WAMBO COAL PTY LIMITED

SOUTH BATES EXTENSION MODIFICATION

ENVIRONMENTAL ASSESSMENT

For the Modification of DA 305-7-2003 (MOD 17)
Extension of the Approved South Bates Underground Mine

March 2017

Peabody ENERGY

WAMBO COAL PTY LIMITED

SOUTH BATES EXTENSION MODIFICATION

ENVIRONMENTAL ASSESSMENT

(Modification 17 to DA 305-7-2003)

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EXECUTIVE SUMMARY

ES1.1 BACKGROUND

The Wambo Coal Mine (Wambo) is situated approximately 15 kilometres (km) west of Singleton, near the village of Warkworth, New South Wales. Wambo is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited.

A range of open cut and underground mine operations have been conducted at Wambo since mining operations commenced in 1969. Mining under the Development Consent (DA 305-7-2003) commenced in 2004 and currently both open cut and underground operations are conducted. The approved run-of-mine (ROM) coal production rate is 14.7 million tonnes per annum (Mtpa) and product coal is transported from Wambo by rail.

An aerial photograph of Wambo, illustrating the approved extent of the open cut and underground mine operations and key infrastructure is provided on Figure ES-1. A summary of the approved Wambo is provided in Table ES-1.

ES1.2 DESCRIPTION OF THE MODIFICATION

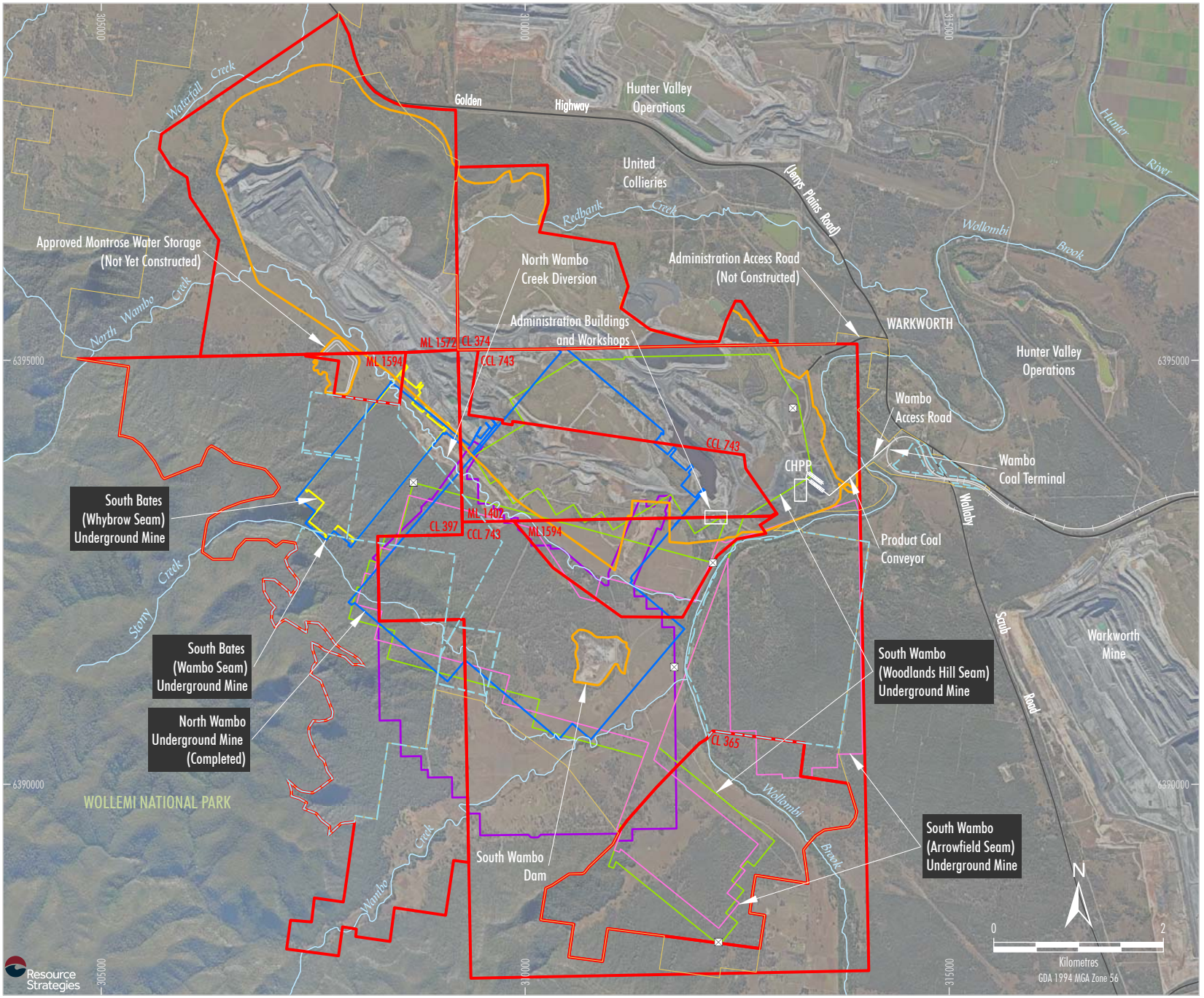
Wambo includes the approved South Bates Underground Mine that incorporates longwall mining in the Whybrow and Wambo Seams.

A viable coal resource in the Whybrow Seam to the north-west of the approved South Bates Underground Mine has been identified based on recent exploration results and geotechnical investigations as well as the successful mining experience in the current South Bates Underground Mine and adjacent open cut mining areas.

Table ES-1
Summary of the Approved Wambo Coal Mine

Component	Approved Wambo[1]
Life of Mine	• *28 years (i.e. until 1 March 2032).*
Open Cut Mining	• Open cut mining at a rate of up to 8 Mtpa of ROM coal from the Whybrow, Redbank Creek, Wambo and Whynot Seams. • An estimated total open cut ROM coal reserve of 98 million tonnes (Mt). • Open cut mining operations up to and including 2020.
Underground Mining	• Underground mining of up to 9.75 Mtpa of ROM coal from the Whybrow, Wambo, Woodlands Hill and Arrowfield Seams. • *Underground ROM coal reserves are estimated at 143.3 Mt.*
Subsidence Commitments and Management	• The subsidence impact performance measures listed in Conditions 22 and 22A, Schedule 4 of the Development Consent (DA 305-7-2003).
ROM Coal Production Rate	• Up to 14.7 Mtpa of ROM coal.
Total ROM Coal Mined	• *241.3 Mt.*
Waste Rock Management	• Waste rock deposited in open cut voids and in waste rock emplacements adjacent open cut operations.
Total Waste Rock	• 640 million bank cubic metres (Mbcm).
Coal Washing	• Coal Handling and Preparation Plant (CHPP) capable of processing approximately 1,800 tonnes per hour (tph).
Product Coal	• Production of up to 11.3 Mtpa of thermal coal predominantly for export under DA 305-7-2003.
CHPP Reject Management	• Coarse rejects and tailings would be incorporated, encapsulated and/or capped within open cut voids in accordance with existing Wambo management practices.
Total CHPP Rejects	• *Approximately 36.6 Mt of coarse rejects and approximately 22.4 Mt of tailings.*
Water Supply	• Make-up water demand to be met from runoff recovered from tailings storage areas, operational areas, dewatering, licensed extraction from Wollombi Brook and Hunter River.
Surface Facilities	• *Construction of surface facilities within the approved surface development area.*
Mining Tenements	• *Coal Lease (CL) 365, CL 374, CL 397, Consolidated Coal Lease (CCL) 743, Mining Lease (ML) 1402, ML 1572, ML 1594, Authorisation (A) 444, Exploration Licence (EL) 7211.*

Note: Italicised components would be modified by the Modification.
[1] Development Consent DA 305-7-2003 (as modified).



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WAMBO COAL MINE

Approved Wambo Coal Mine General Arrangement

Figure ES-1

On the basis of this further understanding of the available resource, WCPL is proposing an extension to its South Bates Underground Mine to mine additional longwall panels in the Whybrow Seam. This proposed extension to the South Bates Underground Mine is referred to as the South Bates Extension Modification (the Modification).

The Modification would involve:

- mining of an additional 18 Mt of ROM coal (with no change to the approved total ROM coal production rate of 14.7 Mtpa);
- an additional 3.7 Mt of coarse rejects and 2.1 Mt of tailings;
- construction of additional infrastructure, including new ventilation shafts within the approved surface development area, gas drainage infrastructure and other ancillary infrastructure;
- an extension of the approved mine life by seven years (i.e. up to and including 2039); and
- obtaining an additional mining lease over a component of A 444.

The modified mine layout of the South Bates Underground Mine is shown on Figure ES-2.

The Modification would not involve changes to any aspects of the approved South Wambo Underground Mine or North Wambo Underground Mine.

Interaction with the United Wambo Open Cut Coal Mine Project

WCPL and United Collieries have formed a joint venture over the tenements adjoining this proposed Modification in relation to the United Wambo Open Cut Coal Mine Project (SSD 15_7142).

The United Wambo Open Cut Coal Mine Project seeks to combine the existing open cut operations at Wambo with a proposed new open cut coal mine at the United Collieries. Wambo's CHPP and underground operations do not form part of the joint venture, and will continue to be owned and operated by WCPL under DA 305-7-2003.

The United Wambo Open Cut Coal Mine Project involves three separate applications:

- a State Significant Development (SSD) application (SSD 15_7142) relating to proposed open cut coal mining for a period of 23 years, with mining in the new United Open Cut combined with ongoing mining at the existing, approved Wambo Open Cut under a modified mine plan;
- a modification application to the Wambo Development Consent (DA 305-7-2003 MOD 16) to harmonise the consent with SSD 15_7142 and extend the period of approved operation of coal handling operations and the CHPP to match the life of the United Wambo Open Cut Coal Mine Project; and
- a modification application to the Wambo Coal Terminal Development Consent (DA 177-8-2004 MOD 3) to harmonise the consent with SSD 15_7142 and extend the period of approved operation of the product coal transport operations to match the life of the United Wambo Open Cut Coal Mine Project.

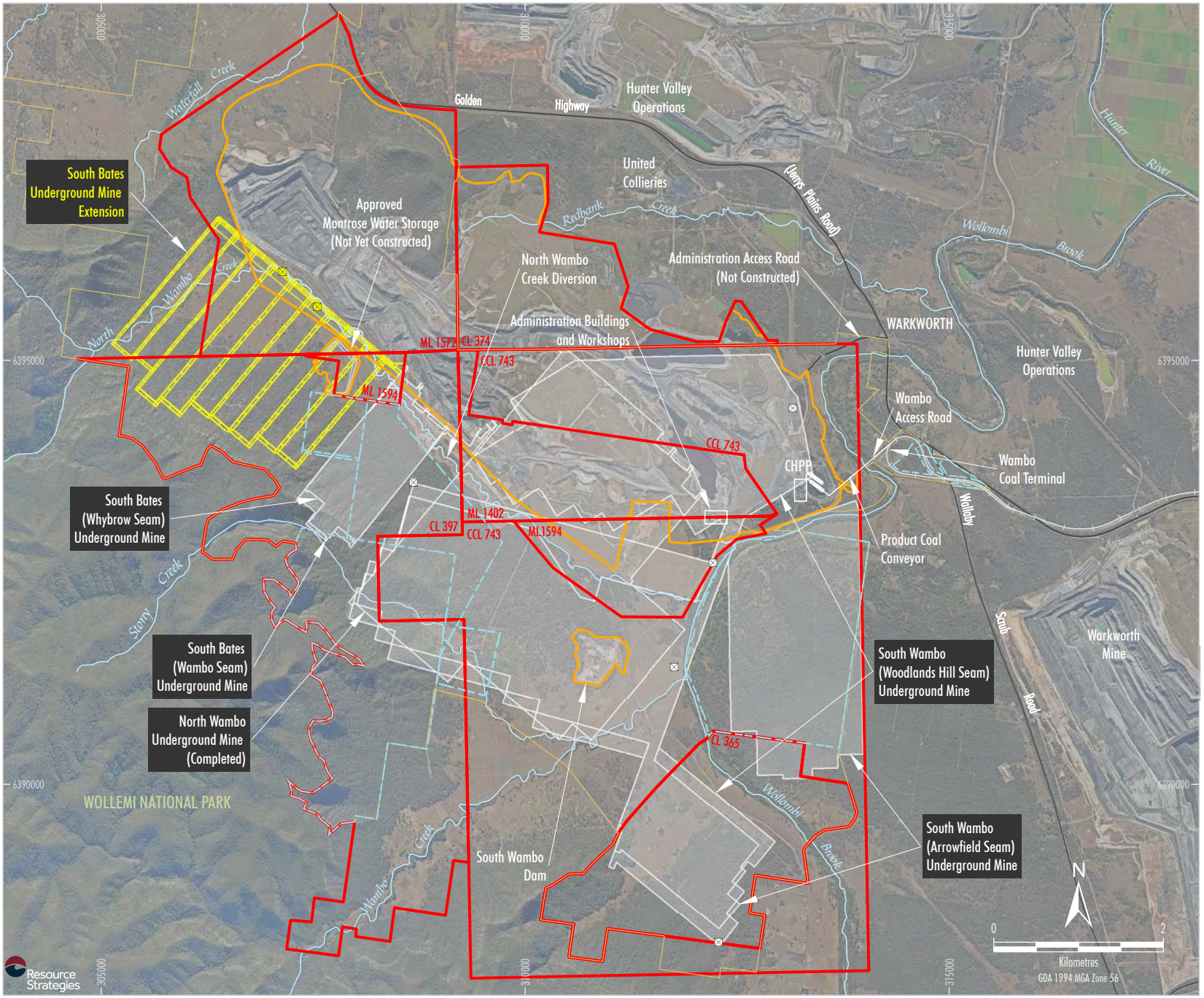
This Modification is independent of, and not reliant on, the proposed United Wambo Open Cut Coal Mine Project. However, it is noted that the proposed extension to the operational life of the approved coal handling, CHPP and product coal transport operations is consistent with the operational life separately being sought by DA 305-7-2003 MOD 16.

Cumulative assessment of this Modification and the United Wambo Open Cut Coal Mine Project is provided in this EA.

ES1.3 ENVIRONMENTAL REVIEW

The potential environmental consequences of the Modification are primarily associated with:

- potential impacts due to subsidence from the Modification longwalls;
- impacts due to disturbance for additional surface infrastructure; and
- changes in the duration of some impacts due to the proposed extension in the life of Wambo.



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WAMBO COAL MINE

Modified Wambo Coal Mine General Arrangement

Figure ES-2

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The Modification longwalls have been designed to be consistent with the subsidence impact performance measures in the existing Development Consent (DA 305-7-2003) (Table ES-2).

In order to assess the potential environmental impacts of the Modification, environmental reviews were completed for key issues. Table ES-3 summarises the key environmental assessment conclusions regarding the Modification.

WCPL would continue to implement existing environmental management and monitoring measures to minimise the potential impacts of Wambo incorporating the Modification on existing environmental values.

Additional mitigation measures, management and monitoring proposed for the Modification are summarised in Table ES-3.

An Extraction Plan (including a suite of management plans) would be prepared for the Modification longwalls prior to the commencement of second workings in accordance with Condition 22C, Schedule 4 of the Development Consent (DA 305-7-2003).

The following management plans would be reviewed, and if necessary, revised to include the Modification (subject to approval of the Modification):

- Surface Water Monitoring Program;
- Erosion and Sediment Control Plan; and
- Surface and Groundwater Response Plan.

ES1.4 JUSTIFICATION OF THE MODIFICATION

The Modification area is within existing mining and exploration tenements held by WCPL. In addition, the land within the Modification area is owned by WCPL. WCPL considers the proposed Wambo site is suitable for the Modification.

The Modification would enable the continued use of existing Wambo infrastructure and workforce and would promote the more efficient and economic recovery of coal resources.

The Modification longwalls would not be viable as a standalone resource and may not be recovered in the future without the use of the existing South Bates Underground Mine infrastructure. The Modification would result in the recovery of approximately 18 Mt of ROM coal.

Were the Modification not to proceed, the following consequences are inferred:

- employment opportunities associated with the Modification would not eventuate;
- approximately 18 Mt of ROM coal would not be recovered;
- total royalties to the State of New South Wales in the order of $66M would not be generated;
- State and Commonwealth tax revenue would not be generated; and
- the associated flow-on effects of the above would also be lost.

This EA has demonstrated that the Modification can be implemented with limited additional biophysical and environmental impacts above those already approved at Wambo with the implementation of the mitigation measures summarised in Table ES-3.

As described above, the Modification would result in substantial economic and social benefits associated with allowing continuity of the underground operations and the extension to the life of the open cut operations.

Table ES-2
Subsidence Impact Performance Measures

Feature[1]	Subsidence Impact Performance Measure[1]	Potential Environmental Consequences from the Modification
Wollombi Brook	Negligible subsidence impacts. Negligible environmental consequences. Controlled release of excess site water only in accordance with Environment Protection Licence requirements.	Wollombi Brook is located more than 4 km from the Modification longwalls and would not be affected by subsidence associated with the Modification. **This performance measure can continue to be achieved.**
Wollemi National Park	Negligible subsidence impacts. Negligible environmental consequences.	Land within Wollemi National Park is predicted to experience less than 20 millimetre vertical subsidence and no measureable tilts, curvatures or strains due to the Modification. **This performance measure can continue to be achieved.**
Warkworth Sands Woodland Community	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.	The Warkworth Sands Woodland community has not been mapped within the Modification area. **This performance measure can continue to be achieved.**
White Box - Yellow Box - Blakely's Red Gum Woodland/ Grassy White Box Woodland Community	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.	The White Box - Yellow Box - Blakely's Red Gum Woodland/Grassy White Box Woodland community has not been mapped within the Modification area. **This performance measure can continue to be achieved.**
Other threatened species, populations or communities	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.	The Modification is unlikely to have a significant impact on threatened species, populations or ecological communities. **This performance measure can continue to be achieved.**
Wambo Homestead Complex	Negligible impact on heritage values, unless approval has been granted by the Heritage Branch and/or the Minister.	The Wambo Homestead Complex would not be impacted by subsidence from the Modification. **This performance measure can continue to be achieved.**
All built features	Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.	Infrastructure and improvements can be managed through the preparation and implementation of the appropriate management strategies as part of the Extraction Plan process, to maintain items in a safe and serviceable condition. **This performance measure can continue to be achieved.**
Public safety	No additional risk.	There would be no additional risk to public safety, through the implementation of appropriate management strategies as part of the Extraction Plan process. **This performance measure can continue to be achieved.**

[1] Conditions 22 and 22A, Schedule 4, Wambo Development Consent DA 305-7-2003.

Table ES-3
Key Outcomes of the Environmental Review

Environmental Aspect	Summary of Environmental Assessment Conclusions	Additional Mitigation Measures, Management and Monitoring Proposed for the Modification[1]
Infrastructure and Improvements	• WCPL owns the infrastructure and improvements potentially affected by subsidence located within the Modification area and immediate surrounds. • Infrastructure and improvements can be managed in a safe and serviceable condition, through the preparation and implementation of the appropriate management strategies as part of the Extraction Plan process.	• A Built Features Management Plan would be prepared as part of the Extraction Plan for the Modification longwalls.
Land Resources	• There would be low potential for material impact to agricultural productivity of the Modification area. • Mitigation measures and management would be required to minimise potential risk to agistment grazing of beef cattle within areas of active subsidence. • Approximately 2 hectares of potential agricultural land would be directly impacted by the Modification, with some of this land progressively remediated to agricultural land.	• A Land Management Plan would be prepared as part of the Extraction Plan for the Modification longwalls.
Groundwater	• There would be negligible additional drawdown along the highly productive Wollombi Brook or Hunter River alluvium as a result of the Modification. • The Modification would have no discernible or negligible impact on stream baseflow or natural river leakage for Wollombi Brook, North Wambo Creek, Wambo Creek or Stony Creek, beyond the effects of the approved mine layout. • The Modification would have no significant impact on the quality of groundwater or surface water around Wambo. • The Modification is consistent with the *Aquifer Interference Policy* and adequate licences are available to account for the potential take of water associated with the approved Wambo operations and the Modification.	• An approved Surface and Groundwater Response Plan would continue to be implemented in the event a complaint is received in relation to loss of groundwater supply. • Groundwater levels and quality would continue to be monitored in accordance with an approved Groundwater Monitoring Program.
Surface Water	• The Modification would result in changes in surface cracking, changes in grade and associated erosion and pool development along North Wambo Creek and the North Wambo Creek Diversion. With the implementation of mitigation and remediation measures, no significant change is expected in the water quality. • The Modification would have no impact on high flows that might lead to flooding in the section of North Wambo Creek between the downstream end of the Diversion and Wollombi Brook, or in Wollombi Brook itself. • The Modification would not have a significant impact on the quality of surface water around Wambo.	• Longitudinal geomorphological surveys would be conducted along the creek reaches affected by subsidence and would be outlined in the Extraction Plan. • Trigger Action Response Plans would be developed for the creeks as part of the Extraction Plan with a process to determine appropriate triggers and remedial actions for any surface cracking and changes in grade and associated erosion and pool development (based on the actions described above). • The Erosion and Sediment Control Plan would be updated and revised to include the additional surface development areas (subject to approval of the Modification).

Table ES-3 (Continued)
Key Outcomes of the Environmental Review

Environmental Aspect	Summary of Environmental Assessment Conclusions	Additional Mitigation Measures, Management and Monitoring Proposed for the Modification[1]
Aboriginal Cultural Heritage	• The field surveys identified 15 previously unrecorded Aboriginal cultural heritage sites, as well as 20 previously recorded sites in the Modification area. • Thirty-five Aboriginal cultural heritage sites of low regional archaeological significance would be impacted by the Modification. At a local level, one site was considered to be of moderate archaeological significance and eight sites of low to possibly moderate archaeological significance. • The risk of subsidence impacts on rock shelters has been assessed as "possible" for Site 499 and "very unlikely" or lower for other rock shelters. • The likelihood of impacts on the previously recorded scarred tree as a result of the Modification was assessed as "unlikely". • The overall cumulative impact of the Modification on sites of Aboriginal heritage is considered to be very low to negligible.	• WCPL intends to leave artefact scatters and isolated finds *in situ*, subject to monitoring. • The rock shelter site that may be possibly impacted by subsidence would be monitored after undermining has occurred to assess and document any impacts. This would form part of the relevant Extraction Plan monitoring program. • Systematic heritage survey of the remaining 34 ha not subject to survey sampling for the ACHA would be conducted prior to secondary extraction. • The final locations of ancillary infrastructure for the Modification would be reviewed against the known locations of Aboriginal heritage sites prior to disturbance for that activity as part of WCPL's Surface Disturbance Permit process. • WCPL would apply for an additional Aboriginal Heritage Impact Permit to cover the portion of the Modification area not covered by the existing permits.
Non-Aboriginal Heritage	• The Wambo Homestead Complex would not be affected by the Modification. • The buildings and structures associated with the Whynot property would be impacted by subsidence from the Modification longwalls. • The Whynot property is not a listed heritage item and is not considered to be significant enough to warrant protection, there would be no detrimental impact to significance if the structures were removed. • The predicted subsidence effects on the Whynot property are acceptable from a heritage perspective.	• WCPL considers that no specific or additional mitigation measures, management or monitoring of non-Aboriginal heritage are required for the Modification.
Flora and Fauna	• Surface infrastructure for the Modification (additional to existing/approved surface disturbance) would total 2 ha. • Surface disturbance for gas management infrastructure would be restricted to grassland areas that are not threatened ecological communities. • The Modification is unlikely to have a significant impact on threatened species, populations, ecological communities or critical habitat.	• The specific locations of new ventilation shafts, gas drainage infrastructure and other ancillary infrastructure would be defined as a component of future detailed mine planning and engineering studies to avoid or minimise impacts on threatened flora and fauna. • Flora and fauna management and monitoring at Wambo would continue to be conducted in accordance with the approved Flora and Fauna Management Plan.
Noise and Air Quality	• The Modification would result in a generally unaltered total sound power level when compared to existing Wambo operations. • The Modification would result in no discernable change to total suspended particulate (dust) emissions when compared to existing Wambo operations. • The Modification would not materially alter cumulative noise or air quality levels at the nearest residential receivers.	• WCPL would undertake an acoustical design review prior to the installation of a fan on the upcast ventilation shaft to confirm compliance with the relevant noise criteria at nearby privately-owned receivers. • WCPL would continue to implement air quality monitoring and response protocols in accordance with the Air Quality Monitoring Program. • Dust control measures and management practices currently implemented at Wambo would continue for the Modification, where relevant.

[1] In addition to measures currently required under the Development Consent (DA 305-7-2003), mining leases, Environment Protection Licence or WCPL management plans and monitoring programs.

1 INTRODUCTION

This document is an Environmental Assessment (EA) for a proposed modification to the Wambo Coal Mine (Wambo), an open cut and underground coal mining operation which operates in accordance with Development Consent DA 305-7-2003 (Attachment 1). Wambo is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited (Peabody).

This Modification is sought under section 75W of the *Environmental Planning and Assessment Act, 1979* (EP&A Act).

1.1 WAMBO COAL MINE

Wambo is situated approximately 15 kilometres (km) west of Singleton, near the village of Warkworth, New South Wales (NSW) (Figure 1). Wambo adjoins grazing land to the south, other coal mining operations to the east and north, grazing land to the north-west and Wollemi National Park to the west and south-west (Figures 1, 2a and 2b).

A range of open cut and underground mine operations have been conducted at Wambo since mining operations commenced in 1969. Mining under the Development Consent (DA 305-7-2003) commenced in 2004 and currently both open cut and underground operations are conducted. The maximum approved run-of-mine (ROM) coal production rate is 14.7 million tonnes per annum (Mtpa) and product coal is transported from Wambo by rail. The Wambo Coal Terminal (Figure 2a) operates under a separate Development Consent (DA 177-8-2004).

An aerial photograph of Wambo, illustrating the existing/approved extent of the open cut and underground mine operations and locations of key infrastructure is provided on Figures 2a and 2b.

1.2 SOUTH BATES EXTENSION MODIFICATION

Wambo includes the approved South Bates Underground Mine that incorporates longwall mining in the Whybrow and Wambo Seams.

A viable coal resource in the Whybrow Seam to the north-west of the approved South Bates Underground Mine has been identified based on recent exploration results and geotechnical investigations as well as the successful mining experience in the current South Bates Underground Mine and adjacent open cut mining areas.

On the basis of this further understanding of the available resource, WCPL is proposing an extension to its South Bates Underground Mine to mine additional longwall panels in the Whybrow Seam. This proposed extension to the South Bates Underground Mine is referred to as the South Bates Extension Modification (the Modification).

The Modification would primarily involve use of the existing approved infrastructure at the South Bates Underground Mine, however the Modification would also involve the construction of new ventilation shafts, gas drainage infrastructure and other ancillary infrastructure.

The total ROM coal mined would increase by approximately an additional 18 million tonnes (Mt) from the modified South Bates Underground Mine.

The Modification would not involve changes to any aspect of the approved (and completed) North Wambo Underground Mine or the layout of the approved South Wambo Underground Mine.

There are no proposed changes to the approved ROM coal production rate from the underground operations, or overall ROM coal processing rate through the coal handling and preparation plant (CHPP).

The Modification would not change the open cut mining operations.

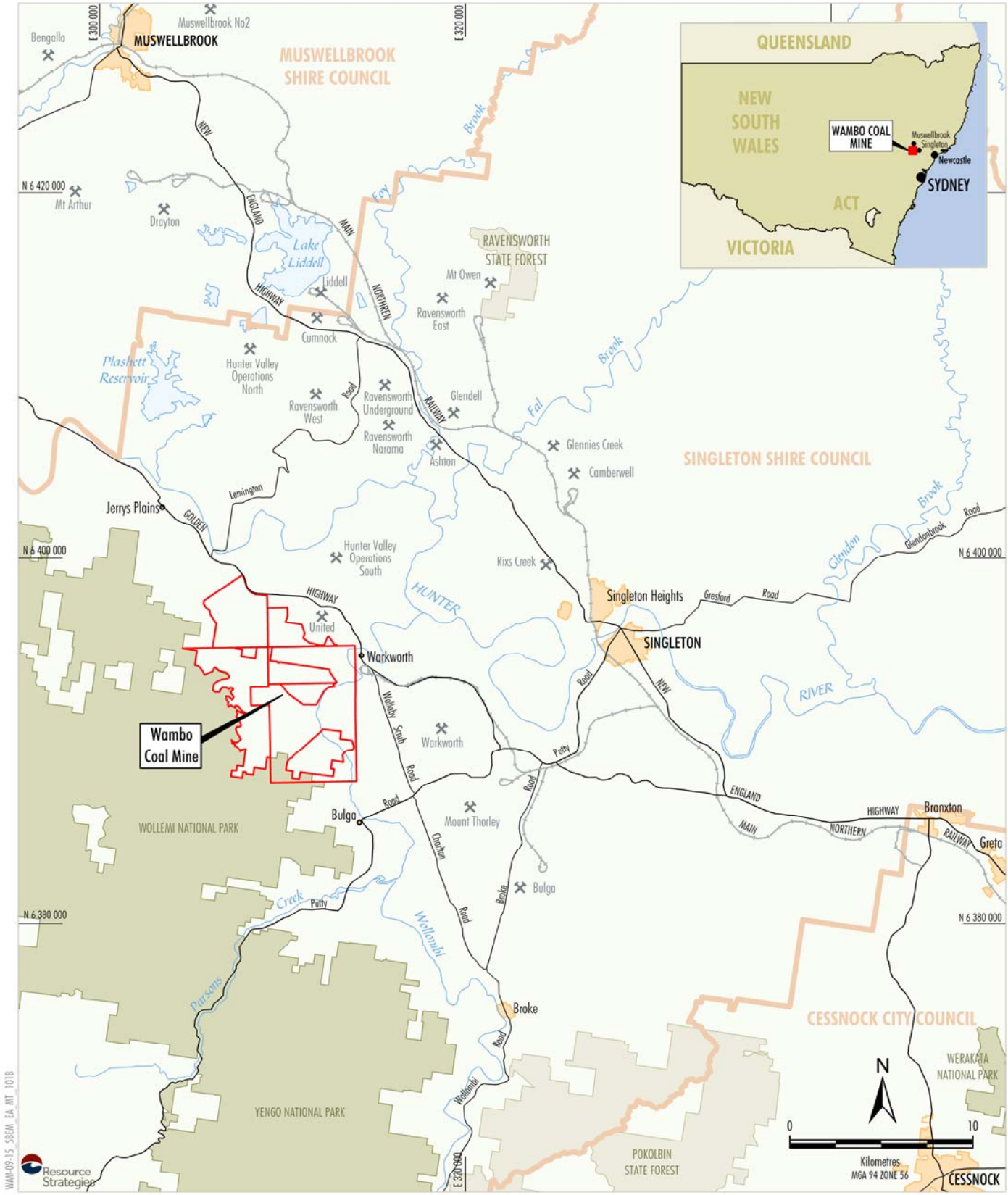
The Modification seeks to extend the Wambo operational life to 2039. This extension is consistent with the operational life being sought by DA 305-7-2003 MOD 16 as part of the United Wambo Open Cut Coal Mine Project (application pending) (Section 2.2).

Table 1 provides a comparative summary of the approved and proposed modified operations at Wambo. The modified layout of Wambo is shown on Figure 3.

1.3 CONSULTATION FOR THE MODIFICATION

Consultation has been conducted with the local community, Aboriginal stakeholders, United Collieries, key State government agencies and Singleton Shire Council (SSC) during the preparation of this EA. A summary of this consultation is provided below.

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



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LEGEND

- Mining and Coal Lease Boundary
- Local Government Boundary
- Mining Operation

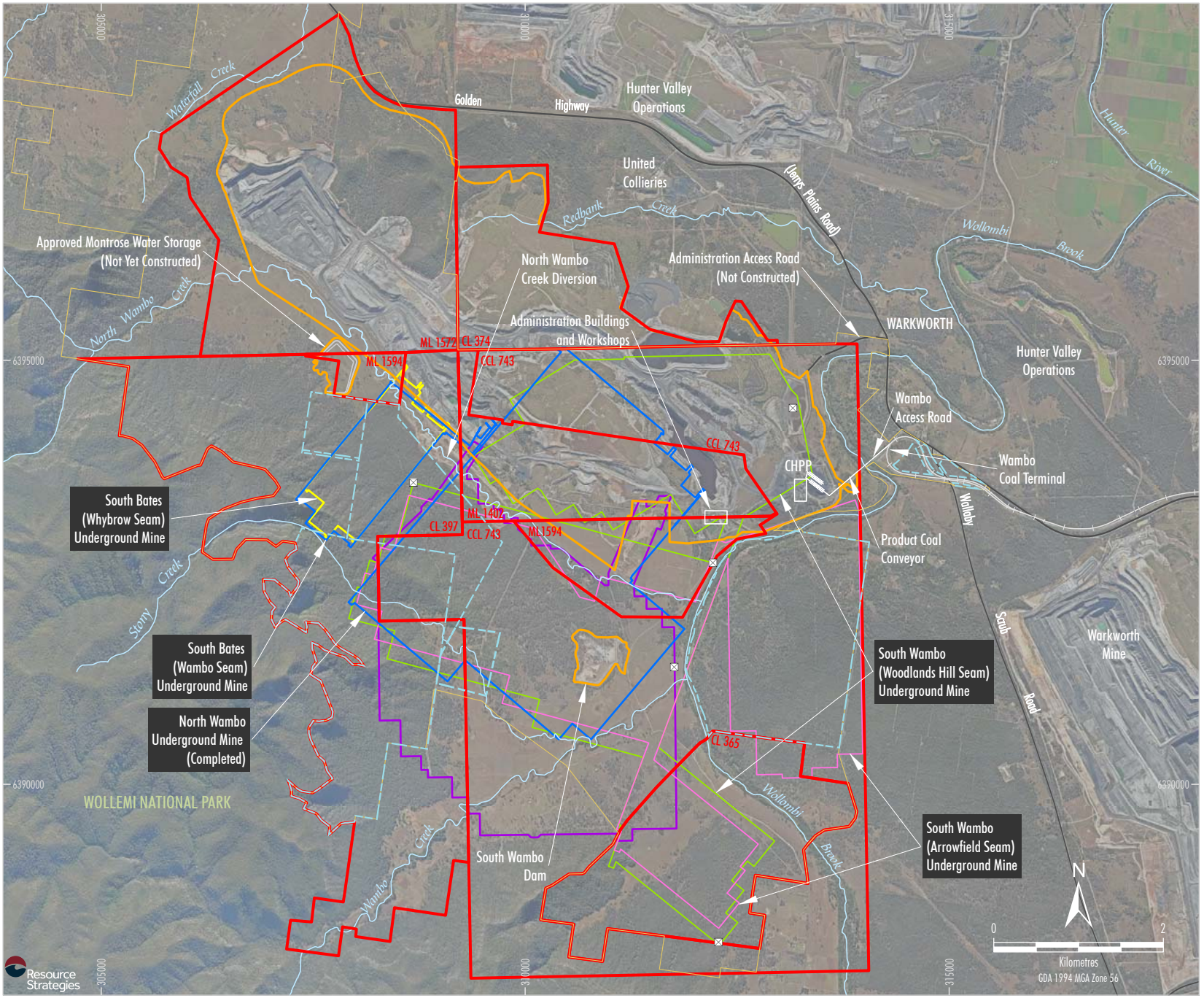
Source: Geoscience Australia (2009)

Peabody ENERGY

WAMBO COAL MINE

Regional Location

Figure 1



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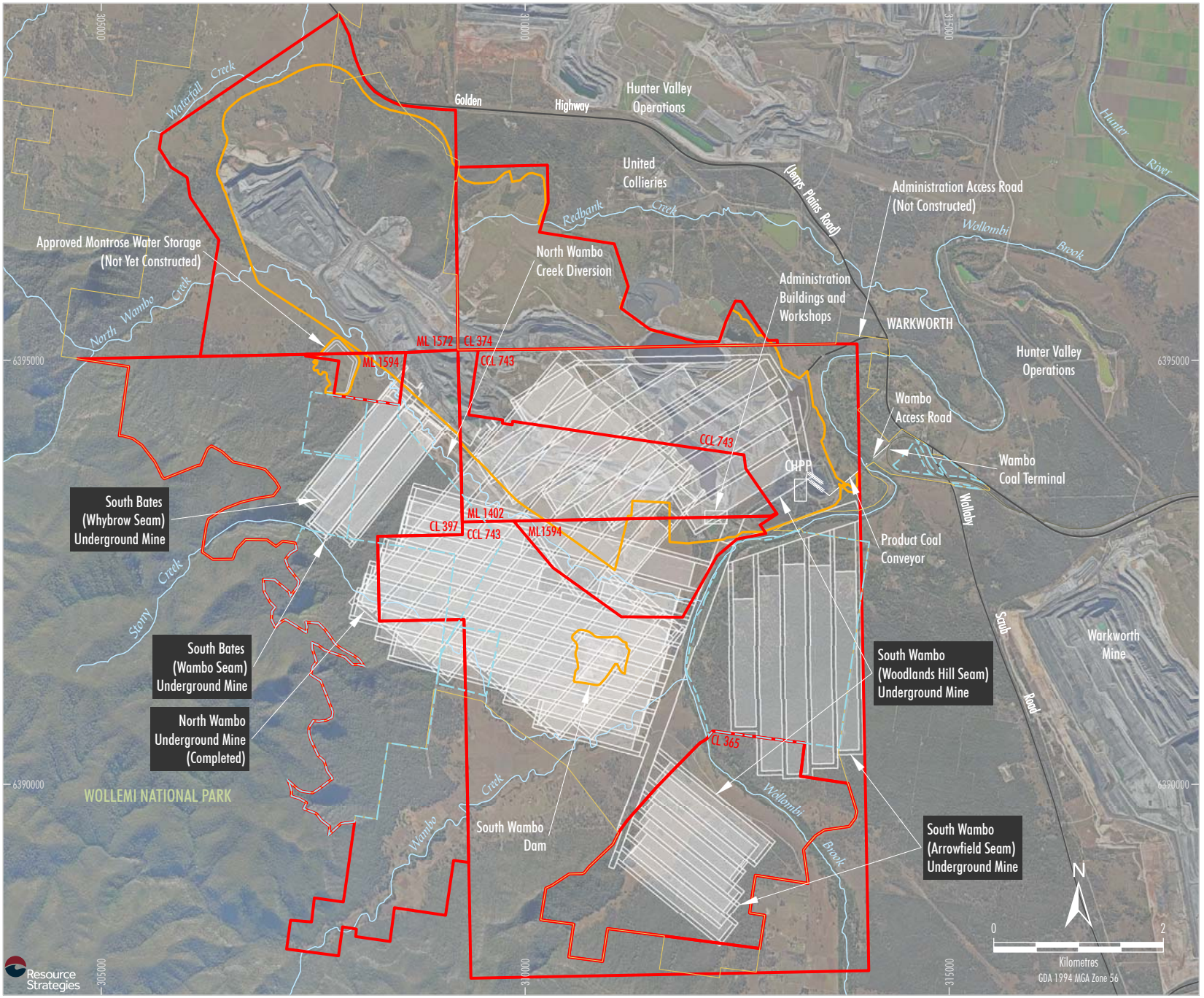
WAMBO COAL MINE

Approved Wambo Coal Mine General Arrangement

Figure 2a



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WAMBO COAL MINE

Approved Wambo Coal Mine Longwall Layout

Figure 2b

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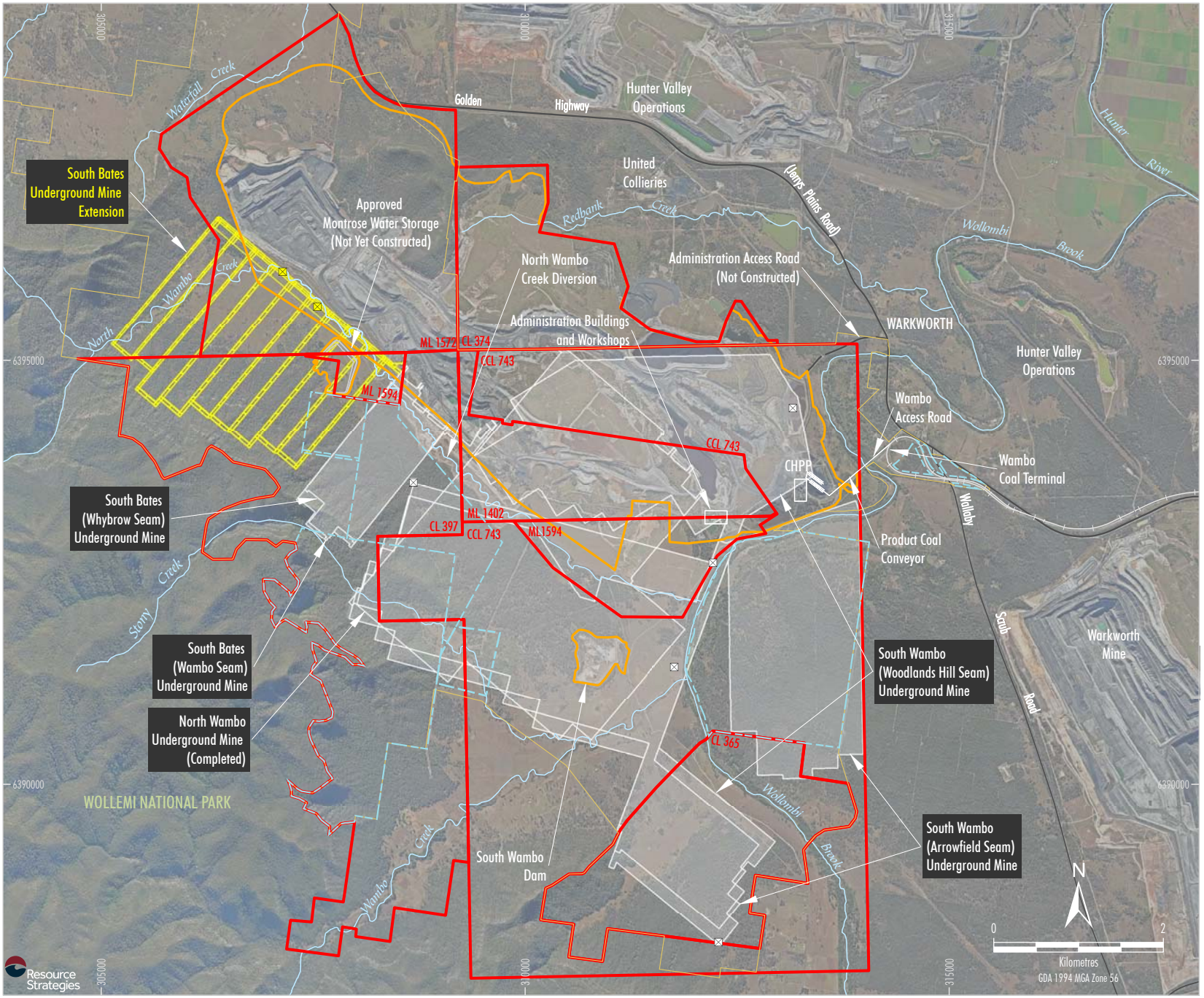

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Peabody ENERGY

WAMBO COAL MINE

Modified Wambo Coal Mine General Arrangement

Figure 3

Table 1
Comparative Summary of the Approved and Modified Wambo Coal Mine

Component	Approved Wambo[1]	Changes Proposed Under MOD 16 (Pending)[2]	Changes Proposed by this Modification (MOD 17)
Life of Mine	• 28 years (i.e. until 1 March 2032).	• An extension to the end of the United Wambo Open Cut Coal Mine Project life (i.e. until end of 2039).	• 35 years (i.e. until end of 2039).
Open Cut Mining	• Open cut mining at a rate of up to 8 Mtpa of ROM coal from the Whybrow, Redbank Creek, Wambo and Whynot Seams. • An estimated total open cut ROM coal reserve of 98 Mt. • Open cut mining operations up to and including 2020.	• Suspension of approved open cut activities under DA 305-7-2003 following commencement of the United Wambo Open Cut Coal Mine Project.	• No changes proposed as part of this Modification.
Underground Mining	• Underground mining of up to 9.75 Mtpa of ROM coal from the Whybrow, Wambo, Woodlands Hill and Arrowfield Seams. • Underground ROM coal reserves are estimated at 143.3 Mt.	• Unchanged. • Unchanged.	• No changes to the target coal seams or the maximum approved extraction rate. Extension of mining in the Whybrow Seam. • Approximately 18 Mt of additional ROM coal from the modified South Bates Underground Mine (i.e. from South Bates Extension).
Subsidence Commitments and Management	• The subsidence impact performance measures listed in Conditions 22 and 22A, Schedule 4 of the Development Consent (DA 305-7-2003).	• Unchanged.	• Unchanged.
ROM Coal Production Rate	• Up to 14.7 Mtpa of ROM coal.	• Unchanged.	• Unchanged.
Total ROM Coal Mined	• 241.3 Mt.	• Approximately 26 Mt of approved ROM coal extraction to be mined under the proposed United Wambo Open Cut Coal Mine Project.	• Approximately 18 Mt of additional ROM coal from the modified South Bates Underground Mine (i.e. from South Bates Extension).
Waste Rock Management	• Waste rock deposited in open cut voids and in waste rock emplacements adjacent open cut operations.	• Suspension of approved open cut activities and associated waste rock management under DA 305-7-2003 following commencement of the United Wambo Open Cut Coal Mine Project.	• No changes proposed as part of this Modification.
Total Waste Rock	• 640 million bank cubic metres (Mbcm).	• Suspension of approved open cut activities and associated waste rock management under DA 305-7-2003 following commencement of the United Wambo Open Cut Coal Mine Project.	• No changes proposed as part of this Modification.
Coal Washing	• CHPP capable of processing approximately 1,800 tonnes per hour (tph).	• Allowance for the Wambo CHPP to receive coal from the United Wambo Open Cut Coal Mine Project.	• No changes proposed as part of this Modification.
Product Coal	• Production of up to 11.3 Mtpa of thermal coal predominantly for export under DA 305-7-2003.	• Unchanged.	• Unchanged.

Table 1 (Continued)
Comparative Summary of the Approved and Modified Wambo Coal Mine

Component	Approved Wambo[1]	Changes Proposed Under MOD 16 (Pending)[2]	Changes Proposed by this Modification (MOD 17)
CHPP Reject Management	• Coarse rejects and tailings would be incorporated, encapsulated and/or capped within open cut voids in accordance with existing Wambo management practices.	• Coarse rejects and tailings would be incorporated, encapsulated and/or capped within open cut voids and emplacement areas associated with the United Wambo Open Cut Coal Mine Project.	• No changes proposed as part of this Modification.
Total CHPP Rejects	• Approximately 36.6 Mt of coarse rejects and approximately 22.4 Mt of tailings.	• Suspension of approved open cut activities and generation of CHPP rejects from open cut activities under DA 305-7-2003 following commencement of the United Wambo Open Cut Coal Mine Project.	• An additional 3.7 Mt of coarse rejects and 2.1 Mt of tailings from underground mining operations.
Water Supply	• Make-up water demand to be met from runoff recovered from tailings storage areas, operational areas, dewatering, licensed extraction from Wollombi Brook and Hunter River.	• Ongoing exchange of water between the United and Wambo operations to allow for integration of the water management systems.	• No changes proposed as part of this Modification.
Surface Facilities	• Construction of surface facilities within the approved surface development area.	• Upgrades to surface facilities within the approved surface development area.	• Construction of additional infrastructure within the approved surface development area.
Mining Tenements	• Coal Lease (CL) 365, CL 374, CL 397, Consolidated Coal Lease (CCL) 743, Mining Lease (ML) 1402, ML 1572, ML 1594, Authorisation (A) 444, Exploration Licence (EL) 7211.	• Unchanged (some mining tenements will be covered by DA 305-7-2003 and the United Wambo Open Cut Coal Mine Project).	• An additional mining lease over a component of A 444 would be required for the Modification.

[1] Development Consent DA 305-7-2003 (as modified).

[2] Modification associated with the United Wambo Open Cut Coal Mine Project (Section 2.2).

Local Community

A Community Consultative Committee (CCC) for Wambo is in place and provides a mechanism for ongoing communication between WCPL and the local community. WCPL provided a briefing regarding the Modification at the CCC meeting on 7 December 2016.

Modification information is publicly accessible on the Peabody Website (http://www.peabodyenergy.com/).

Aboriginal Stakeholders

Aboriginal stakeholders were consulted throughout the preparation of the Aboriginal Cultural Heritage Assessment (ACHA) for the Modification. Consultation was conducted in accordance with the NSW Office of Environment and Heritage (OEH) policy *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water [DECCW], 2010a) and Condition 56A, Schedule 4 of the Development Consent (DA 305-7-2003).

Further detail on consultation with Aboriginal stakeholders for the Modification is provided in Section 4.6.

United Collieries

WCPL and United Collieries have formed a joint venture over the tenements adjoining this proposed Modification in relation to the United Wambo Open Cut Coal Mine Project (Section 2.2). Consultation with United Collieries regarding this Modification is ongoing. During this consultation, the interactions between this Modification and existing and future infrastructure and assessment of cumulative impacts were discussed.

State Government Agencies

WCPL continues to consult with relevant State Government agencies on a regular basis in relation to the current mining operations at Wambo.

Department of Planning and Environment

WCPL presented key components of, and justification for, the Modification to the Department of Planning and Environment (DP&E) during initial briefings in November and December 2016.

A modification application and request for Secretary's Environmental Assessment Requirements (SEARs) were lodged in November 2016 for the Modification.

SEARs for the Modification were subsequently issued under section 75W(3) of the EP&A Act in December 2016. The SEARs were revised in February 2017 to incorporate the environmental assessment requirements from the Commonwealth Department of the Environment and Energy.

Division of Resources and Energy (within the NSW Department of Industry)

Meetings were conducted with representatives of the Division of Resources and Energy (DRE) in December 2016 and January 2017 to provide details on the Modification, the coal resource and the requirement for the Modification.

Office of Environment and Heritage

WCPL held a meeting with representatives of the OEH on 13 December 2016 to provide further detail on the Modification and the outcomes of the ecology and Aboriginal cultural heritage assessments.

WCPL also consulted with the OEH during the preparation of the ACHA (Section 4.6).

Other State Government Agencies

The following State Government agencies were provided with a briefing package describing the Modification between December 2016 and February 2017:

- Environment Protection Authority (EPA);
- Department of Primary Industries (DPI) (including separate correspondence to DPI Water);
- OEH – Heritage Division;
- Dams Safety Committee (DSC);
- Mine Subsidence Board (MSB); and
- NSW Health.

Commonwealth Department of the Environment and Energy

Components of the Modification were referred to the Federal Minister for the Environment and Energy under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) on 15 November 2016 as the Action (EPBC 2016/7816). Further information on the components that form part of the Action is provided in Section 5.2.

A delegate of the Federal Minister determined on 23 December 2016 that the proposed Action is a 'controlled action' for the purposes of the EPBC Act and the proposed action is to be assessed under the assessment bilateral agreement with the NSW Government.

Singleton Shire Council

Wambo is located within the Singleton Local Government Area (LGA). The SSC has been updated on the Modification through its involvement in the CCC (see above). WCPL provided the SSC with briefing on the Modification in February 2017.

1.4 STRUCTURE OF THIS DOCUMENT

This EA comprises a main text component and supporting studies. An overview of the main text sections is presented below:

Section 1	Provides an overview of Wambo, the Modification and the consultation undertaken in relation to the Modification.
Section 2	Provides a description of existing and approved operations at Wambo and the proposed United Wambo Open Cut Coal Mine Project.
Section 3	Provides a description of the Modification.
Section 4	Provides an environmental assessment of the Modification and describes the existing WCPL environmental management systems and measures available to manage and monitor any potential impacts.
Section 5	Describes the general statutory context of the Modification and identifies other approvals required to support the Modification and any site management documents that would require revision in support of the Modification.
Section 6	Provides a consolidated summary of environmental management and mitigation measures, and a conclusion providing justification for the Modification.
Section 7	References.

Attachments 1 to 6 and Appendices A to M provide supporting information as follows:

Attachment 1	Wambo Coal Mine Consolidated Development Consent.
Attachment 2	Secretary's Environmental Assessment Requirements.
Attachment 3	Real Property Descriptions.
Attachment 4	Relevant Environmental Planning Instruments and Government Policies.
Attachment 5	Cross Reference to Assessment Requirements Relevant to the EPBC Act.
Appendix A	Subsidence Assessment.
Appendix B	Groundwater Assessment.
Appendix C	Surface Water Assessment.
Appendix D	Flora Assessment.
Appendix E	Fauna Assessment.
Appendix F	Aboriginal Cultural Heritage Assessment.
Appendix G	Historic Heritage Assessment.
Appendix H	Agricultural Impact Statement.
Appendix I	Noise Review.
Appendix J	Air Quality and Greenhouse Gas Review.
Appendix K	Land Contamination Assessment.
Appendix L	Site Water Balance.
Appendix M	Environmental Risk Assessment

2 WAMBO COAL MINE – EXISTING OPERATIONS

2.1 APPROVALS HISTORY

The Wambo Development Project was approved under Part 4 of the EP&A Act in February 2004. Fourteen modifications to the Development Consent (DA 305-7-2003) have since been granted under the EP&A Act:

- 2004 under section 96(1) – to facilitate the commencement of operations under Development Consent DA 305-7-2003 (MOD 1);
- May 2005 under section 96(2) – to facilitate alterations to the North Wambo Underground Mine (MOD 2);
- January 2006 under section 96(1A) – to facilitate the construction of an open cut workshop extension and surface infrastructure for the North Wambo Underground Mine (MOD 3);
- April 2006 under section 96(1A) – to facilitate the extraction of remnant coal from the existing Wollemi Underground Mine (MOD 4);
- October 2006 under section 96(1A) – to facilitate the construction and operation of a temporary North Wambo Creek bypass around the open cut operations (MOD 5);
- January 2007 under section 96(2) – to facilitate the staged construction of the North Wambo Creek Diversion, a temporary North Wambo Creek pipeline and construction of gas drainage and dewatering infrastructure for the North Wambo Underground Mine (MOD 6);
- June 2009 under section 96(1A) – to facilitate the construction and operation of the Chitter Dump Dam (MOD 7);
- August 2009 under section 96(2) – to facilitate the construction and operation of the South Wambo Dam (MOD 8);
- February 2011 under section 75W – to modify Development Consent DA 305-7-2003 to require WCPL to prepare an Extraction Plan for all underground operations at Wambo, rather than a Subsidence Management Plan (MOD 9);
- January 2013 under section 75W – to modify Development Consent DA 305-7-2003 to facilitate the construction and operation of the Montrose Water Storage and associated supporting infrastructure (MOD 11);
- July 2013 under section 75W – to modify Development Consent DA 305-7-2003 to facilitate the development of two additional longwall panels contiguous with the existing North Wambo Underground Mine and recovery of an additional 3.7 Mt of ROM coal (MOD 13);
- September 2014 under section 75W – to modify Development Consent DA 305-7-2003 to facilitate the development of an additional longwall panel contiguous with the existing North Wambo Underground Mine and recovery of an additional 1.9 Mt of ROM coal (MOD 14);
- November 2015 under section 75W – to modify Development Consent DA 305-7-2003 to facilitate the development of three additional longwall panels in the Wambo Seam at the South Bates Underground Mine below the three approved longwall panels in the Whybrow Seam and recovery of an additional 5.6 Mt of ROM coal (MOD 15); and
- December 2016 under section 75W – to modify Development Consent DA 305-7-2003 to facilitate a realignment and extension/relocation of the South Wambo Underground Mine, an increase in the underground mine ROM coal production rate from 7.5 to 9.75 Mtpa, and an extension in the life of the open cut operations and the life of mine (MOD 12).

A separate modification application regarding the Montrose East Underground Mine (MOD 10) was lodged in March 2011, however was later withdrawn.

A separate modification application related to the United Wambo Open Cut Coal Mine Project (DA 305-7-2003 MOD 16) is pending. This application is described below in Section 2.2.

The consolidated Development Consent (DA 305-7-2003), incorporating these modifications, is provided in Attachment 1.

2.2 UNITED WAMBO OPEN CUT COAL MINE PROJECT

WCPL and United Collieries have formed a joint venture over the tenements adjoining this proposed Modification in relation to the United Wambo Open Cut Coal Mine Project.

The United Wambo Open Cut Coal Mine Project seeks to combine the existing open cut operations at Wambo with a proposed new open cut coal mine at the United Collieries (Figure 4). Wambo's CHPP and underground operations do not form part of the joint venture, and will continue to be owned and operated by WCPL under DA 305-7-2003.

The United Wambo Open Cut Coal Mine Project involves three separate applications:

- a State Significant Development (SSD) application (SSD 15_7142) relating to proposed open cut coal mining for a period of 23 years, with mining in the new United Open Cut combined with ongoing mining at the existing, approved Wambo Open Cut under a modified mine plan;
- a modification application to the Wambo Development Consent (DA 305-7-2003 MOD 16) to harmonise the consent with SSD 15_7142 and extend the period of approved operation of coal handling operations and the CHPP to match the life of the United Wambo Open Cut Coal Mine Project; and
- a modification application to the Wambo Coal Terminal Development Consent (DA 177-8-2004 MOD 3) to harmonise the consent with SSD 15_7142 and extend the period of approved operation of the product coal transport operations to match the life of the United Wambo Open Cut Coal Mine Project.

These applications are pending and the assessment of the United Wambo Open Cut Coal Mine Project by the DP&E is ongoing.

This Modification is independent of, and not reliant on, the proposed United Wambo Open Cut Coal Mine Project. However, it is noted that the proposed extension to the operational life of the approved coal handling, CHPP and product coal transport operations (Section 3.6) is consistent with the operational life separately being sought by DA 305-7-2003 MOD 16.

Cumulative assessment of this Modification and the United Wambo Open Cut Coal Mine Project is provided in this EA.

2.3 UNDERGROUND MINING

The following underground mines at Wambo are approved (Figures 2b and 5):

- North Wambo Underground Mine (Wambo Seam) (now complete);
- South Bates Underground Mine (Whybrow and Wambo Seams) (current mining area); and
- South Wambo Underground Mine (Woodlands Hill and Arrowfield Seams) (not yet commenced).

The approved maximum underground mining rate is 9.75 Mtpa. Underground mining operations are conducted 24 hours per day, seven days per week.

North Wambo Underground Mine

Development of the North Wambo Underground Mine commenced in 2005 and production (using longwall mining methods) commenced in 2007 (WCPL, 2008). Longwall extraction at the North Wambo Underground Mine finished in January 2016.

Access to the North Wambo Underground Mine was via the open cut highwall. ROM coal was conveyed to a 70,000 tonne (t) capacity stockpile adjacent to the open cut highwall where it was loaded into haul trucks and hauled to the ROM bin or the ROM coal stockpile.

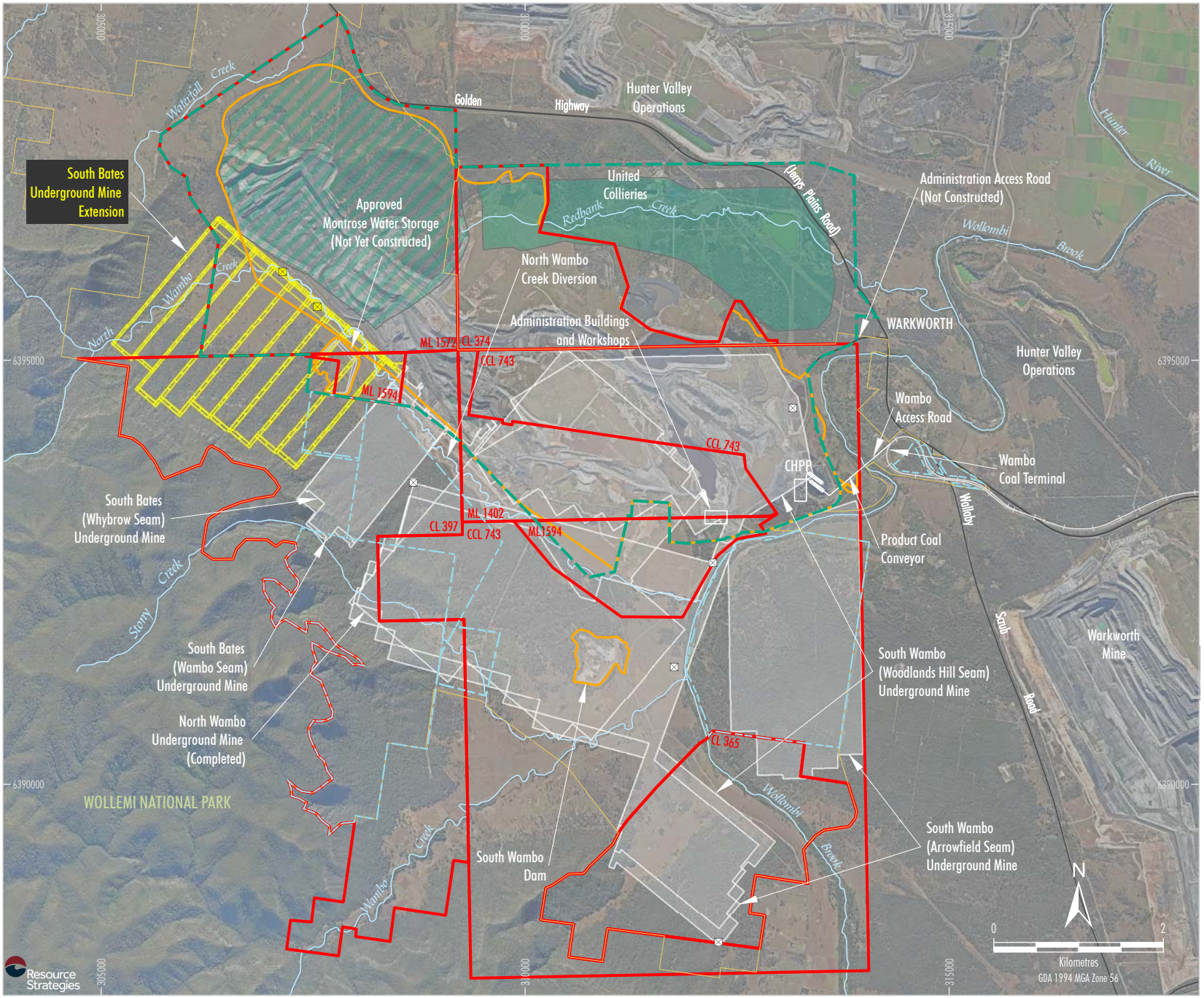
South Bates Underground Mine

Development of the South Bates Underground Mine commenced in October 2014 and longwall mining commenced in the South Bates (Whybrow Seam) Underground Mine (i.e. Longwalls 11 to 13) in February 2016. Subsequently, mining operations will progress to the South Bates (Wambo Seam) Underground Mine, with longwall mining scheduled to commence in June 2017.

Access to the approved South Bates Underground Mine is via the Bates South open cut pit wall. ROM coal is conveyed to a stockpile where it is loaded into haul trucks and hauled to the ROM bin or the ROM coal stockpile.

Underground mining equipment includes continuous miners, longwall mining equipment, electric shuttle cars, load haul dump machines and personnel transporters (WCPL, 2015a).

The currently approved South Bates Underground Mine is scheduled for completion in July 2018.



LEGEND

- Mining and Coal Lease Boundary
- WCPL Owned Land
- Existing/Approved Surface Development Area
- Approved Underground Development
- Modified Underground Development
- Approved Ventilation Shaft
- Modified Ventilation Shaft
- Remnant Woodland Enhancement Program (RWEP) Area

United Wambo Open Cut Coal Mine Project

- Project Area
- Approved and Proposed Wambo Open Cut
- Proposed United Open Cut

Source: Department of Lands (July 2009); WCPL (2016); WCPL Orthophoto (July 2016); Umwelt (2016)

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WAMBO COAL MINE

United Wambo Open Cut Coal Mine Project

Figure 4

WAM-09-15_SBEM_EA_MT_209D

SUPERGROUP	GROUP	SUBGROUP	FORMATION	SEAM
SINGLETON SUPERGROUP	NARRABEEN GROUP	WIDDEN BROOK CONGLOMERATE		
	NEWCASTLE COAL MEASURES [1]	GLEN GALLIC SUBGROUP	Greigs Creek Coal	
			Redmanvale Creek Formation	
			Dights Creek Coal	
		DOYLES CREEK SUBGROUP	Waterfall Gully Formation	
			Pinegrove Formation	
		HORSESHOE CREEK SUBGROUP	Lucernia Coal	
			Strathmore Formation	
			Alcheringa Coal	
			Clifford Formation	
		APPLETREE FLAT SUBGROUP	Charlton Formation	
			Abbey Green Coal	
		WATTS SANDSTONE		
	WITTINGHAM COAL MEASURES	DENMAN FORMATION		
		JERRYS PLAINS SUBGROUP	Mount Leonard Formation	***Whybrow Seam*** [2]
			Althorpe Formation	
			Malabar Formation	***Redbank Creek Seam*** [2]
				Wambo Seam [2]
				Whynot Seam [2]
				Blakefield Seam
			Mount Ogilvie Formation	*Glen Munro Seam*
				Woodlands Hill Seam [2]
			Milbrodale Formation	
			Mount Thorley Formation	***Arrowfield Seam*** [2]
				Bowfield Seam [3]
				Warkworth Seam [3]
			Fairford Formation	
			Burnamwood Formation	*Mount Arthur Seam* [3]
				Piercefield Seam [3]
				Vaux Seam [3]
				Broonie Seam
				Bayswater Seam
		ARCHERFIELD SANDSTONE		
		VANE SUBGROUP	Bulga Formation	
			Foybrook Formation	
			Saltwater Creek Formation	

[1] Previously known as the Wollombi Coal Measures.
[2] Coal reserves currently approved to be mined at the Wambo Coal Mine.
[3] Coal reserves proposed to be mined by the United Wambo Open Cut Coal Mine Project (SSD 7142).

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Resource Strategies

After: DMR (1993)

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WAMBO COAL MINE

Stratigraphy of the Wambo Coal Mine Area

Figure 5

South Wambo Underground Mine

Mining at the approved South Wambo (Woodlands Hill and Arrowfield Seams) Underground Mine is planned to commence after completion of mining at the South Bates Underground Mine.

Access to the South Wambo Underground Mine is approved via a box cut and portal (known as the CHPP portal) and associated mine entries.

ROM coal from the South Wambo Underground Mine will be conveyed to the ROM coal stockpile or directly to the CHPP for processing.

2.4 UNDERGROUND MINE SURFACE INFRASTRUCTURE

Ventilation Systems

The installation of gas drainage wells and ventilation boreholes was approved at the North Wambo Underground Mine (WCPL, 2006).

The South Bates Underground Mine intakes air via portals located at the Bates South open cut pit wall. The Whybrow Seam longwall panels operate independently with separate ventilation systems. Fans are located at the portals for the longwall panel gate roads with up to two fans operating at any one time (WCPL, 2003). The Wambo Seam Underground Mine longwall panels are ventilated via the access drift.

The South Wambo Underground Mine would require construction and operation of five ventilation shafts to support the operation (Figure 2a) (WCPL, 2016a). These ventilation shafts would be staged with the progression of mining and may be used as upcast shafts (including installation of fans) or downcast shafts, depending on the location of mining.

Gas Management

Gas drainage wells at the North Wambo Underground Mine were approved to be installed at approximately 200 metre (m) intervals along the longwall panels (WCPL, 2006).

The ventilation system is the primary mechanism to monitor and control the concentrations of mine gases at the approved South Bates Underground Mine. Gas may also be drained by drilling in-seam (i.e. horizontal) boreholes in advance of mining (WCPL, 2015b).

The installation of a series of gas drainage wells is approved for the South Wambo Underground Mine to allow for gas drainage. Up to four gas drainage wells are approved to be installed for each longwall panel (WCPL, 2016a). Up to two centralised gas plants are approved for the South Wambo Underground Mine to flare gas collected through pre-drainage and goaf gas drainage activities (WCPL, 2016a). Only one gas plant would be operational at any time.

Mine Dewatering

Groundwater that drains from coal seams and surrounding rock and then accumulates in underground workings is pumped to the surface via access drifts and/or boreholes, to be managed within the Wambo water management system.

Overlying and adjacent workings are also dewatered, if required for safety reasons, by surface boreholes.

2.5 OPEN CUT MINING

Approved open cut mining operations at Wambo involve the extraction of coal from the Whybrow, Redbank Creek, Wambo and Whynot Seams (Figure 5). The open cut is bounded by the United Collieries and the Golden Highway to the north, Wollombi Brook to the east (Figure 2a) and by uneconomic strip ratios to the south and west.

The open cut mining fleet includes excavators, dozers, front end loaders, haul trucks, water trucks, service trucks, graders and drills (WCPL, 2015a).

Open cut mining operations are currently approved until 2020.

2.6 CONSTRUCTION AND DEVELOPMENT ACTIVITIES

Surface construction activities at Wambo are generally undertaken during daytime hours (i.e. 7.00 am to 6.00 pm) up to seven days per week (WCPL, 2003).

Underground development activities, including underground roadway development and shafts, are undertaken up to 24 hours per day, seven days per week.

2.7 COAL HANDLING AND PREPARATION

ROM coal from the mining operations is hauled to the CHPP for processing. The majority of ROM coal is placed directly into the 400 t ROM bin and the remainder is placed onto the 250,000 t capacity ROM coal stockpile. ROM coal is reclaimed from the ROM coal stockpile by front end loader as required.

ROM coal is crushed and washed in the CHPP which operates at a rate of approximately 1,800 tph of ROM coal feed. A product coal stockpile with an approximate capacity of 500,000 t is used to stockpile product coal, prior to reclaim and loading to trains for transport off-site.

The CHPP operates up to 24 hours per day, seven days per week. During the 2015 reporting period approximately 9.2 Mt of ROM coal was processed at the CHPP producing approximately 5.8 Mt of product coal (WCPL, 2016a).

2.8 PRODUCT COAL TRANSPORT

The Wambo Coal Terminal is capable of loading product coal onto trains at a rate of 4,500 tph. Product coal is reclaimed from the product coal stockpile at three reclaim points and is transferred via conveyors to the train load-out bin.

The Wambo Coal Terminal operates up to 24 hours per day, seven days per week. An average of four trains are loaded each day, with an approved maximum of six trains per day being loaded during peak coal transport periods.

2.9 WASTE ROCK MANAGEMENT

The open cut operations are expected to produce approximately 640 Mbcm of waste rock during the life of Wambo (WCPL, 2016a). Only a limited amount of waste rock will be produced from the underground operations. The overburden and interburden waste rock materials comprise mudstones, siltstones, sandstone, shale and conglomerates (WCPL, 2012).

Overburden removal is carried out mostly by excavators and haul trucks with the waste rock material hauled to open cut voids or waste rock emplacements. Approximately 26 Mbcm of waste rock was excavated during the 2015 reporting period (WCPL, 2016b).

2.10 COAL REJECT MANAGEMENT

Approximately 36.6 Mt of coarse reject material is expected to be produced over the life of Wambo and will primarily comprise minor quantities of coal as well as sandstone, siltstones, shales, conglomerates and mudstone (WCPL, 2016a). The coarse reject material is selectively handled and co-disposed of with waste rock in open cut voids or is used as bulk fill in the covering and rehabilitation of tailings materials (WCPL, 2003).

Tailings produced at the CHPP primarily comprise carbonaceous shale, sands and clay materials (WCPL, 2003). The tailings are pumped as slurry to open cut voids. Once the tailings have filled a void they are progressively covered with coarse rejects and/or waste rock material using a combination of encapsulation and incorporation. Approximately 22.4 Mt of tailings (dry basis) are expected to be produced over the life of Wambo (WCPL, 2016b).

2.11 INFRASTRUCTURE AND SERVICES

The main administration buildings and workshops are located at the south-east corner of the open cut operations (Figure 2a). An administration block, bathhouse and workshops are also located at the CHPP (Figure 2a).

The South Bates Underground Mine surface facilities (Figure 2a) include offices, control room, crib room, other support buildings, workshop, ablution building, laydown areas, a range of service facilities, access roads and utilities.

Access to Wambo is currently via the sealed Wambo Access Road which intersects the Golden Highway near Warkworth. An Administration Access Road from the Golden Highway is approved but not yet constructed (Figure 2a). Upgrades to the existing Wambo access road, including the construction of a grade separated crossing, are also approved but not yet constructed (WCPL, 2016a).

2.12 SITE WATER MANAGEMENT

The site water management strategy for Wambo is based on the containment and re-use of mine water and on the control of sediment that may be potentially carried with runoff from disturbed areas such as the waste rock emplacements.

The Wambo water management system controls waters generated from development and operational areas while diverting upstream water around such areas. It includes both permanent structures that will continue to operate post-closure and temporary structures that will only be required until the completion of rehabilitation works.

The water management system includes:

- up-catchment diversion structures;
- water storage dams;
- sediment dams;
- water transfer infrastructure (i.e. pumps and pipelines); and
- the North Wambo Creek Diversion.

The site water management system operates predominately as a closed self-contained system. The water balance of the system fluctuates with climatic conditions and as the extent of the mining operations evolves over time.

The Site Water Balance prepared under Condition 30(a), Schedule 4 of the Development Consent (DA 305-7-2003) was approved in November 2015. In accordance with Condition 25, Schedule 4 of the Development Consent (DA 305-7-2003), WCPL reviews the site water balance for Wambo annually and reports the results of this review in the Annual Review.

A section of North Wambo Creek has been diverted to avoid the Wambo open cut. The North Wambo Creek Diversion was constructed in accordance with the approved North Wambo Creek Diversion Plan (WCPL, 2007).

2.13 WORKFORCE

The Wambo workforce currently consists of approximately 670 employees and contractors.

2.14 REHABILITATION

Rehabilitation at Wambo occurs progressively as areas/landforms become available to minimise the area of disturbance at any one time. Approximately 447 hectares (ha) of final rehabilitation had been undertaken at Wambo at the end of 2015 (WCPL, 2016b), with a further 100 ha undertaken in 2016.

A summary of the key elements of the rehabilitation program at Wambo is provided below.

Rehabilitation Principles and Objectives

The following rehabilitation principles form the basis for rehabilitation planning and design at Wambo:

- Existing remnant vegetation to be preserved wherever possible.
- Integration of open cut mining and rehabilitation planning to minimise the area of disturbance at any one time.
- Progressive rehabilitation of disturbed areas, including partial rehabilitation of temporarily inactive waste rock emplacements.
- Creation of post-mining landforms that enhance the amenity of the local landscape and contribute to local and regional habitat corridors as presented in the *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales* (NSW Department of Mineral Resources, 1999).
- Consideration of issues of public safety in the design of final landforms.
- Consultation with the relevant state government authorities, SSC and the CCC during the final design and planning of rehabilitated landforms.
- Implementation of trials and design studies as necessary to maximise effectiveness of the rehabilitation program.
- Routine monitoring in order to identify rehabilitated areas requiring maintenance works.

The rehabilitation objectives at Wambo include:

- The creation of safe, stable, adequately drained post-mining landforms that are consistent with the local surrounding landscape.
- Establishment of woodland vegetation linking remnant vegetation to the north and east of Wambo with the eastern borders of Wollemi National Park.
- Preservation and beneficial use of existing water resources.
- Development of a sustainable post-mining land use plan towards the end of Wambo's life.

Final Landform Concepts

The preferred final landform concepts for Wambo will be revised and refined throughout the life of Wambo, utilising the outcomes of ongoing consultation with relevant authorities, stakeholders and the results of rehabilitation trials.

Surface infrastructure with no ongoing beneficial use will be removed from the site at the completion of mining. Some infrastructure (e.g. site access roads, water storages) may be retained for alternate post-mining uses (where agreed in consultation with the relevant landholders).

Revegetation Strategy

The Wambo revegetation program will establish significant areas and a net increase in woodland vegetation over the long-term. The final distribution of woodland to be established on rehabilitated landforms will ultimately depend on the outcome of closure planning including the shape of final landforms and the agreed post-closure land use (WCPL, 2003).

In recognition of the importance of vegetation corridors to regional biodiversity, rehabilitation initiatives for Wambo will aim to increase the continuity of vegetation in the region through the establishment of woodland corridors. Accordingly, the rehabilitation program has been designed to establish linkages between the rehabilitation areas, existing remnant vegetation and Wollemi National Park (WCPL, 2003).

The provisional revegetation strategy includes the revegetation of disturbance areas with areas of woodland (corridors), areas which contain a mixture of woodland and pasture, and riparian vegetation.

Remnant Woodland Enhancement Program

Six Remnant Woodland Enhancement Program (RWEP) areas have been established at Wambo (Figure 2a). The objective of the RWEP areas is to help to conserve regional biodiversity, whilst enhancing the habitat available to flora and fauna (WCPL, 2016c). Conservation and enhancement of the RWEP areas will strengthen the linkages to be developed between Wollemi National Park, existing remnant woodland and woodland rehabilitation areas.

Details of the management of the RWEP areas are provided in the Biodiversity Management Plan (WCPL, 2016c).

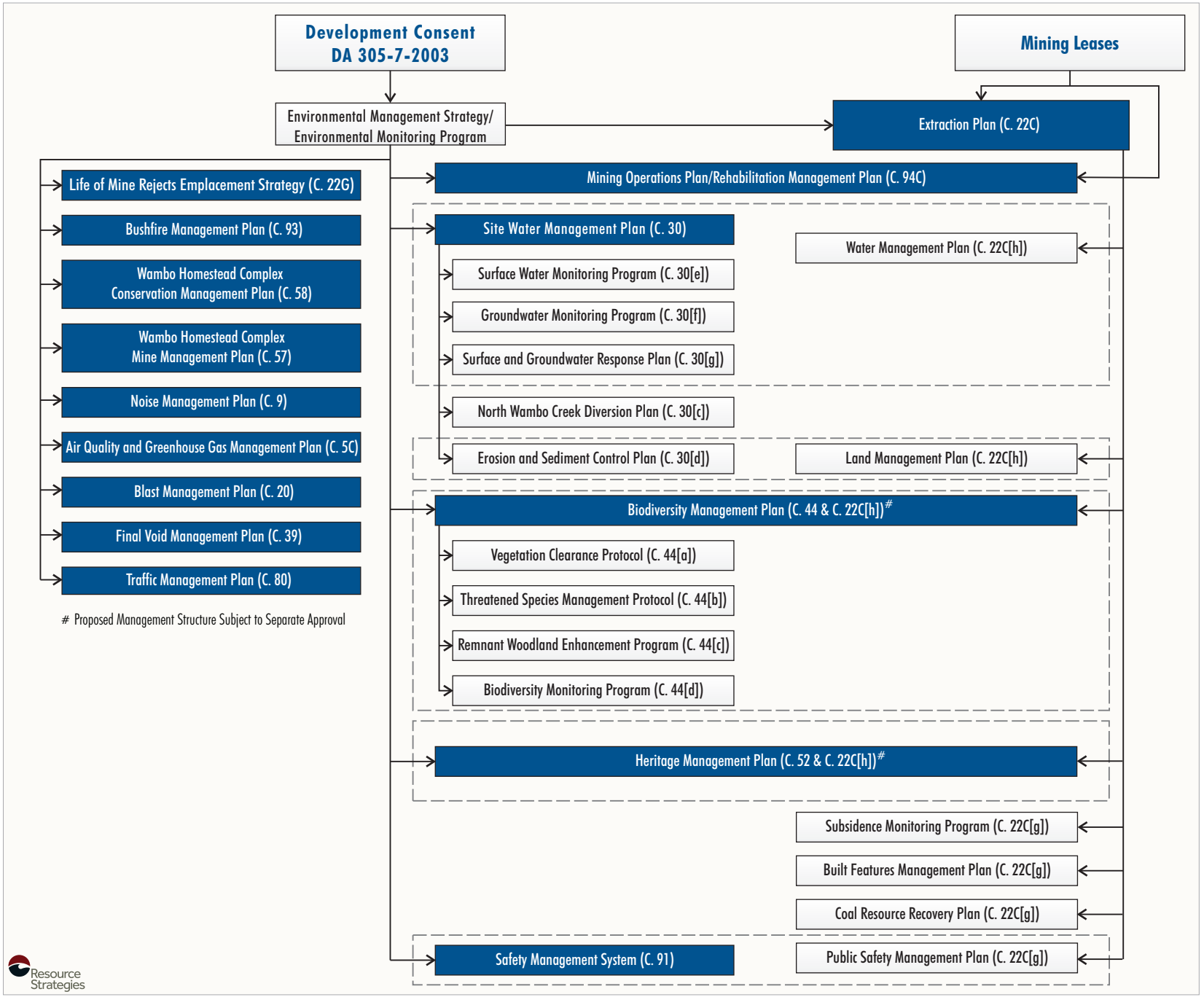
WCPL is currently in the process of finalising agreements to conserve the RWEP areas as part of Voluntary Conservation Agreements under Part 4, Division 12 of the NSW *National Parks and Wildlife Act, 1974* (NPW Act) in accordance with Condition 41, Schedule 4 of Development Consent DA 305-7-2003.

2.15 ENVIRONMENTAL MONITORING AND MANAGEMENT

Environmental monitoring and management at Wambo encompasses a range of management plans and monitoring programs overseen by statutory planning provisions (Figure 6). Approved management plans/monitoring programs include:

- Environmental Management Strategy (WCPL, 2009).
- Flora and Fauna Management Plan[1] (WCPL, 2014a).
- Blast Management Plan (WCPL, 2015c).
- Noise Management Plan (WCPL, 2014b).
- Air Quality and Greenhouse Gas Management Plan (WCPL, 2014c).
- Site Water Management Plan incorporating the following:
  - North Wambo Creek Diversion Plan (WCPL, 2007).
  - Groundwater Monitoring Program (WCPL, 2015d).
  - Surface Water Monitoring Program (WCPL, 2015e).
  - Erosion and Sediment Control Plan (WCPL, 2015f).
  - Surface and Groundwater Response Plan (WCPL, 2015g).
  - Site Water Balance (WCPL, 2015h).
- North Wambo Underground Mine Extraction Plan Longwalls 8 to 10A (WCPL, 2015i).
- South Bates (Whybrow Seam) Underground Mine Extraction Plan Longwalls 11 to 13 (WCPL, 2015j).
- Life of Mine Rejects Emplacement Strategy (WCPL, 2011).
- Bushfire Management Plan (WCPL, 2013).
- Wambo Homestead Complex Mine Management Plan (Godden Mackay Logan, 2012).

[1] Proposed to be replaced with the Biodiversity Management Plan (WCPL, 2016c) submitted for approval in 2016.



Resource Strategies

WAM-09-15_SBEM_EA_MT_002B

Peabody ENERGY

WAMBO COAL MINE

Wambo Coal Mine
Environmental Management System

Figure 6

WCPL maintains an extensive monitoring program whereby data is collected, analysed and maintained for reporting, future examination and assessment. The locations of existing environmental monitoring sites at Wambo are shown on Figures 7 and 8.

Approved management plans/monitoring programs are available on WCPL's website:

> http://www.peabodyenergy.com/content/422/australia-mining/new-south-wales/wambo-mine/approvals-plans-and-reports-wambo-mine

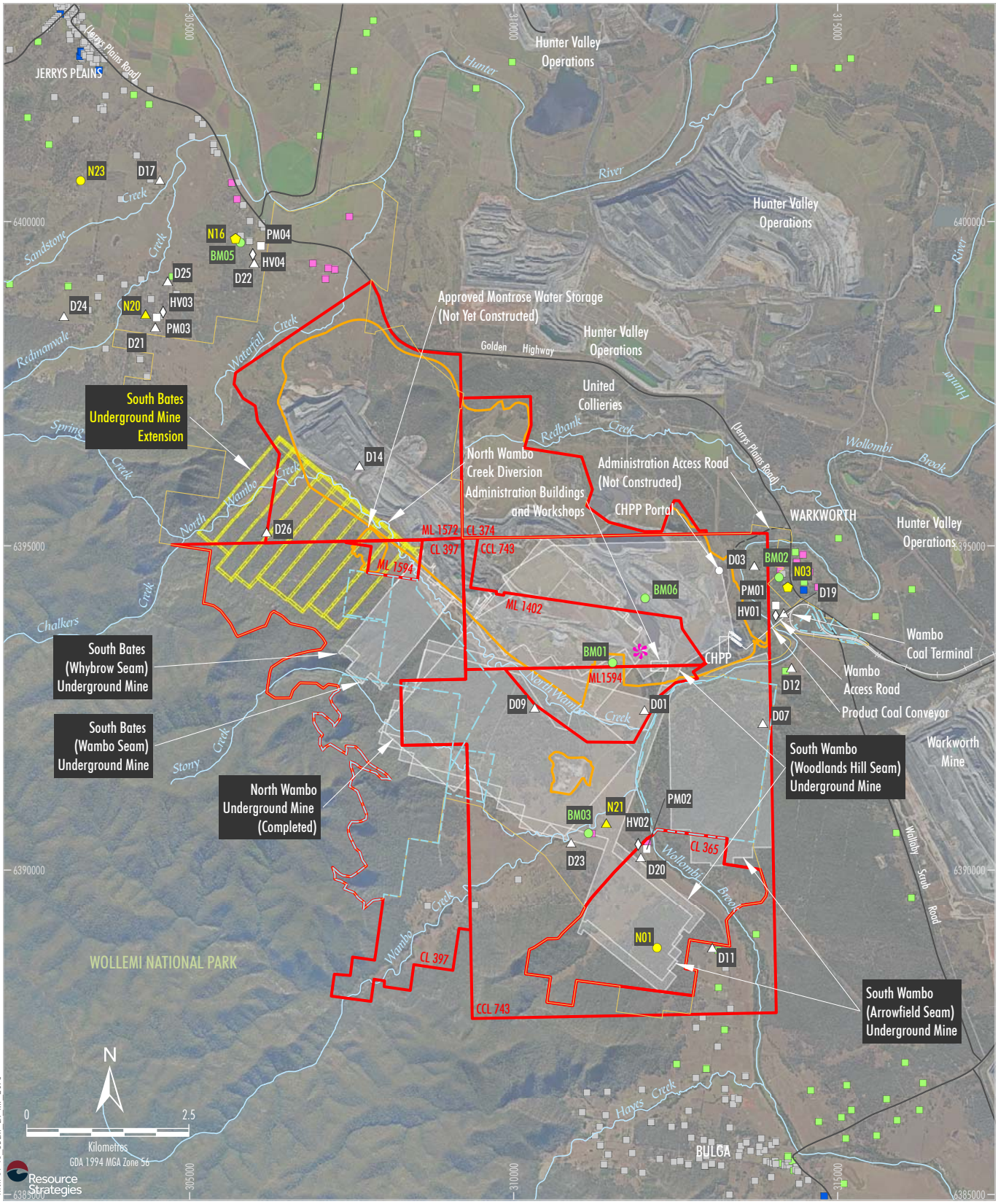
2.16 COMPLAINTS

WCPL maintains a 24 hours per day, seven days per week complaints line which is directed to the Environment and Community Manager (phone 02 6570 2245) and an email address (wambocommunity@peabody.com).

WCPL received a total of 16 complaints during the 2015 reporting period, with the majority related to blasting (69 percent [%]).The complaints received were related to noise, blasting, lighting and dust, and generally not related to the underground mining operations.

In 2016, WCPL received a total of 31 complaints, with the majority related to noise (36%) and air quality (21%), as well as lighting and blasting (i.e. generally not related to the underground mining operations).

Mine-related complaints are managed in accordance with WCPL's Community Complaints Procedure, which includes investigating each complaint, taking action if necessary and responding to the complainant.



LEGEND

- Mining and Coal Lease Boundary
- WCPL Owned Land
- Existing/Approved Surface Development Area
- Approved Underground Development
- Modified Underground Development
- Remnant Woodland Enhancement Program (RWEP) Area

Monitoring Sites

- Noise Monitoring Site (Attended and Real-time)
- Meteorological Station
- Dust Deposition Gauge
- High Volume Air Sampler
- TEOM
- Noise Monitoring Site (Attended)
- Noise Monitoring Site (Real-time)
- Blast Monitoring Site

Residences

- Wambo Owned
- Other Resource Company Owned
- Government Owned
- Private

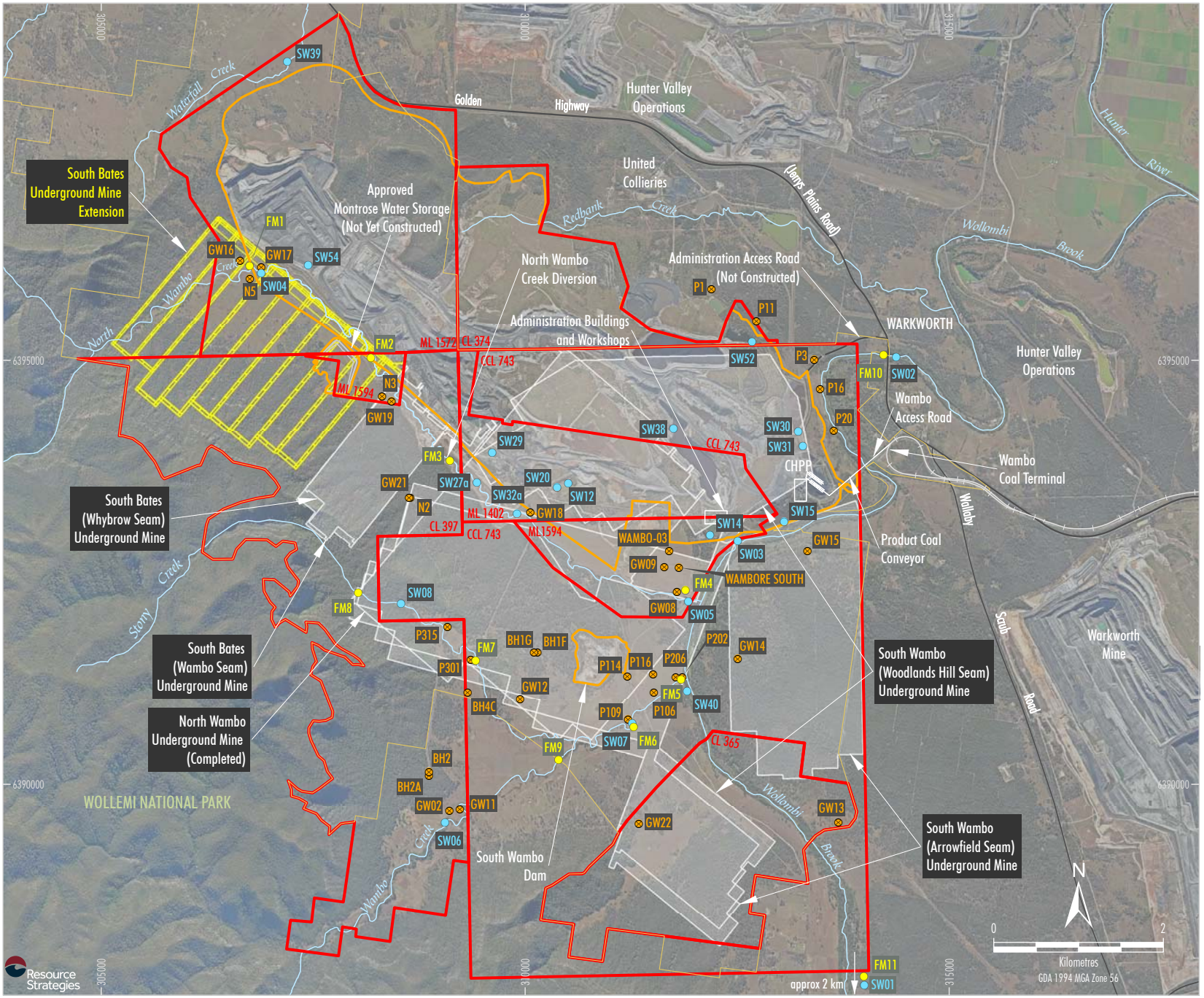
Peabody ENERGY

WAMBO COAL MINE

Locations of Air Quality, Noise and Blast Monitoring Sites

Source: Department of Lands (July 2009); WCPL (2016); WCPL Orthophoto (July 2016)

Figure 7


LEGEND
Mining and Coal Lease Boundary
WCPL Owned Land
Existing/Approved Surface Development Area
Approved Underground Development
Modified Underground Development
Groundwater Monitoring Site
Surface Water Quality Monitoring Site
Surface Water Flow Monitoring Site
Source: Department of Lands (July 2009); WCPL (2016); WCPL Orthophoto (July 2016)
South Bates Underground Mine Extension
South Bates (Whybrow Seam) Underground Mine
South Bates (Wambo Seam) Underground Mine
North Wambo Underground Mine (Completed)
South Wambo (Woodlands Hill Seam) Underground Mine
South Wambo (Arrowfield Seam) Underground Mine
Approved Montrose Water Storage (Not Yet Constructed)
North Wambo Creek Diversion
Administration Access Road (Not Constructed)
Administration Buildings and Workshops
South Wambo Dam
Golden Highway
Hunter Valley Operations
United Collieries
Lleans Plains Road
WARKWORTH
Wambo Access Road
Wambo Coal Terminal
Product Coal Conveyor
CHPP
Warkworth Mine
WOLLEMI NATIONAL PARK
Waterfall Creek
Redbank Creek
Wambo Creek
North Wambo Creek
Stony Creek
Wollombi Brook
Hunter River
Saub Road
Wallaby
ML 1572
CL 374
CCL 743
ML 1594
CL 397
ML 1402
CL 365
WAMBO-03
WAMBORE SOUTH
SW39
SW54
SW04
GW16
GW17
N5
FM1
FM2
N3
GW19
P1
P11
SW52
P3
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Resource Strategies
Peabody ENERGY
WAMBO COAL MINE
Locations of Surface Water and Groundwater Monitoring Sites
Figure 8
WAM-09-15_SBEM_EA_MT_208B

3 SOUTH BATES EXTENSION MODIFICATION

The Modification would not require any significant alteration to the approved Wambo general supporting infrastructure. A description of the Modification is provided below.

3.1 SOUTH BATES UNDERGROUND MINE

Layout of the Underground Mining Area

The proposed layout of the Modification is shown on Figure 9.

The Modification longwalls would have lengths varying between approximately 1.5 and 2.0 km and widths of approximately 250 m.

The longwalls have been designed to achieve negligible impact on the Wollemi National Park escarpment. The extent of the Modification longwalls to the south-west is set back based on a 26.5° angle of draw from the base of the mapped escarpment.

The proposed layout of the Modification is within existing WCPL mining tenements (i.e. CL 397, ML 1572 and ML 1594) and over a component of the WCPL exploration tenement A 444.

Mine Access and Development Works

Access to the proposed Modification longwalls would be via dedicated portals and main headings from the Bates South open cut pit wall. Gate roads would be driven from the main headings to the south-west to allow for the extraction of coal from the Whybrow Seam.

Longwall Mining Operations

Longwall mining operations would be undertaken consistent with operations at the approved South Bates Underground Mine. Longwall mining would commence at the south-western end of the Modification longwall panels and move towards the north-east. In order to start each new longwall panel, the longwall machine would be separated into components and re-assembled in the roadway of the next panel.

ROM coal would be conveyed to the existing stockpile area before it would be delivered by haul truck to the CHPP for processing.

Consistent with approved operations, underground mining operations would be conducted 24 hours per day, 7 days per week.

Approximately 18 Mt of additional ROM coal would be mined over a period of approximately 5 years. Production from the South Bates Underground Mine would be within the approved maximum underground mining rate of 9.75 Mtpa.

Underground Equipment and Mobile Fleet

The existing South Bates Underground Mine equipment and mobile fleet would be used for the Modification.

Ventilation System

One of the existing ventilation fans in the Bates South open cut pit would remain in-pit to service the Modification longwalls via the access portal.

The Modification would also require construction and operation of two ventilation shafts to support the operation of the Modification longwalls. These ventilation shafts would be constructed within the existing approved surface development area, with conceptual locations shown on Figure 9. Final locations of the ventilation shafts within the existing approved surface development area would be presented in the Mining Operations Plan.

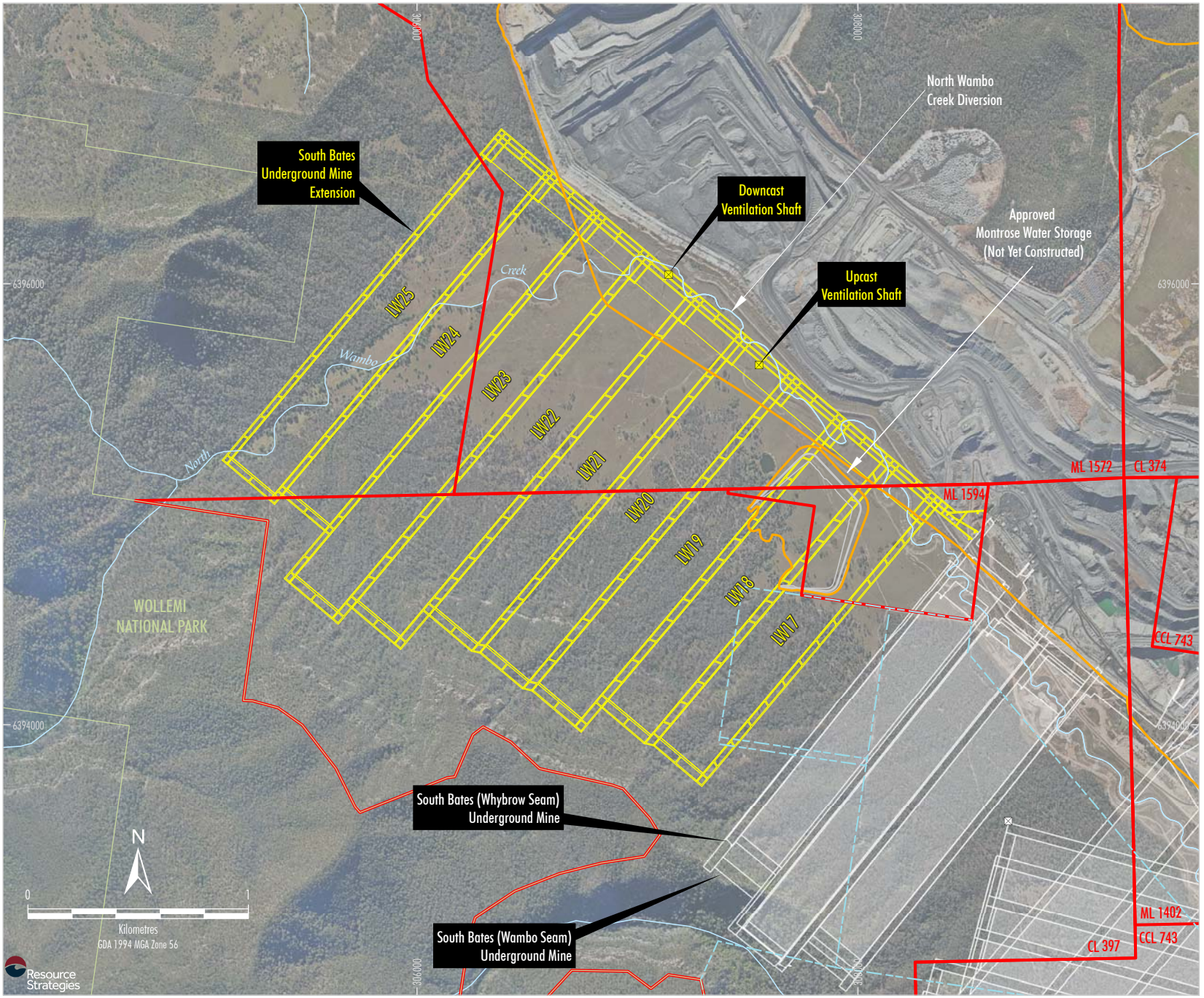
One of these ventilation shafts would be used as upcast shaft (including installation of a fan) and the other would be used as a downcast shaft (intake only with no fan) (Figure 9). The ventilation shafts would require access roads, security (e.g. fencing), electrical infrastructure, water management and flood control infrastructure and other associated ancillary infrastructure.

Mine Safety Gas Management

Gas Drainage

Surface gas drainage and underground in-seam gas drainage may be required for the Modification first workings development and longwalls to reduce the gas content in the coal seams to levels suitable for longwall operations.

Pre-mining gas drainage may be conducted by drilling vertical (i.e. surface to in-seam) boreholes in advance of mining. These vertical wells would extract gas from the coal seam directly to the surface where it would be vented to the atmosphere or flared. Conventional underground in-seam gas drainage may also be utilised.



LEGEND

- Mining and Coal Lease Boundary
- National Park Boundary
- Existing/Approved Surface Development Area
- Approved Underground Development
- Modified Underground Development
- Approved Ventilation Shaft
- Modified Ventilation Shaft
- Remnant Woodland Enhancement Program (RWEP) Area

Source: Department of Lands (July 2009); WCPL (2016); WCPL Orthophoto (July 2016)

Peabody ENERGY

WAMBO COAL MINE

Approved and Modified South Bates Underground Mine

Figure 9

WAM-09-15_SBEM_EA_MT_204F

One or two gas drainage boreholes may be developed for each gateroad either side of the longwalls in the underground mining area. Gas drainage boreholes would be developed using a conventional drill rig. Access to gas management infrastructure for maintenance and monitoring would be via temporary access tracks.

Gas drainage boreholes and associated infrastructure would be progressively constructed, operated and decommissioned.

Centralised Gas Plant

A centralised gas plant could be required for the Modification to flare gas collected through gas drainage activities. The gas plant would be constructed adjacent to the upcast ventilation shaft (Figure 9) in the existing approved surface development area.

The gas plant would consist of a fully fenced area with flares, pumps, nitrogen tanks and monitoring, water collection and surface pipes. Gas would be delivered to the centralised gas plant from the gas drainage boreholes via gas pumps and a network of underground and/or surface pipes.

An example of a typical gas plant is provided in Plate 1.

Plate 1: Typical Gas Plant

Access Tracks

General access tracks would be constructed to facilitate the maintenance and monitoring of gas management infrastructure, including any required power and/or water pipes.

Gas Management Infrastructure Siting

Given the variable gas quantities and the wide range of topography and access constraints across the underground mining area, the specific locations of gas management infrastructure would be defined as a component of future detailed mine planning and engineering studies over the life of the modified South Bates Underground Mine.

Surface disturbance for gas management infrastructure would be restricted to grassland areas that are not threatened ecological communities.

Additional ecology and heritage surveys of potential gas management infrastructure locations would be conducted. If present, any threatened flora species or populations and/or hollow bearing trees would be avoided. If any Aboriginal cultural heritage sites are identified, consideration would be given to relocating the works so as to avoid direct impacts.

The location of gas management infrastructure would be outlined in the relevant Extraction Plan and associated Mining Operations Plan.

If portions of the underground mining area were found to be unsuitable for gas management infrastructure (e.g. due to environmental constraints), mining would proceed using underground gas management techniques.

Surface disturbance associated with gas management infrastructure would be temporary and isolated in nature. The surface disturbance would occur progressively over the life of the modified South Bates Underground Mine and would be rehabilitated progressively as the gas management infrastructure is no longer required.

The potential visual amenity impacts of gas management infrastructure are assessed in Section 4.15.

Dewatering

Groundwater that accumulates in the underground workings would be pumped to the surface via underground sumps and access drifts, consistent with approved operations at the South Bates Underground Mine. Adjacent workings may also be dewatered if required for safety reasons.

3.2 OTHER APPROVED UNDERGROUND OPERATIONS

The Modification would not involve changes to any aspect of the approved (and completed) North Wambo Underground Mine or the layout of the approved South Wambo Underground Mine.

The Modification is seeking an extension to the life of the underground operations to 2039 to accommodate:

- extraction of the additional resource associated with the Modification and associated delay to the commencement of South Wambo Underground Mine; and
- integration of the operations with the United Wambo Open Cut Coal Mine Project, which would result in lower production rates from the underground operations in later years.

This extension is consistent with the operational life separately being sought by DA 305-7-2003 MOD 16 as part of the United Wambo Open Cut Coal Mine Project (application pending) (Section 2.2).

3.3 OPEN CUT OPERATIONS

The Modification would not alter the approved open cut mining methods, open cut maximum production rates, open cut mine fleet or waste rock management practices.

3.4 COAL HANDLING, PREPARATION AND PRODUCT COAL TRANSPORT

The Modification would not alter the approved coal handling, CHPP or product coal transport operations (Sections 2.7 and 2.8).

However, the Modification seeks to extend these operations to 2039. This extension is consistent with the operational life separately being sought by DA 305-7-2003 MOD 16 as part of the United Wambo Open Cut Coal Mine Project (application pending) (Section 2.2).

3.5 COAL REJECT MANAGEMENT

The Modification would result in production of approximately 3.7 Mt of coarse rejects and 2.1 Mt of tailings.

WCPL has conducted a review of the available coal reject storage at Wambo and concluded there would be sufficient storage capacity for the additional coal rejects generated by the Modification.

The Whybrow Seam is approved to be mined as part of current underground and open cut operations at Wambo, therefore no alteration of current coarse rejects or tailings management measures (Section 2.10) would be required.

3.6 INFRASTRUCTURE AND SERVICES

The existing South Bates Underground Mine support facilities (including offices, control room, crib room, other support buildings, workshop, ablution building, laydown areas and a range of service facilities), access roads and utilities (Section 2.11) would be utilised for the Modification.

Additional portal accesses would be developed from the Bates South open cut pit wall for the Modification.

Minor extensions and upgrades to existing utilities (e.g. electrical supply and communications) may be conducted for the Modification as required. Additional minor infrastructure required for the Modification may include:

- extensions/relocations of conveyor belts/drives;
- electrical infrastructure;
- communications infrastructure;
- service pipelines;
- water management/flood control infrastructure;
- ventilation and gas management infrastructure; and
- service boreholes.

3.7 WATER MANAGEMENT AND SUPPLY

The Modification would not include any material changes to the approved water management system, water supply or water demand (Section 2.12).

A site water balance of the water management system for Wambo and the United Wambo Open Cut Coal Mine Project incorporating the modified underground mining operations has been conducted by Hydro Engineering & Consulting Pty Ltd (HEC) and is presented in Appendix L. The site water balance includes a predictive assessment of the performance of the water management system (including supply and containment) for a range of different climatic scenarios.

The predicted CHPP, underground mine and dust suppression water supply reliabilities averaged 99.9%, 95.9% and 99.0% (over all modelled climatic scenarios) which indicates a very low operational risk of water supply deficit (Appendix L).

The site water balance simulation showed that there were no simulated overflows from the water management system in any of the modelled climatic scenarios. To achieve the no water management system overflow outcome, the model showed water would be stored in the open cut pits from approximately 2038 under the 90th and 95th percentile (high) rainfall sequences (Appendix L).

In accordance with Condition 25, Schedule 4 of the Development Consent (DA 305-7-2003), WCPL reviews the site water balance for Wambo annually and reports the results of this review in the Annual Review. In the event that annual water balance reviews identify the likely future requirement to transfer water to open cut pits, alternative options to storing water in the open cut pits would be considered (e.g. purchase of additional Hunter River Salinity Trading Scheme credits) to minimise the potential disruption to open cut mining operations.

Controlled releases would continue to occur from licensed discharge point/s in accordance with the conditions of an EPL.

3.8 WORKFORCE

The existing underground mine workforce would continue to be employed for the Modification and therefore the Modification would not materially result in any additional demand for employees/contractors.

3.9 REHABILITATION

The Modification would not require a material change to the rehabilitation program presented in the *Wambo Development Project Environmental Impact Statement* (WCPL, 2003) (Section 2.13).

The South Bates Underground Mine surface infrastructure with no ongoing beneficial use would be removed from site at the completion of mining. Following decommissioning, these areas would be rehabilitated consistent with the existing principles at Wambo.

The underground mining area would be remediated if visual monitoring identifies any areas subject to excessive erosion and sedimentation as a result of subsidence.

The following mitigation measures would be implemented if required:

- filling of cracks and minor erosion holes, where practicable;
- installation of sediment fences downslope of subsidence-induced erosion areas;
- stabilisation of erosion areas using rock or other appropriate materials;
- stabilisation of banks subject to soil slumping; and
- revegetation using brush matting, seeding or tubestock.

4 ENVIRONMENTAL ASSESSMENT

The Modification would involve extraction of nine additional longwall panels in the Whybrow Seam (referred to as the Modification longwalls).

The "Modification area" is the extent of predicted measurable vertical subsidence from the Modification longwalls (Figure 10) and the additional surface development areas.

4.1 IDENTIFICATION OF KEY ISSUES

The following approved components of Wambo would be unchanged by the Modification (Section 3):

- ROM coal production rate;
- open cut operations;
- coal handling, CHPP and product coal transport operations; and
- major surface infrastructure.

In addition, the Modification would not materially result in any additional demand for employees/contractors.

Therefore, there would be no material alteration to the approved impacts of Wambo on the following aspects:

- open cut blasting;
- road or rail transport network; and
- population and community infrastructure demand.

As a component of the environmental assessment of the Modification, an Environmental Risk Assessment was undertaken to identify key potential environmental issues requiring further assessment.

The key environmental issues identified in the Environmental Risk Assessment (Appendix M) are summarised in Table 2 and addressed in Sections 4.2 to 4.15 and the relevant appendices in the EA.

All of the potential issues identified were ranked within the 'Medium – As Low as Reasonably Practicable' or 'Low' range. The Environmental Risk Assessment is provided in full as Appendix M.

4.2 SUBSIDENCE

4.2.1 Background

Subsidence is the vertical and horizontal movement of the overburden and land surface as a result of the extraction of underlying coal. These land surface movements are generically referred to as subsidence effects. The type and magnitude of the subsidence effects is dependent on a range of variables (e.g. mine geometry, topography and geology).

The different types of subsidence effects include systematic subsidence movements, non-systematic subsidence movements and sub-surface strata movements.

Extraction Plan

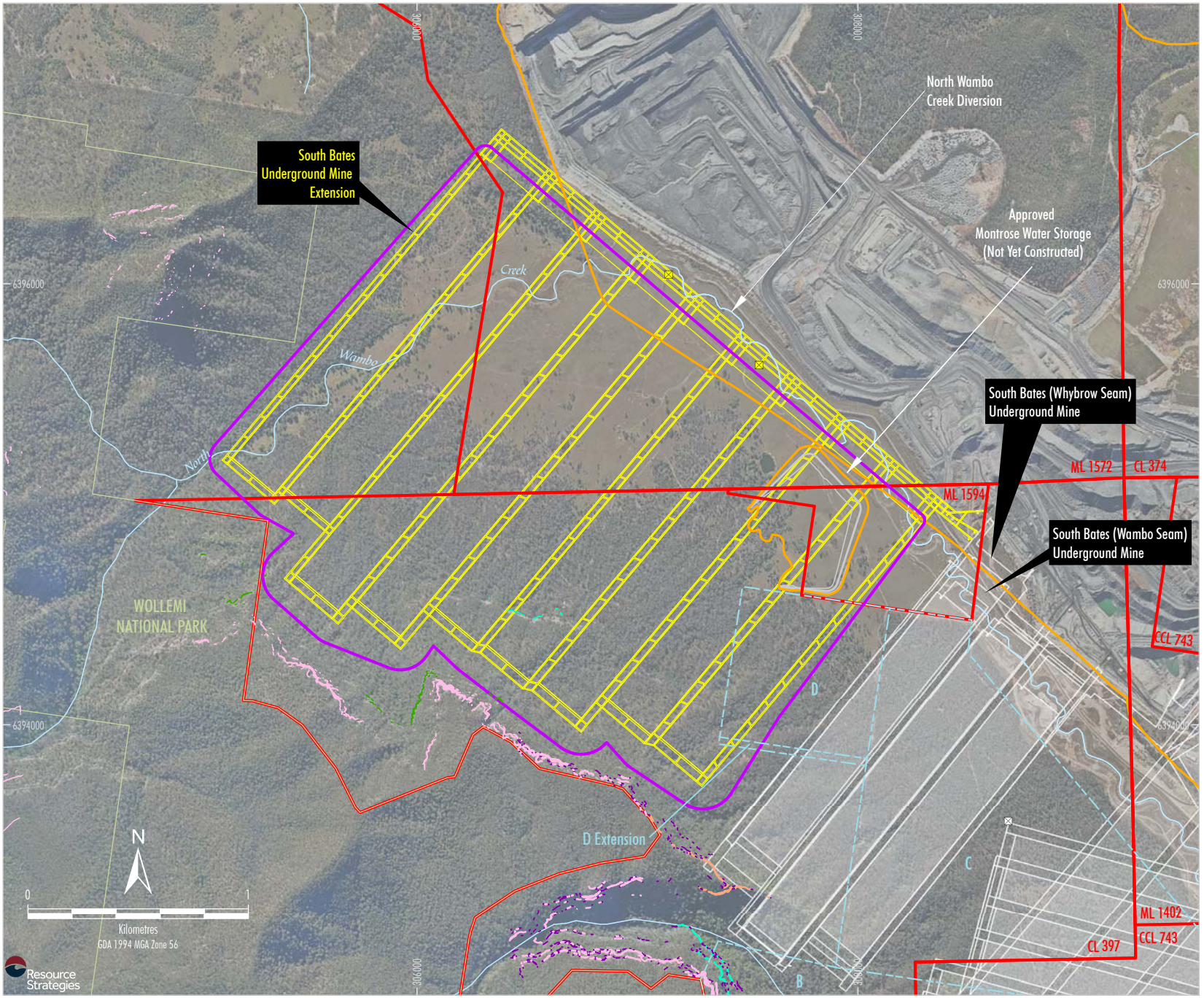
Condition 22C, Schedule 4 of the Development Consent (DA 305-7-2003) requires WCPL to prepare an Extraction Plan for second workings prior to extraction.

4.2.2 Prediction of Subsidence Effects

A Subsidence Assessment for the Modification has been prepared by Mine Subsidence Engineering Consultants Pty Ltd (MSEC) (2017) and is presented in Appendix A. The Subsidence Assessment:

- identifies the natural and built features located above and in the vicinity of the Modification area;
- provides subsidence predictions for the proposed Modification longwalls in the Whybrow Seam and the approved longwalls in the Whybrow and Wambo Seams at the South Bates Underground Mine;
- compares the subsidence predictions with the approved mine layout at the South Bates Underground Mine; and
- assesses the likely subsidence impacts on natural and built features in consideration of the predicted subsidence effects.

A summary of the key findings of the Subsidence Assessment is provided below.



LEGEND

- Mining and Coal Lease Boundary
- National Park Boundary
- Existing/Approved Surface Development Area
- Approved Underground Development
- Modified Underground Development
- Extent of Conventional Subsidence from the Modification Longwalls
- Approved Ventilation Shaft
- Modified Ventilation Shaft
- Remnant Woodland Enhancement Program (RWEP) Area

Cliffs

- Associated with Wollemi National Park Escarpment
- Intermediate Level Cliffs
- Lower Level Cliffs
- Spur
- Minor Cliffs

Source: Department of Lands (July 2009); WCPL (2016); WCPL Orthophoto (July 2016); MSEC (2015, 2016)

Peabody ENERGY

WAMBO COAL MINE

Cliffs in the Vicinity of the Modification Area

Figure 10

WAM-09-15_SBEM_EA_MT_205G

Table 2
Summary of Key Potential Environmental Issues

Environmental Issue Subject Area	Description of Potential Issues	EA Section/Appendix
Groundwater	• Potential for failure of the monitoring program to detect and respond to impacts on the groundwater system.	Section 4.4 and Appendix B
Surface Water	• Potential for North Wambo Creek Diversion to be damaged by subsidence resulting in reduced flow affecting downstream water quality. • Potential for induced leakage from North Wambo Creek Diversion due to subsidence. • Potential for a change in flood regimes or extent of potential inundation due to subsidence. • Potential for subsidence impacts and environmental consequences on North Wambo Creek and the North Wambo Creek Diversion.	Section 4.5 and Appendix C
Biodiversity	• Potential for subsidence impacts and surface disturbance resulting in loss of habitat for threatened species. • Potential for creation of subsidence monitoring tracks to affect the conservation values of RWEP areas. • Potential for subsidence impacts on RWEP areas resulting in a reduction of biodiversity values. • Potential for subsidence impacts on vegetation along the North Wambo Creek Diversion.	Sections 4.8 and 4.9 and Appendices D and E
Aboriginal Cultural Heritage	• Potential for mine subsidence impacts on items of Aboriginal heritage.	Section 4.6 and Appendix F
Agriculture	• Potential for subsidence impacts resulting in injury to livestock. • Potential for incremental ponding of agricultural land.	Sections 4.3 and 4.5 and Appendices C and H
Land	• Potential for unintended subsidence impacts resulting in rock instability of the Wollemi National Park escarpment and associated environmental consequences.	Section 4.2 and Appendix A
Noise	• Cumulative noise impacts associated with the United Wambo Open Cut Coal Mine Project.	Section 4.10 and Appendix I
Air Quality	• Cumulative air quality impacts associated with the United Wambo Open Cut Coal Mine Project. • Potential for subsidence impacts on open cut mining operations resulting in increased wind erosion potential.	Section 4.11 and Appendix J

Source: After Appendix M.

Prediction Methodology

MSEC (2017) has assessed the predicted subsidence effects associated with the Modification.

The Modification longwalls are located in an area that has not previously been mined, and therefore represents single-seam mining conditions.

Predictions of systematic subsidence parameters for the Modification were made using the Incremental Profile Method, which consists of subsidence prediction curves based on monitoring data from mines extracting coal from the Southern, Newcastle, Hunter and Western Coalfields of NSW (Appendix A).

The Incremental Profile Method has a tendency to over-predict the systematic subsidence parameters where the proposed mining geometry and geology are within the range of the empirical database (i.e. the method is based on upper bound curves and is generally conservative) (Appendix A).

A detailed description of the numerical methodologies used to predict subsidence effects associated with the modified mine layout is provided in Appendix A.

Predicted Subsidence Effects

Subsidence effects are the deformation of the ground mass due to underground mining, including all mining-induced ground movements.

Systematic Subsidence Effects

Systematic subsidence movements are described by the following parameters: subsidence, tilt, curvature, and associated strains (tensile and compressive strains).

Table 3 presents a comparison of the predicted cumulative subsidence effects from the approved mine layout at the South Bates Underground Mine and the Modification longwalls.

The maximum predicted total vertical subsidence for the Modification longwalls is 1,950 millimetres (mm). In comparison, the maximum predicted vertical subsidence at the adjacent approved South Bates Underground Mine is 4,150 mm.

Tensile and Compressive Strains

In the Hunter Coalfield, it has been found that a factor of 10 provides a reasonable relationship between the predicted maximum curvatures and the predicted maximum conventional strains for single-seam conditions (Appendix A). In addition, there is an extensive monitoring data set of strains above longwalls with similar geometries.

The depths of cover near the longwall commencing (i.e. south-western) ends typically vary between 200 and 330 m. The 95% confidence levels for the maximum strains that may be experienced above the commencing ends of the Modification longwalls are 5 mm/m tensile and 4 mm/m compressive (Appendix A).

The depths of cover near the longwall finishing (i.e. north-eastern) ends typically vary between 50 and 100 m. The 95% confidence levels for the maximum strains that may be experienced above the finishing ends of the Modification longwalls are 12 mm/m tensile and 17 mm/m compressive (Appendix A).

Further discussion on predicted strains is provided in Appendix A.

Subsurface Subsidence Effects

The caving and subsidence development process above a longwall panel usually results in subsurface fracturing and shearing of sedimentary strata in the overburden. The extent of fracturing and shearing depends on mining geometry and overburden geometry.

The overburden generally comprises a zone of continuous subsurface fracturing and a zone of discontinuous subsurface fracturing.

Within the continuous subsurface fracturing zone, cracking is likely to result in a direct hydraulic connection to the workings, if a subsurface (or shallow surface) aquifer is intersected. Discontinuous subsurface fracturing does not usually provide a direct flow path or connection to the mine workings, but may interact with surface cracks, joints or faults.

The depth of cover above the Whybrow Seam varies between a minimum of 50 m and a maximum of 330 m above the Modification longwalls.

Table 3
Comparison of Predicted Subsidence Effects for the Approved and Modified South Bates Underground Mine

Layout	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Hogging Curvature (km^{-1})	Maximum Predicted Sagging Curvature (km^{-1})
Approved South Bates Underground Mine (Whybrow and Wambo Seams)	4,150	100	> 3.0	> 3.0
Modification Longwalls (Whybrow Seam)	1,950	90	> 3.0	> 3.0

Source: Appendix A.
mm = millimetre.
mm/m = millimetre per metre.
km^{-1} = per kilometre.

Continuous subsurface fracturing may extend to the surface in some areas with low depths of cover above the Modification longwalls. No evidence of continuous subsurface fracturing was observed at the North Wambo Underground Mine, which extracted eight longwalls directly beneath the North Wambo Creek alluvium at depths of cover as low as approximately 75 m.

Changes in bulk rock mass permeability and storage capacity as a result of subsurface fracturing have been modelled as part of the Groundwater Assessment (Section 4.4. and Appendix B).

Non-Systematic Subsidence Effects

Non-systematic subsidence movements include far-field horizontal movements, irregular subsidence movements and valley related movements (Appendix A). Appendix A provides a detailed description of potential non-systematic subsidence predictions.

The potential subsidence impacts to surface features which are sensitive to non-systematic movements have been identified and included in assessments made in the Subsidence Assessment (Appendix A).

4.2.3 Subsidence Impacts

Subsidence impacts are the physical changes to the ground and its surface caused by the subsidence effects described above in Section 4.2.2. Potential subsidence impacts associated with the Modification include:

- surface cracking;
- changes in stream bed gradients;
- ponding and changes in stream alignment;
- slope instability, erosion and rock fall; and
- depressurisation of groundwater aquifers.

The type and magnitude of predicted subsidence effects for the Modification longwalls are generally similar to or less than those of the adjacent approved and operating South Bates Underground Mine.

It is therefore expected that the potential subsidence impacts above the Modification longwalls would be similar to those observed and managed to date at the South Bates Underground Mine.

The Subsidence Assessment (Appendix A) includes detailed subsidence predictions and assessment for key natural and built features across the Modification area. Potential environmental consequences of subsidence on key natural and built features are summarised in Section 4.2.4.

4.2.4 Potential Environmental Consequences on Key Natural and Built Features

The Modification longwalls have been designed to be consistent with the subsidence impact performance measures in the existing Development Consent (DA 305-7-2003) (Table 4).

A summary of the potential environmental consequences of the potential subsidence impacts within the Modification area is provided below, including cross-references to sub-sections with further detail.

Streams

Wollombi Brook

Wollombi Brook is located more than 4 km from the Modification longwalls and would not be affected by subsidence associated with the Modification.

North Wambo Creek

North Wambo Creek has been previously affected by subsidence from the North Wambo Underground Mine downstream of the Modification area.

In addition, North Wambo Creek has been diverted (i.e. redesigned) around the approved Wambo open cut operations and replaced with a constructed channel (the North Wambo Creek Diversion).

A portion of North Wambo Creek upstream of the North Wambo Creek Diversion would be affected by subsidence from the Modification longwalls.

Subsidence impacts on North Wambo Creek include changes in grade and surface cracking.

Potential subsidence impacts and environmental consequences on North Wambo Creek are described in Section 4.5 and Appendix C.

Table 4
Subsidence Impact Performance Measures

Feature	Subsidence Impact Performance Measure
Wollombi Brook	Negligible subsidence impacts. Negligible environmental consequences. Controlled release of excess site water only in accordance with Environmental Protection Licence (EPL) requirements.
Wollemi National Park	Negligible subsidence impacts. Negligible environmental consequences.
Warkworth Sands Woodland Community	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.
White Box - Yellow Box - Blakely's Red Gum Woodland/Grassy White Box Woodland Community	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.
Other threatened species, populations or communities	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.
Wambo Homestead Complex	Negligible impact on heritage values, unless approval has been granted by the Heritage Division and/or the Minister.
All built features	Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.
Public safety	No additional risk.

Source: Conditions 22 and 22A, Schedule 4, Wambo Development Consent DA 305-7-2003.

North Wambo Creek Diversion

The North Wambo Creek Diversion has been directly undermined by longwalls in the Whybrow Seam at the approved South Bates Underground Mine. The Diversion is approved for further subsidence as part of extraction in the Wambo Seam at the approved South Bates Underground Mine.

An additional 120 m of the North Wambo Creek Diversion would be directly undermined by the Modification longwalls.

Potential subsidence impacts and environmental consequences on the North Wambo Creek Diversion are described in Section 4.5 and Appendix C.

Alluvial Aquifers

Alluvium associated with North Wambo Creek is located above the Modification longwalls. The potential impacts of the Modification on alluvium are discussed in Section 4.4 and Appendix B.

Cliffs and Rock Features

Cliffs, minor cliffs and rock outcrops have formed in the Modification area and surrounds from the Widden Brook Conglomerate of the Narrabeen Group (Appendix A). Cliffs and minor cliffs in the Modification area were identified by MSEC (Appendix A) as shown on Figure 10 using Light Detection and Ranging (LiDAR) survey data and detailed site investigations.

Cliffs were defined as a continuous rock face, including overhangs, having a minimum length of 20 m, a minimum height of 10 m and a minimum slope of 2 to 1. Minor cliffs were defined as continuous rock faces, including overhangs, having a minimum length of 20 m, heights between 5 m and 10 m and a minimum slope of 2 to 1; or a rock face having a maximum length of 20 m and a minimum height of 10 m.

Cliffs Associated with the Wollemi Escarpment

Cliffs associated with the Wollemi National Park escarpment are the higher level cliffs located along the boundary of the Wollemi National Park.

These cliffs are located outside of the 26.5° angle of draw associated with the Modification longwalls. MSEC (Appendix A) concludes these cliffs are not predicted to experience any significant conventional tilts, curvatures or strains. While these cliffs associated with the Wollemi National Park escarpment could experience low level far-field horizontal movements, it is unlikely that the cliffs would be adversely impacted (Appendix A).

This is supported by experience at Wambo of mining at similar distances from the Wollemi National Park escarpment at the South Bates Underground Mine and Homestead Underground Mine.

Intermediate Level Cliffs

Intermediate level cliffs are located part way down the steep slopes beneath the Wollemi National Park escarpment to the south-west of the proposed longwalls (Figure 10). The intermediate level cliffs have heights varying between 10 and 20 m and continuous lengths up to approximately 50 m.

The Intermediate level cliffs are predicted to experience up to 30 mm vertical subsidence, but no measurable tilts, curvatures or strains (Appendix A). While these cliffs could experience low level far-field horizontal movements, it is unlikely that the cliffs would be adversely impacted (Appendix A).

Lower Level Cliffs

The larger lower level cliffs are located above the proposed Longwall 20 and Longwall 21 and are shown on Figure 10. These cliffs are discontinuous and are separated with sections of minor cliffs and rock outcrops with a total length of approximately 150 m (Appendix A).

MSEC (Appendix A) estimates that a length of disturbance of approximately 15 m, or a face area of disturbance of approximately 100 square metres of the lower level cliffs may be impacted by subsidence. This represents a very small percentage (i.e. less than 1%) of the total length and face area of the cliffs in the immediate vicinity of the Modification area (Appendix A), and even less in a regional context.

Rock Features

Isolated pagodas have been identified in the vicinity of the Wollemi National Park escarpment, with none identified directly above the Modification longwalls (Appendix A). MSEC (Appendix A) considers it is unlikely the isolated pagodas would be adversely impacted by the Modification.

Steep Slopes

Steep slopes (where the natural gradient is between 1 in 3 and 2 in 1) occur in the Modification area beneath the Wollemi National Park escarpment (Appendix A).

The maximum predicted total tilt for these steep slopes of 30 mm/m (i.e. 1 in 33) is small when compared to the natural surface grades, which are greater than 1 in 3 (Appendix A). Therefore, MSEC (Appendix A) concludes it is unlikely that mining induced tilts would result in any adverse impact on the stability of these steep slopes.

Potential impacts on steep slopes would generally result from the downslope movement of the ground, resulting in tension cracks appearing at the tops of the steep slopes and compression ridges forming at the bottoms of the steep slopes. Remediation of surface cracking is described in Section 4.3.2.

Wollemi National Park

The Wollemi National Park is located approximately 120 m from the Modification longwalls at the closest point (Figure 10). The Modification was designed to maintain WCPL's commitment to maintain an offset equivalent to a 26.5° angle of draw from the base of the Wollemi National Park escarpment, which effectively mitigates subsidence risk to the escarpment.

Land within the National Park is predicted to experience less than 20 mm vertical subsidence and no measureable tilts, curvatures or strains. The magnitude of the predicted vertical subsidence is similar to the natural movements that occur due to the wetting and drying of the surface soils (Appendix A).

It is therefore considered unlikely the Wollemi National Park would be adversely impacted by subsidence movements (Appendix A).

Land Use and Land Resources

Potential consequences on land use and land resources as a result of subsidence impacts are described in Section 4.3.

Aboriginal Cultural Heritage

A number of Aboriginal cultural heritage sites, including artefact scatters and isolated finds, scarred trees and rock shelters have been identified in the vicinity of the Modification area. Potential consequences on Aboriginal cultural heritage sites as a result of subsidence impacts are described in Section 4.6 and Appendix F.

Non-Aboriginal Cultural Heritage

Potential consequences on non-Aboriginal heritage as a result of subsidence impacts are discussed in Section 4.7.

Threatened Ecological Communities

Potential consequences on threatened ecological communities as a result of subsidence impacts are discussed in Section 4.8 and Appendix D.

Infrastructure and Improvements

The potential impacts of subsidence effects on infrastructure and improvements are assessed in Appendix A. Infrastructure and improvements located within the Modification area and immediate vicinity include:

- unsealed roads and tracks across and adjacent to WCPL-owned land;
- WCPL-owned houses and associated rural building structures;
- fences and farm dams used for grazing on WCPL-owned land;
- Wambo open cut mining and emplacement areas (outside the extent of conventional subsidence);
- WCPL groundwater monitoring bores;
- WCPL-owned exploration boreholes; and
- survey control marks.

The Subsidence Assessment (Appendix A) indicates that the predicted levels of impact on infrastructure and improvements can be managed through the preparation and implementation of the appropriate management strategies, as part of the Extraction Plan process, to maintain items in a safe and serviceable condition.

The site of the approved, but not yet constructed, Montrose Water Storage Dam is also located within the Modification area. Construction of the Montrose Water Storage Dam would not commence until following extraction of the Modification longwalls.

Public Safety

Surface cracking, erosion and ponding have the potential to pose a safety hazard.

The Modification area is WCPL-owned. Potential safety issues resulting from the extraction of the Modification longwalls could include:

- potential safety hazards for users of existing unsealed roads and tracks in active subsidence areas; and
- potential safety hazards to agistees accessing active subsidence areas to manage stock.

WCPL would develop management strategies to mitigate any such risks so that there would be no additional risk to public safety as part of the Extraction Plan process.

4.2.5 Mitigation Measures, Management and Monitoring

An Extraction Plan would be prepared prior to the commencement of second workings for the Modification longwalls to:

- demonstrate that the subsidence impact performance measures can be achieved; and
- develop detailed mitigation measures and monitoring to manage the potential impacts and/or environmental consequences on natural and built features.

Mitigation measures and management for potential consequences on land resources, groundwater, surface water, Aboriginal and non-Aboriginal cultural heritage, flora and fauna are described in Sections 4.3 to 4.9.

The mitigation measures and monitoring in the Extraction Plan is anticipated to be similar to the measures implemented at the existing approved South Bates Underground Mine, with the implementation of any improvements identified through WCPL's adaptive management approach.

Public Safety

The Extraction Plan that would be developed for the Modification would include a Public Safety Management Plan as required under Condition 22C(g), Schedule 4 of the Development Consent (DA 305-7-2003).

The existing Public Safety Management Plans for the approved South Bates Underground Mine include measures to maintain public safety (e.g. signage and regular monitoring and remediation of surface cracking).

4.3 LAND RESOURCES AND AGRICULTURAL PRODUCTION

An Agricultural Impact Statement for the Modification was undertaken (WCPL, 2017) and is presented in Appendix H. An Agricultural Resource Assessment prepared by Soil Management Designs (2016) is included as Attachment 1 to Appendix H. The Agricultural Resource Assessment was informed by soil surveys that included 20 soil inspection pits in the Modification area.

4.3.1 Existing Environment

Landforms and Topography

Local topography in the Upper Hunter Valley region is characterised by gently sloping floodplains associated with the Hunter River and the undulating foothills, ridges and escarpments of the Mount Royal Range and Great Dividing Range. To the west of Wambo is steeper land with elevations up to approximately 650 m Australian Height Datum (AHD) within the Wollemi National Park.

The main topographic features of the Modification area are the alluvial flats and terraces associated with North Wambo Creek (Soil Management Designs, 2016).

Elevations in the Modification area range from approximately 100 m AHD near the North Wambo Creek Diversion in the north-east to approximately 320 m AHD in the south-east.

Land Use

Land use in the vicinity of Wambo includes a combination of coal mining operations, RWEP areas, agricultural land use and WCPL-owned lands that are not subject to mining operations, utilised for the agistment of beef cattle.

The Modification area is located on WCPL-owned land. Land uses include coal mining operations, RWEP Area D, other remnant vegetation and agriculture (beef cattle). The North Wambo Creek Diversion is also located across a portion of the Modification area.

Soils

Regional soil landscapes (Kovac and Lawrie, 1991) mapped in the vicinity of the Modification area include Benjang Solodic, Jerrys Plains Soloths, Ogilvie Shallow, Wollombi Alluvial and Branxton Yellow Podzolic soil landscapes (Appendix H).

Soil landscape units associated with the soil inspection pits from the soil surveys undertaken by Soil Management Designs (2016) included:

- Wollombi Alluvial Soils: dominated by Stratic Rudosols.
- Bulga Soloths: dominated by Sodosols.
- Lees Pinch Shallow Soils: co-dominated by Sodosol, Chromosol and Kandosol.

Soil Condition

A broad range of soil physical and chemical constraints for agricultural land use were identified across the Modification area, including (Appendix H):

- waterlogging in subsoil;
- dispersive subsoil;
- compaction in subsoil;
- acidic topsoil and subsoil;
- subsoil salinity in some areas;
- poor water holding capacity in shallow/stony soils;
- nutrient deficiencies, particularly phosphorus; and
- poor organic content in deeper soil layers.

The alluvial soil in the Modification area had much better physical conditions for plant growth (higher water holding capacity, minimal waterlogging, soft when dry) than the non-alluvial areas, but there was a lack of sulphur, phosphorus and nitrogen in the alluvial soils (Appendix H).

Land and Soil Capability

The Land and Soil Capability system (OEH, 2012) is used to give an indication of the land management practices that can be applied to a parcel of agricultural land.

Agricultural land is classified by evaluating biophysical features of the land and soil including landform position, slope gradient, drainage, climate, soil type and soil characteristics to derive detailed rating tables for a range of land and soil hazards (OEH, 2012).

The regional Land and Soil Capability mapping prepared by the OEH (2012) maps the majority of the Modification area as Class 4 and a small portion of Class 7 in the south near the escarpment.

Class 4 land is moderate capability land with limitations for high impact land uses such as cropping, high intensity grazing and horticulture. Class 7 land has very low capability and is generally incapable of agricultural land use.

Agricultural Activities and Productivity

The main agricultural activities in the Upper Hunter region include dairy and beef cattle and pasture production, horse breeding, viticulture and wine making (NSW Government, 2012a).

Agricultural enterprises known to have been conducted in the Modification area include cattle grazing for beef production on rain-fed pastures. The majority of the Modification area is unimproved pastures or low productivity improved pasture, with some medium productivity pastures in the vicinity of North Wambo Creek (Appendix H).

Strategic Agricultural Land

The *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) includes mapping of lands identified as Biophysical Strategic Agricultural Land (BSAL).

The closest mapped BSAL in the Mining SEPP is associated with the Hunter River and is located approximately 2 km to north of the Modification area (Figure 11).

The Modification area is not located within any mapped Viticulture Critical Industry Clusters.

Soil surveys of the Modification area outside existing mining tenements were undertaken in August 2016 to assess the land against the *Interim Protocol for site verification and mapping of biophysical strategic agricultural land* (NSW Government, 2013).

A site verification certificate issued on 23 November 2016 verified the Modification area outside existing mining tenements is not within BSAL.

4.3.2 Potential Impacts

Potential impacts of the Modification on soils would primarily relate to:

- loss of productive agricultural land due to additional minor surface development in the Modification area; and
- subsidence-related impacts.

It is considered that the Modification would not have any significant adverse impacts on the Viticulture Critical Industry Cluster as it is well outside the predicted extent of conventional subsidence.

Surface Development

The proposed ventilation infrastructure, including ancillary infrastructure for the Modification would be located within the approved surface development area and therefore would result in no additional impacts on agricultural resources beyond the approved operations.

The Modification would result in additional minor surface development (approximately 2 ha) to allow for the construction of gas drainage infrastructure and other ancillary infrastructure. Surface development would be restricted to grassland areas.

Additional surface development for gas drainage infrastructure and other ancillary infrastructure would occur progressively. The locations of gas drainage infrastructure are flexible and would be located in order to minimise potential impacts on agricultural productivity (e.g. by avoiding stock fences and dams where practicable). Any surface development associated with gas drainage infrastructure would be progressively rehabilitated.

WCPL-owned lands that adjoin the Modification area would continue to be used for agricultural uses (e.g. via agistment of stock, leasing or agreements with previous landholders).

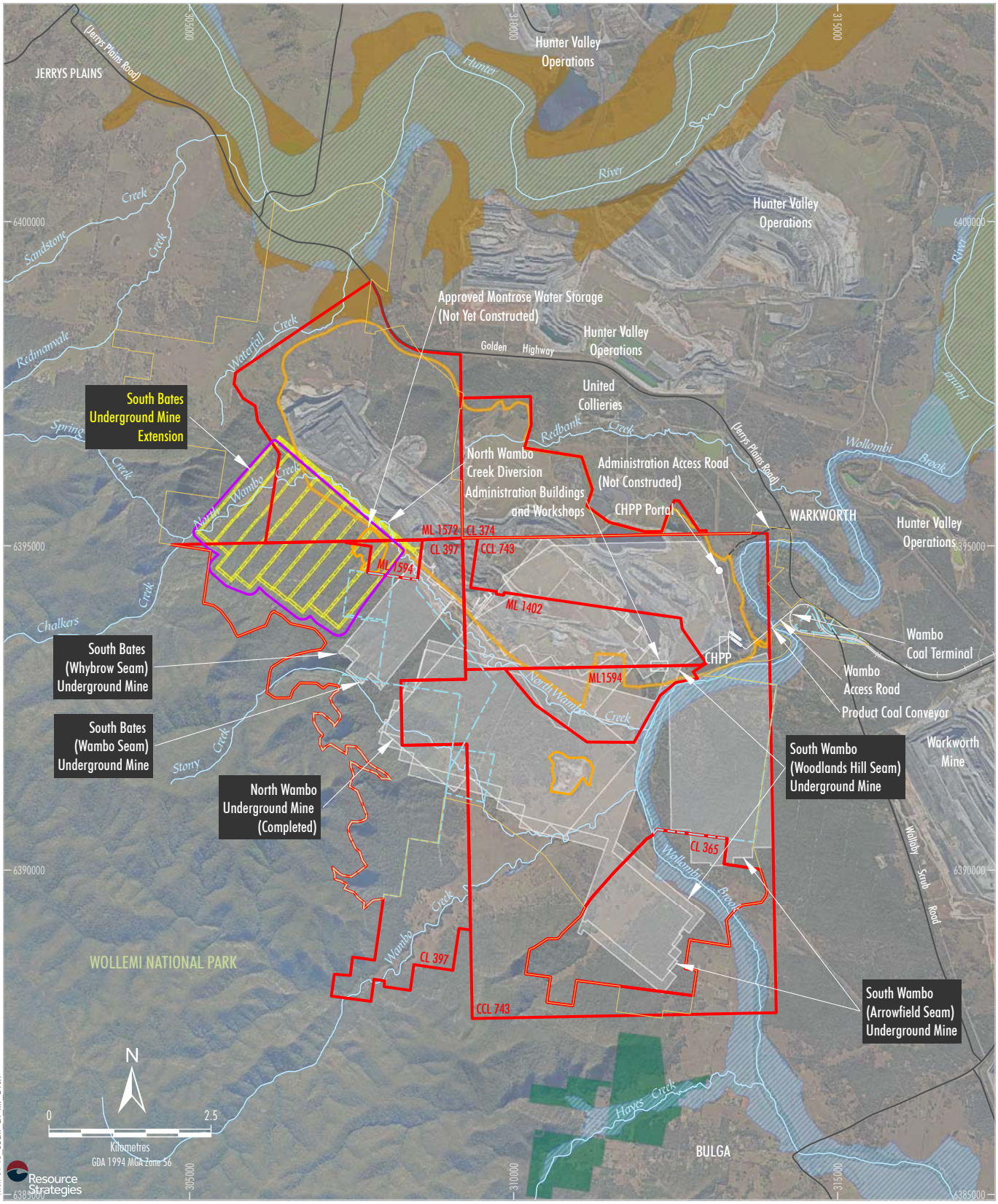
Subsidence-Related Impacts

Potential impacts on soils and agricultural activities would be associated with the following potential subsidence impacts:

- impacts on the integrity of agricultural infrastructure (e.g. fences and dams);
- surface cracking;
- slope instability;
- ponding and changes in stream alignment; and
- ponding in poorly drained areas.

It is noted that Frazier *et al*. (2010) found no significant effect of longwall mining subsidence on agricultural production, including cattle grazing, in the Hunter Valley region.

Subsidence impacts on soils and agricultural activities would be monitored during mining and progressively remediated.



LEGEND

- Mining and Coal Lease Boundary
- WCPL Owned Land
- Existing/Approved Surface Development Area
- Approved Underground Development
- Modified Underground Development
- Extent of Conventional Subsidence from the Modification Longwalls
- Remnant Woodland Enhancement Program (RWEP) Area
- Highly Productive Groundwater
- Biophysical SAL
- Viticulture Critical Industry Cluster SAL

Peabody ENERGY

WAMBO COAL MINE

Strategic Agricultural Land in the Vicinity of Wambo

Source: DP&I (January 2014); Department of Lands (July 2009); WCPL (2016); WCPL Orthophoto (July 2016)

Figure 11

Given the above, there is a low potential for material impact to agricultural productivity in the Modification area.

Potential impacts on the biodiversity values of vegetation in the Modification area are discussed in Sections 4.8 and 4.9.

4.3.3 Mitigation Measures, Management and Monitoring

Agricultural land resource management would include the following key components:

- minimisation of disturbance to agricultural lands, where practicable;
- continued use of adjoining WCPL-owned land for agricultural uses, where practicable;
- management of soil resources so they can be used for rehabilitation; and
- inclusion of agricultural lands in the Wambo rehabilitation strategy.

The management of potential subsidence impacts on agricultural activities would be managed in accordance with an approved Land Management Plan as part of the Extraction Plan process. The Land Management Plan would include measures such as:

- notification to agistees of areas of longwall mining and active subsidence;
- exclusion of agistment grazing from areas where surface cracking presents a reasonable risk to people and/or livestock;
- remediation of surface cracks[2] where practicable using conventional earthmoving equipment;
- stabilisation of any areas of surface fissuring using erosion protection measures;
- drainage works and rehabilitation of subsidence troughs (i.e. areas of induced ponding) as necessary (discussed further in Section 4.5.3);
- monitoring and repair of fences prior to allowing access for agistment grazing;
- remediation of farm dams where it presents a risk to people, livestock and/or the environment; and
- management measures in accordance with the Erosion and Sediment Control Plan.

[2] Minor cracks that develop are not expected to require remediation as geomorphologic processes will result in the natural filling of these cracks over time.

The Modification area would be rehabilitated as per the rehabilitation of existing underground mining rehabilitation areas at Wambo discussed in Section 2.14 and the Mining Operations Plan.

4.4 GROUNDWATER

A Groundwater Assessment for the Modification was undertaken by HydroSimulations (2017) and is presented in Appendix B.

4.4.1 Existing Environment

Hydrogeological Regime

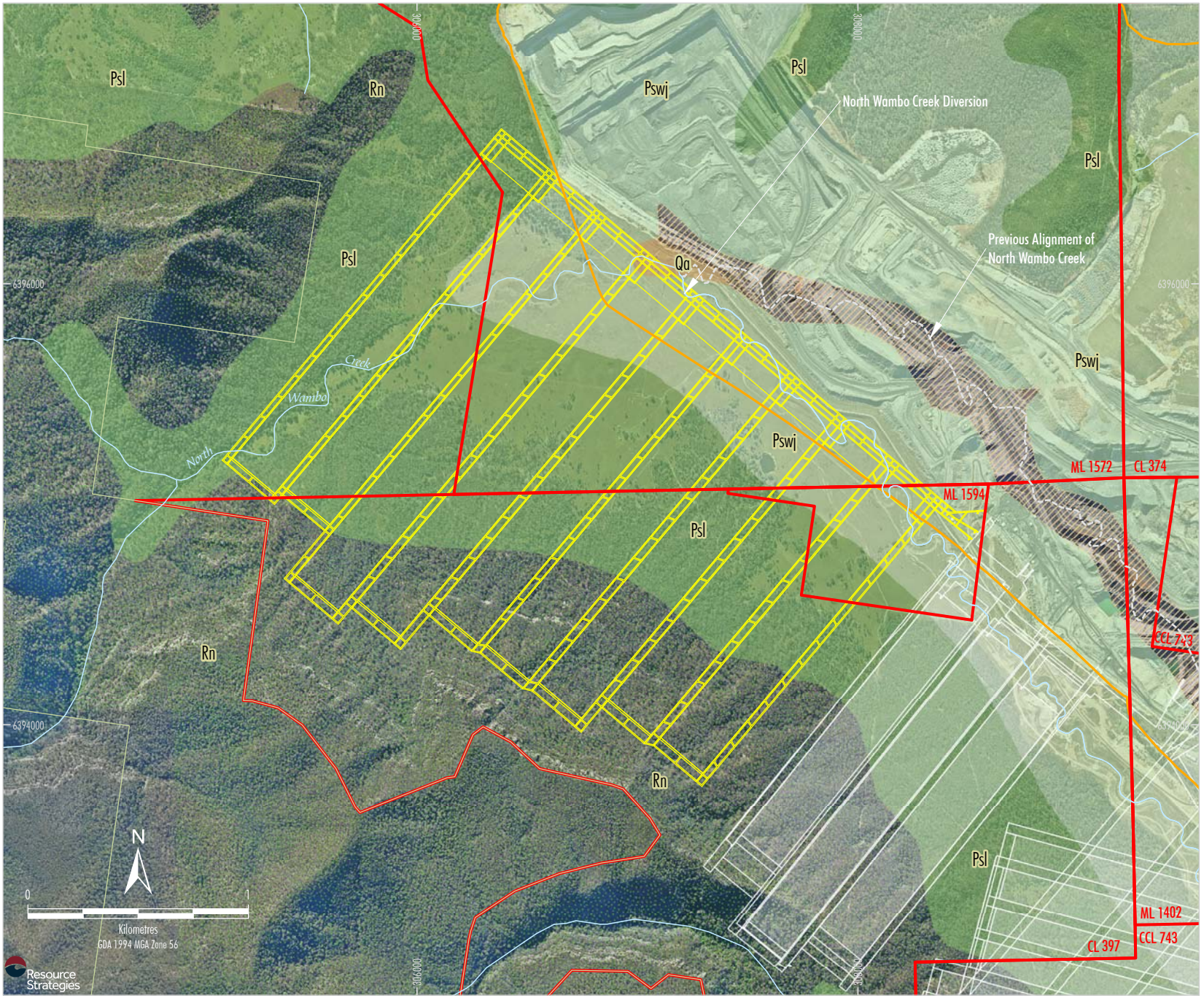
The hydrogeological regime of the Wambo area and surrounds comprises two main systems (Appendix B):

- Quaternary alluvial groundwater within channel fill deposits associated with Wollombi Brook, North Wambo Creek, Wambo Creek and Stony Creek.
- Underlying Permian strata of low hydraulic conductivity and hence very low yielding to almost dry sandstone and siltstone. The coal seams which are the prime water-bearing strata within the Permian coal measures have low to moderate hydraulic conductivity, as do the Triassic strata south-west of Wambo and beneath some parts of the alluvium.

Alluvial Aquifers

Groundwater flow patterns within the alluvium generally reflect topographic levels and the containment of alluvium within the principal drainage pathways (Appendix B).

The alluvium within and adjacent to the Modification area has been disconnected from the regional alluvial system due to the removal of alluvium downstream across the full width of the channel by the approved open cut mining operations (and associated construction of the North Wambo Creek Diversion) (Figure 12). This alluvium has been affected by open cut mining activities, with several metres of drawdown in the alluvium observed to date (Appendix A).



LEGEND

- Mining and Coal Lease Boundary
- National Park Boundary
- Existing/Approved Surface Development Area
- Approved Underground Development
- Modified Underground Development

Quaternary

- Qa — Silt, Sand, Gravel
- Removed by Open Cut Operations

Triassic

- Rn — Widden Brook Conglomerate - Conglomerate and Sandstone

Late Permian

- Psl — Newcastle Coal Measures - Coal Seams, Claystone (tuffaceous), Siltstone, Sandstone, Conglomerate
- Pswj — Wittingham Coal Measures - Coal Seams, Claystone, Tuff, Siltstone, Sandstone, Conglomerate

Source: Department of Lands (July 2009); WCPL (2016); WCPL Orthophoto (July 2016); Glen and Beckett (1993)

Peabody ENERGY

WAMBO COAL MINE

Regional Geology Mapping in the Modification Area

Figure 12

WAM-09-15_SBEM_EA_MT_211B

The modelled groundwater baseflow contributions to North Wambo Creek are very small and would occur as minor seepage which would be lost by evaporation except at times of flow (Appendix C). These baseflow contributions would not provide any measurable contribution to downstream flow (Appendix C).

Permian Aquifers

Prior to the commencement of mining operations in the region, the potentiometric surface within the Permian aquifers of the Wambo area most probably reflected the topography, with higher groundwater levels in areas distant from the major drainages and lower levels in areas adjacent to the alluvial flats (Appendix B).

Historical and ongoing open cut and underground mining within the Wambo area and adjoining mining operations has created a regional zone of depressurisation within the Permian coal measures (Appendix B).

Groundwater Monitoring Program

A Groundwater Monitoring Program (WCPL, 2015d) for Wambo was established in 2005 and details the existing groundwater conditions and baseline data relevant to Wambo, a monitoring program, groundwater impact assessment criteria, data review and investigation processes, and reporting requirements.

Groundwater levels and quality are generally monitored bi-monthly at each of the groundwater monitoring sites (Figure 8) and results are reported in the Annual Review.

Surface and Groundwater Response Plan

A Surface and Groundwater Response Plan (WCPL, 2015g) has been established for Wambo and details measures to mitigate potential surface and groundwater impacts, including processes to deal with a groundwater-related complaint, the groundwater impact investigation protocol and a response plan in the event that an investigation conclusively attributes an adverse impact to an existing groundwater supply user to Wambo operations.

Groundwater Use

There are 49 bores registered for irrigation, domestic and/or stock use, and 20 bores of unknown use within 5 km of Wambo (Appendix B). There are also 117 monitoring/test/industrial bores and 11 mine use/dewatering bores (Appendix B).

There are no bores used for irrigation, domestic and/or stock use within the Modification area.

Groundwater Dependent Ecosystems

The closest 'high priority' groundwater dependent ecosystem (GDE) identified by the NSW Government is Parnell Spring. Parnell Spring likely flows from the Triassic age Narrabeen Group and is located approximately 11 km south-southwest of Wambo. Wambo has resulted in negligible drawdown in Triassic age material.

Groundwater depth exceeds 10 m across most of the Modification area, and is only within 2 m of the surface in very small areas associated with North Wambo Creek (Appendix B).

Most of the remnant woodland and forest vegetation is positioned high in the landscape on footslopes and ridges remote from groundwater sources (Appendix D). Along North Wambo Creek, FloraSearch (Appendix D) observed that vegetation associated with areas of shallow groundwater is not different from nearby areas where the water table depth is greater. On this basis, FloraSearch (Appendix D) concluded that none of the plant communities in the Modification area are groundwater dependent.

4.4.2 Potential Impacts

Numerical modelling has been undertaken to inform the Groundwater Assessment (Appendix B) for the Modification and to quantify the likelihood and magnitude of potential impacts.

The numerical groundwater model covers an area of approximately 300 square kilometres (km^2) (19 km east-west and 16 km north-south) and incorporates the cumulative impacts of neighbouring mining areas (Appendix B).

Further detail on the development and calibration of the numerical groundwater model is provided in Appendix B.

The potential impacts of the Modification on groundwater have been assessed by comparing model outputs for the approved mine layout and the modified mine layout. Neighbouring mines and other influences (e.g. rainfall recharge) are the same in both models.

The main potential impacts on the groundwater regime due to the Modification are as a result of:

- subsurface fracturing and shearing of sedimentary strata above the proposed longwalls resulting in changes in bulk rock mass permeability and storage capacity; and
- dewatering of groundwater that enters underground mining areas as a result of the above.

The potential impacts of the Modification on the groundwater system as a result of these mechanisms are summarised below.

Groundwater Inflows

The peak predicted combined inflow rate to the workings associated with the Modification longwalls is approximately 1.0 megalitre per day (ML/day), compared to 0.9 ML/day for the approved South Bates Underground Mine (Appendix B).

Scheduling of the South Wambo Underground Mine would change as part of the integration of the operations with the United Wambo Open Cut Coal Mine Project (Section 2.2). These changes would reduce the peak inflow from about 3.1 ML/day at the end of 2030, to about 2.9 ML/d at the end of 2037 (Appendix B).

These changes in groundwater inflows have been considered as part of a review of the Site Water Balance (Section 3.7).

Impacts to Permian Aquifers

Depressurisation of the Permian strata within the mine footprint has occurred as part of the approved South Bates Underground Mine and adjacent open cut mining operations.

The Permian coal measures within the Modification area are predicted to be essentially dewatered during mining of the target Whybrow (Appendix B). The Modification would result in additional drawdown of the Permian coal measures, however these incremental impacts would be localised due to the impacts of the approved South Bates Underground Mine and adjacent open cut mining operations.

The impact on water levels due to the Modification is negligible regionally (Appendix B).

Impacts to Alluvial Aquifers

HydroSimulations (Appendix B) concluded there is no predicted change in the maximum drawdown in alluvial aquifers between the approved Wambo and Wambo incorporating the Modification.

The numerical model includes changes in bulk rock mass permeability and storage capacity up to the base of the alluvium in some areas above the Modification longwalls. This would not result in material impacts on stream baseflow, long-term water quality or groundwater users (discussed further below).

There would be negligible additional drawdown along the highly productive Wollombi Brook or Hunter River alluvium as a result of the Modification (Appendix B).

Stream Baseflows

The Modification would have no discernible or negligible impact on stream baseflow or natural river leakage for Wollombi Brook, Wambo Creek, North Wambo Creek or Stony Creek, beyond the effects of the approved mine layout (Appendices B and C).

Impacts on Water Quality

HydroSimulations (Appendix B) concludes the Modification would not have a significant impact on the quality of groundwater or surface water around Wambo.

Groundwater Users

HydroSimulations (Appendix B) predicts there would be no additional privately-owned registered groundwater users affected as a result of the Modification.

The influence on groundwater levels due to the Modification would be localised essentially within the Modification area (Appendix B). No GDEs have been identified within the Modification area, and therefore no additional impacts on GDEs are anticipated from the Modification (Appendix B).

Aquifer Interference Policy

An assessment of the Modification against the minimal impact considerations in the NSW *Aquifer Interference Policy* (the AIP) (NSW Government, 2012b) has been conducted and is presented in Attachment 4.

The Modification is within the 'Level 1' minimal impact considerations outlined in the AIP for highly productive and less productive alluvial aquifers.

HydroSimulations (2017) and previous groundwater assessments for Wambo predict that some privately-owned bores may experience more than 2 m cumulative drawdown as a result of the already approved operations at Wambo. These drawdowns are due to the cumulative effects of all mining in the Wambo district. Therefore, these cumulative impacts fall within the 'Level 2' minimal impact considerations outlined in the AIP for less productive porous rock aquifers.

Further discussion on the AIP and licensing requirements is provided in Attachment 4 and Appendix B.

4.4.3 Mitigation Measures, Management and Monitoring

Relevant monitoring, mitigation and contingency measures to manage potential cumulative groundwater impacts at Wambo include:

- Ongoing monitoring of groundwater levels and quality at Wambo in accordance with the Groundwater Monitoring Program (WCPL, 2015d).
- Implementation of a Surface and Groundwater Response Plan (WCPL, 2015g), which includes:
  - a process to conduct an investigation if a groundwater quality or trigger level specified in the Groundwater Monitoring Program is exceeded; and
  - a process to deal with a complaint received in relation to loss of groundwater supply.
- Monitoring and reporting groundwater extraction as required under the conditions of its water licences.
- Continued refinement of the numerical groundwater model over the progression of the mine life at Wambo.

The existing Groundwater Monitoring Program includes groundwater monitoring bores within and adjacent to the Modification area (Figure 8).

WCPL considers that no specific or additional mitigation measures, management or monitoring of groundwater are required for the Modification.

4.5 SURFACE WATER

A Surface Water Assessment for the Modification was undertaken by Advisian (2016) and is presented in Appendix C.

4.5.1 Existing Environment

Hydrology

Wambo is situated adjacent to Wollombi Brook, south-west of its confluence with the Hunter River. Wollombi Brook drains an area of approximately 1,950 km^2 and joins the Hunter River some 5 km north-east of Wambo. The Wollombi Brook sub-catchment is bound by the Myall Range to the south-east, Doyles Range to the west, the Hunter Range to the south-west and Broken Back Range to the north-east (Hunter Catchment Management Trust, 2002).

The majority of lands within WCPL mining tenements drain via Wambo, Stony, North Wambo and Redbank Creeks to Wollombi Brook, while Waterfall Creek drains directly to the Hunter River (Figure 2a).

A section of North Wambo Creek has been diverted to avoid the Wambo open cut (Figure 12). Approximately 980 m of the North Wambo Creek Diversion is approved to be undermined by the current South Bates Underground Mine.

North Wambo Creek and a number of ephemeral unnamed drainage lines are within the Modification area (Appendix C). North Wambo Creek contains two distinct landforms, steep, heavily forested, headwaters and cleared grassy plains. The unnamed drainage lines have a shallow incision in the surface soils, with some isolated bedrock outcropping along the upper reaches.

Site Water Management and Monitoring

A summary of the existing site water management is provided in Section 2.12.

The Erosion and Sediment Control Plan (WCPL, 2015f) identifies potential erosion and sediment sources and details design criteria, inspection and monitoring programs and reporting requirements.

A Surface Water Monitoring Program (WCPL, 2015e) for Wambo was established in 2005 and details surface water quality, stream flow and creek bed stability monitoring programs, water quality criteria, data review, and reporting requirements.

Surface water quality is generally monitored monthly at each of the surface water monitoring sites and stream flow is measured at the surface water flow monitoring sites during flow events (Figure 8).

A Surface and Groundwater Response Plan (WCPL, 2015g) has been established for Wambo and details measures to mitigate potential surface and groundwater impacts.

4.5.2 Potential Impacts

The following sub-sections describe the potential operational and post-mining impacts of the Modification on surface water flow regimes and surface water quality.

North Wambo Creek

Potential subsidence impacts and environmental consequences on North Wambo Creek identified by Advisian (Appendix C) include:

- creation of five ephemeral or semi-permanent pools along North Wambo Creek up to 1.4 m deep and 350 m long;
- changes in grades in some sections by up to 5% that would require implementation of localised scour protection works;
- potential for flow diversion into a vegetated and stable ancestral channel located near the pillar between Longwalls 23 and 24 (Figure 9) that would return to the existing channel about 300 m downstream;
- cracking of surface soil and underlying rock that may result in temporary changes in surface flow prior to remediation; and
- no significant change in water quality in North Wambo Creek with the implementation of mitigation and remediation measures.

Other Ephemeral Drainage Lines

The Modification is predicted to have minimal impact on some ephemeral drainage lines with minor subsidence impacts anticipated on others (Appendix C).

Any erosion impacts, ponding or cracking would be managed using techniques developed and used elsewhere at Wambo.

No significant change is expected in the water quality in the ephemeral drainage lines as a result of the Modification (Appendix C).

North Wambo Creek Diversion

Approximately 980 m of the North Wambo Creek Diversion is approved to be undermined by the current South Bates Underground Mine (with approximately 630 m undermined to date). An additional 120 m would be undermined by the Modification longwalls.

Subsidence impacts on the North Wambo Creek Diversion as a result of the Modification would be similar to those observed at the adjacent approved South Bates Underground Mine.

Surface cracking along the Diversion would be remediated using methods implemented at the current South Bates Underground Mine.

The Modification would result in a shallow ephemeral pool estimated to be 0.1 m deep and 25 m long (Appendix A). The adjoining floodplain near the upstream edge of this pool may require additional erosion protection measures (Appendix C).

With the implementation of mitigation and remediation measures, no significant change is expected in the water quality in North Wambo Creek Diversion (Appendix C).

Downstream Water Flow

The pools that would form as a result of subsidence would have no detectable impact on total flow compared to the natural variation in the flow regime in the North Wambo Creek Diversion (Appendix C).

Surface water flows in North Wambo Creek are not used for water supply.

The Modification would have no measurable impact when licensed extraction of water is permitted in Wollombi Brook (flow greater than 38 ML/day at Warkworth) (Appendix C).

Advisian (Appendix C) concluded the Modification would have no impact on high flows that might lead to flooding in the section of North Wambo Creek between the downstream end of the Diversion and Wollombi Brook, or in Wollombi Brook itself.

Site Water Management

Changes in site water management associated with the Modification are discussed in Section 3.7.

4.5.3 Mitigation Measures, Management and Monitoring

WCPL would continue to implement the Surface Water Monitoring Program (WCPL, 2015e), Erosion and Sediment Control Plan (WCPL, 2015f) and Surface and Groundwater Response Plan (2015g) at Wambo incorporating the Modification.

Subsidence Monitoring, Mitigation and Remediation

An Extraction Plan would be developed for the Modification longwalls. The Extraction Plan would provide further detail on the following measures and include a Trigger Action Response Plan with a process to determine triggers and remedial actions.

Geomorphologic Survey

Longitudinal geomorphological surveys would be conducted along the creek reaches affected by subsidence. Surveys would be conducted prior to commencement of secondary extraction, immediately following subsidence, and following the completion of any restoration or remediation works.

Ponding

Where ponding is deemed desirable for the provision of aquatic and riparian habitat, it is preferable to minimise any works to re-grade the creek to facilitate drainage of the pond. Any such works have the potential to lead to other problems, such as erosion of the creek bed.

If pools are observed that are significantly larger than predicted, remedial actions would include:

- Assessment of the ecological significance of the pool and its impact on the aquatic and riparian habitat by an appropriately qualified ecologist.
- Consultation with relevant regulatory agencies to determine whether action is warranted to reduce or eliminate the pool.
- Drainage works and rehabilitation of subsidence troughs as necessary.
- Channel excavation and stabilisation works to re-grade a downstream section of channel in order to eliminate or reduce the length of the pool.

Erosion and Sediment Control

Potential areas of erosion would be monitored and the post-mining profile would be regularly observed, particularly after flow events. Where erosion/scour is detected, WCPL would implement suitable stabilisation measures (e.g. vegetation planting, battering back shallow banks).

As described in Section 4.5.2, there is some potential for flow diversion into an ancestral channel of North Wambo Creek. Advisian (Appendix C) considers this diversion of flow would not necessarily have an adverse impact because the ancestral channel appears well vegetated and stable. However, if such diversion was deemed undesirable, minor earthworks could be undertaken to retain the flow in the existing channel.

Stream Bed Cracking

Visual monitoring of all watercourses in the Modification area would be undertaken on a regular basis during undermining to identify any stream bed cracking.

Remediation of any surface cracking along drainage lines and the North Wambo Creek Diversion would be consistent with current practices at Wambo.

Site Water Balance

Water pumped out of underground mine workings would be monitored. The site water balance would be reviewed in consideration of the predicted groundwater inflows and measured water make. The results of the site water balance review would be reported in the Annual Review in accordance with Condition 25, Schedule 4 of the Development Consent (DA 305-7-2003).

4.6 ABORIGINAL CULTURAL HERITAGE

An ACHA was prepared for the Modification by South East Archaeology (2017) and is presented in Appendix F.

The assessment of Aboriginal cultural heritage in the ACHA was undertaken in accordance with the following guidelines and regulations relevant to Aboriginal cultural heritage:

- *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW, 2010a).
- Clause 80C of the *National Parks and Wildlife Regulation, 2009.*

- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b).
- *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (Department of Environment and Conservation [DEC], 2005).
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011).
- The Australian International Council on Monuments and Sites (ICOMOS) *Burra Charter* (Australia ICOMOS, 2013).

4.6.1 Existing Environment

A number of Aboriginal cultural heritage surveys and assessments have previously been undertaken across the Modification area and surrounds.

A comprehensive survey and assessment was undertaken by White (2003) in the area to the east of the Wambo and Jerrys Plains ridgelines (including some of the Modification area).

White (2003) concluded that Wambo Ridge may have formed an access route from the lower valleys of Wambo, Stony and North Wambo Creeks and Wollombi Brook, into the higher sandstone country to the west.

Generally in the Wambo area, artefact occurrences tend mostly to be identified near watercourses, particularly on level or gently inclined landform units and close to higher order streams (Appendix F).

Aboriginal Cultural Heritage Management

Management of Aboriginal cultural heritage at Wambo is currently conducted in accordance with Aboriginal Heritage Impact Permit (AHIP) #2222, AHIP #C0001474 and AHIP #C0002000 issued under section 90 of the *National Parks and Wildlife Act*, *1974*. These AHIPs reference approved methodologies for the salvage of sites within the AHIP areas.

These existing consents cover some of the Modification area. The ACHA provided in Appendix F includes a recommendation to apply for a new AHIP to cover the residual extent of the Modification area.

Assessment Program

The ACHA (Appendix F) used the results of:

- prior field work and previous studies undertaken by archaeologists and representatives of the Aboriginal community;
- search results from the OEH Aboriginal Heritage Information Management System (AHIMS) database and other registers;
- the results of archaeological and cultural surveys of the Modification area conducted by archaeologists and representatives of the Aboriginal community in November 2016; and
- ongoing consultation with the Aboriginal community on the Modification, as well as previous surveys and assessments.

The ACHA included consultation with 68 Registered Aboriginal Parties (Appendix F) in accordance with the OEH policy *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW, 2010a) and Condition 56A, Schedule 4 of the Development Consent (DA 305-7-2003).

Participation of Registered Aboriginal Parties in the field surveys was in accordance with the established Wambo Coal Mine fieldwork roster system, with invitations also extended to the Wanaruah Local Aboriginal Land Council and the registered Native Title Claimant organisation.

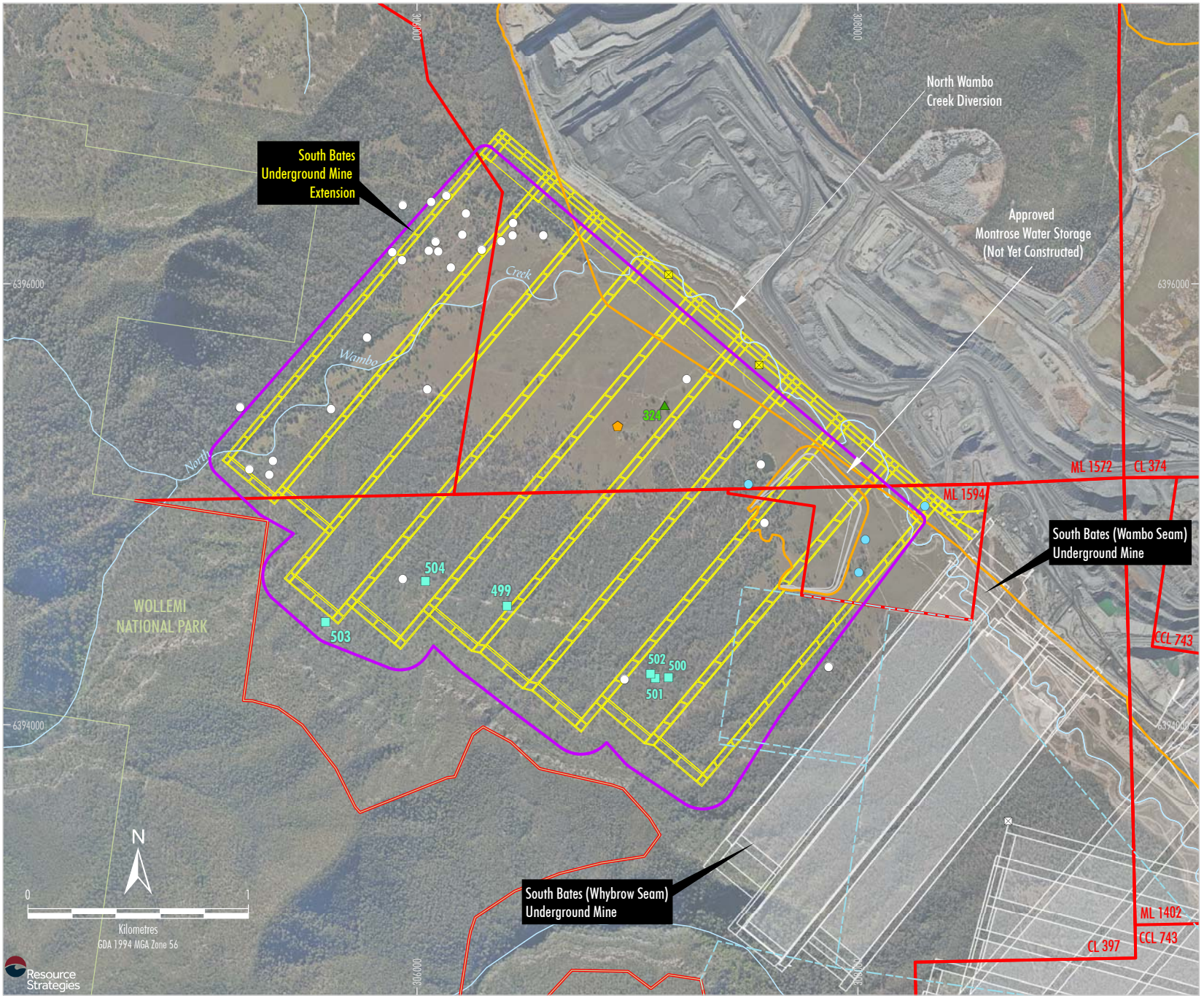
The archaeological and cultural surveys were undertaken over nine days and achieved systematic archaeological survey coverage of 93% of the total investigation area (Appendix F).

Archaeological Findings

The field surveys identified 15 previously unrecorded Aboriginal cultural heritage sites in the Modification area, all of which were surface artefact sites, along with six rock shelters with potential archaeological deposits (PADs).

There are also 20 previously recorded sites within the Modification area, including surface artefact sites, a scarred tree site and four open PAD sites (Appendix F).

The locations of the Aboriginal cultural heritage sites are shown on Figure 13, with a detailed description of all the sites provided in Appendix F.



LEGEND

- Mining and Coal Lease Boundary
- National Park Boundary
- Existing/Approved Surface Development Area
- Approved Underground Development
- Modified Underground Development
- Extent of Conventional Subsidence from the Modification Longwalls
- Approved Ventilation Shaft
- Modified Ventilation Shaft
- Remnant Woodland Enhancement Program (RWEP) Area
- Whynot Homestead

Aboriginal Heritage Sites

- Open Artefact Site
- Open PAD
- Rock Shelter with PAD
- Scarred Tree

PAD - Potential Archaeological Deposit

Source: Department of Lands (July 2009); WCPL (2016); WCPL Orthophoto (July 2016); MSEC (2016); South East Archaeology (2017); EJE Heritage (2017)

Peabody ENERGY

WAMBO COAL MINE

Heritage Sites in the Modification Area

Figure 13

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Archaeological and Cultural Heritage Values

As part of the ACHA, archaeological significance was assessed in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b).

South East Archaeology (Appendix F) concluded that all of the Aboriginal cultural heritage sites within the Modification area were of a low archaeological significance at a regional level. At a local level, one site was considered to be of moderate archaeological significance and eight sites of low to possibly moderate archaeological significance (Appendix F).

The Registered Aboriginal Parties were requested to provide comment in regard to the cultural significance of the Modification area and Aboriginal cultural heritage sites within it at all stages of the consultation process (including during field surveys and review of relevant documentation). Based on the comments received (Appendix F):

- All identified sites are of contemporary cultural significance as they represent a tangible link with the traditional past and with the lifestyle and values of community ancestors.
- Artefact scatters around North Wambo Creek and one of the rock shelters were of particular significance to the Plains Clans of the Wonnarua People.
- In general terms, the use of subsistence or other resources, such as ochre, has contemporary cultural significance.
- In general terms, the traditional use of the area by Aboriginal people, and an ongoing cultural and spiritual connection to the land and resources of the study area by the Wonnarua people has contemporary cultural significance.
- The pathways through the locality, including the potential access from North Wambo Creek to Jerrys Plains Ridge is of particular significance to the Plains Clans of the Wonnarua People.

4.6.2 Potential Impacts

Potential impacts of the Modification on Aboriginal cultural heritage sites would be associated with (Appendix F):

- subsidence impacts from the extraction of the Modification longwalls; and
- direct disturbance associated with development of ancillary infrastructure, vehicle movements and subsidence remediation activities, if required.

Subsidence Impacts

MSEC (Appendix A) assessed the potential for adverse subsidence impacts occurring to the identified rock shelters with PADs. Impacts to one rock shelter (Site 499) were considered possible. The likelihood of impacts on the other rock shelters was assessed as very unlikely or lower.

The likelihood of impacts on the previously recorded scarred tree was also assessed by MSEC (Appendix A) as unlikely.

Open artefact sites (such as artefact scatters, isolated finds and open PAD sites) are not particularly susceptible to subsidence impacts (Appendices A and F). South East Archaeology (Appendix F) concluded that any effects on these sites are likely to be short-term in duration, minimal in extent and confined to the context of the sites (sediments in which the artefacts are located) rather than direct impacts or damage to the artefacts themselves.

Direct Disturbance

Any potential surface impacts associated with the Modification would be limited to small discrete areas, and it would generally be feasible to avoid impacts to identified heritage sites, particularly evidence of significance.

Measures are described in Section 4.6.3 to further investigate, mitigate, avoid and minimise these potential impacts.

South East Archaeology (Appendix F) concluded that with the implementation of the proposed mitigation measures (summarised in Section 4.6.3), the impacts of the Modification on Aboriginal heritage would be very low to negligible within both local and regional contexts.

4.6.3 Mitigation Measures, Management and Monitoring

The rock shelter site that may be possibly impacted by subsidence would be monitored after undermining has occurred to assess and document any impacts. This would form part of the relevant Extraction Plan monitoring program.

The final locations of ancillary infrastructure for the Modification would be reviewed against the known locations of Aboriginal heritage sites prior to disturbance for that activity as part of WCPL's Surface Disturbance Permit process. Any known sites would be avoided if feasible.

If an impact to an open artefact site within the Modification area is likely, the site would be subject to the recommended strategy identified for that site in the ACHA (Appendix F) (e.g. further recording, surface collection or unmitigated impact).

Systematic heritage survey of the remaining 34 ha not subject to survey sampling for the ACHA would be conducted prior to secondary extraction.

In the event that further investigations by qualified archaeologists and/or relevant specialists determine that any of the previously recorded sites are not of Aboriginal origin (e.g. stone artefacts, scarred trees), the above described management measures would no longer be required. WCPL would apply to have any such sites removed from the AHIMS register as required.

Consistent with current site procedures, if any previously unrecorded Aboriginal cultural heritage sites are identified during the course of the Modification, surface works in that area would cease until the site has been recorded. Provisions to guide the management of any previously unrecorded Aboriginal heritage sites that may be identified during future investigations or works are outlined in the ACHA (Appendix F).

In the event skeletal remains are discovered, surface work would cease in that area and the NSW Police Coroner and OEH would be contacted to determine if the material is of Aboriginal origin. If determined to be of Aboriginal origin, an action plan for the management of the skeletal remains would be developed in consultation with OEH and the Registered Aboriginal Parties prior to any further surface works commencing in that area.

As recommended in Appendix F, WCPL would apply for an additional AHIP to cover the remaining portion of the Modification area not covered by the existing AHIPs.

4.7 NON-ABORIGINAL HERITAGE

A Historic Heritage Assessment (Statement of Heritage Impact) was prepared for the Modification by EJE Heritage (2017) and is presented in Appendix G.

The assessment was undertaken in accordance with the following guidelines and regulations relevant to historic heritage:

- *NSW Heritage Manual* (Heritage Office and Department of Urban Affairs and Planning, 1996a).
- *Statements of Heritage Impact* (Heritage Office and Department of Urban Affairs and Planning, 1996b).
- *Burra Charter* (Australia ICOMOS, 2013).

4.7.1 Existing Environment

EJE Town Planning assessed the potential non-Aboriginal impacts of Wambo in 2003 (EJE Town Planning, 2003). The assessment included surveys of lands in the vicinity of Wambo and an assessment of the heritage significance of sites identified during these surveys.

The assessment identified the Wambo Homestead Complex as the only item of non-Aboriginal heritage significance in the Wambo area (EJE Town Planning, 2003). The heritage value of the Wambo Homestead Complex was assessed in 1994 and the Wambo Homestead Complex was subsequently listed on the State Heritage Register of NSW.

Whynot Property

The majority of the Modification area is covered by the Whynot property granted to Noah Long in 1906 and now owned by WCPL.

There is a homestead, other outbuildings and fenced yards on the Whynot property that appear to date from the Federation Period (Appendix G). The buildings are not currently tenanted, are in a degraded state, and show signs of termite activity. The location of the homestead on the Whynot property is shown on Figure 13.

The homestead is a single storey timber framed structure, supported on timber piers, with timber and fibro wall claddings and a metal sheeted roof (Appendix A). Other structures on the property include timber framed sheds with metal sheet cladding and water storage tanks.

Whilst the Whynot property is in proximity to the Wambo Homestead, the Whynot property does not share in its associations or significance (Appendix G).

EJE Heritage (Appendix G) considers that the Whynot property was never part of the Wambo Estate, having been leased from the State of NSW by Noah Long in 1906 and subsequently used for cattle farming. The Whynot homestead and outbuildings are not rare or exceptional examples of their type.

The analysis of heritage significance (Appendix G) concluded that the Whynot property has little significance under any and all criteria within a local context. In addition, EJE Heritage (Appendix G) concluded the structures are not listed as a heritage item on any schedule and are not considered eligible for such protection.

4.7.2 Potential Impacts

The Wambo Homestead Complex would not be affected by the Modification.

The buildings associated with the Whynot property would be impacted by subsidence from the Modification longwalls. The predicted ground movements could result in distortion of the timber frames of the homestead on the Whynot property and it is possible that the structure could become unsafe due to its poor existing condition (Appendix A). Other structures on the property may also become unsafe due to subsidence movements and their current condition (Appendix A).

Should the structures become unstable due to subsidence activity and present an ongoing safety concern, WCPL may consider demolition of the structures on the Whynot Property.

EJE Heritage (Appendix G) considers as the Whynot property is not a listed heritage item and is not considered to be significant enough to warrant protection, there would be no detrimental impact to significance if the structures were removed.

The Statement of Heritage Impact (Appendix G) concluded that subsidence effects on the Whynot property are acceptable from a heritage perspective.

4.7.3 Mitigation Measures, Management and Monitoring

WCPL considers that no specific or additional mitigation measures, management or monitoring of non-Aboriginal heritage are required for the Modification.

Management of subsidence impacts on structures and potential risks to public safety during subsidence are described in Section 4.2.5.

4.8 FLORA

A Flora Assessment for the Modification was undertaken by FloraSearch (2017) and is presented in Appendix D.

The impact of the Modification on threatened flora species, populations and communities was assessed in consideration of the *Guidelines for Threatened Species Assessment* (DEC and DPI, 2005) and the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (Department of the Environment, 2013).

4.8.1 Existing Environment

Regional Setting

The Modification area is located in the north of the Sydney Basin Bioregion as originally defined by Thackway and Cresswell (1995), and in the south west corner of the North Coast Botanical Division (Anderson, 1968; Harden, 1990-2002). It is close to the southern boundary of the Brigalow Belt South Bioregion (Thackway and Cresswell, 1995) and just outside the eastern boundary of the Central Western Slopes Botanical Division (Anderson, 1968; Harden, 1990-2002).

Flora Surveys

The Modification area has been surveyed extensively as part of previous flora surveys conducted at Wambo (Orchid Research [2003] and FloraSearch [2011, 2012, 2014, 2015 and 2016] and Umwelt [Australia] Pty Ltd [Umwelt] [2016] [Appendix D]).

Additional flora surveys for the Modification were carried out by FloraSearch (Appendix D) during September 2016 and included targeted threatened species surveys, quadrat sampling, rapid assessment spot sampling and random meanders.

The Flora Assessment (Appendix D) was informed by the additional flora surveys for the Modification, previous flora surveys conducted at Wambo, literature and database reviews and ground-truthed vegetation mapping.

A detailed description of the flora survey methods, including previous surveys, is provided in Appendix D.

Vegetation Communities

The Modification area supports a diversity of central Hunter Valley vegetation from the floodplain of North Wambo Creek to the steep colluvial slopes below the Narrabeen Sandstone escarpment flanking the south side of the valley (Appendix D). The following 8 native vegetation communities have been identified in the Modification area and immediate surrounds (Figure 14):

- 1 – Rusty Fig – Native Quince – Olive Dry Rainforest.
- 2 – Forest Red Gum – Rough-barked Apple – River Sheoak Forest (disturbed).
- 3 – Narrow-leaved Ironbark – Grey Box Woodland.
- 4 – *Melaleuca decora* Low Forest.
- 5 – Slaty Box Shrubby Woodland.
- 6 – Coast Myall Shrubland.
- 7 – Escarpment Shrubland.
- 8 – Derived Grassland.

A detailed description of these communities is provided in Appendix D.

Condition of Vegetation

Vegetation condition in the Modification area varies considerably from moderate to excellent condition depending on land use history and the degree of disturbance.

The most alienated parts of the Modification area are the Derived Grasslands on the flat valley floor of North Wambo Creek, which has been almost completely cleared of its original native tree and shrub cover (Appendix D). The vegetation over the bulk of the continuously wooded areas was assessed as being in excellent condition. There are few old growth trees, reflecting the effects of past clearing, logging and wildfires (Appendix D).

A small portion of the Modification area comprises forest and woodland that has been set aside as part of the RWEP. Livestock grazing is excluded from this land.

Threatened Ecological Communities

Relevant threatened ecological communities are shown on Figure 15.

Two Endangered Ecological Communities (EECs) listed in the schedules of the NSW *Threatened Species Conservation Act, 1995* (TSC Act) occur within the Modification area:

- *Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions* (Community 3 on Figure 14).
- *Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions* (Community 2 on Figure 14).

One Critically Endangered Ecological Community (CEEC) listed in the schedules of the EPBC Act occurs within the Modification area, namely the *Central Hunter Valley Eucalypt Forest and Woodland* (Communities 3, 5 and 6 on Figure 14).

Threatened Flora Species and Populations

No threatened flora species or flora populations listed under the TSC Act or EPBC Act were recorded during recent surveys of the Modification area (Appendix D).

4.8.2 Potential Impacts

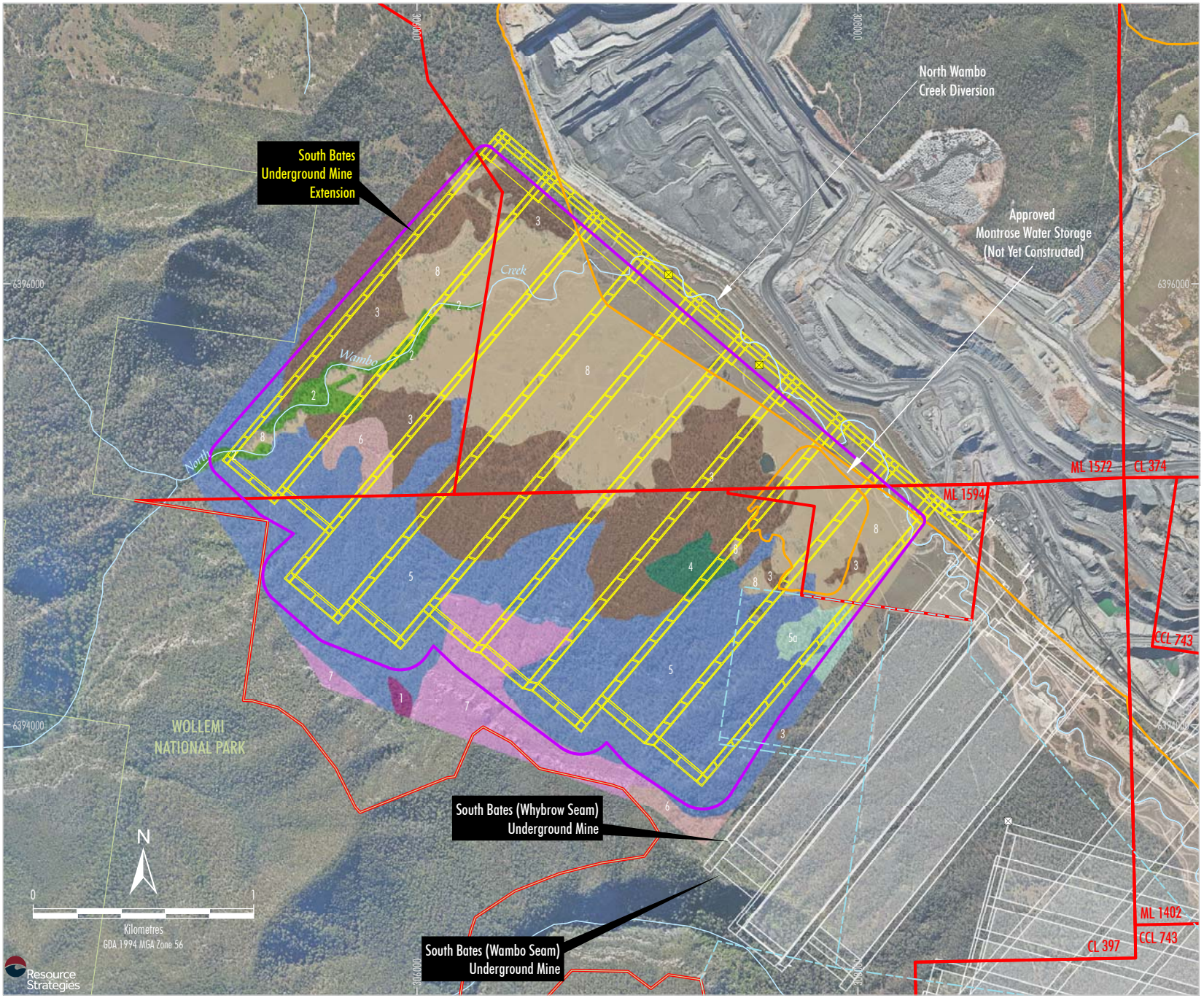
Potential direct impacts of the Modification on flora include (Appendix D):

- potential impacts due to subsidence, which include soil cracking, ponding of water, and impacts on streams; and
- impacts due to vegetation clearance and/or disturbance associated with development of ancillary infrastructure, vehicle movements and subsidence remediation activities, if required.

Potential indirect impacts from the Modification on vegetation (e.g. dust, bushfire risk) are not expected to increase as a result of the Modification.

Subsidence Impacts

FloraSearch (Appendix D) concluded that it is considered unlikely that vegetation would be adversely affected by soil cracking caused by subsidence. This conclusion is supported by inspection of previously undermined areas above the North Wambo Underground Mine, which showed that despite evidence of surface cracking of the soil, the condition of the vegetation on the undermined area was not noticeably different from that on adjacent similar unmined areas and showed no signs of dieback (Appendix D).



LEGEND

- Mining and Coal Lease Boundary
- National Park Boundary
- Existing/Approved Surface Development Area
- Approved Underground Development
- Modified Underground Development
- Approved Ventilation Shaft
- Modified Ventilation Shaft
- Remnant Woodland Enhancement Program (RWEP) Area
- Extent of Conventional Subsidence from the Modification Longwalls

Vegetation Communities

- 1 Rusty Fig - Native Quince - Olive Dry Rainforest
- 2 Forest Red Gum - Rough-barked Apple - River Sheoak Forest (Disturbed)
- 3 Narrow-leaved Ironbark Grey Box Woodland
- 4 *Melaleuca decora* Low Forest
- 5 Slaty Box Shrubby Woodland
- 5a Slaty Box Shrubby Woodland (Disturbed)
- 6 Coast Myall Shrubland
- 7 Escarpment Shrubland
- 8 Derived Grassland

Source: Department of Lands (July 2009); WCPL (2016); WCPL Orthophoto (July 2016); FloraSearch (2017)

Peabody ENERGY

WAMBO COAL MINE

Vegetation Communities

Figure 14

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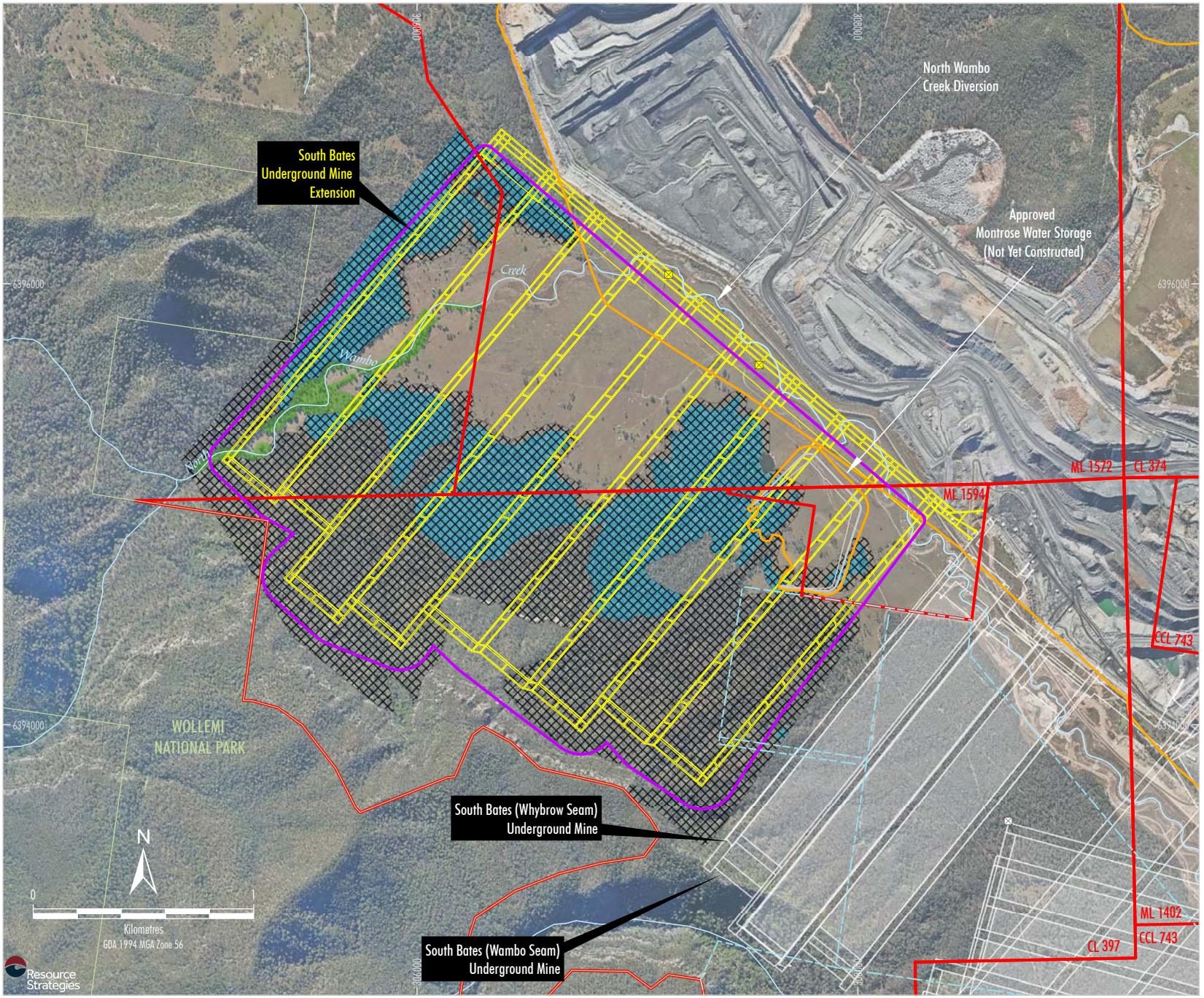

LEGEND

- Mining and Coal Lease Boundary
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- Existing/Approved Surface Development Area
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- Modified Ventilation Shaft
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- Extent of Conventional Subsidence from the Modification Longwalls

Threatened Ecological Communities - EPBC Act

- Central Hunter Valley Eucalypt Forest and Woodland (CEEC)

Endangered Ecological Communities - TSC Act

- Central Hunter Grey Box - Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions (EEC)
- Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions (EEC)

Note: *EEC - Endangered Ecological Community*
CEEC - Critically Endangered Ecological Community

Source: *Department of Lands (July 2009); WCPL (2016); WCPL Orthophoto (July 2016); FloraSearch (2017)*

Peabody ENERGY

WAMBO COAL MINE

Threatened Ecological Communities

Figure 15

WAM-09-15_SBEM_EA_MT_213A

FloraSearch (Appendix D) noted there may be some potential impacts to a small area of woodland vegetation (0.25 ha) associated with the potential for surface ponding. There is also the potential for impacts to riparian vegetation along North Wambo Creek due to changes in stream flow (Appendix D).

Surface Disturbance

Surface infrastructure for the Modification (additional to existing/approved surface disturbance) would total 2 ha. As described in Section 3.1, surface disturbance for gas management infrastructure would be restricted to grassland areas that are not threatened ecological communities.

Additional ecology surveys of potential gas management infrastructure locations would be conducted. If present, any threatened flora species or populations would be avoided.

Threatened Flora Species, Populations and Communities

FloraSearch (Appendix D) concluded that the Modification is unlikely to have a significant impact on threatened flora species, populations, ecological communities or critical habitat.

Overall Assessment

The potential impacts associated with the Modification would be minimal, temporary and isolated in nature given:

- clearance would be restricted to grassland with a total of 2 ha (i.e. woodland vegetation would be avoided);
- disturbance would occur progressively, in isolated patches, with less than approximately 1 ha disturbed at any time; and
- cleared areas would be rehabilitated progressively as gas management infrastructure is no longer required.

Given the above, and with the ongoing implementation of WCPL's flora and fauna management program, the biodiversity values of the region would be maintained in the medium to long-term.

4.8.3 Mitigation Measures, Management and Monitoring

Flora management and monitoring at Wambo would continue to be conducted in accordance with an approved Flora and Fauna Management Plan (or Biodiversity Management Plan).

Management measures outlined in the Flora and Fauna Management Plan (WCPL, 2014a) relevant to flora include:

- Vegetation Clearance Protocol, including delineation of areas to be cleared, pre-clearance surveys, vegetation clearance procedures, seed collection and salvage/reuse of materials.
- RWEP, including offset conservation, limitation of activities within RWEP areas (e.g. no agistment of stock), fencing, weed and pest control programs, Bushfire Management Plan and landform stabilisation.
- Rehabilitation program, including progressive rehabilitation of disturbed areas to minimise total disturbance at any one time.
- Monitoring program, including visual monitoring, assessment of the quality of rehabilitation using Ecosystem Function Analysis and permanent flora survey quadrats that have been established in RWEP areas.

Remediation of subsidence impacts on streams is described in Section 4.5.

WCPL considers that no specific or additional mitigation measures, management or monitoring of flora are required for the Modification.

4.9 FAUNA

A Fauna Assessment for the Modification was undertaken by Eco Logical Australia Pty Ltd (Eco Logical) (2017) and is presented in Appendix E.

The impact of the Modification on threatened fauna species was assessed in consideration of the *Guidelines for Threatened Species Assessment* (DEC and DPI, 2005) and the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (Department of the Environment, 2013). Consideration was also given to the *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44).

4.9.1 Existing Environment

A number of ecological studies have been undertaken previously within the Wambo area and surrounds, including routine ecological monitoring surveys commissioned by WCPL.

A relatively high diversity of animals has been recorded by previous surveys within the Wambo area attributed to the proximity of the site to Wollemi National Park and a variety of habitat types present (Niche Environment and Heritage, 2014).

Fauna Surveys

Additional fauna surveys for the Modification were carried out by Eco Logical (Appendix E) between 26 September and 14 October 2016, specifically targeting areas that had been excluded from the significant body of detailed ecological assessments and monitoring that had previously been completed within Wambo area to date.

Survey methods included fauna habitat mapping, diurnal bird surveys, microbat surveys, remote camera surveys, amphibian and reptile surveys, nocturnal mammal surveys, terrestrial and arboreal mammal trapping, riparian habitat assessment and opportunistic fauna sightings.

A detailed description of the fauna survey methods and previous surveys is provided in Appendix E.

Fauna Habitat

The Modification area largely comprises shrubby woodlands dominated by gum and ironbark species on lower footslopes with floodplains consisting of primarily mixed native/exotic derived grasslands.

Eco Logical (Appendix E) observed that historical logging has reduced the density of hollow-bearing trees within the shrubby woodlands to the extent they are uncommon in the lower relief areas. Remaining hollow-bearing trees and decorticating bark forms habitat for arboreal mammals, hollow-roosting bats and reptile species (Appendix E).

A large proportion of the Modification area contains mixed native/exotic derived grassland, which has been historically cleared for predominantly agricultural purposes. These areas generally have low habitat values for threatened fauna, despite providing broader foraging areas for threatened birds of prey and some microbat species (Appendix E).

Sandstone cliffs and rocky outcrops present in the south-west of the Modification area are likely to provide habitat for a range of bird, bat, mammal and reptile species.

Threatened Fauna

Seven threatened fauna species listed under the TSC Act were recorded during the Modification fauna surveys, as follows:

- *Chthonicola sagittata* (Speckled Warbler);
- *Pomatostomus temporalis temporalis* (Grey-crowned Babbler – eastern subspecies);
- *Daphoenositta chrysoptera* (Varied Sittella);
- *Mormopterus norfolkensis* (Eastern Freetail-bat);
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat);
- *Miniopterus australis* (Little Bentwing-bat); and
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat).

All of the above species are listed under the TSC Act as ‘Vulnerable’. No species listed under the EPBC Act were recorded during the field survey. (Appendix E).

Based on a conservative assessment, Eco Logical (Appendix E) concluded the Modification area is considered to contain potential habitat for 38 threatened fauna species listed under the TSC Act and/or the EPBC Act.

Further information on recorded and potentially occurring threatened fauna species is provided in Appendix E.

4.9.2 Potential Impacts

The Modification would result in subsidence over the Modification area and require additional surface disturbance of approximately 2 ha of grassland areas and potential fauna habitat.

Potential indirect impacts from the Modification on fauna (e.g. noise, night-lighting and pests) are either not expected to materially increase as a result of the Modification or are considered minimal and readily managed.

Subsidence Impacts

Subsidence of vegetation within the Modification area is not expected to result in the loss of vegetation cover or community structure (Appendix E). Therefore, no impacts are expected to occur to diurnal birds, forest owls or tree-roosting microbats as a result of the Modification (Appendix E).

Eco Logical (Appendix E) concluded any impacts on fauna associated with subsidence impacts on streams, cliffs and steep slopes would be minor and not significant.

Surface Disturbance

Surface disturbance for gas management infrastructure would be restricted to grassland areas. Additional ecology surveys of potential gas management infrastructure locations would be conducted. If present, any hollow bearing trees would be avoided.

The nature of the surface disturbance would be small, isolated and temporary. There may be some disturbance to, or removal of, foraging habitat for some species, including isolated paddock trees, woody debris and groundcover. Suitable habitat resources would remain present outside the Modification area, with abundant similar habitat available in wooded areas to the south, north, and west as well as in the connected corridor with Wollemi National Park to the south of the Modification area.

Threatened Fauna Species

Eco Logical (Appendix E) concluded that the Modification is unlikely to result in any significant impacts to threatened fauna species.

4.9.3 Mitigation Measures, Management and Monitoring

Fauna management and monitoring at Wambo would continue to be conducted in accordance with an approved Flora and Fauna Management Plan (or Biodiversity Management Plan).

Management measures outlined in the Flora and Fauna Management Plan (WCPL, 2014a) relevant to fauna include:

- Vegetation Clearance Protocol, including delineation of areas to be cleared, pre-clearance surveys and management of impacts to fauna.
- Collection and stockpiling of suitable habitat features important to threatened fauna species.
- Incorporation of ongoing management for weeds and pest animals to manage potential impacts upon fauna and their habitat.
- Monitoring within revegetated areas (including areas subject to subsidence from underground mining) such as visual monitoring of vegetation to assess the success of revegetation efforts and the condition of the vegetation, to determine the need for any maintenance and/or contingency measures (e.g. the requirement for weed and pest animal control).
- If remediation works are required, use of appropriate native flora species characteristic of the original communities, including use of local provenance seed stock where possible.

WCPL considers that no specific or additional mitigation measures, management or monitoring of fauna are required for the Modification.

4.10 NOISE

The potential noise impacts of Wambo were assessed by Richard Heggie Associates in 2003 (Richard Heggie Associates, 2003). The assessment considered the potential noise and blasting impacts likely to be generated by Wambo and surrounding mining operations at potentially affected receptors against applicable assessment criteria.

A Noise Review for the Modification was undertaken by SLR Consulting Australia Pty Ltd (SLR) (2016) and is presented in Appendix I. The Noise Review was prepared in consideration of:

- *NSW Industrial Noise Policy* (INP) (EPA, 2000);
- *Interim Construction Noise Guideline* (Department of Environment and Climate Change [DECC], 2009);
- *NSW Road Noise Policy* (RNP) DECCW, 2011); and
- *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013).

4.10.1 Existing Environment

Noise Management and Monitoring Regime

Noise management at Wambo is currently undertaken in accordance with the Noise Management Plan (WCPL, 2014b) which outlines:

- noise mitigation measures and controls;
- the noise monitoring and reporting regimes; and
- procedures for the management of exceedances and complaints.

The Noise Management Plan describes general noise management and mitigation measures including:

- the training of contractors and staff on environmental noise control and awareness;
- operation of machinery and potential noise emitting plant by experienced and appropriately trained personnel;
- consideration of sound power levels in equipment selection;
- regular maintenance of plant and equipment and pre-start up inspections;
- management of complaints received;
- monitoring for adverse meteorological conditions and adjusting mining operations where necessary;
- predictive meteorological forecasting to guide day-to-day planning of mining operations; and
- attended monitoring to verify ongoing compliance with noise criteria.

The Noise Management Plan describes the current noise monitoring network, which consists of: two operator-attended monitoring sites; two continuous real-time monitoring sites; two off-site operator-attended/real-time monitoring sites; and one on-site Automatic Weather Station (AWS). Current attended and real-time noise monitoring locations in the vicinity of Wambo are shown on Figure 7.

Current real-time noise monitoring is focused to the north-west, east and south of Wambo in the vicinity of the nearest privately-owned receivers (Figure 7).

As described in the Noise Management Plan, the noise monitoring system provides real-time access to noise data and provides the capacity to set a real-time target noise level (e.g. 2 decibels [dB] below the compliance level).

Upon noise emissions reaching the identified target level, an automated SMS message is sent to the relevant WCPL personnel, who then implement the response protocol described in the Noise Management Plan.

The response protocol includes the identification of the noise source. Upon determination that the noise source is Wambo related, and was not triggered by meteorological conditions (e.g. rainfall events and/or wind gusts greater than 3 metres per second), active measures can be put in place to modify operations or stand down equipment to ensure compliance with noise criteria continues to be maintained.

Compliance and Complaints

To date, the obligation to meet the noise criteria specified in Development Consent DA 305-7-2003 for privately-owned receivers has been achieved by WCPL through a combination of the following:

- Property acquisition, which has reduced the number of privately-owned receivers that could potentially be affected by noise impacts from Wambo.
- For the remaining privately-owned receivers, the implementation of the Wambo noise management strategy as per the Noise Management Plan, which includes the use of real-time noise monitoring to manage noise levels.

Attended noise monitoring is undertaken at Wambo at the locations shown on Figure 7.

The Annual Review 2015 (WCPL, 2016b) indicates that Wambo noise levels complied with relevant noise limits at all monitoring sites during the operator-attended noise monitoring during 2015 (Appendix I).

A review of the monthly Wambo and Wambo Coal Mine Rail Spur – Environmental Noise Monitoring reports for January, February, March, April, May and June 2016 (Global Acoustics, 2016a to 2016f) indicates that noise levels complied with relevant noise limits at all monitoring sites during the operator-attended noise monitoring (Appendix I).

WCPL manages complaints in accordance with the Noise Management Plan. In 2015, two complaints were received in relation to on-site noise and 12 complaints were received in 2016 (Appendix I).

All complaints received by WCPL relating to noise were responded to in accordance with the Community Complaints Response procedure outlined in the Noise Management Plan. In some cases, mining operations were modified in response to a complaint lodged with WCPL during adverse weather conditions (Appendix I).

Noise Measurement and Description

The assessed noise levels presented in Appendix I and summarised in this section are expressed in A-weighted decibels (dBA). The logarithmic dBA scale simulates the response of the human ear, which is more sensitive to mid to high frequency sounds and relatively less sensitive to lower frequency sounds.

4.10.2 Potential Impacts

The Noise Review (Appendix I) included assessment of the following potential impacts associated with the Modification:

- construction noise;
- on-site operational noise; and
- road and rail traffic noise.

These aspects are described further below and in Appendix I.

Construction Noise

All construction activities would be generally undertaken during daylight hours with the exception of the drilling of the ventilation shafts, which would occur up to 24 hours per day, seven days per week.

As the majority of the construction activities associated with the Modification would be conducted during the daytime, potential noise impacts associated with these activities would be minor compared to surrounding operations at Wambo (Appendix I).

Operational Noise

Potential operational noise impacts of the Modification would be associated with:

- changes to the South Bates Underground Mine ROM coal handling activities; and
- modified ventilation system.

ROM coal handling activities associated with the Modification are discussed in Section 3.4. The Modification would not include any significant change to approved ROM coal handling activities and associated noise impacts.

The Modification would not change open cut operations (Section 3.3).

The Noise Review (Appendix I) included a review of the sound power level of the approved and modified South Bates Underground Mine Wambo operations (including ventilation infrastructure).

As presented in Table 5, the total sound power level for the modified South Bates Underground Mine would remain generally unaltered when compared to existing South Bates Underground Mine operations (Appendix I).

Table 5
Comparison of Approved and Modified South Bates Underground Mine Total Sound Power Levels

Sound Power Level (dBA re 1pW)	
Approved South Bates Underground Mine	**Modified South Bates Underground Mine**
133.5	133.7

Source: Appendix I.

The Modification would have minimal potential to alter the existing intrusive or amenity noise levels at the nearest privately-owned receivers in the vicinity of Wambo (Appendix I).

An assessment of the potential cumulative noise impacts of the United Wambo Open Cut Coal Mine Project and the separate approved Wambo CHPP and underground operations was conducted in the *United Wambo Open Cut Coal Mine Project Environmental Impact Assessment* (Umwelt, 2016).

The Noise Review (Appendix I) included a review of the cumulative sound power level of the United Wambo Open Cut Coal Mine Project and Wambo (incorporating the Modification) during four indicative years (i.e. 2019, 2023, 2028 and 2033).

Table 6 presents a comparison of the cumulative sound power levels for the United Wambo Open Cut Coal Mine Project and the approved and modified Wambo operations.

Table 6
Comparison of the Cumulative United Wambo Open Cut Coal Mine Project and the Approved and Modified Wambo Total Sound Power Levels

Indicative Year	Sound Power Level (dBA re 1pW)	
	United Wambo Open Cut Coal Mine Project and Approved Wambo	United Wambo Open Cut Coal Mine Project and Modified Wambo
2019	142.6	142.9
2023	141.7	141.5
2028	140.9	140.8
2033	140.2	140.2

Source: Appendix I.

SLR (Appendix I) concluded that the Modification would have minimal potential to alter cumulative noise levels at the nearest residential receivers based on the review of estimated site sound power levels.

Road and Rail Traffic Noise

Other than an extension of duration, any potential road or rail traffic noise impacts would remain generally unaltered as a result of the Modification (Appendix I).

4.10.3 Mitigation Measures, Management and Monitoring

Noise mitigation and management measures, and monitoring for the existing Wambo operations are described in the Noise Management Plan (Section 4.10.1) and would continue to be implemented for the Modification.

Consistent with the commitments in the *Wambo Development Project Environmental Impact Statement* (WCPL, 2003), WCPL would implement noise mitigation on ventilation infrastructure to achieve compliance with the relevant noise criteria at nearby privately-owned receivers. This may involve installation of silencers on the fans and/or optimised outlet/louver orientation away from receivers.

WCPL would undertake an acoustical design review prior to the installation of a fan on the upcast ventilation shaft (Appendix I).

4.11 AIR QUALITY

The potential air quality impacts of Wambo were assessed by Holmes Air Sciences [HAS] in 2003 (HAS, 2003). The assessment considered the potential air quality emissions likely to be generated by Wambo and surrounding mining operations at potentially affected receptors against applicable assessment criteria.

An Air Quality and Greenhouse Gas Review for the South Wambo Underground Mine Modification was undertaken by Todoroski Air Sciences (Todoroski) (2016a) for the approved Wambo operations. The assessment considered the potential air quality emissions likely to be generated would not result in a significant impact.

An Air Quality and Greenhouse Gas Review for the Modification has been undertaken by Todoroski (2016b) and is presented in Appendix J.

4.11.1 Existing Environment

Air Quality Monitoring Program

An Air Quality Monitoring Program (WCPL, 2014c) for Wambo has been established. It details relevant air quality criteria, monitoring program, air quality management protocols (including air quality monitoring protocol and the complaint response protocol), mitigation and management measures, and reporting requirements.

Air quality management measures currently implemented at Wambo include (WCPL, 2014c):

- minimising disturbance areas;
- progressively rehabilitating disturbed land to reduce total disturbed area;
- revegetating topsoil stockpiles as new stockpiles are created;
- regular watering of haul roads (including four water truck fill points);
- implementing dust suppression measures (e.g. dust skirts, sprinklers) at drills, ROM coal and product coal stockpiles and the CHPP receival bin;
- implementing speed limits on roads to minimise dust generation, including reducing the speed limit in accordance with prevailing conditions;

- designing blast holes with stemming to provide optimum confinement of the blast charge;
- constraining blast operations to reduce potential impact on surrounding receivers (e.g. rescheduling blasts when wind is blowing towards immediate receivers); and
- modifying mining operations during unfavourable weather conditions to reduce dust generation.

Air quality monitoring conducted at Wambo includes dust deposition and dust concentrations (as total suspended particulate [TSP] and particulate matter 10 micrometers [µm] or less in diameter [PM_{10}]). The locations of the air quality monitoring sites are shown on Figure 7.

The annual average dust deposition results at all sites located outside WCPL-owned land were within the criterion in the Development Consent (DA 305-7-2003) (i.e. 4 grams per square metre per month [g/m^2/month]) between 2011 and 2015.

TSP concentrations are measured by high volume air samplers (HVASs) at four locations (Figure 7). Annual average TSP concentrations recorded at each site from January 2011 to December 2015 demonstrate compliance with the annual average TSP criterion in the Development Consent (DA 305-7-2003) (i.e. 90 micrograms per cubic metre [$\mu g/m^3$]) (Appendix J).

PM_{10} concentrations are measured by tapered element oscillating microbalances (TEOMs) at four locations (Figure 7). Annual average PM_{10} concentrations recorded at each site from January 2011 to September 2016 demonstrate compliance with the annual average PM_{10} criterion in the Development Consent (DA 305-7-2003) (i.e. 30 $\mu g/m^3$) (Appendix J).

Maximum 24-hour average PM_{10} concentrations above the criteria of 50 $\mu g/m^3$ have been recorded on occasions from 2011 to September 2016. The majority of these occurrences have been attributed to regional dust events or sources outside the influence of Wambo (Appendix J).

4.11.2 Potential Impacts

Components of the Modification that would potentially impact dust emissions from Wambo include (Appendix J):

- construction activities;
- operational activities; and
- transport of product coal.

Construction Activities

The total amount of dust generated from Modification construction activities is unlikely to be significant relative to the total amount of dust currently generated from the mining activities and other background sources. As such, any potential dust impacts related to construction activities would be unlikely to be discernible beyond the existing levels of dust in the area surrounding Wambo (Appendix J).

Given that construction activities would occur for a limited period, no significant or prolonged effect at any off-site receiver is predicted to arise as a result of construction activities (Appendix J).

Operational Activities

Todoroski (Appendix J) undertook a review of the overall TSP emissions from the approved and modified Wambo underground mine operations. Todoroski (Appendix J) determined that the overall emissions from Wambo, incorporating the Modification, would be lower than the maximum TSP emissions assessed by Todoroski (2016a) for the approved Wambo operations.

The estimated change in dust emissions arising from the Modification relative to the approved Wambo operations is unlikely to be discernible relative to the existing contribution to dust from Wambo (Appendix J).

An assessment of the potential cumulative air quality impacts of the United Wambo Open Cut Coal Mine Project and the separate approved Wambo CHPP and underground operations was conducted by Jacobs (2016).

Todoroski (Appendix J) undertook a review of the TSP emissions for the United Wambo Open Cut Coal Mine Project and Wambo (incorporating the Modification) during four indicative years (i.e. 2019, 2023, 2028 and 2033) and concluded the potential change in the dust levels due to the Modification at any receptor would be too small to be noticed or reasonably measurable.

Transport of Product Coal

Coal produced by the Modification would be transported off-site via rail (Section 3.4).

Studies have been undertaken to determine the effect of coal trains on dust emissions. The findings of these studies indicate that the potential for any adverse air quality impacts associated with coal dust generated during rail transport would be low and would not make any appreciable difference to air quality.

As the Modification is not seeking any increase in the daily or annual rate that product coal is transported from Wambo or any change to rail movements, there would be no change to the potential air quality impacts due to this activity.

4.11.3 Mitigation Measures, Management and Monitoring

The dust control measures and management practices currently implemented at Wambo (Section 4.11.1) would continue for the Modification, where relevant.

In addition, WCPL would continue to implement air quality monitoring and response protocols in accordance with the Air Quality Monitoring Program (WCPL, 2014c).

4.12 GREENHOUSE GAS EMISSIONS

4.12.1 Quantitative Assessment of Potential Greenhouse Gas Emissions

A quantitative review of Modification greenhouse gas emissions was undertaken by Todoroski (2016b) and is provided in Appendix J. A summary of the review is provided below.

National Greenhouse Accounts Factors

In accordance with the *National Greenhouse Accounts (NGA) Factors* (Department of the Environment and Energy, 2016), direct emissions are referred to as Scope 1 emissions, and indirect emissions are referred to as Scopes 2 and 3 emissions. The major sources of greenhouse gas emissions generated by the Modification would include:

- combustion of diesel during mining operations (Scope 1);
- fugitive emissions of gas within the coal seams (Scope 1);
- off-site generation of electricity consumed at Wambo (Scope 2); and
- combustion of product coal produced at Wambo by third parties (Scope 3).

Greenhouse Gas Emissions Estimation Methodology

Todoroski (Appendix J) estimated the greenhouse gas emissions of the Modification based on the maximum ROM coal production rate combined with estimates presented in the most recent National Greenhouse and Energy Reporting document for Wambo (Peabody, 2015). Additionally, fugitive emissions were estimated based on gas quantity and quality testing conducted for the Modification longwalls (GeoGas, 2016).

Todoroski (Appendix J) considers this approach to provide a reasonable 'worst case' approximation of potential greenhouse gas emissions and is considered conservative. It is also considered to be a better method of estimating greenhouse gas emissions at Wambo compared to adopting the generic emissions factors in the National Greenhouse Accounts Factors (Department of the Environment and Energy, 2016).

Modification Greenhouse Gas Emissions

Todoroski (Appendix J) predicted that the total scope 1 and 2 emissions for the modified South Bates Underground Mine would range from 0.01 to 0.28 million tonnes of carbon dioxide equivalent (Mt CO_2-e) per annum (Appendix J).

The estimated annual greenhouse gas emissions for Australia for the 2015 calendar year was 535.7 Mt CO_2-e (Department of the Environment, 2016). Therefore, the maximum annual contribution of greenhouse gas emissions for the Modification in comparison to the Australian greenhouse gas emissions, is conservatively estimated to be approximately 0.05%.

4.12.2 Greenhouse Gas Management Measures and Monitoring

WCPL implements a number of management measures to minimise, to the greatest extent practicable, greenhouse gas emissions from Wambo, including:

- Maximising energy efficiency as a key consideration in the development of the mine plan. For example, significant savings of greenhouse gas emissions (through increased energy efficiency) are achieved by mine planning decisions which minimise haul distances for coal and waste rock transport and therefore fuel use.
- Monitoring the consumption of fuel and regular maintenance of equipment and plant.

- Sealing completed longwall panels to reduce fugitive methane emissions.
- Real-time gas monitoring at ventilation shafts.
- Monitoring site electricity consumption and investigating ways to minimise it.

The greenhouse gas management measures and monitoring described above would continue for the Modification, where relevant.

4.13 SOCIO-ECONOMIC

4.13.1 Existing Environment

The population of the regional economy (i.e. Singleton, Muswellbrook, Dungog, Cessnock and Maitland LGAs) is approximately 177,000 (AnalytEcon, 2016).

Key industries in the region include mining, mining support services, power generation, agriculture, tourism and defence (AnalytEcon, 2016).

Consistent with the general downturn in the mining industry in Australia, the unemployment rate in the region has increased recently and exceeds the NSW unemployment rate (AnalytEcon, 2016).

WCPL contributes to the local economy by providing employment opportunities and supporting the local community through various community initiatives.

4.13.2 Potential Impacts

The Modification would allow the recovery of approximately 18 Mt of additional ROM coal (Section 3.1).

The existing Wambo underground mine workforce would continue to be employed for the Modification. At peak production, approximately 210 direct underground mine operational personnel (excluding support staff) would be employed and an estimated $44M per year in wages would be paid.

In addition to the first-round effect described above, the Modification is expected to give rise to incremental flow-on impacts on the local economy associated with additional disposable income and direct benefits to businesses and their employees in the region associated with additional operating expenditures.

The Modification is not expected to have an adverse effect on other local industries as it would provide for the continuation of an existing mining operation utilising an existing workforce.

In addition, the Modification is not expected to have an adverse effect on health and education services, housing, and other services in the region as it would provide for the continuation of an existing mining operation utilising an existing workforce.

4.13.3 Mitigation Measures

WCPL would make continued contributions to the local community through ongoing support for community initiatives.

No other specific socio-economic mitigation measures are proposed.

4.14 HAZARD AND RISK

A review of potential incidents and hazards identified for the Modification is described in Section 4.14.1. Proposed preventative and control measures to address potential hazards are discussed in Section 4.14.2.

4.14.1 Hazard Identification and Risk Assessment

A preliminary hazard analysis (PHA) was conducted in 2003 to assess the potential hazards and risk associated with Wambo. The PHA comprises a qualitative assessment of risk to the public, property and the environment associated with the development and operations of Wambo (Resource Strategies, 2003). The PHA was conducted in accordance with the general principles of risk evaluation and assessment provided in *Multi-Level Risk Assessment* (NSW Department of Urban Affairs and Planning, 1999).

The PHA identified no incremental risks posing significant off-site impacts (Resource Strategies, 2003).

It is considered that the Modification would not change the existing potential risk areas identified in the PHA conducted for Wambo as the proposed activities associated with the Modification (e.g. underground mining operations) are consistent with the activities assessed in the PHA. However, environmental management plans and monitoring programs would be reviewed, and if necessary, revised to include the Modification and manage any associated environmental risks.

4.14.2 Hazard Prevention and Mitigation Measures

A summary of the potential risks identified by the PHA (Resource Strategies, 2003), preventative measures proposed by the PHA and the equivalent contemporary management plan which outlines the relevant mitigation measures are summarised in Table 7. It is expected that these management plans would continue to be implemented for the Modification.

4.15 VISUAL AMENITY

4.15.1 Existing Environment

There are a number of approved open cut and underground coal mining operations in the vicinity of Wambo (Section 4.3.1), including Hunter Valley Operations, United Collieries and the Mt Thorley Warkworth operations.

Views of Wambo open cut operations and major infrastructure are available from some private dwelling, but are generally restricted due to intervening topography and existing vegetation.

Wambo can be seen from some short sections of the Golden Highway (Jerrys Plains Road). However, there is significant existing vegetation along the Golden Highway which obscures views of the mine along the majority of the road.

4.15.2 Potential Impacts

The Modification would result in only minor changes to the visual landscape. In the context of the existing visual landscape (i.e. a number of open cut and underground coal mining operations), the incremental impact associated with the Modification would be negligible.

Notwithstanding, the potential impacts of the Modification have been considered and are discussed below.

Ventilation Systems

The Modification would require construction and operation of two ventilation shafts to support the operation of the Modification longwalls. One of these ventilation shafts would be used as upcast shaft (including installation of a fan).

The ventilation infrastructure would not be visible from any public road or private dwelling given the proximity to the open cut operations, intervening topography and vegetation and the distance of the ventilation infrastructure from any sensitive locations.

Night-lighting at the ventilation infrastructure is not expected to materially increase night-lighting impacts beyond those of the approved operations, given the proximity of the proposed infrastructure to the open cut operations.

Open Cut Operations

The Modification would not alter the approved open cut mining methods, open cut maximum production rates, open cut mine fleet or waste rock management practices.

Subsidence Effects

As described in Section 4.2, the type and magnitude of predicted subsidence impacts for the Modification longwalls would be similar to or less than those experienced elsewhere above the approved mining areas. Subsidence impacts from the Modification longwalls would be restricted to WCPL-owned land.

Given the undulating terrain in the vicinity of Wambo, the impact of subsidence on the landscape and visual amenity would be negligible.

4.15.3 Mitigation Measures, Management and Monitoring

Given the Modification is predicted to have negligible visual amenity impact, no specific management or mitigation measures are considered to be warranted for the Modification.

Table 7
Risk Identification Table

Project Component	Incidence Type	Scenario	Existing or Proposed Preventative Measures	Risk	Contemporary Management Plan
Transport to Site (Explosives, Fuel, Chemicals and General Goods)	Spill Fire Explosion	Poor maintenance, poor design, collision or human error leading to off-site impacts	• Contractors licensed and operate in accordance with Australian Standards and NSW Legislation. • WCPL Contractor Management Plan. • Radio/mobile telephone communications and on-board fire fighting equipment.	Low	Safety Management System Bushfire Management Plan Pollution Incident Response Management Plan Shotfire & Explosives Management Plan Contractor Management Plan
	Theft	Malicious act resulting in off-site impacts			
On-site Storage (Fuels, Chemicals, Explosives and Water)	Leak/Spill	Failed tank or pipe leading to off-site impacts including chemical or fuel contamination	• Design of structures/tanks/pipes to relevant standards. • Bunding of storage facilities. • Regular inspections and maintenance where required.	Low	Safety Management System Pollution Incident Response Management Plan Shotfire & Explosives Management Plan Erosion and Sediment Control Plan
	Spill	Failed dam leading to off-site contamination	• Design of dam structures to relevant standards. • Regular inspections and maintenance where required.		
	Spill	Exceeded dam capacity leading to an overflow event	• Inspections and intervention where required. • Design of dam structures to relevant standards and required containment capacities.		
General Operations (Construction, ground preparation, mine waste rock emplacements, waste excavation, rehabilitation, CHPP, coal transport and tailings)	Spill	Containment structure not adequately built or maintained leading to off-site discharge of silt or saline water	• Design of dam structures to relevant standards and required containment capacities. • Supervision during construction. • Inspection of containment structures and pipes. • Maintenance or intervention where required.	Low	Safety Management System Pollution Incident Response Management Plan Erosion and Sediment Control Plan
	Spill	Containment structure not adequately built or maintained leading to off-site discharge of diesel or chemicals	• Design to appropriate standard. • Supervision during construction. • Regular maintenance. • Inspection of containment structures and pipes.		

Table 7 (Continued)
Risk Identification Table

Project Component	Incidence Type	Scenario	Existing or Proposed Preventative Measures	Risk	Contemporary Management Plan
General Operations (Construction, ground preparation, mine waste rock emplacements, waste excavation, rehabilitation, CHPP, coal transport and tailings) (Cont.)	Fire	Mobile plant, powerlines, fixed plant, human action or spontaneous combustion leading to off-site fire related impacts	• Expansion of existing operating procedures to manage Project related activities. • Regular maintenance of mobile plant and fire fighting equipment. • Development and maintenance of appropriate fire breaks. • Review and implementation of the existing Bushfire Management Plan in consultation with the Rural Fire Service. • Review and implementation of the existing Emergency Response Plan. • Regular inspections of mobile and fixed plant, coal stockpiles, fire fighting equipment and fire breaks. • Review and implementation of the existing Spontaneous Combustion Management Plan. • Training and competency assessment of plant operators.	Low	Safety Management System Bushfire Management Plan Emergency Response Plan Spontaneous Combustion Management Plan
	Unplanned movement to off-site	Waste rock, mobile plant or equipment parts moved off-site in an uncontrolled manner	• Planning of activities to ensure adequate control and buffer distances. • Supervision by appropriately qualified persons. • Development of appropriate operating procedures. • Training and competency assessment of plant operators.	Low	Safety Management System Mining Operations Plan
General Operations (Drill and Blast)	Unplanned movement to off-site	Blasting leading to flyrock damaging property/persons off-site	• Planning and design of blast events to ensure adequate control and buffer distances. • Operational procedures - blasting undertaken by trained personnel in compliance with Australian Standards. • Where blasting occurs in close proximity to the Golden Highway temporary road closures would occur in accordance with Roads and Maritime Services (RMS) requirements and a Traffic Management Plan. Following blasting, the road would be checked for debris prior to re-opening.	Low	Safety Management System Blast Management Plan

Table 7 (Continued)
Risk Identification Table

Project Component	Incidence Type	Scenario	Existing or Proposed Preventative Measures	Risk	Contemporary Management Plan
Open Cut (Mine Waste Rock Emplacements)	Unplanned movement to off-site	Slump or collapse of mine waste rock emplacement batter leading to off-site impacts	• Mine waste rock emplacement batters designed to appropriate standards. • Establishment of appropriate buffer distances. • Regular inspections and surveys of mine waste rock emplacement batters during their development.	Low	Safety Management System Mining Operations Plan
Underground (Secondary Extraction)	Unexpected rapid subsidence	Unexpected rapid subsidence leading to off-site impact	• Compliance with the requirements of the *Work Health and Safety (Mines and Petroleum Sites) Act, 2013*. • Mine planning and design to control subsidence extent and magnitude.	Low	Safety Management System Relevant Extraction Plan, including the Subsidence Monitoring Plan
CHPP (Tailings)	Leaks/Spills	Pipeline failure leads to off-site release of tailings	• The pipeline systems designed to appropriate standards. • Regular inspections and maintenance as required. • Bunding of portions of the pipeline that are outside of the catchment of containment structures of open cuts. Bunds to be designed to divert tailings to a containment structure.	Low	Safety Management System Pollution Incident Response Management Plan
Transport On-site (Explosives, Fuel, Chemicals and General Goods)	Spill Fire Explosion	Poor maintenance, poor design, collision or human error leading to off-site impacts	• Contractors licensed and operate in accordance with Australian Standards and NSW Legislation. • WCPL Contractor Management Plan. • Site policies, management plans and procedures. • Containment structures. • Operator training.	Low	Safety Management System Pollution Incident Response Management Plan Shotfire & Explosives Management Plan Contractor Management Plan
Transport Off-site (Rail Loop Construction and Rail Loop Operations)	Leaks/Spills	Sediment control structure failure leads to discharge to watercourse	• Sediment control structures to be designed to relevant standards. • Development of construction management plans (including an integrated Erosion and Sediment Control Plan) in consultation with the relevant authorities.	Low	Safety Management System Pollution Incident Response Management Plan Erosion and Sediment Control Plan

Table 7 (Continued)
Risk Identification Table

Project Component	Incidence Type	Scenario	Existing or Proposed Preventative Measures	Risk	Contemporary Management Plan
Transport Off-site (Rail Loop Construction and Rail Loop Operations) (Cont.)	Vehicle Accident	Vehicle accident on a public road due to construction activities associated with the rail loop	• Development of a Traffic Management Plan in consultation with the relevant authorities. • Management of traffic during construction of Golden Highway underpass in accordance with RMS guidelines (including the diversion of traffic and speed limits).	Low	Safety Management System Traffic Management Plan
	Leaks/Spills	Overloading, derailment or collision leading to coal or fuel spillage offsite	• Development of operating procedures and training to minimise the potential for overloading. • Regular inspections of train loading activities and rail infrastructure and intervention/maintenance where required. • WCPL Contractor Management Plan. • Appropriately qualified engineers to design the rail infrastructure and signalling systems.	Low	Safety Management System Pollution Incident Response Management Plan Contractor Management Plan

Source: After Resource Strategies (2003).

5 STATUTORY CONTEXT

5.1 APPLICABILITY OF SECTION 75W OF ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

Wambo was approved under Part 4 of the EP&A Act in February 2004 (Development Consent DA 305-7-2003 – Attachment 1).

Clause 12 of Schedule 6A of the EP&A Act provides that section 75W of Part 3A of the EP&A Act continues to apply to modifications of development consents referred to in clause 8J(8) of the *Environmental Planning and Assessment Regulation, 2000* (EP&A Regulation) following the repeal of Part 3A.

Wambo was approved under Part 4 of the EP&A Act in February 2004 by development consent under Division 4 of Part 4 of the Act (relating to State significant development). Therefore the Development Consent (DA 305-7-2003) is a development consent that falls within clause 8J(8)(c) of the EP&A Regulation. That is, section 75W of the EP&A Act continues to apply to modifications to the Wambo Development Consent (DA 305-7-2003), notwithstanding its repeal.[3]

Approval for the Modification will be sought as a modification to the Development Consent (DA 305-7-2003) under section 75W of the EP&A Act. Section 75W of the EP&A Act relevantly provides:

> **75W Modification of Minister's approval**
>
> *(1) In this section:*
>
> ***Minister's approval** means an approval to carry out a project under this Part, and includes an approval of a concept plan.*
>
> ***modification of approval** means changing the terms of a Minister's approval, including:*
>
> *(a) revoking or varying a condition of the approval or imposing an additional condition of the approval, and*
>
> *(b) changing the terms of any determination made by the Minister under Division 3 in connection with the approval.*
>
> *(2) The proponent may request the Minister to modify the Minister's approval for a project. The Minister's approval for a modification is not required if the project as modified will be consistent with the existing approval under this Part.*
>
> *(3) The request for the Minister's approval is to be lodged with the Director-General. The Director-General may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister.*
>
> *(4) The Minister may modify the approval (with or without conditions) or disapprove of the modification.*
>
> *…*

The Secretary issued revised SEARs for the Modification on 16 February 2017.

This EA has been prepared in accordance with the SEARs issued pursuant to section 75W(3) of the EP&A Act (Attachment 2).

5.2 GENERAL STATUTORY REQUIREMENTS

The following environmental planning instruments may be potentially relevant to Wambo:

- *Singleton Local Environmental Plan 2013* (Singleton LEP);
- Mining SEPP;
- *State Environmental Planning Policy* (*Infrastructure) 2007* (Infrastructure SEPP);
- *State Environmental Planning Policy No 33 – Hazardous and Offensive Development* (SEPP 33);
- SEPP 44; and
- *State Environmental Planning Policy No 55 – Remediation of Land* (SEPP 55).

These environmental planning instruments are discussed further in Attachment 4. The Modification is not inconsistent with these environmental planning instruments.

NSW Government Policy

In September 2012, the NSW Government released the following policy documents potentially relevant to the Modification:

- AIP (NSW Government, 2012b); and
- *Strategic Regional Land Use Policy* (NSW Government, 2012c).

The relevance of these policy documents to the Modification are discussed further in Attachment 4.

[3] Part 3A of the EP&A Act (as in force immediately before its repeal) continues to apply for Wambo. The description and quotations of relevant references to clauses of Part 3A in this document are as if Part 3A of the EP&A Act is still in force.

The Framework for Biodiversity Assessment, the NSW Biodiversity Offset Policy for Major Projects and the Voluntary Land Acquisition and Mitigation Policy apply to State Significant Development and do not apply to this Modification under section 75W of the EP&A Act.

Commonwealth Environment Protection and Biodiversity Conservation Act, 1999

The objective of the EPBC Act is to provide for the protection of those aspects of the environment that are of National environmental significance. Proposals that are likely to have a significant impact on a matter of environmental significance are defined as a controlled action under the EPBC Act.

Components of the Modification were referred to the Federal Minister for the Environment and Energy under the EPBC Act on 15 November 2016 as the Action (EPBC 2016/7816) (Attachment 5).

A delegate of the Federal Minister determined on 23 December 2016 that the proposed Action is a 'controlled action' for the purposes of the EPBC Act due to potential impacts on the following controlling provisions under Part 3 of Chapter 2 of the EPBC Act:

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

The delegate of the Federal Minister also determined on 23 December 2016 that the proposed action is to be assessed under the assessment bilateral agreement with the NSW Government.

The Modification will be assessed in accordance with the Bilateral Agreement and will require approval under both the EP&A Act and the EPBC Act.

Consideration of the assessment requirements relevant to the EPBC Act is provided in Attachment 5.

Other Statutory Requirements

In addition to the EP&A Act, the following NSW Acts may be potentially relevant to Wambo:

- *Aboriginal Land Rights Act, 1983*;
- *Contaminated Land Management Act, 1997*;
- *Crown Lands Act, 1989*;
- *Dams Safety Act, 1978*;
- *Dams Safety Act, 2015*;
- *Dangerous Goods (Road and Rail Transport) Act, 2008*;
- *Explosives Act, 2003*;
- *Fisheries Management Act, 1994*;
- *Heritage Act, 1977*;
- *Mining Act, 1992*;
- NPW Act;
- *Native Vegetation Act, 2003*;
- *Noxious Weeds Act, 1993*;
- *Protection of the Environment Operations Act, 1997* (PoEO Act);
- *Roads Act, 1993*;
- TSC Act;
- *Water Act, 1912*;
- *Water Management Act, 2000*; and
- *Work Health and Safety (Mines and Petroleum Sites) Act, 2013*.

The following approvals would be obtained before the Modification commences:

- modification of the Development Consent (DA 305-7-2003) issued under the EP&A Act, and any relevant secondary approvals under the Development Consent conditions (e.g. management plans);
- approval of the proposed Action (EPBC 2016/7816) under sections 130(1) and 133 of the EPBC Act, and any relevant secondary approvals under the approval conditions (e.g. management plans) (for those portions of the Modification included in the proposed Action); and
- relevant water access licences, and water supply works and use approvals under the NSW *Water Management Act, 2000* where applicable.

Other approvals required to support the Modification include, but are not limited to:

- a mining lease under the *Mining Act, 1992* prior to any mining outside the existing WCPL mining tenements (i.e. CL 397, ML 1572 and ML 1594);
- variation of the premises of EPL 529 under the PoEO Act;

- revisions to the Mining Operations Plan prepared under the conditions of the mining leases;
- an Aboriginal Heritage Impact Permit under section 90 of the NPW Act (for disturbance outside the area covered by Consent 2222); and
- approval of Extraction Plans prior to the commencement of second workings in accordance with Condition 22C, Schedule 4 of the Development Consent (DA-305-7-2003).

5.3 CONDITIONS AND PLANS THAT REQUIRE REVISION

5.3.1 Development Consent Conditions

Table 8 summarises the modifications to the Development Consent proposed as part of this Modification.

5.3.2 Development Consent Land

As noted in Table 8, the Modification necessitates an extension to the land covered by the Development Consent (DA 305-7-2003). Figure 16 shows the extent of the Development Application Area for DA 305-7-2003 and the proposed extension to incorporate the Modification.

Attachment 3 includes a revised Schedule of Land for Wambo incorporating the additional parcels of land for the Modification.

5.3.3 Management Plans

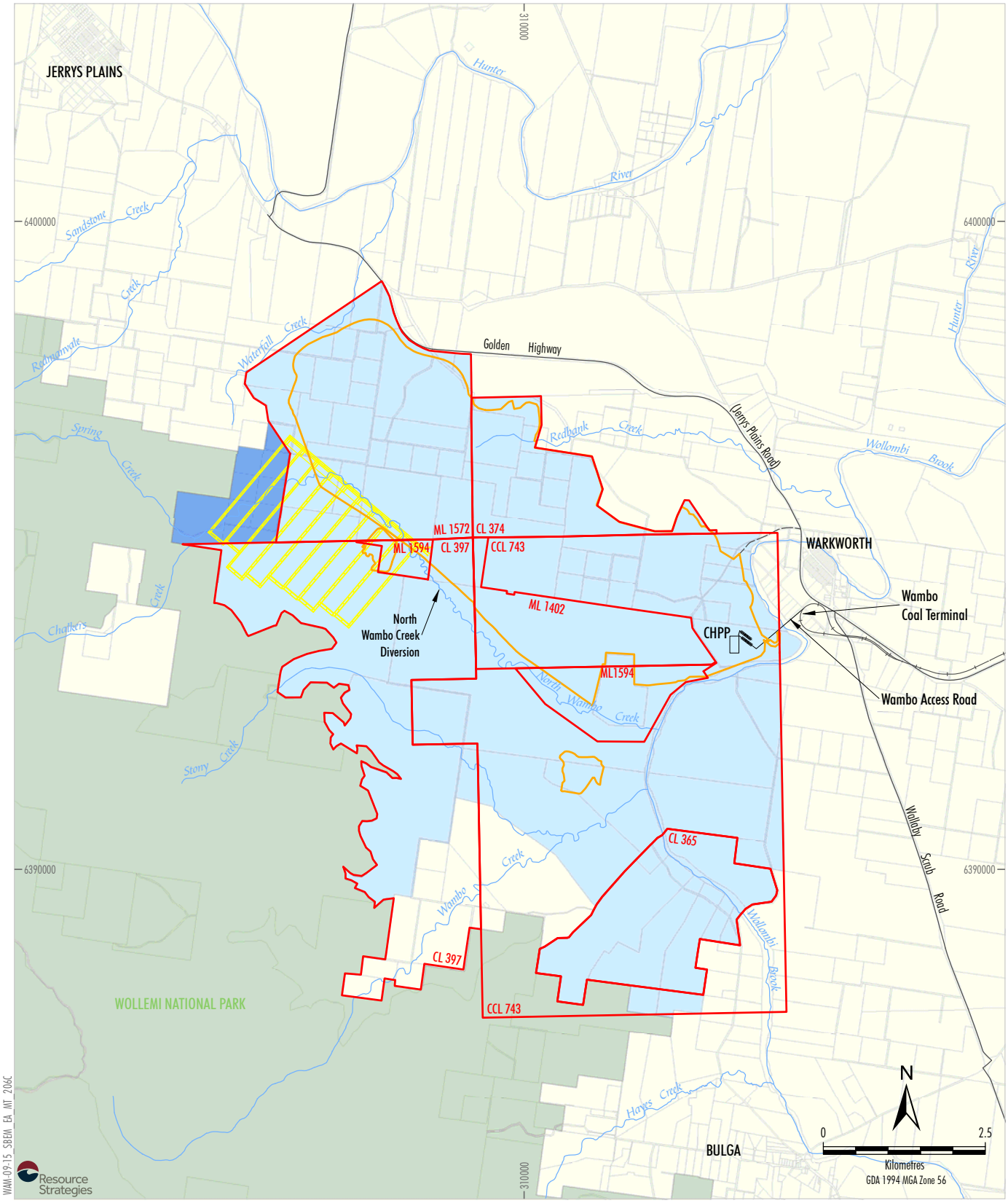
The following management plans would be reviewed, and if necessary, revised to include the Modification (subject to approval of the Modification):

- Surface Water Monitoring Program (WCPL, 2015e).
- Erosion and Sediment Control Plan (WCPL, 2015f).
- Surface and Groundwater Response Plan (WCPL, 2015g).

An Extraction Plan would be prepared for the Modification longwalls prior to the commencement of second workings in accordance with Condition 22C, Schedule 4 of the Development Consent (DA 305-7-2003).

Table 8
Proposed Modifications to the Development Consent

Proposed Modification	Justification
Revise dot point 5 in the 'Proposed Development' in Schedule 1 as follows: • ~~an extension to the existing Wollemi Underground Mine Box Cut (within the limits of the development open cut mining area) to provide direct access for three underground longwall panels in the Whybrow Seam;~~ longwall mining and development of associated roadways in the Whybrow Seam via the open cut highwall;	The Modification proposes additional longwall panels in the Whybrow Seam.
Revise Condition 2, Schedule 3 as follows: 2. The Applicant shall carry out the development generally in accordance with the: … (r) the modification application DA305-7-2003-MOD17 and accompanying document entitled 'South Bates Extension Modification Environmental Assessment'.	Inclusion of reference to this Modification application.
Revise Condition 6, Schedule 3 as follows: 6. The Applicant may carry out mining operations at the Wambo Mining Complex until ~~1 March 2032~~ 31 December 2039.	The Modification involves an extension to the life of mine of 7 years (Table 1).
Revise Condition 4, Schedule 3 to replace the footnote reference 'a' in the second row, third column of Table 3 with the footnote reference 'b'.	The short term impact assessment criterion for particulate matter < 10 µm (PM_{10}) over a 24 hour averaging period should be based on incremental impact (i.e. incremental increase in concentrations due to the development on its own) consistent with current NSW Government Policy (for example, the Voluntary Land Acquisition and Mitigation Policy).
Revise Condition 51, Schedule 3 as follows: 51. Within 12 months of ~~the commencement of this consent~~ entering into a conservation agreement over Remnant Woodland Enhancement Area A referred to in condition 41 above, or as otherwise agreed by the Secretary, the Applicant must develop a ~~conservation agreement (as part of the Deed of Agreement with the Minister referred to in condition 41 above)~~ protocol for the management of Aboriginal cultural heritage in Remnant Woodland Enhancement Area A in consultation with the Aboriginal Communities and OEH.	This condition contains an administrative error as it refers to a Deed of Agreement with the Minister that is no longer required under Condition 41, Schedule 3. Although conservation agreements pursuant to section 69B of the *National Parks and Wildlife Act, 1974* are prepared in consultation with OEH, these agreements are not generally subject to consultation with third parties. It is proposed that a separate protocol (to form part of WCPL's environmental management system) is developed to meet the intent of this condition.
Replace Appendix 1 with the Schedule of Land provided in Attachment 3 of this EA.	As described in Section 5.3.2, the Modification includes an extension to the land the subject of the Development Consent.
Replace Appendix 5 with a figure showing the Modified Wambo layout.	The Modification proposes to modify the approved underground mine layout.



LEGEND

- Mining and Coal Lease Boundary
- Existing/Approved Surface Development Area
- Modified Underground Development
- Land to which DA 305-7-2003 Applies
- Proposed Extension to the Development Application Area

Source: Department of Lands (July 2009); WCPL (2016); WCPL (2003)

Peabody ENERGY

WAMBO COAL MINE

Development Application Area

Figure 16

6 CONCLUSION AND MODIFICATION JUSTIFICATION

6.1 SUMMARY OF ENVIRONMENTAL MANAGEMENT AND MONITORING MEASURES

This section provides a consolidated summary of all proposed environmental commitments for the Modification, as well as management and monitoring measures.

6.1.1 Modification Specific Commitments

Gas Management Infrastructure Siting

The specific locations of gas management infrastructure would be defined as a component of future detailed mine planning and engineering studies over the life of the modified South Bates Underground Mine.

Surface disturbance for gas management infrastructure would be restricted to grassland areas that are not threatened ecological communities.

Additional ecology and heritage surveys of potential gas management infrastructure locations would be conducted. If present, any threatened flora species or populations and/or hollow bearing trees would be avoided. If any Aboriginal cultural heritage sites are identified, consideration would be given to relocating the works so as to avoid direct impacts.

The location of gas management infrastructure would be outlined in the relevant Extraction Plan and associated Mining Operations Plan.

Management of Aboriginal Heritage

WCPL would apply for an additional AHIP to cover the remaining portion of the Modification area not covered by the existing AHIPs.

The rock shelter site that may be possibly impacted by subsidence would be monitored after undermining has occurred to assess and document any impacts. This would form part of the relevant Extraction Plan monitoring program.

Systematic heritage survey of the remaining 34 ha not subject to survey sampling for the ACHA would be conducted prior to secondary extraction.

6.1.2 Environmental Management and Monitoring

Section 4 outlines proposed environmental mitigation, management and monitoring measures.

WCPL would continue to implement the environmental monitoring and management system described in Section 2.15, with augmentations identified in Section 5.3.3.

In addition, environmental management, monitoring and reporting will be conducted in accordance with the conditions of the Development Consent (DA 305-7-2003), which may be updated as a result of approval of the Modification.

6.2 MODIFICATION JUSTIFICATION

The Modification area is within existing mining and exploration tenements held by WCPL. In addition, the land within the Modification area is owned by WCPL. WCPL considers the proposed Wambo site is suitable for the Modification.

The Modification would enable the continued use of existing Wambo infrastructure and workforce and would promote the more efficient and economic recovery of coal resources.

The Modification longwalls would not be viable as a standalone resource and may not be recovered in the future without the use of the existing South Bates Underground Mine infrastructure. The Modification would result in the recovery of approximately 18 Mt of ROM coal.

This EA has demonstrated that the Modification can be implemented with limited additional biophysical and environmental impacts above those already approved at Wambo, with the implementation of the mitigation measures described in Section 6.1. The Modification would result in substantial economic and social benefits associated with allowing continuity of the underground operations (Section 4.13) and the extension to the life of the open cut operations.

6.2.1 Consideration of Alternatives

Alternatives to the proposed location, mining methods and scale of the Modification have been considered by WCPL in the development of the modified South Bates Underground Mine design. An overview of alternatives to the Modification considered by WCPL is provided below.

Modification Location

Mine Layout

The layout of the Modification layout was identified by:

- the presence of coal seams able to be economically mined in the vicinity of Wambo, including consideration of recent geological knowledge of the area;
- the ability to achieve WCPL's existing subsidence impact performance measures for significant natural and built features (in particular the Wollemi National Park escarpment);
- the presence of geological constraints;
- the constraints of the nearby open cut mining areas; and
- mining and exploration tenements held by WCPL;

Surface Development Areas

The Modification has been designed to maximise the use of existing infrastructure at the South Bates Underground Mine, and more broadly at the Wambo complex.

The proposed ventilation infrastructure would be constructed within the existing approved surface development area, minimising the requirements for additional surface disturbance.

Gas Drainage

Surface gas drainage and underground in-seam gas drainage may be required for the modified South Bates Underground Mine to reduce the gas content in the coal seams to levels suitable and safe for development and longwall operations.

WCPL would implement the gas management infrastructure siting process outlined in Section 3.1 for any surface drainage, which would involve consideration being given to relocating the works so as to avoid direct impacts.

Mining Operations

Mining Method

The seam thickness and depth of the coal seams in the Modification area are more amenable to underground mining methods than open cut mining methods. The approved longwall mining method was retained over other mining methods due to its superior productivity and suitability to extract the resource.

Target Coal Seams

The Whybrow Seam proposed to be mined as part of the Modification is currently mined at Wambo in the approved South Bates Underground Mine. The Whybrow Seam produces high quality thermal coal that meets the specification's of WCPL's customers.

Extent and Scale

Resource definition and mine planning indicate that the Modification is of a sufficient extent and scale to be an economic extension to the existing South Bates Underground Mine.

Production from the modified South Bates Underground Mine would be within the approved maximum underground mining rate of 9.75 Mtpa.

As described in Section 5.1, the Modification is within the scope of a modification to the Development Consent (DA 305-7-2003) under section 75W of the EP&A Act.

No Modification

Consideration of the potential consequences of the Modification not proceeding is provided in Section 6.2.5.

6.2.2 Ecologically Sustainable Development Considerations

Background

As described in Section 5, components of the Modification will require approval under both the EP&A Act and the EPBC Act.

In deciding whether or not to approve the proposed Action, the Commonwealth Minister must take into account the principles of ecologically sustainable development (ESD) pursuant to section 136(2) of the EPBC Act. The relevant definition of the principles of ESD is provided in section 3A of the EPBC Act.

The objects of the EP&A Act also require encouragement of ESD. Section 6(2) of the NSW *Protection of the Environment Administration Act, 1991* provides a definition of ESD.

The principles of ESD as outlined in section 3A of the EPBC Act and clause 7(4) of Schedule 2 of the EP&A Regulation are presented and compared in Table 9.

Table 9
Principles of Ecologically Sustainable Development – EPBC Act and EP&A Regulation

Section 3A of the EPBC Act	Clause 7(4) of Schedule 2 of the EP&A Regulation
(a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;	-
(b) 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;	*(a) 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. In the application of the precautionary principle, public and private decisions should be guided by:* *(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and* *(ii) an assessment of the risk-weighted consequences of various options,*
(c) the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;	*(b) 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,*
(d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;	*(c) conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*
(e) improved valuation, pricing and incentive mechanisms should be promoted.	*(d) improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:* *(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,* *(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,* *(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

The design, planning and assessment of the Modification have been carried out applying the principles of ESD, through:

- incorporation of risk assessment and analysis at various stages in the Modification pre-feasibility assessment and design, environmental assessment and decision-making;
- adoption of high standards for environmental and occupational health and safety performance;
- consultation with regulatory and community stakeholders;
- assessment of potential greenhouse gas emissions associated with the Modification;
- optimisation of the economic benefits to the community arising from the development of the Modification; and
- taking account of biophysical considerations in the design, including the principles of ESD as defined in section 3A of the EPBC Act and clause 7(4) of Schedule 2 of the EP&A Regulation.

In addition, it can be demonstrated that the Modification can be undertaken in accordance with ESD principles through the application of measures to avoid, mitigate and offset the potential environmental impacts of the Modification, and adaptive management would be implemented.

The following sub-sections describe the consideration and application of the principles of ESD to the Modification.

Precautionary Principle

Environmental assessment involves predicting what the environmental outcomes of a development are likely to be. The precautionary principle reinforces the need to take risk and uncertainty into account, especially in relation to threats of irreversible environmental damage.

An Environmental Risk Assessment (Appendix M) and review of the previous PHA (Section 4.14) were conducted to identify any incremental risks associated with the Modification and to develop appropriate mitigation measures and strategies.

The Environmental Risk Assessment (Appendix M) considers potential environmental impacts associated with the Modification, including long-term effects. In addition, long-term risks are considered by the specialist studies conducted in support of this EA (Section 1.4). Findings of these specialist assessments are presented in Section 4 and relevant appendices.

Measures designed to avoid, mitigate and offset potential environmental impacts arising from the Modification are also described in Sections 4 and 6.1.

The specialist assessments, Environmental Risk Assessment and review of the PHA have evaluated the potential for harm to the environment associated with the Modification.

Assessment of potential short, medium and long-term impacts of the Modification have been carried out during the preparation of this EA on aspects of (but not limited to) subsidence, groundwater and surface water, ecology, Aboriginal and historic heritage, noise, air quality (including greenhouse gas emissions) and agricultural land uses.

Minimal uncertainty regarding the information used in these specialist assessments is expected given:

- the period of operational experience and number of site-based surveys and assessments conducted at Wambo to date;
- the comprehensive nature of the assessments; and
- the consultation process conducted with key stakeholders (Section 1.3).

A range of measures have been adopted as components of the current Wambo operations and the Modification to minimise the potential for serious and/or irreversible damage to the environment, including physical controls (e.g. physical offsets of longwalls from the Wollemi National Park escarpment) and operational controls (e.g. the Vegetation Clearance Protocol) and the development of environmental management and monitoring programs (Section 4). Where residual risks are identified, contingency controls have also been considered (Section 4).

Wambo would continue to achieve the subsidence impact performance measures in the Development Consent through an adaptive management approach as part of the Extraction Plan process.

The implementation of an adaptive management approach is consistent with the precautionary principle as described by Chief Justice Preston in *Newcastle & Hunter Valley Speleological Society Inc v Upper Hunter Shire Council and Stoneco Pty Limited* [2010] NSW Land and Environment Court 48 at [184]:

> *…In adaptive management the goal to be achieved is set, so there is no uncertainty as to the outcome and conditions requiring adaptive management do not lack certainty, but rather they establish a regime which would permit changes, within defined parameters, to the way the outcome is achieved.*

Social Equity

Social equity is defined by inter-generational and intra-generational equity. Inter-generational equity is the concept that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations, while intra-generational equity is applied within the same generation.

The principles of social equity are addressed through:

- enabling the continued use of existing Wambo infrastructure and workforce;
- implementation of management measures in relation to the potential impacts of the Modification on water resources, heritage, land resources, agriculture, noise and blasting, air quality, ecology, hazards and risks and greenhouse gas emissions (Section 4);
- implementation of environmental management and monitoring programs (Section 4) to minimise potential environmental impacts (which include environmental management and monitoring programs covering the life of Wambo);
- design of the Modification to maintain the biodiversity values of the region in the medium to long-term with the ongoing implementation of WCPL's flora and fauna management program (Section 4.8); and
- continued contributions by WCPL to the local community through ongoing support for community initiatives.

The Modification would benefit current and future generations through the maintenance of employment at Wambo. It would also maintain the current level of stimulus to local and regional economies and provide NSW export earnings and royalties, thus contributing to future generations through social welfare, amenity and infrastructure.

The current Wambo operations and the Modification would incorporate a range of physical controls (e.g. physical offsets of longwalls from the Wollemi National Park escarpment) and operational controls (e.g. the Vegetation Clearance Protocol), and environmental management and mitigation measures to minimise potential impacts on the environment and the costs of these measures would be met by WCPL.

Conservation of Biological Diversity and Ecological Integrity

Biological diversity or 'biodiversity' is considered to be the number, relative abundance, and genetic diversity of organisms from all habitats (including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part) and includes diversity within species and between species as well as diversity of ecosystems (Lindenmayer and Burgman, 2005).

The assessments in Sections 4.8 and 4.9 (and Appendices D and E) describe the potential impacts of the Modification on local and regional ecology.

In accordance with ESD principles, the Modification addresses the conservation of biodiversity and ecological integrity by proposing an environmental management framework designed to conserve ecological values, where practicable, after consideration of potential Modification impacts.

A range of impact avoidance and mitigation measures would be implemented for the Modification to maintain or improve the biodiversity values of the surrounding region in the medium to long-term, as described in Sections 4.8 and 4.9.

Valuation

One of the common broad underlying goals or concepts of sustainability is economic efficiency, including improved valuation of the environment. Resources should be carefully managed to maximise the welfare of society, both now and for future generations.

In the past, some natural resources have been misconstrued as being free or underpriced, leading to their wasteful use and consequent degradation. Consideration of economic efficiency, with improved valuation of the environment, aims to overcome the underpricing of natural resources and has the effect of integrating economic and environmental considerations in decision making, as required by ESD.

While historically, environmental costs have been considered to be external to project development costs, improved valuation and pricing methods attempt to internalise environmental costs and include them within project costing.

Wherever possible, direct environmental effects of the Modification are internalised through the adoption and funding of mitigation measures by WCPL to mitigate potential environmental impacts.

6.2.3 Consideration of the Modification against the Objects of the Environmental Planning and Assessment Act, 1979

Section 5 of the EP&A Act describes the objects of the EP&A Act as follows:

(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

(ii) the promotion and co-ordination of the orderly and economic use and development of land,

(iii) the protection, provision and co-ordination of communication and utility services,

(iv) the provision of land for public purposes,

(v) the provision and co-ordination of community services and facilities, and

(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and

(vii) ecologically sustainable development, and

(viii) the provision and maintenance of affordable housing, and

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

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

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

- incorporates:
  - measures for the management and conservation of natural and artificial resources including water, agricultural land and natural areas (Section 4);
  - development of the State's mineral resources (i.e. coal resources) more economically and efficiently by using existing mine infrastructure;
  - continued implementation of measures to minimise potential amenity impacts associated with noise, blasting, air quality and visual impacts on surrounding land uses (Section 4);
  - maintenance of employment at Wambo and other socio-economic benefits to the community; and
  - an extension of the life of Wambo for a further 7 years and the economic use and development of land;
- would support the ongoing provision of community services and facilities through significant contributions to State royalties, State taxes and Commonwealth tax revenue;
- incorporates a range of measures for the protection of the environment, including the protection of native plants and animals, threatened species, and their habitats (Sections 4.8 and 4.9);
- incorporates relevant ESD considerations (Section 6.2.2);
- is a Modification that would be determined by a delegate of the Minister for Planning, however, consultation with other levels of government and a range of stakeholders has been undertaken (Section 1.3); and
- includes public involvement and participation through the ongoing operational consultation and consultation regarding the Modification (Section 1.3), the public exhibition of the EA document and DP&E assessment of the Modification in accordance with the requirements of the EP&A Act.

6.2.4 Consideration of the Modification against the Objects of the Environment Protection and Biodiversity Conservation Act, 1999

Section 3 of the EPBC Act describes the objects of the EPBC Act as follows:

(1) The objects of this Act are:

(a) to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and

(b) to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and

(c) to promote the conservation of biodiversity; and

(ca) to provide for the protection and conservation of heritage; and

(d) to promote a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and indigenous peoples; and

(e) to assist in the co-operative implementation of Australia's international environmental responsibilities; and

(f) to recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and

(g) to promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge.

The Modification is considered to be generally consistent with the objects of the EPBC Act, because it is a Modification which:

- incorporates a range of measures for the protection of the environment, including listed threatened species and ecological communities, water resources and heritage (Section 4);
- incorporates relevant ESD considerations (Section 6.2.2);
- includes the involvement and participation of the community, landholders and indigenous people through the ongoing operational consultation and consultation regarding the Modification (Section 1.3), the public exhibition of the EA document and DP&E assessment of the Modification in accordance with the requirements of the EP&A Act;
- would not result in a significant impact on migratory species protected under international agreements; and
- includes the involvement of Registered Aboriginal Parties throughout the life of the South Bates Underground Mine through the Heritage Management Plan.

6.2.5 Consideration of the Consequences of not Carrying out the Modification

Were the Modification not to proceed, the following consequences are inferred:

- employment opportunities associated with the Modification would not eventuate;
- approximately 18 Mt of ROM coal would not be recovered;
- total royalties to the State of NSW in the order of $66M would not be generated;
- State and Commonwealth tax revenue would not be generated; and
- the associated flow-on effects of the above would also be lost.

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