MAJOR PROJECT ASSESSMENT: Warkworth Extension Project (09_0202)

Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

October 2011

Cover photos: Coal Reclaimer – Mt Thorley Warkworth Mine Complex

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EXECUTIVE SUMMARY

Warkworth Mining Limited (Warkworth) operates the Warkworth Mine, an existing open cut coal mine located approximately 9 kilometres southwest of Singleton in the Hunter Valley. Warkworth Mine has an approved extraction rate of 18 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal.

Warkworth Mine and the adjacent Mount Thorley Mine are managed as one integrated mining complex, known as Mount Thorley Warkworth (MTW), in which equipment, personnel, overburden, water, coal rejects and coal preparation are managed in an integrated fashion across the complex.

Warkworth proposes to extend existing open cut operations to the west, extending the life of the Warkworth mine by a further 11 years and enabling extraction of an additional 200 million tonnes of ROM coal. The project, known as the Warkworth Extension project, includes all aspects of existing operations for the Warkworth Mine, including maintaining approved annual production levels, processing and coal transport arrangements, and continued integration with Mount Thorley Mine.

As part of the project, Warkworth proposes to undertake open cut mining operations within land previously set aside as a Green Offset under the existing development consent and the existing *Environment Protection and Biodiversity Conservation Act* approval. An alternative offset strategy for the project has been proposed. Warkworth also proposes to undertake open cut mining operations across Wallaby Scrub Road, requiring its closure.

The project has a capital investment value of approximately $629 million, and would provide continued employment for the current workforce of 851 people for a further 10 years, and additional employment for an average 148 full time employees.

The project constitutes a 'major project' under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as it is development for the purposes of coal mining, and consequently requires the Minister's approval. However, under the Minister's delegation, the project application must be determined by the Planning Assessment Commission (PAC) due to the significant level of public interest in the project.

The Department exhibited the Environmental Assessment for the project from 30 April 2010 to 15 June 2010, and received 109 submissions: 7 from government authorities, 19 from special interest groups and 83 from the general public. Most of the public submissions either objected to or raised concerns about the project, with the main issues relating to impacts on Endangered Ecological Communities (EEC), the mining of existing biodiversity offsets and the adequacy of the proposed offset strategy. Other key issues raised related to noise and vibration, air quality and traffic impacts relating to the closure of Wallaby Scrub Road.

The Department has assessed the project application, EA, submissions on the project, Warkworth's response to submissions and preferred project report, in accordance with the objects of the EP&A Act and the principles of ecologically sustainable development.

This assessment has found that the project would have a number of adverse environmental impacts, including:

- the clearing of 764.7 hectares of woodland EECs;
- significant noise and/or dust impacts on 16 privately-owned residences and properties; and
- impacts on 113 Aboriginal sites.

However, the Department is satisfied that these impacts can be adequately mitigated, managed, offset and/or compensated through implementation of a number of commitments made by Warkworth and conditions recommended by the Department. Warkworth has proposed:

- a significant offset strategy involving the protection and enhancement of 4,790 hectares of land for ecological benefit, along with a rehabilitation strategy that would ultimately increase this area to 8,137 hectares of conservation land;

- preparation of a recovery plan for the Warkworth Sands Woodland EEC, and a contribution of $1 million toward research and recovery of this community and the Ironbark Woodland EECs;
- noise and dust mitigation and/or acquisition of significantly affected properties; and
- a cultural heritage conservation area to conserve 510 hectares of land in perpetuity.

The Department has recommended a broad range of stringent conditions to ensure these measures are effectively implemented. In addition, the Department has recommended conditions requiring Warkworth to contribute approximately $10 million toward community enhancement and road upgrades and maintenance for the Bulga and surrounding area.

The Department acknowledges that the project represents a logical extension of the existing mining complex, and that it would make use of existing infrastructure and facilities. The Department also recognises that the project would provide major economic and social benefits for the Hunter region and to NSW, including:

- a direct capital investment in the mine complex of $629 million;
- generating an additional 148 new direct jobs at the mine complex;
- generating in total 44,675 new direct and indirect "employment years" in the Hunter Region, over the life of the project (primarily between the Years 2021 and 2031, which is the extended life of the Warkworth project); and
- direct revenue for the State Government from coal resource royalties.

On balance, the Department believes that the project's benefits would outweigh its residual impacts that it is in the public interest and should be approved, subject to stringent conditions.

1. BACKGROUND

The Mt Thorley-Warkworth (MTW) mine complex is located about 9 kilometres (km) to the southwest of Singleton in the Upper Hunter Valley (see Figure 1).

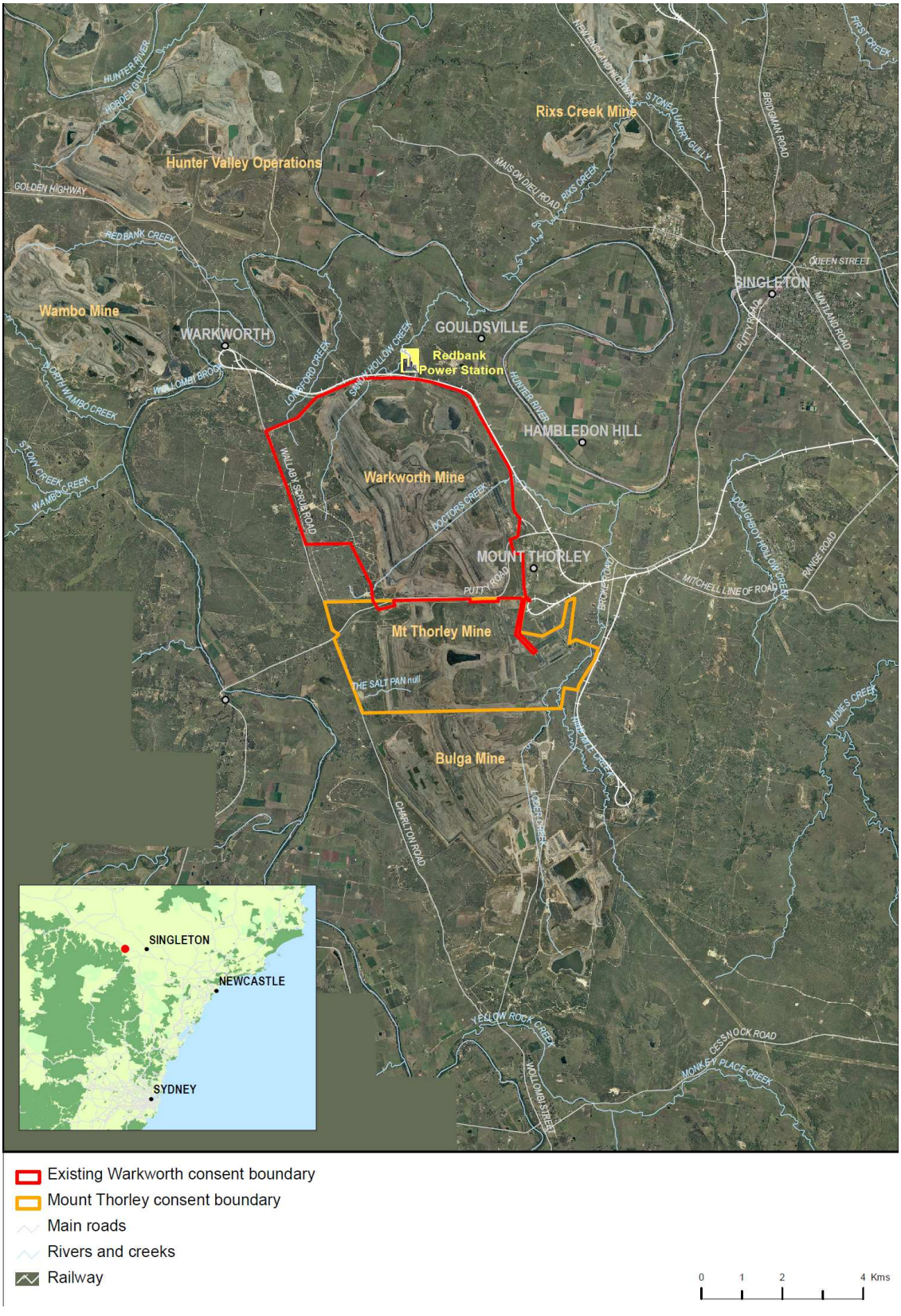


Figure 1: Location of Mt Thorley-Warkworth Mine Complex

It is comprised of two open cut coal mines (see Figures 1 & 2):

- the Warkworth mine, where coal extraction is gradually moving westwards towards Wallaby Scrub Road; and
- the Mt Thorley mine, where coal extraction is gradually moving westwards towards Charlton Road.

These two mines have a separate, but cross-linked, ownership. Warkworth mine is owned by Warkworth Mining Ltd (Warkworth), whereas Mt Thorley is owned by Mount Thorley Operations. The mines also have separate development consents. Nonetheless, due to the overlapping ownership structure (which is dominated by Coal & Allied Industries Ltd), the two mines have been operated under single management as an integrated mine complex since 2004. Under these arrangements, the mines share employees and surface infrastructure - and are now connected by a series of haul roads (with bridges over Putty Road), conveyors and pipelines; they also have highly inter-dependent mining operations with coal, overburden, tailings, and water being moved between the two mines.

Together, the mines have approval to extract up to 28 million tonnes (Mt) of run-of-mine (ROM) coal a year, process this coal at either the Warkworth or Mt Thorley coal preparation plants (CPPs), and then rail it to export markets via the adjacent Mt Thorley Coal Loader.

The area to the west of the existing Warkworth mining operations is currently being managed for conservation purposes, and includes large offset areas that were established following the approval of the most recent expansion of mining operations in 2003 (see Figure 2).

The approved operations of both mines are summarised in Table 1, and depicted in Figure 2.

Table 1: Approved Operations Mt Thorley-Warkworth Mining Complex

Aspect	***Warkworth***	***Mt Thorley***
Company	Warkworth Mining Limited	Mt Thorley Operations Pty Limited
Operations	Commenced 1981	Commenced 1981
Consent	DA 300-9-2002-I, which expires in 2021	DA 34/95, which expires in 2017
Remaining Life	10 years	6 years
Mining Reserves	> 400 Mt	Around 37 Mt
Mining Areas	5 open cut pits (North, West, CD, Woodlands and South) with mining operations moving to the west towards Wallaby Scrub Road	1 open cut pit (Loders) and 2 box cuts (Abbey Green North & South), with mining operations moving west towards Charlton Road.
Extraction Rate	Approved: up to 18 Mt ROM coal a year 2009/10: 6.5 Mt	Approved: up to 10Mt ROM coal a year Actual in 2009/10: 5.7 Mt
Coal Processing	Coal is processed at the: • Warkworth CPP, which can process up to 13 Mt ROM coal a year • Mt Thorley CPP	Coal is processed at the Mt Thorley CPP, which can process up to 10Mt ROM coal a year
Coal Transport	Coal is transported to the: • Mt Thorley Coal Loader by haul road and conveyor, and then railed to export markets • Redbank Power Station by conveyor	Coal is transported to the Mt Thorley Coal Loader by haul road and conveyor, and then railed to export markets.
Overburden	In-pit emplacement behind advancing mining operations at both the Warkworth and Mt Thorley mines	In-pit emplacement behind advancing mining operations at the Mt Thorley mine
Rejects Disposal	• Coarse reject is placed in the in-pit emplacement areas at both the Warkworth and Mt Thorley mines • Fine reject (tailings) is stored in tailings facilities on site • Dewatered tailings is transferred to the Redbank Power Station by conveyor Ash from Redbank Power Station is transferred by pipeline to the tailings storage facilities at the Warkworth mine.	Coarse reject and tailings are disposed of in the Abbey Green North and South pits.

Aspect	*Warkworth*	*Mt Thorley*
Infrastructure	• Warkworth CPP • Site access roads, internal haul roads, and three bridges over Putty Road (only two constructed). • Conveyors to the Mt Thorley Coal Loader and Redbank Power Station • Heavy vehicle workshops and washing facilities • Bulk oil and fuel storages, general stores and workshop • Coal stockpiles, storage hoppers and crushers • Electricity supply infrastructure • Office building and parking	• Mt Thorley CPP • Site access roads and internal haul roads • Conveyor from Mt Thorley CPP to Mt Thorley Coal Loader • Vehicle wash bays and water truck fill points • Workshop, stores, and sewage treatment infrastructure • Office building and parking
Water Management	Water management system including process water and sediment dams, pipelines and water sharing infrastructure with the Mt Thorley and Hunter Valley Operations mines.	Water management system including process water and sediment dams, water and tailings pipelines and water sharing infrastructure with the Warkworth mine.
Biodiversity Offsets	Offset areas to the west and north of the approved mining operations covering 1,646 ha with: • 757 ha in 2 non-disturbance areas (NDAs); • 889 ha in 3 habitat management areas (HMAs).	None
Rehabilitation	2299 ha on site rehabilitation comprising a combination of woodland, open woodland and pasture. 886 ha rehabilitated across MTW complex as at the end of December 2010.	Rehabilitate site to well treed grazing land. 886 ha rehabilitated across MTW complex as at the end of December 2010.
Employment	860 with the Mt Thorley mine	860 with the Warkworth mine

The MTW mine complex is located in an area that is dominated by large-scale and intensive mining operations, which have significantly altered the natural landscape since the late 1970s. The closest mining operations to the complex (see Figure 1) include the:

- Bulga open cut and underground mine complex, which is located to the south of the complex and is allowed to extract up to 26.2 Mt of ROM coal a year;
- Wambo open cut and underground mine complex, which is located to the northeast of the complex and is allowed to extract up to 14.7 Mt of ROM coal a year; and
- Hunter Valley Operations (HVO) mine complex, which is located to the north of the complex, and allowed to extract up to 36 Mt of ROM coal a year.

A consequence of all this mining and industrial activity is that most of the land in the vicinity of the complex is owned by one mining company or another (see Figure 3).

Nevertheless, it is important to recognise that large tracts of land surrounding these mining operations are used for a range of agricultural activities, with the land along the Hunter River and Wollombi Brook being used for intensive agriculture and the rest of the agricultural land being used primarily for grazing (see Figure 1).

It is also important to recognise that one of the largest stands of remnant vegetation of the Hunter Valley floor is located immediately to the west of the complex. This vegetation forms part of a fledgling vegetation corridor across the valley floor (which has been heavily cleared over the last century) between the Wollemi and Yengo National Parks to the southwest of the complex and the Barrington Tops National Park, which is located on the northern edge of the valley floor (see Figure 1). It also contains one of the last stands of Warkworth Sands Woodland, an EEC that is unique to this part of the Hunter Valley.

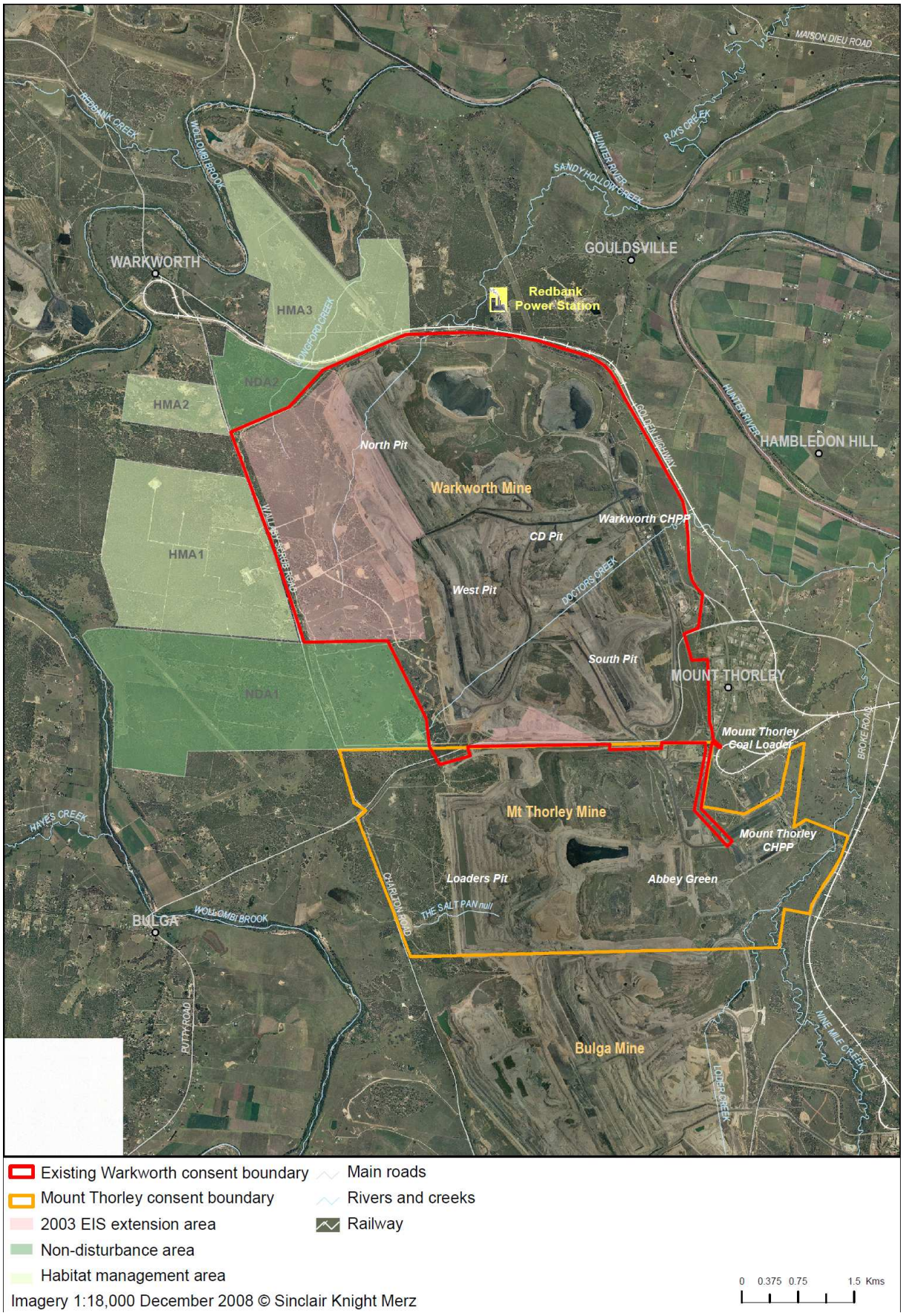


Figure 2: Mt Thorley-Warkworth Mine Complex - Approved Operations (Including Offsets)

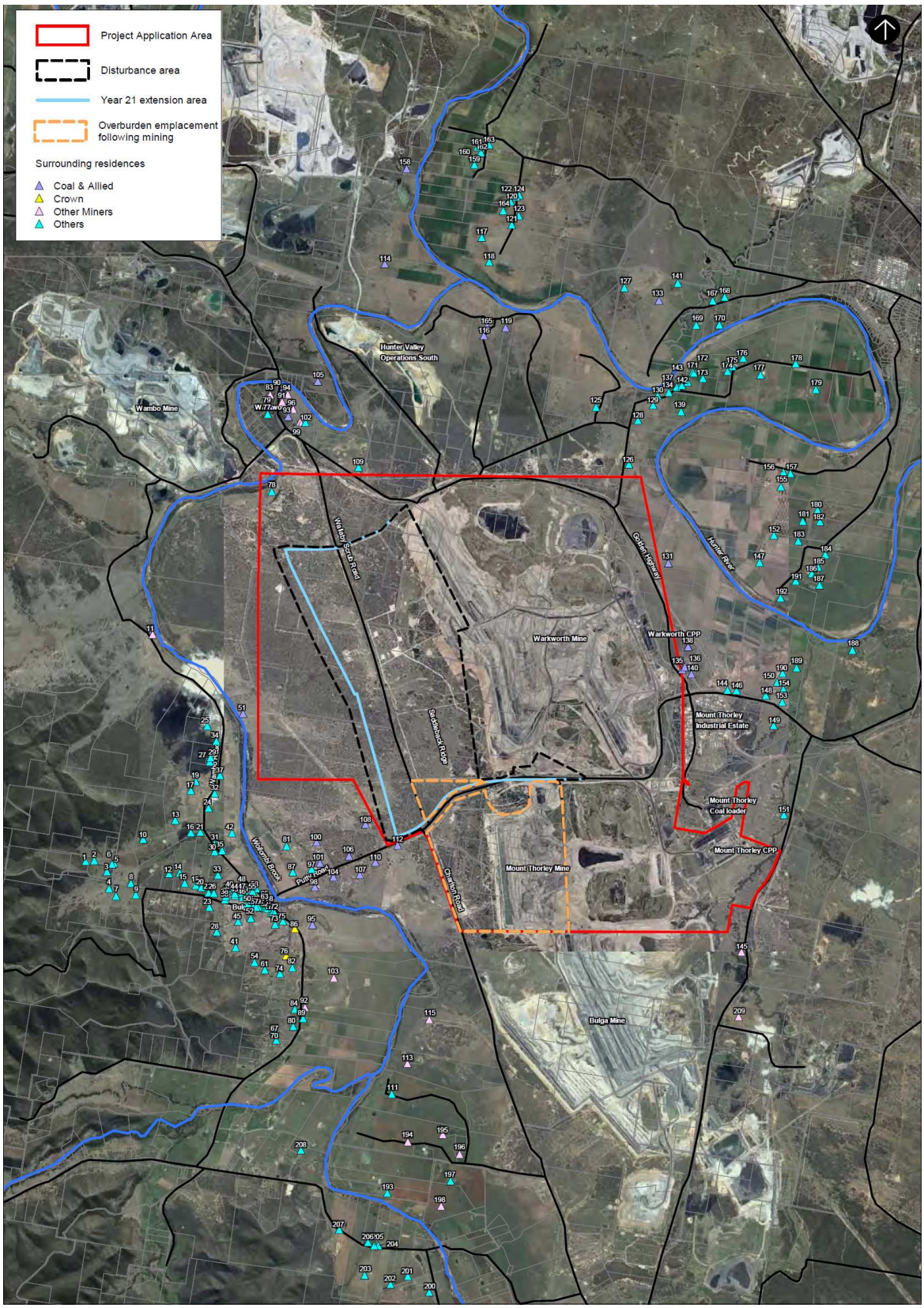


Figure 3: Land Ownership and Nearest Residences

The nearest settlement to the complex is the Bulga Village, which is located adjacent to the Wollombi Brook about 4-5 km to the west of the complex. The village has a population of about 320, and a range of public facilities including a pub, service station and café, police station and rural fire brigade (see Figure 3).

There are also several other rural-residential properties located in close proximity to the complex - Mt Thorley to the east; Hambledon Hill, Wylies Flat and Gouldsville to the northeast; Warkworth to the northwest; and Putty Road to the west (see Figure 3).

Key infrastructure in the area includes the:

- regional road network, which includes two State Roads (the Golden Highway and Putty Road) and number of local roads (Wallaby Scrub, Charlton and Broke Roads);
- private rail spur lines, linking the Bulga, Wambo and MTW mines to the Great Northern Railway to the south of Singleton;
- Mt Thorley industrial estate and coal loader, which are located directly to the east of the complex; and
- Redbank Power Station, which is located directly to the north of the complex (see Figure 1).

2. PROPOSED PROJECT

Warkworth Mining Limited (Warkworth) proposes to extend the Warkworth mine's existing open cut mining operations further to the west, and mine through both Wallaby Scrub Road and some of the offsets for the extension that was approved in 2003 (see Figure 4).

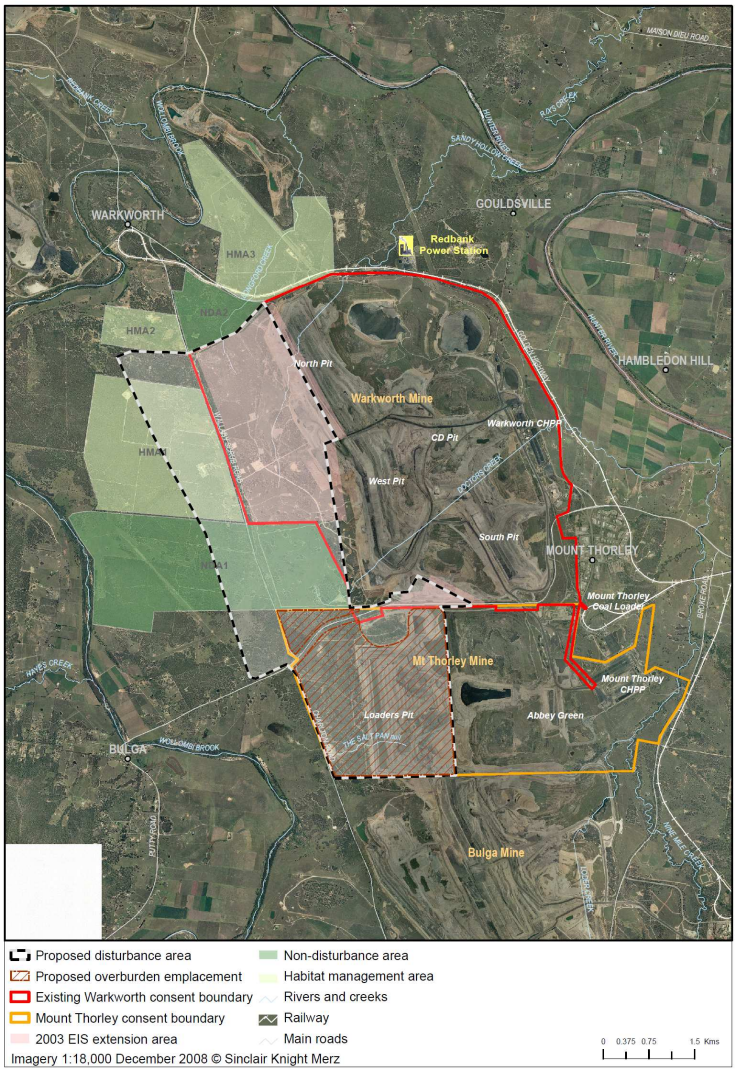


Figure 4: Proposed Extension & Existing Offset Areas

Warkworth Extension Project

The proposal – known as the Warkworth Extension Project – involves the extraction of an additional 200 Mt of ROM coal, and would extend the life of the mine from 2021 until 2031. It would also facilitate further integration between the Warkworth and Mt Thorley mines, with the Warkworth mining operations continuing to use the Mt Thorley mine's surface facilities following the proposed completion of open cut mining at the Mt Thorley mine in 2017.

The primary reason for mining through the existing offsets, including parts of the Non Disturbance Areas which were supposed to be conserved in perpetuity, is that the resources underlying these offsets which were previously uneconomic to mine are now extremely valuable due to the growth in energy demand and increase in the price of coal.

As there are additional coal resources to the west of the proposed extension that are also within existing offset areas, and that Warkworth would like to mine at some stage in the future, Warkworth is proposing to replace the existing offset with an alternative offset. Essentially, it has acknowledged that the design of the original offset was flawed, and should be replaced as soon as possible with a better offset that would not sterilise coal resources and could be safely protected in perpetuity.

The project therefore includes an offset proposal, which seeks to both replace the existing offset and offset the impacts associated with the proposed extension of the mine.

Since the exhibition period, Warkworth has made a number of changes to the original proposal, ostensibly to strengthen the offset proposal. These changes include:

- increasing the size of the proposed Southern Biodiversity Area;
- adding three new biodiversity areas, covering an area of about 1,422 hectares (ha), to the offset;
- agreeing to add at least another 750 ha of woodland; vegetation to the offset within the next 12 months;
- committing to provide up to $1 million for research into the restoration of endangered ecological communities; and
- agreeing to establish at least 2,114 ha of endangered ecological communities (EECs) on the rehabilitated mine site, compared to the 781 ha that was originally proposed.

The major components of the revised project are summarised in Table 2, and depicted in Figures 5 – 7. The project is described in full in Warkworth's Environmental Assessment (EA – see Appendix I), Response to Submissions (see Appendix G), and Preferred Project Report (PPR – see Appendix D).

Associated Modification – Hunter Valley Operations South Project

The Warkworth Extension Project is linked to a proposed modification by Coal & Allied Operations Ltd of its approval for the HVO South Project (06_0261) to:

- reallocate the existing Archerfield offset area, which is located within the HVO mine complex, to a property adjacent to the Goulburn River National Park (see Figure 7); and
- allow the Archerfield offset area to be combined with additional land to form the larger Northern Biodiversity Area, which is part of the proposed offset package for the Warkworth Extension Project (see Figure 7.

The primary reason for doing this is to combine all the Warkworth Sands Woodland EEC within the Archerfield offset area with the Warkworth Sands Derived Native Grassland in the adjoining area to form a larger offset area that can be conserved and enhanced under a single management regime, principally to offset the impacts of the Warkworth Extension project on this EEC.

The proposed replacement for the Archerfield offset area forms part of the larger Goulburn River Biodiversity Area, which is also part of the proposed offset package for the Warkworth Extension Project (see Figure 7).

The proposal is described in full in Coal & Allied's EA (see Appendix I) for the proposed modification.

Table 2: Major Components of the Project

Aspect	***Description***
Project Summary	• **Extend open cut mining operations further to the west through Wallaby Scrub Road and into existing green offset areas;** • **Increase the integration between the Warkworth and Mt Thorley mines;** • **Augment, upgrade and use existing infrastructure;** • **Relocate Wallaby Scrub Road further to the west (if required);** • **Rehabilitate the MTW mine complex, primarily to native woodland; and** • **Offset the biodiversity and Aboriginal heritage impacts of the project offsets.**
Project Life	21 years
Mining and Reserves	Extraction of and additional 200 Mt of ROM coal, taking the approved reserves to around 370 Mt of ROM coal.
Mining Areas	The project involves extending the north and west pits further west, covering an additional 750 ha.
Extraction Rate	No change. The maximum extraction rate of the Warkworth mine would remain18Mt of ROM coal a year, while the maximum extraction rate of the MTW mine complex would remain at 28 Mt of ROM coal a year until 2017, when approved coal extraction is expected to be completed at the completed at the Mt Thorley mine, and then revert back to 18 Mt of ROM coal a year.
Coal Processing	No change. Coal would continue to be processed at the Warkworth CPP (13 Mt a year) and Mt Thorley CPP (10 Mt a year).
Coal Transport	No change. Product coal would continue to be transported to the Mt Thorley Coal Loader and transported by rail to export markets. Some product coal and beneficiated tailings would continue to be transported by conveyor to the adjoining Redbank Power Station.
Overburden Emplacement	The additional overburden would continue to be emplaced in-pit behind the advancing mining operations. There would be no change to the approved overburden emplacement heights at either the Warkworth or Mount Thorley mines.
Rejects Disposal	No change. Coarse rejects and tailings would continue to be disposed of in-pit and tailings storage facilities.
Infrastructure	• Upgrade and augmentation of existing surface infrastructure; • Construct a third bridge over Putty Road between the Warkworth and Mt Thorley mines; • Construct another conveyor between the Warkworth CPP and the Mt Thorley CPP; • Relocate Wallaby Scrub Road (if required);
Water Management	Extension of the mine water management system to include the extension of mining. Continued water sharing between the MTW mine complex and the Redbank Power Station and Hunter Valley Operations mine complex.
Biodiversity Offsets	• Conserve and enhance 7 biodiversity areas (see Figure 8) covering an area of at least 4,790 ha (ha), including the: - Southern Biodiversity Area (977.5 ha); - Northern Biodiversity Area (342.2 ha); - Goulburn River Biodiversity Area (1,299.3 ha); - Seven Oaks Biodiversity Area (522.7 ha); - Putty Biodiversity Area (378.8 ha); - Bowditch Biodiversity Area (519.8 ha); and - an additional biodiversity area which has at least 750 ha of woodland; • Contribute $500,000 to research into restoration of the Warkworth Sands Woodland EEC; • Prepare a recovery plan for the Warkworth Sands Woodland EEC; and • Contribute $ 500,000 to research into rehabilitation of the Central Hunter Grey Box-Ironbark Woodland and Central Hunter Ironbark-Spotted Gum-Grey Box Forest EECs.
Cultural Heritage Conservation	Establish the Wollombi Brook Cultural Heritage Conservation Area, within the Southern Biodiversity Area (see Figure 16)
Rehabilitation	Establish at least 2,114 ha of the Central Hunter Grey Box-Ironbark Woodland and Central Hunter Ironbark-Spotted Gum-Grey Box Forest EECs on the rehabilitated mine complex (see Figure 6).
Employment	To fluctuate between 860 and 1220, within an average of 1000
Capital Value	Approximately $629M
Royalties	Approximately $600 million

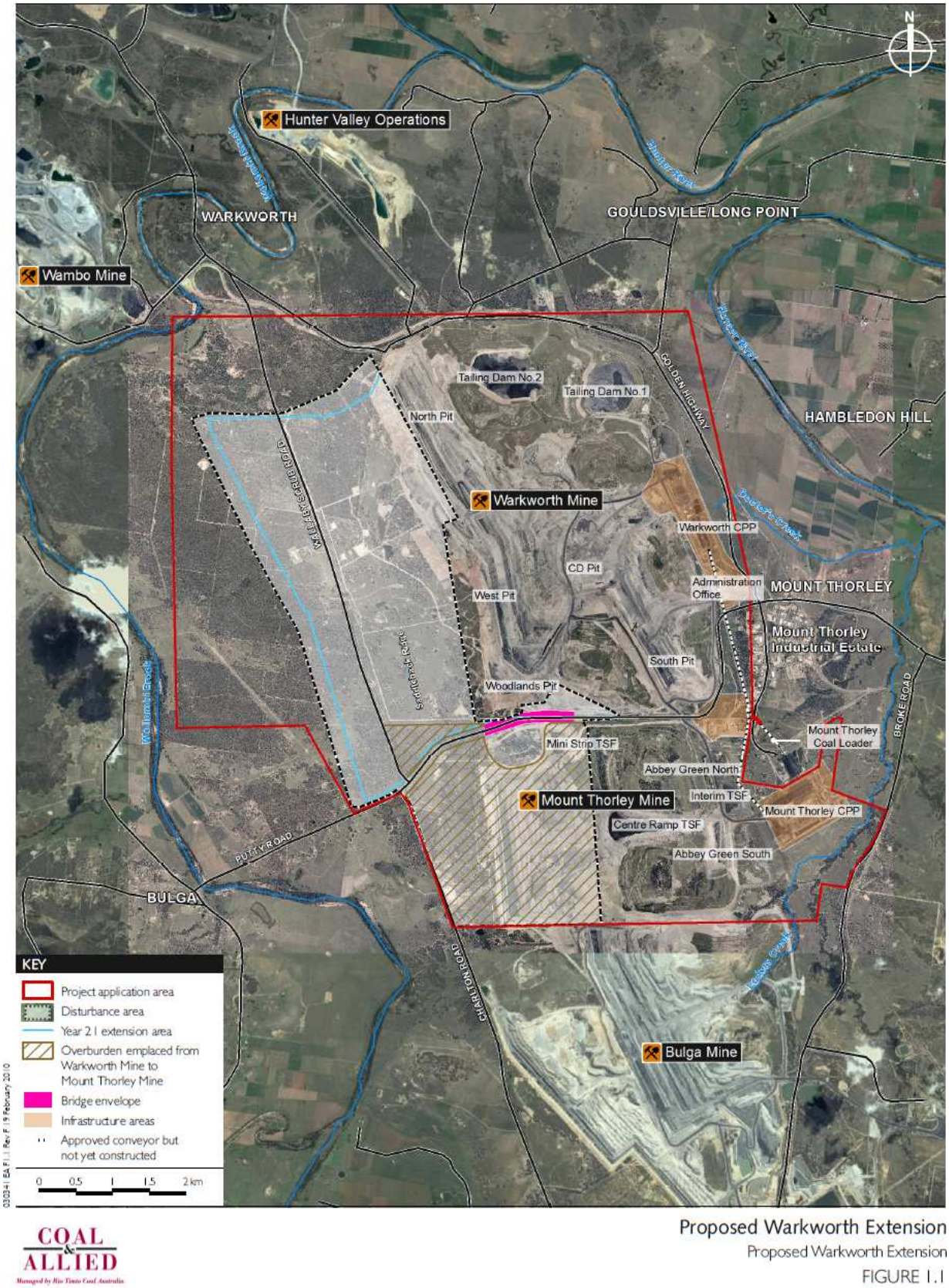


Figure 5: Proposed Warkworth Extension

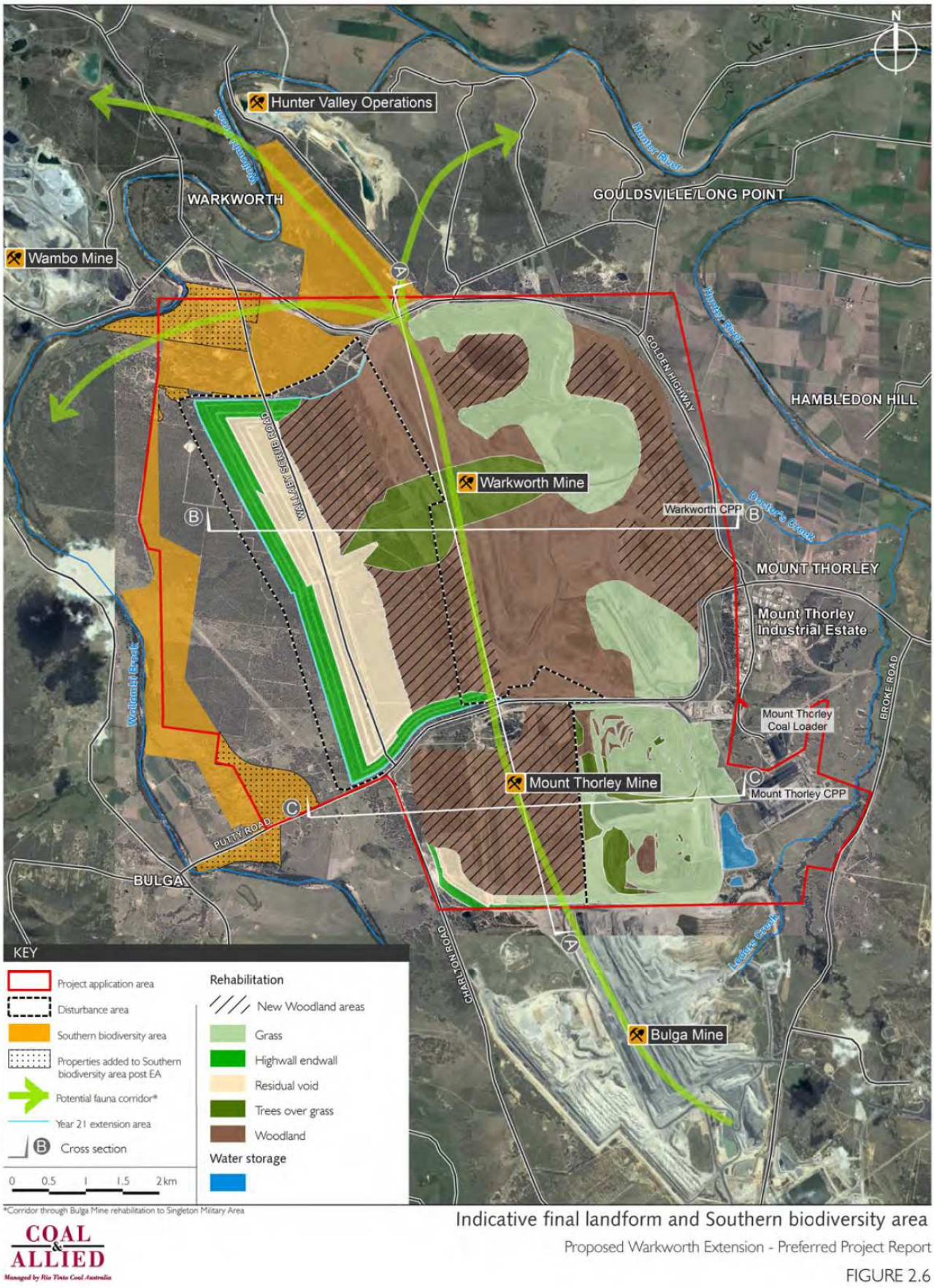


Figure 6: Proposed Final Landform & Southern Biodiversity Area

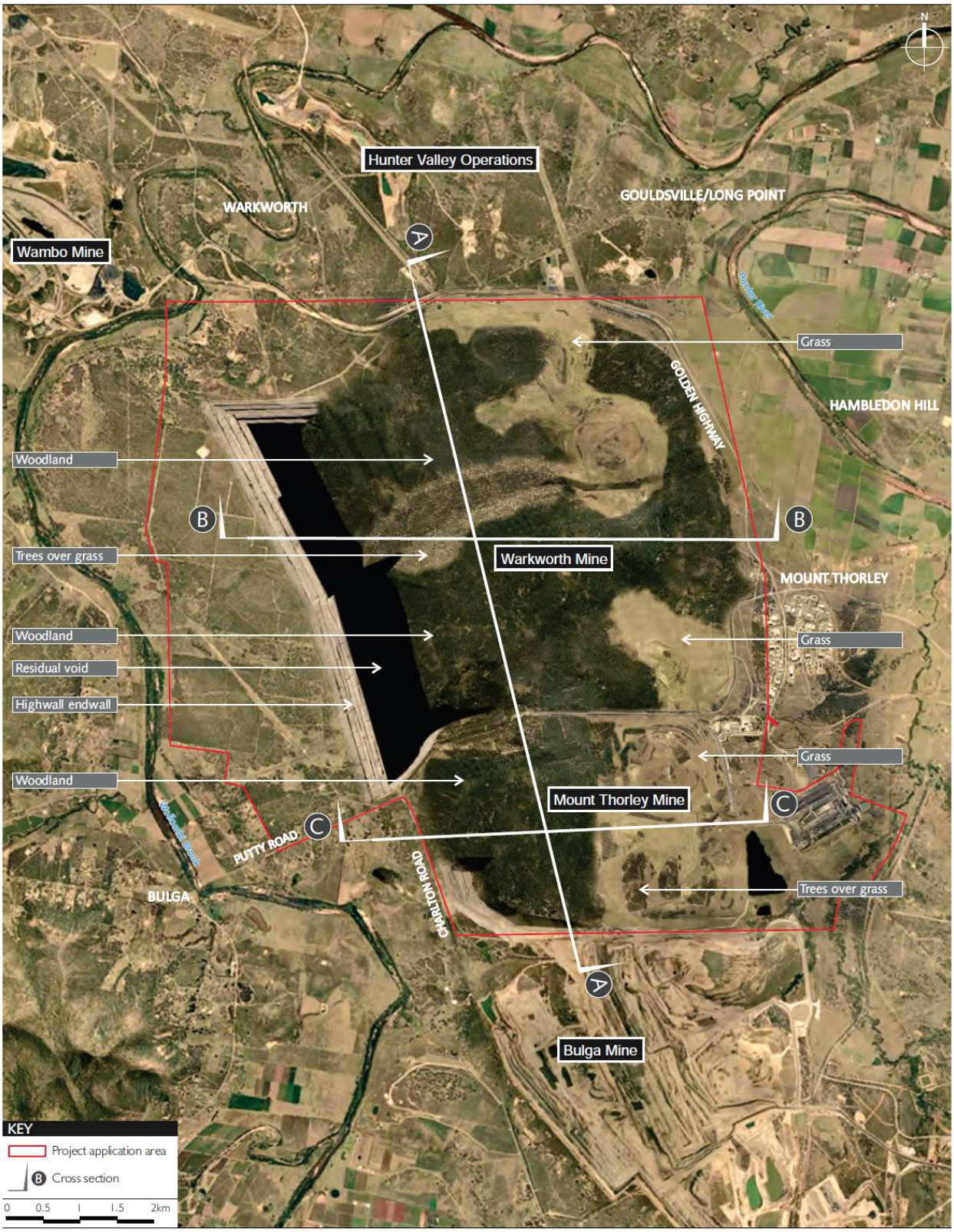


Figure 7: Conceptual Rehabilitation Plan & Southern Biodiversity Area

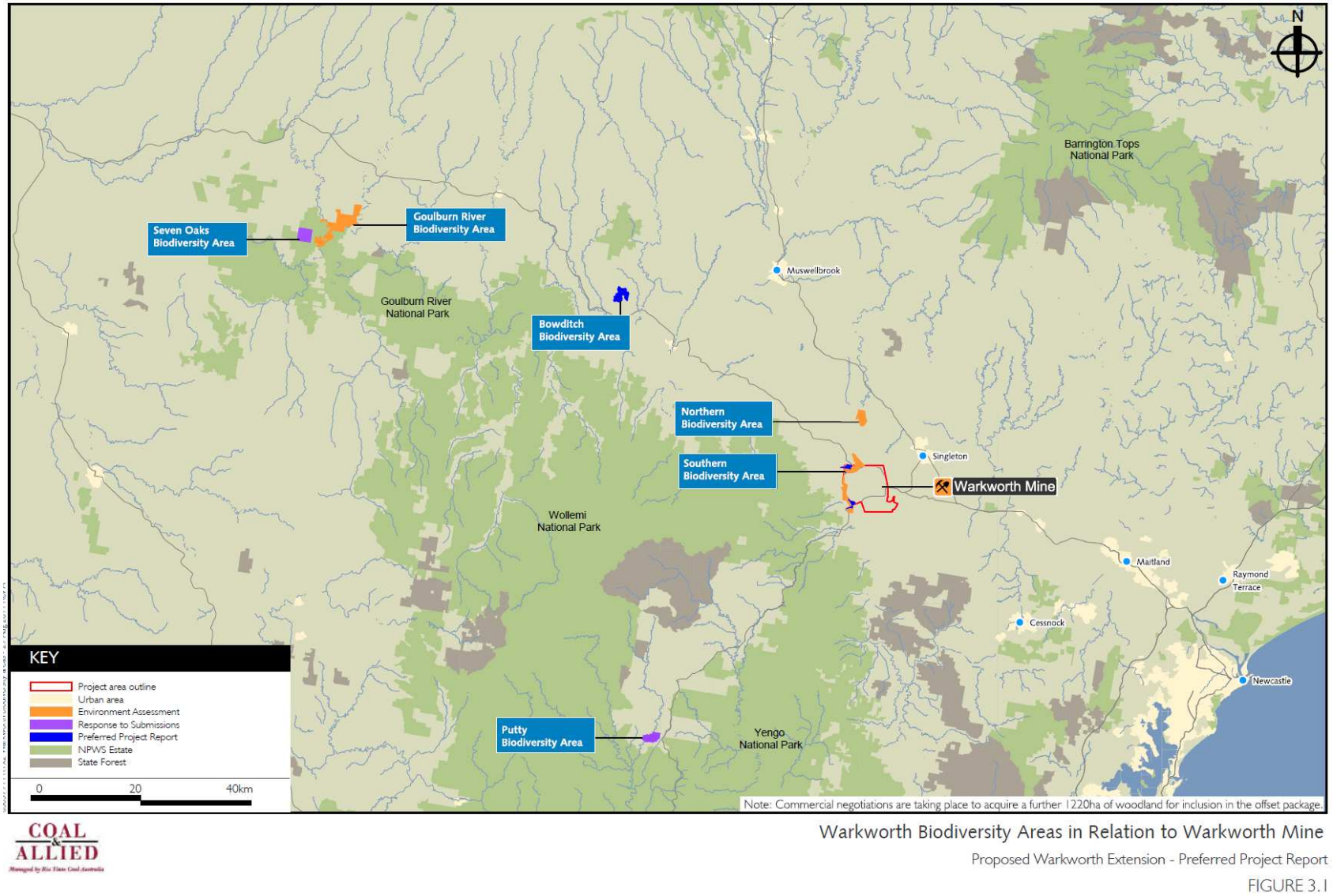


Figure 8: Proposed Offset Areas

3. STATUTORY CONTEXT

3.1 Warkworth Extension Project

Major Project
The Warkworth Extension Project is classified as a major project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) because it is development for the purpose of coal mining, and therefore meets the criteria in Clause 5 of Schedule 1 of *State Environmental Planning Policy (Major Development) 2005*.

The Minister is the approval authority for the project application. However, the application falls within the terms of the Minister's delegation of 14 September 2011 as Singleton Council and more than 25 of the public submissions objected to the project. Consequently, the Planning Assessment Commission (PAC) is required to determine the application.

Permissibility
The land subject to the application is zoned Rural 1(a) under the *Singleton Local Environmental Plan (LEP) 1996*. Mining is permissible with development consent in this zone. Mining is also permissible with development consent on the project site under *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*, as open cut mining may be carried out on any land where agriculture may be carried out. Consequently, the PAC may determine the application.

Integrated Approvals
Under Section 75U of the EP&A Act, a number of other approvals have been integrated into the Part 3A approval process, and are not required to be separately obtained for the project. These include:
- heritage-related approvals under the *Heritage Act 1977* and *National Parks and Wildlife Act 1974*; and
- some water-related approvals under the *Water Management Act 2000*.

Under Section 75V of the Act, a number of further approvals are required to be obtained, but must be approved in a manner that is consistent with any Part 3A approval for the project. These include:
- variations to the existing mining lease under the *Mining Act 1992*;
- approvals for new development within the Patricks Plains Mine Subsidence District under the *Mine Subsidence Compensation Act 1961*;
- variations to the existing environment protection licences for the Warkworth and Mt Thorley mines under the *Protection of the Environment Operations Act 1997*; and
- a consent under Section 138 of the *Roads Act 1993* for the construction of a previously approved bridge over Putty Road and upgrades to the Putty Road/Golden Highway intersection and Broke Road/Golden Highway intersection.

The Department has consulted with the relevant public authorities responsible for granting these integrated approvals, and considered the relevant issues relating to these approvals in its assessment of the project (see Section 5 below). None of these authorities object to the approval of the project subject to the imposition of suitable conditions.

Other Approvals
The Proponent needs to obtain several other approvals for the project, which are not integrated into the Part 3A approval process, including:
- an approval from the Commonwealth Minister for Sustainability, Environment, Water, Population, Communities under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) because the project is a "controlled action" as it is likely to have a significant impact on the nationally endangered Swift Parrot and Regent Honeyeater;
- an approval from Singleton Council to close Wallaby Scrub Road under the *Roads Act 1993*; and
- water licences from the NSW Office of Water (NOW) under both the *Water Act 1912* and the *Water Management Act 2000.*

The Commonwealth has accredited the Part 3A approval process for the Warkworth Extension Project. This means the assessment of both State and Commonwealth matters has been integrated into a single assessment process for the project. Nevertheless, it is important to recognise that the

Commonwealth Minister maintains an independent approval role for the project, and is likely to determine the matter following the PAC's determination.

The Department has consulted with the relevant public authorities responsible for granting these other approvals, and understands that neither the Commonwealth nor NOW object to the approval of the project. However, Singleton Council has indicated that it objects to the closure of Wallaby Scrub Road.

While this objection does not preclude the PAC from approving the project, and allowing mining through Wallaby Scrub Road, Warkworth would still be required to obtain the necessary approval for the closure of Wallaby Scrub Road under the Roads Act 1993, and also a mining lease over the road reserve prior to being able to carry out the PAC's approval.

Exhibition and Notification
Under Section 75H(3) of the EP&A Act, the Director-General is required to make the EA for the project publicly available for at least 30 days. After accepting the EA for the project, the Department:

- made it publicly available from 30 April 2010 until 15 June 2010:
  - on the Department's website,
  - at the Department's Information Centre and Singleton Council, and
  - at the offices of the Nature Conservation Council;
- notified landowners in the vicinity of the project about the exhibition period by letter;
- notified relevant State government authorities and Singleton Council by letter; and
- advertised the exhibition in the Sydney Morning Herald and the Singleton Argus.

This satisfies the requirements of Section 75H(3) of the EP&A Act.

3.2 HVO South Project Modification

Approval Authority
The Minister was the approval authority for the original project application for the HVO South Project, and is consequently the approval authority for the modification application. The application falls within the terms of the Minister's delegation of 14 September 2011, as Singleton Council has objected to the proposal. Consequently, the PAC is required to determine the application.

Modification
The Department has examined the nature of the proposed modification, and is satisfied that the proposed replacement of the offset for the HVO South Project should be treated as a modification to the original approval, as opposed to a new project in its own right. This is primarily because it represents a minor change to the approved project with limited environmental consequences. Consequently, the Department is satisfied that the application may be assessed and determined under Section 75W of the EP&A Act.

Exhibition and Notification
The Department exhibited and notified the EA for the proposed modification in conjunction with the EA for the Warkworth Extension Project from 30 April until 15 June 2010.

3.3 Environmental Planning Instruments

Under Section 75I of the EP&A Act, the Director-General's report for both proposals is required to include a copy of, or reference to, the provisions of environmental planning instruments that substantially govern the carrying out of the project. The Department has considered both proposals against the relevant provisions of several environmental planning instruments (see Appendix C), as well as Warkworth's consideration of these issues in the EA for the Warkworth Extension Project (see Appendix I), and is satisfied that none of these instruments substantially govern the carrying out of this project.

3.4 Objects of the Environmental Planning and Assessment Act 1979

The PAC should consider the objects of the EP&A Act when it makes decisions under the Act on the Minister's behalf.

The objects of most relevance to the PAC's decision on whether or not to approve both the project and modification applications are found in Section 5(a)(i),(ii),(vi)&(vii). They are:

'The objects of this Act are:
(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,
(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 (ESD).'

The Department is satisfied that the project encourages the proper use of resources (Object 5(a)(i)) and the promotion of orderly and economic use of the land (Object 5(a)(ii)), particularly as the subject coal resource is located within an existing exploration licence for coal in a region that is dominated by coal mining operations, can be carried out using existing surface infrastructure, and would provide considerable socio-economic and public benefits.

Consideration of environmental protection (Object 5(a)(vi)) is provided in Section 5 of this report. Following its assessment, the Department is satisfied that the project is able to be undertaken in a manner that would maintain or improve biodiversity values of the locality in the medium to long term.

The Department has fully considered the encouragement of ecologically sustainable development (ESD) (Object 5(a)(vii)) in its assessment of the merits of the project application in Section 5 below, and sought to integrate all significant economic and environmental considerations and avoid any serious or irreversible damage to the environment, based on an assessment of risk-weighted consequences. It has also considered Warkworth's assessment of these matters, including its assessment of the alternatives of not proceeding with or using underground rather than open cut mining methods, in its EA (see Appendix I). Based on this consideration, the Department is satisfied that the project can be carried out in a manner that is consistent with the principles of ESD.

3.5 Statement of Compliance

Under Section 75I of the EP&A Act, the Director-General's report is required to include a statement relating to compliance with the environmental assessment requirements of the project. The Department is satisfied that the environmental assessment requirements have been complied with.

4. CONSULTATION

4.1 Warkworth Extension Project

During the exhibition period, the Department received 109 submissions on the project, comprising:
- 7 from public authorities;
- 19 from special interest groups; and
- 83 from the general public.

A full copy of these submissions is attached in Appendix H.

Warkworth provided a formal response to the issues in these submissions in August 2010 (see Appendix G), and a Preferred Project Report (see Appendix D) in September 2011. During the assessment process, it also provided a range of additional information (see Appendix F) to both the Department and other public authorities to clarify or expand upon matters in the EA, Response to Submissions and PPR.

Since the exhibition period, the Department has consulted further with the company, several public authorities, and selected special interest groups in order to get a better understanding of the key issues, and inform the assessment of the merits of the project.

A summary of the issues raised during the consultation process is provided below.

Public Authorities

The Division of Resources and Energy (DRE) within the ***Department of Trade and Investment, Regional Infrastructure and Services*** (DTIRIS), formerly the Department of Industry and Investment, does not object to the project. DRE noted that Warkworth would require an extension to its existing mining lease for the project under *Mining Act 1992*.

The ***Office of Environment and Heritage*** (OEH), formerly the Department of Environment, Climate Change and Water, initially raised concerns over a number of issues, including issues relating to the assessment of Aboriginal heritage, noise and air quality impacts. However, following the provision of a substantial amount of additional information by Warkworth (see Appendices D-G), OEH is satisfied that potential impacts relating to these issues could be adequately managed and has provided recommended conditions of approval.

Following extensive consultation between Warkworth, OEH and the Department, a revised biodiversity offset package has been proposed by Warkworth to compensate for impacts on biodiversity, particularly the Warkworth Sands Woodland EEC and Ironbark communities. In its final submission, OEH recommended that the offset package would be adequate provided that Warkworth:

- includes additional areas of extant native woody vegetation;
- commits to manage the offset lands in perpetuity; and
- commits that no future open cut mining applications will be made in Areas 1, 2 and 3 of the offset package.

The ***NSW Office of Water*** (NOW) initially raised a number of concerns about the assessment of the potential water impacts of the project, including the:

- site water balance calculations;
- level of detail provided on the extent of alluvial drawdown and its proximity to the alluvial aquifer; and
- potential impact of the project on the groundwater dependant ecosystems in the Wollombi Brook alluvium downstream of the site.

Warkworth has provided a range of additional information to address these concerns, and NOW has subsequently indicated that it does not object to the approval of the project, subject to the imposition of suitable conditions. The Department has incorporated these conditions into the recommended conditions of approval.

The ***Roads and Traffic Authority*** (RTA) supports the project, subject to the imposition of conditions requiring the Broke Road/Golden Highway and Putty Road/Golden Highway intersections to be upgraded; and Warkworth to construct, maintain and decommission the third bridge over Putty Road to the satisfaction of the RTA. The RTA also indicated that there was little benefit in requiring the Wambo mine to upgrade the Wallaby Scrub Road/Golden Highway intersection (under its existing development consent for the Wambo Rail Loop) if Wallaby Scrub Road is to be closed within the next few years.

The ***Department of Primary Industries*** (DPI), formerly the Land and Property Management Authority, does not object to the project. However, it noted that the project would curtail public use of Crown roads and reserves within the project area, and Warkworth would need to make suitable arrangements to address these issues prior to mining in these areas.

The ***Hunter-Central Rivers Catchment Management Authority*** (CMA) objects to the project on biodiversity grounds, saying it would have a significant detrimental impact on the targets in the Hunter-Central Rivers Catchment Action Plan to improve or maintain the biodiversity of the Hunter-Central Rivers region by 2016. Particular concerns related to:

- the regional significance of vegetation to be cleared;
- the adequacy of the proposed offset strategy and offset assessment methodology;
- the assessment of surface water and groundwater impacts as they relate to groundwater dependent ecosystems and the ecological and riparian values of Wollombi Brook; and

- whether the project presents an unacceptable long-term environmental risk.

Warkworth has provided a range of additional information to address these concerns, and substantially increased the size and nature of its proposed biodiversity offset to address the concerns raised the CMA and other submitters.

Singleton Council does not support the project on the following grounds:

- *biodiversity impacts:*
  - Council opposes mining through conservation areas that were meant to be set aside in perpetuity; and
  - the risks associated with trying to re-establish the Warkworth Sands Woodland EEC are too high, and the community could be lost forever;
- *air quality:*
  - Council requests the NSW Department of Health to carry out a full and independent health of the Singleton LGA prior to any further large-scale development being considered under Part 3A of the EP&A Act; and
  - Council requests an integrated assessment of the potential cumulative biodiversity, noise and air quality impacts of all large developments to be carried out on the Bulga, Jerrys Plains, Broke and Warkworth villages; and
- *transport:*
  - Council opposes the closure of Wallaby Scrub Road due to its potential adverse impacts on other local intersections on Putty Road, and that relocation may result in lower usage;
  - Council opposes the relocation of Wallaby Scrub Road as it may result in a lower level of use by the community, and would therefore not be justified from a cost benefit perspective; and
  - Council believes Wallaby Scrub Road should be maintained in its present location for its historical and heritage value.

Special Interest Groups and Community

Several special interest groups made a submission on the proposal, including the Broke/Bulga Landcare Group, Bulga Milbrodale Progress Association, Bulga Rural Fire Brigade, Construction Forestry Mining and Energy Union, Convict Trail Project, Cumberland Bird Observers Club, Hunter Bird Observers Club, Hunter Environment Lobby, Hunter Valley Protection Alliance, Hunter Valley Water Users Association, Jerrys Plains & Districts Progress Association, National Parks Association of NSW, National Parks Association Hunter Brach, North East Forest Alliance, Rivers SOS, Singleton Shire Healthy Environment, and Nature Conservation Council of NSW.

Of the 102 submissions received from the special interest groups and general public during the exhibition period, all but one objected to the project. Many of the submissions made were substantial, and included detailed technical argument from independent experts (see Appendix H). The key issues raised in these submissions are summarised in Figure 9 below.

The key ground for objection to the project was in relation to ecological impacts, in particular, the impact of the project on the Warkworth Sand Woodland and Central Hunter Grey Box-Ironbark Woodland EECs and fauna habitats, the mining of existing biodiversity offsets and the suitability and adequacy of the proposed offset.

The community also had significant concerns about the potential amenity, social and health impacts of the project. Concerns relating to noise and vibration centred on the likely increased noise impacts in Bulga Village resulting from the removal of Saddleback Ridge, increased vibration and property damage from blasting and the methodology of the noise assessment. Concerns regarding air quality focussed on the potential health impacts associated with further increases to currently high dust levels.

The key traffic issues were the opposition to the closure of Wallaby Scrub Road, and the resulting increases in travel time, increases in traffic on surrounding intersections which are already performing poorly, and the impact on response times of emergency services.

A common theme of objections was the potential for the project to impact on the social fabric and lifestyle of the Bulga residents, resulting in the demise of the village in a manner similar to the previous demise of the Warkworth, Camberwell and Ravensworth Villages. Many of those objecting to the project thought that underground mining was the only appropriate way for the project to proceed and that this alternative had not been adequately considered.

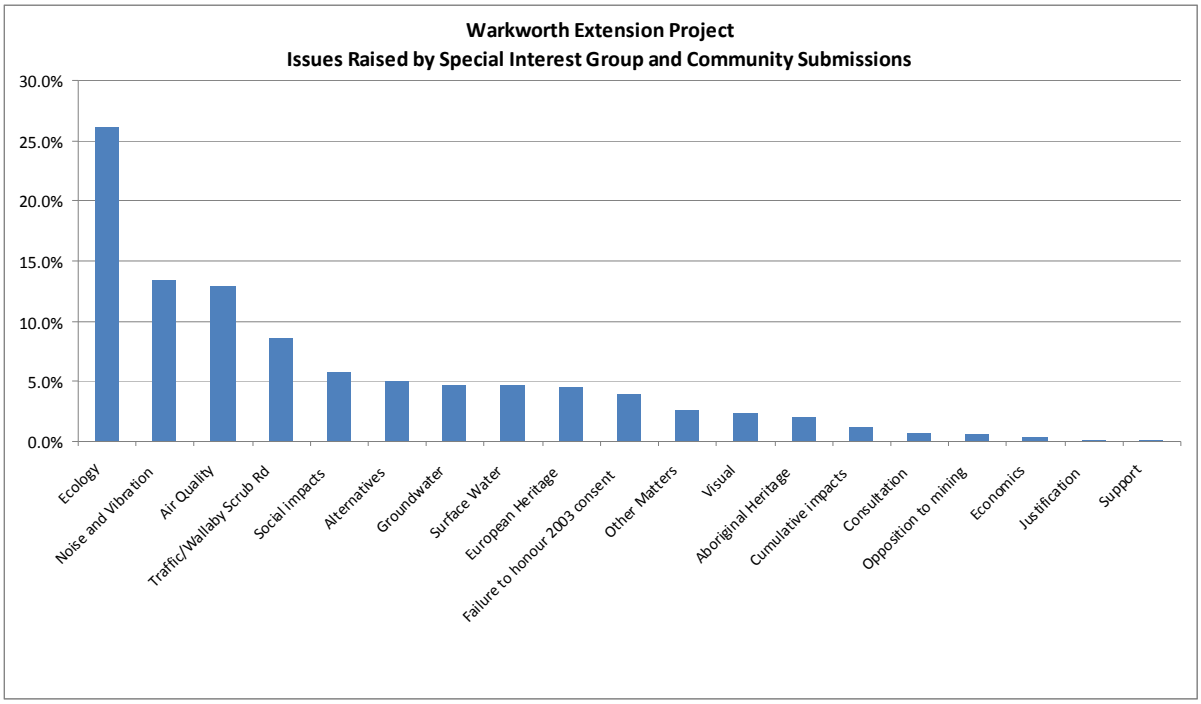


Figure 9: Key Issues for Special Interest Groups and the Community

4.2 HVO South Project Modification

The Department received 15 submissions on the proposed modification to the HVO South Project approval:

- 3 from public authorities;
- 4 from special interest groups (CFMEU, Hunter Environment Lobby, Nature Conservation Council of NSW, National Parks Association of NSW); and
- 8 from the general public.

A full copy of these submissions is attached in Appendix H.

Public Authorities
OEH was critical of the proposal, indicating that the conservation value of the proposed replacement was lower than that of the Archerfield offset area. OEH suggested that Warkworth should be required to find an alternative offset for the HVO South Project with the same or higher conservation value to the Archerfield offset area.

DTIRIS had no objection to the proposal.

Singleton Council objected to the proposal, saying the proposed replacement was too remote from the area where the impact had occurred and would result in a conservation benefit being transferred from one region to another.

Special Interest Groups & Community
Of the 12 submissions received from special interest groups and the community, all but one objected to the proposal. The main reasons for objecting were:

- the EA supporting the proposal was inadequate;
- the vegetation in the proposed replacement was not the same (like for like) as the vegetation in the Archerfield offset area;
- the replacement should be in the local area;
- offsets should be preserved in perpetuity, and should not be replaced or reallocated.

A number of the submissions commented on the risks associated with restoring Warkworth Sands Woodland, which is related more to the Warkworth Extension Project than it is the HVO South Project

modification. Warkworth provided a formal response to the issues in these submissions (see Appendix G).

5. ASSESSMENT

In its assessment of the merits of both the project application and modification application, the Department has considered the:

- EA, submissions, response to submissions, PPR and additional information provided to support the Warkworth Extension Project;
- EA, submissions and response to submission for the HVO South Project modification;
- previous and current development consents,
- relevant content of previous environmental impact statements (EISs), Statements of Environmental Effects (SEEs), independent environmental audit reports, environmental management plans, and monitoring results for both the Warkworth and Mt Thorley mines;
- relevant environmental planning instruments, policies and guidelines; and
- relevant provisions of the EP& Act, including the objects of the Act.

The following is a summary of the findings of this assessment.

5.1 Noise

The EA includes a noise impact assessment undertaken by EMGA Mitchell McLennan in accordance with the applicable guidelines, including the *NSW Industrial Noise Policy* (INP) and the *Environmental Criteria for Road Traffic Noise*.

The assessment was undertaken with reference to sensitive receivers in the vicinity of the MTW mine complex, including rural and rural residential properties surrounding the site and residential properties within Warkworth and Bulga villages. The assessment considers the operational noise, sleep disturbance, blasting and road traffic noise impacts of the Warkworth Extension Project alone and the cumulative noise impacts from Warkworth and surrounding mines.

Approach to Assessment

The MTW mine complex operates under two development consents with two separate noise criteria applicable to the Warkworth and Mt Thorley mines. For this reason, the noise assessment undertaken for the EA considered noise from the project in isolation and did not include noise from the Mt Thorley mine as project-related noise. However, the Warkworth and Mt Thorley mines are in practice managed by one entity, Rio Tinto Coal Australia, as a single integrated mining complex, sharing equipment, infrastructure, resources and personnel.

The continued operation of the site under two separate noise criteria would continue to allow higher noise levels from the complex as a whole than would otherwise be permitted if MTW was considered as a single complex.

Given these factors, the Department believes that a single complex approach to assessing dust and noise emissions is more appropriate. The Department therefore sought a revised noise impact assessment for the project that considered the impacts of the combined MTW mine complex, including the project as defined in the EA. A revised assessment was provided by Warkworth in February 2011 and further discussions between the Department and Warkworth regarding the application of appropriate criteria for the project were undertaken. The position arrived at by the Department, in consultation with Warkworth, is outlined below.

The Department acknowledges that the practical implication of assessing the noise impacts of the MTW mine complex against the project specific noise criteria, is to essentially tighten the noise criteria for the complex as a whole. For this reason, the Department has reviewed the project specific noise criteria to determine the most appropriate criteria for sensitive receivers surrounding the site.

In determining appropriate criteria for the project, the Department considered the implications of applying more stringent whole-of-complex criteria to all receivers surrounding the MTW complex. This approach was not considered appropriate as it resulted in a large number of residences to the east of the project being drawn into the noise impact zone, despite significant reductions in noise impacts being predicted over time as a result of the project. The Department therefore took the view that more

stringent whole-of-complex criteria would be appropriate in circumstances where noise impacts were expected to increase as a result of the project, this being in the Bulga and Warkworth regions to the west and north of the project (refer to Figures 1 and 3).

Based on this review, it is the Department's recommendation that receivers in the Bulga and Warkworth regions be subject to the more stringent whole-of-complex noise criteria, determined in accordance with the INP, while the remaining receivers to the east and south be subject to a criteria based on combined existing noise limits for Warkworth Mine and MTO. This would ensure that receivers to the east and south continue to have the same level of protection from the MTW operations as currently provided, with the knowledge that actual noise levels would reduce as mining moves progressively further away. For residents in Bulga, the application of more stringent criteria has resulted in the number of properties entitled to additional noise mitigation increasing from zero to 26 (see discussion below).

Methodology

Many of the submissions objecting to the project raised concerns regarding certain aspects of the methodology employed for the noise impact assessment.

Establishment of background noise levels

The noise assessment relies on background noise levels established in 2002 and validated in 2008. The methodology used for establishing background is not well documented in the EA and submissions raised concerns regarding the influence of mining operations on background levels. Following review of the 2002 noise study, the Department is satisfied that the method for establishing background noise levels, and the levels themselves, are reasonable and consistent with guidance levels provided by Australian Standards and the INP.

Assessment of removal of Saddleback Ridge

Submissions frequently refer to Saddleback Ridge providing a noise buffer to residences west of the mine and claim that the removal of the ridge would significantly increase noise levels in the Bulga/Milbrodale area. Whilst it is recognised that intuitively this concern would have merit, there is no technical basis to support the claim that substantial noise attenuation is achieved by the ridgeline. Detailed modelling shows that the ridge does not provide appreciable noise mitigation under adverse meteorological conditions, as they neutralise any mitigation effect provided by the ridge.

Assessment of inversions and drainage flows

Several submissions questioned the meteorological data used in the noise assessment. The Department is satisfied that appropriate meteorological data has been used in the noise model, in accordance with the requirements of the INP.

Accuracy of modelling predictions

A number of submissions questioned the accuracy of model predictions and potential margins of error given that a small change to the predicted noise levels would result in a large number of properties being drawn into the noise impact zone. Warkworth provided additional information regarding modelling predictions following the submission of the EA. The Department is satisfied that the noise predictions are reflective of best available modelling endeavours based on realistic schedules of work and equipment, and are representative of worse case scenarios. Notwithstanding, the Department has recommended conditions requiring periodic validation of these predictions and an appropriate management response, should additional impacts be identified.

Categorisation of amenity criteria

Several submissions objected to the categorisation of Bulga under the Suburban noise amenity criteria, rather than the Rural criteria. The Department is of the opinion that areas within Bulga meet the Suburban definition provided by the INP, while other areas meet the Rural definition. Regardless of which category is applied, both have the same acceptable and maximum noise limits for the night time period, which is the limiting period for assessing the noise impacts of the project. Therefore, the chosen category has no influence on the results of the noise impact assessment.

Noise Criteria

The criteria adopted by the Department and OEH for the project are presented in Table 3.

Table 3: Agreed Project Noise Criteria

Location	***Operational Noise Criteria (Night Time)***	***Acquisition Noise Criteria (Night Time)***
Bulga	38	43
Warkworth	38	43
Far North (Maison Due)	35	40
NE (Gouldsville, Long Point)	39	45
East (Hambledon Hill)	38	43
East (Mount Thorley	39 - 44	43 - 47

Operational Noise

The assessment of noise impacts is based Warkworth implementing a number of reasonable and feasible mitigation measures for the project, including the:

- relocation of haul trucks from the high wall to in-pit haul routes;
- reduction of mobile equipment operating during night-time on critical haul routes;
- reduction of dozers operating on elevated overburden emplacement areas at night;
- noise suppression of the haul truck fleet;
- placement of noise suppressed haul trucks on critical haul routes; and
- cladding of the Warkworth CPP.

The Department notes that noise suppression of the haul truck fleet is a key assumption of the noise model. The Department also notes that Warkworth has not been at the forefront of continual improvement in relation to noise mitigation. Given the importance of this factor in the management of predicted noise impacts, Warkworth has provided a specific commitment to the progressive implementation of noise suppression of the haul truck fleet, with 50% of the truck fleet to be attenuated by Year 2, and 80% by Year 6. To ensure that appropriate noise mitigation measures are applied, the Department has included specific conditions requiring Warkworth to implement, validate and report on these and other noise attenuation works.

The assessment indicates that with the proposed mitigation measures in place, and with reference to the new more stringent noise criteria, the project would result in an increase in the total number of residences experiencing exceedances of the applicable noise criteria by up to 13 private properties (in Year 2) under the worst case operating scenario (refer to Table 4).

Table 4 reports the predicted exceedances in the context of the Department's preferred management approach in relation to noise exceedances, how these impacts relate to the existing scenario, and the likely duration of the expected impact.

Table 4: Summary of Operational Noise Limit Exceedances

Noise Exceedance	***Management Approach***	***No. of Affected Private Properties***			
		Existing	***Yr 2***	***Yr 9***	***Y 21***
Marginally affected residences (1-2dB exceedance)	Noise mitigation at source	50	50	13	11
Moderately affected residences (3-5dB exceedance)	Noise mitigation, including mitigation at residence	~30	37	12	2
Significantly affected residences (>5dB exceedance)	Acquisition	5	11	2	3
Significantly affected land (>5dB exceedance on >25% of land)	Acquisition	6	6	6	4
Total Private Properties Exceeding New Noise Criteria		**~91**	**104**	**33**	**20**

The new noise criteria would classify around 50 residences within Bulga Village and to a lesser extent in the rural-residential areas of Hambledon Hill to the east and Gouldsville/Long Point and Maison Dieu to the northeast as expected to experience marginal exceedances of noise criteria by Year 2. This is a similar number to those who currently experience such exceedances associated with the existing approved operations. The Department notes that an increase of 1 to 2 decibels is generally not perceptible to the human ear.

Up to 37 private residences are predicted to be moderately affected by noise under worst case conditions compared with around 30 residences that currently experience these levels under existing approved operations. The residences are again primarily located within Bulga Village, with further rural-residential properties affected to the north and east. Warkworth has made no specific written

commitment regarding additional management and mitigation measures for moderately affected residential receivers, however, in discussions with the Department, Warkworth has committed to implementation of architectural treatments to all moderately affected residential receivers where impact is demonstrated by monitoring. The Department has instead recommended conditions providing an up-front entitlement to architectural treatment (such as double glazing, insulation, and/or air conditioning) for all predicted moderately affected residences.

Eleven residences and five private landholdings are predicted to be significantly affected by noise under worst case conditions during the project with levels of up 8 dB(A) above criteria expected. These exceedances at residences are illustrated in Table 5 below, and primarily affect rural-residential areas to the east of the site, including six residences in Mount Thorley and two in Hambledon Hill. One residence to the north is also affected in Warkworth village and two residences to the west toward Bulga (east of Wollombi Brook). Importantly, no residences within Bulga Village are predicted to be significantly affected by noise from the project.

Table 5: Significantly Affected Properties

Receiver No.	***Receiver Location***	***Criteria dB(A)***	***Worst Case Predicted Noise Level dB(A)***
Residences			
77	Warkworth	38	46 (+8)
81	Bulga East	38	44 (+6)
97	Bulga East	38	44 (+6)
144	Mt Thorley	44	49 (+5)
146	Mt Thorley	42	48 (+6)
147	Hambledon Hill	38	44 (+6)
149	Mt Thorley	41	46 (+5)
154	Mt Thorley	40	44 (+4)
189	Mt Thorley	39	45 (+6)
190	Mt Thorley	39	46 (+7)
192	Hambledon Hill	38	45 (+7)
Additional Significantly Affected Private Landholdings (Land >25% affected[1])			
102, D, E, F, J			

Significantly affected properties would be subject to acquisition rights at the request of the landowner and conditions have been recommended to reflect this. The Department has also recommended conditions providing the affected residences with architectural treatments at the landowner's request, whilst the properties remain privately-owned.

In addition to the mitigation measures assumed in the noise modelling, Warkworth has committed to the implementation of a proactive and reactive noise management system, including:

- the use of real-time weather data to guide mining and overburden emplacement activities; and
- proactive mine planning to provide contingencies, such as during prevailing weather conditions.

The Department believes that if such a proactive system were effectively implemented, the number of marginally, moderately and significantly affected properties could be reduced. Accordingly, the Department has recommended conditions requiring Warkworth to develop and implement such a system, as part of a comprehensive Noise Management Plan for the project.

Whilst the additional monitoring system is considered appropriate, there is some risk to the practical implementation of the monitoring system and proposed noise mitigation measures assumed as part of the noise model. Accordingly, the Department has recommended specific conditions for the reporting and auditing of the implementation of noise mitigation measures and noise monitoring system.

The Department has also recommended a number of other conditions to confirm the noise management requirements for the MTW mine complex. These include requirements to:

- comply with contemporary operational noise limits;

- undertake additional noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at residences which are found to be significantly or moderately affected (see above), if requested by the landowner;
- acquire any property if noise emissions exceed the applicable criteria by more than 5 decibels, if requested by the landowner;
- develop a comprehensive Noise Management Plan, including real-time noise monitoring and an active management system which includes an early warning alert system to identify and manage potential exceedances;
- independently investigate noise complaints and undertake applicable management measures; and
- communicate mining operations with the community, including publicly reporting all monitoring results, and effectively responding to enquiries and complaints.

With these measures in place the Department believes that operational noise levels can be managed to an acceptable impact even during worst-case scenarios. Importantly, it is demonstrated in Table 4 that with the proposed measures in place that there would be significant reductions in the numbers of noise impacted residences after Year 2 with the number of marginally affected residences dropping from a current number of 50 to 13 by Year 9 and the number of moderately affected residences dropping from around 30 currently to 12 over the same period.

Cumulative Noise

A cumulative noise assessment was completed for the project, which considered the impact of the project together with surrounding mining operations. The assessment indicates that cumulative noise levels are predicted to exceed the relevant acceptable night-time amenity criteria at 19 private residences, of which 2 residences are predicted to exceed the maximum amenity criteria. All residences predicted to be affected by cumulative noise impacts are also predicted to be impacted by project-only operational noise, and have been included in the management or acquisition zone for the project.

The Department has recommended conditions requiring Warkworth to comply with the relevant cumulative noise criteria at all residences, except those for which the Department has recommended conditions requiring acquisition upon request.

Sleep Disturbance

The EA includes an assessment of the potential for sleep disturbance associated with mining operations during the night-time period. The assessment indicates that the project would exceed the applicable sleep disturbance criteria at three private residences in Warkworth and Mount Thorley by between one and 10 decibels.

These properties are also predicted to be affected by operational noise from the project alone, and are included within the acquisition zone for the project. In addition to conditions requiring acquisition, the Department has recommended a condition requiring Warkworth to undertake additional architectural noise treatments on these properties (such as double glazing) at the landowners' request, whilst the property remains privately-owned.

The Department has recommended conditions requiring Warkworth to comply with the relevant sleep disturbance criteria at all residences, except those for which the Department has recommended conditions requiring acquisition upon request.

Traffic Noise

Changes to traffic associated with the closure of Wallaby Scrub Road were assessed against the OEH Environmental Criteria for Road Traffic Noise (ECRTN). Results indicate that existing levels of night time traffic noise from Putty Road, Charlton Road and Golden Highway is already above the night time criteria. The closure of Wallaby Scrub Road would increase current noise levels in these locations by a maximum of 1dB(A), which is within the ECRTN allowable incremental increase of 2dB(A). Daytime traffic noise complies with the daytime ECRTN criteria for all receivers.

Rail Noise

The project does not include any change to the quantity of product transported to the Mount Thorley Coal Loader and therefore there is not expected to be any change in noise levels associated with rail movements. Warkworth did not assess the rail noise of the project, and the Department is satisfied that the project would not increase existing rail noise levels.

5.2 Blasting

Blasting has the potential to affect people, structures and private property in three main ways, including:

- annoyance and discomfort, or 'amenity impacts';
- structural damage to homes, buildings and property improvements;
- direct risks to the safety of people and livestock;
- blast fumes.

The EA includes a blast impact assessment undertaken by EMGA Mitchell McLennan. The assessment calculates the maximum instantaneous charge (MIC) able to be used in order to meet relevant amenity-based ground vibration and overpressure criteria at varying distances from the mine.

Annoyance

The criteria recommended by the Australian and New Zealand Environment Council (ANZECC) to minimise annoyance and discomfort at residences are presented in Table 6.

Table 6: Recommended Blast Criteria

Blast Impact	***Amenity Criteria****	***Structural Damage Criteria***
Airblast Overpressure	115 dB (Lin) for 95% of blasts in any year 120 dB (Lin) for 100% of blasts	133 dB (Lin)
Ground Vibration	5 mm/sec for 95% of blasts in any year 10 mm/sec for 100% of blasts	10 mm/sec

* ANZECC *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*
** Australian *Standard AS2187.2-2006 Explosives – Storage, Transport and Use (houses and low-rise residential buildings).*

The EA concludes that blast charges similar to current operations (ie up to 3000 kg maximum instantaneous charge, or MIC) can continue to be used and that levels are predicted to satisfy blast and vibration criteria for residences. However the EA also concluded that as blasting moves closer to Bulga and Warkworth, blast charges would need to be limited to satisfy the relevant criteria.

The maximum blast charge masses (ie MIC) required to meet the amenity criteria at varying distances from the mine as presented in the EA, are provided in Table 7.

Table 7: Limiting Blast Masses to Satisfy Amenity Criteria

Distance to Property (m)	***MIC_{8ms} to Satisfy ANZECC 95% Overpressure Limit of 115db(Lin)***	***MIC_{8ms} to Satisfy ANZECC 95% Ground Vibration Limit of 5 mm/s(ppv)***
900	N/A	268
1,500	163	745
2,000	386	1,324
2,500	753	2,069
3,000	1,302	2,980

The Department notes that the closest private residence is located approximately 1.5 km from the project disturbance area and more than 25 residences in the vicinity of Bulga are located within three km. Table 7 provides some indication that with significantly reduced MICs, the amenity criteria could be achieved at this distance. The limited MICs presented in Table 7 are not inconsistent with MICs assumed for other large mining operations within the Hunter Valley. In addition, the proposed blasting practices would occur at distances greater than three km from the closest private residences in the initial phases of the project. Coupled with the proposed blast monitoring program, this would provide opportunity for further refinement of applicable site laws and appropriate blast design. Accordingly, it would be reasonable to assume that relevant vibration limits could be achieved at the closest private residences. The Department has recommended a condition that requires Warkworth to meet amenity vibration and overpressure criteria at all private residences over the life of the project.

Structural Damage

Structural damage to buildings was a key concern in a number of community submissions. No specific assessment of compliance with structural damage criteria at privately owned residences has been

undertaken. The Department recognises, however, that if blasting is managed to meet the more conservative amenity-based criteria at residences, structural damage is unlikely. As noted above, the Department has recommended conditions requiring Warkworth to meet relevant amenity based criteria over the life of the project.

Given the community concerns relating to structural damage at private residences, the Department has recommended conditions providing an entitlement for a detailed structural damage survey of private residences within 2km of the proposed disturbance area on request.

Sensitive Structures

The EA considers blast impacts on sensitive structures surrounding the site, including Bulga Bridge and St Phillip's Church in Warkworth Village. These structures are located at least 2.5 km from the project blast area. The assessment concludes that blasts well in excess of that typically used on site would be possible without causing damage to these structures, therefore damage from normal blasting practices was highly unlikely.

The Department notes that Wambo Homestead, a State-listed heritage item located less than 3km from the project blast area, has not been specifically addressed in the blast assessment. The Department is satisfied, however, that given the outcomes of the assessment for closer heritage structures that structural damage is unlikely and can be appropriately managed through the recommended blast management plan and structural property inspections.

As discussed in the Aboriginal Heritage assessment below, the impacts of blasting on sensitive Aboriginal archaeological sites located within the proposed Wollombi Brook Cultural Heritage Conservation Area have not been assessed, however the Department is satisfied that impacts on such sites can be managed by meeting appropriate vibration criteria. Conditions requiring further assessment to determine appropriate blast impact criteria for these sites have been recommended by the Department

Safety

The Department notes that all private properties are over 500 metres from the mining area, and therefore have a low risk of being affected by flyrock (ie rock projectiles). Putty Road and Wallaby Scrub Road are, however, located within 500 metres of the proposed mining area and therefore would require ongoing management to protect the safety of road users during blasting. Warkworth has not addressed this aspect in the EA, however the Department is satisfied that this can be readily managed, as it is at many other locations in the Hunter Valley, through temporary road closures. The Department has recommended conditions requiring a road closure management plan be prepared as part of the Blast Management Plan for the project.

Blast Fumes

The potential health impacts associated with blasting fumes is an issue that has been raised in community submissions. There are currently no health based guidelines or criteria which control the emission of blast fumes and therefore a specific assessment of blast fumes has not be required or completed. However, Warkworth is obliged to implement best practice air quality management including all reasonable and feasible measures to minimise offsite fume emissions. This is reflected in the Department's recommended conditions.

Conclusion

The results of the blast impact assessment indicate that there would need to be management of blast practices in order to meet amenity-based overpressure and vibration limits at all private residences. Warkworth has stated that blasting would be managed in accordance with existing blasting procedures that consider overpressure and vibration limits, timing of blasts, blast design and restrictions due to weather, however no specific commitment has been made to meet amenity overpressure and vibration limits at all private residences.

The Department accepts that blasting can feasibly be managed to meet the relevant criteria by reducing MICs and applying other blast management techniques, however, given the lack of clear commitment to meeting the relevant criteria at all private residences, the Department has recommended conditions requiring Warkworth to:

- prior to any blasting in the extension area, preparation and approval of a blast management plan that confirms the blast design and blast management techniques to be used to manage blasting operations to comply with all relevant criteria at private properties;

- manage blasting operations to comply with all relevant criteria at private properties through appropriate blast design;
- limit blast frequencies and hours;
- keep residences notified and up to date regarding blasting operations, and facilitate feedback/complaint management; and
- provide for structural property inspections and investigations to all heritage items and private residences, upon request, within 2 km of the project blast area.

5.3 Air Quality

The EA includes a specialist air quality impact assessment undertaken by PAE Holmes in accordance with applicable guidelines, including OEH's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*.

Consistent with the Department's single complex approach to the MTW complex (see Section 5.1), the Department sought a revised assessment from Warkworth which treats all dust emissions associated with operations of the MTW mining complex as 'project-related' emissions. The Department also requested an assessment of cumulative 24-hour PM_{10} impacts, which was not considered in the EA. Warkworth subsequently provided a revised assessment.

The revised assessment modelled total suspended particulates (TSP), fine particulate matter (PM_{10}) and deposited dust for three representative mining scenarios (Years 2, 9 and 21) as well as the cumulative emissions of the project operating in conjunction with the combined MTW operations and nearby Wambo, HVO South and Bulga mines. Hence the assessment considered the cumulative impacts of the project and other projects operating and proposed within the region.

A number of submissions on the project requested the expansion of the air quality assessment to include additional parameters including $PM_{2.5}$ and emissions other than dust, for example, blast fumes. The Department acknowledges that the potential impacts from these sources of air emissions are a common concern in relation to large scale mining projects.

With regard to $PM_{2.5}$, the Department notes that there are currently no adopted Australian or NSW air quality criteria for $PM_{2.5}$, although the National Environmental Protection Council (NEPC) has developed provisional 'advisory reporting standards' of 8µg/m^3 (annual average) and 25 µg/m^3 (24 hour). The air quality assessment does include modelling of $PM_{2.5}$ (although the results are reported in the main text of the EA), which indicates that the $PM_{2.5}$ impact area would be similar to the PM_{10} impact area. Based on this assessment, and assessments undertaken for similar projects (eg the Mangoola Coal Project), the Department is satisfied that $PM_{2.5}$ impacts would be similar to the PM_{10} impacts, and therefore is satisfied that separate consideration of $PM_{2.5}$ is not necessary or warranted.

With regard to other gaseous emissions such as sulphur dioxide (SO_2) and oxides of nitrogen (NO_x) associated with diesel use, blast fumes and potential spontaneous combustion, based on assessments undertaken for similar projects the Department is satisfied that SO_2 and NO_x emissions would be relatively minor and do not warrant further assessment. Notwithstanding, the Department has recommended conditions requiring Warkworth to implement all reasonable and feasible measures to minimise off-site odours and fumes.

The modelling undertaken for dust (TSP, PM_{10} and deposited dust) is based on a number of existing and proposed mitigation measures that Warkworth would implement to control dust, including:

- minimising disturbance areas;
- watering of haul roads and coal stockpiles;
- limiting the development of minor roads and rehabilitating disused roads;
- revegetating topsoil stockpiles;
- restricting blasting to only occur during favourable conditions;
- minimising dragline and loading/dumping drop heights;
- dust control systems on drill rigs, eg dust aprons, extraction systems and/or water sprays;
- using adequate stemming in blast drill holes;
- suspension of operations in adverse conditions; and
- progressive rehabilitation of disturbed areas.

The predicted worst case contours based on these mitigation measures are shown in Figure 10, and a summary of the affected properties is presented in Tables 8 and 9 below.

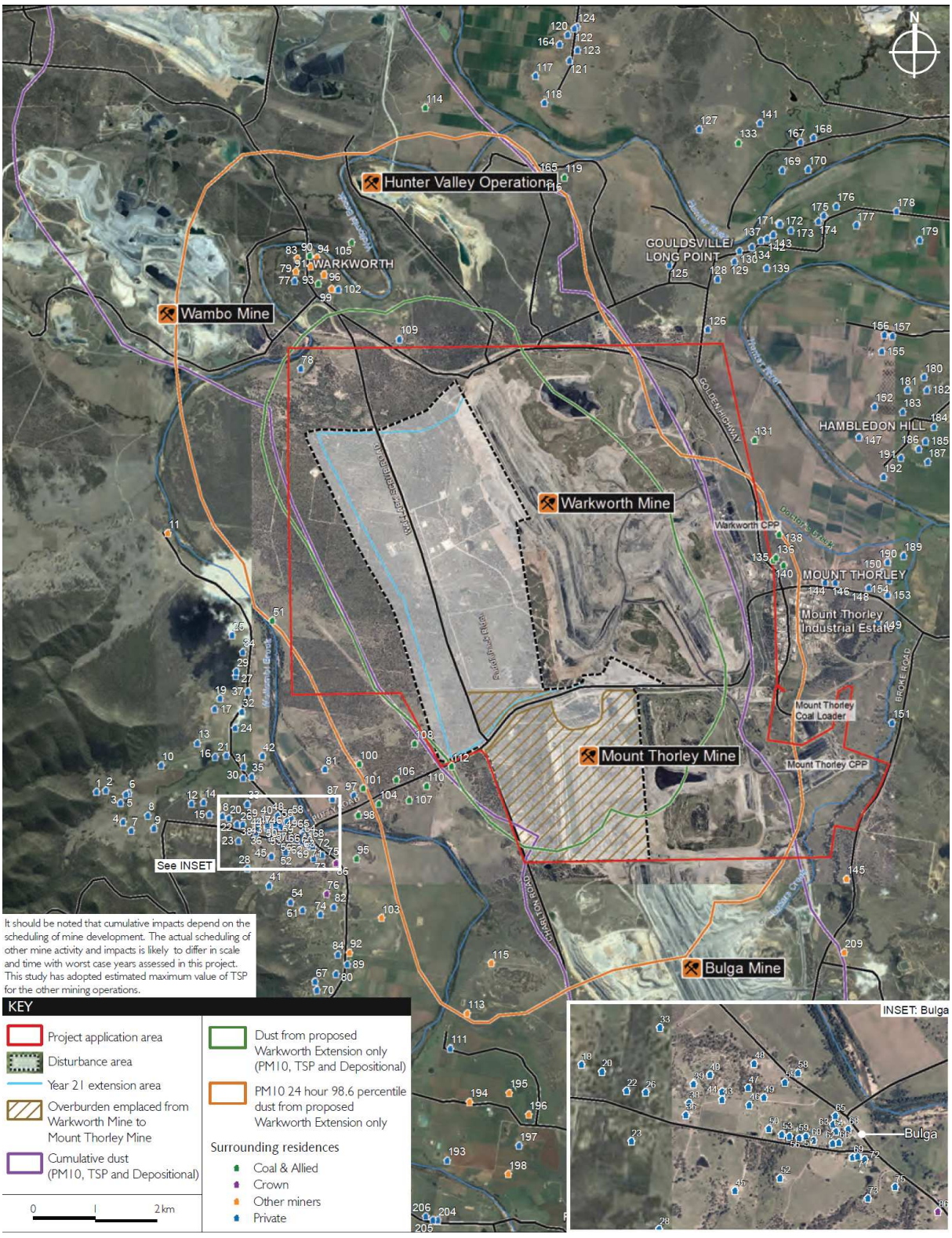


Figure 10: Predicted Worst Case Air Quality Contours

Table 8: Dust Affected Private Residences (Exceedances only shown)

Receiver No.	***Receiver Location***	***Modelling Year/s***	***Worst Case Dust Level (all years)***					
			PM10			***TSP***	***Dust Deposition***	
			Annual/ µg/m³	***24-hour/ µg/m³***		***Annual/ µg/m³***	***Annual/ g/m²/month***	
Criterion			***30***	***50 for >5 days/yr***		***90***	***2 (max increase)***	***4 (total)***
				Max.	***No. days***			
Significantly Affected Residences (or community facility)								
77	Warkworth	9, 21	-	104	42	-	-	-
102	Warkworth (Warkworth Hall)	2, 9, 21	34	113	55	-	-	-
Moderately Affected Residences								
81	Bulga East	21	-	55	2	-	-	-
97	Bulga East	21	-	77	3	-	-	-
111	Fordwich	9, 21	-	134	3	-	-	-
117-118	Maison Dieu	9, 21	-	58	1	-	-	-
121, 123 & 126	Maison Dieu, Gouldsville, Long Point	9	-	55	1	-	-	-
144, 146	Mt Thorley	9, 21	-	64	1	-	-	-
151	Mt Thorley	2	-	52	1	-	-	-
193	Fordwich	9, 21	-	102	2	-	-	-
197	Fordwich	2, 9, 21	-	88	2	-	-	-
199-207	Fordwich	21	-	88	2	-	-	-

Table 9: Additional Significantly Affected Private Landholdings (Land >25% affected[1])

Receiver ID	***Receiver Location***	***Receiver***
A	Warkworth	Maitland, Graham & Coates
B	Warkworth	Johnson Woods & Co Pty Ltd
D	Warkworth	Burley[2]
E	Warkworth	Trewenack[2]
F	Warkworth	Keys[2]
H	Gouldsville, Long Point	Redbank Projects Pty Ltd[2, 3]
K	Bulga East	Recluse Pty Limited

[1] Privately owned properties where more than 25% of the land area exceeds the criteria, but where any residence is not predicted to be affected)
[2] Property also predicted to be significantly affected by noise
[3] Property forms part of Redbank Power Station

The assessment indicates that 8 privately-owned properties – including 1 residence, 1 community hall and 6 land parcels (excluding Redbank Power Station) – are likely to be significantly affected by dust at some stage during the project.

The affected residence and the hall are located in Warkworth to the north of the site. The residence is already within the acquisition area for the Wambo Mine, and the Hall is not inhabited on a continual basis. Both of these properties, as well as 3 of the 6 land parcels, are also predicted to be significantly affected by noise associated with the project (see Section 5.1).

In addition to the significantly-affected properties, the project is also predicted to have moderate dust impacts on a further 22 private residences, which are predicted to experience 24-hour PM_{10} levels above the air quality goal on 5 days a year or less (see Table 8). Most of these properties are located to the south around Fordwich (12 properties), east around Mt Thorley (3 properties) and northeast around Maison Dieu – Gouldsville – Long Point (5 properties), with 2 properties located west toward Bulga. Importantly, the modelling indicates that the project would not result in any moderate-significant dust impacts on the Bulga Village itself.

In addition to the privately-owned properties, approximately 41 mine-owned properties in and around Warkworth, Mt Thorley and to the east of Bulga are predicted to be moderately or significantly affected by dust during the project. Warkworth has committed to providing these tenants with up-to-date information on air quality monitoring and potential health-related impacts, to temporarily vacating tenanted residences where monitoring indicates significant dust impacts, and to allowing tenants to break their lease should they wish to do so based on mining-related impacts. The Department has recommended conditions reiterating and requiring Warkworth to implement these commitments.

The Department acknowledges that the project is predicted to affect a number of properties, but also recognises that Warkworth is implementing, or is proposing to implement, the majority of best practice dust control measures identified in OEH's *NSW Coal Mining Benchmarking Study* (Katestone, 2010) for NSW coal mines. There is, therefore, limited scope to reduce or mitigate these impacts further through 'traditional' mitigation measures without significantly down-scaling mining operations or sterilising significant coal resources. The affected properties are generally located within an area of intensive coal mining, being situated in proximity to the MTW, Wambo, HVO South and Bulga mines.

However, the Department notes that the modelling has not taken into consideration (and is not able to using current modelling methods) a key contemporary mitigation measure that can significantly reduce the identified air quality exceedances, namely the adoption of a real-time dust management system. This uses a combination of real-time dust monitoring and weather forecasting to guide the day-to-day planning of mining operations, and prevent air quality impacts during adverse weather conditions. Such 'active' management systems are increasingly being used in the Hunter Valley, with results indicating that predicted impacts are able to be significantly reduced or eliminated.

Given the relatively significant number of privately-owned properties predicted to be affected as a result of the project, the Department recommends that Warkworth be required to develop and implement an active dust management system for the MTW mine complex. The Department has recommended conditions requiring this system to be developed as part of a comprehensive Air Quality Management Plan for the complex. With such a system, the Department believes that Warkworth should be able to avoid many or all of the predicted 'moderate' impacts identified in Table 8 above.

Nevertheless, and given that the predictive modelling is not currently able to take into consideration (at least with confidence) active management measures, the Department has recommended conditions requiring Warkworth to:

- acquire the 8 significantly affected properties, at the request of the landowner; and
- undertake additional dust mitigation measures (such as air filters or air conditioning) at residences predicted to be significantly or moderately affected.

The Department has also recommended a broad suite of other contemporary conditions to mitigate and manage air quality impacts, including requiring Warkworth to:

- comply with contemporary air quality criteria;
- implement all reasonable and feasible 'source-based' measures to minimise dust emissions on site;
- acquire any property if dust emissions exceed the applicable land acquisition criteria, if requested by the landowner;
- develop a comprehensive Air Quality Management Plan, including a real-time dust monitoring program and an active management system which includes an early warning alert system to identify and manage potential exceedances;
- independently investigate air quality complaints and undertake applicable management measures;
- notify affected landowners (including the tenants of mine-owned properties) of the potential health-related impacts associated with mine dust;
- respond effectively to enquiries or complaints;
- publicly report on its environmental performance; and
- co-ordinate the air quality management on-site with air quality management at nearby mines, to minimise cumulative air quality impacts.

With the implementation of these measures, the Department is satisfied that the air quality impacts of the project are able to be adequately minimised, mitigated and/or at least compensated for, and that the project can be managed in a manner that would not result in any significant cumulative impacts on Bulga village and the wider area.

A number of submissions, including from Singleton Council, raised the need for a regional health study to determine the impacts of air emissions from mining on the health of residents in the Hunter Valley. This is a strategic (as opposed to project-based) issue that is being considered further during the Department has required the implementation of best practice management and monitoring for the project. The Department also notes that OEH is currently in the process of establishing a regional air quality monitoring network for the Upper Hunter Valley's coal mines. The Department's draft conditions enable the monitoring program for the project to be integrated with this wider network.

5.4 Water Resources

Surface Water

The Department has reviewed the surface water assessment prepared by WRM Water & Environment and JP Environmental, submissions, RTS and subsequent correspondence from NOW to assess the surface water impacts of the project.

The project is located within the Hunter River and Wollombi Brook catchments. The local watersheds within these catchments and in the project area are (see Figure 1):

- Doctors and Loders Creeks, draining east to the Hunter River;
- Salt Plan Creek, Doctors Creek and an unnamed ephemeral stream draining west to Wollombi Brook; and
- Longford, Dights and Sandy Hollow Creeks draining north to Wollombi Brook and the Hunter River.

Saddleback Ridge, which runs to the west of the current mining area, divides the catchments along a north-south alignment.

As part of approved operations the MTW mine complex has an established management regime for surface and groundwater resources including:

- an integrated management system that enables transfer of water between Mt Thorley, Warkworth and HVO mines;
- an existing licensed discharge regime in accordance with the Hunter River Salinity Trading Scheme (HRSTS); and
- existing water supply allocations on the Hunter River, provided under the Mt Thorley Joint Venture (MTJV) and licensed under the *Water Act 1912*.

The primary aims of the integrated water management system are to minimise water extraction, maximise reuse, optimise pit workability by maintaining dewatered pits and manage off-site discharges. The existing system would be augmented for the project, including:

- construction of up to 18 new sedimentation dams; and
- enlargement of sedimentation dam 34N to enable discharge to the Hunter River at maximum licensed discharge rates.

The project has the potential to impact on surface water resources by:

- increasing demand for water for mining operations;
- reducing availability of water for other users (agricultural, domestic, environmental flows);
- altering flow regimes via open cut mining through Saddleback ridge;
- reducing catchment runoff by capture and containment of water within mining areas;
- reducing water quality (salinity and sediment) through discharges;
- pollution of waters through accidental overflows or discharges from sediment dams; and
- altering drainage patterns in the rehabilitated landscape.

In relation to demand, the assessment predicts that during typical climatic conditions, demand would be adequately met by existing water extraction entitlements of 1,012ML per annum. During extended dry periods, and at maximum production levels, an additional 700ML per annum may be required to meet demand. Warkworth has several options to meet this demand, including water sharing with HVO, reduced discharge, extraction of water from underground workings at the former Lemington Mine (subject to licence) or purchase of additional allocation from the Hunter River or Wollombi Brook.

The Department is satisfied that sufficient options are available to meet the water demands of the project. However, the Department has recommended a condition requiring Warkworth to match mining activities to available water supply, should the above options not meet demand. In addition,

NOW recommended that the site water balance be updated annually and contingency plans be prepared to address any future demand issues.

The existing MTW complex captures 2,277 ha of catchment area, thereby reducing flows and availability of water for other users. The project would progressively reduce the area of catchment contained, as existing pits to the east would be rehabilitated and catchment runoff returned to Doctors and Loders Creeks. The final void would contain approximately 1160 ha of catchment area, representing a loss of 0.6% of the Wollombi Creek catchment. The impact on flows would be minor, however, the Department requires Warkworth to provide compensatory water supply to any directly affected landowner.

Water quality impacts will continue to be managed via the retention of dirty mine water on site in sedimentation dams, and discharges to the Hunter River at licensed discharge points in accordance with the HRSTS. Sediment dam capacity would be increased with construction of new dams and enlargement of existing dams. There would be no change to licensed discharges. Water quality monitoring is routinely undertaken upstream and downstream of discharge points and within the site water management system. The primary pollutants from the site include salinity and sediment. The Department requires an updated water management plan for the MTW complex that includes performance criteria for surface waters, trigger levels for remedial action and a detailed monitoring program. The management plan would cover operations, final void management and rehabilitation. The Department considers that existing and augmented water management infrastructure and on-going routine monitoring would sufficiently manage any water quality impacts associated with the project.

Flooding

Flood modelling in the EA indicates that the project would have no impact on flood flows, velocities or flood levels along Wollombi Brook for events up to and exceeding the 100 ARI flood event. The Department is satisfied that the project is unlikely to result in any material changes to flooding behaviour in the locality.

Groundwater

The Department has reviewed the groundwater assessment prepared by Australasian Groundwater and Environmental (AGE) Consultants, submissions, RTS and subsequent correspondence from NOW.

The groundwater impact assessment indicates that there are three key aquifer systems in the area, including the:

- hard rock aquifer associated with the coal measures (Permian);
- alluvial aquifer associated with the Hunter River and Wollombi Brook; and
- aquifers of the shallow bedrock near the ground surface.

Within the project area, there is also an ephemeral perched aquifer associated with the aeolian (Warkworth) sand sheets, predominantly in the north eastern part of the application area.

The project has the potential to impact on groundwater resources by:

- drainage of the alluvial aquifer and associated loss of baseflow to Wollombi Brook and the Hunter River;
- reducing availability of water within the alluvial aquifer for other users (bores for agriculture);
- depressurisation and associated groundwater drawdown of the hard rock aquifer;
- alteration of groundwater flows by providing a groundwater sink associated with the final void;
- drainage of the ephemeral perched aquifer as a result of direct severance of the aquifer; and
- affecting groundwater dependent ecosystems.

Alluvial aquifers

The western extent of mining would be 1.4 km from the alluvial boundary of Wollombi Brook, with the southern extent nearer at 600 m; however still well outside the 150 m buffer recommended by NOW (see Figure 11).

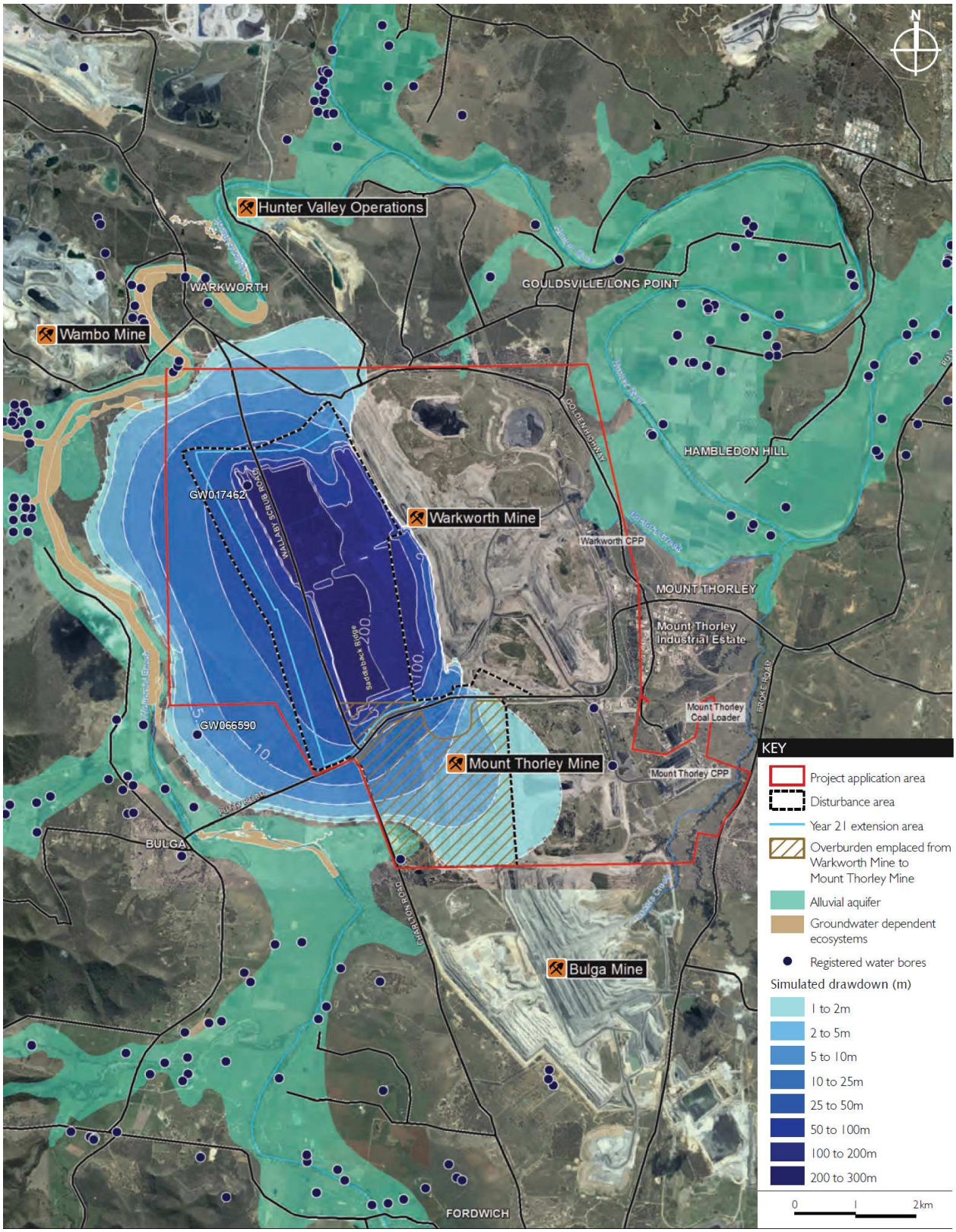


Figure 11: Predicted Groundwater Drawdown in Alluvial Aquifer (project only)

The groundwater assessment made the following predictions:

- the project would not have a significant effect on groundwater levels in the Wollombi Brook alluvial aquifer, with predicted drawdown of less than 1m;
- the cumulative impact of mining on the Wollombi Brook alluvial aquifer was predicted as a loss of 0.45 ML/day, with the project contributing 0.1 ML/day to this loss;
- the loss of baseflow in Wollombi Brook at the end of mining in 2031, as a result of the project, would also be 0.1 ML/day;
- there would be no drainage from the Hunter River alluvium as a result of the project;
- there are nine privately owned bores within the alluvium, west of Wollombi Brook in the Bulga area. These bores would not be affected by the project as predicted drawdown in the alluvium would be minimal.

In its submission, NOW indicated that any drainage of the alluvium and baseflow losses would need to be offset by obtaining appropriate water licences. This requirement is reflected in the recommended conditions. Given the small losses predicted, the Department considers the impacts of the project on the alluvial aquifers and water users to be minimal.

Hard rock aquifers

Groundwater drawdown in the hard rock aquifer is predicted to extend up to 4km from the mine highwall at the end of mining in year 2031, extending underneath the Wollombi Brook alluvial aquifer. A review of bores indicated that one private bore in the hard rock aquifer would be affected by depressurisation in the range of 2 to 5 m. However, it was predicted that given the depth of this bore, water yields would not be significantly affected.

The final void would act as a permanent groundwater sink, limiting the full recovery of pre-mining groundwater levels to 50% within the first 10 years, 75% in 40 years, and then reaching equilibrium in about 300 years. Groundwater would collect in the final void and would not migrate to Wollombi Brook or the Hunter River.

Perched aquifer

A supplementary assessment by AGE Consultants in 2011 directly addressed concerns about potential impacts on the perched aquifer associated with the Warkworth sand sheets. The assessment considered the location of the sand sheets, groundwater flow directions and the potential for impacts on the sand sheets off site. The location of the sand sheets is shown on Figure 12 below.

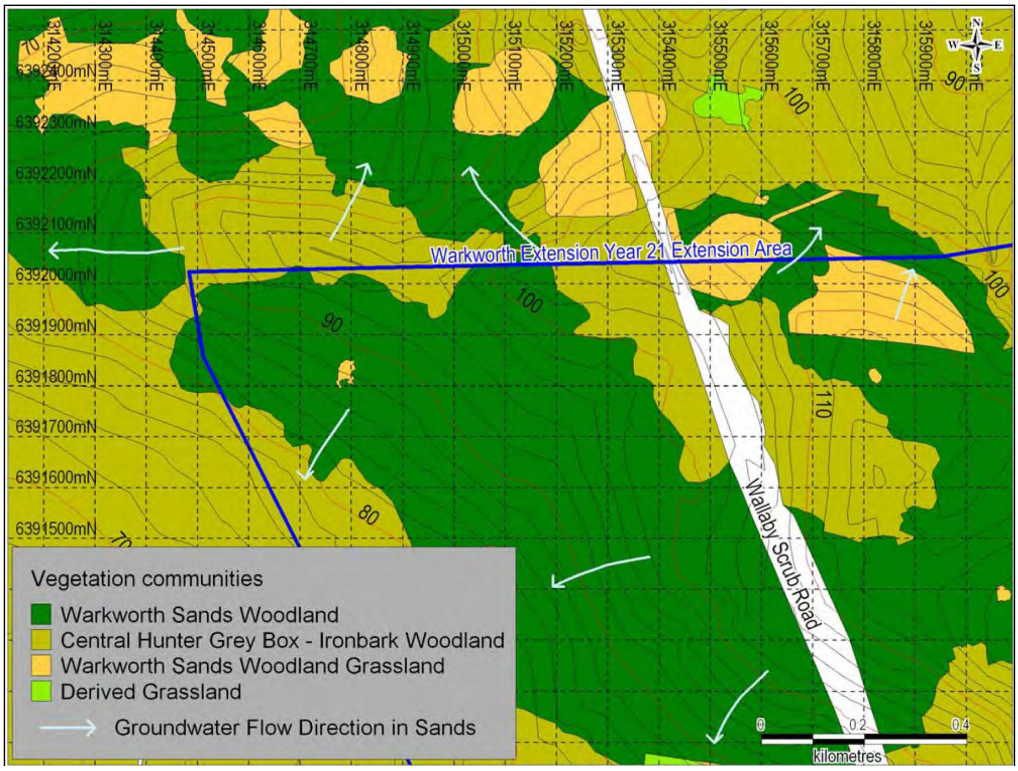


Figure 12: Location of the Warkworth Sand Sheets

The assessment concluded that mining to the west of Wallaby Scrub Road would not impact on the perched aquifer, as groundwater flows on site generally migrate westwards, whilst groundwater flows in the sand sheets just off site, flow northwards. In the area east of Wallaby Scrub Road, a 500m section of the sand sheet aquifer would be excavated for mining. This may result in some seepage from the sand sheet, however this may be limited by the northward flow of groundwater in this area. The assessment predicted that drawdown of the perched aquifer would be approximately 200mm at 30m from the disturbance boundary. This level of drawdown is considered to be minor, however further monitoring would determine whether a low permeability barrier would be required along the face of the excavated sand sheet to ensure seepage is avoided. The Department has recommended a monitoring plan to determine impacts on the perched aquifer, and requires this information via the Water Management Plan within 3 months of project approval.

Groundwater dependent ecosystems (GDEs)
Two groundwater dependent ecosystems are located within the Wollombi Brook alluvium including Hunter Lowlands Redgum Forest EEC and River Red Gum Floodplain Woodland EEC. As the project is not predicted to result in a significant impact on the alluvium of Wollombi Brook, there is unlikely to be an impact on these GDEs. The assessment indicated that GDEs are naturally adaptive to fluctuations in groundwater levels much greater than 1m as predicted for the project. However, NOW recommended that these communities be monitored throughout the project to identify and respond to any adverse impacts. The Department considers this an appropriate management mechanism for ensuring that GDEs near the project are adequately protected.

Conclusion
The Department is satisfied that Warkworth has adequately assessed the project's potential impact on water resources.

Following its assessment, the Department is satisfied that the project can be managed to ensure that it would not have a significant impact on water resources. The Department has recommended conditions that require Warkworth to:

- ensure that it has sufficient water for all stages of the project, and if necessary, adjust the scale of mining operations on site to match its available water supply;
- provide a compensatory water supply to any private landowner whose water supply is adversely affected by the project (although this is unlikely to occur);
- ensure all surface discharges comply with the limits in any environment protection licence; and
- ensure the project does not have an adverse impact on the groundwater dependent ecosystems within the Wollombi Brook alluvium downstream of the site; and
- prepare and implement a comprehensive water management plan for the project, with suitable monitoring programs to evaluate the performance of the project, and contingency plans that would be implement if, for some reason, the impacts of the project are greater than anticipated.

5.5 Biodiversity

The project would disturb around 1,212 ha of land, including:

- 765 ha of native woodland; and
- 447 ha of derived native and exotic grassland.

As explained in Section 2, this clearing would disturb part of Non-Disturbance Area 1 and part of Habitat Management Area 1 which were set aside for conservation in 2003 to offset the biodiversity impacts of the previous extension of the mine.

The EA includes a flora and fauna assessment undertaken by Cumberland Ecology. This assessment draws on the historical studies undertaken for the MTW mine complex, and additional surveys of the proposed extension area. During the assessment process, the work in the EA has been supplemented by a range of additional information which can be found in Appendices D, F and G, including additional expert advice from:

- Dr Anne-Maree Clements, a restoration ecologist, on the prospects of restoring the Warkworth Sands Woodland EEC on existing Warkworth Sands Grassland;
- Gillespie Economics on the trade-offs between reducing the environmental impacts of mining and foregoing the economic benefits of production, particularly in relation to the potential avoidance of mining the Warkworth Sands Woodland to the west of Wallaby Scrub Road; and

- DnA Environmental on the measures that should be implemented to establish the Central Hunter Grey Box-Ironbark Woodland and Central Hunter Ironbark-Spotted Gum-Grey Box Forest EECs on the rehabilitated mine site.

In addition, the Department commissioned Dr Travis Peake, an expert ecologist from Umwelt, to undertake an independent assessment of the potential biodiversity impacts of the project and the adequacy of the proposed offsets. As Warkworth made a number of changes to the proposed offset during assessment process, Dr Peake was asked to consider the merits of these changes and prepare an addendum to his report.

Both of these reports are included in Appendix E.

The Department has considered all of these reports in its assessment of the biodiversity impacts of the project, and also reviewed the existing biodiversity management plans and monitoring programs for the mine complex.

Conceptual Approach to Assessment

Many submissions were extremely critical of the proposal to mine through an existing offset (Warkworth) and replace one offset with another (HVO South), saying these areas should be conserved in perpetuity and that both proposals should be rejected as a matter of principle, regardless of the merits of renegotiating these offsets.

While the Department does not support the principle of developing or replacing offsets, and believes that it should be avoided to the greatest extent practicable, it accepts that in some circumstances these proposals may have some merit, and could be in the public interest.

In this particular case, the Department believes there is considerable merit in reviewing the previous offsets. This is principally because the design of the original offset was flawed: it is underlain with substantial coal resources, a conflict which was acknowledged (but not resolved) in both the 2003 development consent and the associated Deed of Agreement.

In the Department's view the potential trade offs between conservation and resource use warrant proper consideration in this instance, and should not be avoided at all costs to satisfy a principle.

Nevertheless, in reviewing the merits of this particular project the Department believes it is important to consider the merits of the existing offsets as a whole; and if the project has merit, then the old offset should be replaced with a new offset that does not have the same resource use conflicts and provides substantial conservation benefits for the region. In short, the new offset should result in a better conservation outcome than the old offset.

In relation to the HVO South proposal, the Department has not considered the merits of replacing the Archerfield offset area with part of the Goulburn River Biodiversity Area, as was proposed by Warkworth. Instead, it has accepted that the Archerfield offset should remain the offset for the HVO South Project. However, it believes this offset area should be managed as part of the proposed Northern Biodiversity Area, and that there would be some benefit in Warkworth being responsible for this management rather than dividing this responsibility between 2 separate companies.

Consequently, the Department has recommended that the ongoing implementation of the Archerfield offset be transferred to Warkworth, and that the HVO South Project approval be modified to enable this to occur.

Flora

The project area forms part of one of the largest stands of remnant vegetation in the Hunter Valley (see Figure 1). This stand is of regional significance due to the extensive clearing that has occurred on the valley floor over the last 100 years, principally for farming and mining.

A significant proportion of the vegetation that is to be cleared within the project is comprised of endangered ecological communities (EECs) listed under the *Threatened Species Conservation Act 1995* (TSC Act). A summary of the vegetation communities to be disturbed is presented in Table 10 below, and depicted in Figure 13.

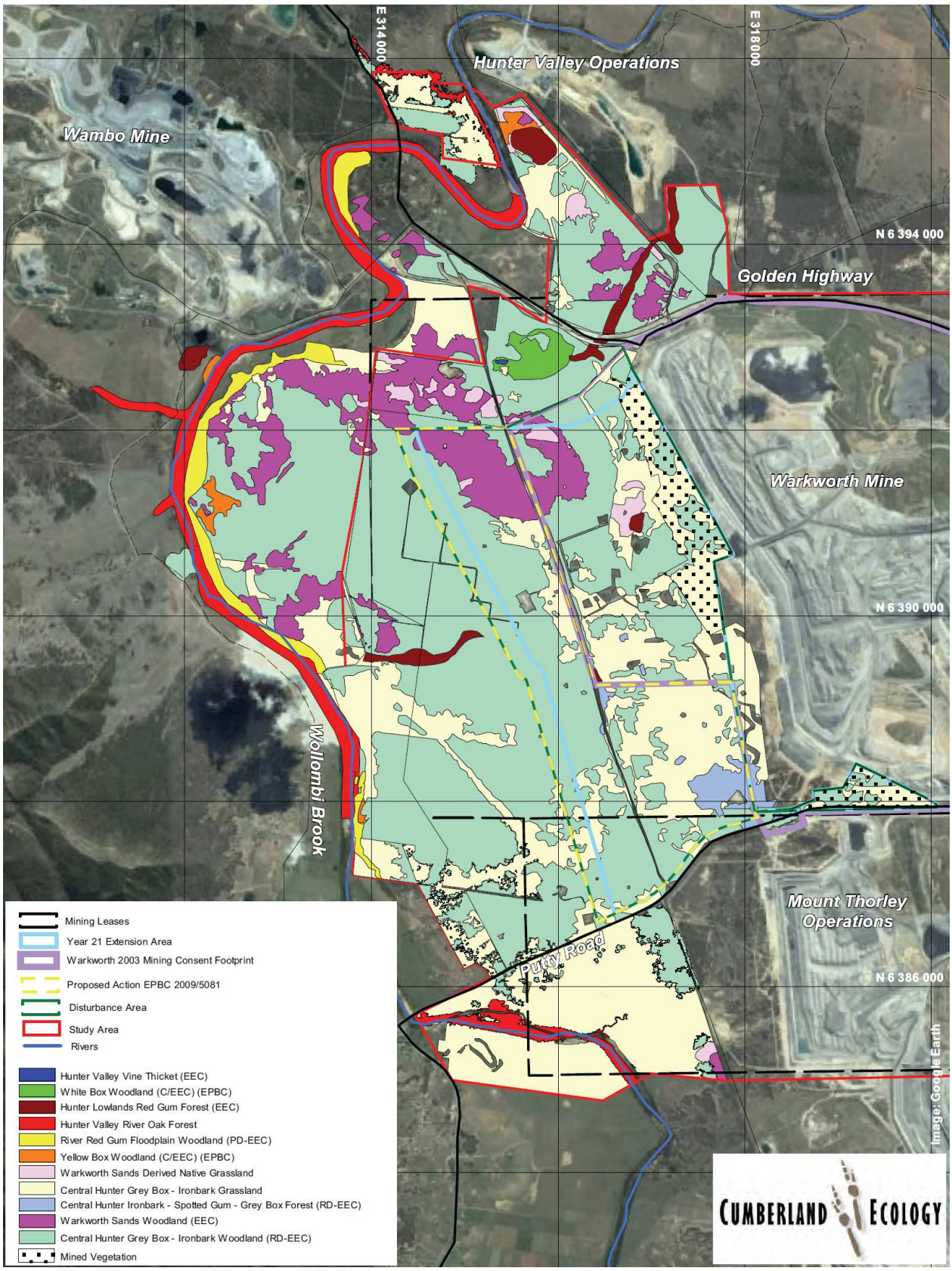


Figure 13: Vegetation Communities in the Project Area & Surrounds

Table 10: Vegetation Communities Impacted by the Project

Vegetation Community	***Approved Extension Area (2003)***	***Additional Extension Area***	***Total Extension Area***
Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC	1.5	29.0	30.5
Hunter Lowlands Red Gum Forest EEC	3.2	0	3.2
Central Hunter Grey Box – Ironbark Woodland EEC	249.1	378.4	627.5
Warkworth Sands Woodland EEC	35.6	67.9	103.5
Total Woodland	**289.4**	**475.3**	**764.7**
Warkworth Sands Woodland (Sand/Grassland)	16.7	1.4	18.1
Derived Grassland	227.1	202.3	429.4
Total Grassland	**243.8**	**203.7**	**447.5**
Total	**533.2**	**679.0**	**1,212.2**

It should be noted that nearly 44% of this vegetation clearing has been approved under the 2003 consent, and that some of the vegetation clearing has already been carried out. This is because of the conceptual approach that has been taken to assessing the impacts of the project, and the need to factor in all historical clearing so an appropriate offset is provided to replace the existing offsets and offset the impacts of the proposed extension of the mine.

It should also be noted that at least two of the EECs (ie. both of the Ironbark communities) were not listed as endangered ecological communities when the previous extension was approved in 2003, and consequently, the historical offsets for these communities was reasonably low (2:1).

The flora assessment in the EA concludes that without any mitigation or offsetting measures the project would have a significant impact on the Warkworth Sands Woodland and Central Hunter Grey Box-Ironbark Woodland EECs.

Warkworth Sands Woodland

The project would clear 103.5 ha of the Warkworth Sands Woodland community, including 35.6 ha that was approved for clearing under the 2003 consent. This would reduce the remaining community by 22%, leaving only 361 ha of the community left.

According to Dr Peake, this clearing would have a significant impact on the community as a whole and could put it at risk of extinction in the long term. To avoid this, he recommended changes to the mine plan to avoid the clearing of all the Warkworth Sands Woodland in the proposed extension area (67.9 ha).

Both Warkworth and Cumberland Ecology are strongly opposed to this recommendation. They argue Dr Peake has significantly overstated the risks of extinction, and that the proposed biodiversity offset strategy (see below) would offset the impacts of the clearing and result in an increase in the total size of the community in the medium to long term, and improved protection for the community than there currently is.

They also argue that the recommendation would result in the sterilisation of up to 47 Mt of ROM coal, which is not justified from an economic perspective.

To support this claim, Warkworth engaged Gillespie Economics to carry out a detailed cost benefit analysis of the recommendation (see Appendix F of the PPR in Appendix D), using the results of a specially targeted choice modelling study to estimate the conservation value of the Warkworth Sands Woodland and associated Aboriginal heritage values of the area. Gillespie Economics concluded that the avoidance of mining suggested by Dr Peake would have a net cost to society of $311 million.

Central Hunter Grey Box Ironbark Woodland

The project would clear 628 ha of the Central Hunter Grey Box Ironbark Woodland, including 249.1 ha that was approved for clearing under the 2003 consent. This would reduce the remaining community by about 4.2%, leaving at least 14,200 ha of the community left.

According to Dr Peake, this clearing would have a significant impact on the community at a local scale, and should be offset at a ratio of around 4:1.

Other EECs
Although it would clear a number of other EECs, the project is not expected to have a significant impact on any of these species. However, the Department has recommended conditions requiring Warkworth to ensure that the project does not have an adverse impact on the Hunter Lowlands Redgum Forest and River Red Gum Floodplain EECs in the Wollombi Brook alluvium downstream of the project area.

Flora Species
The project is not anticipated to have any impacts on endangered flora populations and no significant impacts on threatened flora species. However, 3 threatened orchid species could occur within the extension area. While there was some debate during the assessment process on whether or not the survey effort for these orchids was adequate, the Department has assumed that they are present on site, and concluded that their presence is not sufficiently significant to require a change to the mine plan. Notwithstanding, the Department has drafted conditions requiring Warkworth to:

- carry out additional surveys for these orchids following approval; and
- implement a suitable translocation plan if any orchids are actually found within the extension area.

Fauna
A total of 17 threatened fauna species have been identified, or could occur, in the project area, including (see Figure 14):

- 11 birds, including the EPBC listed Regent Honey Eater and Swift Parrot; and
- 6 bats.

Cumberland Ecology undertook tests of ecological significance for these species, and concluded that without suitable mitigation and offsetting the project would have a significant impact on a number of these species, primarily due to the loss of forest habitat. However, it noted that despite this clearing there would still be a substantial stand of remnant vegetation left between the mine and Wollombi Brook, and that this vegetation would continue to provide important habitat for both mobile and terrestrial fauna species.

To minimise the impacts on fauna, Warkworth proposes to implement a range of standard management strategies, including progressive clearing, pre-clearance surveys and habitat augmentation for certain species. These strategies would be complemented by the proposed biodiversity offset strategy (see below).

The project is not anticipated to have any impacts on endangered fauna populations, as listed under the TSC Act. The independent ecological assessment identifies a risk that some threatened woodland birds could be significantly impacted by the project. The ecology impact assessment places some emphasis on the establishment of appropriate types of vegetation through mine rehabilitation to mitigate impacts on a number of threatened fauna species. In order for this to be an effective mitigation measure, the Department has recommended conditions requiring additional detail on the nature of the rehabilitation, timing and methods to monitor and audit against performance and completion criteria through the preparation of a Rehabilitation Management Plan.

Biodiversity Offset and Rehabilitation Strategy
The EA (and subsequent documentation) includes a biodiversity offset strategy and rehabilitation strategy for the project, both of which are directed towards reducing the biodiversity impacts of the project. The final strategy is summarised in Table 11 below, and depicted in Figure 8.

The biodiversity offset strategy is comprised of 7 biodiversity areas, totalling some 4,790 ha. Together with the rehabilitation strategy, the project would ultimately provide for the establishment and/or protection of some 8,137 ha of woodland to offset the 765 ha that would be cleared (ie a gross long term offset ratio of 9:1).

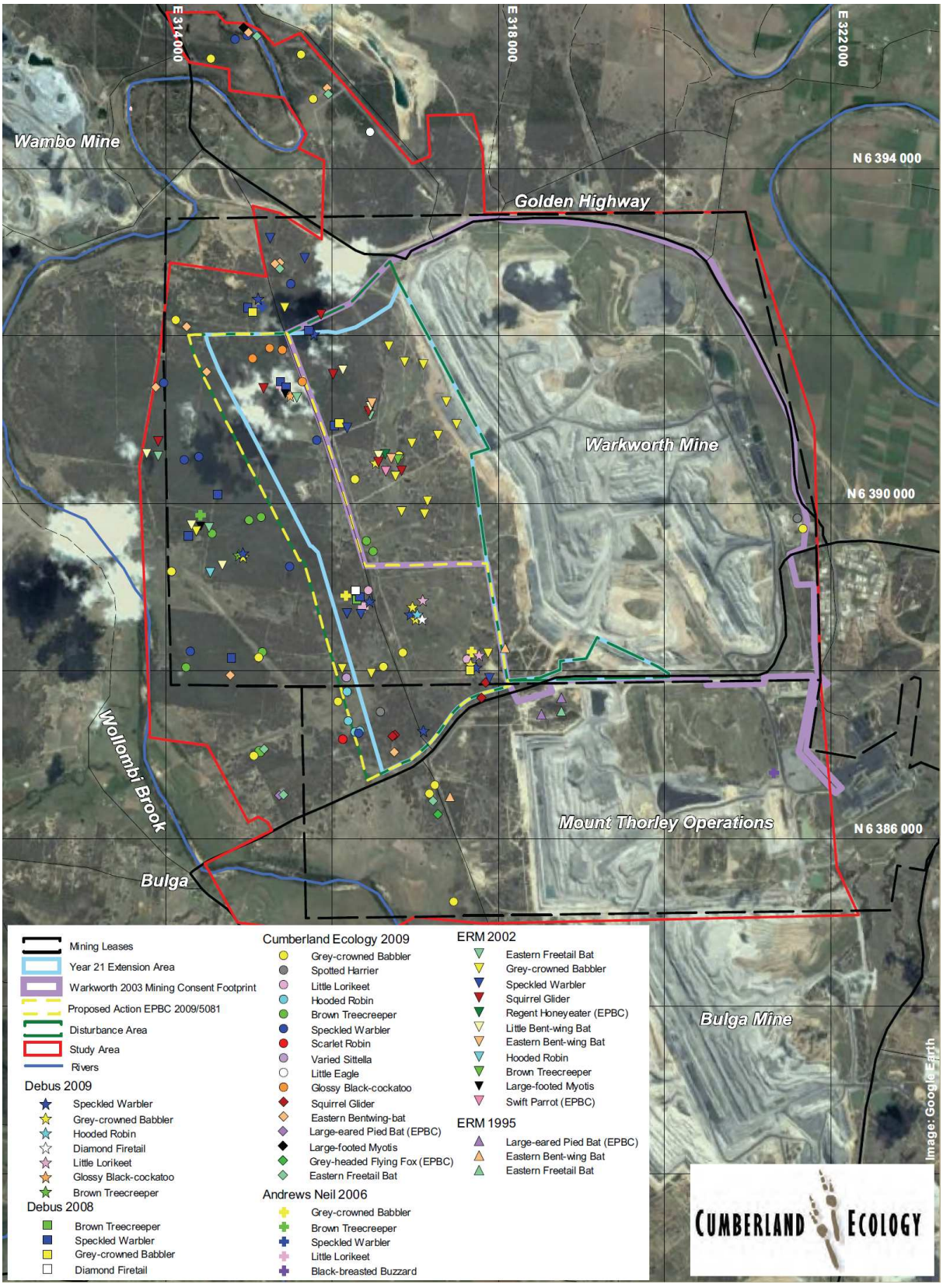


Figure 14: Threatened Fauna Species in the Project Area & Surrounds

Table 11: Summary of the Proposed Biodiversity Offset Strategy

Area	Existing woodland (ha)	Re-establishment of woodland (ha)	Grassland (ha)	Total (ha)
Land based offsets				
Southern Biodiversity Area	661	316.5	-	977.5
Northern Biodiversity Area	123.3	218.9	-	342.2
Goulburn River Biodiversity Area	1,063.5	-	235.8 (EEC)	1,299.3
Putty Biodiversity Area	366.6	12.2	-	378.8
Seven Oaks Biodiversity Area	354	168.7	-	522.7
Bowditch Biodiversity Area	517.5	2.3	-	519.8
Strategic offsets#	750	-	-	750#
Sub-total	*3,835.9*	*718.6*	*235.8*	*4,790.3*
Rehabilitation	-	2,114.0	1,233.0	3,347.0
Total	3,835.9	2,832.6	1,468.8	8,137.3
Non-land based offsets				
Continuation of five year research programme by UNE for WSW (Stage I)				
Contribution of additional $500,000 for Stage II research programme by UNE for WSW				
Preparation of recovery plan for WSW				
Trials to rehabilitate and revegetate old sand quarry				
Contribution of up to $500,000 to research into rehabilitation of ironbark communities				

Notes: *# Strategic offsets of nominally 750 ha of woody vegetation will be secured within 12 months of project approval to the acceptance of OEH.*

** Total includes area of grassland and trees over grassland.*

Warkworth Sands Woodland

During the public exhibition period, the most common issue raised in the submissions was the potential impact on ecology and the associated biodiversity offset strategy proposed by Warkworth for the project. Specifically, this key issue relates to the potential impact of the project on biodiversity values, and in particular on the Endangered Ecological Communities (EEC), including Warkworth Sands Woodland EEC (WSW), impacts on threatened species and the adequacy of the Biodiversity Offset proposed for the project.

For WSW, Warkworth proposes an up-front offset of 130.1 ha, which equates to a 1.26:1 offset to impact ratio. If the commenced and proposed restoration activities in the Northern Biodiversity Area and the restoration of Warkworth Sands Grassland (WSG) in the Southern and Springwood Biodiversity Areas are both successful, the area of existing WSW to be protected in the long term would equate to an offset ratio of 3.52:1. The evidence provided by Warkworth in the EA, and subsequent information, suggests that WSW has high recoverability potential, assuming the presence of the right conditions and/or appropriate management and intervention. In this regard, Cumberland Ecology and the specialist restoration ecologist Dr Anne-Maree Clements note that:

- the sand sheets proposed to be regenerated are in good condition;
- the WSW grassland proposed to be regenerated contains the essential elements (eg seeds, diversity) to enable regeneration;
- the proposed salvage of WSW material from the project disturbance area would contribute to these natural attributes;
- evidence from regeneration of other vegetation communities on sand systems (eg coastal sand systems) suggests that rehabilitation of complex sand ecosystems is achievable; and
- early feedback from the current UNE research is positive and encouraging for WSW rehabilitation on disturbed landscapes.

In addition to the land-based offsets, Warkworth also proposes to implement the following measures to shore up the recovery and long term protection of WSW:

- contribute an additional $500,000 toward WSW research being undertaken by UNE, including research into seed collection, genetic provenance, stressors for key species, as well as collection of seed supplies for regeneration works;
- preparation of a WSW Recovery Plan in consultation with government and industry stakeholders; and
- undertaking rehabilitation trials in a disused quarry within the Southern BOA, using material salvaged from the project disturbance area.

With the implementation of these land-based and non-land based measures, Warkworth and Cumberland Ecology argue that the proposed offset strategy would actually reduce the risk of extinction of WSW in the long term, and not materially change the risk of extinction in the short term.

The OEH has carefully reviewed the potential impacts on WSW and the proposed offset strategy, and has been heavily involved in a comprehensive, iterative consultation process with Warkworth regarding the acceptability of the offset strategy. This process has resulted in a substantial increase in the size and scope of the offset strategy since the EA, to address OEH's concerns. In response to the final offset strategy, OEH acknowledges that the 'distribution of the WSW EEC community is highly restricted and that opportunities for offsetting with extant WSW are very limited.' OEH accepts that the 'rehabilitation of derived WSW grasslands would result in a net increase in the extent of the EEC' over time, with resultant conservation benefits. OEH notes that the rehabilitation works would need to be carefully managed and monitored in order to achieve the outcomes being sought.

The Department also acknowledges the restricted nature of the WSW community, and the risks associated with further clearing of the community. However, the Department is satisfied that Warkworth's final offset strategy provides for the:

- up-front protection of extant WSW, to adequately reduce the risk of extinction of WSW in the short term;
- establishment of additional areas of WSW over the medium to long term, such that the project would provide for a considerable net increase in WSW over time and thus further reducing the risks on the community; and
- enhanced recovery of the WSW over time, through provision of considerable financial and scientific resources towards research and rehabilitation of the WSW community.

The Department has recommended a number of conditions to ensure that the offsetting measures for the WSW EEC are appropriately implemented, and to minimise associated risks. These include requirements to:

- prepare or fund a recovery plan for WSW;
- provide at least $500,000 in funding toward the existing WSW research program;
- undertake a rehabilitation trial to investigate the feasibility of establishing WSW on disturbed land including evaluating, monitoring and reporting on its effectiveness;
- monitor the effects of the project on the WSW adjacent to the mining pit, including the perched aquifer, including contingency measures should monitoring suggest adverse effects;
- consult with Council, the Department of Defence and the owners of the Bulga and Wambo mines to determine the feasibility of implementing a single management regime for all WSW in existing conservation areas or on other land owned by Council, Defence or mine-owned land. If agreement is reached, describe in broad terms, the proposed regime; and
- implement the offset strategy.

Ironbark Woodland EEC

The project would result in the clearing of approximately 658 ha of Central Hunter Ironbark - Spotted Gum - Grey Box Forest EEC and Central Hunter Grey Box - Ironbark Woodland EEC. The offset strategy provides for protection and/or establishment of some 712 ha.

Warkworth acknowledges that the offset strategy does not provide a significant like-for-like offset for the Ironbark communities, but notes that the remaining Ironbark community on the Hunter Valley floor generally occurs in relatively small and isolated patches which is not conducive to management as part of an integrated offset strategy. Accordingly, Warkworth's offset strategy focuses on providing at least some direct like-for-like Ironbark offset, together with a very large regional offset that is of significant strategic conservation value.

OEH has reviewed the offset strategy and accepts that, while like-for-like Ironbark offsets are available in the region, they generally comprise small patches spread across multiple landowners, which would make acquisition and management for conservation purposes problematic. In view of this, OEH noted that it is prepared to accept offsets in other areas with similar vegetation communities but not necessarily like-for-like. OEH recommended that the offset strategy be expanded to include an additional 350 - 400 ha of woodland.

OEH also sought clear commitments from Warkworth that all offset lands would be managed in perpetuity for conservation and that Warkworth would make no application for open cut mining in

Areas 1, 2 and 3 of the Southern Biodiversity Offset. Warkworth has responded, accepting these requirements, including committing to finding an additional offset area of at least 750 ha (see Table 11). On this basis, OEH has indicated that the proposed biodiversity offset package is satisfactory.

Whilst the Department acknowledges that the offset strategy does not provide a significant direct offset for the Ironbark EECs, the Department notes that the strategy would provide for the long term conservation of at least some of this vegetation locally in the Northern BOA and the Southern BOA (ie 712 ha) and the rehabilitation strategy would strive to revegetate a further 2,114 ha, providing a direct long term offset ratio for this vegetation community of more than 4:1, subject to the success of the rehabilitation.

Further, and irrespective of the like-for-like issue, the Goulburn River BOA, together with the Seven Oaks, Bowditch and Putty BOAs provide a high quality and strategic offset area for other reasons, particularly in terms of its:

- *Size* – the offset areas would provide large parcels of conservation land;
- *Connectivity* – the offset area is located adjacent and/or in proximity to large areas of remnant woodland areas, and is better located in terms of proximity to protected areas such as Goulburn River National Park and Wollemi National Park;
- *Variety and complexity of habitat* – including a number of communities of conservation significance;
- *Presence of threatened species* – and habitat for threatened species; and
- *Isolation* – the offset areas are relatively removed from the industrial and/or urbanised areas of the valley, or areas of known viable coal resources, with subsequent lower development pressures than a lot of areas on the valley floor.

Given these values, the Department is satisfied that the implementation of the offset strategy would improve, or at least maintain, the biodiversity values of the area in the medium to long term.

Notwithstanding, the Department recognises the inherent risks associated with re-establishment of high-quality, diverse ecosystems on rehabilitated landscapes. However, the Department also acknowledges Warkworth's commitment to contributing $500,000 toward research aimed at improving rehabilitation of complex Ironbark EEC on rehabilitated landscapes.

In this regard, the Department notes that the recent approval for the Ravensworth Operations Project required the owner of that mine, Xstrata, to develop and implement a Hunter Ironbark Research Program directed at encouraging research into the mapping and recovery of the Ironbark EECs. The Department has recommended a condition requiring Warkworth to prepare and implement a similar program for this project, in a manner that complements the program already being undertaken for the Ravensworth project.

To further mitigate the risk associated with rehabilitation of the Ironbark Woodland EECs, and to provide a strong incentive to ensuring a high quality rehabilitated landscape is achieved, the Department has also recommended a condition requiring Warkworth to undertake a detailed independent ecological audit of the Ironbark Woodland EEC rehabilitation at approximately Year 15 of the project. If the audit finds that the rehabilitated woodland does not constitute, or is not adequately trending towards, Ironbark Woodland EEC, then Warkworth would be required to augment the offset strategy to provide additional offsets for the Ironbark Woodland EECs.

With these measures, the Department is satisfied that the project's impacts on the Ironbark Woodland EECs are able to be effectively mitigated and managed, and/or adequately compensated for such that the communities would be adequately protected and conserved.

Conclusion

The Department acknowledges that the project would require the clearing of a large area of good quality vegetation, including 765 ha of woodland EEC.

However, the Department is satisfied that these impacts are able to be mitigated and/or offset to an extent such that the project could be considered to improve or at least maintain biodiversity values in the area over the medium to long term. To achieve this goal, the Department has recommended conditions requiring Warkworth to:

- implement the offset strategy, including identifying an additional area of at least 750 ha within 12 months;

- commission an independent ecological audit at Year 15, and potentially provide additional offsets based on the outcomes of this audit;
- provide for the long term conservation (ie. in perpetuity) of the offset areas;
- undertake a range of measures to ensure the protection and management of the WSW EEC (as outlined above);
- develop a Hunter Ironbark Research Program, and contribute at least $500,000 toward the program;
- undertake additional surveys for threatened orchid species, and transplant any identified species;
- protect off-site EECs in the area, and manage the biodiversity values of the buffer lands;
- develop a comprehensive Biodiversity Management Pan and Rehabilitation Management Plan to provide for the detailed implementation of the rehabilitation and offset strategies; and
- lodge a substantial conservation and biodiversity bond to ensure that the offset areas are established and maintained to the satisfaction of the Director-General.

5.6 Aboriginal Heritage

The EA includes a summary Aboriginal Cultural Heritage Assessment Study prepared by Central Queensland Cultural Heritage Management and a number of additional studies undertaken since 2001. The summary assessment is based on the previous archaeological assessments within the project area, including the assessments undertaken for the 2002 Warkworth Mine Extension assessment, and is supplemented by a range of additional surveys of areas not previously surveyed.

The Department has reviewed the large number of archaeological reports undertaken within the project area, including the assessments undertaken for 2003 Warkworth Mine Extension Consent area, the archaeological excavations undertaken with permits/ consents associated with these operations (issued under the *National Parks and Wildlife Act 1974*) and the DVD undertaken as part of the Warkworth Sands excavations.

These assessments and excavations have been undertaken in consultation with the Aboriginal community, with the more recent works (2005 onwards) being undertaken in consultation with the Cultural Heritage Working Group (CHWG) established RTCA in 2005. Consultation has included a number of meetings, provision of reports, site inspections, a workshop and an inspection of the Bulga Bora Ground.

The OEH's submission on the project raised a number of concerns regarding the adequacy of the EA with regard to the level of detailed evidence supporting the consultation undertaken as part of the preparation of the Aboriginal Cultural Heritage Study and the apparent discrepancy with the reported outcomes of this consultation process.

The Department has reviewed the Proponent's consultation process, and attended one of the CHWG meetings, and is of the view that the consultation, while not in accordance with current or former OEH consultation requirements, meets the intent of these guidelines (the CHWG predates any obligation for the guidelines to be followed). Additionally over and above the aforementioned requirements, the proponent has continued to consult with the CHWG in relation to the project subsequent to submission of the EA, and has provided further details on the outcomes of this continued consultation with the CHWG to the Department.

Proposed Impacts

The current assessments have identified 312 sites in the project area, of these up to 113 sites are located within the proposed disturbance area and would be impacted the project. The remaining 199 sites will not be impacted as part of this project. Forty two of these are located within a potential future mine development area but 157 sites are located within the proposed Wollombi Brook Cultural Heritage Conservation Area. A summary of the sites identified is presented in Table 12.

In archaeological terms, the proposed Wollombi Brook Conservation Area contains 16 highly significant sites and 57 significant sites (including areas of archaeological potential). The area of disturbance contains 5 highly significant sites and 3 significant sites. The future development zone contains 4 highly significant sites.

Table 12: Aboriginal Site Summary

Site Type	***Within Proposed Impact Area***	***Outside Proposed Impact Area***		***Total***
		Potential Future Development Zone (Buffer lands)	***Proposed Conservation Area***	
Isolated stone artefact/s[1]	101	35	137	273
Isolated stone artefact/s / shell material	0	1	0	1
Isolated stone artefact/s / stone source	0	2	1	3
Stone artefact scatter	8	0	0	8
Scarred tree	3	4	11	18
Grinding grooves	1	0	3	4
Spiritual place	0	0	2	2
Stone source	0	0	1	1
Burial	0	0	1	1
Other	0	0	1	1
Total	**113**	**42**	**157**	**312**

The majority of the sites within the proposed disturbance area have been identified as isolated artefacts. However there is one grinding groove site and three scarred trees located within the identified area of disturbance, these sites have been assessed as being highly significant. Additionally there are three Potential Archaeological Deposits (PADs) within the proposed disturbance area.

Previous archaeological assessments and excavations within the project area have established the archaeological potential of the aeolian (windblown) sand sheets that occur within the project area (see Figure 15). The proponent has previously undertaken archaeological excavations of area B. Results of the studies in 2002 and 2009 on the sand sheets are discussed later in this section.

Culturally, the Aboriginal stakeholders have identified the high cultural value of the entirety of the landscape within the project area and well beyond it, including but not limited to the objects within it. However they have also clearly indicated the unique cultural value of the Bora ground located partially within proposed Wollombi Brook Conservation Area and a number of areas outside of the project area. The Bora ground is discussed in more detail later in this section. The Aboriginal stakeholder's views are well articulated, and captured, in the DVD prepared for the Warkworth Sands Excavations. In addition, all Aboriginal objects contained within the landscape are identified as significant, with scarred trees and grinding grooves having been identified as being of particular significance.

2002 Warkworth Extension

The Department notes that the survey undertaken for the 2002 EIS for the previous extension of the Warkworth Mine identified 122 sites comprising 72 artefact scatters, 49 isolated finds and 3 grinding grooves (of which two were associated with artefact scatters). The assessment also identified the presence of aeolian sand sheets (areas A, B and C on Figure 15) with the potential to contain evidence of early Aboriginal occupation (Pleistocene) in the Hunter Valley. The results of archaeological work on the sand sheets are discussed later in this section.

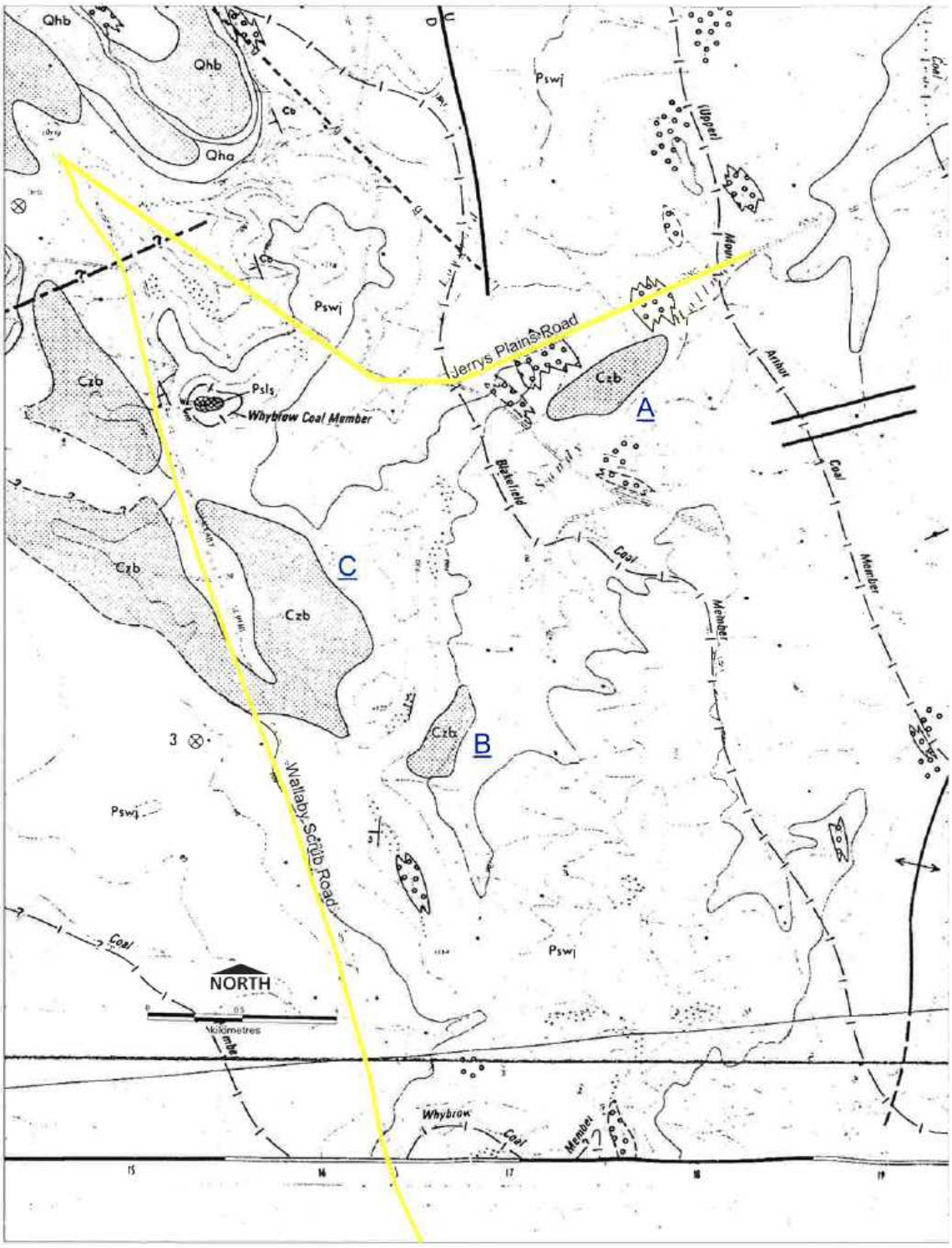
Subsequent to the issue of the 2003 development consent a number of the identified sites were subject to salvage under the *National Parks and Wildlife Act 1974* (including surface collection and archaeological excavation) (see Figure 16 for areas covered by permits). This has resulted in the salvage and collection of around 4,350 artefacts. To date 17 sites within the previous extension area have not been salvaged, these remaining sites will be salvaged as part of the proposed project.

Warkworth Sand Sheet

2002 study

As mentioned previously, the 2002 study by Australian Museum Business Services (AMBS) assessment identified the presence of aeolian sand sheets, also referred to as the Warkworth sands (see areas A, B and C on Figure 15), which had the potential to contain evidence of early (ie Pleistocene) Aboriginal occupation in the Hunter Valley. Area A had been removed by earlier mining operations. Area B was a large body of apparently windblown sand approximately 500 m (north-south) by 200 m (east-west) and up to about 4 m deep. The sand sheet was located along Sandy Hollow creek and the study suggested its alignment indicated that it had derived from Wollombi Brook (c. 3.5 km away). Test excavations were undertaken within area B where 11 test pits recovered 213

artefacts including 88 complete flakes in 10 m^2 of the sands and recovered age determinations of at least 14,000 years and possibly more than 45,000 years.



Geological map of teh study area, showing the mapped distribution of Cainozoic aeolian sands (Czb). The northern-most deposit (A) has been removed by mining. The excavations described in this report were undertaken in the southern deposit (B, Survey Area 4). The western deposit (C) occurred in Survey Area 8c. (Source: Geological Series Sheet 9132-IV-N, 1984).

Figure 15: Aeolian (Windblown) Sand Deposits (from AMBS 2001).

2009 study

The main aim of the 2009 study, undertaken by Scarp Archaeology was to evaluate the 2002 study results, and to determine the frequency, stratigraphic integrity and antiquity of stone artefacts (chiefly those lying just above the clay horizon). The Scarp report comprises and considers a range of scientific studies and detailed analysis including the results of ground penetrating radar, archaeological excavations, artefact analysis and specialist studies covering geomorphic data, Optical Stimulated Luminescence (OSL), and magnetic susceptibility.

The study recovered 1,067 artefacts including 1,014 flakes, 29 retouched flakes (a total of 1043 complete flakes) and 24 cores in 100 m^2. In addition to flakes and cores, a further 2,022 non-diagnostic fragments (which lack macroscopic features diagnostic of stone flaked by people) were recovered, some of which were subsequently identified microscopically as flakes.

The findings of this comprehensive study are that despite considerable mixing (bioturbation), age estimates for the cultural material (stone artefacts) are possible based on archaeological evidence for two artefact concentrations:

- the upper concentration (best age estimate of about 1 - 2,000 years old) is characterised by backed artefact technology typical of later Holocene period commonly found across the Hunter Valley; and
- the lower stone artefact concentration (best age estimate of about 8,450 - 14,100 years old) lacks backed artefacts and has no diagnostic technological indicators of chronology.

The report also acknowledges that there is compelling evidence (based on OSL data) that the oldest artefacts are between 9,450 – 18,500 years old (in Trench 2) and between 8,450 – 14,100 years old (in Trench 1), but bioturbation means that a more exact age is not possible. The distribution of grain doses for these lower ages all indicate considerable downward movement of younger sand grains (and upper movement of older sand grains) as a consequence of bioturbation. Taking into account the high probability of downward movement of artefacts (in the order of 20 cm), the true age of artefacts in the Warkworth sands is likely to be less than 14,000 years. Given the degree of mixing shown by a separate set of Accelerator Mass Spectrometry (AMS) dates, they are possibly all Holocene (less than about 10,000 years).

However, the Department notes that even an early Holocene date for the cultural material makes the site (and the sand sheets) scientifically significant and contributes important temporal knowledge to archaeological understanding and interpretation of the Upper Hunter Valley. The Aboriginal stakeholders have also expressed the Aboriginal cultural values associated with the sand sheets, and as a result, prior to impacts to area B (now removed) undertook cultural salvage across the area.

The Department acknowledges both the potential for significant archaeological deposits in the Warkworth sand sheets that remain and will be impacted by the proposed project, and the difficulty of undertaking archaeological investigations of the sand sheet without disturbing the Warkworth Sands Woodland EEC. As such, the Department has recommended conditions requiring the proponent to undertake an archaeological excavation program within the remaining sand sheet (area C on Figure 15) prior to any development within it and to report on the results of the program.

Additionally, acknowledging the limits of current archaeological and geomorphological understanding of sand bodies (sand dunes and sand sheets) in the Upper Hunter Valley the Department has recommended a condition requiring the proponent to undertake a study to locate and evaluate sand bodies likely to contain evidence of early Aboriginal habitation (Pleistocene and early Holocene). The research design for the study is to be prepared in consultation with the Department, OEH and Aboriginal stakeholders. The intent of this condition is for the study to locate and map windblown sands of a Pleistocene - early Holocene age and evaluate/classify their potential to contain subsurface stratified archaeological material. Some consideration should also be given to geomorphological and/ or archaeological excavations to evaluate the classification system.

Proposed Wollombi Brook Conservation Area

The Proponent has committed to the in perpetuity conservation of the Wollombi Brook Conservation Area, a 510 ha area located to the west of the proposed mine extension in proximity to Wollombi Brook. The proposed conservation area contains 157 sites. This includes a portion of the Bulga Bora Ground, a site of immeasurable significance to the Aboriginal community (the reminder of the site is contained within the Wambo Coal lease area), 3 grinding groove sites, 11 scarred trees and a number of stone artefacts.

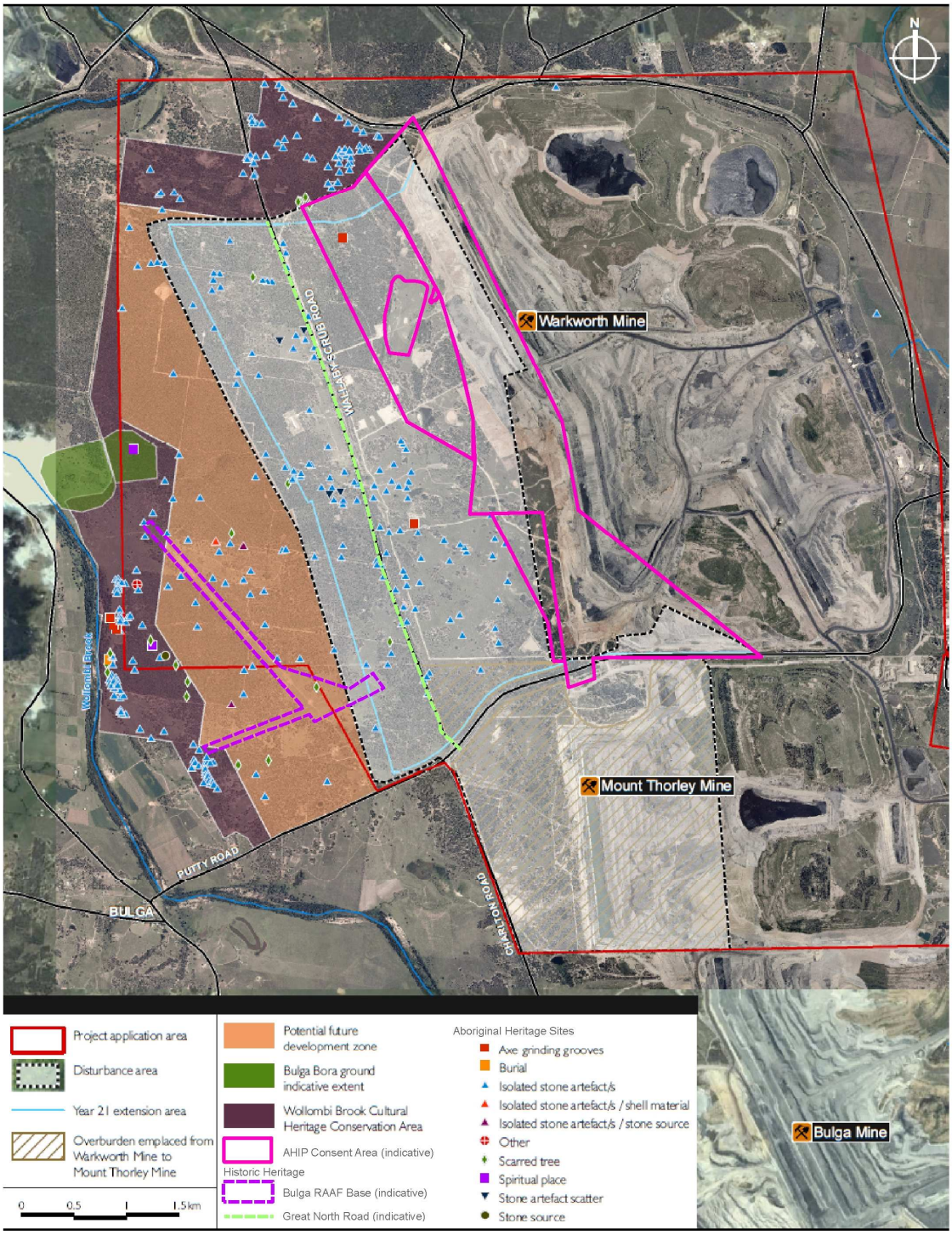


Figure 16: Location of Heritage Items including Aboriginal and Historic Heritage

The Bora grounds and the lands that surround it are of great significance to the Aboriginal community, presenting a very tangible link to their ancestors and culture. For a number of years the exact location of the Bora ground has been unknown, the OEH's AHIMS database containing two potential locations. As a result of the detailed knowledge of a few Aboriginal stakeholders and the proponent's ongoing consideration of this issue, a more precise location for this area is now known. The Aboriginal stakeholders have discussed the significance of the wider area surrounding the Bora ground, and the potential for related camp grounds, activity areas and resource areas in the wider landscape. Some concern has also been raised that part of the Bora ground lies outside of the conservation area and within the mining lease and lands of another mining company.

The Department acknowledges the commitment of the Proponent to protect this area and ensure its long term protection and has recommended condition requiring the in perpetuity conservation and enhancement of this area, to strengthen this commitment. Additionally, acknowledging the cultural significance of the wider landscape, particularly the remaining portion of the Bora ground that lies outside the Wollombi Brook Conservation Area, the Department has recommended the development of a conservation strategy in consultation with the Department, the Aboriginal community and the OEH. This strategy requires the proponent to investigate the potential to expand the Wollombi Brook Conservation Area to include additional land within the Wambo mining lease area and/or ensure collaborative management of the Aboriginal heritage values of the Wollombi Brook Conservation Area and the adjoining Wambo-owned land adjacent to the conservation area, in consultation with the owner of the Wambo mine. Additionally, to further protect, conserve and enhance Aboriginal cultural heritage it requires the identification and management of the Aboriginal cultural heritage values of any associated biodiversity offset areas.

The Wallaby Scrub Road relocation would have resulted in the disturbance of an additional 11 sites and brought through traffic closer to the Wollombi Brook Conservation Area and the Bora ground. During the project consultation process the Aboriginal stakeholder's highlighted concerns with regard to the proximity of the proposed relocated Wallaby Scrub Road to the proposed Wollombi Brook Conservation Area. Of particular concern were the potential impacts to the curtilage of the Bulga Bora Ground spiritual site. As outlined in Section 5.8, the Department has recommended that Wallaby Scrub Road be closed without relocation. To address these concerns, and to ensure a reasonable curtilage around the Bulga Bora Ground, the Department has recommended conditions requiring the proponent to incorporate this area into the Wollombi Brook Cultural Heritage Conservation Area to buffer any future use of the Future Development Area.

The Department notes that three grinding groove sites within the Wollombi Brook Cultural Heritage Conservation Area (and one grinding groove in the project development area prior to its relocation) have the potential to be indirectly impacted through vibration from blasting associated with the project. The potential impact from blasting on these sites has not been assessed. The Department is satisfied that impacts on such sites can be managed by meeting appropriate vibration criteria at the sites, however, as an acceptable vibration criteria has not been identified and no specific commitment has been made to manage vibration impacts at these highly significant sites, the Department has recommended conditions requiring the proponent undertake additional detailed study of potential blast impacts on these features and determine appropriate blast impact criteria for these sites to be incorporated into the Blast Management Plan.

To ensure that Aboriginal heritage is appropriately managed across the mine complex, the Department has recommended conditions that include requiring the proponent to

- Protect the heritage items contained within the conservation area and the future development area, and salvage sites, including PADs, that will be impacted by the project; and
- prepare and implement a comprehensive Heritage Management Plan for the mine complex, in consultation with the Aboriginal stakeholders and the OEH. The Plan would be required to include a detailed plan of management for the Wollombi Brook Aboriginal Cultural Heritage Conservation Area, ensure the ongoing involvement of the Aboriginal community in the conservation and management of Aboriginal cultural heritage on site and within any Aboriginal heritage conservation areas, and a strategy for the short and long term storage of any heritage items salvaged on site.

The Department is satisfied that, with the proposed conditions, and the proponent's statement of commitments, the mine complex (including conservation areas and biodiversity offset areas) can be managed in a manner such that Aboriginal heritage values of the area can be protected and conserved over the long term and that any direct impacts can be appropriately managed.

5.7 Historic heritage

The assessment of historic heritage considers two heritage items located within the project area, the former Royal Australian Air Force (RAAF) Base Bulga located west of Wallaby Scrub Road and a section of the Great North Road along the alignment of Wallaby Scrub Road (see Figure 17). Additionally the EA identified that the former Queen Victoria Inn ruins were located within the footprint of the existing mine but notes that these ruins have been removed as part of previous mining operations.

RAAF Base

The main portion of the former RAAF Base (approximately 45 ha) is located outside the proposed disturbance area however the project would directly impact on a 4.8 ha section of the eastern runway. The proponent completed a heritage assessment of the former RAAF Base. The assessment concluded that the former RAAF Base is of national historical significance for its ability to demonstrate the effort to defend Australia from attack by the Japanese during WWII. However, a range of issues constrain the interpretation of the site, including:

- a disparity between the original plans for the site and actual works completed;
- a lack of physical evidence with only two runways and one kitchen building extant on the site; and
- the poor condition of remaining structures, with the kitchen building structurally unsound.

Given the assessed significance of the former RAAF Base, and to ensure its stability into the future, the Department has recommended a condition requiring the proponent to:

a) undertake an archival recording and survey of the whole site prior to any impacts (the Proponent has committed to undertake this recording in accordance with NSW Heritage Branch standards); and
b) prepare and implement a conservation management plan for the remainder of the site (located outside the proposed disturbance area), including an assessment of the structural integrity of the kitchen building and any works that could be undertaken to enhance its structural integrity.

Great North Road (Wallaby Scrub Road)

No assessment of the heritage significance of the Great North Road (or the section identified within the project area) was undertaken for the EA (the project would require the closure and open-cut mining of the current alignment of Wallaby Scrub Road).

However, following submissions from the community and Singleton Council regarding the heritage significance of Wallaby Scrub Road as part of the Great North Road, the proponent addressed this matter in its response to submissions. The proponent identifies that neither Wallaby Scrub Road, nor the section of the Great North Road within which Wallaby Scrub Road lies, is listed on any statutory or non-statutory heritage register and there is no physical evidence of convict road construction along this part of the road. Additionally, while some well-represented sections of the Great North Road are heritage listed, there is no statutory listing or proposed listing of the Great North Road in its entirety or within the project area.

The Department has considered this issue, and notes that there are other surviving (heritage listed) sections of the Great North Road. However, noting that portions of the Great North Road are listed on the State heritage register (and assessed as being of State significance), the Department has recommended a condition of approval requiring further historic and physical investigations in relation to the location of this section of the Great North Road. The recommended condition requires consideration of relocation and interpretation, should remnant road portions and/ or markers (attributed as evidence the Great North Road) be identified.

Other

Potential indirect impacts on heritage sites outside the project area, including the State heritage listed Bulga Bridge and St Phillips Church at Warkworth (locally listed), have been considered as part of the blasting assessment undertaken for the EA and are discussed in section 5.2. The Department notes that the proponent's assessment did not consider potential structural damage to the State heritage listed Wambo Homestead, located less than 3 km from the project disturbance area, and has incorporated this into the conditions. The Department is satisfied that blasting related to the project can be suitably managed to avoid impacting these heritage items and has recommended conditions to this effect, requiring dilapidation surveys of heritage items with 3 km of the proposed disturbance area and blast monitoring and management.

To ensure heritage sites within and surrounding the project area are appropriately managed, the Department has recommended a condition requiring the proponent to prepare and implement a comprehensive Heritage Management Plan for the project in consultation with the Heritage Branch, OEH and local historical organisations, including requirements for:

- further investigations of the Great North Road (the current Wallaby Scrub Road); and
- photographic and archival recording of the entire former RAAF Base Bulga site and the preparation of a conservation management plan for the remaining site including assessment of structural integrity.

The Department is satisfied that, with the proposed conditions, the project's direct impacts on historic heritage items would not significantly affect the overall heritage values of the area and that any potential indirect impacts can be appropriately managed.

5.8 Transport

The EA includes a traffic impact assessment undertaken by Parsons Brinkerhoff. The assessment considers the potential impacts associated with:

- closure or relocation of Wallaby Scrub Road at approximately Year 7 of the project;
- increased traffic due to additional employee and contractor numbers; and
- increased duration of mining activities beyond the current consent period.

The project would require the closure of Wallaby Scrub Road in order to access coal located beneath its current alignment. Warkworth has proposed closure of the road without relocation, arguing that the impacts of road relocation were greater than the impacts associated with closure, particularly in relation to the ecological and archaeological impacts and benefit cost considerations. However, feedback from the community indicated that closure of the road was of particular concern and that relocation should be considered. Both closure and relocation of the road was considered in the EA and Warkworth has since committed to a relocation option should the project be approved. The location of the proposed Wallaby Scrub Road relocation is shown in Figure 17.

Wallaby Scrub Road carries approximately 780 vehicle movements per day. If the road were to be closed, vehicles travelling to or from Bulga village would need to seek an alternate route, specifically to continue on Putty Road to the Golden Highway, travelling around the Warkworth Mine (refer to Figure 17). Vehicles which would usually travel along Charlton Road and Wallaby Scrub Road would be diverted either onto Putty Road or Broke Road and the Golden Highway (refer to Figure 17).

The proposed route for relocating Wallaby Scrub Road has been presented by Warkworth as the only viable route option, when considering all relevant road design and environmental constraints. The Department recognises that there are significant ecological and archaeological constraints west and north of the proposed mining area, limiting potential route alignment options. It is also noted that there is some uncertainty around the proposed alignment due to potential Aboriginal archaeological impacts. The potential impacts associated with the closure or relocation are summarised in Table 13.

On balance, the Department is of the opinion that the potential impacts associated with relocation of Wallaby Scrub Road cannot be justified for the following key reasons:

- additional and avoidable impacts on EECs, in particular the WSW EEC, and impacts associated with fragmentation of the proposed Southern Biodiversity Area;
- the level of road use is relatively low;
- additional travel times associated with the closure are not significantly greater when compared to additional travel times associated with relocation;
- the costs associated with relocation (to both Warkworth, in terms of capital cost, and the community in terms of ongoing maintenance), are unlikely to outweigh the benefits which would be gained by a small proportion of road users;
- potential additional and avoidable impacts on Aboriginal cultural heritage sites and the proposed Wollombi Brook Cultural Heritage Conservation Area, and increased proximity to the highly significant Bulga Bora Ground; and
- Singleton Council, while objecting to both closure and relocation, identified that closure would decrease road maintenance costs for Council while relocation would require Council to maintain additional road for lesser convenience to road users. Council also identified that relocation may result in a lower level of use by the community and is therefore not likely to result in a positive benefit cost.

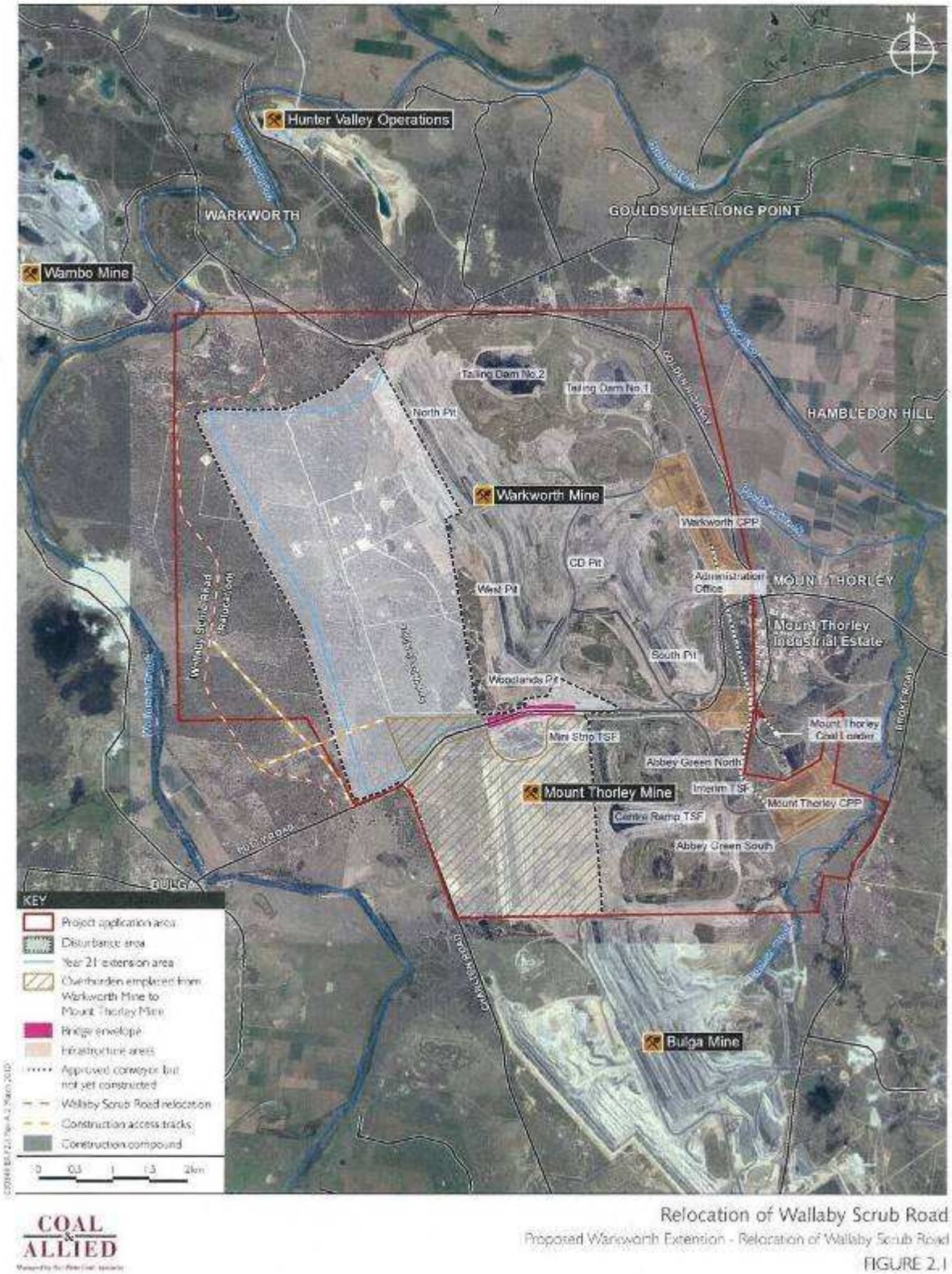


Figure 17: Potential Relocation of Wallaby Scrub Road

Table 13: Summary of Impacts of Closure or Relocation of Wallaby Scrub Road

Aspect	***Closure of Wallaby Scrub Road***	***Relocation of Wallaby Scrub Road***
Increased Travel Time	• Additional 6 minutes when origin / destination Bulga Village (20% of road users)	• Additional 2 minutes
	• Additional 3.5 minutes when origin / destination intersection of Broke Rd & Charlton Rd (80% of road users)	• Additional 2 minutes
Ecology	• No additional ecological impacts	• Clearing of 32.1 ha of EEC woodland, including 3.3 ha of WSW EEC • Fragmentation and edge effects associated with proposed Southern Biodiversity Area
Aboriginal Cultural Heritage	• No additional cultural heritage impacts	• Potential impacts on Aboriginal heritage sites (refer to Figure 18) • Impact on the proposed Wollombi Brook Aboriginal Cultural Heritage Conservation Area (refer to Figure 18)
Construction Noise	• No additional impacts	• Three residences likely to experience construction noise in excess of criteria
European Heritage	• Minor impact on former RAAF base runway (non-listed heritage item) • Removal of a non-listed section of the Great North Road	• Impact over full extent of former RAAF base runway (non-listed heritage item) • Relocation of a non-listed section of the Great North Road
Economics		• Net cost compared to closure of $15.4M

As such, the Department recommends that Wallaby Scrub Road be closed without relocation. On this basis, the following traffic mitigation and management measures have been proposed by Warkworth, subject to negotiation with Singleton Council:

- provision of appropriate development contributions through a Voluntary Planning Agreement (discussed further in Section 5.11);
- development of a road closure management plan in consultation with local stakeholders; and
- installation of speed advisory and curve warning signs on the Putty Road.

The Department acknowledges the concerns raised in submissions relating to the potential impact on the travel times for emergency services, in particular, the Rural Fire Service, if Wallaby Scrub Road were to be closed. The Department has recommended conditions requiring Warkworth to consult with the Rural Fire Service and, where an appropriate alternate location can be identified, fund the relocation of the Rural Fire Service to allow for quicker response times following the closure of Wallaby Scrub Road.

Traffic Network Impacts

The maximum traffic generation associated with the project is predicted to occur in Year 4 of operations, when the workforce peaks at 1200. Additional analysis was also carried out for Year 7 when the closure of Wallaby Scrub Road would result in redistribution of traffic onto Putty Road, Golden Highway, Charlton Road South and Broke Road. The predicted impacts of the project on the level of service of local intersections was analysed and is presented in Table 14.

The level of service of all local intersections are forecast to perform at a satisfactory level (A-C) with the exception of the Golden Highway/Broke Road intersection which currently performs at capacity and, through general traffic increases, will fall to an unsatisfactory level by Year 4 regardless of whether the project proceeds. The project is predicted to adversely impact on the intersection of Putty Road and the northbound on-ramp to the Golden Highway however, this intersection would continue to perform at a satisfactory level (C).

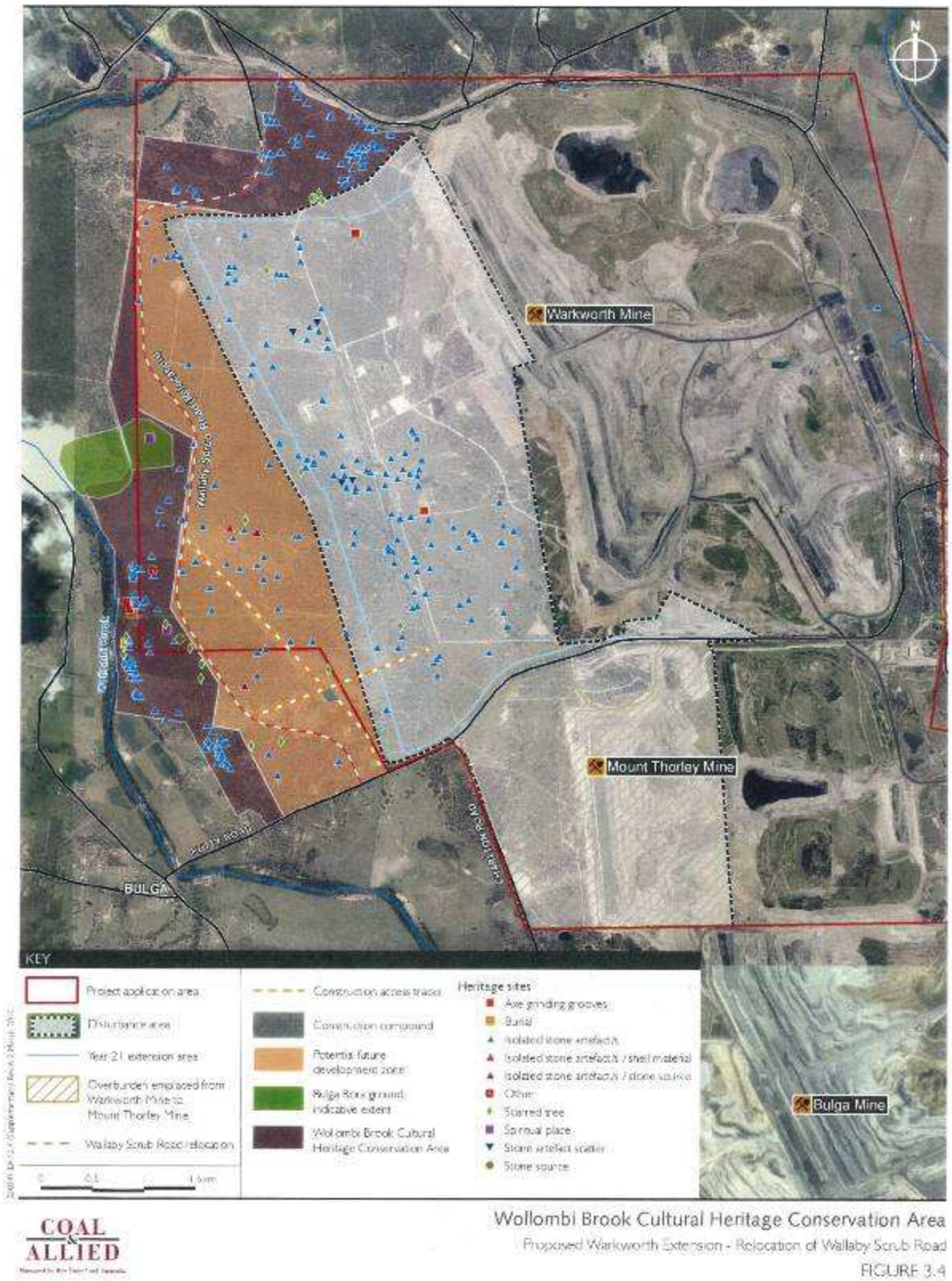


Figure 18: Location of Potential Relocation of Wallaby Scrub Road in Relation to Aboriginal Archaeological Sites and Wollombi Brook Cultural Heritage Conservation Area

Table 14: Local Intersection Level of Service

Year	Current	Year 4		Year 7	
		No Extension	With Extension	No Extension	With Extension & Closure of Wallaby Scrub Road
Golden Highway/Wallaby Scrub Road	A	A	A	A	-
Putty Road/Wallaby Scrub Road	A	A	A	A	-
Putty Road/Northbound on-ramp to Golden Highway	B	B	C	B	C
Putty Road/Southbound off-ramp from Golden Highway	B	B	B	B	B
Golden Highway/Broke Road	E	F	F	F	F
Broke Road/Charlton Road	B	B	B	B	B

The poor performance of key intersections surrounding the project was a key issue raised in submissions, as was the potential impacts on these intersections should Wallaby Scrub Road be closed. Warkworth has proposed to make contributions to improve both these intersections in consultation with Council and the RTA, should Wallaby Scrub Road be closed. The Department has recommended specific conditions to ensure this occurs, however, due to the community concerns in relation to the closure of Wallaby Scrub Road, the Department has recommended that Warkworth undertaken the upgrade of these intersections.

The Department is satisfied that the local and regional road network is capable of accommodating the traffic associated with the project, including the closure of Wallaby Scrub Road, subject to the identified upgrades. In this regard, the Department has recommended conditions requiring Warkworth to:

- improve the channelization at the Putty Road / Golden Highway intersection as required by the RTA; and
- upgrade the Broke Road / Golden Highway intersection in consultation with Council and the RTA prior to the closure of Wallaby Scrub Road.

5.9 Visual Amenity

The EA includes a specialist visual impact assessment undertaken by Integral Landscape Architecture and Visual Planning. The assessment defines the visual impact of the project as a factor of the project's visual effect on a viewing location and the visual sensitivity of that viewing location. The assessment incorporates a number of photo montages to demonstrate the extent of visual impact associated with the project.

The assessment focuses on the major visual elements of the mine, these being the mine pit and out of pit overburden emplacement areas. In this regard, the project would result in the Warkworth Mine open cut pit extending westward to within approximately 2.6km of Bulga village, removing a key topographical feature, Saddleback Ridge, which currently screens views of the mine from areas to the west. The project would also extend overburden emplacement areas within Mount Thorley and Warkworth Mines, however, average overburden emplacement heights would remain unchanged at RL 160m AHD for Warkworth Mine and RL 155m AHD for Mount Thorley. The visual impact of existing overburden emplacement areas and the removal of Saddleback Ridge were issues raised in the submissions on the project.

The Department notes that the assessment does not consider the visual impacts of night lighting. As with the majority of large scale mining operations the potential impacts from night lighting are generally at both a landscape and individual receiver level. From a landscape perspective, the project is located in a well established mining region and as such the potential night lighting impacts would generally be consistent with existing land uses. With regard to potential night lighting impacts on individual residences, the Department would consider that the areas with potentially greater night lighting impacts would correlate with the areas of potential high visual impact, as presented in the EA. These

impacts are commonly managed through compliance with relevant Australian Standards and ongoing management of light sources as part of an operation. The Department has recommended conditions to ensure that these mitigation measures are implemented.

Visual Impacts

The assessment identifies that visual impacts would primarily occur from the east and the west of the mine. Eastern viewing locations would be exposed to the eastern faces of the Warkworth overburden emplacement area. Western viewing locations would have views of the Mount Thorley overburden emplacement area and, following removal of Saddleback Ridge, potential views of the Warkworth overburden emplacement area. Vegetation along Wollombi Brook would assist in screening views of the Warkworth overburden emplacement areas from the west.

A summary of the predicted visual impacts of the project as defined by the visual assessment is presented in Table 15. The table considers the pre-rehabilitated landform and therefore a worst case impact. The predicted extent of these visual impacts, following implementation of mitigation measures, is illustrated in Figure 19. Views of the project from the east and the west are illustrated in Figures 20 and 21.

Table 15: Visual Impact Summary

Sector	***View Location***	***Potential Visual Impact***
North	Warkworth village	No views
	Golden Highway	No views
	Long Point Road	Low
	Maison Dieu	Low
East	Reservoir Hill Lookout	Low – High[1]
	Residences within 7.5km	Low – High[1]
	Putty Road	Low
	Golden Highway	Low – Moderate
South	Broke	No views
	Milbrodale	High[2]
	Putty Road	Low
West	Bulga village	High
	Wambo Road	Low
	Putty Road	Moderate
	Inlet Road	Moderate

[1] Depending on the extent of pre-rehabilitated overburden emplacement areas
[2] Where views of Mount Thorley overburden emplacement area are available

To the west, the assessment indicates that a significant number of residences in the Bulga region would potentially be subject to moderate or moderate to high visual impacts following implementation of proposed mitigation measures. Specifically Figure 18 identifies approximately 33 residences in the Bulga/Inlet Road region that would potentially experience moderate to high visual impacts, with a further 24 residences in the Bulga/Putty Road region potentially being subject to moderate visual impacts. Vegetation screening and topography would vary the level of impact for each of these residences.

To the east, the potential extent of visual impact to residences in the Hambledon Hill area is dependent on Warkworth limiting the extent of the pre-rehabilitated overburden emplacement area to less than 12 ha, in order to avoid high visual impacts. Based on this recommendation, the Department is satisfied that the visual impacts of the project to the east are manageable through effective landform design and progressive rehabilitation.

Visual Mitigation Measures

The assessment highlights the project's reliance on limiting the extent of pre-rehabilitated overburden emplacement areas and timely rehabilitation in order to minimise visual impact. The Department has recommended conditions requiring the effective and timely implementation of rehabilitation over the life of the project, and annual reporting of the progress of rehabilitation works.

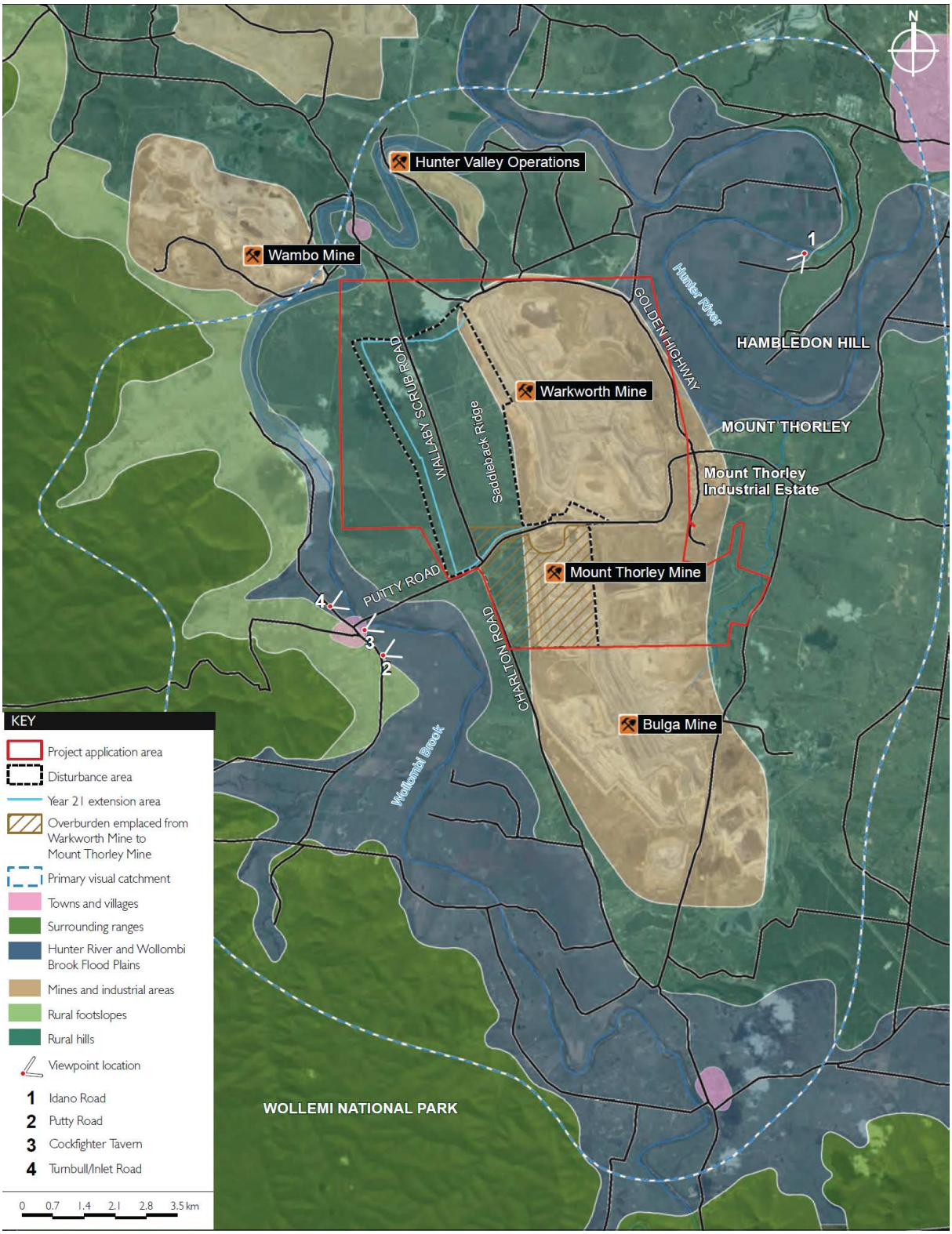
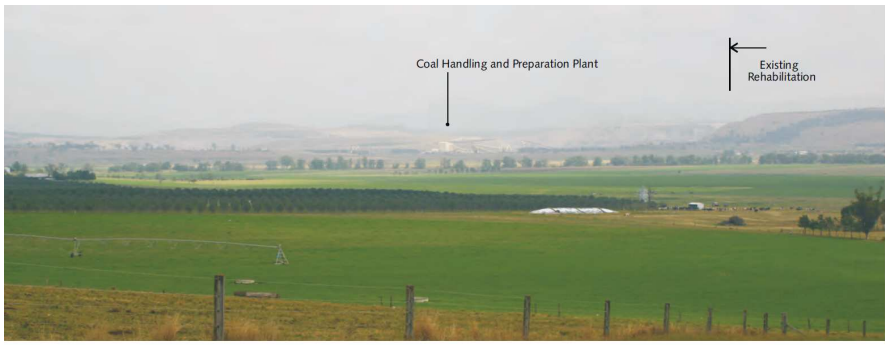


Figure 18: Predicted Extent of Visual Impact within Primary Visual Catchment

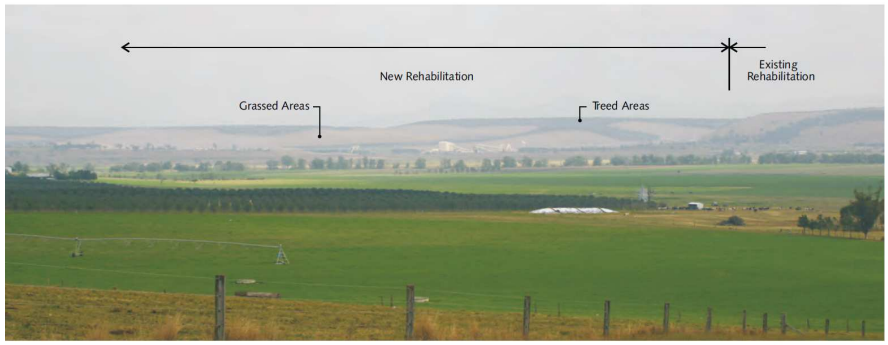


Existing - facing west

2012

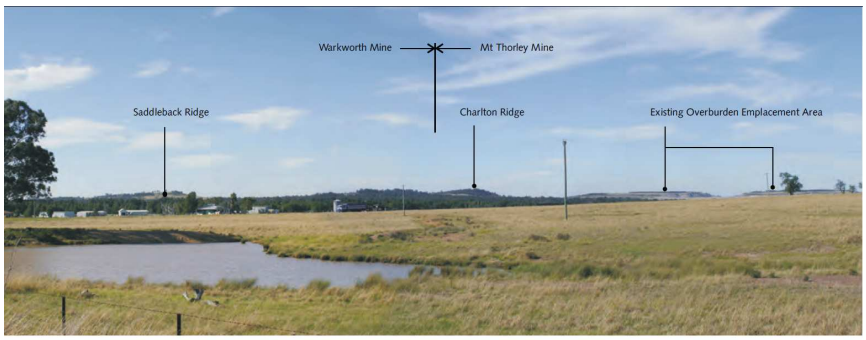
2019

2031

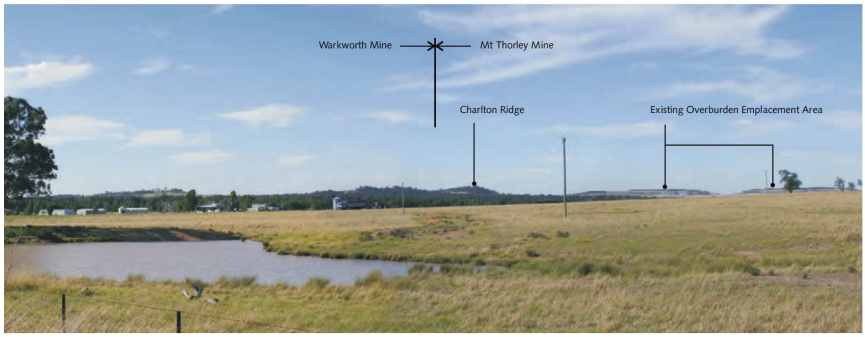


Final Landform

Figure 19: View from Idano Road - East of Warkworth Mine



Existing - facing east



2012

2019

2031

Final landform

Figure 20: View from Putty Road – West of Warkworth Mine

To address potentially moderate to high visual impacts to residences in the Bulga/Inlet Road region, Warkworth has committed to undertaking a site specific visual assessment of significantly affected landowners. The Department acknowledges that there is some uncertainty in the extent of the significantly affected landholders for which this commitment applies. It is likely that the majority of these residences would be located in areas of potential moderate to high visual impact based on Figure 18, however, these impacts could also occur at any elevated location within the primary visual catchment. As such, the Department has recommended conditions to further identify and assess private properties that have the potential to experience significant visual impacts.

The project includes overburden emplacement into the approved Mount Thorley mine to the current approved height provided for by the Mount Thorley approval. The visual assessment acknowledges that the Mount Thorley OEA lacks form diversity and has a strongly shaped western face. Given the reliance on effective rehabilitation in the mitigation of potentially high visual impacts, the Department has recommended Warkworth undertake further detailed design of the proposed final landform to maximise consistency with the surrounding natural landscape. This would be achieved through the preparation of the Visual Management Plan, and reflected in the Rehabilitation Management Plan for the project.

To mitigate the visual impacts of the project, Warkworth proposes to implement a range of mitigation measures, broadly consisting of the following on-site and off-site measures:

- preparation of a Visual Management Plan;
- progressive rehabilitation of overburden;
- limiting the extent of pre-rehabilitated overburden to 1% / 5 ha (or 2.5% / 12ha) of the primary view zone;
- tree planting along Putty Road and leading to the Putty Road overpass bridge;
- reinforce riparian vegetation along Wollombi Brook north of Putty Road Bridge;
- street tree planting within Bulga in liaison with Singleton Council and the community;
- provision of a site specific visual assessment for any significantly affected landowner upon request; and
- where a site specific visual assessment confirms the potential for significant impact, development of site specific mitigation measures in consultation with the landowner.

The Department recognises that the project would result in some permanent changes to the visual landscape and that there would be temporary impacts on surrounding residences, public spaces and roads associated with overburden emplacements. The Department also acknowledges that the existing mining complex and surrounding mining operations already impact many of these receivers and that these impacts would reduce over time with rehabilitation of disturbed areas.

To minimise the visual impacts of the project on receivers as far as practicable, the Department has incorporated the proposed mitigation measures into the recommended conditions and recommended additional conditions requiring Warkworth to:

- prepare a visual management plan;
- notify relevant land owners of their entitlement to additional site-specific visual assessment and landscaping treatments; and
- implement all reasonable and feasible measures to reduce visual impacts.

The Department anticipates that visual impacts and the implementation of mitigation measures could be managed in consultation with the community by way of the Bulga Community Enhancement Strategy proposed by the Department. Further details of the Community Enhancement Strategy are provided in Section 5.11.

5.10 Greenhouse Gas Emissions

The EA includes a greenhouse gas emissions assessment, undertaken by PAE Holmes. The assessment was undertaken in accordance with applicable GHG guidelines, including the Commonwealth Department of Climate Change's *National Greenhouse Account (NGA) Factors*, June 2009.

The assessment calculates direct and indirect GHG emissions associated with the project and the combined Mount Thorley Warkworth (MTW) mining complex, including 'Scope 1' emissions (ie direct GHG emissions from sources controlled by MTW), 'Scope 2' emissions (ie indirect emissions

associated with the import of electricity) and 'Scope 3' emissions (ie other indirect emissions, such as those associated with the downstream combustion of product coal). The calculated GHG emissions associated with the MTW mining complex (including the project) are presented in the Table 16.

Table 16: Mount Thorley Warkworth Direct and Indirect GHG Emissions

Scope	***GHG source(s)***	***Total Project GHG emissions (tonnes carbon dioxide equivalent, TCO2-e)***
Scope 1	Mining and extraction related	21,778,738
Scope 2	Upstream electricity	3,266,570
Scope 3	Downstream emissions, eg transport of product coal	11,101,893
	Downstream coal use	707,466,926
Total (exc. downstream coal use)		**36,147,201**
Total (inc. downstream coal use)		**743,614,127**
Average Annual GHG Emissions		**35,410,197**

The assessment indicates that 95% of the total GHG emissions generated as a consequence of the project are those associated with the downstream burning of the product coal at power stations – ie Scope 3 indirect emissions. The annual average GHG emissions over the life of the project, including coal combustion, are estimated to be 0.001% of current global GHG load. The EA estimates that this could lead to an annual increase in global temperature of 0.00003 degrees. Annual GHG emissions, excluding coal combustion are estimated to increase Australian GHG emissions by 0.2%.

The Department acknowledges the threat posed by global warming/climate change, but does not believe that this threat should necessarily preclude the approval of this project.

Rather, the consideration of the project application with regard to GHG impacts needs to be balanced with consideration to:

- the project's contribution to global warming/climate change;
- whether refusing the project application would reduce global GHG emissions;
- the need for the project;
- the benefits of the project, including job creation and its contribution to the NSW economy;
- the objects of the EP&A Act, including the encouragement of ESD; and
- available GHG impact mitigation measures.

Following consideration of the project's contribution to global warming/climate change, the Department is satisfied that the project's contribution to global GHG emissions, even when assessed on a full life cycle basis (ie including downstream GHG emissions), would be very small.

It must be noted that if the project was not allowed to proceed, the resultant gap in the coal supply would be almost certainly filled by another coal resource either in NSW, Australia or overseas. In other words, removing the GHG emissions from the project would not likely result in any decrease in global CO_2 emissions.

The need for the project is discussed in Section 5.11. Based on its consideration, the Department is satisfied that there is a clear need for the development of new coal deposits, for at least the foreseeable future, to meet society's basic energy needs.

The benefits of the project are also summarised in Section 5.11. Following its consideration, the Department is satisfied that the project would have considerable socio-economic benefits.

The objects of the EP&A Act are outlined in Section 3.6, and these objects have informed the Department's assessment of the project. With regard to the principles of ESD, the Department acknowledges that global warming/climate change presents a clear threat of serious or irreversible environmental damage, as well as a threat to intergenerational equity and a threat to the conservation of biological diversity. However, the Department is satisfied that the project itself does not present such a threat (as the emissions from the project itself are minor in a global and national context), and it must also be acknowledged that the downstream energy and other socio-economic benefits generated by the project would also benefit future generations, particularly through the shoring up of national and international energy needs.

Warkworth has committed to a range of GHG impact mitigation measures, including implementation of an energy monitoring program, regular equipment maintenance and contribution to research programs focusing on reducing GHG emissions and carbon capture technologies. Warkworth is also participating in a coal seam methane pilot project to capture and convert coal seam methane to carbon dioxide, thereby reducing the overall GHG emissions. The Department has recommended that these measures be implemented for the MTW complex as part of a comprehensive a Greenhouse Gas Management Plan, which would require:

- documentation of a process of identifying and implementing all reasonable and feasible greenhouse gas mitigation measures to improve the greenhouse gas intensity of coal products produced;
- a greenhouse gas monitoring and/or calculation program capable of measuring annual greenhouse gas intensity; and
- provisions for reporting of results of greenhouse gas mitigation measures.

5.11 Socio-economics

The project would generate a large number of jobs and inject considerable capital investment into Singleton and the broader Hunter Region, which would have a range of benefits but may also put pressure on public services and facilities.

The EA includes an economic assessment undertaken by Gillespie Economics and Hunter Valley Research Foundation, and a social assessment undertaken by EMGA Mitchell McLennan, which seek to identify and analyse the project's socio-economic costs and benefits.

Cost Benefit Analysis

The assessment includes a cost benefit analysis which seeks to calculate a net benefit/cost associated with the project based on its full range of environmental, social and economic impacts and benefits. These are illustrated in Table 17.

Table 17: Costs and benefits of the project

	Potential Costs	***Potential Benefits***
Production	• Opportunity cost of land and capital required for open cut expansion • Mining and infrastructure capital costs • Mine operating and rehabilitation costs	• Value of export and domestic product coal • Residual land value and capital at project end • Delayed decommissioning and rehabilitation costs originally scheduled for 2021
Potential Externalities	• Greenhouse gases • Noise and vibration • Air quality • Aboriginal and non-Aboriginal heritage • Ecology • Groundwater and surface water • Visual impacts • Traffic and transportation	• Economic and social benefits of employment • Economic value of offsets

The assessment calculates that, after taking into account the project's environmental and social costs, the project would have a net community benefit of some $1.86 billion. The Department understands that this figure does not include consideration of the costs and benefits associated with downstream burning of the coal produced. Notwithstanding, based on this assessment (and other similar cost benefit analyses undertaken for coal mines in the Hunter), the Department is satisfied that the project as a whole would result in a considerable net benefit to society.

The economic assessment includes consideration of the costs and benefits associated with the closure or relocation of Wallaby Scrub Road. The assessment indicates that closure of the road would have a net cost to society of $9.7 million, while the proposed relocation would have a net cost to society of $15.4 million.

As discussed in Section 5.8, Council and a section of the local community is opposed to the closure or relocation of Wallaby Scrub Road, arguing that the road should be maintained in its current location. However, for a number of reasons (as discussed in Section 5.8) the Department believes that the closure of Wallaby Scrub Road is reasonable and appropriate.

From a cost/benefit perspective, maintaining Wallaby Scrub Road on its existing alignment would potentially sterilise tens of millions of tonnes of coal, which has a potential value of hundreds of millions of dollars. Further, relocation of the road would have significant ecological and heritage costs. After careful consideration, the Department is satisfied that the costs associated with either maintaining Wallaby Scrub Road on its existing alignment, or relocating it to another alignment, significantly outweigh the benefits and that closure of the road is reasonable.

To assist in mitigating the costs associated with closure of the road, the Department has recommended conditions requiring Warkworth to:

- add the land earmarked for the proposed relocation to the biodiversity offsets or ecological management areas for the project;
- investigate and implement measures to mitigate impacts on response times for the region's Rural Fire Services due to road closure; and
- make substantial contributions toward community enhancement (see below).

The economic assessment also attempts to calculate an econometric measure to account for clearing of EEC vegetation and provision of biodiversity offsets. The assessment calculates that 1 hectare of EEC would be offset by 1.4 hectares of protection of existing EEC in the region (ie. an offset ratio of 1.4:1), or 4 hectares of EEC planting (ie an offset ratio of 4:1). Whilst the Department is reticent to adopt such an econometric approach to offsetting, it accepts that the proposed offsetting for the project meets these offset ratios. More importantly, the Department is satisfied that the proposed biodiversity offsetting for the project would improve or maintain biodiversity values over the medium to long term (see Section 5.5).

Regional Economic Impacts

The assessment indicates that the project would have considerable socio-economic benefits to the region, including:

At the mine:

- up to 1,217 direct jobs at MTW (approximately 210 jobs above existing approved operations);
- $629 million in capital investment over the life of the project;

For the Regional Economy:

- additional $16,754 million in regional output over the life of the project; and
- 44,675 direct and indirect "employment years" in the Hunter Region, over the life of the project (primarily between the Years 2021 and 2031, the extended life of the Warkworth project). This is essentially a doubling of the regional employment contribution of the existing Warkworth and Mt Thorley Mines, which are estimated, in the assessment's base case, to contribute a total of 39,264 "employment years" between 2011 and 2021.

The assessment includes an assessment of the impact of the project on public services and facilities in the Singleton local government area, which indicates that:

- health services are already strained, and the project would strain these services further;
- primary and secondary school education facilities are likely to have sufficient capacity to accommodate the project;
- housing demand associated with the project is within the annual demand estimated by Singleton Council's *Land Use Strategy 2008;* and
- the closure of Wallaby Scrub Road would result in longer travel times (up to 6 minutes) for local road users.

Whilst the Department recognises the existing pressures on local services and facilities, the Department is satisfied that the project would not significantly increase these pressures, given that it in large part represents a continuation of existing mining activities. The Department also believes that the project's considerable economic benefits to the broader regional economy would benefit and stimulate the orderly growth of these services by the public and private sectors.

The Department also considers that the relatively limited additional impacts on the village of Bulga are unlikely to significantly impact that community's viability. However, the project would nevertheless have some effect on local services, including increased travel times for road users who use Wallaby Scrub Road, as well as increasing demand on community infrastructure and facilities. To compensate for these impacts, Warkworth has offered to enter into a voluntary planning agreement with Council to provide contributions to community facilities. The proposed contribution totals over $11 million, and includes:

- $5.5 million toward community enhancement, particularly for Bulga village;
- $4.5 million toward local road maintenance; and
- $1 million (to the RTA) toward upgrade of the Broke Road/Golden Highway intersection.

Council has informed the Department that it is not prepared to accept the offer, because it objects in principle to the closure or relocation of Wallaby Scrub Road.

Notwithstanding, the Department is satisfied that the proposed contributions would adequately compensate for the project's impacts on local infrastructure and services, and provide considerable benefit to the local community. Accordingly, the Department has recommended conditions requiring Warkworth to establish a trust fund to the total value of approximately $10 million over the life of the project. The fund would be required to be directed toward the provision of benefits to local communities that are affected by the project, particularly the Bulga village community. The Department has also recommended conditions requiring Warkworth to pay the RTA $1 million toward the upgrade of the Broke Road/Golden Highway intersection, or otherwise carry out the upgrade to the satisfaction of the RTA.

With these measures, the Department is satisfied that the socio-economic benefits of the project are likely to far exceed its costs, and is satisfied that the region is able to accommodate the project.

Project Need

The Department recognises that society is currently heavily reliant on coal to meet its basic energy needs (both at a domestic and international level). Coal provides around 90% of NSW's electricity needs, 75% of Australia's electricity needs and 40% of the world's electricity needs.

Access to energy remains a critical development need, particularly for the one-third of the world's population without electricity. As living standards and development in Third World countries increase, it is expected that the demand for coal would rise to satisfy increasing global energy requirements. The project would contribute to supplying this rising annual coal demand. Therefore the ultimate need for the project is driven by both domestic and international markets to meet current and future energy needs. Consequently, the Department is satisfied that there is a demonstrable need for the project in terms of meeting society's need for adequate, reliable and affordable energy.

At the local level, the Department recognises that the proposed area of coal extraction is largely surrounded by existing mining operations. The project is able to be undertaken using existing mining facilities and infrastructure.

From the State's perspective, the project would deliver a number of key benefits as outlined above, including the continuation or generation of up to 1,200 jobs at the MTW mine complex, flow-on regional economic benefits, and significant royalty and tax income. The net economic benefit of the project to the community has been estimated at $1,862 million.

Notwithstanding the above, the Department recognises that a balance must be met in the promotion and co-ordination of the orderly and economic use of land; the proper management and development of the State's resources; and the protection of the environment and ecologically sustainable development. The Department has considered these matters in detail in its assessment of the project.

6. RECOMMENDED CONDITIONS

The Department has prepared recommended conditions of approval for both the Warkworth Extension project application (Appendix A) and the associated HVO South project modification application (Appendix B). These conditions are required to:

- prevent, minimise, and/or offset adverse impacts of the project;
- ensure standards and performance measures for acceptable environmental performance;
- ensure regular monitoring and reporting; and
- provide for the ongoing environmental management of the project.

The Department believes the conditions reflect current best practice for the regulation of coal mines in NSW.

7. CONCLUSION

The Department has assessed the project application, EA, submissions on the project, Warkworth's response to submissions and preferred project report, in accordance with the objects of the EP&A Act and the principles of ecologically sustainable development.

This assessment has found that the project would have a number of adverse environmental impacts, including:

- the clearing of 764.7 ha of woodland EECs;
- significant noise and/or dust impacts on 16 privately-owned residences and properties; and
- impacts on 113 Aboriginal sites.

However, the Department is satisfied that these impacts can be adequately mitigated, managed, offset and/or compensated through implementation of a number of commitments made by Warkworth and conditions recommended by the Department. Warkworth has proposed:

- a significant offset strategy involving the protection and enhancement of 4,790 ha of land for ecological benefit, along with a rehabilitation strategy that would ultimately increase this area to 8,137 ha of conservation land;
- preparation of a recovery plan for the Warkworth Sands Woodland EEC, and a contribution of $1 million toward research and recovery of this community and the Ironbark Woodland EECs;
- noise and dust mitigation and/or acquisition of significantly affected properties; and
- a cultural heritage conservation area to conserve 510 hectares of land in perpetuity.

The Department has recommended a broad range of stringent conditions to ensure these measures are effectively implemented. In addition, the Department has recommended conditions requiring Warkworth to contribute approximately $10 million toward community enhancement and road upgrades and maintenance for the Bulga and surrounding area.

The Department acknowledges that the project represents a logical extension of the existing mining complex, and that it would make use of existing infrastructure and facilities. The Department also recognises that the project would provide major economic and social benefits for the Hunter region and to NSW, including:

- a direct capital investment in the mine complex of $629 million;
- generating an additional 148 new direct jobs at the mine complex;
- generating in total 44,675 new direct and indirect "employment years" in the Hunter Region, over the life of the project (primarily between the Years 2021 and 2031, which is the extended life of the Warkworth project); and
- direct revenue for the State Government from coal resource royalties.

On balance, the Department believes that the project's benefits would outweigh its residual impacts that it is in the public interest and should be approved, subject to stringent conditions.

8. RECOMMENDATION

It is RECOMMENDED that the Planning Assessment Commission:

- consider the findings and recommendations of this report;
- approve the project application, subject to conditions;
- approve the modification application, subject to conditions;
- sign the attached instrument of project approval (see Appendix A); and
- sign the attached instrument of modification (see Appendix B).

Howard Reed 4.10.11

David Kitto
Director
Mining and Industry Projects

4.10.11

Chris Wilson
Executive Director
Major Projects Assessment

4/10/11

Richard Pearson
Deputy Director-General
Development Assessment and Systems Performance

APPENDIX A – RECOMMENDED PROJECT APPROVAL

APPENDIX B – RECOMMENDED NOTICE OF MODIFICATION

APPENDIX C - CONSIDERATION OF ENVIRONMENTAL PLANNING INSTRUMENTS

1 SEPP No.33 – Hazardous and Offensive Development

The Department is satisfied that the project is not potentially hazardous or offensive, and that the proposal is generally consistent with the aims, objectives, and requirements of SEPP 33.

2 SEPP No.44 – Koala Habitat Protection

A koala habitat assessment was completed as part of the ecological assessment of the project, and no core koala habitat was identified, hence the preparation of a Koala Plan of Management is not required. The Department is satisfied that the project is unlikely to significantly affect koala habitat, and that the project is generally consistent with the aims, objectives, and requirements of SEPP 44.

3 SEPP No.55 – Remediation of Land

The Department is satisfied that the project area does not have a significant risk of contamination given its historical landuse, and that the project is generally consistent with the aims, objectives, and provisions of SEPP 55.

4 SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Under clause 7 of the Mining SEPP, the project is permissible with consent.

Part 3 of the SEPP lists a number of matters that a consent authority must consider before determining an application for consent for development for the purposes of mining, including:

- compatibility with other land uses;
- natural resource management and environmental management;
- resource recovery;
- transport; and
- rehabilitation.

The Department has considered all of these matters in its assessment of the project. Based on this assessment, the Department is satisfied that the project is able to be managed in a manner that is generally consistent with the aims, objectives, and provisions of the Mining SEPP.

5 SEPP (Infrastructure) 2007

In accordance with clause 104 of the SEPP, the application was referred to the RTA. The matters raised in the RTA's submission on the project were considered by the Department and conditions of approval in respect of Wallaby Scrub Road recommended by the RTA have been incorporated by the Department.

6 Hunter Regional Environmental Plan (REP) 1989 (Heritage)

The Department is satisfied that the project would not impact on any items listed under the *Hunter Region Environment Plan 1989 (Heritage)*, and that the project can be carried out in a manner that is generally consistent with the aims, objectives, and provisions of the REP.

7 Singleton Local Environmental Plan 1996

The land subject to the application is zoned 1(a) Rural under the *Singleton Local Environmental Plan 1996* (Singleton LEP). Mining is permissible with consent in zone 1(a) Rural. The objectives of the zone cover a range of land uses and values, including sustainable agriculture, natural ecological systems, mining, amenity and landscape quality, rivers and water catchment areas and roads.

Zone objective 1(c) states:

> *"to allow mining where environmental impacts do not exceed acceptable limits and the land is satisfactorily rehabilitated after mining,"*

The Department considers that the proposed extension of Warkworth mine is consistent with this zone objective.

Zone objective 1(b) states:

> *"to promote the protection and preservation of natural ecological systems and processes,"*

The proposed offset strategy would protect and preserve 4,790 ha of land for biodiversity purposes, with nearly 1,700 ha of this land being located within the Singleton Shire. The land would be protected and managed for long term conservation.

The aims and objectives of the Singleton LEP seek to promote orderly economic development, efficiently manage land and natural resources, and ensured equitable economic and social benefits for the community. The objectives also seek to maintain adequate public participation in environmental assessment processes. In its submission the Hunter Environment Lobby stated that the project is inconsistent with the aim and zone objectives of Singleton LEP.

The Department considers that the project is consistent with the aims and objectives of Singleton LEP as it would promote economic development in the Singleton region and provide financial contributions to be invested in community services and infrastructure.

APPENDIX D – PREFERRED PROJECT REPORT

APPENDIX E – INDEPENDENT ECOLOGICAL REVIEW

See attached files containing:

- Review of Ecological Assessments for Warkworth Extension EA and HVO South Modification Projects, prepared by Umwelt (Australia) Pty Limited, August 2011; and
- Addendum to Review of Ecological Assessments for Warkworth Extension EA and HVO South Modification Projects, prepared by Umwelt (Australia) Pty Limited, August 2011.

APPENDIX F – ADDITIONAL INFORMATION

ID	DATE	RECIPIENT	DESCRIPTION
1	28 September 2011	Anthony Russo (Rio Tinto)	Vacant land list - noise and air affected
2	20 June 2011	Gary Davey (OEH)	Office of Environment and Heritage submission
3	17 June 2011	Kylie Seretis (DoPI)	Bulga Bora Ground inspection report
4	17 May 2011	Anthony Russo (Rio Tinto)	Information on Warkworth Sands Woodland
5	3 March 2011	David Kitto (DoPI)	Supplementary Heritage Report
6	25 February 2011	David Kitto (DoPI)	Response to second round of information requests
7	22 February 2011	Kylie Seretis (DoPI)	Aboriginal Heritage Impact Permits
8	21 February 2011	David Kitto (DoPI)	Response to information request for cultural heritage
9	4 February 2011	David Kitto (DoPI)	Response to information request for ecology
10	3 February 2011	David Kitto (DoPI)	Resposne to information request for noise, blasting, and air quality
11	28 January 2011	David Kitto (DoPI)	Response to information request for visual
12	27 January 2011	David Kitto (DoPI)	Response to information request for Wallaby Scrub Road
13	17 January 2011	David Kitto (DoPI)	Request fro revised noise assessment
14	17 January 2011	David Kitto (DoPI)	Councils response to Rio Tinto regarding Wallaby Scrub Road
15	14 January 2011	David Kitto (DoPI)	Additional offset property for Warkworth Sands Woodland
16	14 January 2011	David Kitto (DoPI)	Revised air quality assessment

APPENDIX G – RESPONSE TO SUBMISSIONS

APPENDIX H – SUBMISSIONS

APPENDIX I – ENVIRONMENTAL ASSESSMENT

APPENDIX J – MISCELLANEOUS