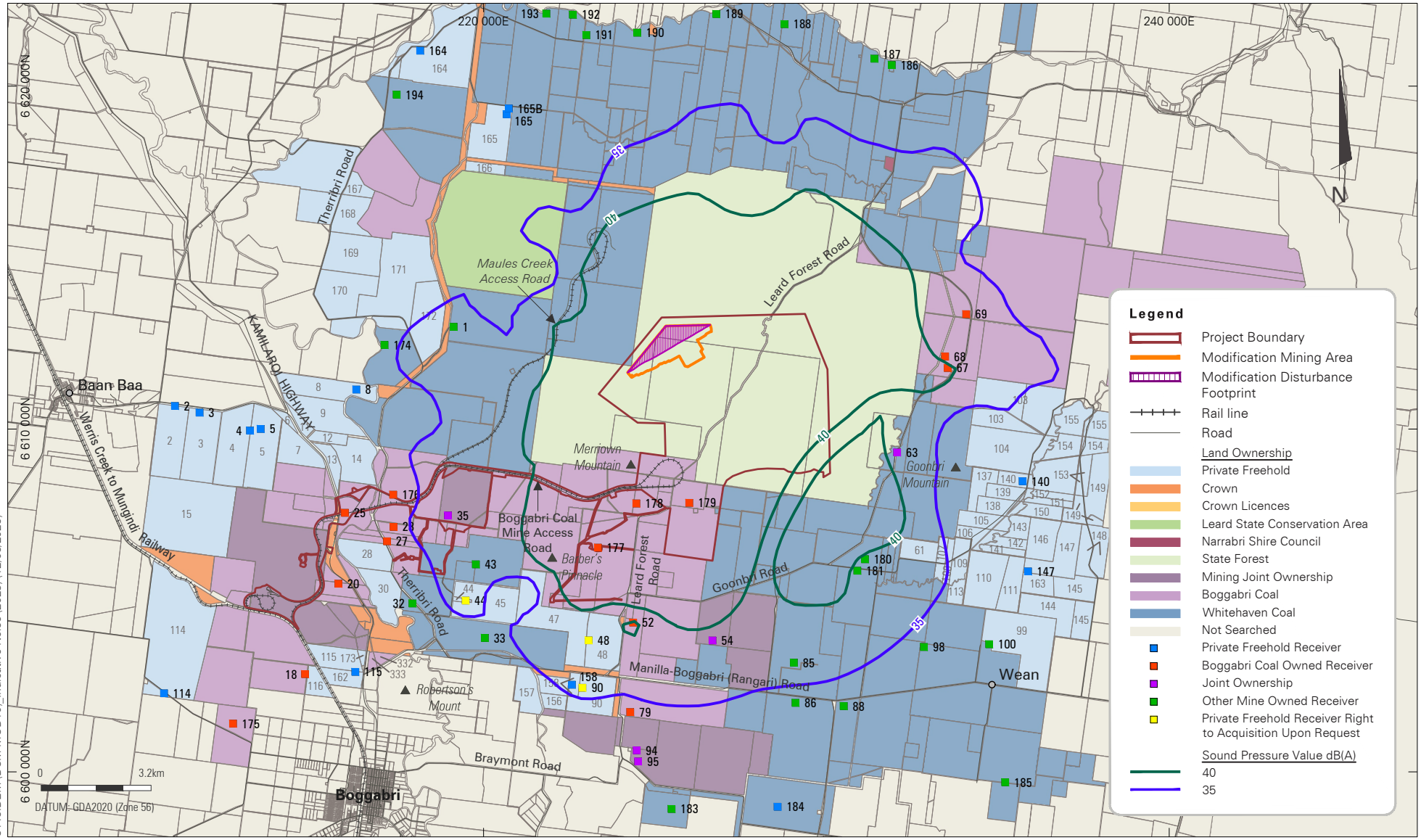
If the predicted noise level minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Characterisation of impacts:	Potential treatment:
All time periods 3-5 dB(A)	> recommended amenity noise level in Table 2.2 of the NPfI, and the increase in total cumulative industrial noise level resulting from the development is > 1 dB.	Impacts are considered to be **moderate.**	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening >5 dB(A)	≤ recommended amenity noise levels in Table 2.2 of the NPfI.	Impacts are considered to be **moderate.**	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening >5 dB(A)	> recommended amenity noise levels in Table 2.2 of the NPfI.	Impacts are considered to be **significant.**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.
Night >5 dB(A)	Not applicable.	Impacts are considered to be **significant.**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.

6.2.3 Assessment of Impacts

6.2.3.1 Operational Noise

Operational noise modelling results show that no exceedances of the relevant noise criteria are predicted for any assessment locations as a result of MOD 10 for either of the two (2) modelled years. **Table 16** summarises the operational noise predictions for the five (5) assessment locations representing nearest privately owned receivers.

The maximum modelled noise impacts for MOD 10 for the years 2028 and 2034 modelling scenarios (for all time periods) are illustrated in **Figure 16** and **Figure 17**.

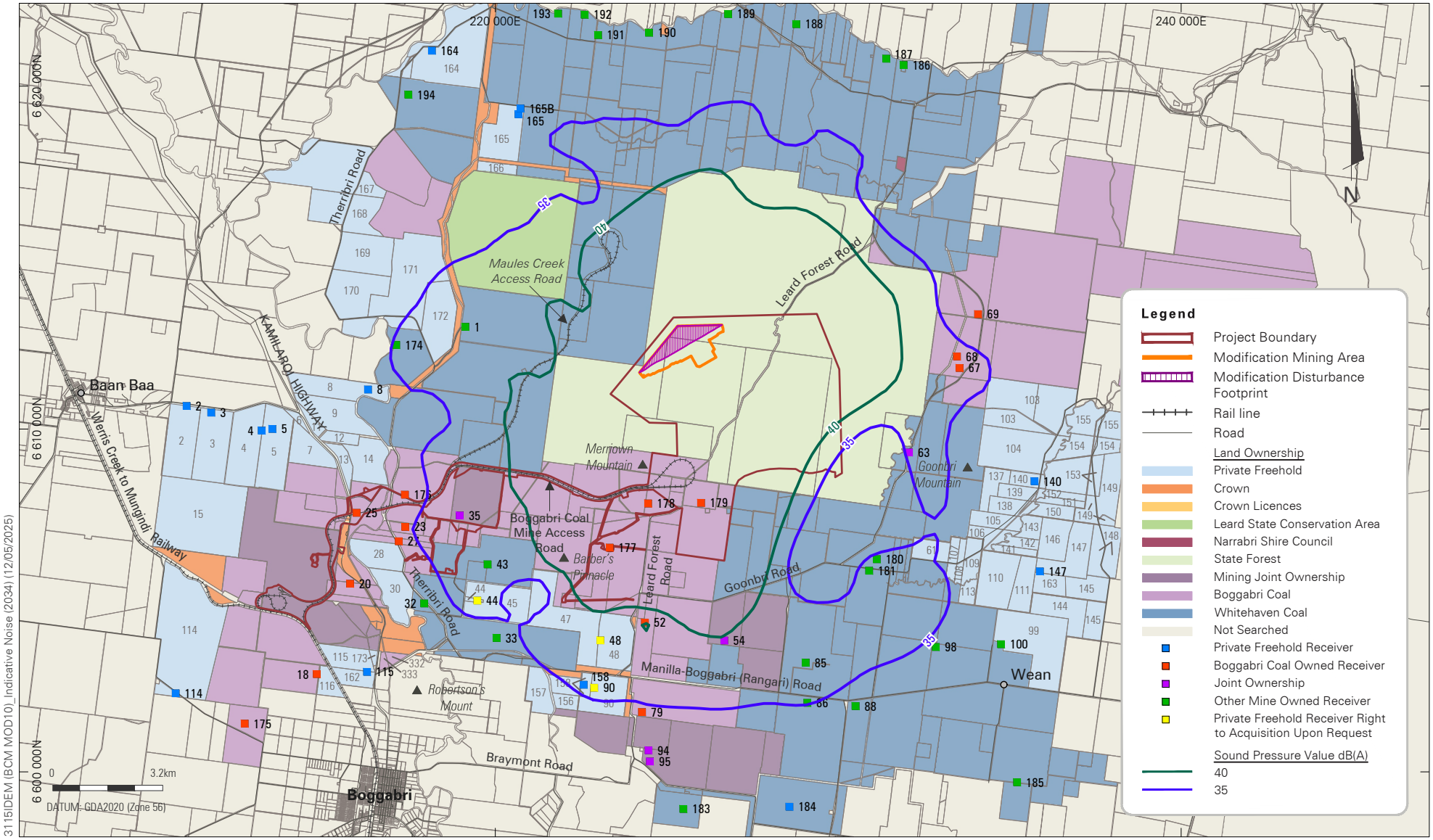


3115IDEM (BCM MOD10)_Indicative Noise (2028) (12/05/2025)

BOGGABRI COAL MINE MODIFICATION

Indicative Noise Contours Year 2028, Max All Periods (LAeq,15minute dB)

FIGURE 16



3115IDEM (BCM MOD10)_Indicative Noise (2034) (12/05/2025)

BOGGABRI COAL MINE MODIFICATION

Indicative Noise Contours Year 2034, Max All Periods (LAeq,15minute dB)

FIGURE 17

Table 16 Operational Noise Predictions - LAeq,15minute dB

ID	Intrusive Noise Criteria			Year 2028			Year 2034		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
8	35	35	35	30	33	34	31	34	35
44^	35	35	36	21	35	36	21	35	36
48^	35	38	39	25	38	39	26	38	39
90^	35	35	36	23	35	36	24	35	36
158	35	36	36	23	35	36	24	35	36

Notes: 1. ^ indicates assessment location entitled to acquisition on request with BCM and is compared against the noise levels in Table 2 within Condition 4 of Schedule 3 of SSD 09_0182.

6.2.3.2 Low Frequency Assessments

The 2028 and 2034 modelling scenarios both indicate that noise levels will remain below the NPfI thresholds for low frequency noise at all privately owned receivers. Accordingly, the low frequency noise modifying factor adjustment is not applicable to the modelling predictions for MOD 10.

6.2.3.3 Maximum Predicted Noise Level Assessment

Potential sleep disturbance impacts were assessed for MOD 10 by predicting levels from plant items known to generate noise levels that at times stand out above the general mining continuum. The assessment of sleep disturbance entailed the modelling of each source and then combining the highest prediction with results for the remainder of operational plant to obtain an estimate of possible short-term maximum noise emissions.

Sleep disturbance model predictions did not identify any privately owned receiver where short-term maximum noise levels exceeded the relevant $L_{A1,1minute}$ criterion prescribed in SSD 09_0182. Accordingly, no sleep disturbance impacts are predicted for MOD 10.

6.2.3.4 Private Land Area Assessment

The VLAMP requires proponents to assess noise (and air quality) impacts over areas of privately owned land (whether a residence occurs on the land or not). The VLAMP states that voluntary land acquisition rights may apply where, even with the implementation of best practice management, the noise generated by the development would contribute to exceedances of the acceptable noise amenity levels in Table 2.2 of the NPfI plus 5 dB on more than 25% of any privately owned land.

The assessment of operational noise impact over privately owned land where there is an existing dwelling, or where a dwelling could be constructed, was completed in accordance with the VLAMP. The assessment indicated that no private landholdings have more than 25% of the land area predicted to exceed VLAMP criteria in any time period, for either of the two (2) stages assessed. Accordingly, no additional properties would be entitled to voluntary land acquisition rights due to any predicted impacts over their land area.

6.2.3.5 Cumulative Noise

A cumulative noise assessment was completed for MOD 10 which included the noise sources from activities at:

- MCCM; and
- TCM.

Predictions from the *Maules Creek Coal Project Acoustics Impact Assessment* (Bridges Acoustics, 2011) and the *Tarrawonga Coal Mine Modification 7 Noise Assessment* (Wilkinson Murray, 2019) were combined with predictions for MOD 10 for privately owned assessment locations. Modelling predictions for MOD 10 indicate that cumulative noise levels will remain well below the criteria prescribed in SSD 09_0182.

6.2.3.6 Blasting

Contemporary blast design and management procedures employed at BCM are consistent with industry best practice. Historical blasting activities at BCM have generally been undertaken in compliance with the approved limits in the previously approved mining areas (albeit two (2) blast events occurring in 2019 which exceeded the overpressure limit of 120 dB(L)). The instances of non-compliance account for a small percentage of the monitoring dataset and it is anticipated that any reoccurring blasting within these areas are expected to result in continued compliance with the approved limits.

The extension of mining toward the north-west proposed by MOD 10 will result in blasting activities outside of the currently approved Mine Disturbance Boundary. However, the nearest assessment locations are approximately 8 km away from the Modification Mining Area.

Calculations indicate that blasting within the Modification Mining Area with a Maximum Instantaneous Charge (MIC) of 10,000 kg (being the maximum range of historically recorded MIC values) or less would result in ground vibration and overpressure levels well below the SSD 09_0182 criteria at the nearest assessment locations. Accordingly, it is unlikely that blasting activities within the Modification Mining Area would cause any meaningful change to blast impacts.

Notwithstanding, BCOPL will continue to undertake off-site monitoring to validate blast impacts and consult with relevant employees / contractors over appropriate techniques and timings to effectively control any air blast and ground vibration impacts from mine blasting activities. BCOPL will also continue to implement suitable design, management and monitoring protocols in accordance with the BCM Blast Management Plan to ensure ongoing compliance with the approved blasting criteria.

6.2.3.7 Noise and Blasting Impact Comparison

Table 17 presents the noise and blasting impacts associated with MOD 10 in comparison to MOD 7 (being the original SSD approval) and the currently approved operations under SSD 09_0182 (i.e. the incremental impacts approved under MOD 8, MOD 9 and MOD 11).

Table 17 Noise and Blasting Impact Comparison

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
Noise	› Predicted noise impacts to BCMs neighbouring privately owned receivers largely result from night-time inversion conditions.	› Four (4) privately owned properties (receivers 44, 48, 90 and 158) predicted to experience noise levels exceeding 35 dB(A) (i.e. the noise trigger level under the NPfI) (MOD 8). › 36 dB(A) criterion applied to receiver 158 (newly built residence) (MOD 8).	› No change.

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
	› 13 affected privately owned properties (all years) under prevailing weather conditions. › Properties affected above the intrusive criteria were afforded the right to be acquired at the request of the landowner.	› Removal of Schedule 3 Condition 14 and the removal of strict sound power levels for plant and equipment (MOD 8).	
Blasting	› No predicted exceedance of relevant overpressure and ground vibration criteria at nearby sensitive receivers.	› No change	› No change.

Table 17 above demonstrates that the incremental change in noise and blasting impacts resulting from MOD 10 will remain generally the same as those currently approved and those approved for MOD 7. It is worthy to note that the majority of private affected properties identified in the 2010 EA are now owned by BCOPL or neighbouring mining operation. As such, noise and blasting impacts are predicted to remain consistent with those approved under MOD 7.

6.2.4 Mitigation and Management

An initial round of noise modelling was undertaken to assist BCOPL in the planning and development of MOD 10 mine plans to ensure that noise impacts were minimised as far as practicable. It was identified that that mining operations could be better managed to reduce overall noise levels to comply with the existing noise criteria. Accordingly, roadside noise bunds along the western edge of mining operations within the MOD 10 mine plans were adopted as a mitigation control and avoid minor exceedances of the noise criteria at nearby privately owned receivers. Whilst the roadside noise bunds were adopted as a mitigation control for modelling purposes, there may be more appropriate controls (either in replacement of or in addition to the roadside noise bunds) which will be implemented at the appropriate time to ensure noise levels remain below the noise criteria specified within SSD 09_0182.

BCOPL manages noise impacts in accordance with the reasonable and feasible measures described in the approved NMP. As outlined in the NMP, BCOPL operates a comprehensive noise management system at the BCM 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. BCOPL will continue to apply reasonable and feasible noise mitigation and management measures during operational activities at BCM as outlined in the NMP.

The NMP will be reviewed and updated for MOD 10 to reflect any changes to relevant conditions and will include additional mitigation measures within the western portion of the mining operation with monitoring continuing as currently undertaken at the BCM to ensure compliance is maintained with the approved criteria. Throughout the life of mine, alternative noise controls and management strategies may also be implemented to ensure ongoing compliance with the approved noise criteria as specified in SSD 09_0182.

6.3 BIODIVERSITY

6.3.1 Background

WSP has prepared a Biodiversity Development Assessment Report (BDAR) for MOD 10 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 G**, with a summary in the following sections.

Given that BCM is an existing operation currently approved under SSD 09_0182, MOD 10 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 and offsets are required to be considered, unless stated otherwise by the Secretary of the DPHI and agency head that the proposed actions are not likely to have a significant impact on biodiversity values.

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 RU3 (Forestry) under the Narrabri LEP and involves the disturbance to a footprint of approximately 85 ha of land, MOD 10 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 Matters of National Environmental Significance (MNES). As a result of a referral for MOD 10 which was submitted under the EPBC Act (EPBC 2024/9887), the Commonwealth Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW) determined the activities proposed by MOD 10 to be a controlled action for potential significant impacts to biodiversity values and water resources in connection with a large coal mining development. The Commonwealth DCCEEW also confirmed that MOD 10 could be assessed in conjunction with MOD 10 under the provisions of the bilateral agreement with NSW Government in accordance with Section 45 of the EPBC Act.

In relation to the potential indirect impacts of MOD 10 on surrounding vegetation which may conform to Groundwater Dependent Ecosystems (GDEs), WSP completed an assessment of potential impacts on GDEs that are known to occur within the region that may be affected by groundwater drawdown from MOD 10. A summary of the GDE assessment is provided within the following sections with the full report provided in **Appendix H**.

6.3.2 Methodology

6.3.2.1 Database Searches

The Modification Disturbance Footprint, which was subject to the BDAR ecological field assessments, covers an area of approximately 85 ha. This area comprises the area of land to the north-west of the currently approved Mine Disturbance Boundary for BCM.

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. This information was used to compare known habitat characteristics with those present in the Modification Disturbance Footprint. This was subsequently used to determine the habitat suitability of each species or population and enable a justification for inclusion of any additional predicated or candidate threatened flora and fauna species not identified by the Biodiversity Assessment Method Calculator (BAM-C). The assessment for MOD 10 also considered previous survey and assessment efforts completed within and immediately surrounding the Modification Disturbance Footprint. This was important in light of the array of previous studies and investigations that have occurred within the area.

6.3.2.2 Site Context

Landscape context was assessed in accordance with Chapter 3 of the BAM, and requirements outlined in Part 1 of the BAM 2020 Operational Manual – Stage 1 (Department of Planning, 2020). Landscape features within the Modification Disturbance Footprint were identified using regional vegetation mapping resources, aerial photographic interpretation and field surveys. These landscape features were subsequently used to inform the habitat suitability for threatened species and potential movement of species across the landscape. This information was used in the landscape context component of the BAM-C. The identification of native vegetation cover was also undertaken using regional vegetation mapping resources, aerial photograph interpretation, existing reports, knowledge of the MOD 10 locality and field surveys.

6.3.2.3 Native Vegetation, Threatened Ecological Communities and Vegetation Integrity Survey Methods

Mapping of the native vegetation extent within Modification Disturbance Footprint is required under Section 4.1 of the BAM and Section 3.2 of the BAM 2020 Operational Manual. Where available, existing information (i.e. regional vegetation mapping resources, aerial photograph interpretation, existing reports and knowledge of the Modification Disturbance Footprint and field surveys) was used to assist with the mapping of vegetation boundaries and to identify Plant Community Types (PCTs) and Threatened Ecological Communities (TECs) within the Modification Disturbance Footprint. Survey methodologies including Rapid Data Point Survey, Plot-based Vegetation Survey (including BAM plots and Vegetation integrity surveys), and random meander surveys were completed to support the mapping of native vegetation extents within the Modification Disturbance Footprint.

6.3.2.4 Threatened Flora Survey Methods

Habitat constraints and microhabitats for candidate threatened flora (species credit) species within the Modification Disturbance Footprint were reviewed and identified in accordance NSW Threatened Biodiversity Data Collection (TBDC) prior to survey. Previous survey results from annual biodiversity monitoring at the BCM was also used to inform habitat constraints and microhabitats for candidate species.

Targeted surveys within the Modification Disturbance Footprint were completed for candidate flora species credit species (including those listed under the EPBC Act). These surveys incorporated survey techniques including a two-phase grid-based systematic survey, and parallel field traverses of microhabitats (or where suitable habitat area was less than 50 ha in size) as described in the *Surveying of threatened plants and their habitats; NSW guide for the Biodiversity Assessment Method* (Department of Planning, Industry and Environment, 2020).

Whilst initial surveys completed between September 2018 and January 2020 were completed prior to the release of updated survey guidelines, the additional surveys completed in 2023 and 2024 for candidate threatened flora species appropriately cover the current BAM requirements.

6.3.2.5 Threatened Fauna Survey Methods

Habitat constraints and microhabitats for candidate threatened fauna (species credit) species within the Modification Disturbance Footprint were also reviewed identified in accordance NSW TBDC prior to survey. Similarly, existing BDAR's and other biodiversity reports developed as part of historical assessments in and surrounding the Modification Disturbance Footprint were reviewed to identify existing biodiversity values.

Targeted seasonal surveys were completed for threatened fauna species, species credit species and EPBC Act listed species in potential habitat within the Modification Disturbance Footprint. The fauna surveys completed for MOD 10 were conducted in accordance with the following guidelines and assessment methodologies:

- NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation, 2004);
- Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide (Department of Planning and Environment, 2022);
- NSW Survey Guide for Threatened Frogs (Department of Planning Industry and Environment, 2020);
- 'Species credit' Threatened Bats and their Habitats. NSW Survey Guide for the Biodiversity Assessment Method (Office of Environment and Heritage, 2018);
- Survey guidelines for Australia's Threatened Birds (Department of the Environment, Water, Heritage and the Arts, 2010);
- Threatened Reptiles Biodiversity Assessment Method Survey Guide (Department of Planning and Environment, 2022); and
- Threatened Species Profile Database (Office of Environment and Heritage, 2024).

Fauna surveys completed for candidate species which were predicted to have a moderate to high likelihood of occurrence in the Modification Disturbance Footprint included:

- Rapid data points and habitat assessments;
- Diurnal bird surveys;
- Targeted hollow transects for bird species;
- Targeted raptor nest transects;
- Insectivorous bat survey;
- Koala spot assessments;
- Herpetofauna active searches;
- Stag watching and auditory survey;
- Spotlighting;
- Call playback (large forest owls);
- Call playback (nocturnal birds and mammals);
- Remote camera; and

- Opportunistic sightings.

Following the completion of surveys, the BAM-C was utilised to calculate the ecosystem and species credit species impacts for MOD 10.

Further details on the survey efforts completed for candidate flora and fauna species for MOD 10 are provided in **Appendix G**.

6.3.2.6 Groundwater Dependant Ecosystems

The MOD 10 GDE Assessment was undertaken via desktop analysis utilising available knowledge of vegetation surrounding the BCM and the previous approval documents completed for mines within the BTM Complex. This included a broad range of spatial and regional specific datasets, a literature review, extensive vegetation mapping and an analysis of leaf green index. Two (2) study areas were established for which the MOD 10 GDE assessment was focussed:

- Regional Study Area – encompassing an approximate 10 km radius of the Modification Disturbance Footprint to consider the potential cumulative impacts on regionally mapped high priority GDEs. This area incorporates drainage features such as Back Creek, Goonbri Creek and Bollol Creek, and the high potential GDE's that these water sources may support; and
- Nagero Creek Study Area – an area of alluvium to the south west of the BCM to focus on the vegetation which occurs in the area where incremental groundwater drawdown was expected to occur as a consequence of MOD 10.

This assessment considered extensive vegetation mapping of the Project Boundary and nearby Biodiversity Offset Area's (BOA's). Where field verified vegetation mapping was not available proximate to BCM, regional state-based broad-scale vegetation mapping was relied on. Where field verified vegetation mapping occurred, the information collected during survey was used to determine the PCT for each vegetation type and whether the vegetation aligned to any State or Commonwealth listed TEC. Given that Poplar Box Grassy Woodland on Alluvial Plains was listed under the EPBC Act on the 4 July 2019 (i.e. after field validation of vegetation mapping within the BCM Project Boundary and BOA's), areas of native vegetation in the regional study area with potential to meet the EPBC Act listing have not been assessed against the TECs key diagnostic characteristics or condition thresholds. As such, a precautionary approach was applied. For the purposes of this assessment, it was therefore assumed that all remnant patches previously mapped as PCT 101 and areas of PCT 88 on the Namoi alluvial floodplain (not including the Nagero Creek study area) meet the EPBC Act listing. Similarly, where the state vegetation mapping was relied upon for areas in which no field verification has occurred, PCT alignment to Commonwealth listed TECs was determined using the associated TECs listed for each.

The literature review was undertaken to inform the assessment of the potential impacts of MOD 10 on GDE's within the Nagero Creek study area and the Regional study areas. These desktop reviews focussed on previous assessments and approval documentation for mine sites within the BTM Complex, relevant guidelines and literature pertaining to rooting depths and likely reliance of terrestrial vegetation on groundwater.

An Assessment of Significance was also completed in accordance with the *Significant Impact Guidelines 1.1 Matters of National Environmental Significance* (DoE, 2013) for the key listed vegetation communities which have a potential to be impacted for groundwater drawdown from MOD 10.

The GDE Assessment for MOD 10 is provided in **Appendix H**, with a summary included within the following sections.

6.3.3 Assessment of Impacts

6.3.3.1 Vegetation Communities

Field validation surveys confirmed that native vegetation covers approximately 69.29% of the Modification Disturbance Footprint. The NSW State Vegetation Type Map (SVTM) maps the entirety of the Modification Disturbance Footprint as a single PCT being PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion. Surveys for MOD 10 did confirm PCT 592 to be most dominant within the Modification Disturbance Footprint, however an additional four (4) PCTs were also identified present. These include:

- PCT 462 Dwyer's Red Gum -White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion;
- PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion;
- PCT 588 White Box – White Cypress Pine shrubby hills open forests mainly in the Nandewar Bioregion; and
- PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of the Brigalow Belt South Bioregion and Nandewar Bioregion.

Approximately 1.84 ha of the Modification Disturbance Footprint is comprised of non-native vegetation. These areas are considered 'highly disturbed areas with no or limited vegetation' such as access tracks and borehole exploration pads.

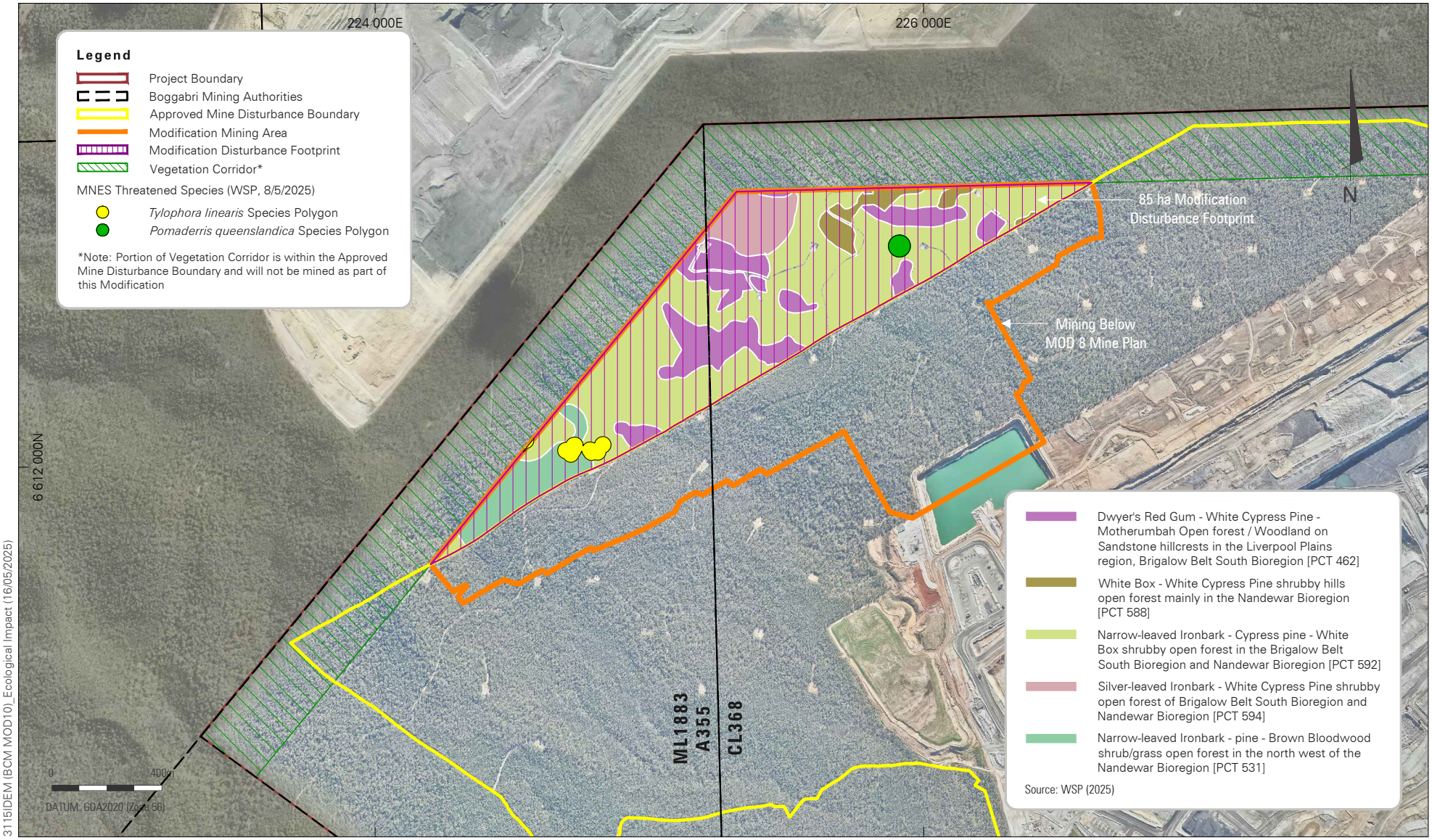
Ecological surveys have confirmed that MOD 10 will not disturb any TECs listed under the NSW BC Act and the Commonwealth EPBC Act. However, the proposed disturbance of woodland area within the Modification Disturbance Footprint may indirectly impact threatened fauna species known to occupy the Leard State Forest which are detailed in the following sections.

The extent of PCTs identified within the Modification Disturbance Footprint, as well as their respective conditions and listing under relevant state and federal legislation is detailed in **Table 18**. The distribution of PCTs within the Modification Disturbance Footprint is shown in **Figure 18**.

Table 18 PCTs identified within the Modification Disturbance Footprint

PCT ID	PCT Name	Modification Disturbance Footprint Area (ha)	Condition	BC Act Status	EPBC Act Status
PCT 462	Dwyer's Red Gum -White Cypress Pine – Motherumbah open forest/ woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	16.35	Moderate	Not Listed	Not Listed
PCT 531	Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion	7.32	Moderate	Not Listed	Not Listed
PCT 588	White Box – White Cypress Pine shrubby hills open forests mainly in the Nandewar Bioregion	3.59	Moderate	Not Listed	Not Listed

PCT ID	PCT Name	Modification Disturbance Footprint Area (ha)	Condition	BC Act Status	EPBC Act Status
PCT 592	Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	51.51	High	Not Listed	Not Listed
PCT 594	Silver-leaved Ironbark – White Cypress Pine shrubby open forest of the Brigalow Belt South Bioregion and Nandewar Bioregion	5.71	Moderate	Not Listed	Not Listed
	Total Area	**84.48 ha**			



3115IDEM (BCM MOD10)_Ecological Impact (16/05/2025)

BOGGABRI COAL MINE MODIFICATION 10

Vegetation Communities and Listed Species Records

FIGURE 18

6.3.3.2 Groundwater Dependent Ecosystems

Impacts to GDEs were assessed within the Groundwater Impact Assessment (GIA) (**Section 6.4.3.5**) and the Terrestrial Groundwater Dependent Ecosystem Assessment (**Section 6.3.3.8**) completed for MOD 10.

Vegetation mapped within the Modification Disturbance Footprint consistent with PCT 592 and PCT 594 was assessed as having low potential to be a terrestrial GDE. No high potential terrestrial GDEs were identified within the Modification Disturbance Footprint.

PCTs identified within the Modification Disturbance Footprint have been assessed to likely be classified as vadophytic vegetation of which primarily use water in the unsaturated zones above the water table and are associated with moisture holding soils. Accordingly, it has been assessed that PCTs within the Modification Disturbance Footprint are unlikely to be groundwater dependent.

Notwithstanding, the cumulative impacts of groundwater drawdown associated with the currently approved operations at the BTM Complex, and the proposed operations sought under MOD 10 has the potential to impact on terrestrial GDEs surrounding the BTM Complex (See **Section 6.3.3.8**).

6.3.3.3 Threatened Flora

Table 19 lists the candidate threatened flora species which were determined present within the Modification Disturbance Footprint.

Table 19 Determining presence of candidate flora species credit species in the Modification Disturbance Footprint

Flora Species	BC Act Status	EPBC Act Status	Potential Habitat	Species recorded during target surveys
Cyperus conicus	E	Not Listed	PCT 531 and PCT 592	No
Dichanthium setosum (Bluegrass)	V	V	PCT 531, PCT 592 and PCT 594	No
Diuris tricolor (Pine Donkey Orchid)	V	Not Listed	PCT 592	No
Monotaxis macrophylla (Large-leafed Monotaxis)	E	Not Listed	PCT 462, PCT 531, PCT 588, PCT 592 and PCT 594	No
Polygala Linariifolia (Native Milkwort)	E	Not Listed	PCT 531 and PCT 592	No
Pomaderris queenslandica (Scant Pomaderris)	E	Not Listed	PCT 531, PCT 592, PCT 594 and PCT 462	Yes
Thesium australe (Austral Toadflax)	V	V	PCT 594	No
Tylophora linearis	V	E	PCT 531, PCT 592, PCT 594 and PCT 462	Yes

6.3.3.3.1 *Tylophora linearis*

Three (3) patches of sparsely occurring *Tylophora linearis* individuals (listed as Vulnerable under the BC Act and Endangered under the EPBC Act) were recorded within the Modification Disturbance Footprint. The number of individuals recorded within the Modification Disturbance Footprint was determined as the total number of 'aerial stems'. A total of 30 aerial stems were recorded within the Modification Disturbance Footprint. A *Tylophora linearis* species polygon was also mapped in accordance with the BAM requirements covering an area of approximately 1.29 ha (comprised of 0.68 ha within PCT 531 and 0.61 ha within PCT 592) (See **Figure 18**).

These individuals form part of a larger population which extends throughout the Leard State Forest and into the Leard State Conservation Area and neighbouring properties. Previous studies completed within these areas has modelled that the *Tylophora linearis* population is likely to contain 1.04 million plants within the region.

Samples of *Tylophora linearis* recorded within the subject land were sent to the Royal Botanic Gardens Herbarium to confirm the identification of the species. These samples were confirmed as *Tylophora linearis*.

6.3.3.3.2 *Pomaderris queenslandica*

One small clump of densely occurring *Pomaderris queenslandica* individuals were recorded within the Modification Disturbance Footprint. Similarly, the sample was sent to the Royal Botanic Gardens Herbarium which confirmed the species as *Pomaderris queenslandica*. Given that of *Pomaderris queenslandica* is an area species, the species was mapped in accordance with *Biodiversity Assessment Method Threatened Flora Survey Guide* (Department for Planning Industry and Environment, 2020) (See **Figure 18**). The individuals recorded within the Modification Disturbance Footprint were identified on a lower slope within an area mapped as PCT 592 located approximately 30 m west of an ephemeral first order drainage line.

Despite extensive surveys, *Pomaderris queenslandica* was only recorded in the one location within the Modification Disturbance Footprint. This clump of individuals covered a small circular area of 0.0314 ha, equivalent to a 10 m radius circle. Due to the absence of this species from the remainder of the Modification Disturbance Footprint, it is considered that suitable habitat is restricted to this locality. Notwithstanding, a 30 m buffer has been applied to the clump to create the species polygon to ensure that the extent of vegetation zone containing he species and similar adjacent habitats that are likely to be suitable for the species were captured. As such, the *Pomaderris queenslandica* species polygon within the Modification Disturbance Footprint therefore covers an area of 0.5 ha comprised entirely of PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion.

6.3.3.4 Threatened Fauna

Table 20 lists the candidate threatened fauna species credit species which were determined present within the Modification Disturbance Footprint.

Table 20 Presence of Candidate Flora Species Credit Species in the Modification Disturbance Footprint

Common Name	Scientific Name	BC Act Status	EBPC Act Status	Species Recorded During Targeted Surveys
Birds				
Barking Owl (breeding)	*Ninox connivens*	V	Not Listed	No
South-eastern Glossy Black Cockatoo (breeding)	*Calyptorhynchus lathami lathmi*	V	V	No
Little Eagle (breeding)	*Hieraaetus morphnoides*	V	Not Listed	No
Masked Owl (breeding)	*Tyto novaehollandiae*	V	Not Listed	No
Square-tailed Kite (breeding)	*Lophoictinia isura*	V	Not Listed	No
White-bellied Sea-Eagle (foraging)	*Haliaeetus leucogaster*	V	Not Listed	No
Mammals				
Eastern Pygmy Possum	*Cerartetus nanus*	V	Not Listed	No
Grey-headed Flying-Fox (breeding)	*Pteropus poliocephalus*	V	V	No
Koala	*Phascolarctos cinereus*	E	E	Assumed Present
Rufous Bettong	*Aepyprymnus rufescens*	V	Not Listed	No
Squirrel Glider	*Petaurus norfolcensis*	V	Not Listed	Assumed Present
Reptiles				
Border Thick-tailed Gecko	*Uvidicolus sphyrurus*	V	V	No
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	Not Listed	Assumed Present
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	No

6.3.3.4.1 Koala (*Phascolarctos cinereus*)

Koala is listed as Endangered under both the BC Act and the EPBC Act. Previous studies within the Leard State Forest completed for Koala occurrences proximate to BCM have indicated low population density, low habitat utilisation in the southern sections of the Leard State Forest, and therefore low koala activity.

Despite the absent observations of Koala activity within the Modification Disturbance Footprint, the species is considered to occupy the Leard State Forest in a low population density. Given the previous ecological studies, local records and the presence of suitable foraging habitat, the Modification Disturbance Footprint has the potential to be used intermittently during local movements. Accordingly, the Koala has been assumed present in all PCTs and vegetation zones within the Modification Disturbance Footprint.

6.3.3.4.2 Squirrel Glider (*Petaurus norfolcensis*)

The Squirrel Glider is listed as Vulnerable under the NSW BC Act. Targeted surveys did not identify the Squirrel Glider within the Modification Disturbance Footprint. However, given the historical records on the locality, the presence of suitable foraging habitat and the hollow-bearing trees for nesting and breeding activities, and the general 'cryptic' nature of the species, it is considered that the Modification Disturbance Footprint would form part of the species distribution range and thus is likely to be occupied by the species. Accordingly, the Squirrel Glider has been assumed present in all PCTs and vegetation zones within the Modification Disturbance Footprint.

6.3.3.4.3 Pale-headed Snake (*Hoplocephalus bitorquatos*)

The Pale-headed Snake is listed as Vulnerable under the NSW BC Act. Targeted surveys did not identify the Pale-headed Snake within the Modification Disturbance Footprint. However, the species has been regularly recorded within the Leard State Forest during annual tree clearing operations. Based on historical records, and the general cryptic nature of the species which can hinder survey efforts, it is considered that the species would occupy the Modification Disturbance Footprint. Accordingly, the Pale-headed Snake is assumed present in all PCTs and vegetation zones within the Modification Disturbance Footprint.

6.3.3.5 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 MOD 10 is likely to have significant impacts on the following species:

- *Nyctophilus corbeni* (Corben's Long-eared Bat);
- *Anthochaera phrygia* (Regent Honeyeater); and
- *Lathamus discolor* (Swift Parrot).

Surveys completed for MOD 10 did not identify any migratory species within the Modification Disturbance Footprint. MOD 10 has been considered unlikely to substantially modify, destroy or isolate an area of important habitat for any EPBC Act listed migratory species and is unlikely to disrupt the lifecycle of an ecologically significant proportion of a population of migratory birds.

Further detail on the assessments of significance to MNES is provided in **Appendix G**.

6.3.3.6 Serious and Irreversible Impacts

No threatened ecological communities listed under the BC Act occur within the Modification Disturbance Footprint. Accordingly, no threatened flora Serious and Irreversible Impacts (SAII) entity will be affected by MOD 10.

No SAII flora species listed under the BC Act occurred within the Modification Disturbance Footprint. Accordingly, no threatened flora SAII entity will be affected by MOD 10.

No SAII fauna species listed under the BC Act occurred within the Modification Disturbance Footprint. Accordingly, no threatened fauna SAII entity will be affected by MOD 10.

6.3.3.7 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 development footprint or within retained areas. This includes impacts from activities related to the construction and / or operational phase of MOD 10. Indirect impacts associated with MOD 10 include:

- Inadvertent impacts on adjacent habitat or vegetation;
- Reduced viability of adjacent habitat due to noise, dust or light spill;
- Transport of weeds, pests and pathogens from the site to adjacent vegetation;
- Trampling of threatened flora species; and
- Increases fire risk.

Residual indirect impacts likely to occur on native vegetation, threatened entities and their habitat beyond the subject land is detailed in **Appendix G**. Residual indirect impacts are constrained to the extent of all PCTs with the likelihood and consequence ranging from negligible to moderate.

The increase of disturbance will not interfere with the conditions of consent as specified in SSD 09_0182 and will retain and protect native vegetation within the Vegetation Corridor as conditioned. Whilst MOD 10 is likely to increase noise, dust and light spill into areas of the Vegetation Corridor, it is unlikely to reduce the viability of these adjacent habitats.

6.3.3.8 Groundwater Dependent Ecosystem

Some areas of the alluvial plain have been identified as having a low potential for vegetation reliance on subsurface groundwater. The vegetation mapped within and immediately surrounding the Nagero Creek study area is assessed as having a low potential to be a GDE.

Previous assessments for the BCM and desktop analysis of regional vegetation mapping has confirmed the presence of five (5) PCTs and one exotic community within the Nagero Creeks study area. The dependence (or interaction) of these vegetation communities identified in the Nagero Creek study area was determined by aligning them with hydrological ecosystem types finding that one PCT, being PCT 101 Poplar Box – Yellow Box – Western Grey Box grassy woodland, was considered to have potential to be at least partially reliant on access to groundwater (phreatophytic vegetation) in the Nagero Creek Study Area. As stated in **Section 6.3.2.6**, given that timing of which Poplar Box Grassy Woodland on Alluvial Plains was listed under the EPBC, a precautionary approach was applied therefore assuming all remnant patches meet the EPBC Act listing. PCT 101 is a low potential terrestrial GDE which occurs on the low lying floodplain and within the upper reaches of the Nagero Creek. Given its classification as a low potential terrestrial GDE, it is not likely to be entirely dependent on groundwater, rather it is likely to be opportunistic in its use of groundwater resources.

Within the Nagero Creek study area, the depth to the groundwater table is estimated between 7 metres below ground level (mbgl) and 10 mbgl. Groundwater depth threshold of *Eucalyptus populnea* (i.e. Poplar Box) are known to be in the range of 12.6 mbgl to 26.6 mbgl. Poplar Box has a deep extensive taproot system which has previously been recorded to be at a maximum of 25 m below the surface where it accesses groundwater. Whilst Poplar Box would access soil water and perched aquifers, due to their potential for extensive tap roots, they are likely to proportionally use groundwater to fulfil their requirements. Therefore, the PCT 101 has been assessed to be a potential GDE due to it proportional dependence on groundwater.

The three (3) operating mines of the BTM Complex have the potential to induce cumulative impacts on the alluvial aquifer associated with the Nagero Creek study area. However, no mining induced effects to the alluvial groundwater system have been observed to date with groundwater modelling merely predicting potential alluvial drawdown only in the eastern fringes of the alluvial tongue directly south-west of BCM.

Drawdown in the alluvial tongue attributable to BCM is predicted to reach 1.3 m which is consistent with that currently approved. As such, no BCM specific incremental change in the alluvium attributable to MOD 10 is predicted.

Maximum cumulative drawdown predicted in the alluvium is generally less than 2 m for the currently approved BTM Complex and MOD 10. The predicted drawdown exceeds 2 m in a small proportion of the alluvial tongue that is directly south-west of BCM, where a maximum drawdown of 5.1 m is predicted at the very fringes of the alluvium. Drawdown directly attributable to BCM (including MOD 10) in this area reaches a maximum of 1.3 m. A maximum cumulative drawdown of 3.8 m is predicted in areas near PCT 599 along Nagero Creek, and moving away from the BCM, to the south-west of the Nagero Creek study area, a maximum drawdown of 0.7 m is predicted in the alluvium near patches of field verified PCT 101. The incremental drawdown as a result of MOD 10 alone would be small.

6.3.3.8.1 Potential Impacts to GDE's

The Nagero Creek study area has been historically modified for agriculture and much of its original vegetation (canopy and shrub layers) has been removed. However, one remnant native vegetation community recorded on the alluvial plain (being PCT 101) was considered to have at least a partial dependency on groundwater with several patches of PCT 101 in the Nagero Creek study area corresponding with the Poplar Box Grassy Woodland on Alluvial Plains TEC.

Groundwater forms only part of the overall water balance for many terrestrial plants with vegetation typically using shallow soil water first before seeking groundwater. Where soil water is insufficient, plants capable of accessing groundwater will become increasingly dependent on that water source. However, those GDE's that rely solely on groundwater are at risk from water level fluctuations due to roots being distributed just above the water table in the vadose zone (the unsaturated zone above the water table). Poplar Box trees have a dual (dimorphic) root system, with lateral roots that are close to the surface, and a taproot that penetrates deep in the soil in which enables this vegetation to source water from multiple sources. As such, their reliance and use of groundwater are potentially facultative (optional).

The predicted maximum cumulative groundwater drawdown impacts beneath potential high priority GDE's includes:

- Up to 3.8 m of cumulative drawdown in the alluvium underlying terrestrial GDEs adjacent to a small section of the lower reaches of Goonbri Creek adjacent to mining at TCM;
- Less than 1 m of cumulative drawdown in the alluvium underlying terrestrial GDEs along Goonbri Creek away from mining at TCM.
- Between 3.8 m and 11.9 m of cumulative drawdown in the water table underlying terrestrial GDEs in the mid to upper reaches of Goonbri Creek.
- Up to 43 m of cumulative groundwater drawdown in the water table underlying GDEs adjacent to Back Creek.
- Up to 0.3 m cumulative drawdown in the alluvium underlying GDEs associated with Maules Creek.

Patches of PCT 101 occurring in the Nagero Creek study area were subject to an analysis of leaf green index and correlated with climate data (see **Appendix H**). This analysis indicated that PCT 101 was reliant on soil moisture. However, PCT 101 occurring within the Nagero Creek study area typically occurred where groundwater levels are around 10 mbgl. Therefore a connection with sub-surface water cannot be discounted and this community has the potential to be impacted by groundwater drawdown. Cumulative drawdown predicted in the alluvium of the Nagero Creek study area that may affect this terrestrial GDE is less than 1 m for current approved mining and MOD 10. Therefore, it is not likely that this potential terrestrial GDE would be substantially impacted by the modelled groundwater drawdown in the alluvium.

Further details on the assessment of potential impacts on GDEs is provided in **Appendix H**.

6.3.3.8.2 Updated Vegetation Survey in Bollol and Goonbri Creeks

Following recommendations from the Independent Exert Scientific Committee (IESC) over the MOD 8 modification application, an assessment of community composition, canopy cover, and tree condition was completed in accessible locations of potential GDE's located in Bollol Creek and Goonbri Creek. This work was undertaken to determine whether populations had been altered since the commencement of mining operations in the BTM Complex and to develop a contemporary baseline which to assess for potential impacts to GDE's. As such, four (4) vegetation integrity plots were completed, recording one terrestrial PCT along Bollol Creek and Goonbri Creek. The vegetation community conformed to PCT 112 Black Tea-tree – River Oak – Wilga riparian low forest/shrubland wetland and was assessed to be in moderate condition.

Historical field based survey and recent sampling has identified emergent tress including *Angophora floribunda* (Rough-barked Apple) and *Eucalyptus blakelyi* (Blakely's Red Gum) along creeks, with dense shrub layers of *Melaleuca bracteata* (Black Tea-tree) and *Geijera parviflora* (Wilga) present. However, groundcovers have remained generally consistent over time. Similarly, a wide range of exotic species are associated with the PCT along Goonbri Creek and Bollol Creek owing to the favourable fertile alluvial soils where this community occurs. Previous sampling from 2022 indicated that *Melaleuca bracteata* (Black Tea-tree) trees are in good condition with no dieback or dead trees present in either Goonbri Creek or Bollol Creek. Consequently, changes in PCT 112 are not likely to have occurred since the commencement of the BCM. Furthermore, analysis of leaf green index of high potential terrestrial GDE's along Goonbri and Bollol Creek indicate reliance on surface and soil moisture rather than groundwater.

6.3.3.8.3 Matters of National Environmental Significance

Eight (8) TECs listed under the EPBC Act were predicted to occur in the regional study area. Of these, four (4) are known to occur in the regional study area (see **Table 21**).

Table 21 Threatened ecological communities known to occur in the regional study area

Threatened Ecological Community	EPBC Act status	Recorded in the study area.
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Yes – recorded in the regional study area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Yes – recorded in Nagero Creek study area and regional study area
Weeping Myall Woodlands	Endangered	Yes – recorded in the regional study area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Yes – recorded in Nagero Creek study area and regional study area

An assessment of vegetation occurring in the Nagero Creek study area identified the presence of one remnant native vegetation community on the alluvial plain that may have a partial dependency on groundwater, being PCT 101 Poplar Box – Yellow Box – Western Grey Box grassy woodland. Field validation confirmed that several patches met the key diagnostic criteria and condition thresholds, and therefore met the EPBC Act listing for the Poplar Box Grassy Woodland on Alluvial Plains TEC.

No BCM specific incremental impact in the Nagero Creek alluvium is predicted for MOD 10. Predicted cumulative drawdown within the Nagero Creek study area affecting this terrestrial GDE is predicted to reach a maximum of 0.7 m for both the current approved mining and MOD 10.

An Assessment of Significance has been completed to assess the predicted groundwater drawdown impacts associated with MOD 10 on Poplar Box Grassy Woodland on Alluvial Plains TEC listed under the EPBC Act. This Assessment of Significance concluded that any cumulative impact on this TEC within the Nagero Creek study area is likely to be negligible and not result in a significant impact.

6.3.3.9 Biodiversity Impact Comparison

Table 22 presents the impacts to biodiversity values associated with MOD 10 in comparison to MOD 7 (being the original SSD approval) and the currently approved operations under SSD 09_0182 (i.e. the incremental impacts approved under MOD 8, MOD 9 and MOD 11).

Table 22 Biodiversity Impact Comparison

Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
› 2,047 ha of disturbance	› No change. All additional mining operations, Pre-Shift Infrastructure, workshop extension etc were proposed within the approved disturbance boundary for BCM.	› Additional 85 ha of disturbance (increase of disturbance by approximately 4% from MOD 7 to 2,132 ha).

Table 22 above demonstrates that there will be a 4% increase in ground disturbance for MOD 10 when compared to the original approval (MOD 7). This is a relatively minor increase to the total disturbance footprint of the BCM. The disturbance will occur to vegetation communities which are located within and surrounding the BCM Project Boundary and within the BCM biodiversity offset strategy which will be adjusted as required for MOD 10. Accordingly, the development footprint is substantially the same as that currently approved.

6.3.4 Mitigation and Management

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

- *Biodiversity Management Plan* (BMP) (BCOPL, 2018);
- *Boggabri Coal Mine Biodiversity Offset Strategy* (BOS) (WSP, 2018);
- *Rehabilitation Management Plan* (RMP) (BCOPL, 2024); and
- *Rehabilitation Strategy* (BCOPL, 2024).

The following mitigation management measures which are currently in place for BCM will be implemented for MOD 10:

- Ensuring that all relevant personnel (including sub-contractors) are trained on biodiversity management protocols and the requirements for MOD 10 through inductions, toolbox talks, targeted training and are provided with clearing boundaries and exclusion zones;
- Tree clearing and habitat removal will be undertaken in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in the approved BMP;

- The Nest Box Management Plan will be implemented for the creation of nest boxes or other hollow creation methods to provide alternative roosting and / or nesting habitat for threatened fauna in accordance with the approved BMP and associated *Appendix B – Clearing and fauna management procedure*;
- Rehabilitation of the Modification Disturbance Footprint will be completed in accordance with the approved RMP and BMP;
- Lighting design will be in accordance with the *National Light Pollution Guidelines for Wildlife* (DEE, 2020) (where it does not affect mine safety) to ensure that light spill into adjacent habitats is minimised;
- Noise or daily / seasonal timing of construction and operational activities to reduce noise related impacts will be managed in accordance with the approved Biodiversity Management Plan;
- Dust controls will be implemented as per the BCM's existing operation to ensure indicated dust impacts to adjacent habitats are minimised;
- Weeds and pest species will be managed in accordance with *Appendix C – Weed and Pest Management Strategy* as detailed in the approved BMP and Biodiversity Corridor Plan;
- Sediment and erosion control will be implemented in accordance with the approved *Surface Water Management Plan* (SWMP) (BCOPL, 2024) and the exiting vegetation monitoring program (as described in Section 5 of the approved SWMP) will be used to identify changes to stream and riparian conditions of the Nagero Creek and Namoi River;
- The existing vegetation monitoring program as described in Section 4.1.8 of the approved *Groundwater Management Plan* (GWMP) (BCOPL, 2017) will be used to monitor drawdown from the BCM mining operation and to determine any adverse impacts to potential terrestrial GDEs associated with the Nagero Creek.; and
- Appropriate speed limits for unformed access roads located adjacent to remnant habitat will be implemented in accordance with onsite management measures as per the requirements of the Mining Lease.

The above management measures are further outlined in **Appendix G**.

6.3.4.1.1 Adaptive Management Strategy for Uncertain Impacts

BCM currently implements four (4) biodiversity monitoring programs to monitor the potential impacts of mining operations on the Leard State Forest and the adjacent Nagero Creek and Namoi River floodplain. These monitoring programs include the following:

- Leard State Forest biodiversity monitoring program (Section 7.1.1 of the BMP);
- Vegetation corridor monitoring (Section 7.1.2 of the BMP);
- Stream and riparian vegetation monitoring (BCOPL, 2024) (WSP, 2018); and
- Terrestrial groundwater dependent ecosystem monitoring (BCOPL, 2017).

The implementation of these programs will continue for MOD 10 and will continue to allow for the identification of potential mine precinct impacts through the sampling of biological variables.

6.3.4.1.2 Biodiversity Offset Strategy

Biodiversity offset calculations for MOD 10 were developed following the completion of ecological field surveys. These estimates were determined using the BAM-C.

Table 23 outlines the impacts of MOD 10 that require offsetting via the application of ecosystem credits. **Table 24** identifies the impacts on threatened species (species credit species).

Table 23 Impacts that Require an Offset - Ecosystem Credits

PCT Name	Condition	TEC	Impact area (ha)	Number of ecosystem credits required
PCT 462 Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	Moderate	No	16.35	394
PCT 531 Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion	Moderate	No	7.32	172
PCT 588 White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	Moderate	No	3.59	71
PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	High	No	51.51	1,258
PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	Moderate	No	5.71	148
Total Credits				**2,043**

Table 24 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
Tylophora linearis	*Tylophora linearis*	Vulnerable	Endangered	1.29	45
Scant Pomaderris	*Pomaderris queenslandica*	Endangered	Not Listed	0.5 ha	20
Koala	*Phascolarctos cinereus*	Endangered	Endangered	84.48	3,048
Squirrel Glider	*Petaurus norfolcensis*	Vulnerable	Not Listed	84.48	3,048

Common name	Scientific name	BC Act status	EPBC Act status	Estimated species polygon (ha)	Number of species credits required
Pale-headed Snake	*Hoplocephalus bitorquatus*	Vulnerable	Not Listed	84.48	3,048
Total Credits					**9,209**

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

MOD 10 has been estimated to have an ecosystem credit liability of approximately 2,043 ecosystem credits. Given the quality of vegetation within these areas, the entirety of the MOD 10 ecosystem credit liability is comprised of hollow bearing tree credits. Surveys have also confirmed the presence of five (5) species credit species requiring offsets in accordance with the BAM and BOS. It is estimated that the combined species credit liability for MOD 10 is approximately 9,209 species credits.

BCMs existing BOAs are managed under the current BCM BOS and are conserved in perpetuity under CA's or via dedication to National Parks and Wildlife Services. As such, there are no surplus BAM credits available to satisfy all or part of the MOD 10 offset liability. Given this, the mechanisms available to BCOPL to fulfil the MOD 10 offset obligation under the BOS include:

- Retirement of credits generated via the establishment of a Biodiversity Stewardship Agreement (BSA) or existing credits available for purchase off the open market;
- Direct payment into the Biodiversity Conservation Trust (BCT) Biodiversity Conservation Fund (BCF); or
- Funding of biodiversity conservation actions in accordance with Clause 6.5 of the *Biodiversity Conservation Regulation 2017* (capped at 10% of the offset requirement).

BCOPL is investigating these options to determine the preferred approach and will keep DPHI informed over the status of these investigations throughout the Government assessment process.

6.3.4.2 Groundwater Dependent Ecosystems

Terrestrial GDE monitoring programs being implemented by BCOPL are detailed in the WMP and associated GWMP and SWMP. The monitoring program was established in 2018 and seeks to monitor baseline conditions of the stream and riparian vegetation, health of terrestrial vegetation and the presence and diversity of stygofauna within the Namoi River alluvial aquifer. Given that modelling has found there will be no incremental drawdown as a result of MOD 10, no additional monitoring measures are required. Accordingly, these existing monitoring programs will continue to be implemented. If monitoring identifies impacts to GDEs are as a result of BCM's operations, rehabilitation of these affected areas will be considered.

6.4 GROUNDWATER

6.4.1 Background

A Groundwater Impact Assessment (GIA) was undertaken for MOD 10 by Australasian Groundwater and Environmental Consultants (AGE). The GIA is provided in **Appendix I** and a summary is included in the following sections.

The purpose of the GIA was to assess the cumulative and incremental impacts of the mine plan changes associated with MOD 10 on the regional groundwater regime in accordance with the requirements of NSW and Federal government legislation and policies. The objective of the groundwater study is to assess the types of impacts, the likelihood of impacts, and the magnitude of environmental risk to the groundwater regime posed by MOD 10. The GIA also addressed the potential cumulative impacts to the regional groundwater regime as a result of MOD 10, in conjunction with mining within the BTM Complex and other hydrological stresses within the region.

6.4.1.1 BTM Complex Numerical Model

AGE was commissioned by WHC (on behalf of the BTM Complex) in early 2024 to complete a revision to the BTM Complex Numerical Model to address the requirements of relevant approval conditions for BCM, MCCM and TCM to verify the groundwater model. As the BTM Complex Numerical Model is a regional model that has been calibrated to the latest information for the three (3) mines, BCOPL decided that the GIA for MOD 10 would utilise to predict the likely impacts on the regional groundwater regime. The updated BTM Complex Numerical Model was utilised to assess the impacts of MOD 10 on the identified Quantities of Interest (QoIs) and to satisfy State and Commonwealth regulatory requirements.

A further detailed description of the setup and assumptions used in the BTM Complex numerical modelling utilised for MOD 10 is provided in **Appendix I**.

6.4.1.2 Regional Setting and Stratigraphy

BCM is located within the Maules Creek Sub-basin, part of the larger Gunnedah Basin. The Maules Creek Sub-basin is bounded to the west by the north-south trending volcanic Boggabri Ridge and to the east by the Mooki Thrust Fault System. BCM is situated east of the Boggabri Ridge at the western edge of the Maules Creek Sub-basin, where coal seams are close the surface and are, therefore suitable for open cut mining.

6.4.1.3 Local Geology

There are four (4) general hydrogeological systems across the BCM and surrounding area. These generally include:

- Two (2) Quaternary alluvial groundwater systems, including:
  - Narrabri formation; and
  - Gunnedah formation.
- A Permian groundwater system of the Maules Creek Formation; and
- A later Carboniferous / early Permian groundwater system of the Boggabri Volcanics.

Local outcrops associated with tertiary volcanic intrusions (whilst not extensive in the area) have also been mapped in the local area (e.g. Goonbri Mountain located to the east of TCM) and dykes are also known to be present within the BTM Complex (however are a relatively minor component of the overall geology within the BTM Complex).

6.4.1.3.1 Quaternary Alluvium

Alluvial plains surround the mined Permian outcrop. These include the:

- Maules Creek alluvium to the north of BCM;
- Bollol, Driggle Draggle and Barneys Spring Creek alluvium to the south of BCM;
- Nagero Creek alluvium (a relatively minor flood plain) immediately southwest of BCM; and
- Namoi River alluvium to the west of BCM.

The alluvium is typically divided vertically into two (2) geological units, namely the Narrabri Formation at the surface and the underlying Gunnedah Formation. This distinction characterises differences in alluvial sediments such that:

- The Narrabri Formation forms the surficial cover and comprises extensive overbank clays, with lesser channel sands and gravels, deposited by leveed meandering streams; and
- The underlying Gunnedah Formation which fills the main paleochannel floors and consists of moderately well sorted sands and gravels, with interbedded clays, deposited by braided streams.

The alluvium is generally thickest within the main Namoi River alluvial plain (often more than 100 m), thinning towards the edges of the plain and along the tributaries. The alluvium is thickest where the Gunnedah Formation is present, indicating the presence of palaeochannels. The Nagero Creek alluvium in proximity to the BCM ranges in thickness from 20 m to 40 m.

6.4.1.3.2 Permian Maules Creek Formation

The Permian Maules Creek Formation is a thick sequence of interbedded coarse-grained conglomerate, sandstone, mudstone and coal. Mining activities are limited to the extraction of high-quality coal seams within the Maules Creek Formation, with the underlying Leard Formation only containing a few minor coal seams generally of poor quality. Relatively thick sequences of interburden separate coal seams and are predominantly comprised of cemented conglomerate, with less frequent layers of sandstone and siltstone.

The Maules Creek Formation sediments typically dip to the east (by approximately 2° to 5°), with the dip being steepest in the west near the Boggabri Volcanics. As the sequence levels out, the formation thickens reaching a maximum thickness of between 745 m and 1,135 m close to the Mooki Thrust Fault System. Coal measures at the western edge of the Maules Creek Sub-basin either onlap onto the Boggabri Volcanics, or subcrop beneath the regolith or alluvium.

6.4.1.3.3 Leard Formation

The Lower Permian Leard Formation is the basal unit in the Gunnedah Basin sequence, resting unconformably on the weathered volcanic basement. This formation is typically 12 m to 18 m thick (maximum 32 m), and consists of buff-coloured kaolinised pelletoidal claystone, conglomerate, sandstone, and siltstone, often interbedded with coal. Clasts within the strata are kaolinite clay pellets generally less than 25 mm in diameter. Many of the colluvial deposits in the Leard Formation are derived from the weathering of the basal volcanic rocks.

6.4.1.3.4 Boggabri Volcanics

The silicic Boggabri volcanics form the western boundary of the Maules Creek Sub-basin. Since its formation during the late Carboniferous / early Permian, the volcanics has been subject to extensive erosion and weathering. This has ultimately resulted in an irregular paleo-topography onto which the sediments of the Maules Creek Formation were deposited.

The Boggabri Volcanics outcrop to the west of the BCM. The eastern flank dips steeply to the east with coal seams stratigraphically lower than the Jeralong seam onlapping the volcanics in the vicinity of the BCM. Coal seams lower than the Nagero intercalate with the Pelletoidal claystones of the Leard formation, which in conformably overlies the Boggabri volcanics at depth.

6.4.1.4 Structural Geology

6.4.1.4.1 Hunter-Mooki thrust fault system

The Gunnedah Basin is bounded to the east by the Hunter-Mooki Thrust Fault, which separates it from the New England Fold Belt. This fault exhibits both compressional and left-lateral strike-slip movement and extends along the eastern boundary of both the Sydney and Gunnedah basins. Additional sub-parallel faults perpendicular to the Hunter-Mooki Thrust have been revealed by historic Regional Transient Electromagnetic data and have tentatively been identified with vertical throws ranging from 20 m to 50 m.

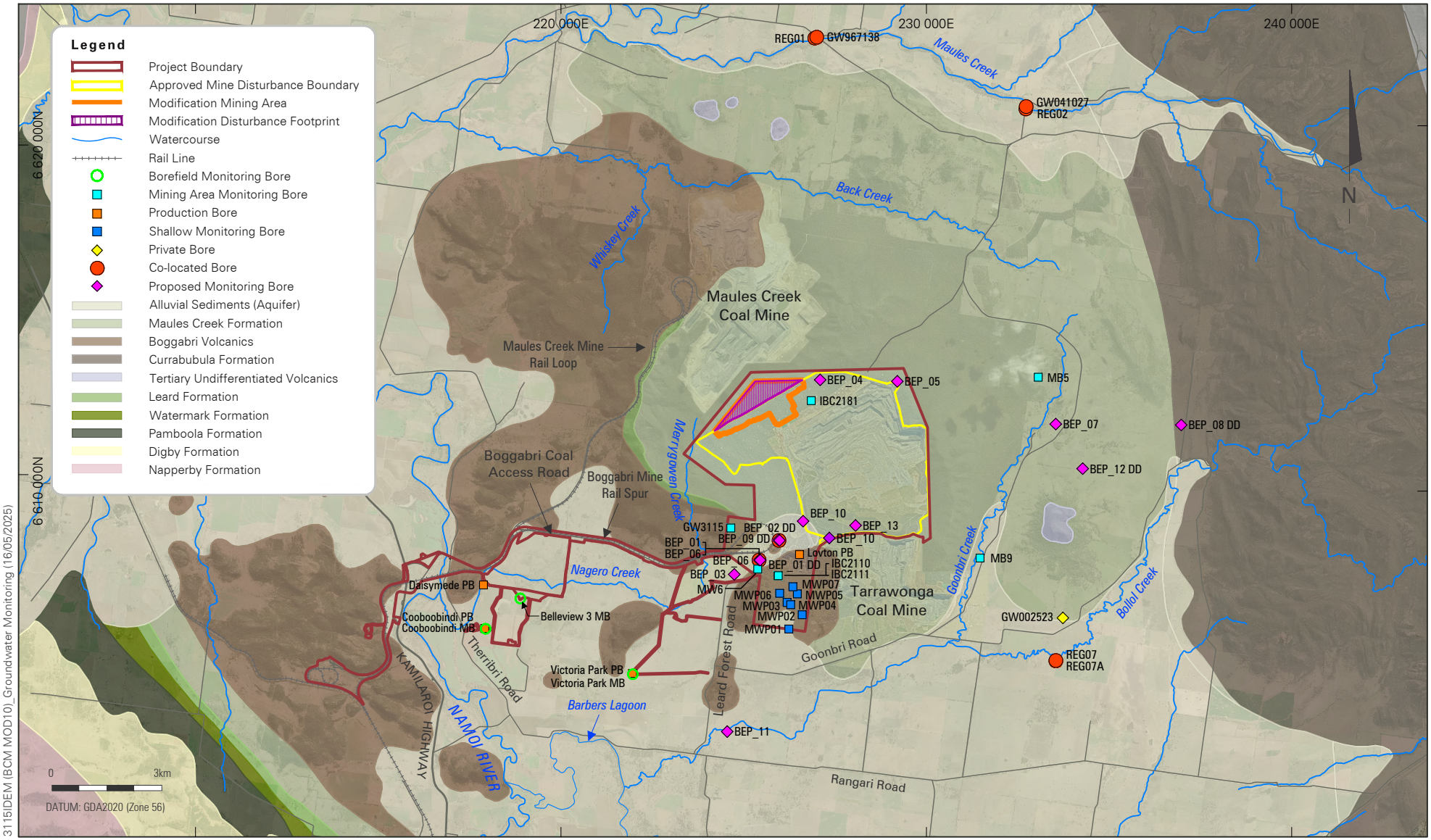
6.4.1.4.2 Conomos Fault

The Conomos Fault strikes north-west to south-east (~300 degrees) with a reported displacement of ranging from 60 m to 100 m. Previous versions of the TCM geological model which extend beyond the inferred location of the Conomos Fault, confirms its presence. The Conomos Fault was most recently considered in MOD 8 as a combined conduit barrier.

6.4.1.5 Groundwater Monitoring Network

Groundwater levels and quality are monitored at BCM via a network of standpipe (SP) monitoring bores and vibrating wire piezometers (VWP). Additionally, there is a network, the 'REG' series bores, installed further from the mining areas to detect any cumulative impacts from the BTM Complex. The BTM Complex monitoring network includes bores installed in the alluvium, Maules Creek Formation and the Boggabri Volcanics.

Monitoring at BCM focusses on the primary Qols including the monitoring of drawdown and water quality in the Nagero Creek, Bollol Creek, Goonbri Creek alluvial systems, and propagation of drawdown to the east towards the Namoi alluvium. The existing and proposed BCM groundwater monitoring regime is shown in **Figure 19**.



3115IDEM (BCM MOD10)_Groundwater Monitoring (16/05/2025)

BOGGABRI COAL MINE MODIFICATION

Surface Geology and Groundwater Monitoring Locations

FIGURE 19

A program for the installation of additional groundwater monitoring bores (BEP) commenced in 2024, and is continuing into 2025. The purpose of this is to meet MOD 8 approval commitments and also to expand the existing groundwater monitoring network to replace those bores destroyed during the progression of mining and to understand groundwater impacts down to the Templemore Seam. The bores committed to be drilled as part of the MOD 8 commitments have recently been finalised.

Additional bores required to expand the existing network are proposed, however have not yet been installed to date. Bores installed in 2024 and early 2025 include BEP_01, BEP_02, BEP_03, BEP_04, BEP_05, BEP_06 and BEP_11. **Table 25** provides the rationale for each planned installation. Information relating to the planned locations, depths and formations is provided in **Appendix I**.

Table 25 'BEP' groundwater monitoring bores

Location ID	Rationale	Type of Monitoring and Geology
BEP_01*	Monitoring in Nagero Creek alluvium, which is consistent with MOD 8 commitments. Bores adjacent to mapped Poplar Box Woodland.	2 x Standpipes (SP) in alluvium
BEP_02	Monitoring in Nagero Creek alluvium, which is consistent with MOD 8 commitments.	1 x SP in alluvium
BEP_03*	Monitoring in downstream Nagero Creek alluvium, which is consistent with MOD 8 commitments.	1 x SP in alluvium
BEP_04*	Partially replaces mined out 'IBC' series of bores. Allows for the collection of groundwater level/quality data in the deeper seams that are targeted by MOD 8 and MOD 10.	3 x SPs in Templemore, Nagero, and Merriown seams
BEP_05*	BCM specific monitoring of groundwater levels in the deeper seams that are targeted by the MOD 8 Amendment. Records of the expected coal seam depressurisation as mining progresses will improve the calibration of future updates to the numerical groundwater model.	VWP – 4 x sensors in Templemore, Tarrawonga, Nagero, and Merriown seams
BEP_06	Assessment of potential impacts propagating to the west through the volcanics. Consistent with AGE (2019) recommendations.	VWP – 3 x sensors in Boggabri Volcanics
BEP_07	Long term monitoring in deep to shallow Permian coal seams. Assessment of impact propagation towards Goonbri Creek and Bollol Creek. Consistent with AGE (2019) recommendations.	VWP – 4 x sensors in Templemore, Nagero, and Merriown, and Braymont seams
BEP_08	Assessment of lithology and water pressures east of the mapped Mooki thrust fault. Appreciation of fault behaviour in line with IESC guidance. Consistent with AGE (2019) recommendations.	1 x SP on eastern side of Mooki Thrust Fault
BEP_09	In line with IESC guidance, assessment of the Conomos Faults role in the hydrogeological regime. Also, further afield monitoring of potential impact propagation. Relative to AGE (2019), position moved so that monitoring point is now closer to active mining and nearer the Conomos fault (500 m).	VWP – 3 x sensors in Nagero, Merriown, and Jeralong 1 x SP in alluvium

Location ID	Rationale	Type of Monitoring and Geology
BEP_10	In line with IESC guidance, assessment of the Conomos Faults role in the hydrogeological regime. Also, further afield monitoring of potential impact propagation.	VWP – 3 x sensors in Nagero, Merriown, and Jeralong 1 x SP in alluvium
BEP_11*	Monitoring of groundwater levels and groundwater quality in a downstream portion of Bollol Creek where cumulative impacts are predicted and where there is some evidence that the water table may be close to the surface.	1 x SP in alluvium
BEP_12	Coal seam monitoring bore for verification of existing VWP data as per NSW Department of Natural Resources Access Regulator (NRAR) requests.	1 x SP in Braymont seam

*Notes: *bores installed in 2024*

Prior to the commencement of BCM, a baseline groundwater assessment was completed which included the installation of monitoring bores, permeability testing, and groundwater modelling for the first six (6) years of the mine life. This project included the installation of the thirteen 'IBC' series bores around the mining area for the purpose of targeting coal seams between the Braymont and Merriown seams, as well as the volcanic basement. The majority of these bores are located within the approved Mine Distruabnce Boundary and have been destroyed due to the progression of mining operations. Notwithstanding, two (2) active bores remain including IBC2110 and IBC2111.

BCOPL has also installed three (3) additional 'MB' monitoring sites in late 2018 as part of groundwater management plan commitments. These sites comprised of two (2) VWPs (MB5 and MB9) installed into the interburden / Merriown Seam and a single adjacent monitoring bore (MB9A) installed into alluvium.

The 'REG' series bores were installed to measure cumulative effects of all mining in the BTM complex. The cumulative monitoring 'REG' series consists of nine (9) SP bores: three (3) installed in the alluvium and six (6) in the Boggabri Volcanics. Additionally, there are six (6) multi-level VWPs with sensors installed in the Jeralong, Merriown, Nagero, Therribri, Braymount, Upper Northam and the fault zone.

WaterNSW maintain a network of monitoring bores within the Namoi Valley alluvium that surrounds the BCM. The purpose of these bores is to monitor groundwater levels and quality within the Narrabri and Gunnedah Formations. A long record of groundwater level trends is available given the WaterNSW routine monitoring of some of these bores since the mid-1970's. Several of these WaterNSW bores have telemetered electronic water level loggers, with real time datasets available online.

TCM and MCCM also have a network of monitoring bores managed by each mine.

6.4.2 Methodology

6.4.2.1 MOD 10 Work Program

The objective of the GIA was to assess the types and likelihood of impacts, as well as the magnitude of environmental risk to the groundwater regime as a result of MOD 10. To achieve this objective, a scope of works was developed that comprised the following:

- Stage 1 – Data review and gap analysis;
- Stage 2 – Data collection;
- Stage 3 – Conceptual model;

- Stage 4 – Numerical model;
- Stage 5 – Impact and risk assessment; and
- Stage 6 – Mitigation, management and monitoring.

Stages 1 to 4 were subject to the work program completed by AGE for WHC (on behalf of the BTM Complex). Once the BTM Complex Numerical Model had been developed and calibrated, it was then handed over to separate teams to utilise the model to predict impacts of changes to the groundwater regime as a result of MOD 10 mine plans.

During Stage 1, a review of the available datasets was conducted, revealing gaps in the understanding and monitoring of the groundwater regime. A data collection program was initiated to address these identified gaps. Stage 2 involved planning additional groundwater monitoring bores to fulfil prior commitments from MOD 8 and to provide supplementary data for model updates. Drilling and installation of monitoring bores were carried out concurrently with the model updates. The existing and new data collected during Stage 2, available at the time, were used to update the conceptual model of the groundwater regime in Stage 3. In Stage 4, the numerical model (BTM Complex numerical model) was updated according to the scheduled update as discussed previously. Predictions from the BTM Complex numerical model were then used to evaluate the nature and magnitude of risks in Stage 5, with mitigation and management addressed in Stage 6.

6.4.2.2 Conceptual Groundwater Model

The objective of the conceptual model is to describe how water enters, moves through and exits the model area as well as how groundwater interacts with surface water and other water-dependent features. The conceptual model consists of the following elements:

- Hydrogeological domain;
- Hydrostratigraphic units;
- Hydraulic (aquifer and aquitard) properties;
- Geological structures and boundary conditions;
- Groundwater levels and flow directions;
- Groundwater surface water interaction;
- Groundwater recharge, discharge, and conceptual water balance;
- Groundwater quality;
- Environmental receptors; and
- Overview Conceptual Hydrogeological Model.

Detailed descriptions of these model elements are provided in **Appendix I**.

The BTM Complex numerical model consists of a 3-D groundwater flow model developed using MODFLOW-USG. The model is approximately 30 km wide in an east to west direction, and 28 km long to the north and south. The spatial scale refers to the models representation of the coal measures of the Maules Creek sub-basin, extending to the eastern boundary with the New England Fold Belt, the underlying volcanic basement and the overlying alluvial groundwater systems associated with the Nami River, Maules Creek and Bollol Creek. The model also represents the regional structures, including the Conomos Fault.

The model consists of 34 layers each of which comprises up to 18,920 cells per layer. Accordingly, the model is considered spatially large and complex. Systems stresses represented by this model include:

- Zones of spatially varying diffuse rainfall recharge and recharge through porous creek beds;
- Flow of groundwater to ephemeral creeks as baseflow where the water table intersects the creek bed;
- Dynamic interaction between alluvial aquifers and the surface water systems of the Namoi River;
- Evapotranspiration of groundwater when the water table rises to within 2 m of the land surface;

- Abstraction of groundwater from registered irrigation water supply bores installed within the Namoi valley alluvial aquifer; and
- Incidental interception of groundwater associated with approved mining activities within the BTM complex.

A history matching process was used to determine the optimal hydraulic properties to assign to each of the 34 layers in the numerical model with parameter estimation software subsequently used to automate the adjustment of hydraulic properties and recharge rates, thereby replicating water level observations from the BTM Complex groundwater monitoring network as closely as possible. The model was then used to simulate the influence of the approved and proposed mining within the BTM Complex from the commencement of mining in 2006 to the proposed cessation of mining activities in the BTM Complex (i.e. 2045). A post-mining period was also included to simulate recovery in the groundwater regime over 200 years from 2045 to 2245.

Predictions for the approved and proposed mining scenarios were used to assess the impacts of mining activities on the groundwater regime in comparison to the NSW Aquifer Interference Policy (AIP) minimal impact considerations. These scenarios considered both the currently approved and proposed mining operations, enabling the improved apportionment of impacts to QoIs from each mine. The uncertainty in model predictions and associated model parameters was assessed to consider the risks to the QoIs, primarily the water supply bores in the alluvial aquifer (Namoi River) and high-priority GDE's in the Nagero Creek.

6.4.2.3 Uncertainty Analysis

An uncertainty analysis was undertaken for MOD 10 to determine the magnitude of uncertainty associated with the numerical model predictions. For this analysis, the IESC Explanatory Note on Uncertainty Analysis for groundwater modelling (Peeters and Middlemis, 2023) was adopted as best practice.

Two (2) methods were followed to implement the uncertainty analysis in accordance with the IESC guidelines including:

1. A constrained Monte-Carlo approach which was used to produce spatial drawdown probability surfaces of the water table; and
2. A Data Space Inversion (DSI) which was used to assess uncertainty in value predictions of maximum drawdown at receptors, mine inflow across all mine sites, and cumulative water take from the alluvial zones identified in the WSPs.

These two (2) approaches were required as DSI relies on a surrogate and is therefore unable to provide a spatial distribution of drawdown to create a probability surface. DSI was the primary approach for the MOD 10 uncertainty analysis as it is less prone to the deleterious effects of information loss and / or corruption that can potentially accompany a complex groundwater model. The application of both methods are fully supported by the IESC Explanatory Note on uncertainty analysis for groundwater modelling (Peeters and Middlemis, 2023).

Appendix I presents further technical details on the uncertainty analysis and extended results for the BTM Complex numerical groundwater model.

6.4.2.4 Independent Peer Review

The BTM Complex model has historically been subject to various reviews and updates since its adoption. The purpose of the three (3) yearly reviews aim to validate and update the BTM Complex model with the latest monitoring information and mining progressions.

This revision to the BTM Complex model has been independently and progressively peer reviewed throughout the work program by Dr Noel Merrick from HydroAlgorithmics. Dr Merrick has expertise in groundwater modelling and coal mining in NSW and has previously been involved in the independent peer review of previous versions of the BTM Complex groundwater model.

An independent peer review of the MOD 10 GIA and its use of the BTM Complex model was also completed by Dr Merrick. The associated peer review report is contained within **Appendix I**.

6.4.3 Assessment of Impacts

6.4.3.1 Groundwater Inflows

Differences in the predicted groundwater inflows between the approved and proposed mining scenarios are minimal with key differences attributed to the changes in mine progression and overall depth of mining at the BCM.

The maximum annual inflows at BCM under the approved scenario is 581 ML/yr (in Year 2025), with the inflows anticipated to peak at 613 ML/yr (in Year 2025) under the proposed MOD 10 scenario. From 2037 to 2040 (i.e. when mining is proposed to continue beyond the approved operations at BCM), the maximum inflows will peak at 189 ML/yr in 2040. BCM inflows are anticipated to increase from 2035 as dewatering from the surrounding mines within the BTM Complex cease in line with their approved mine life. As such, the peak in groundwater inflows recorded that are in 2036 (298 ML/yr) are likely attributed with the end of approved mining operations at MCCM.

6.4.3.2 Drawdown and Depressurisation

6.4.3.2.1 Heads and Flow Direction

Predicted drawdown is the most significant at the end of mining. This predicted drawdown slowly recovers post-mining when dewatering of the mining area ceases. However, this recovery does not reverse the direction of the hydraulic gradients within the assessment period (100 years).

The key differences in the water table drawdown between the approved and proposed model scenarios relates to the reduction in the water table to the north of the currently approved mine within the BCM MOD 10 Modification Mining Area. Similarly, the area of the ridge separating BCM from the MCCM and controlling the flow direction between the two (2) mines is reduced in both the approved and proposed scenarios. Thus, groundwater flows towards the MCCM and BC mining areas, which act as sinks for the assessment period.

The regional east-to-west flow direction aligned with the alluvial aquifers remains largely unchanged through the operations and closure stages for both the approved and proposed mining scenarios. Changes in the water table are largely confined to the bedrock ridge area where mining is situated.

6.4.3.2.2 Cumulative Drawdown

Predictions of maximum drawdown for the alluvium, Merriown and Templemore Coal Seams, and the Boggabri Volcanics were assessed as part of the GIA.

Cumulative drawdown in the alluvium for both the approved and proposed mining scenarios is generally less than 2 m. The greatest drawdown predicted is located in the alluvial plains south of the TCM, within the Goonbri alluvium between TCM and Goonbri Creek, and the Nagero Creek alluvium immediately southwest of the BCM. The cumulative drawdown predicted in the Nagero Creek alluvium (closest to mapped GDEs) is 3.8 m. A small area at the fringes of the alluvium nearest to mining predicts a drawdown of up to 5.1 m. However, this is restricted to the very fringes of the alluvial tongue, where it extends into the currently approved Mine Disturbance Boundary.

The lateral extent of drawdown in the coal measures shows a minimal change between the approved and proposed mining scenarios. As such, drawdown within the Merriown Coal Seam shows little change in drawdown near to mining with a small increase in the area north of the Modification Mining Area.

Drawdown within the Templemore Coal Seam increases more significantly close to the Modification Mining Area. This is expected given the deepening of seams within the approved Mine Disturbance Boundary. Drawdown propagation to the south remains relatively unchanged, with an increase in drawdown to the north of the Modification Mining Area being more evident.

Differences in drawdown in the Boggabri Volcanics between the approved and proposed mining scenarios is minimal. A small increase in drawdown propagating to the west is predicted, at this point the drawdown reaches a maximum of 0.1 m.

6.4.3.2.3 BCM Specific Impact

Simulated maximum drawdown throughout the period of mining within the alluvium, Merriown and Templemore Coal Seams, and the Boggabri Volcanics were assessed as part of the GIA. Within the alluvium, drawdown (i.e. loss of saturated thickness) as a result of BCM operations (including MOD 10) is confined to a portion of the Nagero Creek alluvial tongue southwest of the BCM on BCOPL owned land. Drawdown within this portion of the alluvium attributable to BCM (including MOD 10) reaches a maximum of 1.3 m, consistent with the currently approved BCM drawdown values. No specific incremental impact for MOD 10 (compared to those currently approved) is predicted to occur within the Nagero Creek alluvium. When looking at the incremental BCM specific impact, a small area of drawdown is predicted to occur at the eastern edge of the Nagero Creek alluvial tongue. Incremental loss of saturation in the alluvium reaches a maximum of 0.3 m at the fringes of the alluvial tongue. The remainder of the incremental drawdown is approximately 0.1 m and is unlikely to be discernible from climate fluctuations.

BCM is currently approved to mine down to the Templemore Coal Seam within the approved Mine Disturbance Boundary. MOD 10 seeks the extraction of an additional 30 Mt (approximate) of ROM coal down to the Templemore Coal Seam within the Modification Mining Area, to the north of the Mine Disturbance Boundary. The small relative change in mining is reflected in the spatially constrained increase in drawdown in the Merriown Coal Seam, with the maximum drawdown in the Merriown Coal Seam located within the Modification Mining Area.

The lateral extent of drawdown is more pronounced in the Templemore Coal Seam, with a maximum drawdown of approximately 50 m predicted within the Modification Mining Area. This is anticipated given the Templemore Coal Seam is the target basal coal seam. Further east of the BCM, the incremental drawdown in the Templemore Coal Seam due to mining operations is mostly less than 5 m.

Predicted drawdown in the Boggabri Volcanics attributable to MOD 10 is expected to be between 10 m to 20 m, with up to 26 m of maximum drawdown within the Modification Mining Area. This is predominantly beneath the Modification Mining Area, with an additional 5 m incremental change predicted for the remainder of the area beneath the approved Mine Disturbance Boundary at BCM. Further east of the BCM, the incremental drawdown in the Boggabri Volcanics due to BCM mining operations is mostly less than 2 m.

6.4.3.3 Water Take and Water Licensing

Table 26 provides a summary of the estimated peak water take for MOD 10 and the total number of units held by BCOPL to account for incidental, passive and consumptive takes.

Table 26 Estimated Peak Water Take and Water Licenses

Water Sharing Plan	Water Source	Category of Water Take	Year	Predicted Peak Water Take (ML/yr)	WAL Units held by Proponent
NSW Murray Darling Basin Porous Rock Groundwater Sources	Gunnedah-Oxley Basin porous rock	Incidental take within pits	2025	479	842
Namoi Alluvial Groundwater Sources	Zone 4 alluvium	Passive indirect take	2026	144	1,028
Namoi Alluvial Groundwater Sources	Zone 5 alluvium	Passive indirect take	-	n/a	-
Namoi Alluvial Groundwater Sources	Zone 11 alluvium	Passive indirect take	2040	22	20

Table 26 indicates that despite existing WAL units covering predicted water takes from the majority of water sources, BCOPL currently do not hold sufficient WAL units to account for the predicted water takes in the Zone 11 alluvium anticipated in 2040. As such, in the event that future modelling predictions confirm this water take will eventuate, BCOPL may need to secure an additional 2 units of WAL to account for this predicted water take beyond its current allocation.

6.4.3.4 Impact on Water Supply Bores and Groundwater Users

For water supply bores installed within the highly productive alluvial water sources (such as the Nagero Creek and Bollol Creek alluvium), the Level 1 minimal impact consideration threshold is stated in the AIP as "a maximum of a 2 m decline cumulatively at any water supply bore".

Drawdown is not predicted to exceed the AIP minimal impact considerations Level 1 threshold of 2 m within the highly productive alluvium at the site of any know water supply bore for both the approved and proposed mining scenarios.

It should be noted that the GIA has identified six (6) privately owned bores within the Maules Creek Formation and Boggabri Volcanics which are predicted to experience more than a 2 m drawdown as a result of approved mining operations within the BTM Complex as well as the operations proposed by MOD 10. The predicted maximum drawdown between the approved and proposed mining scenarios is similar, with no additional private water supply bores being identified to be impacted as a result of MOD 10. In accordance with the AIP, BCOPL would implement 'make good' provisions at any privately owned water supply bore experiencing more than 2 m of drawdown as a result of its mining operations at BCM (including MOD 10).

'Make good' provisions would be assessed on a case-by-case basis and implemented in consultation with the affected landholder. Any make good provisions would be undertaken in consideration of the proportion of drawdown from all three (3) mines (MCCM, BCM and TCM) at the impacted supply bore.

6.4.3.5 Groundwater Dependent Ecosystems

High-priority GDEs have been regionally mapped within the relevant WSPs alongside drainage features, including the Namoi River, Barber's Lagoon, Maules Creek, Back Creek, Goonbri Creek, and the upper reaches of Bollol Creek, as well as parts of Driggle Draggle Creek. The maximum cumulative drawdown predicted to occur beneath high-priority GDEs include:

- Goonbri Creek;
  - Up to 3.8 m drawdown in the alluvium and up to 11.9 m drawdown in the water table underlying GDEs.
  - Maximum drawdown was predicted at locations adjacent to mining operations at TCM;
  - Drawdown less than 1 m in the alluvium in areas more distance from TCM mining operations.
- Bollol Creek;
  - Up to 1.5 m in the alluvium underlying GDEs.
- Barber's Lagoon;
  - Up to 0.16 m in the alluvium underlying GDEs.
- Maules Creek; and
  - Up to 0.3 m in the alluvium underlying GDEs.
- Back Creek
  - Up to 43 m in the water table beneath GDEs.

Predicted cumulative drawdown is similar to those previously predicted and reported within the MOD 8 GIA. The above cumulative drawdown impacts on Goonbri Creek, Bollol Creek and Back Creek exceed with AIP minimal impact threshold of less than or equal to 10% cumulative variation in water table at these regionally mapped GDEs.

Predicted drawdown within the Nagero Creek alluvium is expected to reach a maximum of 5.1 m at the fringes of the alluvial tongue. A predicted maximum drawdown of 3.8 m is anticipated in areas near the Nagero Creek. However, drawdown of up to 0.7 m is predicted at the location of field-verified mapped populations of PCT 101. Based on previous modelling completed for MOD 8 which predicted a maximum drawdown of 4.3 m in Nagero Creek, WSP (2021) concluded that the risk of the predicted cumulative drawdown impacting the ecological community PCT 101 in Nagero Creek was low.

Field verified mapped populations of PCT 599 (WSP, 2021) also confirmed its presence within the Nagero Creek alluvium close to mining operations at the BCM. Maximum drawdown in the alluvium beneath these communities was previously modelled to be approximately 3.6 m for the proposed mining scenario. Previous studies complete for MOD 8 (as amended) involving a soil-adjusted vegetation index between populations of PCT 599 and the Leard State Forest confirmed that PCT 599 was unlikely to be connected to the groundwater system.

6.4.3.6 Groundwater Quality

Groundwater flow predictions for MOD 10 indicates that the mined area will continue to act as a groundwater sink for the period of simulation. Groundwater inflows into the mining void will continue to be treated as contaminated water managed in accordance with existing site procedures.

Previous geochemical studies completed for the BCM has concluded that the potential risk to the groundwater from water in contact with mining waste was low. These studies have also confirmed that the coal reject material is generally non-acid forming (NAF), with salinity levels equivalent to or lower than those fund in the surrounding groundwater systems and concentrations of dissolved trace metals little to low (See **Section 6.8**).

Geochemical assessments completed for MOD 10 has identified that material from Herndale and Onavale coal seams to have elevated Sulfur content and are potentially acid-forming (PAF). However, the total amount of PAF material is considered a low fraction of the total NAF overburden.

PAF coal reject material will be strategically managed by deep in-pit burial, which will be covered by inert NAF overburden materials in accordance with current procedures at the BCM.

6.4.3.7 Post Mining Recovery

The MOD 10 Conceptual Final Landform has been designed to be generally consistent with the currently approved final landform design. Further, MOD 10 landform has been designed consistent with the existing BCM rehabilitation objectives such that it seeks to minimise the size and depth of the final void as far as reasonable and feasible, and to ensure that the void contains no retained surface water (i.e. no pit lake). The MOD 10 Conceptual Final Landform has been designed with partially infilled void at the northern edge of the BCM at an elevation of 285 mAHD. Whilst lower than the terrain, the partially infilled void has been designed to remain above the water table where it may pond only during significant rainfall events when infiltration capacity is exceeded.

Modelling completed for MOD 10 incorporated a scenario up to the end of mining, plus an additional 200 years into the future. To assess the likely final equilibrium state of the system, a steady-state model was run after the transient model concluded. This adopted the same mean stresses used in the 200-year post-mining simulation period. The simulated water table shows that groundwater remains below the levels of the final partially infilled void. Testing the sensitivity of the water table beneath the void infill was also accomplished by varying the properties of the spoil and future recharge in the final steady-state stress period. Under modelling conditions, the water table remained below surface elevation. Reductions in water table was attributed to the change in transmissivity of the aquifer as a result of partially infilling the final void.

Previous assessments completed for the BCM indicated a recovery duration of 300 years post-mining. Modelling completed for MOD 10 included a 200-year post-mining simulation in which the hydraulic heads did not achieve a new equilibrium which ultimately prompted the inclusion of a steady-state simulation as the final stress period of the model. As such, recovery duration could not be assessed explicitly however is expected to exceed 200 years. This is consistent with previous groundwater assessments completed for the BCM.

6.4.3.8 Compliance with Aquifer Interference Policy

The BTM Complex numerical groundwater model and associated predicted groundwater impacts has been assessed in accordance with the provisions of the AIP. As such, the model was appropriately calibrated and validated, it has been developed in accordance with relevant and applicable modelling guidelines, and has been independently peer reviewed by Dr Noel Merrick of HydroAlgorithmics.

There are two (2) levels of minimal impact considerations specified in the AIP. If the predicted impacts are less than the Level 1 minimal impact considerations, then these impacts will be considered as acceptable. Where the predicted impacts are greater than the Level 1 minimal impact considerations then the AIP requires additional studies to fully assess these predicted impacts.

If this assessment shows that the predicted impacts do not prevent the long-term viability of the relevant water-dependent asset, then the impacts will be considered to be acceptable.

Modelling completed for MOD 10 has confirmed that drawdown is not predicted to exceed the AIP minimal impact considerations Level 1 threshold of 2 m within the highly productive alluvium at the site of any known private water supply bore for the approved or proposed mining scenarios. However, six (6) bores within the 'less productive' Gunnedah-Oxley Basin Porus Rock Water Source' were identified as exceeding the Level 1 threshold on a cumulative basis for the scenarios with and without MOD 10. Maximum drawdown was also determined to be likely to exceed the 10% cumulative drawdown threshold for several GDEs along Goonbri Creek, Bollol Creek and Driggle Draggle Creek. These potential impacts have been addressed in previous approvals and no further incremental drawdown is predicted as part of MOD 10.

Changes in groundwater quality are not predicted to affect the beneficial use in either of the Water Sources, nor are any long-term salinity increases expected in connected surface water bodies.

Modelling has confirmed that BCOPL holds sufficient WALs under the WSP Murray Darling Basin Porous Rock Groundwater Sources for the Gunnedah-Oxley Basin porous rock water Source and Zone 4 and Zone 5 of the Namoi Alluvial Groundwater Sources. However, it has been identified that BCOPL does not hold sufficient WALs for the Zone 11 of the Namoi Alluvial Groundwater Sources, whereby predicted water takes exceed WAL entitlement by 2 ML in 2040. Accordingly, BCOPL will be required to acquire additional WALs to account for this predicted water take.

6.4.3.9 EPBC Act Considerations

MOD 10 was determined a Controlled Action on 20 August 2024 under the provisions of Section 75 of the EPBC Act.

Modelling completed for MOD 10 indicates that changes in flow regimes, recharge rates, aquifer pressure or water table levels, groundwater-surface water interactions, river-floodplain connectivity, and inter-aquifer activity are not expected to be of sufficient scale or intensity to significantly reduce the quantity or quality of water resources for third-party users or the environment.

Incremental impacts assessed for MOD 10 relative to approved mining operations are considered minimal, with cumulative impacts equivalent to those already approved. MOD 10 is therefore unlikely to have a significant impact on the hydrological characteristics of surrounding water sources. Further to this, with negligible incremental drawdown predicted to occur as a result of MOD 10 to the Nagero Creek alluvium below the identified GDEs, it is unlikely that the approval of MOD 10 would result in material additional impacts to these GDEs.

6.4.3.10 Uncertainty Analysis

As discussed in **Section 6.4.2.3**, an uncertainty analysis was completed for MOD 10 to determine the magnitude of uncertainty associated with the numerical model predictions.

Key points of the uncertainty analysis results are:

- Likelihoods of cumulative water table drawdown exceeding 2.0 m in the alluvium are unlikely. This includes the Nagero Creek and other alluvial zones around the BTM Complex;
- Uncertainty in cumulative mean annual groundwater take from alluvial zones 4 and 11 ranges from 10 Megalitres per year (ML/yr) to 25 ML/yr;
- Uncertainty in mean annual mine inflow can be as high as 275 ML but is mostly less than 100 ML for the BCM; and
- Greater than 2.0 m drawdown impacts to private groundwater users attributed to MOD 10 operations is very unlikely.

Further details on the extended uncertainty analysis results is included in **Appendix I**.

6.4.3.11 Groundwater Impact Comparison

Table 27 presents the groundwater impacts associated with MOD 10 in comparison to MOD 7 (being the original SSD approval) and the currently approved operations under SSD 09_0182 (i.e. MOD 8, MOD 9 and MOD 11).

Table 27 Groundwater Impact Comparison

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
Pit groundwater inflows	› Peak of 457 ML/year at back end of mine life (AGE, 2010). › Peak of 324 ML/year between 2024 and 2036 (AGE, 2022).	› Peak of 583 ML/year between 2024 and 2036 (AGE, 2022). › Peak of 581 ML/year between 2025 and 2040 (AGE, 2025).	› Maximum of 613 ML/year between 2025 and 2040 (AGE, 2025) (additional 156 ML/year compared to AGE, 2010). › Inflows remain within current WAL entitlement.
Private Groundwater Bore Users	› No alluvial or porous rock aquifer bores within predicted drawdown greater than 2 m (AGE, 2010).	› One private bore potentially located within weathered rock materials to impacted by more than 2 m cumulative drawdown.	› No change to alluvial aquifer bore impact. › Four (4) porous rock aquifer bores to experience more than 2 m of cumulative drawdown (no material change as a result of MOD 10).
Drawdown	› The zone of influence largely remains within the Permian outcrop zone › Potential impacts to a small valley of drawdown in the Nagero Creek alluvial tongue between 2 and 5 m (AGE, 2010).	› Increase of 0.3 m drawdown in the alluvium as a result of MOD 8 (AGE, 2022). › Cumulative drawdown in Nagero Creek alluvial of up to 4.3 m. › Cumulative drawdown in the south west corner of TCM greater than 2 m. › Cumulative drawdown for Merriown and Templemore Seams most significant within the mined footprint, with up to 110 m and 150 m drawdown (depth of the coal seams).	› No incremental drawdown in the alluvium as a result of MOD 10 from the currently approved mine (SSD 09_0182 (MOD 11)). › 50 m incremental increase in the Templemore Coal Seam from currently approved mine. › Cumulative drawdown for Templemore Seams most significant within the Modification Mining Area, with up to 50 m drawdown.

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
GDEs	› No GDEs are present in the vicinity of mining due to the presence of ephemeral creeks and depths to water greater than 2 m. › No high-priority mapped GDEs to be impacted by groundwater drawdown.	› Incremental drawdown in the Nagero Creek alluvium by a maximum of 0.3 (MOD 8). › Potential cumulative impacts on GDEs.	› No incremental drawdown as a result of MOD 10 compared to SSD 09_0182 (as modified). › Cumulative drawdown at potential GDEs to be monitored and managed utilising the existing systems.
Water Take	› Peak take from Permian of 457 ML/year (AGE, 2010). › Peak take from Permian of 252 ML/year (AGE, 2022). › Peak take from alluvium (Zone 4) of 73 ML/year at end of mine life (AGE (2010). › Peak take from alluvium (Zone 4) of 86 ML/year in year 2023 (AGE, 2022). › Peak take from alluvium (Zone 11) of 4 ML/year in year 2033 (AGE, 2022).	› Peak take from Permian of 502 ML/year in year 2024 (AGE, 2022). › Peak take from the Permian of 478 ML/year in 2025 (AGE, 2025). › Peak take from the alluvium (zone 4) of 95 ML/year in year 2026 (AGE, 2022). › Peak take from the alluvium (zone 4) of 144 ML/year in year 2026 (AGE, 2025). › Peak take from the alluvium (zone 11) of 6 ML/year in 2033 (AGE, 2022). › Peak take from the alluvium (zone 11) of 10 ML/year in year 2034 (AGE, 2025).	› Peak take from the Permian of 479 ML/year in year 2025 (AGE, 2025). › Peak take from the alluvium (zone 4) of 144 ML/year in year (AGE, 2025). › Peak take from the alluvium (zone 11) of 22 ML/year in year 2040 (AGE, 2025).
Groundwater Quality	› No significant environmental concern relating to the concentration of dissolved metals in initial run-off and seepage from potential coal reject materials or overburden	› No change	› No change

Table 27 above demonstrates that the incremental change in groundwater impacts relative to MOD 7 and those currently approved under SSD 09_0182 will remain generally consistent albeit the requirement to acquire additional WALs to account for peak predicted water takes, additional groundwater inflows and the additional porous rock aquifer bores with drawdown greater than 2 m. These impacts will be managed through existing BCM procedures which have historically been applied to acquire water entitlements as required.

6.4.4 Mitigation and Management

BCOPL manages impacts to groundwater resources in accordance with its WMP and associated GWMP. The GWMP focusses on assessing, monitoring, and, when necessary managing impacts on the groundwater regime.

BCOPL has established and operates a groundwater monitoring network to assess and monitor impacts associated with mining operations at BCM and the wider BTM Complex. This includes the regular monitoring of groundwater bores that are installed within the alluvial aquifers and deeper Permian strata (including the coal measures). Existing bores and those currently being installed to supplement the monitoring network are considered to be sufficient to assess any changes in water levels and quality associated with the progression of mining at BCM. This network also includes an array of VWPs to monitor pressure in deeper strata and provide multilevel monitoring along the Nagero Creek underlying Permian strata.

The WMP and associated GWMP will be reviewed and updated to accommodate the activities proposed by MOD 10. Despite the specific impacts to groundwater assets as a result of MOD 10 being predicted to be generally consistent with those currently approved at the BCM, the following additional measures will be undertaken:

- Installation of replacement bores have been planned and will continue to be installed during the remainder of 2025;
- Continuous monitoring will be undertaken to distinguish between natural groundwater level fluctuations, (e.g. those occurring in response to rainfall), and potential impacts from groundwater level changes resulting from depressurisation due to MOD 10;
- The Annual Review processes will be used to identify whether additional monitoring sites are required or whether the existing monitoring network should be optimised;
- The trigger levels as specified in the GWMP Trigger Action Response Plan should continue to undergo periodic reviews in consultation with relevant agencies, and
- The numerical model predictions will continue to be reviewed and updated every three (3) years in accordance with current practices within the BTM Complex.

6.5 SURFACE WATER

6.5.1 Background

A Surface Water Impact Assessment (SWIA) was undertaken for MOD 10 by EMM Consulting Pty Ltd (EMM). The SWIA report is provided in **Appendix J** with a summary provided within the following sections.

6.5.1.1.1 Site Water Management System

The existing site water management system at the BCM is operated in accordance with the approved *Water Management Plan* (WMP) (BCOPL, 2017) and supporting SWMP. The WMP and supporting SWMP are currently under review in consultation with relevant regulatory authorities and to the approval of DPHI. The key objectives and functions of the water management system at BCM include:

- Where reasonable and feasible, clean water runoff from upstream catchments is diverted around the mine to reduce loading on the water management system;

- Provide sufficient on-site storage to minimise the risk of discharging contaminated water;
- Provide water quality and quantity controls to treat (via sedimentation) and minimise stormwater discharge offsite; and
- Prioritise the use if dirty and contaminated water on-site to reduce demand on external water sources.

6.5.1.1.2 Site Water Balance

The site water management system generally operates as a closed system and is designed to minimise the use of the water from external sources (such as the borefield and Namoi River). Notwithstanding, water collected within the site water management system can be released to the downstream environment under certain circumstances.

Sources to the site water balance include:

- Direct rainfall and runoff from clean, dirty and mine water catchments.
- Groundwater inflows; and
- Licensed imported water (from the borefield or the Namoi River).

The primary demands within the site water balance include:

- Dust suppression;
- CHPP processes;
- Mine Infrastructure Area and potable water; and
- Evaporation from water storages.

6.5.1.1.3 Water Monitoring

BCOPL conduct surface water monitoring in accordance with the processes outlined in the SWMP. The SWMP includes monitoring of the following elements of the site water management system and surrounding catchment area:

- Surface water quality and flows in upstream and downstream watercourses;
- Geomorphic condition of Nagero Creek, upstream and downstream of the BCM;
- Stream and riparian health conditions in the Nagero Creek and the Namoi River; and
- On-site water management, including water quality within the dirty and mine water dams.

6.5.2 Methodology

6.5.2.1.1 Operational Water Balance

A site water balance model (SWBM) for the BCM was developed as part of the *Continuation of Boggabri Coal Mine Project Surface Water Assessment* (WSP, 2010). The SWBM was developed using the GoldSim (version 14.0) software package. This SWBM is reviewed and updated annually. For the purpose of this SWIA, the historical SWBM has been adopted.

A continuous simulation methodology was applied to the SWBM for the purpose of simulating responses within the water management system under various climatic conditions (such as rainfall and evaporation). This was achieved by representing the water management system as a series of elements (each of which containing pre-set rules and data), that are linked together to simulate interactions. As a result, the SWBM simulated the volume of water within the water management system.

The assessment of potential impacts of MOD 10 on the water balance is based on outcomes of the GoldSim SWBM scenarios developed using the staged mine plans for MOD 10. The model applied 135 different climate patterns over the simulation timeline which were based on historical climate records.

The simulation timeline was modelled for 135 realisations, each of which representing a single model run beginning with a different year of the historical climate record. This approach enabled all recorded historical climatic events to be captured in the SWBM. The Australian Water Balance Model was also incorporated in the GoldSim SWBM, calibrated and verified using measured water management data to estimate surface runoff from rainfall.

AGE provided forecast groundwater inflows for MOD 10 based on modelling predictions from the BTM Complex numerical groundwater model, as discussed in **Section 6.4**.

6.5.2.1.2 Final Void Water Balance

A final void water balance model was developed using GoldSim to assess whether water would accumulate within the partially infilled final void and to assess potential risks for overflow. This is necessary to demonstrate that the proposed Conceptual Final Landform for MOD 10 will achieve the existing rehabilitation objective for the final void, with rainfall and runoff from upstream catchments. A continuous simulation methodology was applied to the model to simulate the water level response of the final void under a range of climatic conditions (i.e. rainfall and evaporation).

6.5.3 Assessment of Impacts

6.5.3.1.1 Site Water Balance Model

The SWBM has been run for six (6) staged mine plans for MOD 10 including Years 2025, 2028, 2031, 2034, 2036 and 2040. An overview of the average results from the water balance modelling for each of these years is provided in **Table 28**.

Table 28 BCM MOD 10 Summary of Median Predicted Water Balance

Component	Volume (ML/Year)						
	Existing[2]	2025	2028	2031	2034	2036	2040
Inputs							
Runoff and direct rainfall:							
› Dirty Water Sediment Dams.	87	85	41	165	218	257	318
› Contaminated Water Dams, MWDs and Pit.	722	675	637	592	512	493	473
Groundwater Inflows	225	530	188	177	72	247	148
Import from Borefield	608	642	1,028	1,028	1,028	670	699
Import from Additional Sources	0	0	259	138	79	0	0
Total Inputs	**1,642**	**1,932**	**2,153**	**2,100**	**1,909**	**1,667**	**1,638**

Component	Volume (ML/Year)						
	Existing[2]	2025	2028	2031	2034	2036	2040
Outputs							
Demands:							
› Dust Suppression – Haul Roads.	1,330	1,544	1,693	1,578	1,429	1,225	1,227
› CHPP/MIA.	311	310	311	310	310	311	310
Evaporation:							
› Dirty Water Sediment Dams.	38	41	39	92	89	90	90
› Contaminated Water Dams, MWDs and Pit.	248	233	202	197	196	199	199
Uncontrolled Discharges:							
› Dirty Water Sediment Dams.	0	0	0	0	0	0	0
› Mine Water Dams and Pit.	0	0	0	0	0	0	0
Total Outputs	**1,927**	**2,128**	**2,245**	**2,177**	**2,024**	**1,825**	**1,826**
Change in Storage[1]	**-291**	**7**	**32**	**48**	**60**	**46**	**8**

1 The change in storage represents the median change in storage that is predicted to occur in any given year based on all modelled realisations. It does not represent the difference between median inputs and outputs.

2. Existing conditions relates to the water management system in 2024.

The water balance modelling indicates total water inventory onsite is primarily driven by the groundwater inflows to the pit and imported make-up water from the groundwater borefield. During periods of low groundwater inflow and surface water capture, additional external water supplies may be required to sustain site demands. This is consistent with the current water management procedures at BCM. Import from additional water sources (other than the borefield) is predicted to be required under median conditions during mine plan staged years 2028 to 2034 when peak water demands exceeding the current allocations.

Dust suppression is the largest outflow from the water management system, peaking in 2028 in line with maximum haul road lengths. Dust suppression demands are predicted to decrease as haul road lengths reduce during the later years of mining operations. No offsite discharges from surface water storages are expected under median conditions. The water balance modelling indicates that under median conditions there will be no uncontrolled discharges from the mine water management system or the sediment dams.

The current site total storage volume is shown to have adequate capacity to contain the potential maximum site water inventory under most conditions. However, the results do indicate that water may need to be stored in the pit for short periods of time under extreme wet conditions, as is current practice at BCM.

The void associated with the active mining area has a capacity of several thousands of megalitres and is more than sufficient to store surplus water during periods of significant wet weather.

The predicted volume of intercepted runoff is shown to generally decrease over time as mining progresses to the north and as established rehabilitation areas are released downstream, reducing the overall contributing catchment area.

The occurrence of dirty water discharges generally increases over the LOM as temporary rehabilitation progresses and a larger portion of the disturbance area drains to dirty water dams rather than the mine void. The maximum overflow from dirty water storages of up to 780 ML/year is predicted to occur at the end of the LOM when a substantial portion of the temporary rehabilitation areas will drain to sediment dams. The risk of dirty water discharges occurring in any given year is appropriately 10% over the LOM.

No overflows from contaminated water dams are predicted for the LOM. Any excess contaminated water will be stored in the pit to prevent overflows.

The water balance inputs and outputs are generally consistent between the MOD 8 and MOD 10 scenarios. A minor increase (7%) in water demands associated with slightly longer haul roads is observed for MOD 10. An 11% increase in imported water is required to meet the additional water demands. The predicted increase in volume imported from the borefield is still within BCOPL's existing groundwater entitlements (1,028 unit-shares) and subject to approved extraction conditions. Hence, the 11% increase in imported water is considered consistent with the approved BCM.

6.5.3.1.2 Final Void Water Balance

Model results indicate that the partially infilled final void area (to RL 285 m) is generally expected to remain empty over the 10,000-year stochastic climate sequence applied to the model. The modelling indicated that the final void area will experience short periods of ponded water immediately following significant rainfall events. However, this water will be rapidly lost to evaporation.

The maximum modelled pit water level was at RL 286 m, which is approximately 1 m of water within the base of the final void area. This temporarily pooled water is well below the spill level of the final void area. The final void is not predicted to maintain a permanent pit lake or reach levels where water would overflow from the void.

A sensitivity analysis was undertaken for the final void and further indicated that an overflow event or the generation of a permanent pit lake within the final void area is highly unlikely.

6.5.3.1.3 Surface Water Impacts

Direct Impacts to Watercourses

MOD 10 will mine through the upper reaches of several ephemeral watercourses in the upper Back Creek and Nagero Creek catchments which are both impacted by existing mining operations. These impacted watercourse reaches collectively drain an area of approximately 85 ha, which represents the entire additional disturbance area that will be impacted by MOD 10. The impacts to these upper reaches will not materially change the impacts that are currently being experienced from existing mining operations.

Streamflow Regimes

MOD 10 will disturb an additional 76 ha of the upper headwaters of the Nagero Creek catchment. This represents approximately 1% of the total Nagero Creek catchment area. Runoff from this impacted portion of the Nagero Creek catchment is intercepted by existing mining operations or is planned to be intercepted as mining operations progress to the north-west as part of the approved BCM operation. Accordingly, no additional impacts to the streamflow regime of Nagero Creek are expected due to MOD 10.

The northerly extension of operations for MOD 10 will disturb approximately 9 ha of the upper headwaters of the Back Creek catchment. Back Creek has a catchment area of 97 km^2. Accordingly, MOD 10 will reduce the Back Creek catchment by approximately 0.1%. Given the relatively small, impacted area, the reduction in catchment area is expected to have negligible impact on streamflow regime of the Back Creek.

The final landform is generally consistent with the approved BCM (albeit the additional 85 ha of area). As such, no material impacts to catchment areas or downstream flow regimes are expected due to MOD 10.

The extension of the LOM by an additional four (4) years will result in continued interception of rainfall and runoff, and groundwater inflows. The water management system will continue to capture and manage rainfall, runoff and groundwater inflows as per the approved BCM operations. Reductions in catchment runoff to existing watercourses will be consistent with the impacts associated with the approved BCM. Accordingly, any potential for changes to downstream flow regimes and users are comparable to the approved BCM impacts, albeit the additional four (4) years.

Water Use and Availability

Current site storage volumes have adequate capacity to contain the potential maximum site water inventory under most conditions, with water being stored in the pit on occasion for short periods following significant rainfall or extended wet periods.

Water balance modelling completed for MOD 10 has indicated that current WALs are sufficient to supply BCM under median conditions, with the periodic purchase of additional water continuing as per current practices at BCM.

Potential changes to downstream water users are therefore limited to the additional four year disturbance period, with potential impacts considered minor compared to the approved BCM.

Surface Water Quality

Residual water quality impacts associated with dirty water overflows from sediment dams are considered comparable to the approved BCM impacts, albeit the extension of these impacts by a further four (4) years. Impacts to downstream watercourses and users due to the extended period of disturbance associated with MOD 10 are considered minor and manageable utilising the existing and proposed management measures.

Flooding and Watercourse Stability

No changes are proposed to existing infrastructure in proximity to the Namoi River Floodplain or to the water management system which would result in further flooding impacts. Dirty water discharges will continue to be managed using the procedure specified within the existing SWMP for the additional four (4) years of operations. MOD 10 does not include any changes which will materially change downstream surface flows and flooding regimes, except due to the extension of mining operations. Accordingly, potential changes to downstream flooding regimes and watercourse stability are considered negligible and consistent with the approved BCM impacts.

Cumulative Impact Assessment

MOD 10 will disturb an additional 76 ha of the upper headwaters of the Nagero Creek catchment. This represents an approximate 1% increase to the maximum cumulative BTM Complex disturbance area in the Nagero Creek catchment.

MOD 10 will reduce the Back Creek catchment area by approximately 9 ha and is unlikely to materially change streamflow in Back Creek. MOD 10 therefore represents an approximate 0.1% increase to the maximum cumulative BTM Complex disturbance area in the Back Creek catchment.

MOD 10 will result in continued water demands, groundwater interception and reduced runoff to Nagero Creek, Bollol Creek and the Namoi River for an additional four (4) years to 2040. This is broadly consistent with impacts of mining operations across the BTM Complex.

Incremental water quality impacts from the extended disturbance period are considered consistent with approved BCM impacts, albeit for a further four (4) years.

The Conceptual Final Landform objectives remain unchanged, including the BTM Complex cumulative landform objectives. No changes in flood risk impacts are anticipated, maintaining a low risk for the additional disturbance period, and no change in cumulative flood risk.

Water Licensing

The SWBM was used to calculate licensing requirements associated with the interception of local catchment runoff from the Bluevale Water Source. The licensable water take is shown to vary from 40 ML/year for dry conditions to 284 ML/year for wet conditions. The SWBM estimates 284 ML of entitlement is generally sufficient to meet BCOPL's licensing requirements over the LOM.

BCOPL currently holds 93 units of water entitlements within the Bluevale Water Source. This is predicted to be sufficient to cover licensing requirements during drier years. The licensing approach to obtain additional water entitlements for years where water take exceeds BCOPL's existing 93 ML entitlement is provided in **Section 6.5.4.1.1**.

The water balance model predicts up to 2,040 ML/year of external water supply will be required over the remaining life of mine to meet operational water demands. External water supplies will be preferentially sourced from the Namoi Valley Groundwater Source via the BCM borefield. BCOPL's combined surface water and groundwater WAL entitlements that could be used to meet the external water supply demand are approximately 1,350 ML/year. The licensing approach to obtain additional water entitlements for years where water take exceeds BCOPL's entitlement is provided in **Section 6.5.4.1.1**.

6.5.3.2 Surface Water Impact Comparison

Table 29 presents the surface water impacts associated with MOD 10 in comparison to MOD 7 (being the original SSD approval) and the currently approved operations under SSD 09_0182 (i.e. the incremental impact approved under MOD 8, MOD 9 and MOD 11).

Table 29 Surface Water Impact Comparison

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
Catchment Areas and Flow Regimes	› Unlikely to result in significant surface water impacts on the catchment or downstream water users.	› No change.	› An additional 85 ha of disturbance to the upper reaches of ephemeral watercourses in the upper Back Creek and Nagero Creek catchments. These catchments are impacted by approved mining operations and no significant changes to flow regimes are anticipated.
Water Licensing	› Predicted peak external operational water demand in a dry year of 2,647 ML/year (MOD 5), requiring the trade of water licences (PB, 2015).	› During average conditions, borefield demand will remain within the water licence entitlements.	› Requirement to secure an additional 191 unit-shares for the Bluevale Water Source during wet conditions (consistent with current operations).

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
		› During adverse dry weather conditions, additional external water supplies will need to be secured, consistent with the current approach.	› Requirement to secure up to an additional 690 ML/year of water licence to meet predicted external water supply demand under dry conditions (consistent with current approvals).
Surface water discharge	› Mine water to be contained onsite in mine water management system. › Dirty/sediment water dams – spills to downstream environment following rainfall events greater than design capacity. › Clean water diverted around operations where reasonable and feasible.	› No change.	› No change.

Table 29 above demonstrates that the incremental surface water impacts will remain generally consistent with those approved as at MOD 7 and those currently approved under SSD 09_0182. However, an additional demand on external water requirements is predicted, consistent with the current operations. The licensing approach for BCOPL to acquire additional WALs for this external water supply is described in **Section 6.5.4.1.1**. Notwithstanding, surface water impacts associated with MOD 10 remain substantially the same as those previously approved under MOD 7, albeit the requirements to acquire additional WAL's.

6.5.4 Mitigation and Management

Surface water impacts at BCM are managed in accordance with the BCM WMP and associated SWMP. The existing water management system at BCM is operated and managed in accordance with the SWMP which is designed to use and manage water from numerous sources and of varying quality. The existing water management system will continue to be used as part of MOD 10. Accordingly, there are no material changes to the approved water management system, albeit those associated with extending the LOM by an additional four (4) years to 2040. The existing water management system will be modified (as required) to remain consistent with the relevant provisions of EPL No 12407, SSD 09_0182 approval conditions, and the objectives of the water management system.

Given that impacts associated with MOD 10 are generally comparable to existing impacts for the approved BCM and are therefore minor, negligible and / or low risk (albeit the additional four (4) years of mining), no material changes to the existing management measures for surface water impacts are required. Accordingly, predicted impacts for MOD 10 are considered manageable with the existing and proposed management measures in place.

Mitigation measures and residual impacts associated with MOD 10 are summarised in **Appendix J**. Residual impacts in comparison to the approved MOD 8 are generally negligible, minor or not present. Accordingly, mitigation controls as described in **Appendix J** will remain generally consistent with the approved practices at BCM.

6.5.4.1.1 Licensing Approach

The Bluevale Water Source has a total of 2,972 unit-shares of unregulated river access licences. BCOPL would need to obtain an additional 191 unit-shares to achieve the predicted peak of 284 ML/year of licensable water take from the Bluevale Water Source, which would occur during wet conditions. BCOPL has historically been successful in temporary trading water entitlements to account for water take associated with the interception of local catchment runoff. It is therefore anticipated that sufficient water would be available in the market for trade when required.

The Upper Namoi Zone 4, Namoi Valley Groundwater Source has a total of 21,000 unit-shares of aquifer access licences and an active trading market. BCOPL has historically been successful in temporary trading water entitlements to meet operational water demands during drier periods. The significant number of entitlements available and active water market provides confidence that BCOPL will be able to continue using temporary trade as a viable option to secure any additional water entitlements that may be needed during drier periods.

A summary of the water licensing requirements, WAL entitlements held by BCOPL and the approach to obtain additional WALs (as needed) is provided in **Table 30**.

Table 30 BCM MOD 10 Water Licensing Requirements

Water Requirement	Water Take Mechanism	Water Sharing Plan	Water Source	WALs Required[3]	WALs Held[6]	Licensing Approach[4]
Interception of catchment runoff	Incidental water takes	Namoi and Peel Unregulated Rivers Water Sources 2012	Bluevale Water Source	191 ML[5]	93 ML	Temporary trade
External water supply	Namoi River via pump and pipeline	Upper Namoi and Lower Namoi Regulated River Water Sources 2016	Lower and Upper Namoi Regulated River Water Sources	2,040 ML[3]	322 ML[1]	-[2]
	Extracted from borefield via pump and pipeline	Namoi Alluvial Groundwater Sources 2020	Upper Namoi Zone 4, Namoi Valley Groundwater Source		1,028 ML	Temporary trade

Notes:
1. Does not include the 32.1-unit shares of supplementary water that BCOPL hold in these water sources.
2. Additional entitlements required to meet external water supply demands to be preferentially sourced via groundwater.
3. Represents the maximum annual water take based on 130 years of climate data.
4. Licensing approach is in addition to the WALs held by BCOPL.
5. Based on the 80th percentile intercepted runoff volume.
6. Assumes 1 unit of water access licence accounts for 1 ML of water allocation (or Available Water Determination at 100%).

It is noted that the *Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020* facilitates the carryover of water entitlements not used within the previous years. This option may be (and has in the past) utilised in preference to securing additional WAL entitlements from the open market. BCOPL will consider utilising this approach to ensure sufficient licensing is held to account for its water takes.

6.6 ABORIGINAL CULTURAL HERITAGE

6.6.1 Background

An Aboriginal Cultural Heritage Assessment (ACHAR) was undertaken by OzArk Environment and Heritage Pty Ltd (OzArk) to assess whether MOD 10 would result in any impacts to Aboriginal heritage sites during the progression of mining outside of the approved Disturbance Boundary and into the Modification Disturbance Footprint.

A copy of the ACHAR is provided within **Appendix K** with a summary provided in the following sections.

6.6.2 Methodology

The Modification Mining Area describes the area in which additional mining operations are proposed to occur. This area includes areas of additional mining operations proposed within the approved Mine Disturbance Boundary, as well as extending mining operations into the Modification Disturbance Footprint. The Modification Disturbance Footprint covers an area of approximately 85 ha outside of the existing approved Mine Disturbance Boundary where additional surface disturbance is to occur for MOD 10.

Based on the topography of the Modification Disturbance Footprint, two (2) survey units were identified to capture the major topographical features. The designation of these survey units allows for a comparison of archaeological potential of each major topographical feature within the Modification Disturbance Footprint to understand the likelihood of landforms containing Aboriginal objects. The mapped survey units included steep and moderate slopes, and ridges.

The archaeological assessment followed the *Code of Practice for the Investigation of Aboriginal Objects in New South Wales* (Code of Practice) (DECCW 2010).

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* (the Guide) (OEH, 2011) and the *Aboriginal cultural heritage consultation requirement for proponents* (ACHCRs) (DECCW, 2010b).

The ACHAR for MOD 10 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 Footprint to formulate a predicative model for the site location;
- Identify and record Aboriginal cultural heritage values within the Modification Disturbance Footprint. 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 Registered Aboriginal Parties (RAPs); and
- Assess the likely impacts of the proposed work to Aboriginal cultural heritage values and provide management recommendations.

6.6.2.1 Desktop Review

A desktop search was conducted on the Commonwealth Heritage Listings, National Native Title Claims Search, AHIMS and Local Environment Plan (LEP) to identify any previously recorded sites within the Modification Disturbance Footprint.

The Modification Disturbance Footprint was shown to include land currently subject to Native Title claim (Tribunal File No. NC2011/006, Federal Court No. NSD37/2019, Claimant, Gomeroi People).

There is one previously recorded site within the Modification Disturbance Footprint. This site (20-4-0220 (LFNV11)) was previously included within the 2010 EA and comprises an isolated find. A further known site (20-4-0572 (TC7/15)) has previously been subject to surface salvage. The centre point of this site is located within the approved Mine Disturbance Boundary and outside of the Modification Disturbance Footprint. However, this site which was recorded as a potential archaeological deposit (PAD) was identified to potentially extend into the Modification Disturbance Footprint. Accordingly, the field survey was tailored to investigate the potential for this site to extend into the Modification Disturbance Footprint.

6.6.2.2 Consultation

Consultation for MOD 10 was completed in accordance with the ACHCRs. The ACHCRs include four (4) main stages as described below.

6.6.2.2.1 Stage 1 - Identification of Registered Aboriginal Parties (RAPs)

The existing BCM RAP list established through the BCM Aboriginal Stakeholder Community Forum (ASCF) was used for consultation over MOD 10. This approach was utilised for previous modifications at BCM and has been accepted by DPHI previously. Notwithstanding, the existing RAP list was refreshed following the provision of the Heritage NSW Aboriginal stakeholder list for the Gunnedah LGA. This allowed for those not originally present to be identified and invited to be registered and involved in MOD 10 consultation.

An additional four (4) people / groups registered to be consulted. Upon the closing of registration, a total of 31 groups or individuals were registered to be consulted as RAPs for MOD 10.

6.6.2.2.2 Stage 2 - Overview of the Modification

Detailed project information was provided in the assessment methodology issued to all RAPs for their consideration on 19 August 2024.

6.6.2.2.3 Stage 3 - Acquiring Information Relating to Aboriginal Cultural Values Associated with MOD 10

Stage 3 of the ACHCRs was achieved through RAP consultation and field work. Feedback was requested on the proposed assessment methodology which was issued to the RAPs on 19 August 2024. RAPs were provided 28 days to review and comment on the assessment methodology, the closing date of which was 16 September 2024. No written responses were received from the RAPs. However, BCOPL received feedback from the RAPs during a ASCF meeting and were passed onto OzArk.

The field surveys for MOD 10 were completed on 17 and 18 October 2024. Two (2) Aboriginal Site Officers assisted with the surveys for MOD 10.

6.6.2.2.4 Stage 4 - Drafting of ACHAR

A draft ACHAR was issued to the RAPs for their review and comment. The ACHAR documented the results of the field survey and assessment, outlined opportunities for conservation of Aboriginal cultural values, and suggest recommendations for the management of Aboriginal objects should impacts to these objects be unavoidable.

6.6.2.3 Field Survey and Sampling

Field surveys were conducted on 17 and 18 November 2024 over the Modification Disturbance Footprint using standard archaeological field survey and recording methods as described within the methodology distributed to RAPs. Surveys were constrained by the dense vegetation and leaf litter throughout the Modification Disturbance Footprint which inhibited ground surface visibility and mobility.

A full pedestrian survey was not achieved within the western extent of the Modification Disturbance Footprint, which comprises moderate to steeply sloping landforms. However, there is confidence that further coverage would not have resulted in the identification of previously unrecorded Aboriginal sites given the unsuitability of this landform type for occupation. Aboriginal Cultural Heritage sites in proximity to the BCM are illustrated in **Figure 20**.

6.6.3 Assessment of Impacts

No previously unrecorded Aboriginal sites were identified during the survey, and the Modification Disturbance Footprint has been assessed as having low archaeological potential. The lack of Aboriginal site recordings is almost entirely due to the steeply sloping landforms and their distance to ample water supplies.

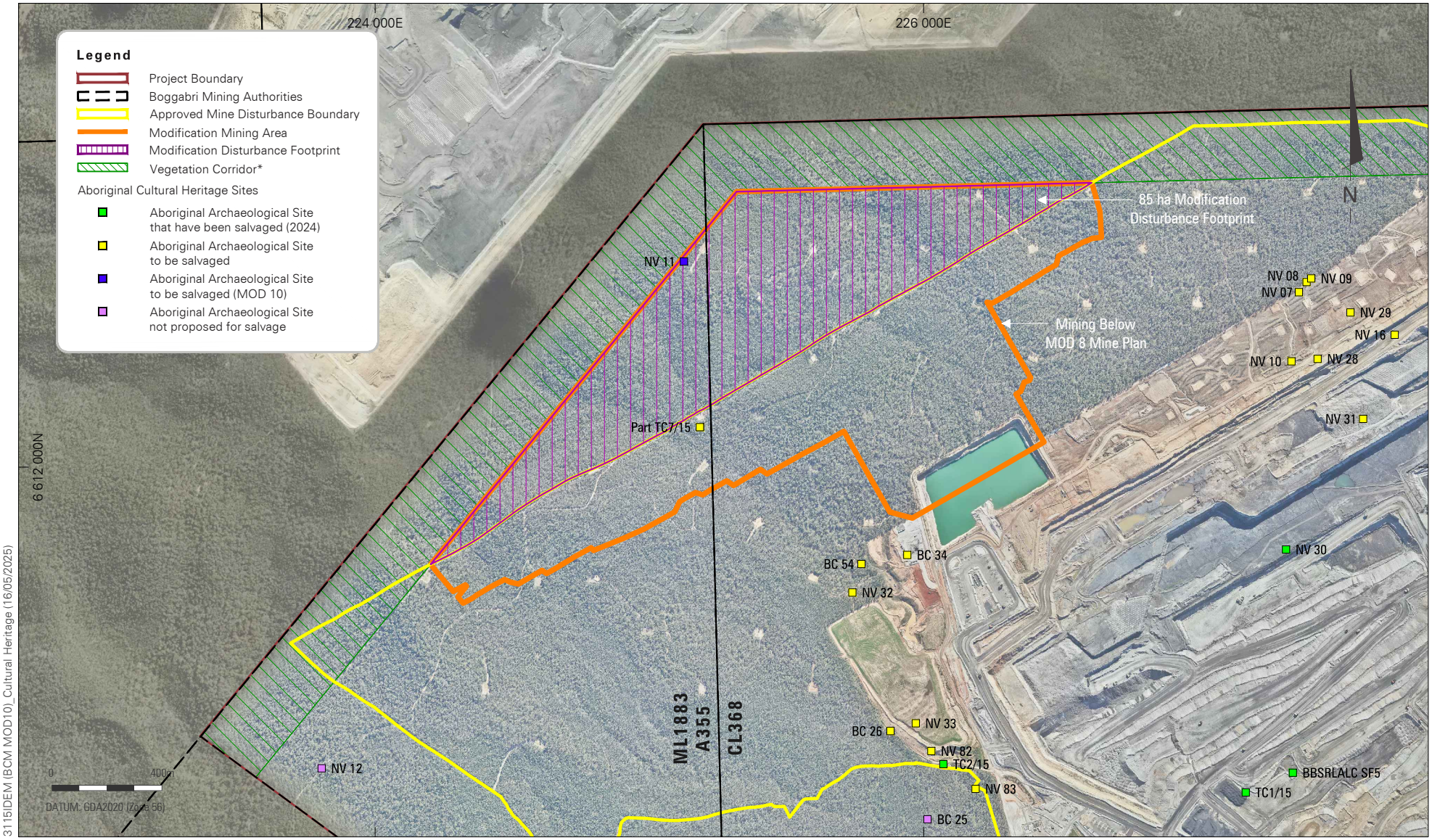
Areas of low outcropping conglomerate sandstone were noted within the Modification Disturbance Footprint. However, there were no evidence of grinding grooves identified, nor was the material of rock considered suitable for these practices. Similarly, while high amounts of pebbles were noted, especially within the ridge landform, the materials were assessed to be not suitable for the manufacturing of stone tools.

No landforms within the Modification Disturbance Footprint were assessed to have the potential for subsurface archaeological deposits of a significant or conservable nature.

Site LFVN11 was inspected during the recent field surveys with no objects being identified. LFNV11 was originally recorded during the field surveys for the Aboriginal Cultural Heritage Impact Assessment Report for the Continuation of Boggabri Coal Mine (Insite Heritage 2010). LFNV11 was originally reported as is a chalcedony isolated flake of which this type and material is not unique to the region. The artefact is considered to have limited archaeological value given its displacement from its depositional context. LFVN11 was also assessed as having low aesthetic value, and given that no association with historically important persons, places, or events, is assessed to have no historic values. The scientific value of LFNV11 is considered to have a low potential to provide further information on the traditional Aboriginal use of the region due to limited representational abilities of low-density artefact sites.

Site TC7/15, which is located outside of the Modification Disturbance Footprint was also sighted and was assessed that the PAD area does not extent into the Modification Disturbance Footprint.

Overall, the archaeological potential for the Modification Disturbance Footprint to contain significant archaeological deposits of conservation has been assessed as low in accordance with the ACHCRs.



BOGGABRI COAL MINE MODIFICATION

Aboriginal Cultural Heritage Sites

FIGURE 20

6.6.3.1 Aboriginal Cultural and Historic Heritage Impact Comparisons

Table 31 presents the Aboriginal and historic heritage impacts associated with MOD 10 in comparison to MOD 7 (being the original SSD approval) and the currently approved operations under SSD 09_0182 (i.e. the incremental impacts approved under MOD 8, MOD 9 and MOD 11).

Table 31 Aboriginal Cultural and Historic Heritage Impact Comparisons

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
Recorded Aboriginal Cultural and Historic Heritage Sites	› A total of 104 Aboriginal sites identified within the Project Boundary (63 identified as being impacted by operations at the BCM) (2010 EA). › Six (6) historic heritage items potentially impacted by the Project (2010 EA). › Disturbance to two (2) existing Aboriginal heritage sites previously identified and approved for disturbance and salvage in the 2010 EA (MOD 4). › Impact to an additional historic heritage item due to realignment of the rejects haul road (MOD 4). › Impact to nine (9) Aboriginal heritage sites all assessed to be of low archaeological significance (MOD 5).	› No change (MOD 8) › No change (MOD 9) › No change (MOD 11)	› Salvage of one previously reported Aboriginal site within the Project Boundary and Modification Disturbance Footprint. › No impacts anticipated to historic heritage items.

Table 31 above demonstrates that the incremental change in Aboriginal and historic heritage impacts will remain generally consistent with those currently approved and for the original approval (MOD 7). One additional Aboriginal cultural site will be salvaged for MOD 10. Further MOD 10 is not expected to result in any material impacts to historic heritage sites (see **Section 6.7**).

6.6.4 Mitigation and Management

BCM currently operates in accordance with the approved HMP. The BCM HMP was prepared in consultation with BCM RAPs and will be reviewed and updated (if required) to address any requirements of MOD 10.

Disturbance related to MOD 10 will be confined to the Modification Disturbance Footprint and subject to the relevant procedures outlined within the BCM HMP. Upon the identification of an 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 BCM HMP will then be implemented to identify the appropriate course of action as currently done at BCM. Furthermore, all BCM employees and mine contractors should be made aware of their responsibility to notify mine supervisors if a suspected Aboriginal object is noticed.

Given that one previously reported Aboriginal site (LFVN11) is located within the Modification Disturbance Footprint that cannot be avoided, this site will be salvaged through the recording and collection of the surface artefact prior to works proceeding. The methodology for salvage will include the following:

- Flagging of the artefact in the field;
- Photograph of the site after flagging and before recording;
- Recoding 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 BCM HMP.

6.7 HISTORIC HERITAGE

6.7.1 Background

A Historic Heritage Assessment was undertaken by OzArk to assess any impacts to historic heritage sites, both known and previously unrecorded, that would be encountered during the progression of mining outside of the approved Disturbance Boundary associated with MOD 10.

The Historic Heritage Assessment Report (HHAR) is provided within **Appendix L**, with a summary in the following sections.

6.7.2 Methodology

The Historic Heritage Assessment for MOD 10 was completed in accordance with the typical Planning Secretary's Environmental Assessment Requirements (SEARs) and the Heritage Council's *NSW Heritage Manual* (1996).

The inspection and assessment of heritage significance follows the:

- *The Australia ICOMOS Charter for Places of Cultural Significance* (Burra Charter) (The International Council on Monuments and Sites, 2013);
- *Investigating Heritage Significance. A guide to identifying and examining heritage items in NSW* (Heritage Council of NSW, 2021); and
- *Assessing heritage significance. Guidelines for assessing places and objects against the Heritage Council of NSW criteria* (Department of Planning and Environment, 2023).

The objectives of the Historic Heritage Assessment, including field investigations, were to:

- Identify whether historical heritage items or areas are, or are likely to be, present within the Modification Disturbance Footprint;
- Assess the significance of any recorded historical heritage items or areas;
- Determine whether MOD 10 is likely to cause harm to recorded historical heritage items or areas; and
- Provide management recommendations and options for minimising and managing impacts.

The assessment involved a desktop review of available information, followed by the field inspection.

6.7.2.1 Desktop Review

Desktop database searches were conducted on the National and Commonwealth Heritage Lists, State Heritage Register, and the State Heritage Inventory (Local Environmental Plans/state agency registers) to identify any potential previously recorded heritage items within the Modification Disturbance Footprint.

6.7.2.2 Field Inspection

The survey component of the historic heritage assessment took place at the same time as the Aboriginal heritage assessment for MOD 10. This was undertaken on 17 to 18 October 2024 using standard archaeological field survey and recording methods.

6.7.3 Assessment of Impacts

There are no listed heritage items within 5 km of the Modification Disturbance Footprint. A search of the National, State, and local heritage databases, including the Narrabri LEP, returned no records for historical heritage sites within the designated search areas. Further the previous Historic Heritage Assessments completed for the BCM did not identify any historic heritage sites within the Modification Disturbance Footprint.

No historic heritage items were recorded during the field survey of the Modification Disturbance Footprint. There was no historic evidence of any structures existing within the confines of the Modification Disturbance Footprint).

6.7.4 Mitigation and Management

Given that no items of historic heritage significance were identified within the Modification Disturbance Footprint, no additional management measures are required beyond the measures currently committed to. However, should consent for MOD 10 be granted, the BCM HMP will be updated to include the area of the Modification Disturbance Footprint.

6.8 GEOCHEMISTRY

6.8.1 Background

A geochemical assessment was undertaken by RGS Environmental to assess the interburden and potential coal reject material that would be encountered during the mining operations at BCM for MOD 10. A copy of this report is provided within **Appendix M**, with a summary provided in the following sections.

6.8.2 Methodology

The purpose of the geochemical impact assessment was to:

- Characterise the overburden, interburden and coal rejects (including coarse rejects and fine rejects) associated with open cut mining of the targeted coal seams for MOD 10; and
- Develop and recommend any necessary environmental management measures related to overburden, interburden and coal reject emplacement and BCM's rehabilitation program.

RGS Environmental completed an initial review of previous geochemical programs completed at BCM along with any other relevant site data. This facilitated the development of an appropriate sampling strategy and geochemical sampling program to obtain representative samples of interburden and potential coal reject materials associated with MOD 10.

Three (3) drill holes (BC2569, BC2571 and BC2572) were sampled by BCOPL personnel and these samples were provided to RGS Environmental for geochemical testing and assessment purposes.

Samples from the three (3) drill holes produced a total of 96 samples for testing. The samples represented the overburden, interburden and coal seam roof and floor materials expected to be encountered during the proposed mining activities at BCM associated with MOD 10. The samples ranged in depth from approximately 5 m to 320 m below surface and focussed on the stratigraphic profile from the Herndale Seam to the Templemore Seam.

Samples were subjected to a series of geochemical tests at a commercial laboratory in Brisbane. A series of static and kinetic geochemical tests were completed on the collected BCM samples. This program was designed to assess the degree of risk from the presence and potential oxidation of sulfides, and generation and the presence/leaching of soluble metals/metalloids and salts. The assessment also included characterisation of salinity and major metal/metalloid concentrations.

6.8.3 Assessment of Impacts

6.8.3.1 Coal Rejects and Coal

The results of the static geochemical tests demonstrate that most of the overburden, and coal seam roof and floor materials have very low sulfur content, excess Acid Neutralising Capacity (ANC), and have been classified as Non-Acid Forming (NAF). The results suggest these samples represent materials with a very low risk of acid generation and a high factor of safety with respect to generating acidic drainage.

Some samples of coal seam roof and floor materials from two (2) of the fourteen coal seams mined at BCM (i.e. the Herndale and Onavale coal seams) have elevated sulfur content and have been classified as Uncertain or PAF.

The total amount of PAF coal seam roof and floor materials associated with the Herndale and Onavale seams was identified to represent a small fraction of the total amount of NAF overburden, interburden and coal seam roof and floor materials material with excess ANC. Hence if managed according to existing site procedures for PAF coal reject materials (i.e. buried deep in the open pit profile and covered with NAF spoil material), the risk of acid and metalliferous drainage (AMD) from the encapsulated PAF materials that may be generated from processing coal from the MOD 10 extension area will be low.

Most of the materials represented by the samples tested have excess ANC and are likely to provide a significant source of buffering to any unexpected acidity generated from specific mining materials.

6.8.3.2 Seepage Water Quality

The risk of significant water quality impacts from NAF coal and mining waste material was assessed to be low. Static and Kinetic Leach Column (KLC) geochemical testing results indicated that initial and ongoing surface runoff/seepage is expected to be pH neutral to slightly alkaline and have a low level of salinity.

In contrast, the pH and acidity/salinity of leachate from any PAF roof and floor materials associated with the Herndale and Onavale seams could decrease (i.e. become acidic) and increase (i.e. become saline), respectively, over time due to the oxidation of sulfide if these materials are left unmanaged and exposed to ongoing oxidising conditions.

The concentration of dissolved trace metals/metalloids in leachate from bulk NAF overburden, interburden and coal seam roof and floor materials was assessed to be low, and below applied water quality guideline limits. However, if PAF roof and floor materials associated with the Herndale and Onavale seams are unmanaged and allowed to freely oxidise, the concentration of dissolved trace metals/metalloids in leachate could be elevated for elements such as aluminium, iron, manganese, nickel and zinc.

While there is likely to be some variability in the geochemical characteristics of the coal seam plies (used to produce coal rejects) in a lateral and vertical direction, the majority of the coal samples tested and included in the longer term BCM total sulfur database have a relatively consistent total sulfur content.

6.8.3.3 Soil Characteristics

Overburden, interburden, and coal seam roof and floor materials are not expected to present any environmental issues associated with metal/metalloid concentrations for revegetation and rehabilitation.

Dispersive materials can impact surface water environments through increasing the sediment load present in surface waters and increased turbidity of surface waters. Overall, the results of the geochemical tests indicate that the interburden materials are unlikely to be sodic or dispersive. Therefore, overburden and interburden materials may be suitable for use in site infrastructure and as part of revegetation and rehabilitation activities.

Overburden and interburden materials represented by the samples tested do however, have a low concentration of exchangeable cations. This indicates that nutrient levels are low, and these materials could benefit from fertiliser and/or organic matter application if used in rehabilitation activities.

6.8.3.4 Geochemistry Impacts Comparison

Table 32 presents the geochemistry impacts associated with MOD 10 in comparison to MOD 7 (being the original SSD approval) and the currently approved operations under SSD 09_0182 (i.e. the incremental impacts approved under MOD 8, MOD 9 and MOD 11).

Table 32 Geochemistry Impact Comparison

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
Geochemical properties of overburden, and coal seam roof and floor materials.	› Most overburden has low sulphur content, moderate ANC and is classified as NAF barren. › Overburden materials are generally sodic and will generate slightly alkaline and relatively low-salinity runoff and seepage. › Most coal reject materials have low sulphur and are NAF-barren. However rejects from the Braymont and Jeralong roof and floor have high sulphur content and low factor of safety and PAF. › Most coal reject materials will generate slightly alkaline and low salinity runoff and seepage, except for PAF materials where acidic and saline runoff and seepage may occur (if not managed appropriately – e.g. deep inpit burial to limit oxygen exposure).	› No change for new materials to be mined (below Merriown) and will continue to be managed using existing measures in place at BCM (MOD 8) › No change (MOD 9) › No change (MOD 11)	› No change.

Table 32 above demonstrates that the incremental changes in geochemical properties of overburden, and coal seam roof and floor materials will continue to be of a very low risk of acid generation. The risk of significant water quality impacts from these materials will continue to be low. As such, overburden, interburden, and coal seam roof and floor materials are not expected to present any additional environmental issues or associated impacts compared to the MOD 7.

6.8.4 Mitigation and Management

The ongoing management of overburden will consider the geochemistry of these materials with respect to their potential risk to cause harm to the environment and their suitability for use in construction and revegetation. The following mitigation measures will be implemented for MOD 10:

- Continue operational sampling and geochemical testing of mining waste, consistent with best practice, throughout the mine life;
- In line with current management practices at BCM for coal rejects, coal seam roof and floor materials associated with the Herndale and Onavale seams, coal reject materials will continue to be buried deep in the open pit profile and covered with NAF spoil;
- The KLC data collected over the 6 – 12-month test period from representative samples of overburden, interburden, and NAF and PAF coal seam roof and floor materials will be used as an input into the development of source terms associated with any future site water balance/quality modelling activities and/or closure studies at BCM; and
- BCOPL will revise and update the target parameters for site water quality based on the unique aspect of the site. The range of water quality parameters described the geochemical report (**Appendix M**) will be included in the water quality monitoring program for MOD 10 as part of the BCM WMP.

6.9 LAND RESOURCES, REHABILITATION AND FINAL LAND USE

6.9.1 Background

The 2010 EA included an assessment of the potential impacts of the BCM to soils and land resources within the BCM Project Boundary, which includes the land within the Modification Disturbance Footprint. Further to this, Landloch (2020) completed a Site Verification Assessment over the portion of the BCM Project Boundary (and western portion of the Modification Disturbance Footprint) that now falls in ML 1883 to confirm whether the land was Biophysical Strategic Agricultural Land (BSAL). For the purposes of this Modification Report, a review of these previous assessments was undertaken to assess the likely additional impacts to soil resources as a result of MOD 10.

A review of the revised Conceptual Final Landform for MOD 10 has also been undertaken to ensure that it complies with the BCM rehabilitation objectives and to identify any material changes in long-term impacts as a result of the landform changes.

The objectives of the assessment were to:

- Evaluate land resources to be disturbed in consideration of the existing rehabilitation strategies currently implemented at the BCM and any required changes;
- Consider the changes to Conceptual Final Landform and any associated adjustments to the Final Land Use Plan;
- Consider the any changes to landform stability for the revised Conceptual Final Landform for MOD 10, including the changes proposed for the northern highwall; and
- Review the potential impacts of climate change on BCM's final rehabilitation operations and to develop appropriate mitigation and management measures to facilitate sustainable mine rehabilitation.

6.9.2 Methodology

BCM has been subject to previous landform and land resources assessments as part of the environmental approvals process and consideration of rehabilitation management practices. The 2010 EA included the *Continuation of Boggabri Coal Mine Project Environmental Assessment.*

Soil Survey and Land Resource Impact Assessment Report (GSSE, 2010) (2010 Soils Assessment) which considered the soil and land resources within the Project Boundary.

Additional to this, the *Boggabri Coal Mine Site Verification Assessment of Biophysical Strategic Agricultural Land* (SV Assessment) (Landloch, 2020) was completed over the area now covered by ML 1883, which includes the western portion of the Modification Disturbance Footprint.

The outcomes of the 2010 Soils Assessment and SV Assessment have been reviewed and utilised where relevant to describe the soil resources within the Modification Disturbance Boundary.

From a landform stability perspective, landform stability assessments have been completed as part of the former Mining Operations Plan (now included within the Rehabilitation Management Plan) and for MOD 8 to SSD 09_0182. These assessments include:

- Conceptual Landform Study (Landloch, 2012);
- Erosion Modelling Update letter report (Landloch, 2018); and
- *Boggabri Coal Mine Evaluation of Proposed Changes to Final Landform – Modification 8* (Landloch, 2021).

These reviews generally entailed the assessment and comparison of:

- Drainage patterns;
- Simulated landform erosion rates;
- Identified areas with potential erosion risk;
- Integration of the Conceptual Final Landform design with the adjoining mining operations, and
- Inclusion of a soil and land capability assessment to describe soil types, land capability and agricultural suitability, stripping depths and erosion and sediment control measures.

Projected impacts of climate change on ongoing mining operations and rehabilitation efforts was also considered for MOD 10. Consideration involved a review of the influence of rising temperatures, altered precipitation patterns, extreme weather events, and drought in terms of the potential risks associated with the Conceptual Final Landform and BCM rehabilitation activities.

6.9.3 Assessment of Impacts

6.9.3.1 Soils and Land Resources

The 2010 Soils Assessment mapped the soils within the Modification Mining Area to be part of the Light Brown Uniform Gravelly Sand Soil Unit. This soil unit was identified to generally consist of light brown to brown very gravelly loamy sands throughout the soil profile (GSSE, 2010).

GSSE (2010) found these soils were well drained soils with moderately acidic to strongly acidic at depth. Further these soils are generally non-saline and comprise poor fertility characteristics and are non-sodic in nature. Standard erosion and sediment controls were recommended for these soils given the limited erosion risks.

Within the SV Assessment, the soils within the Modification Disturbance Footprint were assessed to conform to a soil profile class conforming to Maules Gravelly Sands. These soils in turn conform to Orthic and Leptic Tenosols, which are gravelly to moderately gravelly clayey sands formed on the sedimentary Maules Creek Formation. Shallower soil depths were identified to be present in soils within this Soil Profile Class on hill crests and steeper slopes.

GSSE (2010) identified these soils were generally unsuitable for stripping, due to the identified high stone content. However, mining operations at BCM have advanced into this soil unit as part of its recent mining operations. BCOPL has identified the opportunity of stripping these soil resources for use in mine rehabilitation (despite the higher stone content).

Whilst the higher content of stones may not be favourable from an agricultural perspective, the rehabilitation of the mined landform to biodiversity final land use is unlikely to be problematic from a final landform perspective.

Assuming a 0.5 m stripping depth for these soil materials across the 85 ha additional disturbance area (and a 10% soil loss factor), a further 382,500 cubic metres of soil resources will be available for use in the final rehabilitation activities for the BCM.

6.9.3.2 Final Landform Review

The Conceptual Final Landform for MOD 10 generally retains similar landform characteristics to that presented in the 2010 EA and modified as part of the MOD 8 amendment. Accordingly, the final landform for BCM will continue to comprise an elevated OEA and a partially infilled final void. The partially infilled final void is proposed to be developed to a level higher than the pre-mining groundwater pressures and ensures that the final void will retain no surface water (i.e. no pit lake). Consistent with the approved final landform from the MOD 8 amendment, the final void has also been reduced in area and contained within the most western portion of the mining footprint to better address the objective of minimising the size and depth of the final void as far as reasonable and feasible.

Soil erodibility is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. Site soils at BCM are generally poor quality and often are stripped with low organic carbon levels, sometimes sodic properties, and comprise dispersion issues. Given these characteristics, the soils at BCM are of moderate erodibility and are actively managed as part of existing rehabilitation and soil management activities. Such measures include stripping and mixing with mulch, application of gypsum and fertilisers and emplacement on the final landform which has been appropriately contoured and shaped to meet site specific landform design parameters.

The risk of erosion from the rehabilitated landform is significantly influenced by the steepness and the length of a given slope. Soil loss rates generally decrease with more intensive vegetative cover. In this regard, the most efficient cover management option that has been applied at BCM to mitigate soil loss rates is with the establishment of a temporary cover crop which stabilises the landform slopes until the native understory is established.

As identified previously, BCOPL has commissioned several reviews of landform stability for the BCM landforms. The evaluation of the proposed final landform for MOD 8 to SSD 09_0182 (Landloch 2021) found that the erosion rates of this final landform (i.e. in the range of 5.3 to 6.9 tonnes per ha per year [t/ha/y]) were within the range of the commonly applied "acceptable" rate and ultimately did not indicate large erosion risk for the currently approved Conceptual Final Landform.

The MOD 8 Conceptual Final Landform includes an OEA a maximum height of 400 m AHD (consistent with the design as described in the 2010 EA), including a 5 m increase in height to facilitate the construction of macro-relief elements to promote drainage to the natural environment post mining. The Conceptual Final Landform for MOD 10 has been designed generally consistent with the MOD 8 landform design.

The Conceptual Final Landform for MOD 10 results in the partially infilled final void to extend further to the north in line with the increased mining footprint. The MOD 10 Conceptual Final Landform will continue to be established to maintain a free draining landform consistent with that currently approved. The lower lying sections of the partially filled final void will continue to capture surface water drainage from its catchment. Modelling completed as part of the Surface Water Impact Assessment (see **Section 6.5**) confirms that water will temporarily pool within the partially infilled final void following extreme rainfall events. This pooling of water has been assessed to be temporary in nature, as this water will be lost to evaporation and infiltration through the base of the partially infilled final void to the underlying groundwater table.

Whilst the Conceptual Final Landform for MOD 10 will remain generally consistent with the currently approved final landform for BCM, the revised landform will entail the emplacement of overburden materials against the northern highwall.

The emplacement of overburden materials against the northern highwall at the end of mining operations will facilitate the revegetation of this portion of the landform which will substantially improve the amenity, stability and contribute to the biodiversity values on the post mining landform. The landform against the northern highwall has been designed with concave slopes. Parts of this landform will exceed the standard landform design criteria of 10 degrees.

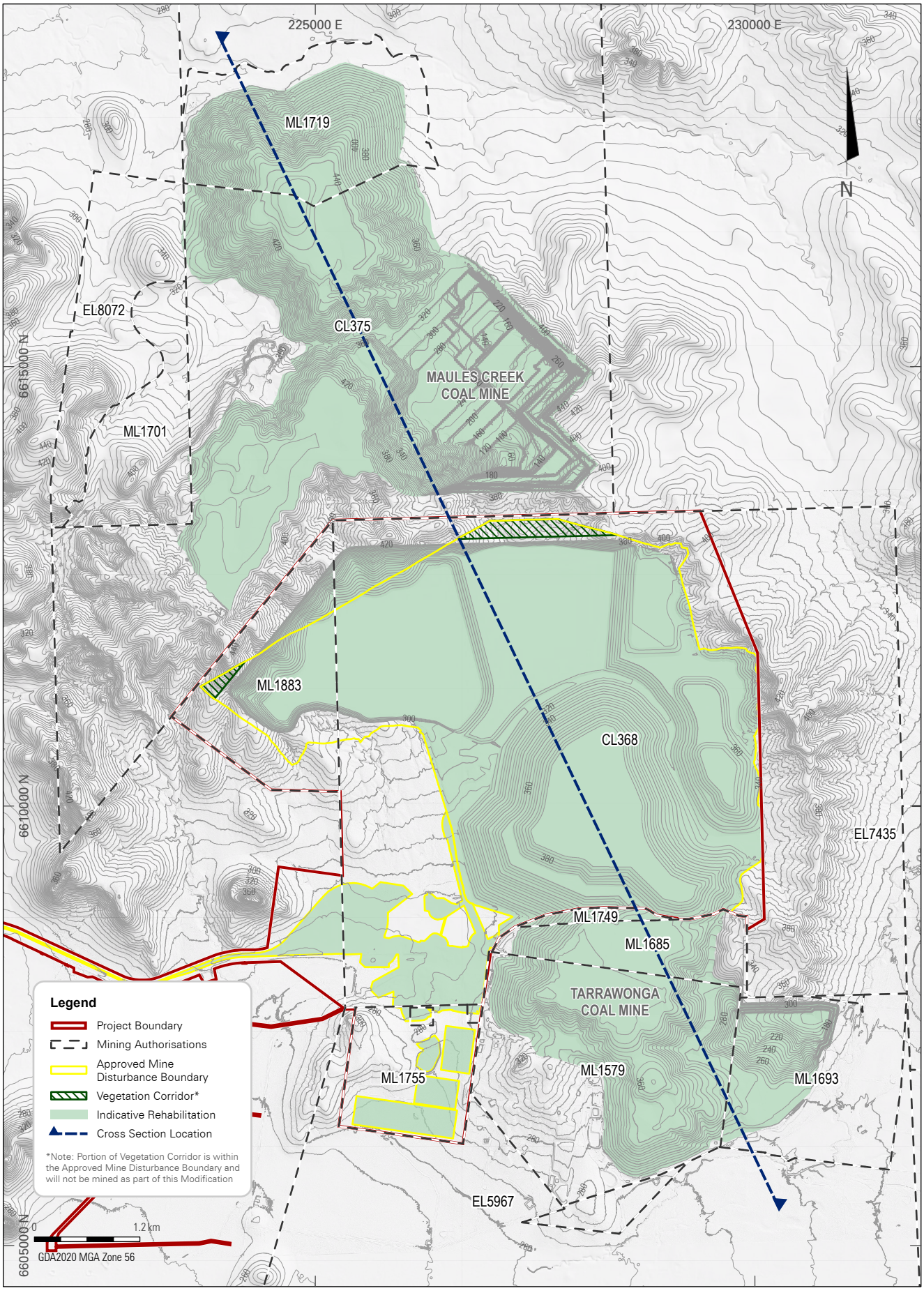
The concave slope design that has been adopted is anticipated to improve the overall stability of this landform when compared with a conventional linear slope.

Further review and assessment of the Conceptual Final Landform design will be completed as part of the work program to be completed as part of the Final Void and Mine Closure Plan, which is required under Schedule 3, Condition 74 of SSD 09_0182. It is anticipated that the timing of this work will be adjusted to enable the work to be completed in relation to the MOD 10 Conceptual Final Landform design.

The Conceptual Final Landform for MOD 10 has also included refinements to the final landform design at the common boundary with TCM (in accordance with the Common Lease Boundary Agreement in place with WHC). The remaining overburden emplacement and rehabilitation activities along this southern boundary will be undertaken as part of the progressing operations at TCM. The Cumulative Conceptual Final Landform is illustrated in **Figure 21** with an associated cross section provided in **Figure 22**.

The rehabilitation objectives as outlined in Table 16 of Schedule 3, Condition 69 of SSD 09_0182 are not proposed to be modified as a result of the mine plan changes sought by MOD 10. As discussed, the Conceptual Final Landform design has been developed to generally align with the existing rehabilitation objectives and the currently approved Conceptual Final Landform design to ensure the partially infilled final void remains above the modelled post-mining groundwater levels. The Conceptual Final Landform Design for MOD 10 has incorporated a partially infilled final void with a minimum fill level of RL 285 m. This fill level will remain above the modelled post-mining groundwater levels within this area to ensure that no surface water is retained (i.e. no pit lake). Consistent with current practice at BCM, the slopes of the OEA for the Conceptual Final Landform have been designed to manage landform stability and to sustain the proposed woody vegetation communities (consistent with that currently approved under SSD 09_0182). The proposed final landform design proposes the emplacement of overburden materials against the final northern highwall to develop a safer, stable and non-polluting final landform. It will also facilitate the revegetation potential of this landform which will in turn improve its visual amenity and biodiversity value.

As discussed in **Section 3.5.2**, the MOD 8 amendment resulted in minor adjustments to the vegetation communities to align these to the revised landform design when compared to the 2010 EA landform design. These vegetation communities illustrated in **Figure 12** generally remain unchanged for the purposes of MOD 10. It is noted that the Woodland / Forest on Sloping Lands located on the western portion of the rehabilitated OEA were established prior to the grant of SSD 09_0182 in 2012. The rehabilitation of these areas was undertaken with the former vegetation species mix and prior to the commencement of the current approach to focus on the establishment of Shrubby Woodland vegetation communities. These areas of rehabilitation have been established for more than 13 years and provide important biodiversity values and habitat for the threatened fauna species known to occur within the area. Accordingly, it is envisaged that these areas will remain as a specific patch of woodland rehabilitation at BCM which comprises some alternate woodland species to the remainder of the mine site.



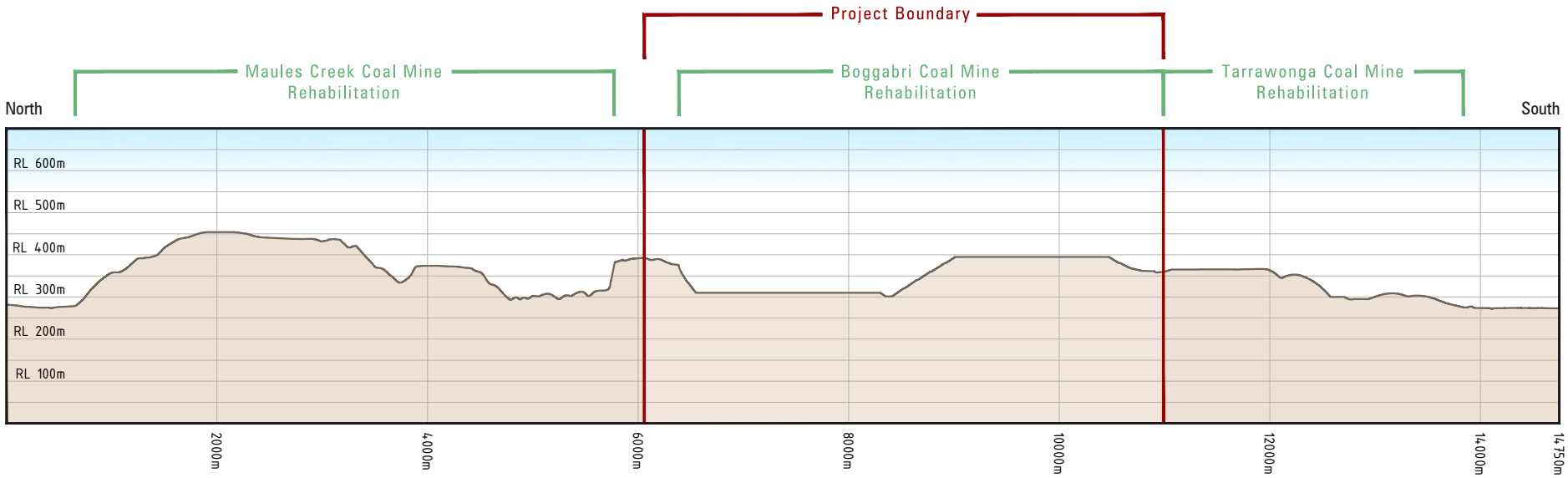
3115\DEM (BCM MOD10)_Cumulative Final Landform.aprx

BOGGABRI COAL MINE MODIFICATION

Conceptual Cumulative Final Landform

FIGURE 21

Indicative Cumulative Final Landform



0 1200m Horizontal Scale

0 300m Vertical Scale

Horizontal / Vertical Scale = 1/4

3115IDEM (BCM MOD10)_Compiled Final Landform Section (27/05/2025)

BOGGABRI COAL MINE MODIFICATION

Indicative Cumulative Final Landform Cross Section

FIGURE 22

6.9.3.3 Climate Change

A review of the potential impacts of climate change to existing and future operations at BCM has been completed. This review identified the following potential impacts that will need to be managed during the ongoing operations at BCM to ensure the longer-term success of rehabilitation activities :

- Water availability: Higher temperatures and reduced rainfall will increase water demand, creating competition between operational and ecological needs and thus alternative water strategies (i.e. to minimise evaporation or to apply additional recycling opportunities) may be necessary;
- Erosion risk: intense rainfall may elevate erosion risk, especially during the early stages of rehabilitation where vegetation cover has not been established. Accordingly, enhanced erosion management measures may be required to be implemented;
- Revegetation success: Rising temperatures and prolonged droughts has the potential to hinder vegetation establishment on rehabilitated landforms, requiring further measures to be implemented to ensure success during these conditions; and
- Increased costs and resource demand: Projected climate change may lead to higher costs in sourcing additional water, implementation of additional erosion controls, and infrastructure improvement.

It is important to note that these potential impacts apply to the currently approved operations at BCM and are not (apart from the further four (4) years of operations) as a consequence of MOD 10. Notwithstanding, climate change risk is being effectively managed with approximately 253 ha of land successfully rehabilitated (as reported during the 2024 reporting period). Associated risks are and will continue to be managed through the approved BCM RMP.

6.9.3.4 Final Landform Impact Comparison

Table 33 presents the landform impacts associated with MOD 10 in comparison to MOD 7 (being the original SSD approval) and the currently approved operations under SSD 09_0182 (i.e. the incremental impacts approved under MOD 8, MOD 9 and MOD 11) and the original approval as at MOD 7.

Table 33 Final Landform Impact Comparison

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
Final Landform Objectives	› The Conceptual Final Landform is to be developed: ▪ to reduce the size and depth of the final void (as far as practicable); ▪ With a partially infilled final void being developed to a height above the pre-mining groundwater levels (to avoid development of pit lake) ▪ Maximum height of OEA to RL 395 m.	› The Modified (MOD 8) Conceptual Final Landform comprises: ▪ Increased OEA height by up to 5 m (i.e. to a maximum height of RL 400 m) to include macro relief elements. ▪ Relocated partially infilled final void to reduce catchment. ▪ Minor adjustment to the vegetation communities.	› The Modified (MOD 10) Conceptual Final Landform comprises: ▪ Rehabilitated landform extends to north into Modification Disturbance Footprint. ▪ Partially infilled final void to extend further to the north in line with the increased mining footprint. ▪ Emplacement of overburden materials against the northern highwall.

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
	▪ The Final Landform will integrate with the adjacent mining operations within the BTM Complex (2010 EA).	▪ Commitment for improved integration with TCM. › No change (MOD 9) › No change (MOD 11)	▪ Minor adjustments to the Final Landform vegetation communities to consider rehabilitation areas established prior to the 2010 EA.

Table 33 above demonstrates that the incremental changes to the Conceptual Final Landform characteristics for the BCM will remain generally the consistent with that granted for MOD 7. Incremental cumulative changes to the Conceptual Final Landform since the grant of MOD 7 includes: increased maximum height of OEA by 5 m, minor adjustments to the vegetation communities, relocation of the final void to reduce catchment and the emplacement of overburden against the final highwall. The MOD 10 Conceptual Final Landform is therefore substantially the same as that presented within the 2010 EA and as approved at the grant of MOD 7 whilst providing additional environmental benefits.

6.9.4 Mitigation and Management

BCOPL currently manages impacts of BCM's activities on soil resources in accordance with the mitigation and management measures described within the BCM Soil Management Protocol (SMP) which is appended to the BCM RMP. These management strategies will continue to remain relevant to the mining operations within the Modification Disturbance Footprint and will be readily implemented for the purposes of MOD 10 to manage any impacts associated with the progression of mining operations to the north west. The SMP is updated regularly to reflect the progression of mining operations and will take on board the stripping and stockpiling activities associated with the progression of mining into the Modification Disturbance Footprint. Furthermore, the topsoil inventory will be adjusted to accommodate additional soil resources required for the Conceptual Final Landform and the materials which will be salvaged and available for use in rehabilitation.

Consistent with current operations at BCM, the following mitigation and management strategies will be implemented:

› Erosion and sediment control measures will be planned and implemented prior to ground disturbance activities occurring to appropriately manage erosion risks;
› Prior to disturbance, soil resources will be identified and a plan for soil stripping and recovery will be developed to ensure these are available for reuse in the final rehabilitation activities at BCM;
› Soil materials will be stripped in a moist condition and placed directly onto shaped rehabilitation areas (where practicable) or temporarily stockpiled using methods to reduce impacts to soil structure and compaction for reuse later on rehabilitation areas; and
› Soil materials salvaged for clearing activities will be recorded within the BCM soil inventory as detailed within the SMP.

BCOPL works closely with the adjacent mining operations within the BTM Complex to manage cumulative impacts on the environment. The BCM shares a common mining lease boundary with the TCM where mining operations are approved to be undertaken right to the boundary. BCOPL and WHC have an established Common Boundary Agreement which ensures that the final landform within this area is integrated to ensure environmental impacts from these landforms are appropriately managed. BCOPL will continue to consult with adjacent mining operations to ensure that the surrounding landforms are appropriately integrated.

6.9.4.1 Temporary Rehabilitation

Given that the majority of the eastern portions of the OEA will be re-disturbed at the end of the mine life to source overburden materials to partially infill the final void and to backfill overburden against the highwall, there will be limited areas available during the upcoming years of mining operations for progressive rehabilitation.

Consistent with the intent of Schedule 3, Condition 70 of SSD 09_0182, areas of temporary rehabilitation on the OEA have been proposed (See **Figure 6** to **Figure 10**). Temporary rehabilitation areas will occur on overburden materials with no topsoil to be applied given the temporary nature of this rehabilitation. The temporary rehabilitation will occur on landforms ranging from slightly free draining to very steep (angle of repose). Temporary rehabilitation of landforms with slopes less than 18° will be ameliorated with an appropriate rate of gypsum (if required), contour ripped and sown with cover crops.

Temporary rehabilitation areas exceeding 18° will be aerially sown with cover crops. The application of soil binders (by ground or aerial spraying) will also be considered as a contingency where crop surface coverage is insufficient following sowing activities on temporary overburden slopes to minimise dust generation and erosion. Fertilisers may also be utilised in temporary rehabilitation as determined by site specific overburden characterisation.

Runoff from all temporary overburden slopes will report to sediment control structures within the mine water management system. Such structures will be designed and constructed in accordance with *Managing Urban Stormwater: Soils and Construction – Volume 2E, Mines and quarries* (Blue Book) (Landcom, 2004).

6.10 VISUAL AMENITY

6.10.1 Background

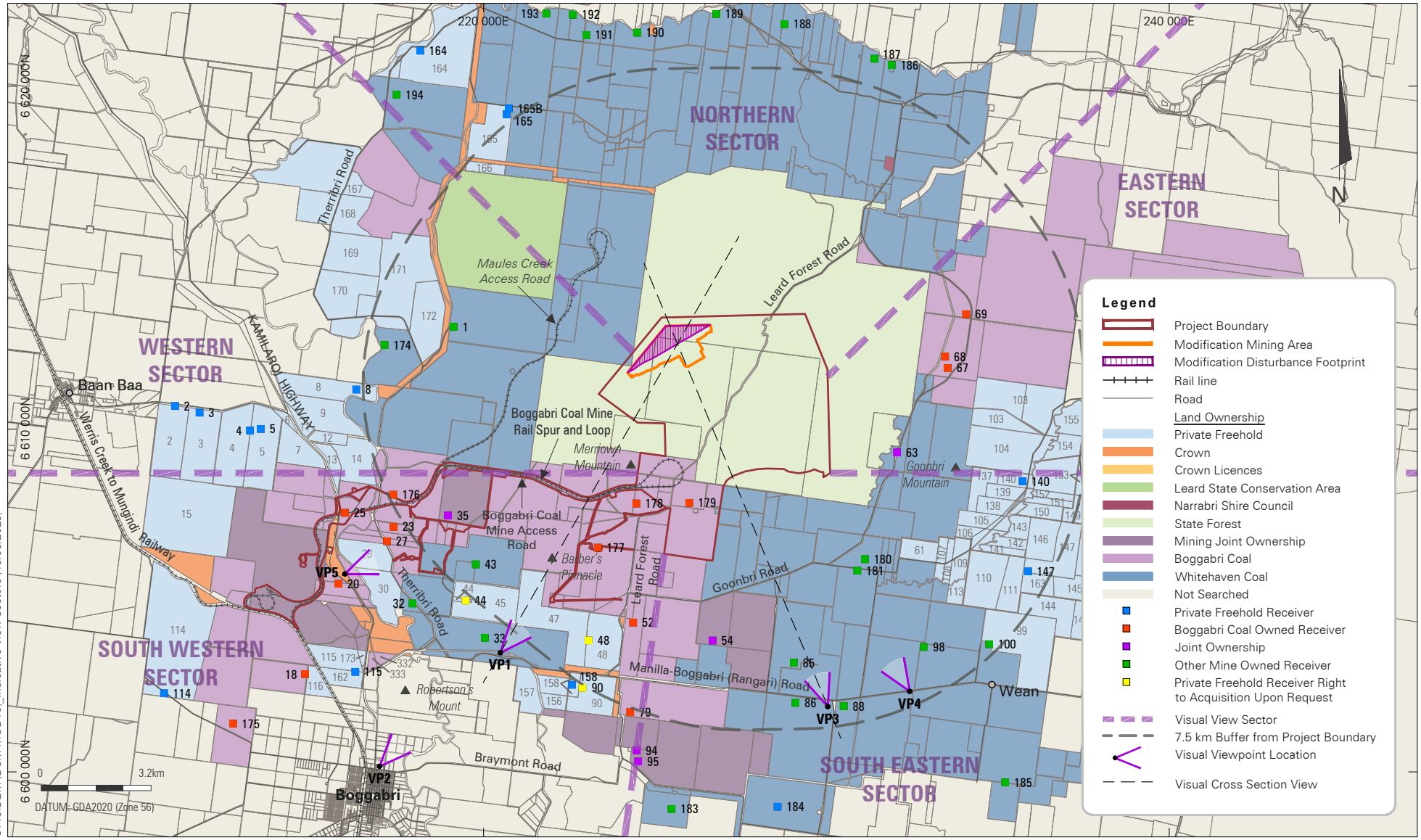
A Visual Impact Assessment (VIA) was undertaken by Xenith to assess the visual impacts of MOD 10 within the contemporary landscape. A copy of the VIA is provided in **Appendix N**, with a summary provided in the following sections.

6.10.2 Methodology

The VIA for MOD 10 generally entailed the following:

- Desktop literature review and consideration of previous assessments completed for the BCM and the surrounding mines to determine the background visual character of the landscape. This included the *Continuation of Boggabri Coal Mine Visual Impact Assessment* (2010 VIA) (Integral, 2010), and the *Boggabri Coal Mine Visual Impact Assessment Modification 8* (MOD 8 VIA) (Hansen Bailey, 2021);
- Review of the proposed changes to the BCM staged mining progression and Conceptual Final Landform for MOD 10 to determine the Primary Visual Catchment (PVC), view sectors and key viewing locations to visit during the field assessment. The PVC, view sectors and view locations assessed for MOD 10 were generally consistent with those assessed in the 2010 VIA and the MOD 8 VIA (as amended) (see **Figure 23**);
- Field assessment to review the visual character of the existing mining operations (including any changes since the previous assessments) and take photographs of the representative viewing locations to support the MOD 10 assessment;
- Determination of the visual effect and visual sensitivity of the proposed mine plan changes sought by MOD 10. The visual effect and visual sensitivity were assessed by considering the visual characteristics of the proposed mine plan changes in the context of the existing landscape (and the approved mining operations at BCM and surrounding mines within this landscape);
- Assessment of visual impact by considering the interactions between the visual sensitivity of the key viewing locations and the visual effect of the proposed mine plan changes;

- Consideration of the potential impacts of MOD 10 on the contemporary visual character of the landscape; and
- Identification of any further mitigation and management measures required to minimise the potential visual impacts created by MOD 10.



3115IDEM (BCM MOD10)_Indicative View Sectors (13/05/2025)

BOGGABRI COAL MINE MODIFICATION

Indicative View Sectors

FIGURE 23

The visual effect is the combination of the visual properties of BCM against the approved operations, with consideration of the proportion of the view occupied by the changes proposed by MOD 10. The degree in which the visual characteristics of MOD 10 contrasts with the existing landscape determines the type of visual effect.

The visual effect of MOD 10 primarily relates to the northerly extension of mining operations (and associated increases in spoil emplacement volumes) compared to the current approved mining footprint which will be viewed in conjunction with the existing operations. Accordingly, the visual effect as described within the 2010 VIA will remain generally consistent for MOD 10 with no additional incremental visual effects of expected.

Visual sensitivity is a combination of the sensitivity of land use and the visibility of BCM (as a measure of distance) to measure how critically a change to the existing landscape is viewed by people from different land use areas in the vicinity of the development.

Assessing visual impact requires qualifying the change to the existing environment at BCM with the addition of changes sought by MOD 10. The magnitude of the impact will depend on the visual effect and the visual sensitivity of any representative views. **Table 34** illustrates the interaction between the parameters of visual sensitivity and visual effect to establish the visual impact.

Table 34 Visual Impact Methodology

Visual Effect	Visibility Sensitivity		
	High	Moderate	Low
High	High	High/Moderate	Moderate/Low
Moderate	High/Moderate	Moderate	Moderate/Low
Low	Moderate/Low	Moderate/Low	Low
Very Low	Low	Very Low	Very Low

6.10.3 Assessment of Impacts

Table 35 summarises the assessed visual impacts of the proposed mine plan changes sought by MOD 10.

6.10.3.1 North Sector

The topographic elements and vegetated ridgelines of the Willow Tree Range (and the associated vegetation corridor separating the MCCM and BCM) will continue to screen the majority of mining activities from views in this sector. Part of the Modification Mining Area will extend beyond the ridge of the Willow Tree Range in the northern corner, however this mining area will cause only a marginal reduction in elevation for this ridgeline and given the establishment of vegetation, the visibility to the north of the Modification Mining Area will be reduced by the intervening vegetation in the Vegetation Corridor.

Table 35 Summary of the Visual Impact of the Modification

Viewing Point	Visual Sensitivity	Visual Effect	Visual Impact
VP1	Low	Moderate	Moderate to Low
VP2	Moderate	Low	Low

Viewing Point	Visual Sensitivity	Visual Effect	Visual Impact
VP3	Low	Moderate	Moderate to Low
VP4	Low	Moderate	Moderate to Low
VP5	Low	Low	Low

The establishment and progression of the MCCM OEA will also reduce views of the BCM mining landform from the distant locations in this sector.

Accordingly, the north sector will continue to have low sensitivity to mining operations at the BCM. A low visual impact will therefore be afforded to this sector as a result of MOD 10.

6.10.3.2 East Sector

No private receivers are located within the East Sector which are within 7.5 km of the BCM Project Boundary. Notwithstanding, the Willow Tree Range will continue to screen views of the proposed mining operations at BCM. This sector will therefore continue to have a low visual sensitivity to mining operations at the BCM. A low visual impact will therefore be afforded to this sector as a result of MOD 10.

6.10.3.3 South-East Sector

Field assessments and an evaluation of aerial photography indicates that the surrounding Willow Tree Range and the adjacent TCM OEA's will screen potential views towards the northern portion of the approved Mine Disturbance Boundary. As such, views towards the Modification Mining Area are anticipated to be limited from the south-east sector.

Views of the progression of mining operations from representative view locations within this sector (View Point (VP) 3 and VP4) are expected to be generally screened by the ongoing emplacement and subsequent rehabilitation of the southern BCM OEA and the existing and approved TCM Landform. The visual impacts associated with these views are expected to reduce in magnitude as rehabilitation activities progress.

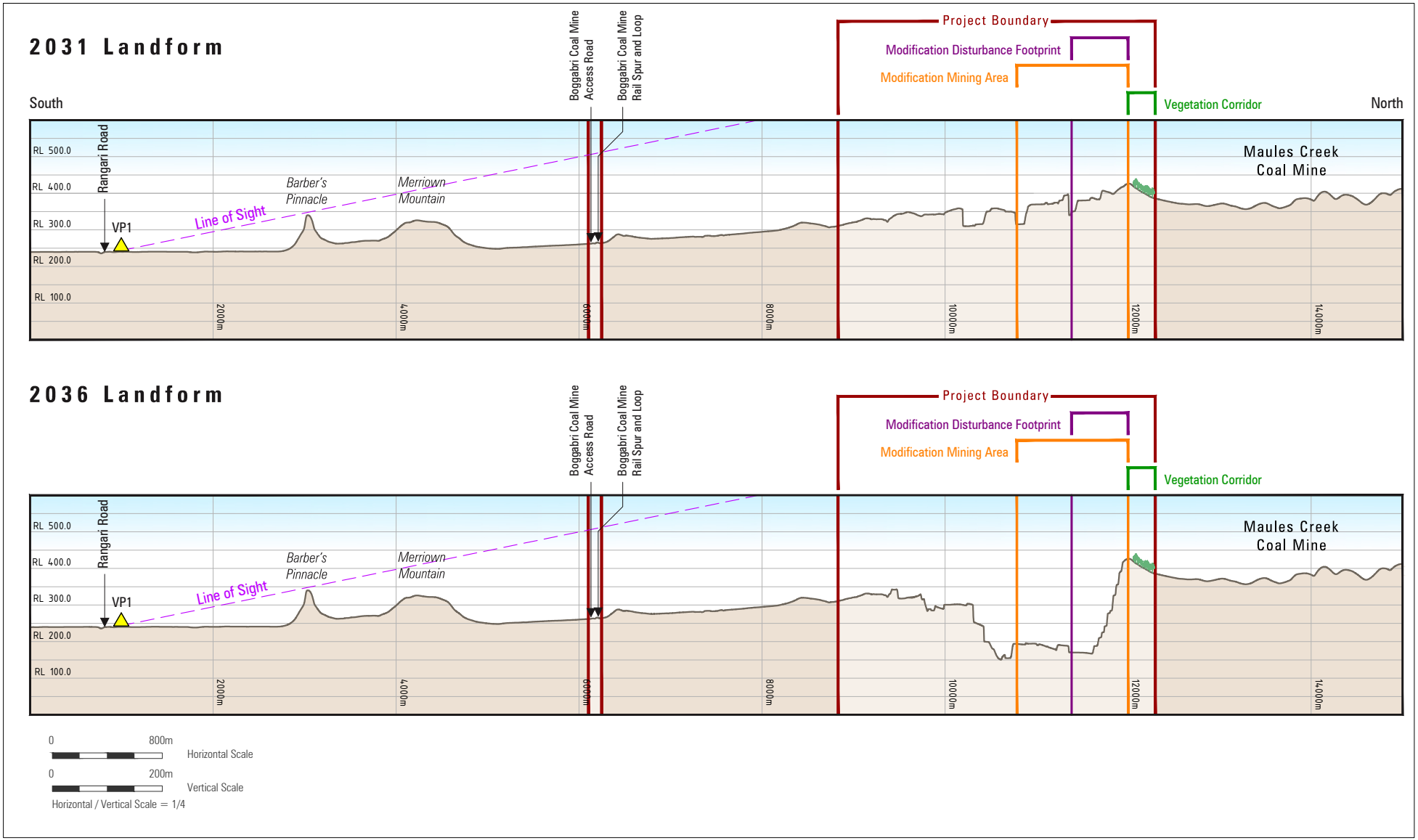
6.10.3.4 South-West Sector

Three (3) private residences (receivers 44, 48 and 90) are located within the south-west sector within 7.5 km of the Project Boundary. However, all these residences are located further than 7.5 km from the Modification Mining Area. Views from these locations are anticipated to be generally screened by topographic features associated with Barber's Pinnacle, Merriown Mountain, other surrounding terrain containing semi-open woodland vegetation and the existing TCM OEA.

Views from the Boggabri township (VP2) will be generally screened by surrounding topography including the distant Barber's Pinnacle, the Leard State Forest and woodland vegetation alongside the Namoi River. Given the distance (approximately 12 km) from the Project Boundary, the views of the Leard State Forest / Willow Tree Range are obscured by foreground and middle ground woodland vegetation, effectively rendering the Modification Mining Area out of view. Given that the Modification Mining Area is approximately 15 km from the Boggabri township, sensitivity to any views of the mining operation will continue to be low.

Distant views of the Leard State Forest and the Willow Tree Range are experienced from the Kamilaroi Highway alongside the Namoi River, to the north of the Boggabri township (VP5). Immediate views of the existing BCM operations including the BCM Rail Spur are generally screened by woodland vegetation alongside the Namoi River and the topography associated with Barber's Pinnacle and Merriown Mountain. Views from this location will continue to be restricted by topographic elements including foreground vegetation on the Namoi River, Barber's Pinnacle, Merriown Mountain, associated ridges and the foothills adjacent to the Project Boundary.

For representative years (Mine Plan 2031 and Mine Plan 2036), the existing BCM OEA obscures and surrounding topography of Barber's Pinnacle and associated woodland vegetation will obscure most views from this sector. Visual cross-sections using Mine Plan 2031 and Mine Plan 2036 have been developed for VP 1 and VP 3 as being representative of views when operations progress into the Modification Disturbance Footprint (see **Figure 24** and **Figure 25**).



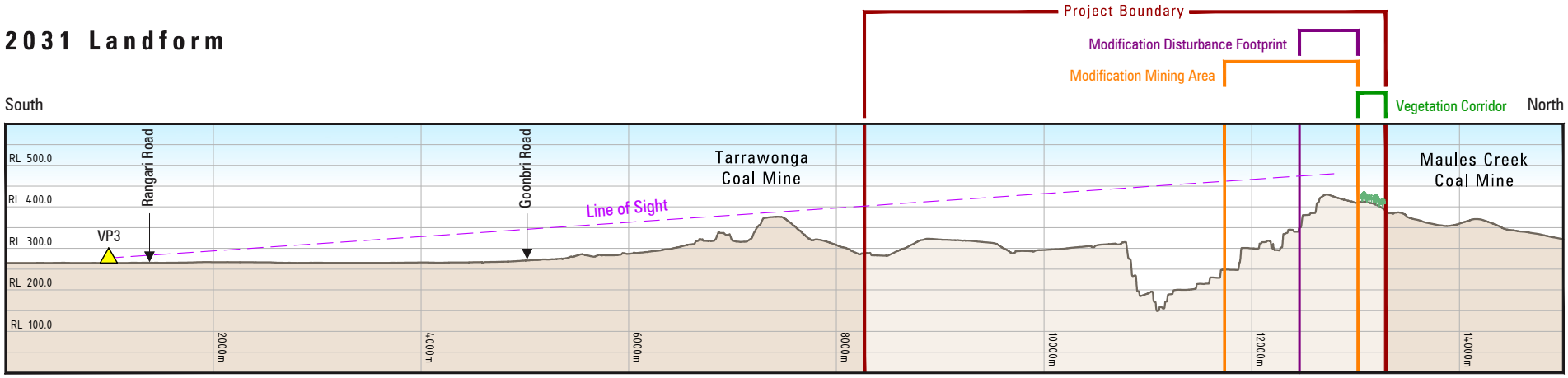
3115IDEM (BCM MOD10)_Visual Long Sections (15/05/2025)

BOGGABRI COAL MINE MODIFICATION

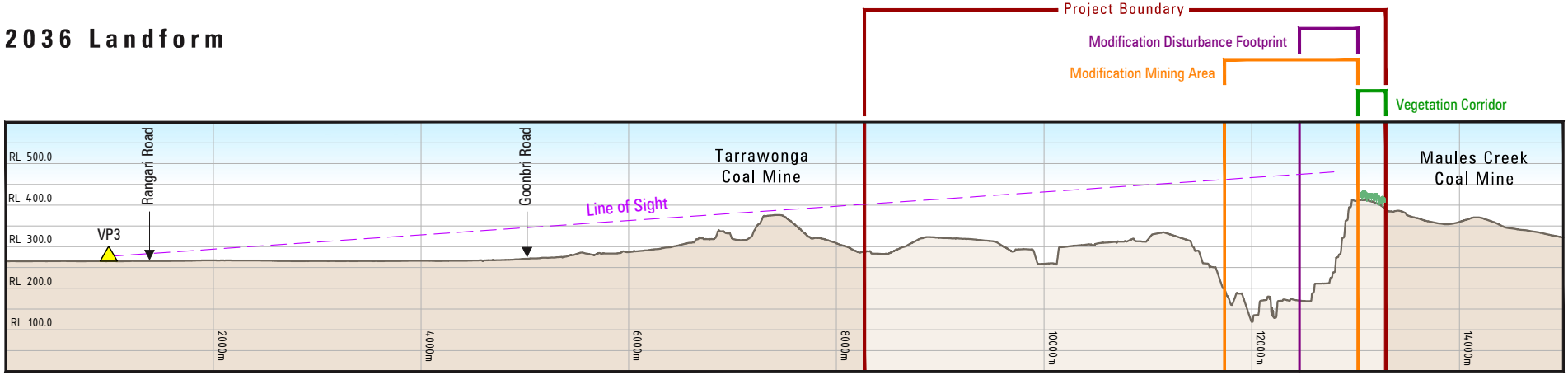
Visual Cross Section VP1 - Years 2031 and 2036

FIGURE 24

2031 Landform



2036 Landform



0 800m Horizontal Scale

0 200m Vertical Scale

Horizontal / Vertical Scale = 1/4

3115IDEM (BCM MOD10)_Visual Long Sections (15/05/2025)

BOGGABRI COAL MINE MODIFICATION

Visual Cross Section VP3 - Years 2031 and 2036

FIGURE 25

6.10.3.5 West Sector

The western sector remains entirely screened by the Willow Tree Range and elevated sections of the Leard State Forest. Accordingly, no visual impacts are anticipated for this sector.

6.10.3.6 Night Light

MOD 10 will not exacerbate the predicted night lighting impacts beyond those previously described in the 2010 VIA, albeit the continuation of impacts associated with the additional four (4) years of mining.

Direct light sources at BCM are primarily associated with vehicle movements and mine void lighting. BCM truck and vehicle lighting will continue to be screened by topography, vegetation and the exiting OEA. However, upon progressing into the Modification Mining Area, some distant direct lighting effects from mine vehicles and mobile lighting sets may be experienced for a short period before mine depth increases. During this period, these impacts are predicted to be moderate dropping to low once direct lighting can no longer be seen.

Notwithstanding, the foreground topography and vegetation of the surrounding landscape are expected to generally screen the majority of these views.

No changes are expected for diffuse night lighting from BCM operations and the visual effect of lighting associated with BCM is expected to remain generally consistent with the currently approved development.

6.10.3.7 Visual Impact Comparison

Table 36 presents the visual impacts associated with MOD 10 in comparison to MOD 7 (being the original SSD approval) and the currently approved operations under SSD 09_0182 (i.e. the incremental impacts approved under MOD 8, MOD 9 and MOD 11).

Table 36 Visual Impact Comparison

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
Visual and lighting Impacts	› Restricted visibility of the BCM to the east, west and north due to its location within the Willow Tree Range. › Potential for significant impacts on residential receivers to the southeast and southwest due to the southern OEA where there is a direct line of sight from private residences within 7.5 km of the BCM. › Potential visual impacts related to the transport infrastructure, particularly the bridges over the Namoi River and Kamilaroi Highway.	› Negligible short-term additional visual impacts to southern receivers as a result of an increase in elevation of southern OEA by 5 m (MOD 8). › No change (MOD 9). › No change (MOD 11).	› No changes to visual impacts within the east, west and north view sectors. › Limited views from private residences in the south-east and south-west sectors. Views afforded to these sectors are anticipated to reduce in magnitude as rehabilitation activities at the BCM and TCM progress (consistent with that presented in the 2010 EA). › Potential for minor distant views of direct lighting as surface operations progress into the Modification Mining Area.

Table 36 above demonstrates that the incremental changes to visual impacts associated with the BCM since the grant of MOD 7 are substantially the same as those originally approved with negligible additional impacts potentially being experienced to southern receivers.

6.10.4 Mitigation and Management

The changes to BCM operations sought by MOD 10 are not anticipated to result in any material additional impacts on the surrounding visual landscape at any private receiver. As MOD 10 is not anticipated to result in any additional material impact, no additional mitigation or management measures are proposed.

As such, BCOPL will continue to manage operations at BCM in accordance with the relevant conditions of SSD 09_0182 and other applicable guidelines.

6.11 SOCIAL

6.11.1 Background

Xenith completed a Social Impact Assessment (SIA) to identify the potential socio-economic benefits and impacts associated with MOD 10. The SIA also identifies appropriate strategies to avoid, mitigate or manage negative impacts or enhance positive opportunities associated with MOD 10.

A copy of the SIA is provided within **Appendix O** with a summary provided in the following sections.

6.11.2 Methodology

The SIA was prepared in consideration of the following:

- *Social Impact Assessment Guideline* (SIA Guideline) (DPE, 2023a); and
- *Technical Supplement Social Impact Assessment Guideline for State Significant Projects* (SIA Technical Supplement) (DPE, 2023b).

The methodology for the MOD 10 SIA was achieved through a phased approach. This approach included:

- Phase 1 – Preparation of Stakeholder Engagement Plan (SEP) and the initial identification and analysis stakeholders;
- Phase 2 – Scoping: Identification of material impacts;
- Phase 3 – Community profiling of social locality;
- Phase 4 – Identification and assessment of impacts and opportunities; and
- Phase 5 – Identification of management and enhancement strategies.

6.11.2.1 Stakeholder Identification and Engagement

Stakeholder engagement was a key component throughout the preparation of the MOD 10 SIA. During the preparation of the MOD 10 SIA, a range of stakeholders and stakeholder groups were engaged through a variety of mechanisms.

Stakeholder groups who participated in the MOD 10 SIA consultation program for MOD 10 included:

- Local Government representatives (i.e. NSC and GSC);
- Community organisations;
- CCC members;
- Local and regional services and facility providers;
- BCOPL employees and mine contractors; and
- Local and regional community members (i.e. residents).

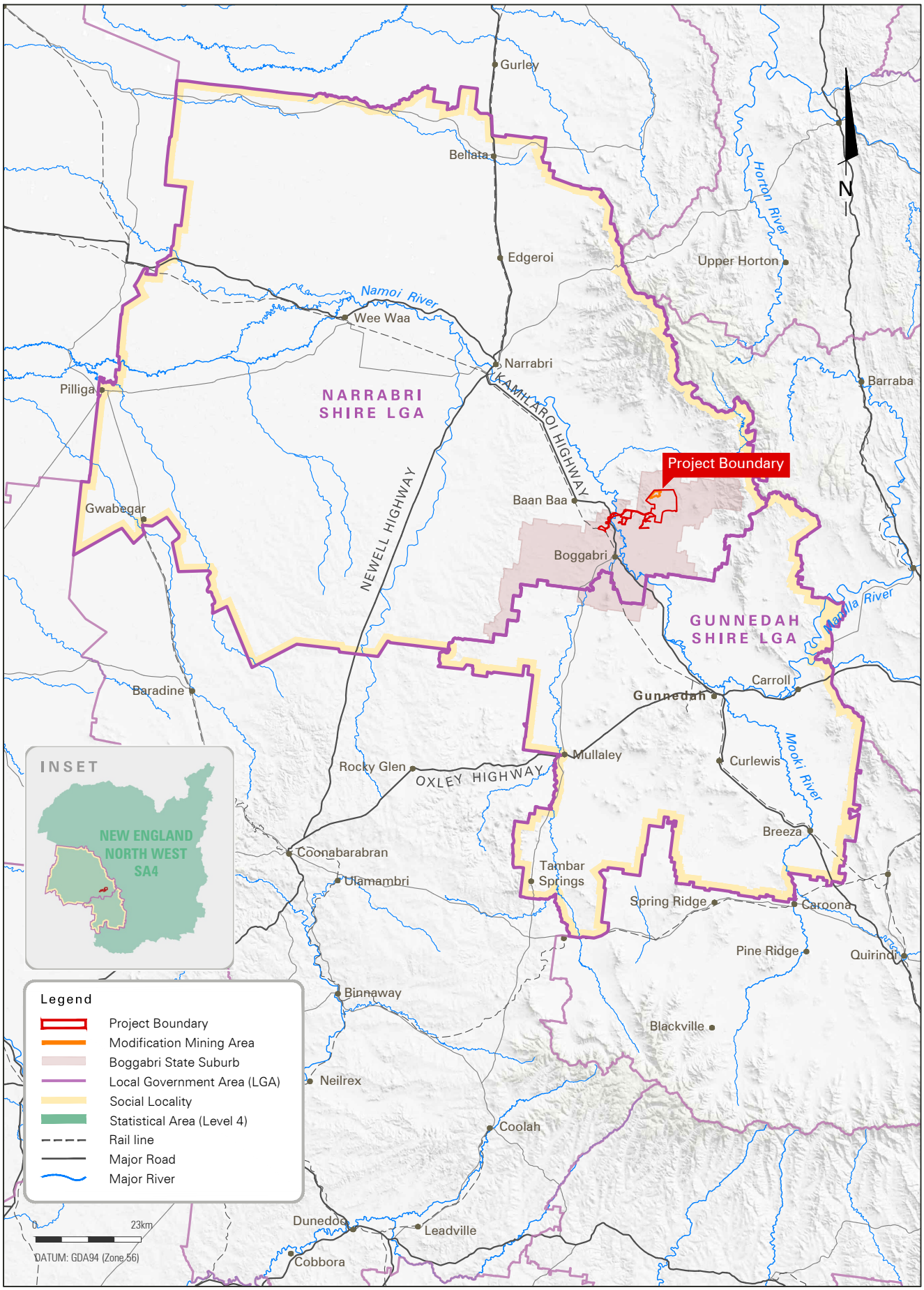
Engagement for the MOD 10 SIA occurred over the period July 2024 to March 2025. Consultation included the distribution of a community newsletter(s) to key stakeholders and groups as well as six (6) telephone and three (3) in-person interviews/surveys. Various electronic survey proformas were also completed, including a workforce survey, with a total of 403 persons responding.

6.11.2.2 SIA Social Locality

The Social Locality refers to the people / areas in which may be impacted (either adversely or positively) by a given Project or development. The Social Locality for BCM extends along the Namoi Valley reaching from Wee Waa in the north-west of the Narrabri Township, to the Boggabri and Gunnedah townships located to the south of BCM. The Social Locality for MOD 10 consists of the:

- Regional Study Area – comprised of the combined areas of the Narrabri and Gunnedah LGAs which form part of the larger New England North West (NENW) Region (defined by the NENW Statistical Area Level 4 (NENW SA4); and
- Local Study Area – comprising the BCM and those residents at risk of experiencing impacts associated with MOD 10. The Local Study Area is defined by the Boggabri State Suburb (SS) boundary and near neighbours.

The Social Locality for MOD 10 is illustrated on **Figure 26**.



JBA 2281 BCM SIA - Social Locality (3/02/2025)

BOGGABRI COAL MINE MODIFICATION

Social Locality

FIGURE 26

6.11.2.3 Socio-economic Profile

The following sections describe the socio-economic profile of the Local and Regional Study Area's considered for MOD 10. Further information regarding the social baseline and associated statistics is provided in **Appendix O**.

6.11.2.3.1 Local Study Area

The Boggabri SS is the closest town to the BCM (approximately 15 km to the south-west). The Boggabri SS had a population of 1,203 people in 2021 (ABS, 2021a), covering an area of 858.5 km^2. The Boggabri SS has historically been used for agricultural gazing activities and boasts a heritage-listed railway station established in 1882 that originally serviced the surrounding region. The Boggabri SS largely remains that of a small rural community, despite the contemporary influence of the mining industry that has been experienced in recent decades.

6.11.2.3.2 Regional Study Area

The BCM is located proximate to the Narrabri and Gunnedah LGA boundaries and is located wholly within the Narrabri LGA.

The township of Narrabri is the key regional centre for the Narrabri LGA and is located approximately 45 km north-west of the BCM. The Narrabri LGA has a population of approximately 12,692 people (National Emergency Management Agency, 2024) covering an area of 13,015 km^2. The Namoi Valley located within the Narrabri LGA has an approximate population size of 61 people (ABS, 2021b). Land use within the Narrabri LGA has diversified from grazing and crop cultivation to coal mining and coal seam gas production, contributing to a stranger and growing economy centred on agricultural production and agribusiness, and mineral resource production.

The Gunnedah township is the regional centre of the Gunnedah LGA and is located approximately 40 km south of the BCM. The Gunnedah LGA had a population of 12,929 people in 2021 (ABS, 2021c) and covers an area of 4,987 km^2. Major land uses within the Gunnedah LGA include urban settlement and agriculture (a combination of cropping, grazing and livestock breeding), as well as mineral production (the Gunnedah LGA contains the high yield deposits of the Gunnedah Coal Basin, the NSW states third largest coal reserve). Coal mining began in the area during the 1880's, however significant population and housing developments in the area did not occur until the 1950's and 1960's, responding to the growth of the Australian wool industry.

Both the Narrabri and Gunnedah LGAs are located within the south-west area of the NENW Region, for which the closest regional city is Tamworth. The NENW Region is home to 16% of all farm businesses in NSW and consists of a diverse economy, growing up to a fifth of NSW's produce (DPIE, 2021). The NENW Region had a population of 185,560 people in 2021 (ABS 2021d) and covers an area of approximately 99,140 km^2.

6.11.3 Assessment of Impacts

Social impacts and opportunities were identified and assessed for the Social Locality. Impacts associated with MOD 10 highlighted through consultation with stakeholders principally relate to a lack of support and availability of healthcare facilities, early education institutions, housing availability and affordability, and traffic impacts (i.e. road quality). Perceived opportunities were identified as being related to economic benefits resulting from the extension of mine life at BCM, increases in community resulting from prolonged employment, and the opportunity to develop increased housing and infrastructure within the Narrabri LGA. **Table 37** provides the potential perceived benefits of MOD 10. **Table 38** provides the potential perceived impacts as identified by stakeholder groups through SIA consultations for MOD 10.

Table 37 Perceived Modification Benefits

Perceived Modification Benefits	Stakeholder Group
Increased utilisation and support of local businesses and services within the local and regional locality.	Service Providers
Ongoing economic contributions to support the local community.	Service Providers
Opportunity to progress with housing commitments to develop new housing and infrastructure within the Narrabri LGA	Local Government
Ongoing voluntary contributions from BCOPL to the surrounding local and regional study area through sponsorship and donations, and the VPA royalties with NSC.	Local Government
Opportunity to increase engagement with the GSC and financially assist with community investment projects (where possible).	Local Government
Continued growth in the region which results in more families moving into town.	Service Providers
Ongoing community support resulting in a more vibrant town.	Service Providers
Increased opportunities for BCOPL to connect and invest in local schools.	Service Providers

Table 38 Perceived Modification Impacts

Perceived Modification Impacts	Stakeholder Group
Changes in property values (including rental price) for properties in the local and regional areas, and experienced housing shortages and affordability issues.	Service Providers Residents Employee / Contractor
Potential cumulative impacts arising from the extension of mining at BCM coupled with the existing mining operations within the region (i.e. the adjacent TCM and MCCM).	Residents Employee / Contractor
Increased demand for childcare, youth and aged care facilities, educational institutions and healthcare services (including mental health), and the requirement for upgrades to the local hospital and pathology services in the local area.	Service Providers
Poor quality of public roads in the local and regional area and a lack of government funding for repairs.	Service Providers
Current early learning centres are not large enough to support increased demand from the number of families moving to the area.	Service Providers
If MOD 10 does not go ahead, this will impact the number of enrolments into early learning facilities and employment.	Service Providers

Further details on stakeholder responses and the assessment of perceived benefits and impacts associated with MOD 10 is provided in **Appendix O**.

6.11.4 Assessment of Significance

A risk-based framework was adopted to prioritise the identified social impacts associated with MOD 10. This social risk matrix considers the consequences of the potential social impact and the likelihood of the impact occurring to the determine an overall risk assessment of social impact. The assessment of significance methodology was adapted from the SIA Guideline which largely presents a fair analysis of positive and negative social impacts. The assessment of significance considered the mitigation and management measures described in the approved *Social Impact Management Plan* (SIMP) (BCOPL, 2023) with additional mitigation measures required to manage environmental impacts associated with MOD 10 outlined in relevant technical studies appended to this Modification Report.

The outcomes of the significance evaluation indicate that the potential significant areas of social impacts relate to the following areas:

- Potential amenity impacts (including cumulative impacts) on nearby neighbours from visual, noise and dust emissions affecting health and well-being;
- Local community concerns over the condition of local roads and prolonged traffic impacts on local roads as a result of the extension of mine life;
- Concerns over loss of surface water and groundwater affecting availability for agriculture;
- Contribution to GHG emissions from continued mining; and
- Minor impacts on population growth, demand for social infrastructure and services or housing, as FTE numbers will not increase for MOD 10, however they will extend for a further four (4) years.

The outcomes of the significance evaluation indicate that the potential significant benefits of MOD 10 include:

- Extension of mining until 2040 will provide ongoing employment opportunities for the local community and surrounds;
- A positive social impact on livelihoods as employment and business opportunities will continue to be realised for an additional four (4) years;
- Extension of the financial benefits of the mine to the local community and wider State of NSW and Australia; and
- Continuation of VPA and community contributions towards community infrastructure, services and facilities.

6.11.4.1 Social Impact Comparison

Table 39 presents the social impacts associated with MOD 10 in comparison to MOD 7 (being the original SSD approval) and the currently approved operations under SSD 09_0182 (i.e. the incremental impacts approved under MOD 8, MOD 9 and MOD 11).

Table 39 Social Impact Comparison

Impact	Original SSD 09_0182 (MOD 7)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
Social Impacts	› Social impacts largely linked to concerns over the expanding mining industry in the region and cumulative impacts associated with industry growth. › Social impacts to local communities in proximity to the BCM.	› Concerns relating to water, amenity and cumulative impacts for the additional three (3) years of mining. › Concerns relating to housing availability and affordability. › No change (MOD 9). › No change (MOD 11).	› Social impacts identified for MOD 10 remain largely consistent with typical impacts raised for coal mining approvals and those previously subject to scrutiny by the public for the BCM.

Table 39 above demonstrates that the incremental changes to social impacts associated with the BCM since the grant of MOD 7 will remain substantially the same as those identified in previous approvals to support the BCM.

6.11.5 Mitigation and Management

Social impacts at BCM are managed in accordance with the BCM SIMP. The BCM SIMP will continue to be implemented for MOD 10 to ensure that social impacts are managed and the potential opportunities of the MOD 10 are enhanced. Should MOD 10 be approved, the BCM SIMP would be reviewed and updated to reflect the outcomes of the SIA and any relevant approval conditions.

Mitigation and management measures have been identified for all potential social impacts and opportunities associated with MOD 10. These measures are a combination of:

› Standard mitigation/enhancement measures. These are commonly applied mitigation measures such as the discussion of environmental monitoring results at CCC meetings, or complaints and grievances procedures e.g., 24 hour complaints telephone hotline; and

› Modification specific mitigation/enhancement measures. These are measures that have been specifically identified and tailored to address the particular social impacts of MOD 10.

BCOPL will also continue to engage with local stakeholders through various established processes including the BCM and BTM CCC, ad hoc engagement with local and state government agencies, the BCM complaints register, and attendance and involvement in key community events.

6.12 ECONOMICS

6.12.1 Background

An Economic Impact Assessment (EIA) for MOD 10 has been prepared by Gillespie Economics. A summary of the findings of the EIA is presented below with a copy of the report provided in **Appendix P**.

6.12.2 Methodology

The EIA for MOD 10 was prepared in accordance with the requirements of the in the *Guidelines for the economic assessment of mining and coal seam gas proposals* (the Economic Guidelines) released by the NSW Government in December 2015.

The EIA included the preparation of a cost benefit analysis (CBA) and a local effects analysis (LEA). Further to this, a supplementary LEA was completed using Input-Output (IO) Analysis to assess flow-on impacts of local employment and expenditure to the local economy.

The Economic Guidelines also require an estimate of the potential costs generated by MOD 10. Accordingly, an estimate of the environmental, social and transport related costs has been completed in accordance with the *Technical Notes supporting the guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals*.

6.12.2.1 Cost Benefit Analysis

CBA is the recommended method used to consider the economic efficiency of proposals by providing a comparison of the present value of aggregate benefits to society, as a result of the proposed change(s), with the present value of the aggregate costs (i.e. the net benefit).

Should the present value of aggregate benefits to society exceed the present value of aggregate costs (i.e. a net present value of greater than zero), a proposal (MOD 10) is considered to improve the well-being of society and hence is desirable from an economic efficiency perspective.

The Economic Guidelines set out the CBA framework to measure the net benefits of a proposal (MOD 10) to the NSW community. **Table 40** provides a summary of how the net benefits and costs have been estimated for MOD 10. Consistent with the Economic Guidelines, the CBA was undertaken in 2025 real values, with discounting at 7 percent (%). Sensitivity testing was also completed at 4% and 10%.

The CBA analysis period is 16 years, coinciding with the proposed life of MOD 10 (i.e. 2025 to 2040) plus one year pre-approval and three (3) years for rehabilitation and closure. Any impacts that occur after this period are included in the final year of the analysis as a terminal value.

An estimate of environmental, cultural and social impacts has also been undertaken using market data and benefit transfer which have been incorporated them into an estimate of the net social benefit of MOD 10.

6.12.2.2 Local Effects Analysis

The LEA uses a similar framework to the CBA. However, the LEA is focussed on the net economic impacts to the local community (rather than to the State of NSW). The local area is defined as the Narrabri and Gunnedah LGA's, within which MOD 10 is located. This region is considered likely to be the main source of labour and non-labour inputs for MOD 10.

The LEA method specified by the Economic Guidelines adjusts the incremental employment (i.e. difference between the base case and MOD 10 case) by only considering those that already live in the region, which was assumed at 70% based on current employment data.

Table 40 Cost Benefit Analysis Framework

Direct Benefits	Indirect Benefits	Indirect Costs
The net benefits that accrue to NSW from the direct operations of MOD 10. This includes: › Net producer surplus attributable to NSW; › Royalties payable; and › Company tax attributable to NSW.	The net benefits that are generated for parties that economically interact with MOD 10. This includes: › Net economic benefits to landowners; › Net economic benefits to NSW employees; and › Net economic benefits to NSW suppliers.	Social costs generated by MOD 10, borne by the NSW community. This includes: › Net environmental, social and transport related costs; › Net public infrastructure costs; and › Loss of surplus to other industries.

The LEA method then further adjusts incremental employment by calculating the incremental net income for those already living in the region (i.e. the difference between after tax (net) mining wage and average after tax (net) wage in the region) and calculating the net FTE jobs to local residents by dividing this increase in net income by the average net mining wage.

6.12.3 Assessment of Impacts

6.12.3.1 Cost Benefit Analysis

The CBA prepared for MOD 10 is provided in **Appendix P**. MOD 10 was assessed against the potential incremental economic benefits and costs illustrated in **Table 41**. The main potential economic benefit is producer surplus (net production benefits) generated by the changes sought to the mine plan by MOD 10. The main potential economic costs relate to any environmental, social and cultural costs resulting from any additional impacts from MOD 10 beyond those currently approved for BCM.

The CBA demonstrated that MOD 10 will have a global net production benefit of $964 Million (present value), with a minimum of $421 Million (present value) of these net production benefits accruing to Australia and $279 Million (present value) accruing to NSW.

Table 41 MOD 10 Potential Incremental Economic Costs and Benefits

Category	Costs	Benefits
Production	› Opportunity cost of land after final rehabilitation; › Opportunity cost of capital after base case completion; › Development costs; › Operating costs, including administration, mining, processing, transportation, mitigation measures and offsets (but excluding royalties); and › Decommissioning and rehabilitation costs at cessation of MOD 10.	› Avoided decommissioning and rehabilitation costs after base case completion; › Sale value of coal; and › Residual value of capital and land at the cessation of MOD 10.
Indirect Impacts	› GHG generation; › Operational noise impacts; › Road transport impacts; › Air quality impacts; › Groundwater impacts; › Surface water impacts; › Biodiversity impacts; › Aboriginal heritage impacts; › Historic heritage impacts; › Visual impacts; › Net public infrastructure costs; and › Loss of surplus to other industries.	› Wage benefits to employment; › Economic benefits to existing landholders; and › Economic benefits to suppliers.

These net production benefits of MOD 10 to Australia and NSW are predicted in the form of:

› Additional company tax to the Commonwealth government ($192 Million present value) which is subsequently used to fund provision of government infrastructure and services across Australia, including NSW (estimated at $61 Million present value); and

- Additional royalties to the NSW government as a result of recovering the MOD 10 coal resource ($200 Million present value) which are subsequently used to fund provision of government infrastructure and services across the State, including the local area.

6.12.3.2 Indirect Costs and Benefits

The EIA quantified (and where not possible to quantify, qualitatively described) the main environmental, cultural and social impacts of MOD 10 to Australia and NSW for comparison to the net production benefits.

Many of the environmental and social costs are internalised into the production costs of MOD 10. However, other costs not already included in the production cost are associated with opportunity costs of the existing WALs held by BCOPL and those to be acquired for MOD 10 ($3 Million present value) and the additional GHG costs resulting from MOD 10 ($0.2 Million present value to Australia and $0.1 Million present value to NSW).

6.12.3.3 Social Costs and Benefits

The main decision criterion for assessing the economic desirability of a project to society is its net present value (NPV). NPV is the present value of benefits less the present value of costs. A positive NPV indicates that it would be desirable from an economic perspective for society to allocate resources to the project, because the community as a whole would obtain net benefits from the project. Overall, with consideration of the above indirect costs, MOD 10 is estimated to have net social benefits to both Australia and NSW of $418 Million (present value) and $276 Million (present value) respectively.

6.12.3.4 Sensitivity Analysis

The sensitivity analysis indicated that the CBA results are not highly sensitive to changes in capital costs, or environmental costs that have not already been internalised into production costs, such as GHG, groundwater and surface water costs. Since mitigation, offset and compensation costs are a small component of the capital and operating costs of MOD 10, it is unlikely that large changes in these cost levels would have any significant impact on the CBA results.

Under all scenarios examined (i.e. with 4%, 7% and 10% discount rates), MOD 10 is predicted to result in net social benefits to NSW. The sensitivity analysis indicated that the CBA results are not sensitive to changes in capital costs (or indirect costs that have not already been internalised). Given the similar net social benefits of MOD 10, relative to the economic base case, the same results would apply. Accordingly, it is unlikely that large changes in cost levels would have any significant impact on the CBA results.

6.12.3.5 Local Effects Analysis

MOD 10 will provide increased direct economic activity, including jobs, to the local economy, and indirect economic activity to the local area (Narrabri and Gunnedah LGAs) via both wage and non-wage expenditure. A summary of the local economic effects of BCM, including MOD 10 as well as the incremental effects is provided in **Table 42**.

The expenditure by employees, who reside in the region, and non-labour expenditure that is captured by the local area, provides flow-on economic activity to the local economy. Recognised methods for assessing second round and flow-on effects include IO analysis. The results of the supplementary IO analysis are also included in **Table 42**.

The IO analysis determined that MOD 10 is likely to provide the following ongoing total annual direct and indirect effects to the local economy between 2025 and 2043:

- $869 Million in output;
- $510 Million in value-added;
- $121 Million in gross wages; and
- 1,190 jobs.

Table 42 Summary of Average and Incremental Annual Effects on Local Community

Local Effects (Local Effects Analysis)	Direct Total	Direct Already Resident in the Local Area	Net
Average Annual Total FTE of MOD 10 (2025-2040)	673	431[1]	284
Average Annual Total Income of MOD 10 ($Million) (2025-2040)	90	-	40
Average Annual Total Non-labour expenditure of MOD 10 in the Local Area (2025-2040)	176	-	-
Average Annual FTE of MOD 10 (2037-2040)	398)	278	168
Average Annual Total After Tax Income of MOD 10 ($Million) (2037-2040)	56	-	24
Average Annual Total Non-labour expenditure of MOD 10 ($Million) (2037-2040)	122	-	-
Local Impacts (Input-Output Analysis) 2025 to 2040	**Direct**	**Flow-on**	**Total**
Output ($Million)	1,124	360	1,484
Value-added ($Million)	725	188	913
Income ($Million)	99	93	191
Employment	673	1,209	1,882
Local Impacts (Input-Output Analysis) 2037 to 2040	**Direct**	**Flow-on**	**Total**
Output ($Million)	586	207	794
Value-added ($Million)	358	109	467
Income ($Million)	58	53	112
Employment	398	697	1,095
Other Local Economic Impacts			
Contraction in other sectors e.g. tourism	No material impact*		
Displaced activities e.g. agriculture and forestry	No material impact*		

Local Effects (Local Effects Analysis)	Direct Total	Direct Already Resident in the Local Area	Net
Wage rise impacts	No material impact*		
Housing impacts	No material impact*		
Price impacts on food and other services	No material impact*		
Local Environmental Impacts			
No material impact			

[1] This is based on the proportion (70%) of coal mine workers that reside in the Local Area.
** NSW regulations require many impacts to be borne by the proponent via mitigation, offset and compensation. Where these measures perfectly mitigate, offset or compensate then no residual impacts occur, and all impacts are borne by the proponent..*

6.12.3.6 Conclusion

In summary, MOD 10 is estimated to have net social benefits to both Australia and NSW of $418 Million and $276 Million, respectively. MOD 10 will provide direct economic activity, including jobs, to the local economy, and indirect economic activity to the local area via both wage and non-wage expenditure. Whilst there will be additional disturbance to 85 ha of native vegetation communities (which provide habitat for a number of threatened fauna species) within the Modification Disturbance Footprint, these impacts will be appropriately compensated for through a biodiversity offset strategy which will be developed in accordance with the relevant State and Commonwealth requirements.

MOD 10 can be considered to provide an improvement in economic efficiency and hence is justified on economic grounds.

6.12.3.7 Economic Impact Comparisons

Table 43 presents the impacts associated with MOD 10 in comparison to MOD 7 (being the original SSD approval) and the currently approved operations under SSD 09_0182 (i.e. the incremental impacts approved under MOD 8, MOD 9 and MOD 11) and the original approval as at MOD 7.

Table 43 Economic Impact Comparison

Impact	MOD 7 (Original Approval)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
Economic Impacts	› Net social benefits of $1,362 Million (2009 values)	› Additional Net social benefits to NSW of $131 Million (2022 values) (MOD 8). › No change (MOD 9)	› Additional Net Social Benefits to NSW of $276 Million (present value).

Impact	MOD 7 (Original Approval)	SSD 09_0182 (as modified by MOD 8, MOD 9 and MOD 11)	MOD 10
	› Provide major economic activity and social benefits to the NENW region (particularly the Narrabri and Gunnedah LGA's) and to wider NSW through direct and indirect output/business turnover and the associated direct revenue for the State Government from coal resource royalties, value added, household income, employment.	› No change (MOD 11).	

Table 43 demonstrates that MOD 10, together with the previous modifications approved to SSD 09_0182 since MOD 7 (i.e. MOD 8, MOD 9 and MOD 11) have resulted in and will continue to result in additional net economic benefits to the NSW society.

The economic assessments completed in relation to all modifications has demonstrated that each modification is beneficial from an economic efficiency perspective. Whilst additional net benefits have been identified as a result of the modification since MOD 7 and as proposed for MOD 10, it is noted this is largely due to the additional seven years of mine life proposed to recover the additional 58 Mt of ROM coal (as a result of the approved MOD 8 and proposed MOD 10 mining operations).

6.12.4 Mitigation and Management

Mitigation measures for the specific environmental and social issues considered in the EIA are described within the relevant sections throughout this Modification Report.

6.13 OTHER ENVIRONMENTAL CONSIDERATIONS

The 2010 EA provided a comprehensive assessment of socio-economic and environmental impacts and risk associated with operations at the BCM. The assessment of these impacts and risks have been supported by further assessments associated with historical modifications to SSD 09_0182.

The potential socio-economic and environmental impacts identified in previous assessments prepared for the BCM were reviewed during the preparation of this Modification Report. This review determined that whilst there will be the continuation of impacts from mining operations for a further four (4) years until 2040, MOD 10 will not result in any material additional environmental impacts and risk beyond those previously considered and subsequently approved under SSD 09_0182. For example, no additional material impacts to the road networks in proximity to the BCM are anticipated beyond the those currently approved (albeit the extension of approved impacts for an additional four (4) years). The previous assessment for MOD 8 to SSD 09_0182 (as amended) confirmed that the road network will continue to operate within acceptable traffic volumes. Impacts on the road networks in the vicinity of BCM were therefore considered to be minor, and no additional mitigation controls were required.

BCOPL has prepared and implements a comprehensive environmental management strategy at the BCM which comprises several environmental management plans and procedures for the management, monitoring and reduction of potential impacts of its operations to the surrounding environment. These plans and procedures describe the ongoing monitoring and management framework to address environmental impacts and risks of operations at the BCM. Notwithstanding, the plans and procedures associated with the BCM environmental management strategy will be reviewed and updated (as required) to accommodate for potential impacts that may arise from MOD 10.

7. EVALUATION

7.1 Ecological Sustainable Development

The principles of ecologically sustainable development (ESD) are described in Section 6(2) of the *Protection of the Environment Administration Act 1991*. **Table 44** lists the four (4) principles of ESD and explains how the modified development would continue to satisfy these principles.

Table 44 Principles of Ecologically Sustainable Development

Principle	Application to the Modified Development
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 impacts of MOD 10 have been assessed by technical specialists to determine potential risks of harm during the proposed continuation of mining operations for a further four (4) years. No material environmental risks have been identified beyond those already approved for the BCM. Where a risk of harm for MOD 10 has been identified, appropriate controls have been proposed to minimise environmental impacts (refer to **Section 6**).
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.	Upon completion of mining, the land will be rehabilitated in accordance with SSD 09_0182 and the conditions imposed on relevant ML's to return the land to its past ecological value. MOD 10 seeks to improve the final landform design by emplacing overburden against the northern highwall. This will facilitate the revegetation of this area to benefit the future generations.
Conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.	MOD 10 proposes disturbance to an additional 85 ha of land within the Modification Disturbance Footprint. A BDAR has been prepared for MOD 10 with associated offset liability credits generated to offset the identified impacts to biodiversity values (refer to **Section 6.3**). Additionally, the Vegetation Corridor separating the BCM and MCCM will not be directly impacted as a result of MOD 10. Accordingly, the biodiversity and ecological value within this area are not anticipated to be impacted as a result of MOD 10.
Improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services.	The modified development is consistent with the 'polluter pays' principle for the following reasons: › The proponents bear the cost of all environmental controls, including monitoring and biodiversity offsets; and › The proponents compensate for their social impacts through their VPAs (refer to **Section 6.11**) and other contributions (including mining royalties and company tax).

7.2 Merit Evaluation

The mining of the additional coal reserves will extend the life of the BCM by a further four (4) years (to the end of 2040). The NSW Government's *Strategic Statement on Coal Exploration and Mining in NSW* (NSW Government, 2022) 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 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 (2) decades. The use of coal in the production of steel (coking coal) is likely to be sustained for a longer timeframe as there is currently limited practical substitutes available. MOD 10 will assist BCM in continuing to supply its high energy, low ash premium quality thermal, semi-soft coking and PCI coal products to its long-term international clients.

MOD 10 as assessed in this Modification Report, will result in the following changes to the currently approved BCM:

- Extension of mining to the north-west outside of the currently approved Mine Disturbance Boundary but within the approved Project Boundary. This will result in an additional 85 ha (approximate) of disturbance;
- Recovery of an additional 30 Mt of ROM coal, yielding 25 Mt of additional product coal;
- The extension of LOM by an additional four (4) years; and
- Amendments to the Conceptual Final Landform design.

Mining will recover coal down to the Templemore Coal Seam within the existing Mine Disturbance Boundary recovering up to 15.4 Mt (approximate) of additional ROM coal resource. A further 14.5 Mt of ROM coal will be extracted down to the Templemore resulting from the extension of operations into the Modification Disturbance Footprint. The Conceptual Final Landform design will be amended to account for the additional mining activities proposed by MOD 10.

The following aspects of the BCM will remain unchanged as a result of MOD 10:

- Approved mining methods;
- Annual ROM coal extraction rate of up to 8.6 Mtpa;
- Operational workforce and the approved operational hours;
- Approved coal seams for extraction;
- Approved Project Boundary;
- Mining related infrastructure including the water management system;
- Coal handling and processing; and
- Transport methods and rates of access to BCM.

BCM is an active open cut coal mine which has been operating within the Leard State Forest since 2006. Mining operations at the adjacent MCCM and TCM also occur within the Leard State Forest. The Leard State Forest is recognised as Zone 4 under the BC Act which dedicates the area for the purposes of forestry, recreation and mineral extraction. MOD 10 is permissible and consistent with the existing and surrounding land uses.

BCOPL has consulted with relevant regulatory and community stakeholders over the Modification Application and has considered their feedback in the preparation of this Modification Report.

The environmental, social and economic assessments completed as part of this Modification Report (**Section 6**) have not identified any material additional environmental, social or economic impacts which will result from MOD 10 beyond those currently approved under SSD 09_0182.

The assessments for MOD 10 concluded:

- Air Quality and GHG – Dust impacts for BCM including MOD 10 were found to generally remain within the relevant air quality criteria for the neighbouring privately owned receivers. Accordingly, no additional mitigation or management measures are required for MOD 10. The forecast GHG emissions for MOD 10 have identified emissions intensity will continue as currently approved, with the additional emissions relating to the additional years of mining operations. BCOPL will continue to monitor and manage its energy efficiencies and GHG emissions in accordance with the Air Quality and GHG Management Plan which will be revised and updated for MOD 10. Additionally, BCOPL is continuing the investigation of possible strategies to further avoid and minimise GHG emissions from its operations.
- Noise and Blasting – Noise modelling for the BCM including the changes sought by MOD 10 has found that the operations will continue to remain within the approved noise and blasting criteria set out within SSD 09_0182. The noise mitigation and management measures that are described within the approved Noise Management Plan will continue to be implemented to ensure that noise levels remain acceptable to neighbouring privately owned receivers.
- Biodiversity – MOD 10 will result in the additional disturbance of an approximate 85 ha of native vegetation within the Modification Disturbance Footprint. This native vegetation does not conform to any listed threatened ecological community. However, it has been identified to comprise habitat value for a number of threatened fauna species which are known to occur within the Leard State Forest and surrounding region. MOD 10 will also impact on two (2) threatened fauna species which are known to occur at other locations throughout the Leard State Forest. Biodiversity Offset credit calculations have been prepared for the disturbance proposed by MOD 10. BCOPL proposes to prepare a Biodiversity Offset Strategy for MOD 10 which may comprise of land based offsets, purchase of credits on the open market and implementation of conservation initiatives.
- Groundwater – The revised Numerical Groundwater model developed by AGE for the BTM Complex has been utilised to simulate the changes resulting from MOD 10. The modelling indicated that MOD 10 will result in no material changes to the surrounding hydrological regime and water users. There will be an increase in depressurisation in the deeper Permian coal seams strata to be mined as part of MOD 10, generally within and to the north of the Modification Mining Area. However, this depressurisation is not expected to result in any noticeable incremental drawdown within the alluvial groundwater systems. The predicted incremental impacts of MOD 10 do not identify any significant impacts to any privately owned water supply work or any GDEs known to occur within the area. However cumulative depressurisation of the Permian strata (as a result of BCM and neighbouring mines) does highlight the potential for some privately owned bores to be impacted by more than 2m of drawdown, which will need to be addressed as part of the BTM Complex Water Management Strategy. All predicted groundwater takes from water sources surrounding the BCM will remain within the current WAL entitlements held for BCM. The exception is for Zone 11 – Maules Creek Water Source, where predicted water takes at the end of the BCM MOD 10 mine life will exceed the current entitlement by 2 ML/year. MOD 10 has been found to result in no significant impacts on the hydrological characteristics of the surrounding water sources.
- Surface Water – MOD 10 will extend mining into the upper portions of the catchment of Nagero Creek and Back Creek which are currently impacted by approved mining operations at BCM and the neighbouring MCCM. Accordingly, MOD 10 is not expected to result in significant impacts to these catchments of the Namoi River. Surface water balance modelling for MOD 10 using the staged mine plans and revised groundwater inflows from the revised BTM Complex Numerical Modelling has indicated that some greater demand on the groundwater borefield and other water sources will be required when compared with MOD 8. BCOPL has previously secured water allocations on the open market to cater for the years of peak demand from external water supplies and will continually review this demand in line with the water balance reviews undertaken as part of the Annual Review. The water management system as described within the Water Management Plan will continue to according to the requirements of SSD 09_0182 and EPL 12407.

- Heritage – No additional Aboriginal cultural heritage or historic heritage sites were identified within the Modification Disturbance Footprint. One previously identified site, comprising an isolated artefact is known to occur within this area and will be salvaged in accordance with the procedures identified within the Cultural Heritage Management Plan.
- Land Resources, Rehabilitation and Final Landform – The Conceptual Final Landform for MOD 10 remains generally consistent with that presented in the 2010 EA and as modified as part of the MOD 8 amendment. As such, the MOD 10 Conceptual Final Landform comprises a partially infilled final void which will be filled to a level higher than the pre-mining groundwater pressures to ensure that the final void will retain no surface water (i.e. no pit lake). The rehabilitated landform will extend to the north into the Modification Disturbance Footprint. Associated with this additional mining footprint, the partially infilled final void to extend further to the north. MOD 10 proposes the emplacement of overburden materials against the northern highwall to develop a concave slope. This will facilitate the revegetation of this portion of the landform which will substantially improve the amenity, stability and contribute to the biodiversity values on the post mining landform. The rehabilitation objectives as outlined in Table 16 of Schedule 3, Condition 69 of SSD 09_0182 are not proposed to be modified as a result of the mine plan changes sought by MOD 10. Similarly, the approved vegetation communities to be applied to the final landform design will remain generally unchanged. The Shrubby Woodland / Forest on Sloping Lands located on the western portion of the rehabilitated OEA which was established as part of a tree trial in 2008 comprises some alternate woodland vegetation to the broader area of Shrubby Woodland vegetation.
- Visual and Lighting – The additional mining operations proposed for MOD 10 will extend into the upper sections of the Willow Tree Range. Surface operations may be visible from some view locations located to the south and south west of the BCM. Moderate to low visual impacts will be experienced to these receivers, consistent with the current impacts experienced for approved operations at BCM. Negligible changes are likely to be experienced for the lighting impacts from MOD 10.

BCOPL is seeking approval to extend mining operations outside of the approved Mine Disturbance Boundary to mine additional known coal resources to a depth of the basal Templemore coal seam (as currently approved). Approval of MOD 10 will increase BCM's coal reserves whilst allowing for the continuation of mining operations for a further four (4) years (i.e. to 2040).

MOD 10 is expected to deliver net social benefits (i.e. considering the social costs in relation to net production benefits) to both Australia and NSW of $418 Million and $276 Million respectively. These benefits will be generally distributed as Royalites to the NSW Government ($213 Million, present value) and as Company Tax ($208 Million, present value to the Australian Government and $66 Million, present value apportioned to NSW).

MOD 10 will not result in any additional material environmental or social impacts beyond those currently approved for BCM, and it will continue to deliver material direct and indirect economic activity to the local, State and National economies. MOD 10 is justified on environmental, social and economic grounds, accords with the principles of ecologically sustainable development and is the public interest.

8. REFERENCES

- ANZEC (1990). *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*.
- Australasian Groundwater & Environmental Consultants Pty Ltd (2010) *Continuation of Boggabri Coal Mine Groundwater Assessment.* Prepared for Boggabri Coal Pty Ltd. Project No. G1465. Dated October 2010.
- Australasian Groundwater & Environmental Consultants Pty Ltd (2022) *Groundwater Impact Assessment Boggabri Coal Mine MOD 8 Amendment to SSD 09_0182.* Prepared for James Bailey & Associates on behalf of Boggabri Coal Pty Ltd. Project No. BCO50000.001. Dated October 2022.
- Australian Bureau of Statistics (2021a). *Census of Population and Housing – Boggabri SS*
- Australian Bureau of Statistics (2021b). *Census of Population and Housing – Narrabri LGA*
- Australian Bureau of Statistics (2021c). *Census of Population and Housing – Gunnedah LGA*
- Australian Bureau of Statistics (2021d). *Census of Population and Housing – New England North West*
- Australian Standards (2006). *Australian Standard 2187.2-2006 'Explosives – Storage and use – Part 2: Use of explosives*.
- Australian Standards (2023). *Australian Standard 4282 (INT) – Control of Obtrusive Effects of Outdoor Lighting*.
- Bergsma, E (1996). *Terminology for Soil Erosion and Conservation: Concepts, Definitions and Multilingual Lists of Terms for Soil Erosion and Conservation.*
- Boggabri Coal Operations Pty Ltd (2017). *Groundwater Management Plan*.
- Boggabri Coal Operations Pty Ltd (2017). *Water Management Plan*.
- Boggabri Coal Operations Pty Ltd (2017). *Water Management Plan*.
- Boggabri Coal Operations Pty Ltd (2018). *Biodiversity Management Plan*.
- Boggabri Coal Operations Pty Ltd (2018). *Biodiversity Management Plan. Appendix C – Weed and pest* management strategy.
- Boggabri Coal Operations Pty Ltd (2018). *Biodiversity Management Plan. Appendix B – Clearing and fauna* management *procedure*.
- Boggabri Coal Operations Pty Ltd (2023). *Social Impact Management Plan*.
- Boggabri Coal Operations Pty Ltd (2024). *Air Quality and Greenhouse Gas Management Plan*.
- Boggabri Coal Operations Pty Ltd (2024). *Boggabri Coal Annual Review 2023*.
- Boggabri Coal Operations Pty Ltd (2024). *Boggabri Coal Mine Rehabilitation Management Plan*.
- Boggabri Coal Operations Pty Ltd (2024). *Heritage Management Plan*.
- Boggabri Coal Operations Pty Ltd (2024). *Noise Management Plan*.
- Boggabri Coal Operations Pty Ltd (2024). *Rehabilitation Management Plan*.
- Boggabri Coal Operations Pty Ltd (2024). *Rehabilitation Strategy*.
- Boggabri Coal Operations Pty Ltd (2024). *Surface Water Management Plan*.
- Bridges Acoustics (2011). *Maules Creek Coal Project Acoustics Impact Assessment*.
- Department for Planning Industry and Environment. (2020). *Biodiversity Assessment Method Threatened Flora Survey Guide*
- Department of Energy, Climate Change and Water (2009). *Interim Construction Noise Guideline*.
- Department of Energy, Climate Change and Water (2010b). *Aboriginal cultural heritage consultation* requirements *for proponents.*

- Department of Energy, Climate Change and Water (2011). *Road Noise Policy*.
- Department of Environment and Conservation (2004). *NSW Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities*.
- Department of Environment, Climate Change and Water (2010). *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*.
- Department of Natural Resources (2005). *Rural Land Capability Classification System*.
- Department of Planning and Environment (2022). *Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide*.
- Department of Planning and Environment (2022). *New England North West Regional Plan 2041*.
- Department of Planning and Environment (2022). *Threatened Reptiles Biodiversity Assessment Method Survey Guide*.
- Department of Planning and Environment (2023). *Assessing heritage significance. Guidelines for assessing places and objects against Heritage Council of NSW criteria*.
- Department of Planning and Environment (2023). *Assessing heritage significance. Guidelines for assessing places and objects against the Heritage Council of NSW criteria*.
- Department of Planning and Environment (2023). *Dark Sky Planning Guideline*.
- Department of Planning and Environment (2023a). *Social Impact Assessment Guideline*.
- Department of Planning and Environment (2023b). *Technical Supplement Social Impact Assessment Guideline for State Significant Projects*.
- Department of Planning, Housing and Infrastructure (2024). *State Significant Development Guidelines.*
- Department of Planning, Industry and Environment (2020). *Net Zero Plan Stage 1: 2020-2030*.
- Department of Planning, Industry and Environment (2020). *NSW Survey Guide for Threatened Frogs*.
- Department of Planning, Industry and Environment (2020). *Surveying of threatened plants and their habitats; NSW Guide for the Biodiversity Assessment Method*.
- Department of Planning, Industry and Environment (2022). *Cumulative Impact Assessment Guidelines for State Significant Projects*.
- Department of Planning, Industry and Environment (2022). *State Significant Development Guidelines – Preparing a Modification Report.*
- Department of Primary Industries (1990). *Agricultural Suitability Classification System*.
- Department of the Environment (2013). *Matters of Environmental Significance – Significant impact Guidelines 1.1*.
- Department of the Environment (2013). *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*.
- Department of the Environment and Energy (2017). *Technical Guidelines for the Estimation of Greenhouse Gase Emissions by Facilities in Australia*.
- Department of the Environment and Energy (2020). *National Light Pollution Guidelines for Wildlife*.
- Department of the Environment, *Water, Heritage and the Arts (2010). Survey guidelines for Australia's Threatened Birds*.
- Environment Protection Authority (2013). *Rail Infrastructure Noise Guideline*.
- Environment Protection Authority (2017). *Noise Policy for Industry*.
- Environment Protection Authority (2022). *Approved Methods and Guidance or the modelling and Assessment of Air Pollutants in NSW*.
- Environment Protection Authority (2023). *Climate Change Policy*.
- Environment Protection Authority (2024). *Draft Climate Change Assessment Requirements for Large Emitters*.

- Environment Protection Authority (2025). *NSW EPA Guide for Large Emitters*: Guidance on how to prepare a greenhouse gas assessment as part of NSW environmental planning processes.
- GSS Environmental (2010). *Continuation of Boggabri Coal Mine Project Environmental Assessment. Soil Survey and Land Resource Impact Assessment Report*.
- Hansen Bailey (2010). *Continuation of Boggabri Coal Mine Environmental Assessment.*
- Heritage Council of NSW (2021). *Investigating Heritage Significance. A guide to identifying and examining heritage items in NSW*.
- ICI Technical Services (1995). *Imperial Chemical Industries (ICI) Explosives Blasting Guide*.
- Integral (2010). *Continuation of Boggabri Coal Mine Visual Impact Assessment*.
- Internation Council on Monuments and Sites (2013). *The Australian ICOMOS Charter for Places of Cultural Significance (Burra Charter)*.
- International Erosion Control Association (2008). *Best Practice Erosion and Sediment Control*.
- Landcom (2008). *Managing Urban Stormwater: Soils and Construction – Volume 2E, Mines and quarries (Blue Book)*.
- NSW Government (2012). *Narrabri Local Environment Plan 2012.*
- NSW Government (2018). *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments*.
- NSW Government (2022). *Strategic Statement on Coal Exploration and Mining in NSW*.
- Office of Environment and Heritage (2011). *Guide to investigating, assessing and reporting Aboriginal cultural heritage in NSW*.
- Office of Environment and Heritage (2018). *'Species credit' Threatened Bats and their Habitats. NSW Survey Guide for the Biodiversity Assessment Method*.
- Office of Environment and Heritage (2024). *Threatened Species Profile Database*.
- Parsons Brinkerhoff (2015). *Boggabri Coal Mine - Project Approval Modification Environmental Assessment (MOD 5)* dated 20 November 2015.
- Parsons Brinkerhoff (2017). *Boggabri-Tarrawonga-Maules Creek Air Quality Management Strategy*.
- Peeters, LJM and Middlemis, H. (2023). *Information Guidelines Explanatory Note: Uncertainty Analysis for groundwater modelling*.
- Queensland Government (2024). *Scientific Dataset for Landowners*.
- Wilkinson Murray (2019). *Tarrawonga Coal Mine Modification 7 Noise Assessment*.
- WRM (2016). *Narrabri Flood Study*.
- WRM (2023). *Narrabri Floodplain Risk Management Strategy and Plan*.
- WSP (2010). *Continuation of Boggabri Coal Mine Project Surface Water Assessment*.
- WSP (2018). *Boggabri Coal Mine Biodiversity Offset Strategy*.

9. ABBREVIATIONS

Abbreviation	Meaning
(Commonwealth) DCCEEW	(Commonwealth) Department of Climate Change, Energy, the Environment and Water
(NSW) DCCEEW	(NSW) Department of Climate Change, Energy, the Environment and Water
2010 EA	'Continuation of Boggabri Coal Mine Environmental Assessment' (Hansen Bailey, 2010)
A	Authorisation
ACCU	Australian Carbon Credit Unit
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHCRs	'Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010' (DECCW, 2010)
AHD	Australian Height Datum
AHIP	Aboriginal Heritage Impact Permit
AIP	The NSW Aquifer Interference Policy
ANC	Acid Neutralising Capacity
Approved Methods	Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2022)
AQGGMP	Air Quality and Greenhouse Gas Management Plan
AS 4282	Australian Standard (AS)4282 (INT) 2023 – Control of Obtrusive Effects of Outdoor Lighting
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	(*NSW*) Biodiversity Conservation Act 2016
BCF	Biodiversity Conservation Fund
BCM	Boggabri Coal Mine
BCOPL	Boggabri Coal Operations Pty Ltd
BCPL	Boggabri Coal Pty Ltd
BCT	Biodiversity Conservation Trust
BDAR	Biodiversity Development Assessment Report

Abbreviation	Meaning
BMP	Biodiversity Management Plan
BOS	Biodiversity Offsets Scheme
BSA	Biodiversity Stewardship Agreement
BTM Complex	Boggabri, Tarrawonga, Maules Creek Mining Complex
CA	Conservation Agreement
CBA	Cost Benefit Analysis
CCC	Community Consultative Committee
CEPAR	Chugoku Electric Power Australia Resources Pty Ltd
CER	Clean Energy Regulator
CHPP	Coal Handling and Preparation Plant
CL	Coal Lease
DA	Development Application
Dark Sky Guideline	Dark Sky Planning Guideline (DPE, 2023)
dB	Decibel
dB(A)	A-weighted decibels
DPHI	NSW Department of Planning, Housing and Infrastructure
DSI	Data Space Inversion
EIA	Economic Impact Assessment
ENM	Environmental Noise Model
EP&A Act	(*NSW*) Environmental Planning and Assessment Act 1979
EP&A Regulation	(*NSW*) Environmental Planning and Assessment Regulation 2021
EP&A Savings Regulation	Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017
EPA	Environment Protection Authority
EPA CCP	Environment Protection Authority Climate Change Policy (NSW EPA, 2023)
EPBC Act	(*Commonwealth*) Environment Protection and Biodiversity Conservation Act 1999
EPI	Environmental Planning Instrument

Abbreviation	Meaning
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development
Forestry Corporation	Forestry Corporation of New South Wales
FRMP	Narrabri Floodplain Risk Management Strategy and Plan (WRM, 2023)
FTE	Full Time Equivalent
GDE	Groundwater Dependent Ecosystem
GHG	Greenhouse Gas Emissions
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).
GIA	Groundwater Impact Assessment
GWMP	Groundwater Management Plan
ha	hectare
Heritage Act	(*NSW*) Heritage Act 1977
HHAR	Historic Heritage Assessment Report
HMP	Heritage Management Plan
ICNG	Interim Construction Noise Guideline
ID	Property Identification
IESC	Independent Expert Scientific Committee
IO analysis	Input-output analysis
IPC	Independent Planning Commission NSW
KLC	Kinetic Leach Column
km	Kilometre
kV	Kilovolt
LEA	Local Effects Analysis
LEP	Local Environmental Plan
LGA	Local Government Area
LOM	Life of mine

Abbreviation	Meaning
M	metres
Mbcm	Million bank cubic metres
Mbgl	
MCCM	Maules Creek Coal Mine
MCCPL	Maules Creek Coal Pty Ltd
MDB	Murray Dalring Basin
MEG	Department of Planning, Housing and Infrastructure – Division of Mining, Exploration and Geoscience
MIA	Mine Infrastructure Area
MIC	Maximum Instantaneous Charge
Mining Act	(*NSW*) Mining Act 1992
ML	Megalitre
MNES	Matters of National Environmental Significance
MOD 10	Boggabri Coal Mine Modification 10
Mt	Million tonnes
Mtpa	Million tonnes per annum
MVA	Megavolt ampere
MWh	Megawatt-hour
MWP	Megawatt peak
NAF	Non-acid forming
NBIA	Noise and Blasting Impact Assessment
NENW	New England North West
NGER Act	(*Commonwealth*) National Greenhouse and Energy Reporting Act 2007
NMP	Noise Management Plan
NO_x	Oxides of Nitrogen
NPfI	Noise Policy for Industry
NPV	Net Present Value
NPW Act	(*NSW*) National Parks and Wildlife Act 1974

Abbreviation	Meaning
NSB	NS Boggabri Pty Limited
NSC	Narrabri Shire Council
NSW	New South Wales
NSW DCCEEW BCS	NSW Department of Climate Change, Energy, the Environment and Water – Biodiversity Conservation Science Division
NSW DCCEEW Water	NSW Department of Climate Change, Energy, the Environment and Water – Water Division
NZC	Net Zero Commission
OEA	Overburden Emplacement Area
PAD	Potential Archaeological Deposit
PAF	Potentially Acid-Forming
PCT	Plant Community Type
Planning SEPP	State Environmental Planning Policy (Planning Systems) 2021
PM_{10}	Particulate matter with equivalent aerodynamic diameters less than 2.5 microns
$PM_{2.5}$	Particulate matter with equivalent aerodynamic diameters less than 10 microns
PMF	Probable Maximum Flood
POEO Act	Protection of the Environment Operations Act 1997
PSI	Pre-Shift Start-up Infrastructure
PVC	Primary Visual Catchment
QoI	Quantities of Interest
RAPs	Registered Aboriginal Parties
Regional Plan	New England North West Regional Plan 2041 (DPE, 2022)
Resources SEPP	State Environmental Planning Policy (Resources and Energy) 2021
RL	Reduced Level
RNP	Road Noise Policy (DECCW, 2011)
ROM	Run of Mine
SAII	Serious and Irreversible Impacts
SEARs	Secretary's Environmental Assessment Requirements

Abbreviation	Meaning
SEPPs	State Environmental Planning Policies
SIA	Social Impact Assessment
SIA Guideline	Social Impact Assessment Guideline (DPE, 2023a)
SIMP	Social Impact Management Plan
SMP	Soil Management Protocol
SP	Standpipe
SPA	Sale and Purchase Agreement
SPLs	Sound Power Levels
SS	State Suburb
SSD	State Significant Development
SSD Guideline	State Significant Development Guidelines' (DPHI, 2024)
SVTM	NSW State Vegetation Type Map
SWBM	Site Water Balance Model
SWIA	Surface Water Impact Assessment
SWMP	Surface Water Management Plan
t	Tonnes
TARP	Trigger Action Response Plan
TCM	Tarrawonga Coal Mine
TCPL	Tarrawonga Coal Pty Limited
TEC	Threatened Ecological Community
the Guide	Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH, 2011)
Tph	Tonnes per hour
TSP	Total Suspended Particulate Matter
VIA	Visal Impact Assessment
VLAMP	NSW Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments (DPIE, 2018)
VP	View Point

Abbreviation	Meaning
VPA	Voluntary Planning Agreement
VWP	Vibrating Wire Piezometer
WAL	Water Access License
WHC	Whitehaven Coal
WM Act	(*NSW*) Water Management Act 2000
WMP	Water Management Plan
WSP	Water Sharing Plan



Hunter Valley
The Singleton Centre
Shops 4-6, Mezzanine Level
157-159 John Street
SINGLETON NSW 2330
P 02 6536 2999

xenith.com.au