ASSESSMENT REPORT

WAMBO COAL MINE
Additional Longwalls Modification (DA 305-7-2003 MOD 15)

1. BACKGROUND

The Wambo coal mine is located in the Hunter Valley about 15 kilometres (km) west of Singleton, near the village of Warkworth (see **Figure 1**). The mine is bounded by several coal mining operations to the north and east, agricultural activities associated with Wambo Creek and Wollombi Brook to the south and Wollemi National Park to the southwest (see **Figure 2**).

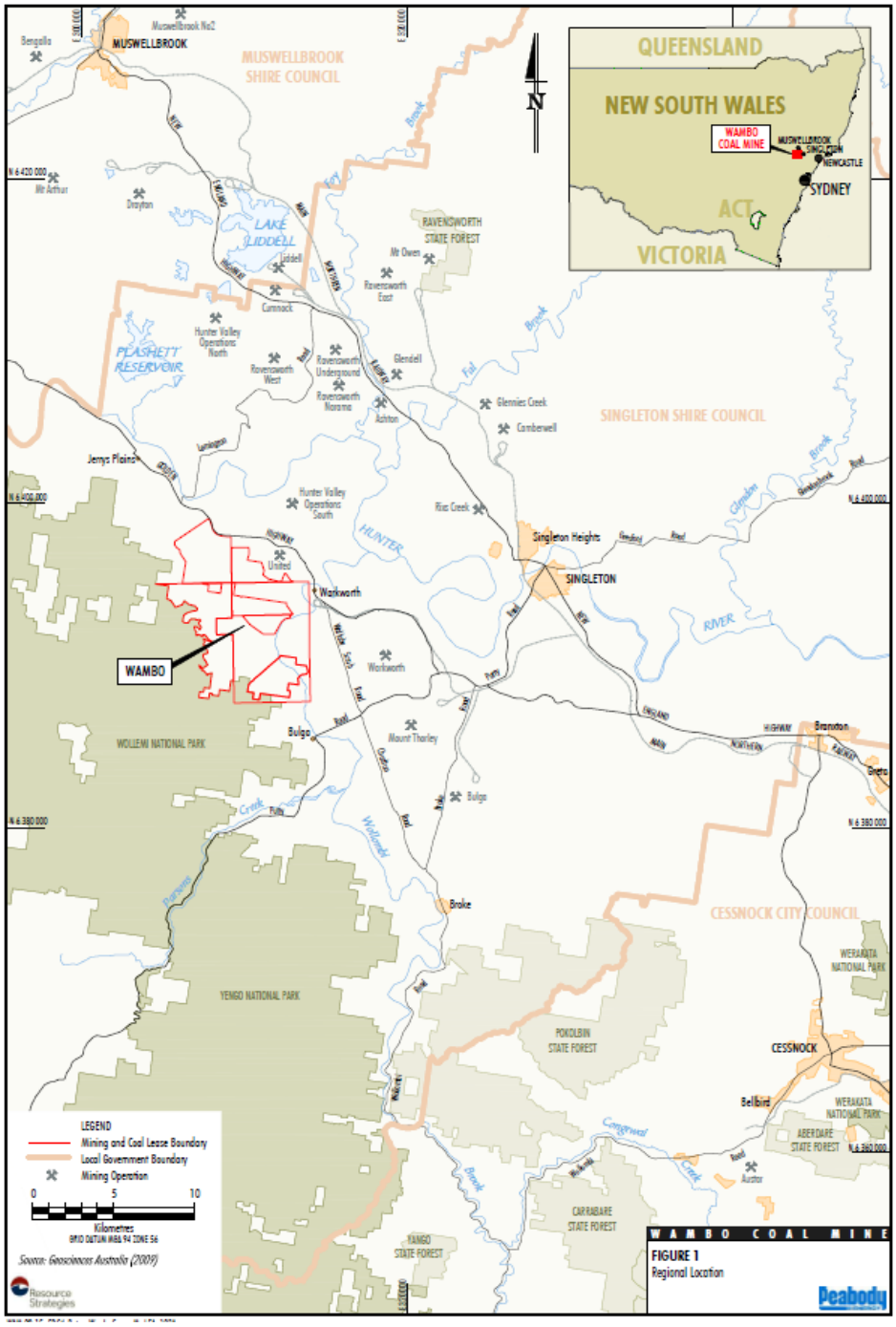

Figure 1: *Locality map*

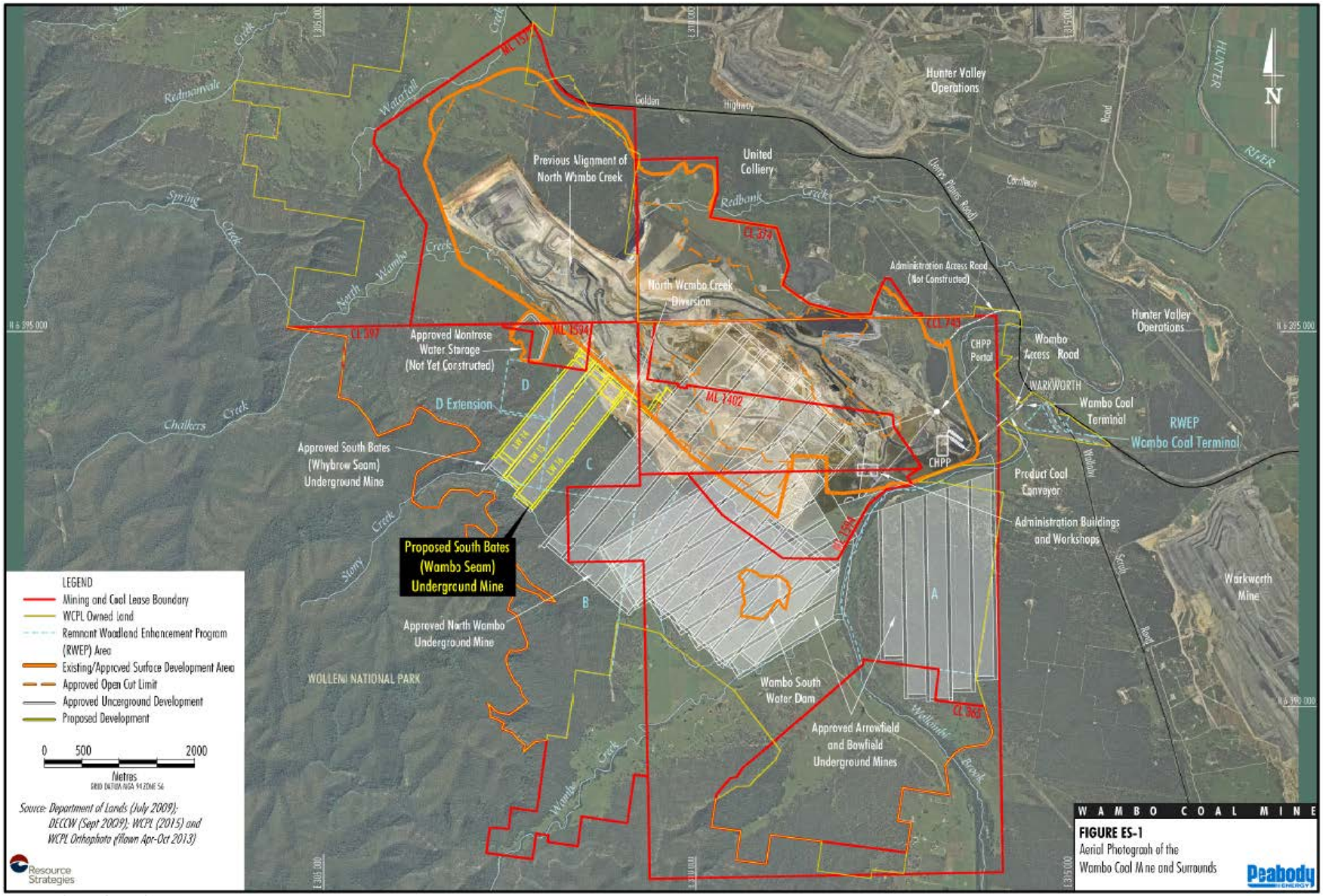

Figure 2: *Layout of the proposed Longwalls and approved underground mine workings*

The mine originally commenced operations in 1969 and is currently operated by Wambo Coal Pty Limited (Wambo), a subsidiary of Peabody Energy. The operations currently involve mining in the North Wambo Underground Mine and the Wambo Open Cut Mine. Longwall mining is yet to commence in the approved South Bates Underground Mine (the subject of the current modification application), the Arrowfield Underground Mine or the Bowfield Underground Mine.

Current operations at the mine are controlled by two Ministerial development consents: one for the open cut and underground mining operations (DA 305-7-2003 granted on 4 February 2004), and the other for the associated rail operations (DA 177-8-2004 granted on 16 December 2004). Under these consents, Wambo is authorised to:

- extract up to 14.7 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal, comprising
  - up to 8 Mtpa of ROM coal from its open cut mining operations; and
  - up to 7.5 Mtpa of ROM coal from its underground mining operations;
- process this ROM coal at its onsite coal handling and processing plant (CHPP); and
- transport up to 15 Mtpa of product coal from the mine via rail.

Secondary extraction is currently occurring in Longwall 10A of the North Wambo Underground Mine and mining is scheduled to commence at the South Bates Underground Mine in early 2016.

United Collieries Pty Ltd has requested Secretary's Environmental Assessment Requirements (SEARs) for its United and Wambo Open Cut Coal Mine Project. The proposal involves a Joint Venture project between United Collieries and Wambo to integrate the existing open cut operations at Wambo Open Cut with a proposed new open cut mine at United under a modified mine plan. The project would involve extraction of an additional 149 Mt of ROM coal over approximately 21 years and proposes a number of changes to the layout of existing mining and public infrastructure including relocation of a 2 km section of the Golden Highway and a section of 330kV powerlines. The Joint Venture project will not be seeking to modify underground mining operations authorised under DA 305-7-2003.

2. PROPOSED MODIFICATION

With extraction in the North Wambo Underground Mine scheduled for completion in late 2015/early 2016, Wambo has identified an opportunity to optimise its operations at the approved South Bates Underground Mine through the development of additional longwalls (Longwalls 14 – 16) in the Wambo Seam underneath the already approved longwalls (Longwalls 11 – 13) in the Whybrow Seam (see **Figure 2**). Wambo has determined that it is economical to mine these additional longwalls using underground longwall mining methods and considers such a proposal to be a natural extension of the existing approved underground operations at Wambo.

In addition to the recovery of 5.6 Mt of ROM coal, these three longwall panels would generate approximately 14 months of additional employment for the South Bates Underground Mine workforce and provide continuity of operations within the South Bates Underground Mine in an area that is already approved for subsidence. The modification would result in a small increase in total rejects from the CHPP (an additional 1.1 Mt coarse reject and 0.8 Mt tailings).

The major natural topographical feature near to the mine is the Wollemi Escarpment, which is located immediately to the southwest of the proposed longwalls. A ridgeline off the main escarpment crosses above the southwestern ends of the proposed longwalls. The Bates South Open Cut Pit is located immediately to the northeast of the proposed longwalls. The proposed geometry of the longwalls is outlined in **Table 1** below.

Table 1: *Proposed geometry of Longwalls 14 – 16*

Longwall	***Overall void length including installation heading (m)***	***Overall void width including first workings (m)***	***Overall tailgate chain pillar width (m)***
LW14	1,570	233	-
LW15	1,749	238	35
LW16	1,740	251	31

Due to the south-westerly dip of the coal seam, the depth of cover to the surface would increase from a minimum of about 135 m in the northeast above the finishing end of Longwall 16 to around 550 m in the southwest near the commencing end of Longwall 14. This thickness of the Wambo Seam varies between 1.85 m and 2.15 m, with Wambo proposing to extract a constant thickness of 2.1 m.

The interburden thickness between the overlying Whybrow Seam and the Wambo Seam within the extents of the proposed longwalls varies between 70 and 80 m. The approved Whybrow Seam longwalls are planned to extract a constant thickness of 3 m.

The modification would effectively be a continuation of mining in the Wambo Seam and would use the existing underground workforce, approved South Bates (Whybrow Seam) Underground Mine and Wambo surface infrastructure and equipment fleet. The modification is not proposing to change the overall life of the mine, ROM coal production rate, open cut operations, coal handling, CHPP and product coal transport operations, operating hours or major surface infrastructure.

The Department queried how the proposed modification could provide an additional 14 months of employment but not change the approved overall life of the mine. Wambo advised that an extension to the approved mine life required to complete the South Wambo Underground Mine would be sought as part of Modification 12, which had environmental requirements issued in October 2012, but has not yet been pursued by Wambo.

Further, as the existing underground ventilation, gas management and dewatering systems would be extended from the South Bates (Whybrow Seam) Underground Mine and/or the Bates South pit, the modification would not require any additional surface disturbance for these activities.

As the modification only relates to the underground workings for the South Bates Underground Mine, all other aspects of the approved mining operations at the Wambo coal mine would remain the same. A further detailed description of the modification is provided in Wambo's Environmental Assessment (EA, see **Appendix A**).

On 2 November 2015, Wambo requested to incorporate an additional component within the modification application request. Approved access to the South Wambo Underground Mine is via the CHPP portal. Based on geotechnical and mine planning investigations, Wambo proposes to relocate the approved CHPP portal approximately 650 m north to an area within the existing/approved surface development area. The Department considers that this minor amendment to the proposed modification does not, in itself, warrant public exhibition. However, the relevant documents were made publicly available on the Department's website.

3. STATUTORY CONTEXT

3.1 Section 75W

DA 305-7-2003 was granted in 2004, under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). As such, in accordance with Clause 8J(8) of the *Environmental Planning and Assessment Regulation 2000* and the transitional arrangements under Schedule 6A of the EP&A Act, the modification is to be determined under the former section 75W of the EP&A Act.

The Department is satisfied that the proposal can be characterised as a modification to the existing development consent. The additional coal to be recovered is a small fraction of the mine's annual and overall production, the disturbance footprint occurs within an area of approved underground mining, and the proposal could be achieved with minimal environmental impact (see **Section 5**).

Given these considerations, the Department is satisfied that the proposed modification is within the scope of section 75W, and may be determined accordingly.

3.2 Approval Authority

The Minister for Planning is the approval authority for the application. However, the Executive Director, Resource Assessments and Compliance, may determine the application under the Minister's delegation of 16 February 2015, as Wambo has not made any reportable political donations, Council does not object to the proposal, and there were less than 10 public objections.

3.3 Environmental Planning Instruments

A number of environmental planning instruments (EPIs) apply to the modification, including:

- SEPP *(Mining, Petroleum and Extractive Industries) 2007* (the Mining SEPP);
- SEPP *(Infrastructure) 2007* (the Infrastructure SEPP);
- SEPP *(State and Regional Development) 2011;*
- SEPP No. 33 – *Hazardous and Offensive Development*;
- SEPP No. 44 – *Koala Habitat Protection*;
- SEPP No. 55 – *Remediation of Land*; and
- *Singleton Local Environmental Plan 2013*.

The Department has assessed the modification against the relevant provisions of these instruments and reviewed Wambo's consideration of these matters in the EA. Based on this assessment, the Department is satisfied that the proposed modification can be carried out in a manner that is consistent with the aims, objectives and provisions of these instruments.

4. CONSULTATION

The Department exhibited the modification application from 5 August 2015 until 24 August 2015 and made the accompanying EA publicly available on its website and at the Department's Information Centre, Singleton Shire Council's administrative centre and the office of the Nature Conservation Council.

In response to this exhibition, the Department received 4 submissions from Government agencies, and a single objection from a nearby landowner. Copies of these submissions and a copy of Wambo's Response to Submissions (RTS) are included at **Appendix C** and **Appendix D**, respectively**.** A summary of the residual issues raised in these submissions is provided below.

4.1 Agency Submissions

The **Department of Primary Industries–Water (DPI-Water)** supported the modification's proposal to construct additional monitoring bores to complement the existing groundwater monitoring system and requested that the mine's Groundwater and Surface Water Monitoring Plans are updated to incorporate monitoring for potential impacts resulting from the proposed modification.

The Department notes that under condition 6 of Schedule 6, Wambo is required to review, and if necessary revise, the strategies, plans and programs required under its consent to the satisfaction of the Secretary within three months of any modification to its consent.

The **Office of Environment and Heritage (OEH)** was satisfied with the proposed management of Aboriginal heritage sites and indicated that the likely impacts on these sites could be managed under existing consent conditions and an amended Aboriginal Heritage Impact Permit. OEH did not identify any flooding issues as long as all regulatory requirements are followed.

Whilst noting that the modification would not clear any threatened vegetation, OEH requested that the Department give further consideration to the potential effects of increased subsidence on threatened biodiversity overlying the modification area. Residual concerns include the:

- assessment of threatened biodiversity and the absence of any biodiversity offsets for proposed impacts;
- potential for subsidence impacts on the Greater Blue Mountains World Heritage Area/Wollemi National Park; and
- perceived inadequacy of the current subsidence performance measure for Wollemi National Park.

The Department received a late submission (29 September 2015) from the **Greater Blue Mountains World Heritage Area Advisory Committee**. The Committee raised concerns regarding the potential loss of biodiversity and potential subsidence impacts on Wollemi National Park. The Department notes that members of the Committee attended a site inspection at Wambo in September 2015.

The Committee also sought assurance that the proposed modification had been referred to the Commonwealth Department of Environment for assessment under the relevant Commonwealth legislation.

The Department sought a further response from Wambo in relation to a Commonwealth referral based on similar comments made by OEH. Wambo considers that, based on the findings presented in its EA and specialist reports (discussed in **Section 5**), there is no need to refer its proposed modification to the Commonwealth. The Department notes that the onus is on Wambo to ensure it meets the requirements of all State and Commonwealth legislation.

The **Division of Resources and Energy (DRE)** within NSW Department of Industry noted that the modification area is located within existing mining leases held by Wambo and identified that, should the modification be approved, Wambo would be required to prepare revised Rehabilitation, Subsidence Management and Mining Operations Plans.

The **Environment Protection Authority (EPA)** noted that it would be able to regulate the impacts of the modified development under Wambo's existing Environmental Protection Licence.

The Department did not receive a submission from **Singleton Shire Council (Council)**.

4.2 Public Submission

A local landowner objected to the proposal. This landowner raised concerns with a range of matters including: Wambo's perceived history of non-compliance; subsidence impacts on the Wollemi Escarpment; impacts on surface water and groundwater resources; and inadequate rehabilitation.

The Department recognises that Wambo's compliance history is complex and has included issues which could have potentially affected the surrounding environment. There have been a number of dust issues at the site which have now been largely resolved. Through the assessment processes for the many modifications to the project, the Department has significantly strengthened the conditions of consent, including conditions to ensure better management of the environment. It is also recognised that in February 2013 a significant storm caused major erosion of the North Wambo Creek Diversion after it was opened prematurely. The repair of this has required ongoing management. The Department's Compliance Team has taken an active role in overseeing the ongoing remediation of the diversion.

All other concerns have been considered further in **Section 5**.

5. ASSESSMENT

In assessing the merits of the proposal, the Department has considered the EA, submissions on the proposal and Wambo's RTS. The Department considers the key assessment issue to be the proposal's subsidence impacts and related potential impacts to surface water, groundwater and biodiversity values. Consideration of these impacts is provided below, with consideration of other impacts provided in **Table 5**.

5.1 Subsidence

5.4.4 *Introduction*

Underground mining commenced at Wambo in 1969 as part of the former Homestead and Wollemi Mines, which used bord and pillar and longwall mining methods to extract coal from the Whybrow Seam (see **Figure 3**). Under DA 305-7-2003, granted in 2004, Wambo is permitted to develop multi-seam mining operations in the Whybrow, Wambo, Arrowfield and Bowfield coal seams.

The modification would cause surface and sub-surface subsidence impacts, including cumulative subsidence impacts, which could affect a range of built and natural features. The EA includes a detailed subsidence assessment undertaken by Mine Subsidence Engineering Consultants (MSEC). The subsidence impact zone associated with the modification was determined as being the greater of the 20 mm predicted subsidence contour and a 26.5 degree angle of draw from the proposed longwalls.

In accordance with the Department's standard practice for managing mine subsidence, Wambo is already subject to consent conditions which stipulate key subsidence performance measures and require the development of a detailed Extraction Plan to govern the secondary extraction of approved longwall panels. The Extraction Plan is required to be approved by the Secretary before the carrying out of any second workings. Key potential subsidence impacts are considered below.

5.1.2 Subsidence Predictions and Effects

Subsidence effects refer to deformation of the groundmass due to mining, including all mining-induced ground movements. 'Conventional subsidence' includes vertical displacement, tilt, and tensile and compressive strains. Additional 'non-conventional subsidence' components include those arising in steep or incised topography (valley closure and upsidence) and far-field horizontal movements.

MSEC's subsidence assessment states that subsidence effects would vary across the longwall area. Various factors would act to control overall subsidence and the resulting effects and impacts, including cover depth, interburden thickness and local geological conditions (see **Section 2**). **Table 2** summarises the predicted conventional subsidence effects over Longwalls 14 – 16 based on three scenarios, namely the:

- approved Whybrow Seam layout (ie Longwalls 11 – 13);
- proposed Wambo Seam layout (ie Longwalls 14 – 16); and
- approved layout and the proposed layout combined.

Table 2: *Comparison of maximum predicted total subsidence parameters based on the approved, proposed and combined layouts*

Layout	***Maximum predicted total conventional subsidence (mm)***	***Maximum predicted total conventional tilt (mm/m)***	***Maximum predicted total conventional hogging curvature (km^{-1})***	***Maximum predicted total conventional sagging curvature (km^{-1})***
Approved Layout (Whybrow Seam only)	1,950	90	>3.0	>3.0
Proposed Layout (Wambo Seam only)	2,500	35	1.0	1.0
Combined Layout (Whybrow and Wambo Seams)	4,150	100	>3.0	>3.0

The maximum predicted total subsidence resulting from the approved layout coupled with the proposed modification is 4.15 m, which represents 80% of the total proposed mining height of 5.1 m for both coal seams. The maximum total predicted subsidence occurs above the northeastern parts of the longwalls, where depth of cover is the shallowest. The Department notes that the cumulative maximum predicted total subsidence is approximately double the maximum predicted based on the approved layout (ie 1.95 m). Nevertheless, it is also noted that potential impacts on surface features depend on the differential movements (ie tilt, curvature and strain) rather than on the absolute movement (ie vertical subsidence).

The maximum predicted total tilt, based on the combined layout, of 100 mm/m is around 11% greater than the 90 mm/m maxima predicted based on the approved layout. Maximum overall curvatures are predicted to increase by around 20% as a result of the proposed modification. Maximum predicted total conventional subsidence, tilt, hogging curvature and sagging curvature are predicted to occur at the northeastern ends of the longwalls, where the depths of cover are the shallowest. **Figures 3** and **4** show that the predicted subsidence bowls are generally regular in shape, with significant subsidence restricted to the panel footprints and the intervening pillars. However, these narrow, regular subsidence bowls have closely-spaced contours, reflecting relatively high tilts.

It is not simple to predict relationships between curvature and strain for multi-seam mining conditions, since there is very limited empirical data in Australia to establish such relationships. Relationships between curvature and strain for multi-seam mining conditions are not linear, as localised strains develop as a result of remobilising the existing goaf and chain pillars in the overlying seam, which are not directly related to curvature.

The most extensive nearby multi-seam strain data comes from the North Wambo Underground Mine and the Blakefield South Mine. The magnitudes of the strains for the proposed longwalls are expected to be similar to those observed for multi-seam conditions during the previously extracted longwalls at the adjacent North Wambo Underground Mine.

Predicted far-field movements resulting from extraction of the proposed longwalls are very small and could only be detected by precise surveys. The Department is satisfied that the far-field horizontal movements on natural and built features within the vicinity of the proposed longwalls are unlikely to be significant or to cause any adverse impacts.

The Department notes that it is likely that non-conventional ground movements would occur in the vicinity of the proposed longwalls due to the multi-seam mining conditions, near surface geological features and shallow depths of cover. Whilst noting that such subsidence movements may occur, MSEC predicts they are unlikely to cause any adverse impacts, and that any impacts which do occur would be of the order and magnitude experienced at North Wambo Underground Mine, which have been effectively managed to date.

The Department is satisfied that an appropriate subsidence prediction model has been used and notes that the model is already calibrated to measured heights of fracturing for a given mining geometry and geology and therefore has allowances for natural variations built into it. The Department considers that MSEC's subsidence predictions are conservative.

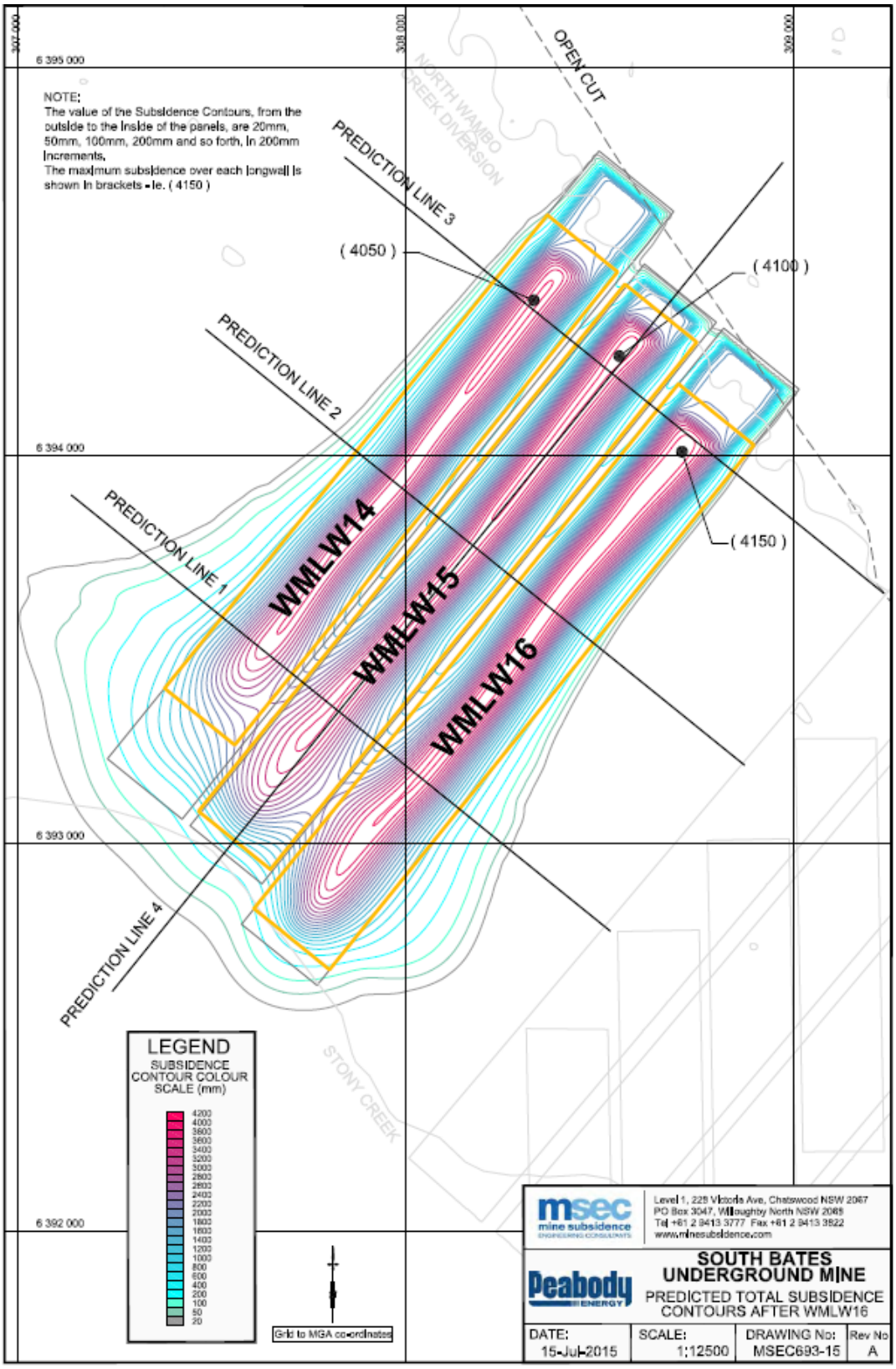

Figure 3: *Predicted total subsidence contours after Longwall 16*

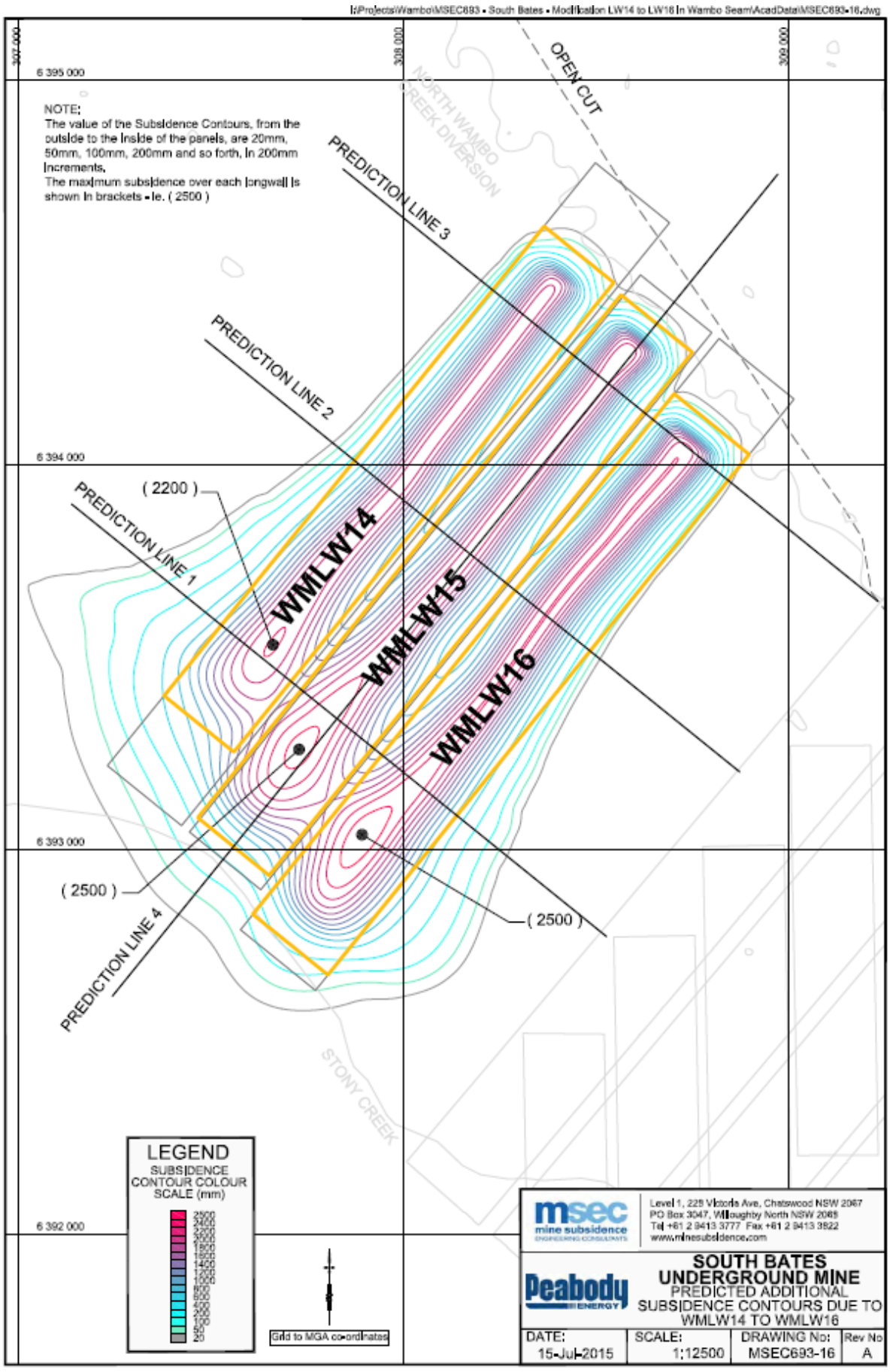

Figure 4: *Predicted additional subsidence contours due to the proposed longwalls*

5.1.3 Surface Features and Potential Impacts

The proposed longwalls are located beneath Wambo's Remnant Woodland Enhancement Programme (RWEP) areas, in an area dominated by native bushland with few built features (see **Figure 2**). The proposed modification area is within RWEP Areas B, C, D and D extension.

Built features within the vicinity of the proposed longwalls are few, and include:

- unsealed roads and drainage culverts;
- Wambo-owned water pipeline;
- Wambo-owned power and telecommunications cables; and
- a number of Aboriginal cultural heritage sites (see **Section 5.4**).

There are a number of natural features located above and in the vicinity of the proposed longwalls. Impacts on natural features are discussed below and in **Sections 5.2** – **5.4**.

Cliffs

MSEC's subsidence assessment categorised cliffs into three groups:

- cliffs associated with the Wollemi Escarpment;
- low level cliffs (beneath the escarpment); and
- cliffs along the spur ridgeline (ie directly above the southwestern ends of the longwalls).

Details of the length, height and closest distance to the proposed longwalls for each category of cliffs can be found in **Table 3** below.

Table 3: *Details of the cliffs in the vicinity of proposed Longwalls 14 – 16*

Location	*Label*	*Overall length (m)*	*Typical height (m)*	*Closest distance to proposed longwalls (m)*
Cliffs associated with the Wollemi Escarpment	CL-ES1	250 (discontinuous at one or two levels)	10 ~ 20	300 to LW15
	CL-ES2	20	10	300 to LW15
	CL-ES3	50	10	300 to LW15
	CL-ES4	50	10 ~ 15	270 to LW15
	CL-ES5	200 (at one or two levels)	10 ~ 20 (over 100 m) 20 ~ 40 (over 50 m) 40 ~ 50 (over 50 m)	250 to LW15
	CL-ES6	125	10 ~ 20	240 to LW16
	CL-ES7	40	10 ~ 15	290 to LW16
	CL-ES8	20	10	320 to LW16
Low level cliffs	CL-LL1	40	10	250 to LW15
	CL-LL2	20	10	230 to LW15
	CL-LL3	80	10 ~ 15	180 to LW15
	CL-LL4	30 (discontinuous)	10	170 to LW15
	CL-LL5	20	10 ~ 15	160 to LW15
	CL-LL6	20	10	160 to LW15
	CL-LL7	20 (discontinuous)	10	180 to LW15
	CL-LL8	20	10	180 to LW15
	CL-LL 9	40	10 ~ 15	170 to LW16
	CL-LL10	30	10 ~ 15	190 to LW16
	CL-LL11	125	10 ~ 25	200 to LW15/16
	CL-LL12	20	15	200 to LW15
	CL-LL13	20	15	210 to LW15
Cliffs along the spur ridgeline	CL-SP1	20	10	Above LW15
	CL-SP2	80	10 ~ 20	25 to LW14
	CL-SP3	125	15 ~ 20	70 to LW14
	CL-SP4	30 (discontinuous)	10 ~ 15	150 to LW14
	CL-SP5	30	15 ~ 20	70 to LW14
	CL-SP6	150	15	50 to LW14
	CL-SP7	40	10	110 to LW14
	CL-SP8	25	10	210 to LW14
	CL-SP9	20	10	290 to LW14
	CL-SP10	30	10 ~ 15	340 to LW14

The cliffs associated with the Wollemi Escarpment are located at a minimum distance of 240 m southwest of the proposed longwalls and are predicted to experience less than 20 mm vertical subsidence and no significant conventional tilts, curvatures or strains. The Department is satisfied that it is unlikely that these cliffs would experience any adverse impacts as a result of mining.

The low level cliffs are located at a minimum distance of 160 m southwest of the proposed longwalls and are predicted to experience up to 80 mm total vertical subsidence due to the combined mining layout and very low levels of conventional tilt, curvature and strain. MSEC concludes that it is possible that isolated and minor rock falls could occur, however no large scale cliff failures are anticipated.

The cliffs along the spur ridgeline are located directly above the southwestern ends of the proposed longwalls and are likely to experience some impacts associated with subsidence due to the combined mining layout. It is predicted that only minor and isolated rockfalls would occur at Cliffs CL-SP7 and CL-SP8, which would represent less than 1% of the lengths of these two cliffs (see **Table 3**). MSEC predicts that any impacts to cliffs along the spur ridgeline would affect less than 5% of their total lengths, or less than 3% of their total face area.

Pagodas
Isolated pagodas of approximately 3 – 5 m height are located along the spur ridgeline. These pagodas could experience some fracturing and potential spalling of exposed rock faces. It is predicted that impacts resulting from mining would affect less than 1% of total surface area of the pagodas.

Steep Slopes
Steep slopes are located along the spur ridgeline directly above the southwestern ends of the proposed longwalls and to the southwest (ie beneath the Wollemi Escarpment). Surface cracking and compression heaving could occur along the steep slopes located directly above the proposed mining. However, impacts are not predicted along the steep slopes located outside the footprint of the proposed longwalls, including beneath the Wollemi Escarpment.

Wollemi National Park
The Wollemi National Park is located at a minimum distance of 290 m west of the tailgate of Longwall 14. The national park is predicted to generally experience less than 20 mm vertical subsidence. The corner of the national park boundary closest to Longwall 14 could experience levels of vertical subsidence up to 50 mm, but is not predicted to experience any significant conventional tilts, curvatures or strains and, therefore no significant impacts. Far-field horizontal movements of around 75 mm could occur at the boundary of the national park. OEH remains concerned that there could be subsidence effects within the national park.

OEH noted in its response to Wambo's RTS that it's "advice for an offsetting requirement has always been for the event that unexpected subsidence [impacts] occur". The Department notes that under the existing conditions of consent Wambo is required to provide a suitable offset to compensate for the impact or environmental consequence in the event a performance measure is exceeded, and it is not reasonable or feasible to remediate the impact or environmental consequence or remediation measures have failed.

Furthermore, there are specific performance measures for Wollemi National Park ("negligible subsidence impacts" and "negligible environmental consequences"). OEH has noted that it considers that the performance measures for Wollemi National Park are not clearly defined and would be problematic for monitoring and compliance purposes. The Department notes that under the existing conditions of consent, Wambo is required to define more detailed performance indicators for these performance measures under the relevant management plan (condition 22 of Schedule 4).

The Department considers that the existing conditions of consent are adequate to manage the unlikely event of impacts on Wollemi National Park.

5.1.4 *Conclusion*
The Department is satisfied that MSEC's subsidence assessment has used conservative assumptions, and that the resulting subsidence predictions provide a sound basis to assess the potential subsidence impacts and associated environmental consequences of the proposed modification. The subsidence assessment used empirical data from the current mining operations, where the application of existing conditions of consent controlling subsidence has proven successful in managing and mitigating the risk of significant impacts.

Existing conditions include strict subsidence performance measures which act to protect all natural and built features in the underground mining area and require offsets if unforeseen impacts occur which cannot be successfully remediated. The Department considers that the current performance

measures remain appropriate, and that these measures would provide adequate impact protection to all significant surface features in the modification area.

A comprehensive Extraction Plan must also be prepared following consultation with relevant agencies and be approved prior to the commencement of the proposed longwalls. The Extraction Plan would detail the proposed subsidence impact assessment, monitoring and reporting frameworks for all built and natural features.

The Department has carefully considered the potential impacts of subsidence on the natural and built features as detailed above and is satisfied that these impacts are not significantly greater than those already approved and that approval of multi-seam mining in the area would not adversely affect these features.

Subsidence predications, hydraulic connectivity and the subsequent potential environmental consequences on water resources and biodiversity are discussed in **Sections 5.2** and **5.3**.

5.2 Water Resources

The modification would cause surface and sub-surface subsidence impacts, including cumulative subsidence impacts, which could affect a range of surface water and groundwater features. The EA includes a detailed Groundwater Assessment undertaken by HydroSimulations and a detailed Surface Water Assessment undertaken by Advisian.

5.2.1 Groundwater Resources

Local groundwater resources are characterised by two main aquifers, namely a highly productive alluvial aquifer system which interacts with the surrounding surface creeks and a less productive, deeper and more saline Permian porous rock aquifer system.

Groundwater flow patterns within the shallow alluvial aquifers reflect topographic levels and the containment of alluvium within the principal drainage pathways. HydroSimulations reports that the alluvial aquifer is responsive to rainfall recharge and it is likely that the alluvium plays an important role in supplying the recharge to the underlying Permian strata as well as contributing the baseflow of surface water features.

The Department notes that there are no natural alluvial aquifers located in the immediate vicinity of the proposed modification area. The Department also notes that 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.

The main potential impact of the proposed modification on groundwater resources includes subsurface fracturing and shearing of strata above the proposed longwalls resulting in changes in rock mass permeability and storage capacity. This has the subsequent effect of drawing groundwater that then enters the underground mining area. It also requires dewatering of the overlying workings in the Whybrow Seam to mitigate inflow risk to the underground mining area in the Wambo Seam.

The peak predicted inflow rates to the South Bates (Whybrow Seam) Underground Mine based on the approved mining layout is approximately 0.34 megalitres per day (ML/day). The proposed modification would result in a combined inflow rate of up to 0.49 ML/day, an increase of approximately 54 ML per annum. DPI-Water has advised that additional take of water from both alluvial and hard rock aquifers as a result of the proposed modification is covered by existing entitlements. The Department notes that these predicted inflows are less than the modelled inflows to the North Wambo Underground Mine, which have been successfully managed to date.

Overall, the Department is satisfied that:

- the predicted inflows are able to be appropriately managed by Wambo, using the existing management practices;
- the proposed modification would have a negligible impact on regional water levels and there would be no discernible additional drawdown in any alluvial aquifer when compared to the approved mining layout;
- there would be no discernible 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 mining layout;

- there would be no significant impact on the quality of groundwater or surface water around Wambo and there is no potential for increased flux of more saline water from the Permian strata to the alluvium; and
- no privately-owned registered bores in alluvium or regolith would be affected by drawdown beyond the effects of the approved mining layout.

5.2.2 Surface Water Resources

Natural Streams

Wambo Mine is situated adjacent to Wollombi Brook, southwest of its confluence with the Hunter River. Wollombi Brook drains an area of approximately 1,950 km² and joins the Hunter River about 5 km northeast of Wambo Mine. The majority of the land within Wambo's mining tenements drain via Wambo, Stony, North Wambo and Redbank Creeks to Wollombi Brook (see **Figure 2**).

The natural streams within the proposed modification area include Stony Creek and ephemeral drainage lines (see **Figure 2**). A diverted section of North Wambo Creek is also located in the proposed modification area (see below). Wollombi Brook is located outside the extent of measurable tilts, curvatures or strains associated with the proposed modification. Subsidence predictions for Stony Creek and the North Wambo Creek Diversion are outlined in **Table 4**.

Table 4: *Comparison of predicted subsidence effects on North Wambo Creek Diversion and Stony Creek for the approved and modified mining layouts*

Layout	North Wambo Creek Diversion		Stony Creek	
	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Change in Gradient (%)	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Change in Gradient (%)
Approved Mining Layout (Whybrow Seam Only)	1,950	7.5	400	0.6
Modified Mining Layout (Wambo and Whybrow Seams)	2,750	8.0	675	0.9

The natural section of North Wambo Creek is located a minimum of 700 m from the proposed longwalls and is predicted to experience less than 20 mm of vertical subsidence and no measurable tilt, curvature or ground strain. The Department accepts that it is unlikely that the creek would experience any adverse impacts from the proposed modification, even if predictions were exceeded by a factor of two times.

MSEC considers it unlikely that increased levels of ponding or scouring (beyond those already approved) would occur along the streams within the proposed modification area, as the natural gradients are greater than the predicted mining-induced tilts. Nevertheless, the Department notes that the drainage lines in the proposed modification area could experience increased localised ponding with depths up to 0.1 m and lengths up to 50 m.

If adverse impacts were to develop as a result of localised ponding, it could be remediated by locally re-grading the beds, so as to establish natural gradients. The Department accepts this approach as reasonable and feasible and notes that such remediation works would be covered under the relevant management plans under existing consent conditions.

Based on the subsidence predictions in **Table 4**, fracturing of the bedrock in Stony Creek and the drainage lines above the proposed modification area could occur. Cracking would only be visible at the surface where surface soils are shallow, or where the bedrock is exposed. Fracturing of exposed bedrock could result in spalling or dislodgement of rocks, and potentially some diversion of surface water flows into the dilated strata beneath the beds. MSEC predicts that any diverted surface water would re-emerge further downstream due to the high natural gradients in these locations. The potential for complete hydraulic connectivity is discussed in **Section 5.2.3**.

The Department notes that it may be necessary, at the completion of mining, to remediate some sections of the ephemeral drainage lines, where depths of cover are the shallowest. Management strategies have previously been developed and applied for sections of creeks and drainage lines that have been undermined at North Wambo Underground Mine.

Condition 6 of Schedule 6 of the mine's consent requires Wambo to review and revise (if necessary) all management plans and strategies following approval of any modification of the consent. Management and monitoring of the watercourses above the proposed modification area would be included in such a review. It would also be further examined in detail during the Extraction Plan process.

To strengthen the existing conditions in regards to rehabilitation of watercourses, the Department has recommended the inclusion of an additional rehabilitation objective requiring Wambo to ensure that all watercourses subject to subsidence impacts are hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than prior to mining.

Consequently, the Department is satisfied that the potential impacts to surface water bodies above the proposed modification area would not be significantly different to those already approved, and that any adverse impact that may occur can be appropriately detected, managed and/or remediated under existing conditions of consent.

North Wambo Creek Diversion

North Wambo Creek, which is an ephemeral stream, has been diverted around the active Bates South Open Cut Pit. While the diversion is located above the finishing ends of the approved Longwalls 11 – 13, it is almost completely outside the actual footprint of the proposed Longwalls 14 – 16, which have been shortened to provide an appropriate stand-off distance to the open cut (see **Figure 2**). As a result, the major subsidence impacts on the diversion are associated with the approved mining in the Whybrow Seam, rather than the proposed mining in the Wambo Seam.

The creek diversion is already approved for subsidence impacts from mining in the Whybrow Seam, including increased ponding areas up to 1.4 m deep and up to 250 m long and extensive surface cracking. The predicted ponding due to mining in the Wambo Seam is an additional 10 m adjacent to proposed Longwalls 14 and 15. Further surface cracking could also develop where the proposed longwalls are adjacent to the diversion. The depths of cover in this location vary between 60 m and 85 m to the Whybrow Seam and between 135 m and 170 m to the Wambo Seam. MSEC concludes that it is therefore likely that fracturing would occur from the seams to the surface (discussed further in **Section 5.2.3**).

MSEC recommended that remediation strategies are developed so that any larger surface cracking within the alignment of the creek diversion can be remediated during active subsidence. The Department accepts this approach as reasonable and feasible and notes that such remediation works would be covered under management plans required under existing consent conditions.

5.2.3 Hydraulic connectivity

The EA considers the potential for hydrological connectivity. For the purpose of subsidence assessment, the following four zones were adopted by MSEC:

- *caved or collapsed zone*: comprises loose blocks of rock detached from the roof and occupying the cavity formed by mining (ie the goaf);
- *disturbed or fractured zone*: comprises in-situ material that has undergone significant deformation and is supported by the material in the caved zone. This zone has sagged downwards and consequently suffered significant bending, fracturing, joint opening and bed separation;
- *constrained zone*: comprises confined rock strata above the disturbed zone which have sagged slightly but, because they are constrained by the disturbed zone, have absorbed most of the strain energy without suffering significant fracturing or alteration to the original physical properties. Some bed separation or slippage can be present as well as some discontinuous vertical cracks, but not to a degree or nature which would result in connective cracking or significant increases in vertical permeability. Some increases in horizontal permeability can be found; and
- *surface zone*: comprises unconfined strata at the ground surface in which mining-induced strains may result in the formation of surface cracking or ground heaving.

It is generally accepted that the height of discontinuous fracturing can extend 1 to 1.5 times the longwall width above an extracted seam. Given the proposed overall void widths of between 233 m and 251 m, discontinuous fracturing could therefore extend 250 m to 375 m above the Wambo Seam. Discontinuous fracturing to the surface does not necessarily imply hydraulic connectivity between the surface and the mine, as the vertical fractures may be discontinuous due to the presence of strata layers with low permeability. However, the Department considers that this

potential for hydraulic connectivity requires further consideration of its potential environmental consequences.

As noted in **Section 2**, the depth of cover to the proposed longwalls in the Wambo Seam varies between 135 m and 550 m. The depth of cover to the approved Whybrow Seam longwalls varies between 54 m and 470 m. The interburden thickness between the Wambo and Whybrow Seams varies between 70 m and 80 m.

Based on MSEC's subsidence assessment, discontinuous fracturing would extend from the proposed longwalls in the Wambo Seam up to the approved longwalls in the overlying Whybrow Seam and is expected to then extend to the surface above the northeastern ends and central parts of the longwalls, where depth of cover is less. MSEC does not expect that there would be a hydraulic connection between the surface and the Whybrow seam over the majority of the area of the longwalls. No connection was previously observed after extraction of the first seven longwalls at the North Wambo Underground Mine, which were extracted directly beneath North Wambo Creek at a depth of cover of approximately 100 m. MSEC considers that depths of cover >100 m would prevent connective fracturing to the surface and minimise associated hydrological connectivity between the mine workings and the surface water features in the vicinity of the longwalls. However, it is possible that hydraulic connection between the surface and the Whybrow Seam could develop above the northeastern ends of the proposed longwalls, where depth of cover to that seam is <100 m.

Extensive surface cracking would also occur along the alignment of the North Wambo Creek Diversion (primarily from mining of the Whybrow Seam). The depth of cover along the alignment of the creek diversion above the finishing ends of the longwalls varies between 60 m and 85 m and it is therefore likely that fracturing would occur from the seam to the surface in this location. It is therefore possible that some of the surface water flows in the creek diversion could flow into the mine workings. As flow in the creek diversion is ephemeral, this would only occur during major rainfall events and for short periods thereafter.

Modelling predicts that flows in excess of 10 ML/day can be expected on approximately 22 days per year, comprising events of 2-3 days duration. A flood event in early 2013 resulted in a peak flow of 35 – 50 m^3/s along the creek diversion. Analysis of subsequent recorded flows indicated that flow typically reaches a peak approximately 24 hours following a storm and then returns to negligible flow about two days later. Based on this modelling, the 2013 flood event would have had a maximum volume of the order of 2000 – 3000 ML/day. This flow would be sufficient to cause inflows to the underground workings, should the creek be flowing during the period of mining when the cracks are open. Mining is planned to progress in the up-dip direction of the seam, so any increased water flows into the mine would flow away from the extraction face.

Subsidence cracks are not expected to develop until the longwall face is directly under the creek diversion and for the next 100 m of longwall retreat. The creek diversion crosses the Longwall 16 panel generally perpendicular to the gateroads but its additional meanders mean that there is about 160 m of retreat distance where new cracks could open in the immediate vicinity of the creek diversion. It is predicted that this would lead to a time window of approximately two weeks where cracking might occur on the creek diversion bed.

Wambo proposes to operate a remediation works program to reduce the hydraulic conductivity of any cracks that may open at the surface. This is based on the assumption that all significant cracks are expected to be visible at the surface. The Department accepts this assumption as the bed of the creek diversion is mostly exposed rock, or covered by a depth of soil typically less than 1 m.

Cracks are to be sealed using the following sequence of actions, commencing as soon as cracks appear:

- washing a slurry containing well-graded sandy silt into the cracks in the underlying rocks, using water from the mine workings; and
- infilling larger surface cracks with typical alluvial material.

The Department supports Wambo's initiation of remediation works as soon as cracking is observed (and ongoing during the period of mining) in order to reduce the time that subsidence-induced cracks are open and the longwall panel is vulnerable to an inflow event. However, the Department raised concern that the proposed infill material may not adequately prevent inflows due to its fine and/or porous nature.

Following discussions with the Department, Wambo has committed to consider the addition of bentonite or other clays to the alluvial material. The use of bentonite would be beneficial due to its ultra-fine particle size and expansive and sealing properties. A percentage of bentonite would be blended with the alluvial material where required to supplement its fines content to achieve a level of seal consistent with the surrounding host material. The Department is satisfied with this approach and notes that it would be further considered in detail as part of the Extraction Plan process for the proposed longwalls and for Longwalls 11 – 13.

In the event that inflow to the workings indicates that sealing is inadequate, the relevant surface pool would be drained by pumping to allow access for visual inspection and any required further remedial action, including the option of cement-based grouting.

The critical consideration for the Department is the probability of a high rainfall event occurring in the two to three week period between the longwall face first passing under the creek diversion and Wambo being able to undertake remediation works to reduce the inflow rate to acceptable levels. The Department considers that the proposed remediation works would generally reduce the risk of high inflows as a result of hydraulic conductivity to tolerable levels.

It is not expected that there would be a hydraulic connection between the surface and seam at Stony Creek, or the natural section of North Wambo Creek, as there have been no adverse impacts reported along the sections of these creeks which have been undermined at the North Wambo Underground Mine at lesser depths.

Surface to seam cracking is not expected to occur across more than 20 hectares (ha) in total. The area over the approved Whybrow Seam panels (Longwalls 11 to 13) with a depth of cover of less than 100 m is approximately 20 ha (0.2 km^2). The proposed Wambo Seam panels (Longwalls 14 to 16) underlie approximately 9 ha (0.09 km^2) of this area (noting that the proposed panels are shorter than the approved panels at the northeastern end). This represents approximately 7% of the total surface area of Longwalls 14 to 16 (approximately 122 ha). The Department notes that Wambo has designed the proposed modification to avoid extraction directly beneath the low flow channel of the creek diversion.

Based on the Department's assessment of the subsidence impacts of the proposed modification and its consideration of the potential impacts of subsidence on the natural and built features, it is satisfied that these impacts are not significantly greater than those already approved and that approval of multi-seam mining in the area would not adversely affect these features. The Department is satisfied that the modification is unlikely to significantly increase the risk of long term impacts of the project on the nearby alluvial and surface water sources (including Wollombi Brook), beyond that permitted under the existing consent.

Existing conditions include strict subsidence performance measures which act to protect all natural and built features in the underground mining area and require offsets if unforeseen impacts occur which cannot be successfully remediated. The Department considers that the current performance measures remain appropriate, and that these measures would provide adequate impact protection to all significant water features in the modification area.

A comprehensive Extraction Plan must also be prepared following consultation with relevant agencies and be approved prior to the commencement of the proposed longwalls. The Extraction Plan would detail the proposed subsidence impact assessment, monitoring and reporting frameworks for all built and natural features. It must also include detailed consideration of the potential for hydraulic connectivity and the proposed monitoring, management and remediation measures.

The Department notes that to further mitigate the risk of any unforeseen impacts on water sources, the Department has previously required Wambo to improve its existing water monitoring and contingency response plans. The Department is satisfied that these amendments can be managed through the consent's requirement to review the existing Surface Water and Groundwater Management Plans following the approval of any modification to the consent.

5.2.4 Conclusion

Nevertheless, the Department recognises that both the existing and modified mine layout will result in subsidence-induced fracturing and increased hydrological connectivity, particularly around the North Wambo Creek Diversion area. Under the existing consent, Wambo is already required to address these impacts through ongoing surface and groundwater monitoring and the development

of a Surface and Groundwater Response Plan, including trigger values and impact response plans.

The Department is satisfied that the modification would not significantly change the surface and groundwater impacts of the approved development and that the incremental impacts can be managed through amendments to the existing management and response plans.

5.3 Biodiversity

The modification would cause surface and sub-surface subsidence impacts, which could potentially affect a range of vegetation species and communities, as well as fauna species and their habitat. The EA includes a detailed Flora Assessment undertaken by FloraSearch and a detailed Fauna Assessment undertaken by EcoLogical.

The majority of land in the proposed modification area comprises forest and woodland that has been set aside as part of the RWEP. Livestock grazing is excluded from this land. The objective of the RWEP is to help conserve regional biodiversity, whilst enhancing the habitat available to flora and fauna. The Department notes that Wambo is currently in the process of finalising agreements to conserve the RWEP areas using a Voluntary Conservation Agreement under the *National Parks and Wildlife Act 1974* in accordance with the project's consent.

A total of eight broad vegetation communities have been mapped within the proposed modification area. The general condition of vegetation in the proposed modification area has been assessed as very good, with the exception of a small area of cleared derived grassland.

Threatened biodiversity within the proposed modification area include:

- two threatened ecological communities listed under the *Threatened Species Conservation Act 1995* (TSC Act): *Central Hunter Grey Box-Ironbark Woodland* and *Hunter Valley Footslopes Slaty Box Woodland*;
- one Critically Endangered Ecological Community (CEEC) listed under the *Environment Protection and Biodiversity Conservation Act 1999*: *Central Hunter Valley Eucalypt Forest and Woodland*; and
- several threatened fauna species listed under the TSC Act, either known or likely to occur.

As the proposed modification would not require clearing of any threatened vegetation and the recorded threatened fauna species generally comprise highly mobile species, the potential impacts would be largely restricted to the effects of subsidence on landscape characteristics (eg ponding and surface cracking). As discussed in **Section 5.2**, there is only minor potential for increased ponding as a result of the proposed modification and that would be restricted to the constructed North Wambo Creek Diversion where no natural vegetation community has yet developed. MSEC concludes that the proposed modification is unlikely to materially increase the subsidence impacts on threatened flora, beyond that of the approved operations.

OEH raised a number of concerns regarding the EA's assessment of threatened species. There were largely addressed by Wambo in its RTS. OEH has residual concerns with the assessment of threatened biodiversity and the absence of any biodiversity offsets for proposed impacts. The relevant consultants all concluded that subsidence is unlikely to cause any significant impacts, beyond those already approved. Therefore, the Department does not consider it necessary for an upfront offset for the proposed modification.

OEH notes in its response to the RTS that its "advice for an offsetting requirement has always been for the event that unexpected subsidence [impacts] occur". In response to OEH's request during the assessment of Mod 14, the Department strengthened the subsidence impact performance measures regarding impacts on threatened biodiversity. It also included a new condition requiring Wambo to suitably remediate or offset any impacts or environmental consequences arising from exceedances of these performance measures. With these updated conditions in place, the Department is satisfied that the modification would not significantly impact on the biodiversity values of the area.

Any unexpected impacts can be appropriately managed through existing consent conditions and amendments to Wambo's existing Flora and Fauna Management Strategy. Under existing conditions of consent, Wambo is required to define detailed performance indicators in this management plan for the consent's performance measures preventing impacts on threatened biodiversity. This management plan is currently under review in consultation with the Department's Compliance Team, with the review expected to be finalised in early 2016. The Department

considers that the existing conditions of consent are adequate to manage the predicted and potential impacts on biodiversity.

5.4 Other impacts

The Department is satisfied that the other impacts of the proposed modification are likely to be minor. The assessment of other impacts is summarised in **Table 5** below.

Table 5: *Assessment of other impacts*

Issue	*Consideration and Assessment*	*Recommendation*
Aboriginal Heritage	• A number of Aboriginal objects have been identified in the area overlying and surrounding the proposed longwalls. These would be subject to a range of impacts associated with subsidence of the proposed panels, in addition to potential subsidence impacts already approved under the development consent for Longwalls 11 – 13. • Wambo currently manages the majority of the modification area under an Aboriginal Heritage Impact Permit (AHIP No 2222). The subsidence assessment prepared for the modification concluded that subsidence effects would extend beyond the boundary of AHIP 2222. • Seven previously unrecorded Aboriginal sites were identified within the proposed modification area. There is now a total of nine recorded Aboriginal sites, including: - three artefact scatters (Wambo Sites 382, 383 and 385); - two isolated finds (Wambo Sites 297 and 382); and - four grinding groove sites (Wambo Sites 296, 386, 387 and 388). • The newly identified sites (Wambo Sites 382 – 388) were not located during previous surveys and therefore have not been considered in previous subsidence reports, including the assessment for the approved South Bates (Whybrow Seam) Underground Mine. • MSEC concluded that the risk of adverse subsidence impacts on the Aboriginal sites was unlikely to very unlikely, with the exception of Wambo Site 387 (grinding groove) where the risk was considered possible (>25%). • Given the generally low risk of potential impacts to artefact scatters and isolated finds, Wambo intends to leave these sites *in situ*, subject to subsidence monitoring. • Prior to commencing any longwall mining in the proposed modification area, all grinding groove sites would be archivally recorded. With regard to Wambo Sites 387 and 296, Wambo would consider engineering solutions to prevent cracking or to minimise movement (eg installing stress relief slots and/or stabilisation/removal of the sandstone boulder) as part of the Extraction Plan process. • OEH was supportive of the proposal to leave Aboriginal sites *in situ* and monitor these sites during the project. • OEH has recently provided Wambo with a draft AHIP to incorporate the proposed modification area. • The Department is therefore satisfied that the modification's potential impacts to Aboriginal objects would be appropriately managed by amending Wambo's existing Heritage Management Plan and the AHIP process.	No additional conditions necessary.
Rehabilitation	• Wambo implements a rehabilitation program in accordance with its approved Flora and Fauna Management Plan. As noted earlier, this management plan is currently under review in consultation with the Department's Compliance Team. This review is expected to be finalised in early 2016. • Wambo is also required to prepare and implement a separate rehabilitation management plan to the satisfaction of DRE. • DRE recommended a number of rehabilitation objectives for inclusion in the modified consent. The Department carefully considered these objectives and notes the following: • **Mine site –** recommended objective already included in existing consent; • **Rehabilitation Materials** – the recovery, appropriate management and effective use of materials is required under condition 94A of Schedule 4; • **Water Quality** – water quality objectives are managed under the Water Management Plan; and • **Post-mining agriculture** – the wording of the recommended objective does not account for events beyond the control of the company. The Department considers that the intent of this recommendation is covered by other existing conditions of consent.	The Department has recommended additional rehabilitation objectives for landforms and all watercourses subject to subsidence impacts.

Issue	*Consideration and Assessment*	*Recommendation*

	• However, to strengthen the existing conditions, the Department recommends the following:
	  • **Landforms** - – o be consistent with surrounding topography; and
	  • **Subsidence Management** – inclusion of an objective for hydraulically and geomorphologically stable watercourses, with riparian vegetation that is the same or better than prior to mining.
	• It is noted that condition 6 of Schedule 6 of the consent requires Wambo to review and revise (if necessary) its management plans following approval of any modification.
	• The Department is therefore satisfied with the rehabilitation program for the proposed longwalls, subject to the inclusion of the recommended additional rehabilitation objectives.	

Agriculture	• The Department has also considered relevant provisions of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* and notes that the modification area does not contain Biophysical Strategic Agricultural Land and is located over 13 km southeast of the nearest mapped equine critical industry cluster (CIC) land and around 3 km north of the nearest area of mapped viticulture CIC land. • Further, the modification would not be considered to significantly impair the ability of agricultural enterprises to access support services, infrastructure or transport routes, or result in the loss of scenic and landscape values. • The Department is therefore satisfied that the agricultural impacts of the modification would be consistent with the existing operations and could continue to be managed under the Extraction Plan process.	No additional conditions necessary.
Historic Heritage	• There are no items of non-Aboriginal heritage significance in the vicinity of the proposed modification area. • The modification area is located over 3 km west of the Wambo Homestead Complex Curtilage, and would remain well outside the Wambo Homestead Exclusion Zone. • The Department is satisfied that the modification would have no impacts on the heritage values of the Wambo Homestead Complex.	No additional conditions necessary.
Surface Infrastructure	• The modification would use the existing underground ventilation system to manage mine gases and as such, would not require any additional surface or in-seam drilling for pre-mining or post-mining (goaf) gas drainage. • The Department is satisfied that mine gases can be managed through the existing underground gas management system.	No additional conditions necessary.
Waste Material	• The modification would produce an additional 0.8 Mt of tailings and 1.1 Mt of coarse rejects. In line with approved arrangements, the tailings would be pumped as slurry to dedicated emplacement areas and encapsulated in the open cut voids. The coarse rejects would be co-disposed in the open cut voids or used as bulk fill to cap the mine's tailings emplacement areas.	No additional conditions necessary.
Air Quality & Noise	• The modification is not expected to materially change the mine's approved air quality and noise impacts, which would continue to be managed in line with Wambo's existing monitoring and management plans.	No additional conditions necessary.
Social and Economic Impacts	• The modification would utilise the existing operational workforce and equipment fleet to optimise coal recovery from an area already approved for underground mining, with minor additional impacts on nearby receivers. • The Wambo workforce currently consists of approximately 670 employees and contractors. • The modification would recover an additional 5.6 Mt of ROM coal, provide continued employment for the South Bates underground mine employees and contractors, provide continued State and Commonwealth taxes and royalties, and efficiently recover State-owned mineral resources that would otherwise be sterilised. • Importantly, this modification would assist in providing continuity of operations with the South Bates Underground Mine, which would reduce operational downtime and potential layoffs of the existing underground workforce.	No additional conditions necessary.
Relocation of the CHPP Portal	• Based on geotechnical and mine planning investigations, Wambo proposes to relocate the approved CHPP portal approximately 650 m north to an area within the existing/approved surface development area. • The Department has carefully considered Wambo's request and its supporting information (see **Appendix B**) and considers that the relocation of the portal would have no additional impacts beyond those already approved. Furthermore, the relocation of the portal would allow for an improved drift layout and interaction with existing surface infrastructure. Any impacts associated with the relocation of the portal would be managed under the already required management plans.	No additional conditions necessary.

6. RECOMMENDED CONDITIONS

The Department has drafted a recommended notice of modification (see **Appendix E**) and a consolidated version of the consent as it is proposed to be modified (see **Appendix F**). These conditions strengthen the existing rehabilitation objectives.

Wambo does not object to the recommended conditions.

7. CONCLUSION

The Department has assessed the merits of the proposed modification in accordance with the requirements of the EP&A Act. This assessment has shown that, with the implementation of minor amendments to existing conditions, Wambo's proposed mitigation measures and amendments to existing management plans, the proposed modification can be carried out with minimal environmental impact.

Importantly, the Department notes that the modification can be economically mined with underground longwall mining methods and is a natural extension to the existing approved underground operations at Wambo.

In addition to the recovery of 5.6 Mt of ROM coal, these longwall panels would generate approximately 14 months of additional employment for the South Bates Underground Mine workforce and provide continuity of operations within the South Bates Underground Mine in an area that is already approved for subsidence. Ensuring continuity would provide significant economic and social benefits by avoiding any significant operational downtime and potential layoffs of the existing underground workforce.

The Department is therefore satisfied that the proposed modification is in the public interest and should be approved, subject to conditions.

8. RECOMMENDATION

It is recommended that the Executive Director, Resource Assessments and Compliance, as delegate of the Minister:

- **considers** the findings and recommendations of this report;
- **determines** that the modification is within the scope of section 75W of the EP&A Act;
- **approves** the modification application, under section 75W, subject to conditions; and
- **signs** the notice of modification at **Appendix E**.

Howard Reed

Howard Reed
Director
Resource Assessments
3-11-15

Oliver Holm
Executive Director
Resource Assessments and Compliance

APPENDIX A – ENVIRONMENTAL ASSESSMENT

Refer to the Department's website:
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6720

APPENDIX B – CHPP RELOCATION REQUEST

Refer to the Department's website:
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6720

APPENDIX C – COPY OF SUBMISSIONS

Refer to the Department's website:
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6720

APPENDIX D – RESPONSE TO SUBMISSIONS

Refer to the Department's website:
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6720

APPENDIX E – NOTICE OF MODIFICATION

APPENDIX F – CONSOLIDATED DEVELOPMENT CONSENT