GEM OF THE WEST
MANILDRA GROUP
100% AUSTRALIAN OWNED

Invincible Southern Extension Project

RESPONSE TO SUBMISSIONS

PART A

CC
Castlereagh Coal

umwelt

February 2017

INVINCIBLE SOUTHERN EXTENSION PROJECT

Response to Submissions Report
Part A

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Castlereagh Coal Pty Limited

Project Director:	Tim Crosdale
Project Manager:	David Holmes
Report No.	3622/R09/V2
Date:	February 2017

Newcastle

75 York Street
Teralba NSW 2284

Ph. 02 4950 5322

www.umwelt.com.au

Table of Contents

Figures

Tables

Appendices

Appendix 1.....Geotechnical and Dump Balance Report
Appendix 2.....Blasting Review – Castlereagh Highway

1.0 Introduction

The Environmental Assessment (EA) for the Invincible Southern Extension Project (the Southern Extension Project) was placed on public exhibition from 27 September 2016 to 8 November 2016.

The Southern Extension Project seeks to modify the Invincible Project Approval to extend the life of approved mining operations at Invincible Colliery (Invincible) and obtain approval to extend the open cut mining operations to an area immediately south of the existing operations referred as the Southern Extension Area, located approximately 25 kilometres (km) north-west of Lithgow in New South Wales (NSW) (refer to **Figure 1.1**).

During the exhibition period 858 submissions were made on the Southern Extension Project. This included 7 government agencies, 840 community and 9 interest group and organisation submissions. The 840 submissions received from the community and 9 from interest groups and organisations included 550 submissions in support of the Southern Extension Project.

The Department of Planning and Environment (DP&E) requested a formal response to issues raised in submissions from Government agencies, the community and interest groups and organisations for the Southern Extension Project. This Response to Submissions (RTS) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of the proponent, Castlereagh Coal Pty Ltd (Castlereagh Coal), to address the key issues raised in the submissions received during the public exhibition period of the EA. The RTS is divided into two separate reports. This Report – (Report A), responds to all issues raised in the submissions excluding surface and ground water related issues.

Report B will respond to specific water related issues raised in submissions.

Report A includes:

- a brief summary of the Southern Extension Project to provide context for the submissions (**Section 1.1**)
- an analysis of the issues and themes raised in the community and interest group submissions (**Section 2.0**)
- a detailed response to all key issues raised in Government agency, community and interest group submissions (**Section 3.0**).

1.1 The Invincible Southern Extension Project

The Southern Extension Project seeks to modify the Invincible Project Approval to extend open cut mining operations to the south of the existing approved mining area under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The primary objective of the Southern Extension Project is to secure a reliable supply of specialty nut coal for use at Manildra's Shoalhaven Starches plant, located at Bomaderry on the NSW South Coast. Nut coal is a specialty coal resource which can only be economically sourced at a few existing mining operations in NSW, and was previously sourced from Invincible under existing approvals

The Southern Extension Project includes:

- Extending the period in which mining can continue for a period of eight years from approval of the modification application

- Extending the open cut mining area to mine down to, and including, the Lithgow Seam to the south of the existing mine in the Southern Extension Area. No highwall mining or open cut mining in any other areas of Invincible is proposed as part of the Southern Extension Project

- Use of existing open cut voids and former underground workings for temporary water storage

- No change to currently approved maximum mining production rates

- Continued use of existing Invincible infrastructure (including maintenance work and minor upgrades, and operation of the existing Invincible Coal Preparation Plant (CPP)

- No change to currently approved product coal transport arrangements with coal to be transported from the site by road truck to either the Shoalhaven Starches plant or Mt Piper Power Station

- Rehabilitation of the proposed Southern Extension Area and all existing disturbance areas at Invincible by reshaping mining areas to remove voids and revegetating the reshaped landform with locally endemic woodland and forest communities.

The Southern Extension Project will provide access to an additional 2.7 million tonnes of run-of-mine (ROM) coal from all seams down to, and including, the Lithgow Seam. Based on current coal quality information, only coal from the Lithgow Seam is of sufficient quality for use in the Shoalhaven Starches plant. The Lithgow Seam resources, when washed, will provide approximately 300 kilotonnes of nut coal for the Shoalhaven Starches plant. The demand per annum for nut coal at Shoalhaven Starches plant is approximately 85 kilotonnes per annum.

Castlereagh Coal is seeking approval for the extension of mining to occur over a period of up to eight years to provide for flexibility in the supply of nut coal through:

- providing an option for Manildra to source all required nut coal directly from Invincible

- continuing to source nut coal from a range of other existing sources supplemented by supply from Invincible where necessary or cost effective to do so

- utilising a blended product using coal from the other seams within the Southern Extension Area where further assessment of coal quality indicates this can be used at the Shoalhaven Starches plant.

The nut coal resource available in the Lithgow Seam in the Southern Extension Area equates to approximately four years supply of nut coal for the Shoalhaven Starches plant if Invincible is the sole source of supply. Mining rates will vary at Invincible based on the supply needs for the Shoalhaven Starches plant.

The mining of coal in the Lithgow Seam will necessarily involve the extraction of coal from the Lidsdale and Irondale Seams which are located above the Lithgow Seam. Investigations are currently being undertaken to assess whether coal from the Lidsdale or Irondale Seams can be used at the Shoalhaven Starches plant when washed and blended with coal from the Lithgow Seam. Surplus coal from the Lidsdale and Irondale Seams which is unable to be used in Manildra's Shoalhaven Starches plant will be sold to local power stations for energy production consistent with the previous mining operations at Invincible. The maximum production rates under the current Invincible Project Approval conditions are required to account for the sale of surplus Lidsdale and Irondale Seam coal extracted in the process of obtaining sufficient product for use at the Shoalhaven Starches plant. If a blended product utilising Irondale and/or Lidsdale coal can be utilised, overall mining and production rates at Invincible will be significantly lower than the current approved rate.

The flexibility being sought in this modification application is different to many coal mining projects in that its primary purpose is to provide Shoalhaven Starches plant with certainty of supply of specialty nut coal.

Aside from minor upgrades and maintenance to the Invincible CPP and associated infrastructure, as well as changes to the water management system associated with the changes in disturbance area, no other changes to the approved mining operations or existing surface facilities are proposed as part of the modification. These existing facilities will be utilised over the life of the Southern Extension Project.

1.1.1 Project Design Features

As outlined in Section 1.3 of the EA, the following project design features have been incorporated in the design to minimise impacts of the Southern Extension Project:

- The primary objective of the Southern Extension Project is to provide specialty nut coal to the Shoalhaven Starches plant in Bomaderry, which can be met with comparatively lower total coal volumes and a smaller mining footprint

- The additional disturbance proposed for the Southern Extension Project is located in areas that have been previously impacted through historical mining, forestry and infrastructure activities

- The Southern Extension Project has been designed to avoid areas of threatened ecological communities and areas of comparatively diverse ecological and habitat value to the north-east of the existing Invincible site

- The extent of mining and associated disturbance has had regard to potential impacts on threatened flora and fauna species known or with potential to occur in the area around Invincible

- The disturbance footprint will be set back at least 210 metres (m) from all pagoda formations and, with the exception of a single isolated pagoda formation, will be at least 300 m from all pagodas

- Mining operations have been designed to minimise the risk of impact on significant landscape features to the east of Invincible, including pagoda formations, through design features to minimise potential impacts from blasting

- Relative to past operations and recent proposals, mining operations will be further from private residences and the Cullen Bullen township, located approximately 820 m and 3 km from the Southern Extension Area respectively, and in less exposed locations resulting in lower predicted noise, air quality, blasting and visual amenity impacts.

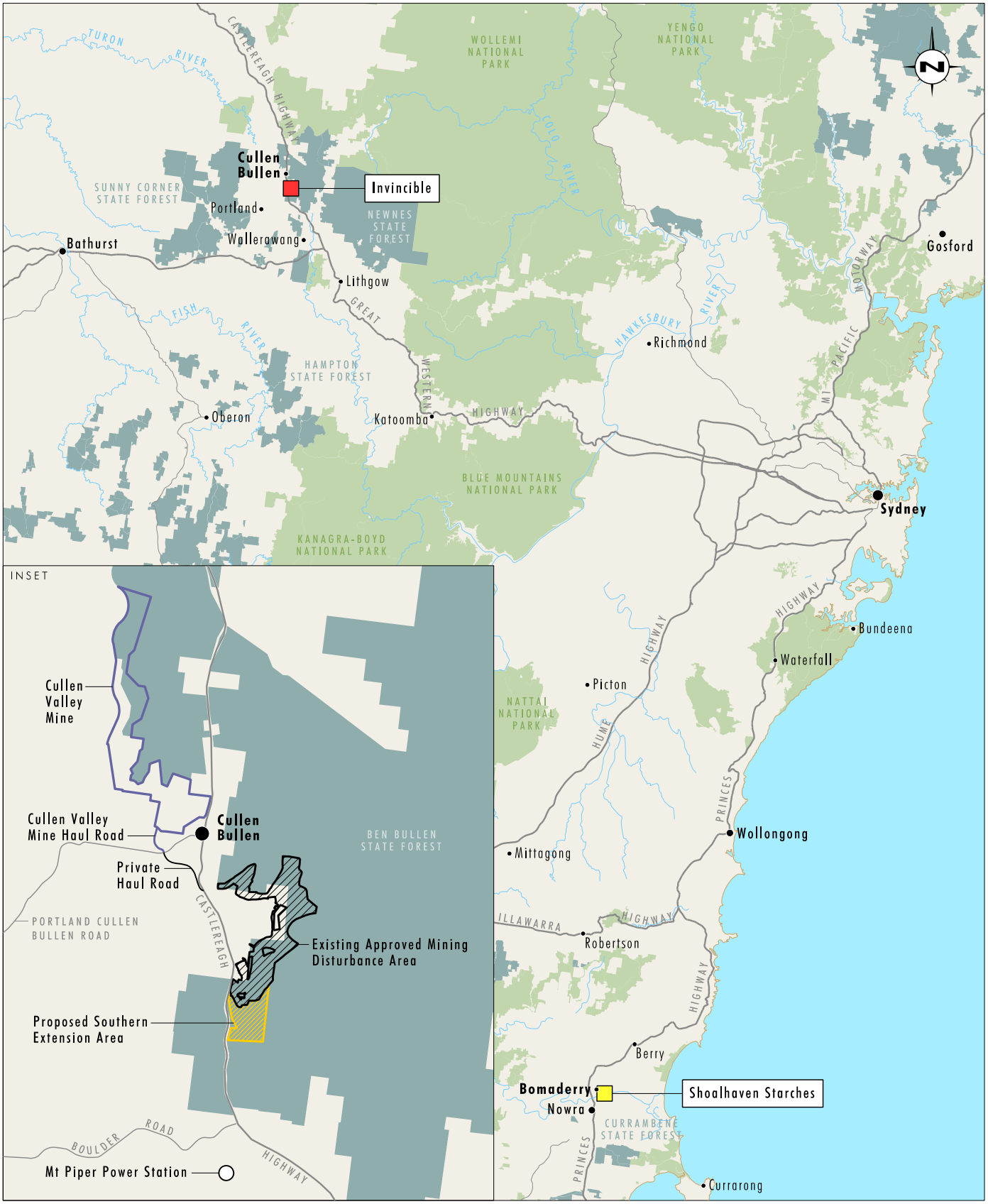


FIGURE 1.1

Locality Plan

2.0 Submissions Analysis

2.1 Background

A total of 856 submissions were received in relation to the EA which was exhibited from 27 September 2016 to 8 November 2016. This included 7 government agency submissions, 840 community submissions and 9 interest group and organisation submissions. The 840 submissions received from the community and 9 from interest groups and organisations included 550 submissions in support of the Southern Extension Project.

2.2 Agency Submissions

The 7 NSW agency submissions addressed in this RTS were from:

- Lithgow City Council
- Department of Primary Industries – Water (DPI - Water) – addressed in Part B report
- Environment Protection Authority (EPA) – water related issues addressed in Part B report
- Office of Environment and Heritage (OEH)
- Roads and Maritime Services (RMS)
- Transport for New South Wales (TfNSW)
- Department of Industry, Resources and Energy (DRE).

Several agencies made submissions seeking further clarification regarding aspects of the assessment of the Southern Extension Project and one agency stated its objection (RMS) until further consultation is undertaken and information is submitted. Additional information requested by DPI - Water and the EPA in relation to impacts on surface water and groundwater and related licensing issues are discussed in the Response to Submissions Report B. The required clarifications to other agency submissions are discussed further in **Section 3.0**. In addition, further consultation has occurred with RMS, with required clarifications provided in **Section 3.0**.

In addition to the agency submissions, DP&E in its formal request for a response to submissions highlighted a number of specific issues to be addressed through this process. These matters are outlined and addressed in **Section 3.0**.

2.3 Interest Group and Organisation Submissions Analysis

Submissions were received from nine interest groups and organisations, with six indicating support for the Southern Extension Project and three objecting to the Southern Extension Project.

2.3.1 Supporting Submissions

The submissions received in support of the Southern Extension Project were from the Cullen Bullen Progress Society, the Cullen Bullen Raceway, Energy Australia, Shoalhaven Starches, Forsons Group and Bella Investments.

All community group and organisation submissions that were received in support of the Southern Extension Project cited project justification, and associated economic benefits as the reasons for their support.

Specific reasons of note included:

- Employment opportunities
- Local expenditure
- Broader economic benefits to the region and state through strong and viable coal mining industry.

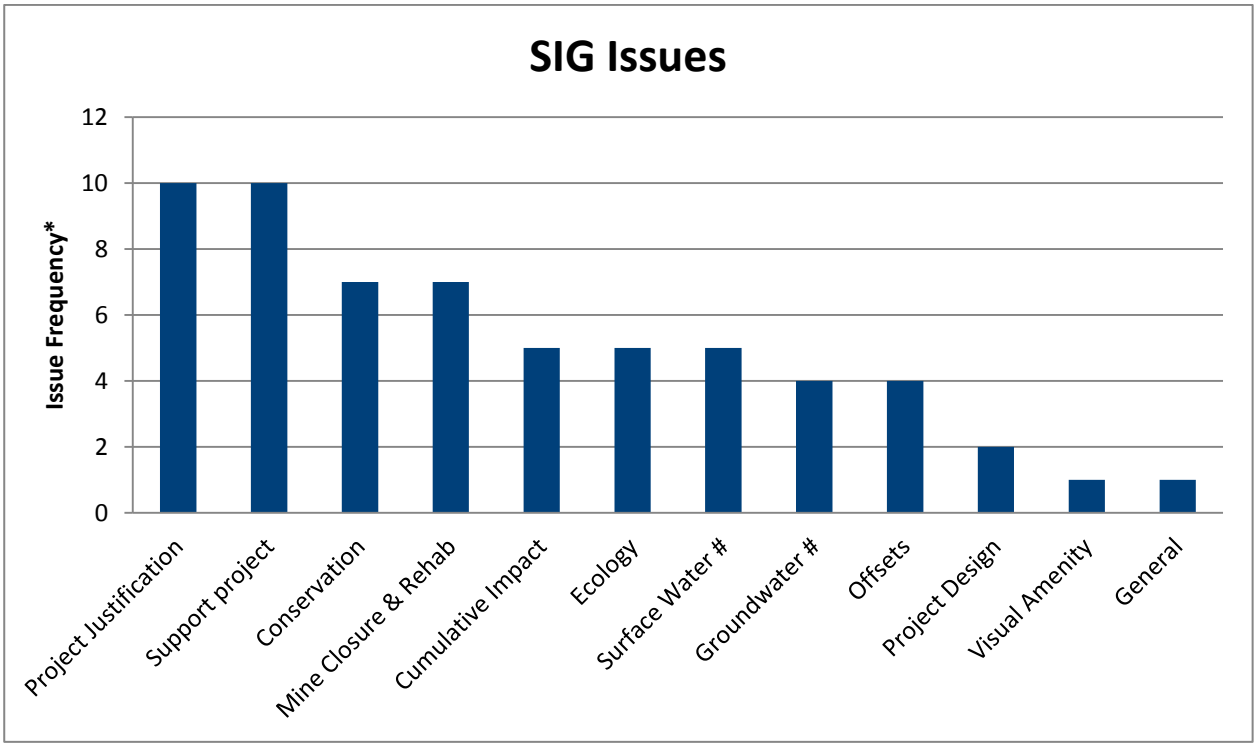
> *"Mt Piper power station will directly benefit from the project by receiving relatively small volumes of coal from Invincible to supplement supplies from Springvale mine. Diversity of coal supply remains a significant challenge for Energy Australia and a risk to Mt Piper contributing to secure and affordable electricity in Australia" (Energy Australia).*
>
> *"Both these mines have contributed to our speedway and other none-profit organisations around the local community with help to assist in their projects" (Portland District Motor Sports Club).*
>
> *"The development of the mine will bring in revenue streams for the State and local economies in a socially responsible and environmentally considerate way" (Bella Investments (NSW)).*

2.3.2 Objecting Submissions

The three special interest group (SIG) submissions that objected to the Southern Extension Project outlined a range of issues (refer to **Figure 2.1**). Conservation and mine closure and rehabilitation were the most frequently cited issues with cumulative impacts, ecology, economic, project justification and surface water issues also raised.

The issues raised in objections are discussed in detail in **Section 3.0** of this Report excluding water and groundwater issues.

Figure 2.1 Frequency of Issues by Special Interest Group and Organisation

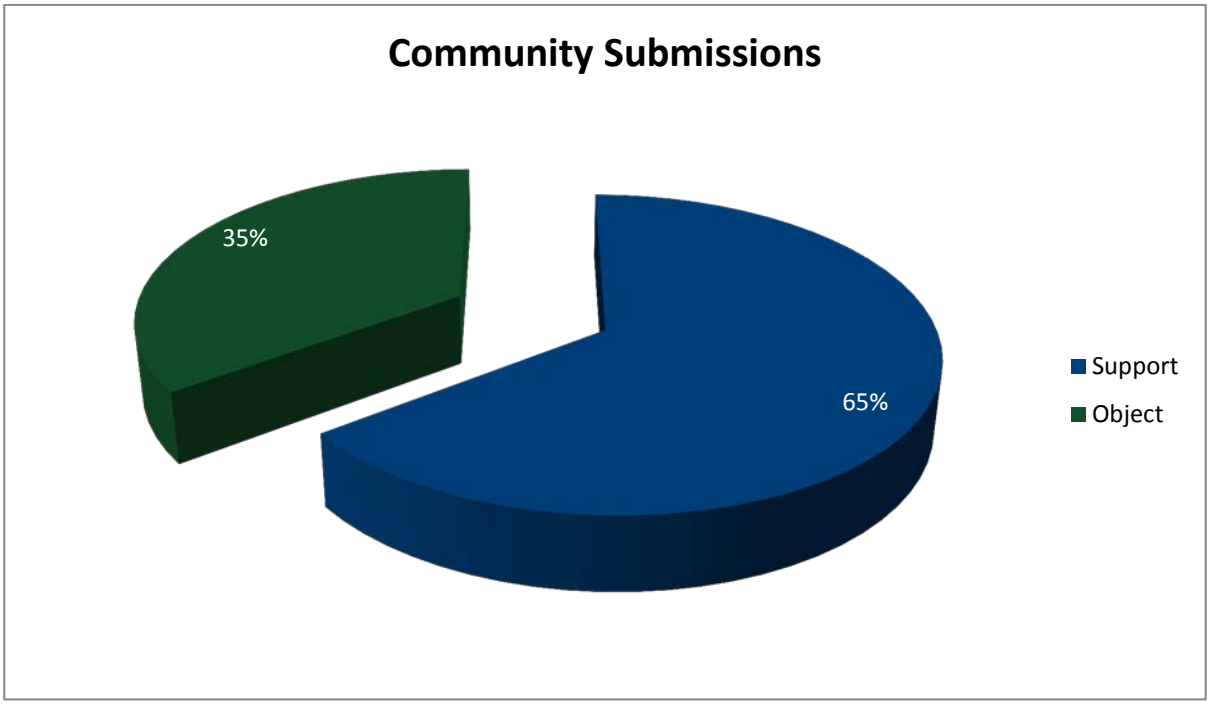


*multiples issues allowed
addressed in Part B report

2.4 Community Submissions Analysis

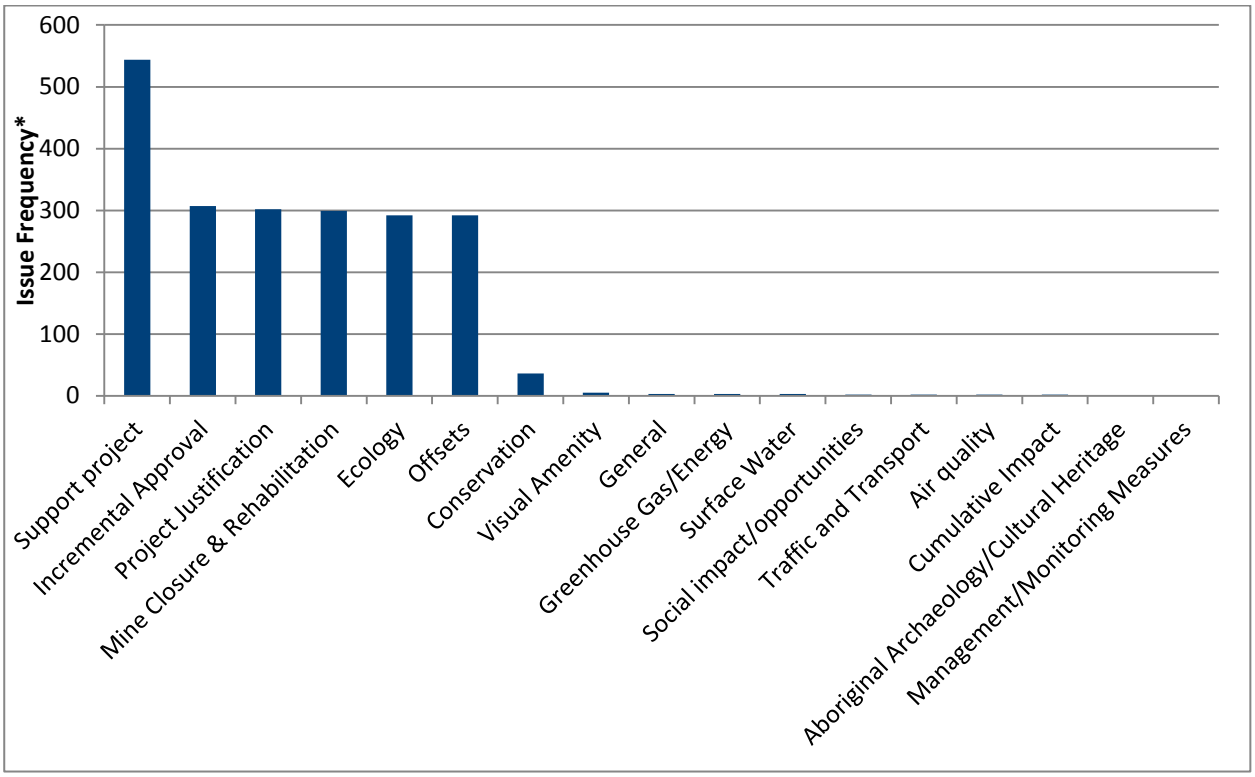
A total of 840 individual submissions were received from community members. Of these, 296 submissions stated opposition to the Southern Extension Project while 544 were in support. That is, approximately 65 per cent of the submissions stated support of the Southern Extension Project (refer to **Figure 2.2**).

Figure 2.2 Percentage of Supporting and Objecting Community Submissions.



A content analysis was undertaken on all community submissions in response to the Southern Extension Project, to understand the key issues raised by the community in relation to the Southern Extension Project (refer to **Figure 2.3**).

Figure 2.3 Frequency of issues raised in submissions*#



*Individual submissions have raised multiple issues

Submissions of support have been grouped and included for completeness

2.4.1 Supporting Submissions

All of the 540 community submissions in support of the Southern Extension Project related to the justification of the Southern Extension Project. Of these submissions, the majority were specifically related to the employment and regional development in the Lithgow region and the long-term sustainability of Shoalhaven Starches. It is noted that a large number of the supporting submissions were submitted as form letters which raised the same or similar reasons for support across each of the submissions.

> *"A cost-effective and viable fuel source is imperative to the sustainability and long-term future of Shoalhaven Starches and the hundreds of direct and indirect local jobs that it creates."*

Other statements relating to project justification focused on the specific benefits of the Southern Extension Project to the local and regional community, such as local expenditure by workers and their families and businesses associated with the mining operations.

> *"I would really like the mining to go ahead as it will provide more job prospects for the locals - something that is greatly needed in our area".*
>
> *"This approval makes sense not only economically for the local area but also complete sense in regards to proximity to the Mt Piper Power station."*
>
> *"Having an industry in town will be a boost to the town"*

2.4.2 Objecting Submissions

Based on an analysis of the 296 community submissions objecting to the Southern Extension Project, 17 themes or issues have been identified. As can be seen in **Figure 2.3**, the dominant theme of the objections was around incremental approvals, project justification, mine closure and rehabilitation, followed by ecological impacts and offsets. It is noted that a large number of the submissions objecting to the Southern Extension Project were submitted as form letters that raised the same or similar reasons for objection across each of the submissions.

Given that the individual responses raised the same or similar issues in relation to the Southern Extension Project, a detailed response to each submission has not been undertaken. Rather, a response to the key issues and themes raised in these submissions is provided in detail in **Section 3.0** of this report.

2.5 Issues Raised by Location

The community submissions received on the Southern Extension Project were from a range of broad locations across Australia, with 37 submissions received interstate and 801 submissions received in NSW and 2 locations withheld (refer to **Figure 2.4** and **Figure 2.5**). Of the submissions received in NSW, **Figure 2.6** provides a summary of the key issues raised by region.

As can be seen from Figure 2.7, the vast majority of submissions in opposition to the Southern Extension Project were from outside the Lithgow LGA. As is also shown in Figure 2.7, there were higher levels of support relative to objection in the local area around Invincible (shown as Lithgow LGA). This higher level of support for the Southern Extension Project in the Cullen Bullen area was also observed during the stakeholder engagement process undertaken for the Southern Extension Project and documented as part of the Social Impact and Opportunities Assessment (SIOA) completed as part of the EA (refer to Appendix 11 of the EA). The high level of support in the South Coast and Southern Tablelands area is likely to reflect the benefits that the Southern Extension Project provides for Shoalhaven Starches which is a significant employer in the South Coast Region.

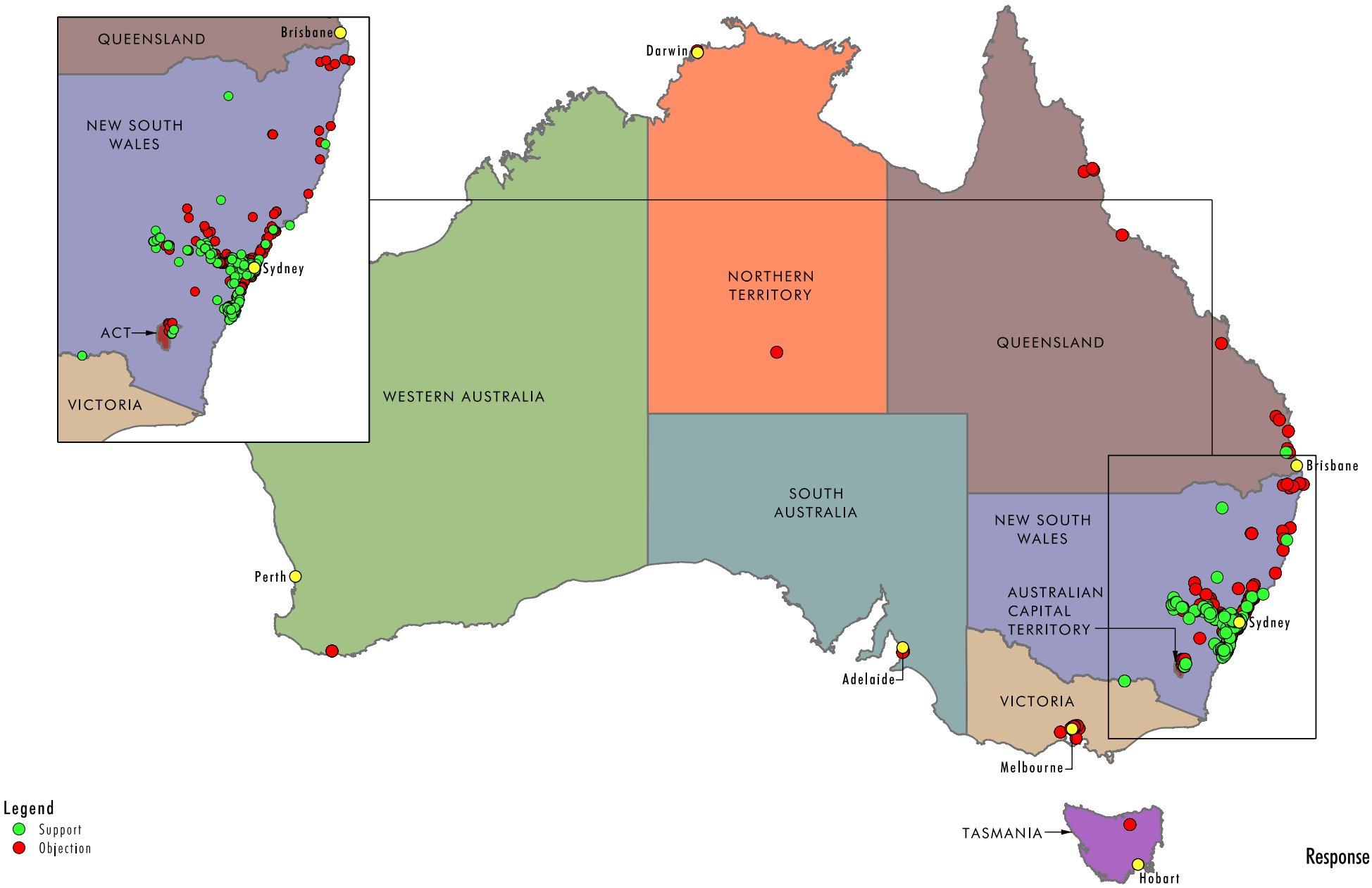


FIGURE 2.4

Response to Submissions

Figure 2.5 Submission by Region

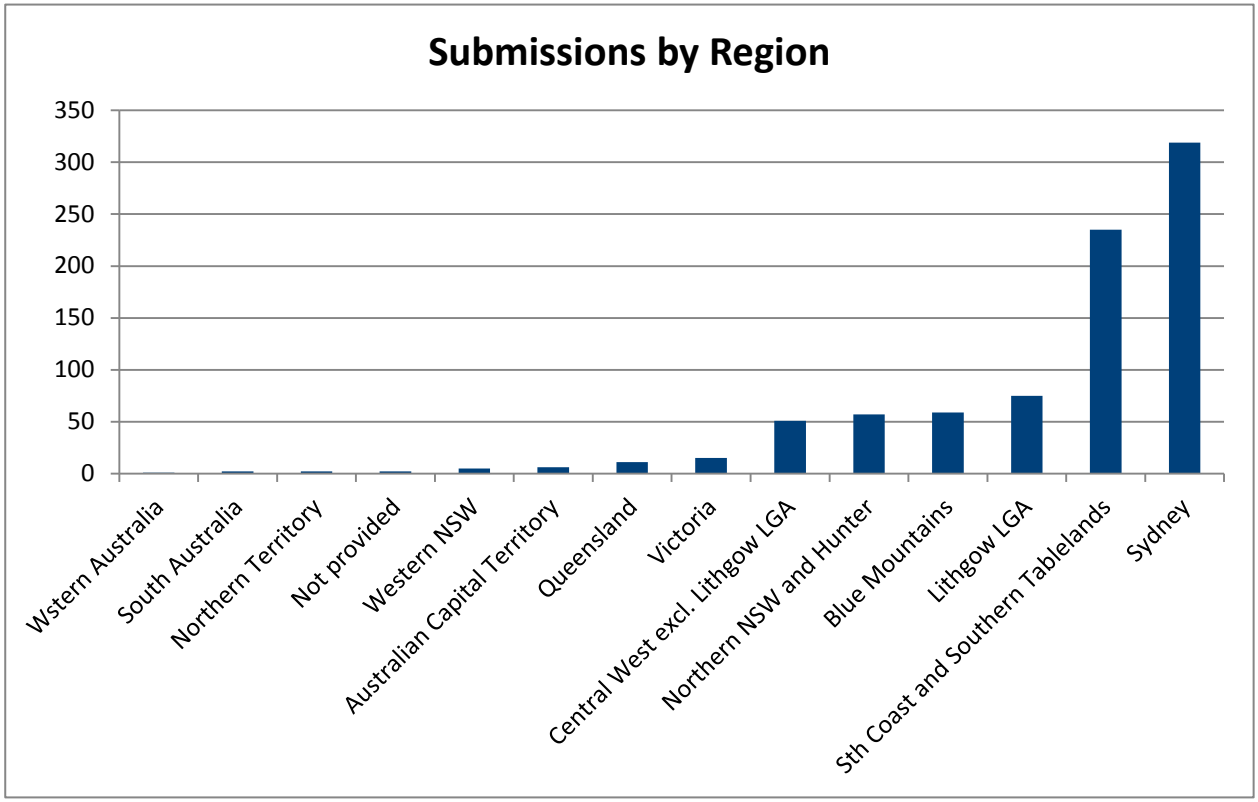
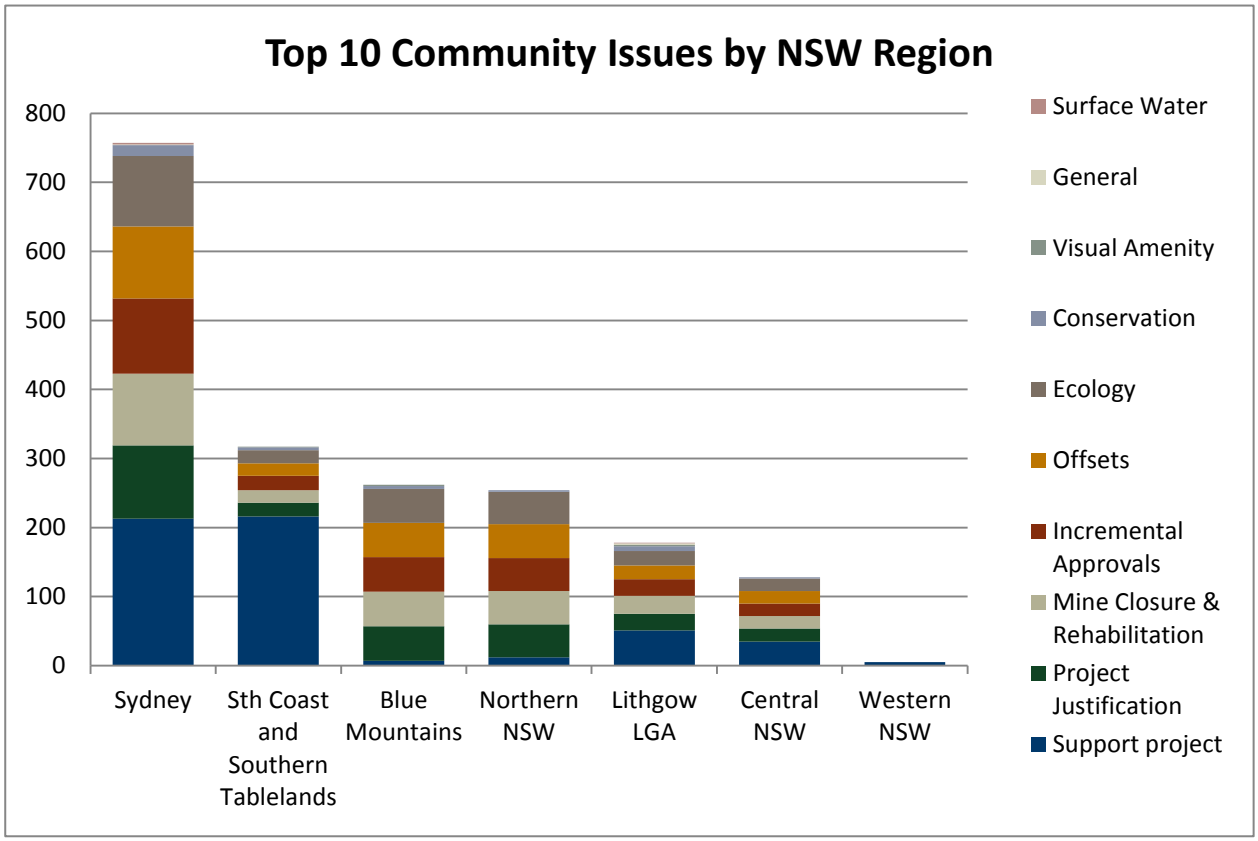
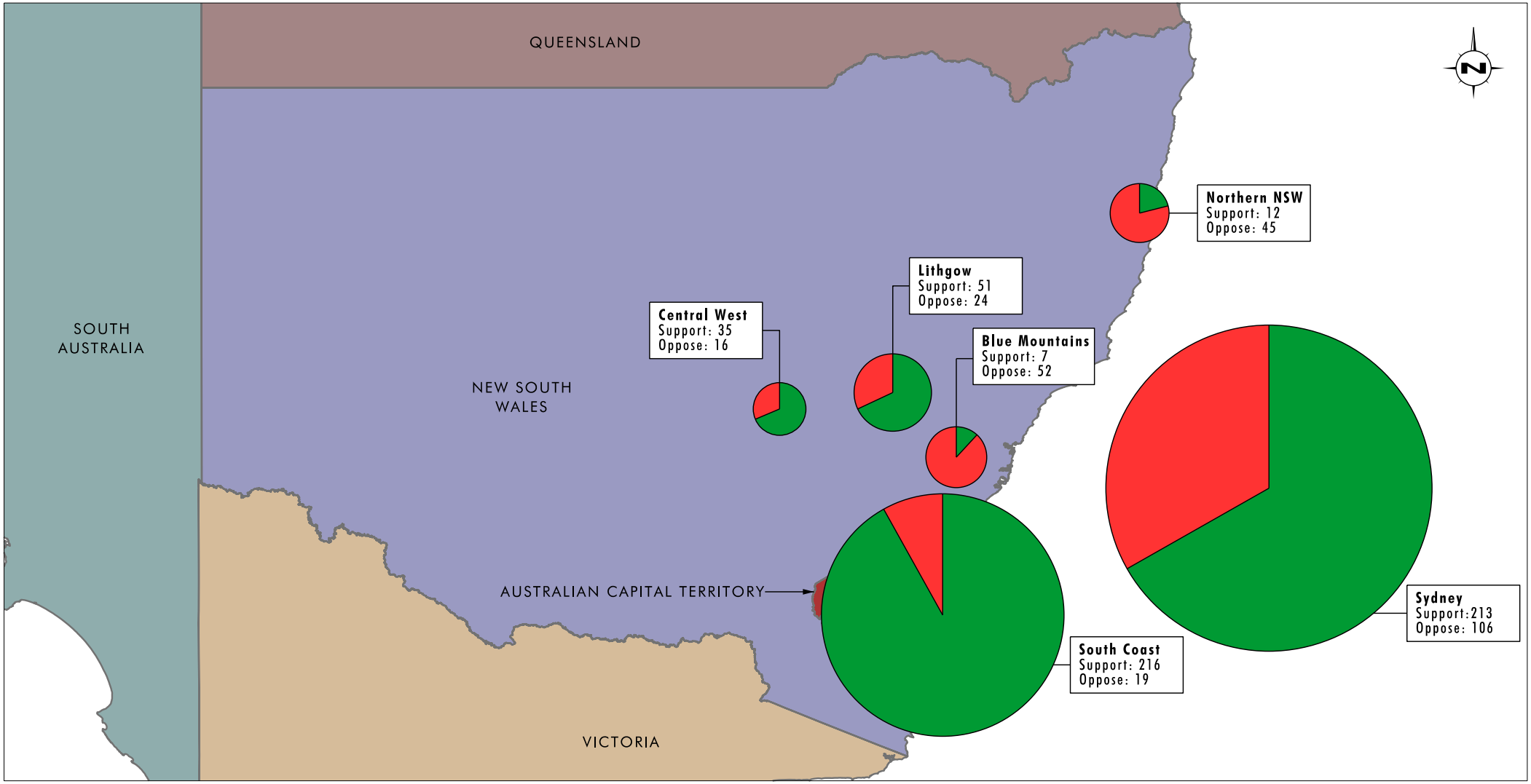


Figure 2.6 Community Issues by Region





Legend

- Support
- Oppose

FIGURE 2.7

NSW Community Submissions by Type

2.6 Comparison with Previous Applications

As discussed in Section 5.1 of the EA, the detailed planning for the Southern Extension Project considered the key issues raised in relation to previous applications for mining at Invincible as well as issues raised during the consultation undertaken for the Southern Extension Project. The issues raised in relation to the previous applications for mining at Invincible were considered early in the project design process as a way of selecting and designing a project that addresses the key issues raised in relation to previous applications whilst achieving the objective of sourcing a reliable supply of nut coal for Shoalhaven Starches. Minor changes were then made to the design or management measures in response to additional issues which were raised during the consultation process. The key features incorporated into the design in response to issues previously raised in relation to other applications and during the consultation process are shown in **Table 2.1**. This is discussed further in Section 5.3 of the EA. In addition, where required to address specific issues raised in submissions, additional and/or revised mitigation and management measures are committed to, as detailed in **Section 4.0.**

Table 2.1 Key Stakeholder Issues and where addressed in project design

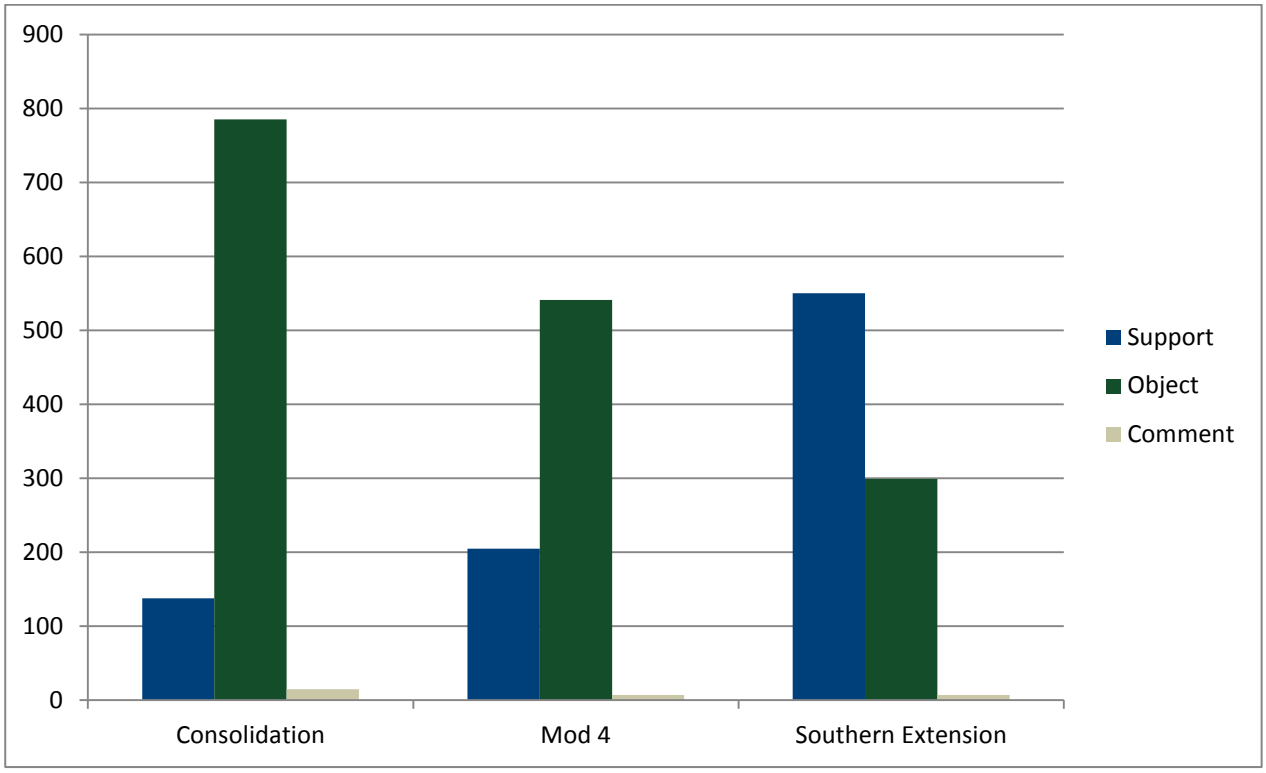
Issue	Project Design / Assessment Input
Economics	The primary objective of the Southern Extension Project is to secure a supply of specialty nut coal for the Shoalhaven Starches plant. This has dictated project design and has enabled a targeted open cut mining project that has been sited and designed to avoid and minimise impacts as far as practicable.
Geology / Pagodas	The boundary of the Southern Extension Project has been determined so as to avoid direct impact to pagoda structures. Highwall mining is not included in the mine design and areas to the north of Invincible with identified pagoda and associated biodiversity values were avoided through restricting the mining area to the south of the current Invincible open cut disturbance area. Appropriate setbacks to pagodas in proximity to the Southern Extension Area have been incorporated into project design based on consideration of potential impacts to threatened species habitat. A detailed geotechnical assessment has been undertaken for pagoda structures in proximity to the Southern Extension Areas and appropriate criteria developed to avoid potential blasting impacts on these features. Detailed management measures are outlined in EA.
Ecology	A range of measures have been incorporated into the project design to avoid and minimise ecological impacts. This includes locating the mining area to the southern extent of Invincible which has comparatively lower biodiversity values and appropriate setbacks from pagoda structures and associated biodiversity features. A comprehensive Biodiversity Assessment Report (BAR) has been completed, which identifies requirements for offsetting unavoidable impacts to biodiversity associated with the Southern Extension Project. Castlereagh Coal has committed to implementing a Biodiversity Offset Strategy to offset the loss of biodiversity values in accordance with the Framework Biodiversity Assessment (FBA).
Health	Any potential impacts to health have been assessed as part of detailed assessment of potential amenity impacts related to noise and air quality as detailed below.
Air Quality	The Southern Extension Project is located as far as practicable from surrounding private residences. A comprehensive assessment of potential air quality impacts (based on closest locations to surrounding private residences) has been completed as part of the EA.

Issue	Project Design / Assessment Input
Noise and Blasting	The Southern Extension Project is located as far as practicable from surrounding private residences and the mine plan has been developed based on a mining fleet which has been selected to minimise noise impacts. A comprehensive assessment of potential noise impacts (based on closest locations to surrounding private residences) has been completed as part of the EA. A comprehensive blast impact assessment has been completed to assess impacts and identify detailed blast design considerations for private residences, pagoda and cliff line structures, public infrastructure and heritage items in proximity to the Southern Extension Project.
Ben Bullen State Forest Conservation	The Southern Extension Project has been sited to minimise impacts on Ben Bullen State Forest. Rehabilitation commitments in relation to the Southern Extension Area (i.e. returning the area to native woodland communities consistent with pre-mining vegetation) were developed in consultation with NSW Forests. The Southern Extension Area is within an area of Ben Bullen State Forest that is currently utilised for firewood gathering; recreational use for trail bike riding and it has also been impacted previously through underground mining impacts and existing power line easements. Following rehabilitation, the Southern Extension Area will remain available for these uses.
Rehabilitation and Final Landform	Progressive rehabilitation of the existing Invincible mine site and Southern Extension Area is incorporated into project design. The overall final landform will return native vegetation consistent with surrounding land uses. The final landform will not contain any final voids or pit lakes.
Visual and Lighting	The Southern Extension Project is located as far as practicable from surrounding private residences. Mining operations are daytime only which will minimise potential lighting impacts. There will be limited views of the mining area from the Castlereagh Highway and no residences are predicted to have views of mining to the Southern Extension Area.
Surface Water	Onsite water management will be similar to that for the previously approved operations. The management plans to be implemented for the Southern Extension Project are designed to manage impacts to surface water catchments downstream of the Southern Extension Project. No changes to the current Environment Protection Licence are required as part of the Southern Extension Project for the management of surface water. This is discussed further in Part B Report.
Groundwater	Due to depressurisation associated with historical mining in the area, the Southern Extension Project is not predicted to have any significant impacts on groundwater resources. Underground water stored in the Ivanhoe No. 2 workings in the Southern Extension Area will be transferred to the Invincible Underground Workings via the Invincible open cut workings which are hydraulically connected to the former underground workings. Water levels in the underground workings and spoil will be monitored as part of the Southern Extension Project. This is discussed further in the Part B report.
Traffic and Transport	Production and employee levels are consistent with the existing approved Invincible mining operations with similar associated traffic impacts.
Aboriginal Archaeology and Cultural Heritage	A detailed Aboriginal Cultural Heritage Assessment has been completed for the Southern Extension Project in consultation with registered Aboriginal parties. The Southern Extension Project has been located to minimise impacts to identified significant sites.

Issue	Project Design / Assessment Input
Social	A comprehensive community and stakeholder engagement process was implemented which included the identification and assessment of social impacts. The additional employment generated by the Southern Extension Project and the commitment by Castlereagh Coal to endeavour to recruit the workforce locally will have positive social and economic impacts for the local community.

Figure 2.8 compares, at a high level, the number of objecting and supporting submissions received for the Southern Extension Project relative to the previous applications for mining at Invincible. As shown in **Figure 2.8**, the number of submissions supporting a mining project at Invincible (and Cullen Valley in relation to the Consolidation and Mod 4 Projects) has increased for the Southern Extension Project. Moreover for the Southern Extension Project the majority of submissions (64 per cent) are in support, which differs from previous applications for mining at Invincible.

Figure 2.8 Classification of Submissions by Application



3.0 Responses to Submissions Received

This response to submissions is structured around the key themes raised in submissions. Each issue in turn discusses the Agency, Interest Group and Community submissions related to each of the key themes. The comments raised in the submissions are identified in ***bold italic*** text with the response to the issues identified in the submission following. In relation to community submissions, where a number of different submissions raise a similar issue, the individual submissions are identified and grouped with the response to the issue following.

As discussed in **Section 2.4.2**, 295 submissions objecting to the Southern Extension Project were based on template paragraphs prepared by the Colong Foundation. While some of these submissions used slightly modified wording to the template paragraphs, the wording in each of the submissions regarding the different issues raised was substantially the same. Accordingly, detailed responses to each submission have not been provided. Rather, a representative version of the paragraph(s) based on these templates has been extracted and responded to in the following sections.

3.1 Project Justification

3.1.1 Agency Submissions

No issues were raised by any agencies in relation to the project justification.

3.1.2 Interest Group Submissions

3.1.2.1 Blue Mountains Conservation Society

The EA claims that the IEP should be approved because it is smaller than previous applications. This is irrelevant. The current proposal needs to be assessed on its merits; not in comparison with failed previous proposals. The 2014 PAC made this point in relation to the Invincible Mine Modification: "The PAC has assessed the proposal on its merits rather than against some alternative application that was found to be unacceptable" The same approach must be applied here. The issue is not that it is small enough to be let through or approved. The issue is what this proposal will damage and destroy and how that will impact on the larger area of sensitive and unique pagoda landscape.

The key distinction between the Invincible Southern Extension Project and the previous applications is the underlying rationale for the Southern Extension Project. Section 3.6 of the EA includes a detailed discussion regarding the rationale for the Southern Extension Project which is to ensure that the Manildra Group's Shoalhaven Starches plant at Bomaderry has a cost effective and reliable supply of nut coal, thereby ensuring the continued operation of the plant and the continued employment of its workforce. Sections 3.6 and 3.7 of the EA include a detailed discussion regarding the alternatives considered in meeting the supply requirements for Shoalhaven Starches and the mine design options considered in the development of the Southern Extension Project mine plan.

As discussed in Section 1.3 of the EA, the assessment findings and submissions from agencies and other stakeholder groups were taken into account in selecting the Southern Extension Area as the preferred mining area. Environmental constraints studies and mine design work were also undertaken to refine the mine plan for the Invincible Southern Extension area. As outlined in Section 3.7 of the EA, as part of the detailed constraints review, the Southern Extension Project has been located and designed to minimise impacts whilst still achieving the objective of a reliable supply of nut coal to Shoalhaven Starches.

Following selection of the preferred mining area, detailed environmental assessment studies were undertaken to assess the potential impacts of the Southern Extension Project. The findings of these studies are documented in Section 6.0 of the EA.

The Southern Extension Project was assessed in its entirety against the government agency specific requirements for mining applications and the key principles of ecologically sustainable development. These include the precautionary principle, a consideration of inter-generational equity, the conservation of biological diversity and the appropriate valuation and pricing of resources.

The EA does not assert that the Southern Extension Project should be approved simply because it is smaller than previous proposals; rather, the EA concludes that, with the implementation of the management, mitigation and offset measures proposed by Castlereagh Coal the Southern Extension Project will result in substantial net benefits to the local, regional and NSW community.

The EA says that there is not enough fill for voids without more mining. This is due to mismanagement by the previous mine owners. This was a liability of the mine and so it is a cost which the new owners took on along with the responsibility for rehabilitation of the site. This cost would have been identified in the due diligence for the sale. DRE holds a bond which is to pay for the rehabilitation if it is not done by the owner. Lack of reject material on site should not be accepted as a justification for more destructive mining. Material could be sourced in other ways and should be paid for by the owners if necessary, not used as a reason to mine and avoid the true cost. This argument was completely rejected by the 2014 PAC in the case of the invincible modification. The PAC was "not convinced that additional mining to fulfill the proponent's pre-existing rehabilitation commitments and requirements is appropriate justification for these extensions. Further, (it) .could set a dangerous precedent" It should not be given any weight in the assessment of the IEP.

The statement that there is insufficient material available to fill the existing voids without further mining is incorrect. As discussed in Section 3.7.1.1 of the EA, there is sufficient material available however the earthworks required to fill these voids would require the disturbance of areas where rehabilitation has already commenced in accordance with existing approvals. This would significantly delay the successful rehabilitation of these areas and the further rehandling of emplaced topsoil in these areas increases risks associated with erosion and degradation of the biological resources in the soil material.

The proposed mine plan for the Southern Extension Project is designed to maximise filling of existing voids early in the proposed mine life, with the creation of an integrated final landform which contains no voids. This is detailed in Section 3.5 of the EA. The justification for the Southern Extension Project is not based upon the need for mining to fill existing voids. The Southern Extension Project is justified on the basis that the benefits of the Southern Extension Project outweigh any environmental, social and economic impacts, based on the detailed studies completed as part of the EA.

Mining in this location is not essential. There are other sources of coal for Manildra's Shoalhaven plant. This is solely for the financial benefit of the proponent. The target product of this proposal, the "primary objective" of the proposal, is securing nut coal for its Shoalhaven plant. However, the supply of nut coal for the proponent's Shoalhaven factory is already being supplied from Clarence mine, a mine in the same area. This means that producing nut coal from the IEP will not increase local jobs. These jobs are already here but working for a different company. There is no need for another area in the Gardens of Stone region to be damaged permanently in order to extract nut coal. The same is true for extracting coal for Mount Piper Power Station (MPPS). MPPS has and is currently using other sources of coal for its electricity generation.

This is a very environmentally damaging proposal given it will only provide 300,000 tonnes of the all-important nut coal. This is an underhand way to restart a dead and discredited mine and mine method. Castlereagh Coal presumably would have got to own the Invincible mine at a bargain price because of Coalpac's bankruptcy. It is a bonus on top of that that the proponent will be able to sell all the other coal it has to extract to get the nut coal.

The rationale for the Southern Extension Project is to provide additional certainty and security of speciality coal supply to Shoalhaven Starches plant. The details of the supply requirements including potential alternative supply arrangements are discussed in detail in Section 3.6 of the EA.

The coal price being paid for the specialty nut coal from the Clarence operation is significantly higher than Castlereagh Coal's expected costs of production for the same product as part of the Southern Extension Project. This is partly as a result of the nut coal being considered a niche product which requires different production and handling requirements which increases costs. The characteristics of specialty nut coal from Invincible meet the specific coal quality requirements for use in the Shoalhaven Starches plant. Any change in the quantity or quality of this particular energy input would require significant capital and plant upgrades, in addition to major operational impacts at Shoalhaven Starches plant.

There is also a lack of suppliers of the product in NSW which is also considered to be a factor in pricing. Given that the market for this niche product is relatively small, the volume of coal required by Shoalhaven Starches would not be sufficient by itself to justify the continued operation of the Clarence operation. If market forces were to impact on the Clarence operation this would be expected to have significant impacts for Shoalhaven Starches. It is for this reason that ensuring a certainty of supply is vital. It is also noted that the ROM coal mined at Clarence Colliery and processed for nut coal production is a high quality product and could be sold into alternative markets if not purchased by Shoalhaven Starches. For this reason, it is considered unlikely that there would be any job losses at Clarence Colliery associated with Southern Extension Project.

It is also noted that the submission from Energy Australia in support of the Southern Extension Project includes the following statement:

> *'Energy Australia owns and operates the nearby Mt Piper power station, which provides up to 15% of NSW's electricity. Invincible was one of four local mines that supplied coal to Mt Piper prior to 2013. Currently Mt Piper relies on coal supply from a single source, being the Springvale mine.*
>
> *Mt Piper power station will directly benefit from the project by receiving relatively small volumes of coal from Invincible to supplement supplies from the Springvale mine. Diversity of coal supply remains a significant challenge for Energy Australia and a risk to Mt Piper contributing to provide secure and affordable electricity in NSW.*
>
> *We also support efforts to maintain a strong and viable coal mining industry in the Lithgow region. A capable and functioning coal industry in the Lithgow region makes significant contributions to the local economy and provides mining and electricity generation jobs.'*

The Energy Australia submission supports the discussion in Section 3.6 of the EA regarding the importance of diversity of supply options (both for Shoalhaven Starches and for the Mt Piper Power Station).

The economic assessment included in the EA has conservatively assumed that some of the 35 employees transitioning from similar jobs in the industry from within and external to the local area and the cost benefit analysis therefore does not assume that there will be a net increase of 35 full time jobs. Notwithstanding, the 35 full time equivalent jobs that would be created as a result of the Southern Extension Project this will result in a net increase in local jobs which have flow-on benefits within the local economy (refer to Section 6.12 and Appendix 13 of the EA). This is particularly important as it is occurring

during a period when the area has been experiencing the effects of the closure of a number of large employers in the region. Moreover, the need for additional employment in the local area was the key issue raised through detailed consultation with the local community (refer to Section 5.2 of the EA) and referenced in the reasons for supporting the Southern Extension Project in the 544 submissions received in support.

3.1.2.2 The Colong Foundation for Wilderness Ltd

Manildra believes it has been subject to unreasonable prices for the supply of its nut coal which has led it to engage in coal mining. This seems odd. Manildra should pursue relief through the provisions of the Competition and Consumer Act, 2010 regarding the misuse of market power to ensure that it is getting a fair price. At present Manildra thinks it is easier and cheaper to destroy public forests for a poor nut coal resource 300 kilometres away from its industrial plant, than to take on the price fixing behaviour of its suppliers and obtain a fairer price for this resource. The Colong Foundation believes that other nut coal options which would prove cheaper and more profitable have not been thoroughly canvassed.

Castlereagh Coal and Shoalhaven Starches have not asserted, nor do they contend, that Centennial or any other potential supplier of nut coal is engaging in anti-competitive behaviour or is seeking unreasonable prices in relation to the nut coal product supplied.

The Southern Extension Project is proposed to ensure that Shoalhaven Starches has access to a cost effective and reliable supply of nut coal. The price paid for nut coal from Centennial or other suppliers will always be subject to supply and demand and recent increases in global demand for both thermal and coking coal mean that the price of nut coal is also (reasonably) likely to rise. As discussed in Section 3.6 of the EA, further increases in coal prices will place pressure on Shoalhaven Starches' continued competitiveness in national and international markets.

The coal price being paid for nut coal from Clarence and Whitehaven's operations is significantly higher than Castlereagh Coal's expected costs of production for the same product from the Southern Extension Project. As discussed in Section 3.6 of the EA, the Southern Extension Project also ensures that Shoalhaven Starches have a reliable source of coal and production at the Shoalhaven Starches plant so that it is not exposed to disruptions from other suppliers.

As the costs of production for nut coal at Invincible are considerably lower than Shoalhaven Starches obtaining coal from Clarence or Whitehaven, the Southern Extension Project has significant economic advantages for Shoalhaven Starches over maintaining current nut coal supply arrangements.

Section 3.6 of the EA considers a broad range of different supply options for Shoalhaven Starches. None of these options provide both the energy supply security and cost certainty for Shoalhaven Starches which are provided by the Southern Extension Project.

It is unclear from Manildra's Environment Assessment which coal seam Whitehaven uses to manufacture nut coal, but bituminous coal from the Gunnedah Coalfield has been used to manufacture nut coal for Manildra. It is mystifying why it would not be cheaper for Manildra to purchase bituminous coal delivered to Port Kembla and manufacture nut coal there rather than tie up capital investing in a small, inefficient, inoperative coal mine. Manildra could haul their nut coal 60 kilometres if a processing plant were established at Port Kembla, instead of 300 kilometres from the Invincible Mine near Cullen Bullen. This would seem much more efficient and less environmentally damaging than to attempt coal mining in the Gardens of Stone region. The proponent claims that trucking the product from Port Kembla to Nowra is not viable due to the small amount of nut coal required. How can it be cheaper to mine for nut coal at Invincible, when production at Port Kembla would save 480 truck kilometres per load?

As discussed in Section 3.6.1 of the EA, Shoalhaven Starches currently obtain some of its coal supply from Whitehaven's operations in the Gunnedah Basin. The viability of processing of nut coal at Port Kembla is also discussed in Section 3.6.2.2 of the EA. As discussed in Section 3.6.2 and 3.6.3 of the EA, the continued supply from Whitehaven's operations do not satisfy the supply certainty and/or cost effectiveness drivers for Shoalhaven Starches In the case of the Port Kembla processing option canvassed in the submission, this is not viable.

Only 7% of each tonne of coal mined at Invincible is suitable for nut coal production. Annually 1.15 million tonnes of high ash coal needs to be mined to produce 85,000 tonnes of nut coal. The proponent's specialty resource argument is misconceived. Manildra's nut coal production will be a by-product of supplying up to 1.15 million tonnes of high ash, low-energy value coal to Mt Piper Power Plant. This coal will produce high volumes of fly ash and high carbon pollution relative to other coal supplies available to the power plant. The coal will make the power plant less carbon efficient and so is contrary to the NSW Government's Climate Change Fund draft strategic plan (contrary to Section 2.7, page 18).

The primary objective of the Southern Extension Project is to ensure the certainty of supply of nut coal to the Shoalhaven Starches plant in Bomaderry NSW. The EA has acknowledged the Southern Extension Project will necessarily involve the extraction of coal from the Lidsdale and Irondale Seams which are located above the Lithgow Seam. As identified in the EA, Castlereagh Coal is actively investigating the possibility of using coal from the Irondale and Lidsdale Seams in the Shoalhaven Starches facility. Any coal produced which is not able to be used at the Shoalhaven Starches plant will be sold to Mt Piper Power Station for energy production consistent with the previous mining operations at Invincible. The sale of coal to Mt Piper will assist in covering operating costs associated with the Southern Extension Project which assists in reducing the cost of nut coal for Shoalhaven Starches.

Energy Australia owns and operates the Mt Piper power station and has provided strong support for the Southern Extension Project through its submission during the public exhibition period. Energy Australia believes it will directly benefit from an increased diversity of supply if it were to receive relatively small volumes of coal from Invincible as a result of the Southern Extension Project being approved. Currently Mt Piper relies on one source of coal where previously it had four, one of which was Invincible. Energy Australia's response acknowledges the robust and thorough assessment process which has been undertaken for the Southern Extension Project and believes that there will be strong beneficial environmental and social outcomes should it be approved.

Only 35% of the Lithgow Coal Seam remains to be mined. It's the only proven source for nut coal production at Invincible as the two other inferior seams above the Lithgow seam have 30% ash. The entire nut coal resource in the modification area is just 300,000 tonnes and will supply Manildra's Bomaderry plant for less than four years. Economic viability of this short term supply proposal is further eroded through royalty payments to Ivanhoe Coal Pty Ltd for coal extraction from CCL 712.

The Economic Impact Assessment prepared for the Southern Extension Project (Appendix 13 of the EA) has concluded that the economic benefits associated with the Southern Extension Project significantly outweigh the costs.

As discussed in the EA, the proposed eight year life of the Southern Extension Project allows for potential use of coal from other seams extracted as well as mixed supply options from both Invincible and other suppliers of nut coal. The eight year life of mine for the Southern Extension Project will also enable the investigation of future supply and energy options for Shoalhaven Starches to be undertaken. Eight years is considered to be sufficient time to investigate boiler and/or coal supply options and obtain any necessary approvals to meet the long term energy needs of Shoalhaven Starches. Additionally, as outlined in Section 3.1 of the EA, the detailed assessments completed for the EA were based on maximum production scenarios to ensure potential worst case scenarios for the proposed modified operations.

3.1.2.3 The Colo Committee

I object to the proposed modification of the Invincible coal mine. This proposal is predicated on the argument that only this coal can provide the thermal properties needed. What nonsense, any gas system can be tailored to do this. They do not need this coal in particular.

A discussion of alternative energy supply options for Shoalhaven Starches is discussed in Section 3.6.2.3 of the EA, as summarised below.

The Shoalhaven Starches plant currently utilises a number of energy sources for the plant which include gas, coal, electricity and a small amount of woodchip combustion. Gas and electricity currently account for between 65 and 74 per cent of the total energy costs for the plant, while nut coal accounts for between 25 and 30 per cent. Nut coal represents the lowest cost per gigajoule (GJ) of these three main sources of energy. Energy, along with flour and water is one of the three key inputs at the plant. Reducing costs is critical in ensuring that the plant remains internationally competitive and there are limited opportunities for lowering costs in terms of gas and electricity prices. Additionally, there are significant capital costs and operational impacts associated with installation of gas boilers and decommissioning of the installed coal powered boilers.

Having mixed energy supply options of coal, gas and electricity reduces production risks at Shoalhaven in the event that one of the supply options becomes unavailable. For example, if gas was relied upon as the primary energy source, any supply disruptions would significantly impact upon operations at the Shoalhaven Starches plant with associated upstream and downstream economic impacts; this risk is mitigated through a diversity of energy supply options. Additionally there are added capital and operational costs associated with this that would impact on the ongoing competitiveness of the plant.

Coal from Manildra's open-cut Invincible mine will be more expensive in terms of overall costs to the economy and the environment than coal from existing operating mines that can meet the requirements of Manildra's Bomaderry plant for many decades. Approving Manildra's 50 hectare open-cut proposal will force worse environmental outcomes upon this outstanding natural area. The true cost of this damage to the community and environment cannot be compensated.

The Southern Extension Project rationale, including alternative supply arrangements, is discussed in detail in Section 3.6 of the EA.

The Economic Impact Assessment for the Southern Extension Project (refer to Appendix 13 of the EA) includes a comprehensive consideration of costs and benefits associated with the Southern Extension Project and concludes that the Southern Extension Project would provide significant net positive economic benefits for the State and local region.

3.1.3 Community Submissions

Project Justification issues were raised in 287 community submissions. The issues raised and relevant response is provided below.

3.1.3.1 Form Letters

Coal from Manildra's open-cut Invincible mine will be more expensive in terms of overall costs to the economy and the environment than coal from existing operating mines that can meet the requirements of Manildra's Bomaderry plant for many decades. Approving Manildra's 50 hectare open-cut proposal will force worse environmental outcomes upon this outstanding natural area. The true cost of this damage to the community and environment cannot be compensated.

The Economic Impact Assessment for the Southern Extension Project (refer to Appendix 13 of the EA) includes a comprehensive consideration of costs and benefits associated with the Southern Extension Project and concludes that the Southern Extension Project would provide significant net positive economic benefits for the State and local region.

3.1.3.2 Other Community Submissions

"With appropriate investment in tracks and signage, the encouragement of hoteliers and tourist operators there would days of scintillating and adrenalin pumping opportunities that would make this area a Mecca for domestic and overseas visitors. The economic benefits would be at least comparable to those of Katoomba and Leura that were recently estimated to be worth $70 million per annum. There would be real stimulus to small business and ongoing investment in both Lithgow and also the surrounding smaller settlements. Opportunities for the local Aboriginal people to benefit in a positive way as tour guides to take visitors to the many art sites is a further plus. A substantial lead in this direction has already been made by the Emirates with successful construction and operation of the One&Only Wolgan Valley Resort. This is the type of investment that the area needs — not coal mining."

"As a city, Lithgow has reinvented itself many times and it is quite capable of doing it one more time as a tourism hub"

Sandstone cliff lines and pagoda formations are prominent landscape features of the terrain to the north and east of Invincible. These formations and related ecosystems have been identified as having significant conservation value due to their uniqueness, visual character and ecological value. The Southern Extension project has been designed to avoid direct impacts on these features.

The Project will not prevent people from accessing the areas of Ben Bullen State Forest to the north or east of the Invincible Open Cut Area It is this area within Ben Bullen State Forest that has the highest conservation and aesthetic values which may be of value from a tourism perspective.

Unlike the existing disturbance, the Southern Extension Area will not be visible in the foreground against the more visually prominent pagoda features in Ben Bullen State Forest which are located further north. The Southern Extension Project also includes the full rehabilitation of the existing disturbance area over a relatively short timeframe. While the rehabilitation of this area is an existing obligation, the Southern Extension Project will avoid the redisturbance of some areas of existing and established rehabilitation and the time frame for the rehabilitation of the existing disturbance area is likely to occur over a faster timeframe than the progressive rehabilitation associated with the closure of the existing approved operations.

To the extent that open cut mining at Invincible operates as a potential deterrent to tourism investment in the area, these impacts have already occurred and the additional disturbance associated with the Southern Extension Project is unlikely to increase these impacts in any significant way and may even reduce impacts through the earlier rehabilitation timeframe of the disturbance areas closer to the more prominent pagoda features.

There are significant areas of pagoda landforms and other visually spectacular terrain in the broader area including significant areas which are already subject to conservation as National Park. These areas, together with undisturbed areas of State Forest proposed as the approximately 40,000 hectare Gardens of Stone Stage 2 area will continue to provide significant tourism opportunities for future investment. The disturbance of a 50 hectare area (approximately 0.00125%) on the western extremities of the proposed Gardens of Stone Stage 2 area will have negligible impacts on tourism opportunities associated with the 'Gardens of Stone'.

Coal, via the conduit of royalty payments is the economic saviour of NSW and as such any 'request' of the coal industry for access to this black gold over rides any reasoned argument to protect irreplaceable heritage. The reason that the original proposal for the Wollemi National Park excluded the areas now under threat was at the 'request' of the mining industry. The reality is it was no 'request' it was, and is, blackmail. The 'black bounty' underlies the entire Sydney Basin in a sequence of seams of varying quality and thickness. A sad thing is that the cheapest points of access to this 'bounty' are at the edges of the Basin where it is closest to the surface. This same selvedge is where pagodas have developed their most advanced forms.

This comment is noted.

It is long overdue for Australia to move to renewable and sustainable resources. Coal mining is a dirty industry that destroys the environment and our air.

This is such a backward proposal....when we should be investing in renewables and leading Australia into a future which values the health of the planet. Absolutely disgusting proposal!

We have lost far too much land to mining, and coal mining should not be expanded. We should be investing in renewables.

The rationale for the Southern Extension Project, including alternative energy options for the Shoalhaven Starches plant is discussed in detailed in Section 3.6 of the EA and the response to submissions above.

3.2 Conservation

3.2.1 Agency Submissions

No issues were raised by any agencies in relation to conservation.

3.2.2 Interest Group Submissions

3.2.2.1 Blue Mountains Conservation Society

Conservation value of Ben Bullen State Forest confirmed by two independent Planning Assessment Commissions in 2012 and 2014. The reports from the commission found that the area has a unique landscape and significant levels of biodiversity. 2012 PAC "The pagodas are considered to be internationally significant geological features some 250 million years old and worthy of total protection". 2014 PAC "the pagoda landform complex is a natural feature of special significance and that the features warrant the highest level of protection, i.e. they should be fully protected from risks of mine induced impacts." The 2014 report further states that the highest and best use of the land is conservation purposes and that mining is incompatible with the significant conservation values of the site.

The EA does not dispute the conservation value of pagoda features or associated landscape features. As discussed in detail in Section 3.7.3.2 of the EA, the Southern Extension Project has been designed to avoid direct impacts on the pagoda structures themselves through the siting of the project away from the pagodas and the management of blast design to meet conservative impact criteria derived through testing of the pagoda structures in closest proximity to the proposed mining area. Unlike the previous proposals considered by the PAC, the Southern Extension Project does not include highwall mining and has been designed to avoid impacts on pagodas.

The Southern Extension Project has a substantially lower level of disturbance relative to previous proposals considered by the PAC, particularly in those areas that are considered to be of high value such as those associated with the narrow steep valley habitats that occur to the north east of the Southern Extension Area.

The selection of the Southern Extension Area had regard to potential impacts on biodiversity including:

- The avoidance of the higher biodiversity value areas which are associated with the gullies adjacent to and between pagoda features; and

- The incorporation of setbacks from pagodas to minimise potential impacts on the broad-headed snake and other fauna associated with the pagoda features.

The pagodas located to the east of the Southern Extension Project are typically smaller in scale and are associated with much drier vegetation communities than the more significant terrain features associated with the more northerly pagodas.

Potential residual biodiversity impacts associated with the Southern Extension Project have been assessed in accordance with the Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects (FBA). The detailed Biodiversity Assessment Report (Appendix 6 of the EA) prepared for the Southern Extension Project and offset requirements are discussed in detail in Section 6.4 of the EA. **Section 3.4** of this Response to Submissions include further discussion on the proposed offsets for the Southern Extension Project.

Overall, the project design has had regard to the conservation values in the area identified by the PAC in relation to its assessment of previous proposals and the Southern Extension Project avoids impacts on these conservation values and includes offset measures in relation to residual biodiversity impacts developed in accordance with NSW policy.

This specific land system does not occur outside the [Ben Bullen State Forest] as it is physically constrained by badly damaged land from mining in the north, badly degraded lands from mining to the south and significant differences in altitude and rainfall to the north, west and east. None of this pagoda landscape complex is protected. The particular grassy tableland woodlands are not found in existing reserves.

None of the vegetation communities occurring within the Southern Extension Area are listed as a threatened ecological community under the NSW *Threatened Species Conservation Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The vegetation communities which would be impacted by the Southern Extension Project are not limited to the Southern Extension Area or the area around Invincible and are found in other areas of Ben Bullen State Forest and surrounding areas. As discussed above and in Section 3.7 of the EA, the Southern Extension Project has avoided other areas of these communities which are present to the north and east of the existing Invincible Open Cut disturbance area. Further, the rehabilitation strategy for the broader Invincible disturbance area aims to recreate these communities in the rehabilitated landscape (refer to Section 6.18 of the EA).

The Biodiversity Assessment Report (Appendix 6 of the EA) outlines the various environmental attributes used in the BioBank Credit Calculator (BBCC) to assess the impact on biodiversity values. The BBCC uses landscape features, regional and local connectivity, patch size, percentage native vegetation cover and vegetation condition to determine the Landscape Value Score of the impact area which becomes a multiplier when determining the credits required to offset the impacts of a project. All landscape information entered into the BBCC for the Southern Extension Project is specific to the Southern Extension Project Area and in accordance with the requirements of the FBA.

The credits generated by the impacts of the Southern Extension Project therefore include consideration of the landscape feature of the area, the vegetation communities occurring in the area and the flora and fauna species occupying the area. These credits were prepared through the implementation of a Biodiversity Offset Strategy as discussed in **Section 3.4.**

The proposal will reduce the buffer for nearby world heritage areas and reduce connectivity in the southern part of the BBSF.

The Southern Extension Area is located approximately 9 kilometres to the south of the closest part of the Greater Blue Mountains World Heritage Area. The Southern Extension Project will not reduce the buffer area associated with the world heritage area as Ben Bullen Colliery and the existing Invincible open cut mining area are both located between the Southern Extension Area and the closest part of the world heritage area.

The Southern Extension Project will not result in any loss of connectivity between vegetated areas as connectivity will be maintained to the south of the Southern Extension Area. It is also noted that potential impacts on connectivity are considered in the BBCC assessment and as such any impacts to connectivity are considered in the biodiversity offset strategy for the Southern Extension Area as discussed in **Section 3.4**.

3.2.2.2 The Colong Foundation for Wilderness Ltd

The international environmental significance of the Ben Bullen pagoda land system has been recognised by successive Planning Assessment Commissions (PAC). The PAC determination found the pagoda landform worthy of the highest level of protection (PAC 2014, pp 10, 12 and 20) and that mining in the vicinity of these landforms [in that case to within 300 metres as with this proposal] was unacceptable. The Department of Planning and Environment (DPE) and the PAC concluded that "from a regional , national and international land use planning perspective, the highest and best use of the site should be for conservation purposes" [DPE Director General's Environmental Assessment Report, Coalpac Consolidation Project, 2013 at p. 5) DPE also recognised "…the inherent incompatibility of open cut mining with preserving the internationally significant conservation value of the site" [DPE Director General's Environmental Assessment Report, Coalpac Consolidation Project, 2013 at p. 5]. The 2014 PAC determination should also apply to this 'extension' as open-cut mining is similarly proposed within 300 metres of pagodas, which clearly does not ensure 'the highest level of protection' to the pagoda landscape.

This issue is largely addressed in the response to a similar submission by the Blue Mountains Conservation Society in **Section 3.2.2.1** above. The 300 metre setback recommendation identified by the PAC was based on potential impacts on the foraging habitat of broad-headed snake which is typically restricted to 300-500 metres from its winter habitat which can include features associated with pagodas. These requirements are discussed in detail in Section 3.3.2.3 and 4.1 of the Biodiversity Assessment Report (Appendix 6 of the EA).

Unlike previous proposals, the Southern Extension Project does not include any highwall mining or underground mining and will not have any subsidence impacts on the pagoda. Extensive project design consideration has also been given to minimise any potential impacts on pagoda structures from blasting as detailed in Section 3.7 of the EA.

Aside from one instance, the limit of disturbance associated with mining in the Southern Extension Area is set back at least 300 metres from all pagoda formations in line with recommendations made by the PAC for the 2014 Modification Project. The setback from one single pagoda was reduced to approximately 210 metres following further investigations which identified that winter habitat features for the broad-headed snake (*Hoplocephalus bungaroides*) at the pagoda were generally absent at this pagoda feature. Potential

impacts on the broad-headed snake have been considered in the Biodiversity Assessment Report in accordance with the FBA. The offset requirements for the broad-headed snake are based on potential foraging habitat within 500 metres of potential winter habitat (i.e. pagoda structures). Notwithstanding the general absence of winter habitat for the species at the nearest of the pagodas, the BBCC have conservatively assumed that this pagoda does provide potential habitat for this species. The approach to assessing offset requirements in relation to the broad-headed snake are discussed in Section 6.0 of the Biodiversity Assessment Report (Appendix 6 of the EA). This approach to the assessment of any potential residual impacts on this species has been supported by the OEH in their submission on the Southern Extension Project.

The 50 hectare Manildra open-cut is a short term project, providing short term benefits. It will have significant impacts on the Ben Bullen pagoda land system and is in an area of significant conservation value. This proposal seeks to overturn previous PAC determinations on the protection of the Ben Bullen Pagoda Land System, but offers no valid reasons for such a decision.

This issue is addressed in the responses to submissions on project justification in **Section 3.1** of this report and the response to the detailed submission by the Blue Mountains Conservation Society addressed in **Section 3.2.2.1** above**.**

Most of the Tablelands Grassy Woodlands on the Permian rocks of the Illawarra Coal Measures have been cleared. The western section of Ben Bullen State Forest is now the sole location where this grassy woodland occurs in association with platy pagodas. The loss of 50 hectares of this community by open-cut mining will have a significant impact and cannot fail to impact adjoining areas of the other two units in the land system to cause the loss of the pagoda landform complex as a whole from this part of the forest. In other words the loss of one land unit is amplified as the land system is lost.

None of the vegetation communities occurring within the Southern Extension Area are listed as a threatened ecological community under the NSW *Threatened Species Conservation Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.* This community is not limited to the Southern Extension Area or the area around Invincible and is found in other areas of Ben Bullen State Forest and surrounding areas. The Southern Extension Project has avoided other areas of this community to the north and east of the existing Invincible Open Cut disturbance area and the rehabilitation strategy for the broader Invincible disturbance area aims to recreate these communities in the rehabilitated landscape (refer to Section 6.18 of the EA).

The BAR (Appendix 6 of the EA) outlines the various environmental attributes used in the BBCC to assess the impact on biodiversity values. The BBCC uses landscape features, regional and local connectivity, patch size, percentage native vegetation cover and vegetation condition to determine the Landscape Value Score of the impact area which becomes a multiplier when determining the credits required to offset the impacts of a project. All landscape information entered into the BBCC for the Southern Extension Project is specific to the Southern Extension Project Area and in accordance with the requirements of the BAR.

The credits generated by the impact of the Southern Extension Project therefore include consideration of the landscape feature of the area, the vegetation communities occurring in the area and the flora and fauna species occupying the area.

The proposal area is a unique landscape of Triassic platy pagodas above grassy woodlands on Illawarra Coal Measures. It is irreplaceable, as there are no replicates elsewhere. It also cannot be offset in the manner described, which only addresses individual values. The association of platy pagodas with other woodlands is irrelevant, as they comprise another landscape.

As discussed above, the Southern Extension Area is not unique and similar landscapes are located in areas to the north, south and east of the Southern Extension Area, including areas specifically avoided though project design as discussed in Section 3.7 of the EA.

As discussed above, the impacts on biodiversity features have been assessed in accordance with the NSW FBA process. The calculation of residual biodiversity impact offsetting requirements has had regard to the communities being impacted and landscape features. Subject to clarifications discussed in **Section 3.3.1.1**, the OEH support the biodiversity impact assessment undertaken for the Southern Extension Project.

3.2.3 Community Submissions

Conservation issues were raised in 27 community submissions. The issues raised and relevant response is provided below.

3.2.3.1 Form Letters

There were no community submissions which utilised template paragraphs raising conservation issues.

3.2.3.2 Other Community Submissions

The proponents offer in their Environmental Impact Statement that mining is allowed in SCA's. This is the case where the mining impacts do not significantly adversely affect the conservation values of the area in question. This cannot be said for this proposal.

The Southern Extension Area and much of the existing Invincible operations are located within Ben Bullen State Forest. This area of the Ben Bullen State Forest is part of the approximately 40,000 hectare (ha) Gardens of Stone Stage 2 conservation proposal put forward by the Colong Foundation for Wilderness, Blue Mountains Conservation Society and The Colo Committee. The Southern Extension Project is located on the south-western edge of the approximately 7800 hectare Baal Bone and Long Swamp component of the Gardens of Stone Stage 2 Proposal area which has been proposed by the above groups to be made into a State Conservation Area under the *National Parks and Wildlife Act 1974* (NPW Act).

It is noted that the Gardens of Stone Stage 2 proposal was lodged in October 2005 but has not been formally adopted by the NSW Government. Further, it is noted that should the site be declared in the future as a State Conservation Area, mining would be still permissible in this area in accordance with both the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) and the NPW Act.

The proposed impact on approximately 50 hectares of the 7800 hectares area proposed as a State Conservation area will not have a significant impact on the conservation value of the broader area; particularly given the immediate area is already disturbed by open cut mining. The Southern Extension Project includes the rehabilitation of both the existing open cut disturbance areas and the Southern Extension Area. Rehabilitated areas will be revegetated with vegetation communities similar to those existing pre mining disturbance. Once rehabilitated, the Southern Extension Project (and the Invincible Open Cut) will not have any impact on the long term conservation values of the proposed State Conservation Area.

"Everything must be done to protect for Australia's future generations not the short term gain of an open cut on the edge of what should be part of the Gardens of Stone National Park. Having walked extensively in this unique area of pagodas witnessed Aboriginal sites all must be done to preserve this natural beauty."

"I want to see no more of the public lands of Ben Bullen State Forest permanently destroyed by coal mining. These limited areas of conservation significance should be protected for all time, rather than destroyed for short term mining gains."

" I personally enjoy the mountains and regularly camp, hike, climb and canyon in this environment. It serves the people of NSW far better for it to be protected for future generations to enjoy."

"Please do not approve this latest modification to the Invincible coal project. The Gardens of Stone area in the Ben Bullen State Forest is an iconic region that should have national park status with its unusual landscape and its endangered fauna and flora."

"No more coal. And no mines destroying areas of significant and irreplaceable beauty such as the Gardens of Stone."

'Coal mines are already on the nose without sacrificing special areas of the beautiful places we have left. Somewhere, sometime we have to stop this destruction of our landscape heritage that will benefit Australians for generation's not just short term economic gain. Nature created these places you cannot get them back.'

'I have extensively walked the Ben Bullen State Forest area immediately surrounding the existing mine and consider it one of the top bushwalking destinations in NSW. This location is full of incredible and unique natural features that must be preserved as part of our national heritage, not wrecked or compromised by the proposed further mine expansion. The list of the outstanding natural features that are located within 1 kilometre or less of the existing mine includes: The Monument, Three Level Cave, Galadriel Gorge, Hall of Galadriel, Hall of Celebrian, Hall of Elrond, Hall of Arwen, Arwens Pathway, Four Level Cave, The Amphitheatre, Vertigo Slot, Buddha Cave, Telescope Rock, Golum Canyon, Gandalf Slot, Pegasus Rock, Aragorn Slot, Seal Rock, Waterfall Ledges, Crumble Ledge, Signature Cave, Discontiguous Fern Slot, Kew Slot, Wombat Gully, Invincible View Cave, King Kong Head. Book 5 of the 'Gardens of Stone and beyond' series (680pp) is dedicated to this area and contains full descriptions and photos of the above features and many others. I am one of the co-authors of this series.'

I am an active walker and visitor to the Gardens of Stone region, and have seen first-hand the incredible beauty of this region. This area is globally unique and must be preserved so that our children can witness at their leisure the beauty of Australia. We have lost so much of this landscape already, and we must now say "enough is enough".

This is a sensitive part of the Gardens of Stone region. Open cut coal mining would be a disaster in this region, ruining irreplaceable environments.

The destruction by open-cut mining is total and permanent. Large areas have already been destroyed.

Coal mines are already on the nose without sacrificing special areas of the beautiful places we have left. Somewhere, sometime we have to stop this destruction of our landscape heritage that will benefit Australians for generation's not just short term economic gain. Nature created these places you cannot get them back.

"Earlier this year I directed a team of filmmakers, musicians and conservationists in the production of a short film to raise awareness about this beautiful landscape, its threatened wildlife and Indigenous Australian art sites. Since its release it has spread across this country and the world - hundreds of people continue to watch it every day. Why? Because the Gardens of Stone area (not just the portion currently protected by National Parks) is iconic and extraordinary. So far, thousands who have seen it for the first time have come to join with those who have been fighting for its conservation for many years. They are realising that the future of this area is not in its mineral resources but in a transition to sustainable

tourism as the rational economic plan for people living nearby. Mining is depleting and putting at risk this valuable asset. The Gardens of Stone has been surprisingly little known. However, this is changing fast and support for its protection is gaining ground. Please consider your position with this wider public perspective in mind. Not only does our environment stand to lose with this latest development proposal but also the population of Lithgow and their children's future. Gardens of Stone will be a national treasure."

In December 1979, The NSW State Government effectively the put a stop to all development of power station proposal by creating the Wollemi National Park, which included the Colo River, and the site of the proposed dam, an essential element of the power station plan. Whilst the worst aspects of the power station proposal have now been killed, the correct course of action from here is to stop the rape of NSW irreplaceable heritage, proclaim the area as a part of the Gardens of Stone National Park.

[We] are very opposing the open cut mine, as [we] take people out this area on our tours = Respite Tours. Let keep the land we have left. The Ben Bullen pagoda landscape is unique, irreplaceable and covers a small area of which the woodlands affected by the proposed Invincible open-cut mining operation is a key part. It is a key part of the only area where grassy tableland woodlands adjoins pagodas. This woodland is an integral part of the pagoda landscape and its loss will destroy this beautiful pagoda landscape.

Every time I drive past, the sight of it distresses me as I know the local environmental negative impacts upon vegetation, wildlife, air and water quality.

As discussed above, sandstone cliff lines and pagoda formations are prominent landscape features of the terrain to the north and east of Invincible and these formations and related ecosystems have been identified as having significant conservation value. The Southern Extension Project has been designed to avoid direct impacts on these features and will not prevent people from accessing the areas of Ben Bullen State Forest to the north and east of the Invincible Open Cut Area.

The existing Invincible open cut mining area and surface infrastructure are located to the immediate west of a line of prominent pagoda structures. As shown in Figures 6.2 and 6.3 in the EA, the disturbance associated with this historical mining can be seen from the Castlereagh Highway and some areas to the south and west of Cullen Bullen. As required by the development consent covering these operations, this disturbance is in the process of being rehabilitated. Disturbance associated with past mining is also visible from areas to the east of the mine where there are views to the west of the escarpment.

The Southern Extension Project will result in additional disturbance to the south of the existing disturbance area. As shown in Section 6.15 of the EA, the Southern Extension Project will not significantly increase visual impacts associated with existing mining operations visible from elevated areas in Ben Bullen State Forest. This additional disturbance area is significantly more screened in terms of visual impacts than the existing disturbance and will only be visible to the public from a small area on Castlereagh Highway and some elevated areas to the east of the mining area (unlike the existing disturbance, the Southern Extension Area will not be visible in the foreground against the more visually prominent pagoda features in Ben Bullen State Forest which are located further north). The Southern Extension Project also includes the full rehabilitation of the existing disturbance area over a relatively short timeframe. While the rehabilitation of this area is an existing obligation, the Southern Extension Project will avoid the re-disturbance of some areas of existing rehabilitation and the rehabilitation of this existing disturbance area is likely to occur over a faster timeframe than the progressive rehabilitation associated with the closure of the existing approved operations.

To the extent that open cut mining at Invincible operates as a potential deterrent to tourism investment in the area, these impacts have already occurred and the additional disturbance associated with the Southern Extension Project is unlikely to increase these impacts in any significant way and may even reduce impacts through the earlier rehabilitation timeframe of the disturbance areas closer to the more prominent pagoda features.

There are significant areas of pagoda landforms and other visually spectacular terrain in the broader area including significant areas which are already subject to conservation as National Park. These areas, together with undisturbed areas of State Forest proposed as part of the approximately 40,000 hectare Gardens of Stone Stage 2 area will continue to provide significant tourism opportunities for future investment. The disturbance of a 50 hectare area (approximately 0.00125%) on the western extremities of the proposed Gardens of Stone Stage 2 area will have negligible impacts on tourism opportunities associated with the 'Gardens of Stone' and will not have a significant impact on the conservation value of the broader area; particularly given the immediate area is already disturbed by open cut mining.

As discussed above, the Southern Extension Project includes the rehabilitation of both the existing open cut disturbance areas and the Southern Extension Area. Rehabilitated areas will be revegetated with vegetation communities similar to those existing pre mining disturbance. Once rehabilitated, the Southern Extension Area (and the Invincible Open Cut) will not have any impact on the long term conservation values of the proposed broader Gardens of Stone Stage 2 Area or 7800 hectare Baal Bone and Long Swamp proposed SCA area.

In support of my objection, I am enclosing copies of extensive and comprehensive texts, "The Gardens of Stone National Park and beyond, Books 1 to 8 that I and my co-authors Brian Fox and Yuri Bolotin have written regarding this World Heritage sensitive geo diverse and bio diverse area. The application should be thrown out and the entire Ben Bullen State Forest be immediately gazetted as a part of the Gardens of Stone National Park as per the Colong Foundation for Wilderness Stage 2 proposal.

The Gardens of Stone National Park is located approximately 9 km to the north of the Southern Extension Area. The Gardens of Stone Stage 2 proposal put forward by the Colong Foundation for Wilderness, Blue Mountains Conservation Society and The Colo Committee proposes the reservation of the area of Ben Bullen State Forest that the Southern Extension Project is located within as a State Conservation Area. This proposal was lodged in October 2005 but has not been formally adopted by the NSW Government. Should the area be declared, mining would be still permissible in this area in accordance with both the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) and the NPW Act.

As discussed above, the Southern Extension Project has been designed to avoid direct impacts on the pagodas and higher biodiversity value areas associated with the pagoda and escarpment terrain features. Residual biodiversity impacts are proposed to be offset in accordance with the NSW FBA offset policy.

The Southern Extension Project also includes the rehabilitation of both the existing open cut disturbance areas and the Southern Extension Area. Rehabilitated areas will be revegetated with vegetation communities similar to those existing pre mining disturbance. Once rehabilitated, the Southern Extension Area (and the Invincible Open Cut) will not have any impact on the long term conservation values of the proposed broader Gardens of Stone Stage 2 Area or 7800 hectare Baal Bone and Long Swamp proposed SCA area.

I want to see no more of the public lands of Ben Bullen State Forest permanently destroyed by coal mining. These limited areas of conservation significance should be protected for all time, rather than destroyed for short term mining gains. The huge amount of existing rehabilitated mining areas show that these mining companies will not voluntarily do the right thing, and will get away with doing nothing if they are allowed to by the government. If you want to create jobs, hire a lot of workers to properly fix up the existing huge mess.

I recently completed a 3 day bushwalk in this area. I spend a lot of time looking at overseas bushwalking areas. This area is far more special than many of the overseas sites which lure tourists and their money from over the world. It should not be degraded by further mining.

The Southern Extension Project includes the rehabilitation of both the existing open cut disturbance areas and the Southern Extension Area. Rehabilitated areas will be revegetated with vegetation communities similar to those existing pre mining disturbance. If approved, implementation of rehabilitation commitments identified in the EA will be a commitment under both the Project Approval for Invincible and the Invincible Mining Leases. The DRE currently hold security to cover the rehabilitation commitments in relation to the existing Invincible Mining Leases. This security amount will be required to be reviewed and updated as part of the Mining Operations Plan approval process for the Southern Extension Project to ensure that DRE holds sufficient security to cover the rehabilitation obligations.

Substantial rehabilitation efforts have already been undertaken at Invincible. The existing rehabilitation strategies employed at Invincible have largely been successful to date in meeting the rehabilitation plan which is approved and managed by DRE. These practices will be applied to the Southern Extension Project with appropriate modifications as necessary. To reinforce this point, when conducting interviews with local residents for the social impact and opportunity assessment one of the responses was "*Continue rehab at Cullen Valley, we can already see the improvement from early seeding."*

Consistent with existing rehabilitation commitments, the Southern Extension Project does not include any final voids in the final landform and reshaped areas will be revegetated with vegetation communities similar to those existing pre mining disturbance. Forestry NSW, as the landholder, has reviewed the rehabilitation strategy and does not object to the plans that have been put forward in this regard.

The rehabilitation of the existing disturbance area will be more efficiently achieved through the Southern Extension Project and, as discussed in Section 3.7.1.1 of the EA, the Southern Extension Project will avoid the disturbance of some areas of existing rehabilitation that would be required if the Southern Extension Project is not approved. Accordingly, the Southern Extension Project is likely to result in far more timely remediation and revegetation of existing disturbance areas than is likely to occur under existing approved operations.

Once rehabilitated, the Southern Extension Area (and the existing Invincible Open Cut) will not have any impact on the long term conservation values of the proposed Gardens of Stone Stage 2 Area or 7800 hectare Baal Bone and Long Swamp proposed SCA area.

This region carries international natural heritage significance – as its World Heritage status implies. The land around the Cullen Bullen region is an integral part of the geology (some would say a gem in the region's geology) and ecology of the Greater Blue Mountains region. This needs protection in its own right. It would also be fitting to not have mines causing unpleasant scars in visually dominant parts of this region because of its World Heritage significance.

This whole area is of National and even World Heritage significance and upmost protection is needed and the area has major international tourist's potential! Any mining proposal in this sensitive area is just shear madness.

The Gardens of Stone region in the Western Blue Mountains is a sensitive area of unique natural heritage, including landscapes and plant communities that cannot be replaced or compensated for if they are destroyed by open cut mining.

The Southern Extension Area is located approximately 9 kilometres to the south of the closest part of the Greater Blue Mountains World Heritage Area. The Southern Extension Project will not reduce the buffer area associated with the world heritage area as Ben Bullen Colliery and the existing Invincible open cut mining area are both located between the Southern Extension Area and the closest part of the world heritage area. While the Ben Bullen State Forest area has been proposed as a State Conservation Area by several conservation groups, there is no proposal to extend the World Heritage Area to the Ben Bullen State Forest Area

As discussed above, once rehabilitated, the Southern Extension Area (and the existing Invincible Open Cut) will not have any impact on the long term conservation values of the proposed broader Gardens of Stone Stage 2 Area or 7800 hectare Baal Bone and Long Swamp proposed SCA area.

The region in question also lies within the proposed Gardens of Stone Proposal Stage 2 (GoS Stage 2) – the last remaining non-protected area in conservationist Myles Dunphy's seminal and visionary outline for protection of the natural state of this region in 1932. The people and governments have acknowledged his insights by progressively subsequently placing all his proposed areas under conservation protections – except as yet the GoS Stage 2 area. This area has been proposed to be protected as a State Conservation Area (SCA) – in part to strike a possible industry / conservation compromise with the underground mining that goes on in other locations in this region – providing surface impacts can be kept to an acceptable level (and even these have been a significant challenge to achieve with underground mining operations).

The Gardens of Stone Stage 2 proposal put forward by the Colong Foundation for Wilderness, Blue Mountains Conservation Society and The Colo Committee proposes the reservation of the area of Ben Bullen State Forest that the Southern Extension Project is located within as a State Conservation Area. This proposal was lodged in October 2005 but has not been formally adopted by the NSW Government. Should the area be declared a State Conservation Area, mining would be still permissible in this area in accordance with both the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) and the NPW Act.

As discussed above, the Southern Extension Project has been designed to avoid direct impacts on the pagodas and higher biodiversity value areas associated with the pagoda and escarpment terrain features. Residual biodiversity impacts are proposed to be offset in accordance with the NSW FBA offset policy.

The Southern Extension Project also includes the rehabilitation of both the existing open cut disturbance areas and the Southern Extension Area. Rehabilitated areas will be revegetated with vegetation communities similar to those existing pre mining disturbance. Once rehabilitated, the Southern Extension Area (and the Invincible Open Cut) will not have any impact on the long term conservation values of the proposed broader Gardens of Stone Stage 2 Area or 7800 hectare Baal Bone and Long Swamp proposed SCA area.

As an ecologist, a bush walker and as one concerned about the ecological and tourism future of New South Wales I object to the proposed modification of the Invincible coal mine. The long term value of this area for protection of endangered ecosystems, an international standard landscape and hence an international tourist destination far outweighs the short term benefit an open cut mine would bring.

The landscape of pagodas in the Ben Bullen area is outstanding and the surrounding woodlands are an integral part of this amazing ecosystem and landscape. The woodlands and pagodas must not be destroyed.

The current proposal will adversely impact on the woodland as that sit below the sandstone pagoda geo/ecosystems that comprise an important and special natural environment. This area has been previously endorsed for protection by the Office of Environment and Heritage as being of high conservation value. The forests above, below and around the pagodas are integral parts of this ecosystem and need to be protected.

Castlereagh Coal has located and designed the Southern Extension Project to avoid and minimise potential impacts on biodiversity values. Key site selection and planning phase avoidance measures include:

- The Southern Extension Project does not include any highwall mining or other underground mining and will not have any subsidence impacts that may affect the pagodas and associate habitat values.

- Locating the mining area to the south of Invincible, which avoids direct impacts on the steep valleys between the pagoda formations located to the northeast of the Southern Extension Area, previously identified as providing a diverse range of vegetation communities and rocky habitat features in close proximity to pagoda structures for key species, including the broad-headed snake.

- The pagodas located directly to the east of the Southern Extension Area are typically smaller in scale and are associated with much drier vegetation communities than the more significant terrain features associated with the more northerly pagodas.

- The area to the south of Invincible represents an area of relatively homogenous vegetation types and relatively low threatened species diversity and habitats compared to other areas of vegetation in proximity to Invincible.

- The limit of disturbance associated with mining was initially set back at least 300 m from all pagoda formations. The setback from the nearest pagoda was reduced to approximately 210 m following further investigations which identified that the appropriate microhabitat requirements, exfoliated slabs and crevices, required by the species were generally absent or sparse at this and other pagodas located in proximity to the Southern Extension Area.

The ecological assessment of the Southern Extension Project was undertaken in accordance with the FBA which is an approved pathway for major projects. OEH has reviewed the BAR and did not have any merit issues with the application of the FBA to the Southern Extension Project. The field work undertaken as part of the ecological assessment was done during appropriate seasons to detect the threatened species known or likely to occur within the Southern Extension Project Area in accordance with the OEH Threatened Species Profile Database (TSPD).

The BAR that was prepared and exhibited outlines the various environmental attributes used in the BBCC to assess the Southern Extension Projects potential impact on biodiversity values. The BBCC uses landscape features, regional and local connectivity, patch size, percentage native vegetation cover and vegetation condition to determine the Landscape Value Score of the impact area which becomes a multiplier when determining the credits required to offset the impacts of a project. All landscape information entered into the BBCC for the Southern Extension Project is specific to the Southern Extension Project Area and in accordance with the requirements of the FBA.

The credits generated by the impacts on the Southern Extension Area are therefore reflective of the landscape feature of the area, the vegetation communities occurring in the area and the flora and fauna species occupying the area.

3.3 Ecology

3.3.1 Agency Submissions

3.3.1.1 OEH

Adequacy of Vegetation Survey

Recommendation
1. Additional plot data for CW263 should be collected. If this is not possible, the values of the plot closest to benchmark should be used in the BioBanking calculator.
The BioBanking calculator requires three plots to be sampled in the vegetation type CW263. The BAR indicates that only two plots were sampled due to the remapping of an area of CW263 containing the third plot being remapped as CW117. This deficiency has been compensated for by using the mean value of each of the site values of the other two plots. OEH recommends that additional plot data is collected however, if this is not possible, the values of the plot closest to benchmark should be entered into the credit calculator.

As a point of clarification the plot deficiency was associated with CW117, as identified in Table 2.2 of the BAR rather than CW263.

As part of the calculator assessment undertaken for the BAR, Umwelt compared both the mean and data closest to (Q4) and furthest from (Q1) the benchmark for CW117 in relation to the credits generated by the BBCC. Using the mean biometric values collected in plot-based surveys on site generated 542 credits whereas using the data closest to benchmark (Q4) yielded 510 credits. Using the data furthest from the benchmark (Q1) yielded the same credits as the mean data, 542. In this case, in the absence of sufficient site specific data to meet the survey guidelines for CW117, the most conservative option was used, with mean values generating the highest number of credits in this case.

Therefore, based on this approach, there is no change to the number of credits which are required to adequately offset the impacts of the Southern Extension Project to CW117.

Capertee Stringybark (Eucalyptus cannonii)

Recommendation
2. Targeted systematic searches be conducted to determine the precise distribution and population size of E. cannonii across the Southern Extension Area.

Twenty four individuals of E. cannonii are reported to occur across five locations in the Southern Extension Area. Figure 2.1 provides details of flora survey locations and flora survey tracks. Table 2.4 indicates that the search effort for E. cannonii entailed general meandering searches. OEH has concerns that this survey effort is insufficient to detect all E. cannonii trees within the Project Area as there appears to be areas where survey has not been undertaken.

Descriptions of the vegetation communities provided in the BAR indicate that Narrow-leaved Stringybark (E. sparsifolia) is a co-dominant in both vegetation communities that occur in the Project Area while Blaxland's Stringybark (E. blaxlandii) occurs scattered throughout CW117. OEH officers visited the site on 24 October 2016 and confirmed that stringybark trees were common in the Southern Extension Area and are of the view that the survey methods described may not have detected all E. cannonii present in the area.

The offset credit requirement for E. cannonii is based on the number of individuals impacted by the development. It is therefore important that the survey effort be sufficiently robust to detect all E.cannonii trees occurring in the Project Area.

Prior to conducting field surveys a detailed literature review and data analysis was undertaken to identify the ecological values and specific threatened species known to occur within the Southern Extension Area and the local area more generally. Substantial data had been previously collected within the immediate area, including the Southern Extension Project Area, as part of the Ecological Assessment for the Coalpac Consolidation Project (Cumberland Ecology 2012). This assessment identified Capertee Stringybark *(Eucalyptus cannonii)* within the Southern Extension Area that is the subject of this assessment and therefore targeted surveys for the species were undertaken to determine the extent of the species within the Southern Extension Area.

Surveys for Capertee Stringybark *(Eucalyptus cannonii)* were undertaken over 14 days and five survey periods:

- 25 to 26 August 2015
- 11 to 13 November 2015
- 11 to 15 January 2016
- 7 to 8 April 2016
- 18 to 19 April 2016.

The majority of the floristic sampling and targeted searches were undertaken between the 11-15 January 2016 however additional plot work and targeted searches were completed on the 7-8 and 18-10 April 2016.

A systematic approach to targeted threatened plant survey of Capertee stringybark was conducted in accordance with the *NSW Guide to Surveying Threatened Plants* (OEH, 2016) whereby the majority of the searches were conducted when this species is known to flower (between January and April) to maximise the likelihood of identification. A total of 13 plots and in excess of 30 kilometres of targeted or opportunistic walking surveys were undertaken within the Southern Extension Area (approximately 50 hectares in size) throughout the January and April 2016 surveys. Other survey periods identified above included opportunistic observations and the collection of voucher specimens. This survey effort satisfies the requirement of searching a large portion of area for potential habitat of Capertee stringybark.

Whilst other stringybark species were recorded within the Southern Extension Area, the Capertee stringybark differs in appearance (both the colour of the bark and growth form) and has distinctively different fruiting bodies compared to narrow-leaved stringybark *(E. sparsifolia)* and Blaxland's stringybark (*E. blaxlandii*) making it relatively distinctive (when compared to the abovementioned species) and identifiable in the field. Issues associated with the identification of this species arise when another closely related stringybark species (*E. macrorhyncha*) also occurs. This was not the case within the Southern Extension Area where all candidate trees were sampled (voucher specimens) and further interrogation post surveys concluded that all specimens were Capertee stringybark.

Considering the above, the surveys conducted within the Southern Extension Area are considered sufficiently rigorous to accurately identify and map the presence of Capertee stringybark within the Southern Extension Area and complies with the *NSW Guide to Surveying Threatened Plants* (OEH, 2016)

Bathurst Copper Butterfly (Paralucia spinifera)

Recommendation

3. Targeted surveys from late August to late November be conducted to determine whether Bathurst Copper Butterflies are present in the Southern Extension Area.

The BAR (Table 3.13) indicates that targeted surveys were conducted for the Bathurst Copper Butterfly however no details of such surveys are provided. The BAR concludes that this species is not likely to occur in the Southern Extension Area, and thus not be impacted, as its host plant Bursaria spinosa occurs in small patches and is "distributed sporadically". The BAR acknowledges that the closest record of the species 5 kilometres to the south-east. This is within the dispersal distance for the species. On a site visit on 24 October 2016, OEH officers identified some Bursaria patches that were of sufficient size and suitably located, i.e. in patches receiving periods of direct sunlight, to potentially support a population of Bathurst Copper Butterflies. No butterflies were observed on 24 October although the peak period of activity for adults is September.

The butterflies emerge between August (later at higher altitude sites) and November, with a two-week peak of activity in September. Surveys are required throughout the length of the flying season as the period of activity can be influenced by site variables such as the aspect of the site. OEH recommends surveys are undertaken from late August to late November. Surveys will be required throughout this timeframe as individual butterflies may appear for periods as short as two weeks.

Targeted surveys for the Bathurst copper butterfly were undertaken during the fauna surveys between 11 and 13 November 2015 and the presence of potential habitat for this species was assessed further in January 2016. To supplement these previous surveys and in addition to the inspection by OEH and Umwelt on 24 October 2016, Umwelt ecologists undertook additional targeted surveys for the butterfly between 26 and 28 October 2016. These surveys were undertaken in appropriate weather conditions (still and sunny) and during the period when the butterflies are on the wing. The surveys comprised two ecologists searching areas of potential habitat that were identified by OEH. No Bathurst copper butterflies were recorded during the OEH site inspection or over the three day targeted survey undertaken by Umwelt. As such, the conclusion drawn within the BAR that this species is not likely to occur in the Southern Extension Area remains unchanged.

As identified in Table 6.40 of the EA, the Seed mix for the Tableland Gully Ribbon Gum-Blackwood-Apple Box Forest community includes *Bursaria spinosa*. This is the target community for the area where *Bursaria spinosa* has been observed in the Southern Extension Area (refer to Figure 6.34 in the EA). As the Bathurst copper butterfly prefers patches of *Bursaria spinosa* which receive direct sunlight, the MOP/RMP will include a requirement that any infill planting in the areas targeted for Tableland Gully Ribbon Gum-Blackwood-Apple Box Forest include a higher percentage of *Bursaria* in the seed mix and lower canopy species seed density. The approach to revegetation should maintain or increase the extent of *Bursaria* in the revegetated landscape and increase the amount of potential habitat in the area should the species increase its range to this area.

Threatened Species Requiring Offset

Recommendation

5. Remove reference to ecosystem-species credits in Section 5.3

6. Table 5.1, Ecosystem-credit species requiring offset, is not required.

Section 5.3 indicates that a number of ecosystem-credit species require offsets as part of the Project.

Ecosystem species do not require offsetting. Impacted vegetation types are offset with ecosystem credits being calculated based on the threatened species that can be reliably predicted to occur within a PCT. The BioBanking calculator uses the highest threatened species offset multiplier to determine the credit requirements for impacted vegetation types.

The Biodiversity Credit Report (Appendix E), and Section 6 of the BAR, correctly summarises the credit requirements of the Project.

Table 5.1 is not required.

The above recommendations by OEH are noted and have been considered in the Biodiversity Offset Strategy for the Southern Extension Project.

3.3.1.2 DP&E

Provide information about the timing and extent of targeted surveys for the Bathurst Copper Butterfly and Broad-Headed Snake.

Targeted searches for broad-headed snake were undertaken over a 5 day period, including nocturnal searches, in November 2015 and April 2016 within the Southern Extension Area, which is consistent with relevant guidelines. The searches targeted the identification of potential rocky habitat and involved traversing rocky areas and searching in cracks, crevices and under rocks in the warmest parts of the day along with targeted nocturnal survey as recommended in the *Survey Guidelines for Australia's Threatened Reptiles* (DSEWPC 2011). The hollow-bearing trees within the Southern Extension Area that may provide potential summer habitat for this species were mapped in an additional visit to the Southern Extension Area in April 2016. In excess of 20 kilometres of searching by foot was conducted across the five days of survey for the broad-headed snake, of which approximately 10 kilometres were walked during the day.

Surveys for the Bathurst copper butterfly coincided with the diurnal searches for the broad-headed snake from the 11-13th November 2015 and habitat for this species was separately assessed in January 2016. Approximately 10 kilometres of walking surveys were undertaken across the Southern Extension Area searching for this species. In addition to this, an additional four days of surveys within the known active period for the butterfly were undertaken post EIS submission, including during the site inspection with OEH. The additional survey dates were 24, 26, 27 and 28 October 2016.

The detailed field surveys undertaken for the Southern Extension Project are considered adequate to determine the presence and/or extent of habitat for the broad-headed snake and Bathurst copper butterfly within the Southern Extension Area.

Provide an update on the progress of the Biodiversity Offset Strategy for the project.

A Biodiversity Offset Strategy is currently in preparation to offset the identified impacts of the Southern Extension Project on biodiversity values and will comprise a land-based offset (BioBank site) and a range of supplementary measures to offset those values that cannot be adequately offset through the retirement of credits in the proposed land-based offset, in accordance with the FBA and as described in the BAR. **Section 3.4** of this Report includes a description of the proposed Hillcroft BioBank Site which addresses the offsetting requirements for all species and vegetation communities identified in the BAR other than broad-headed snake.

Section 3.4 also includes discussion of supplementary measures proposed to meet offsetting requirements for the predicted residual impacts to potential broad-headed snake habitat identified in the BAR consistent with the processes outlined in the FBA.

3.3.1.3 EPA

There has been no investigation of the aquatic ecology in Cullen Creek despite the proposal to discharge an estimated 2,121 ML of mine water to Cullen Creek in the first year of mine operation. This is considered to be a significant deficiency in the EA. There is little foundation for the statement (Umwelt 2016) that 'Water quality monitoring results indicate negligible impact on downstream systems'. Based on the limited groundwater data that is available (which is high in Nickel and Zinc), there is significant potential for adverse toxicological effects on the aquatic biota of Cullen Creek if untreated mine water is discharged to the environment.

There has been no investigation of the aquatic ecology in the receiving waters of Cullen Creek. A proper assessment of the potential impacts of the project on aquatic ecology is required before any discharge is authorised.

Additional information in relation to aquatic impacts associated with the Southern Extension Project is discussed in the Response to Submissions Report B associated with the surface water and groundwater issues raised in relation to the Southern Extension Project.

3.3.2 Interest Group Submissions

3.3.2.1 Blue Mountains Conservation Society

The pagoda land system has three well-defined land units: the Cullen Plateau Unit, the Ben Bullen Range Pagoda Unit and the Tablelands Grassy Woodland Complex Unit which characterise the landform, soil, geology and vegetation attributes of the system. The grassy tableland woodlands lie on Permian bedrock that supply the nutrients for native vegetation that supports the herbivore and insect prey that allows bats, birds and other fauna to roost and nest in the adjoining pagoda areas of lower fertility. The proposed IEP, which is covered by tableland woodlands on slopes, is an integral part of this pagoda land system.

The IEP EA ignores the importance of the pagoda land system and only refers to the pagodas. This is a serious omission in the EA and demonstrates no understanding of the conservation values of the western part of BBSF as recognised by two PACs, Department of Planning and the Office of Environment. This significantly devalues the conservation importance of the IEP land. It is an integral part of the pagoda land system and needs to be preserved along with the actual pagodas.

The landform comprises a complex arrangement of habitats including rock faces, rocky steep slopes and forested slopes and valley floors dominated by various eucalypt vegetation communities. All components contribute to the overall significance of the pagoda landform complex and any impacts in one component of the complex have the potential to compromise the significance of the complex as a whole.

None of the vegetation communities occurring within the Southern Extension Area are listed as a threatened ecological community under the NSW *Threatened Species Conservation Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The vegetation communities which would be impacted by the Southern Extension Project are not limited to the Southern Extension Area or the area around Invincible and is found in other areas of Ben Bullen State Forest and surrounding areas. As discussed above and in Section 3.7 of the EA, the Southern Extension Project has avoided other areas of these communities which are present to the north and east of the existing Invincible Open Cut disturbance area. Further, the rehabilitation strategy for the broader Invincible disturbance area aims to recreate these communities in the rehabilitated landscape (refer to Section 6.18 of the EA).

The BAR (Appendix 6 of the EA) that was prepared and exhibited outlines the various environmental attributes used in the BBCC to assess the impact on biodiversity values. The BBCC uses landscape features, regional and local connectivity, patch size, percentage native vegetation cover and vegetation condition to determine the Landscape Value Score of the impact area which becomes a multiplier when determining the credits required to offset the impacts of a project. All landscape information entered into the BBCC for the Southern Extension Project is specific to the Southern Extension Project Area and in accordance with the requirements of the BAR.

The credits generated by the impacts of the Southern Extension Project therefore include consideration of the landscape feature of the area, the vegetation communities occurring in the area and the flora and fauna species occupying the area.

3.3.2.2 The Colong Foundation for Wilderness Ltd

The Ben Bullen Pagoda Land System has three well-defined land units: the Cullen Plateau Unit; the Ben Bullen Range Pagoda Unit; and the Tablelands Grassy Woodland Complex Unit all will be impacted by this proposal. Scattered platy and less common smooth pagodas occur throughout the Ben Bullen Range Pagoda Unit, particularly along the more gently sloping spurs that radiate from the Ben Bullen Range. The Tablelands Grassy Woodlands Complex comprises woodland types from dry woodland of Inland Scribbly Gum and Capertee Stringybark to alluvial flats dominated by Ribbon Gum. The Cullen Plateau Unit only occurs in small areas and consists of Inland Scribbly Gum and Narrow-leaved Stringybark. The Ben Bullen Pagoda land system is very limited in extent. This land system can only be properly understood and appreciated where its three component land units occur together.

This issue is addressed in the response to the submissions by the Blue Mountains Conservation Society discussed in **Section 3.3.2.1**.

3.3.2.3 The Colo Committee

The Ben Bullen pagoda landscape is unique, irreplaceable and covers a small area of which the woodlands affected by the proposed Invincible open-cut mining operation is a key part. It is a key part of the only area where grassy tableland woodlands adjoins pagodas. This woodland is an integral part of the pagoda landscape and its loss will destroy this beautiful pagoda landscape. The pagoda rock features cannot be considered in isolation from the surrounding woodlands that are proposed to be mined. The Planning Assessment Commission correctly observed in 2012 and confirmed 2014 that the pagoda landscape consists of the pagodas and woodlands below them.

This issue is addressed in the response to the submissions by the Blue Mountains Conservation Society discussed in **Section 3.3.2.1**.

3.3.3 Community Submissions

Ecology issues were raised in 283 community submissions. The issues raised and relevant response is provided below.

3.3.3.1 Form Letters

The Ben Bullen pagoda landscape is unique, irreplaceable and covers a small area of which the woodlands affected by the proposed Invincible open-cut mining operation is a key part. It is a key part of the only area where grassy tableland woodlands adjoins pagodas. This woodland is an integral part of the pagoda landscape and its loss will destroy this beautiful pagoda landscape.

The pagoda rock features cannot be considered in isolation from the surrounding woodlands that are proposed to be mined. The Planning Assessment Commission correctly observed in 2012 and confirmed 2014 that the pagoda landscape consists of the pagodas and woodlands below them.

This issue is addressed in the response to the submissions by the Blue Mountains Conservation Society discussed in **Section 3.3.2.1**.

3.3.3.2 Other Community Submissions

In addition to the ecology issues raised in the community form letters (refer to **Section 3.1.3**), a number of additional ecology issues were raised in community submissions. The issues raised and relevant response is provided below.

"This is one of the most biodiverse areas for ground Orchids in the Lithgow LGA, if not NSW. There are two Spider Orchids in flower in the proposed open-cut area that have not been recorded in the LGA since 1885 and 1922! Open-cut coal mining is not compatible with such a biodiverse, scenic and sensitive part of the Gardens of Stone region. The people have made this clear on numerous occasions since the Coalpac Consolidation proposal was first lodged in 201 (edit - actual year not recorded in letter)."

"Eight vulnerable fauna species and only one vulnerable flora species were recorded by the proponent's consultants in the 50 hectares proposed for open-cut mining. The proposal area also qualifies as habitat for the broad-headed snake and foraging habitat for the large-eared pied bat. The area is recognised as having high floristic diversity yet surprisingly few threatened plants were identified. Flora, such as ground orchids, have been missed. These results are at odds with independent plant surveys around this mine. In October on one short inspection four orchids were identified by amateur botanists from the Lithgow Environment Group - Pterostylis bicolor, Caladenia tentaculata, Caladenia fitzgeraldii and Calochilus campestris. Even if these surveys did identify all threatened plant species, the subsequent calculation of offsets could not compensate for the significant damage that would be caused to the irreplaceable Ben Bullen Pagoda Land System."

The ecological assessment of the Southern Extension Project was undertaken in accordance with the FBA which is an approved pathway for major projects. OEH has reviewed the BAR and did not have any merit issues with the application of the FBA to the Southern Extension Project. The field work undertaken as part of the ecological assessment was done at the appropriate time to detect the threatened species known or likely to occur within the Southern Extension Area in accordance with the OEH Threatened Species Profile Database (TSPD).

Table 3.13 in the BAR outlines the threatened species predicted to occur by the BBCC or considered to have the potential to occur based on a review of the OEH Atlas of NSW Wildlife for the CMA sub-region. No threatened orchids were identified in this process. None of the orchids mentioned in the response above, *Pterostylis bicolor, Caladenia tentaculata, Caladenia fitzgeraldii* or *Calochilus campestris* are listed as being threatened under NSW or Commonwealth legislation and their occurrence within the Southern Extension Project Area does not affect the results of the BBCC.

3.4 Offsets

3.4.1 Agency Submissions

3.4.1.1 OEH

A detailed offset strategy should be provided prior to the approval of the impact so that its likely effectiveness in maintaining or improving biodiversity can be assessed. The offset strategy should:

Propose an offset which is consistent with the NSW Biodiversity Offsets Policy for Major Projects.

While the credit requirement for offsetting has been calculated no Biodiversity Offset Strategy (BOS) has been provided. The FBA states (Section 11.1.1.2) that the BOS should be submitted with the BAR as part of the EIS. No explanation has been provided as to why a BOS has not been provided.

Offset commitments should be demonstrated prior to the approval of the impact.

The Biodiversity Credit Report (Appendix E), and Section 6 of the BAR, correctly summarises the credit requirements of the Project.

As outlined in Section 6.4.5 of the EA, Castlereagh Coal is committed to delivering a Biodiversity Offset Strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the Southern Extension Project. The assessment completed for the EA (refer to Appendix 6 of the EA) identified the required ecosystem and species credits required for the Southern Extension Project in accordance with relevant government policy and guidelines. As detailed in the EA, fulfilling the offset requirements under the NSW *Biodiversity Offset Policy for Major Projects* can be undertaken using a combination of the following strategies:

- Securing required credits through an open credit market, off site
- Offsetting through a land based offset site secured by a BioBank Agreement
- If suitable offset are unavailable, contributing funds to supplementary measures in accordance with relevant conservation or recovery actions relevant to the species
- Contributing to the offsets fund.

At the time of exhibiting the EA, Castlereagh Coal was actively investigating a number of land based offset sites in the vicinity of Invincible however was unable to publically disclose these at that time. Since the exhibition of the EA, further survey and investigations have occurred and Castlereagh Coal has secured a land based offset site, known as the Hillcroft landholding, to provide the required credits to offset the identified unavoidable impacts associated with the Southern Extension Project. Further details of the Hillcroft landholding, and approach to the Biodiversity Offset Strategy are provided in the following sections. Further development of the Biodiversity Offset Strategy will be undertaken in accordance with relevant conditions of the modified project approval, if granted, for the Southern Extension Project.

Hillcroft BioBank Site

The proposed Hillcroft BioBank Site is approximately 368 hectares in area and located approximately 5 kilometres north west of the Southern Extension Area (refer to **Figure 3.1**). Detailed plot-based floristic sampling in accordance with BBAM 2014 was undertaken within the Hillcroft BioBank Site in April 2016. These surveys were undertaken to enable the calculation of the ecosystem credit yield of the site to offset the identified impacts of the Southern Extension Project.

Table 3.1 below provides a summary of the proposed Hillcroft BioBank Site and **Figure 3.1** shows the location of the BioBank Site in relation to the Southern Extension Area.

Table 3.1 Proposed Hillcroft BioBank Site Details

Offset Site Details	
Size	368 hectares
Location	Cullen Bullen
IBRA Bioregion	South Eastern Highlands
IBRA Subregion	Capertee Uplands
Mitchell Landscape	Capertee Plateau
Rivers, Streams, Estuaries	6th Order Stream - Williwa Creek
Other Biodiversity Features	Known habitat for squirrel glider, Capertee stringybark and Clandulla Geebung

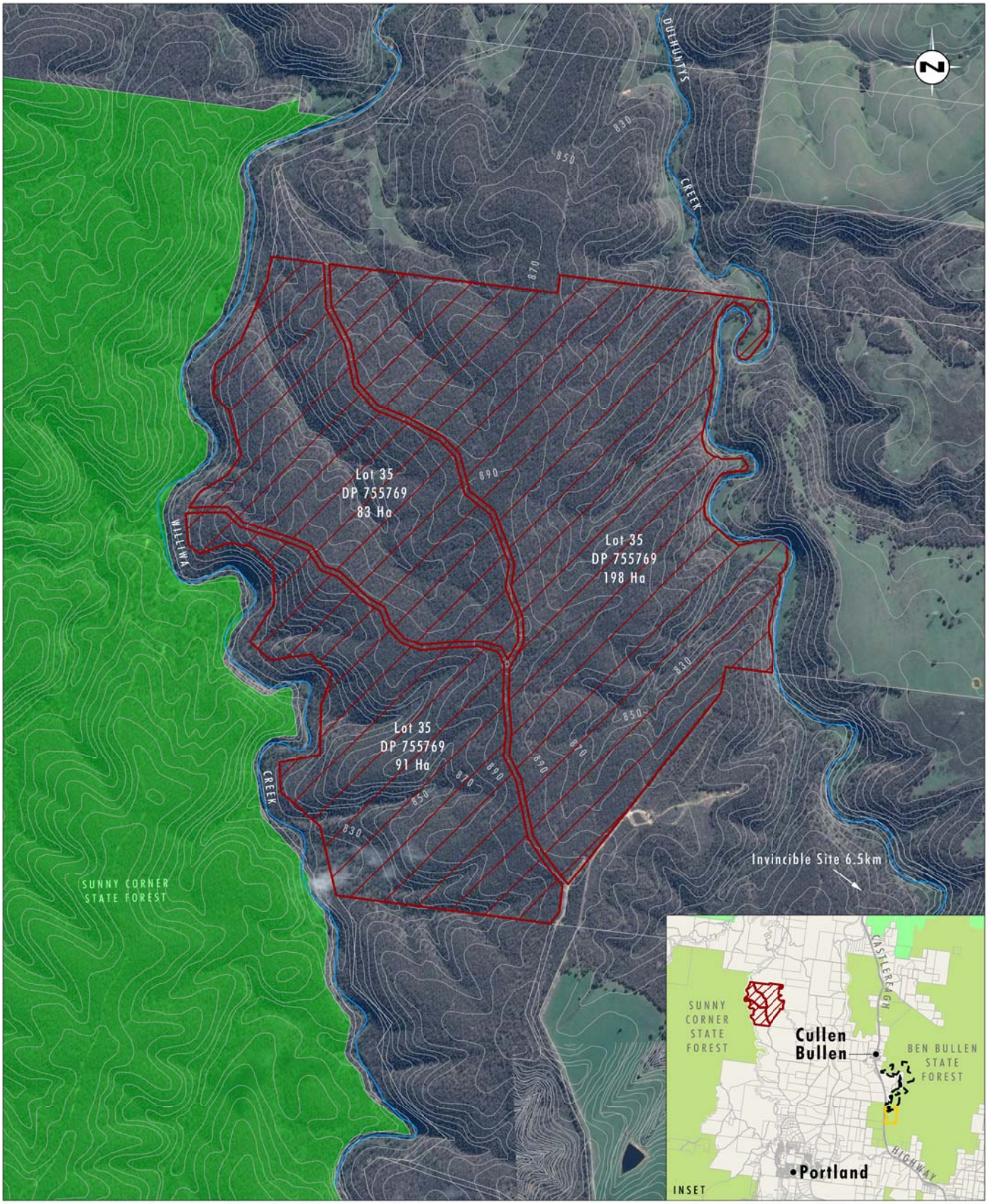


Image Source: Google Earth - CNES / Astrium (May 2014)
Data Source: LPI (2009)
Note: Contour Interval 20m

0 0.25 0.5 1.0km
MAIN 1:20 000
0 3.75 7.5 15km
INSET 1:300 000

Legend

- Existing Invincible Approved Mining Disturbance Area
- Proposed Invincible Southern Extension Area
- Proposed Hillcroft BioBank Site
- State Forest

FIGURE 3.1

Proposed Hillcroft BioBank Site

Ecosystem Credits Generated

Table 3.2 below outlines the BVTs and site value scores created at the proposed Hillcroft BioBank Site. **Figure 3.2** shows the vegetation communities at the Hillcroft BioBank Site

Table 3.2 Biometric Vegetation Types at Proposed Hillcroft BioBank Site and the Ecosystem Credits Generated

Biometric Vegetation Type	Vegetation Zone	Area in Hillcroft Offset Site	Likely Landscape Value	Current Site Value Score	Future Site Value Score	Highest Threatened Species Multiplier	Likely Ecosystem Credits Created
CW117 - Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	1	22.82	27	70.31	89.58	3.0	305
CW117 - Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	2	105.32	27	70.31	86.11	3.0	1281
CW263 - Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes	3	239.90	27	81.25	100	3.0	3197

A comparison of the credits required to offset the impacts of the Southern Extension Project and credits generated at the proposed Hillcroft BioBank Site is provided in **Table 3.3** below:

Table 3.3 Credits Required to Offset the Impacts of the Southern Extension Project and Ecosystem Credits Generated by the Proposed Hillcroft BioBank Site

Biometric Vegetation Type	Credits Required	Likely Credits Generated (difference)
CW117 - Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion	542.0	1586 (1044)
CW263 - Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes	2893	3197 (304)

As identified in **Table 3.3** above, the ecosystem credits generated by the Hillcroft Offset Site are surplus to that required to offset the impacts of the Southern Extension Project.

Species Credits Generated

Currently, species credits have been generated for the squirrel glider (*Petaurus norfolcensis*) at the proposed Hillcroft BioBank Site. The species credit species relevant to the Southern Extension Project and the adequacy of the proposed Hillcroft BioBank Site to satisfy species credit requirements is described below.

Squirrel glider (Petaurus norfolcensis)

The squirrel glider (*Petaurus norfolcensis*) was recorded during targeted surveys from October to December 2016. Based on the habitat attributes of the Hillcroft Offset Site and being consistent with the FBA assessment, both CW117 and CW263 PCTs are considered habitat for this species with a total of 2613 credits generated. The 2613 credits generated are surplus to the 1047 generated by the impacts of the Southern Extension Project.

Capertee stringybark (Eucalyptus cannoni)

Targeted surveys for Capertee stringybark (*Eucalyptus cannoni*) confirmed the presence of the species within the proposed Hillcroft BioBank Site, however sufficient fruiting material was not located to determine the extent of the population within the site. Additional targeted surveys will be undertaken for the species during 2017 to determine the species population size. It is considered highly probable that the proposed Hillcroft BioBank site will provide sufficient Capertee stringybark (*Eucalyptus cannoni*) species-credits to offset the impacts of the Southern Extension Project.

Species credits for these species will be generated and retired in accordance with the FBA and as part of the final Biodiversity Offset Strategy to be developed in consultation with OEH and DPE.

Broad-headed snake *(Hoplocephalus bungaroides)*

The proposed Hillcroft BioBank Site does not provide habitat for the broad-headed snake (*Hoplocephalus bungaroides*). This species is highly cryptic and occupies a very specific habitat type that is likely to be difficult to find and acquire as a land based offset site as much of the habitat is within existing national park or state forest areas. Fulfilling offset requirements under the NSW *Biodiversity Offset Policy for Major Projects* will be undertaken using one or a combination of the following offset strategies:

- securing required credits through the open credit market, off site
- offsetting through a land-based offset site secured by a BioBank Agreement
- if suitable offsets are unavailable, contributing funds to supplementary measures in accordance with relevant conservation or recovery actions relevant to the species, and / or
- contributing to the Offsets Fund.

The *Approved Conservation Advice for Hoplocephalus bungaroides (broad-headed snake)* lists the following research priorities that will be investigated, in consultation with OEH, in order to determine supplementary measures that are appropriate for the species:

- More precisely assess ecological requirements, the summer life cycle, the type of use (obligatory versus facultative) of winter shelter sites and the relative impacts of threatening processes.
- Develop and validate a habitat model for the broad-headed snake.
- Investigate the influence of wildfire on the broad-headed snake and its main prey items, to clarify direct and indirect impacts of planned and natural fire.
- More precisely assess the species abundance and monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Investigate DNA-based or other approaches for the identification of individual and/or populations to provide a means for detecting and prosecuting illegal collection from the wild.

In the event that a land-based offset for the broad-headed snake (*Hoplocephalus bungaroides*) cannot be located and supplementary measure are approved by OEH, the calculation of the financial contribution of the supplementary measures will be undertaken in accordance with Appendix B of the *NSW Biodiversity Offsets Policy for Major Projects*.

The identification of a suitable offset for the broad-headed snake (*Hoplocephalus bungaroides*) will be undertaken in consultation with OEH and DPE.

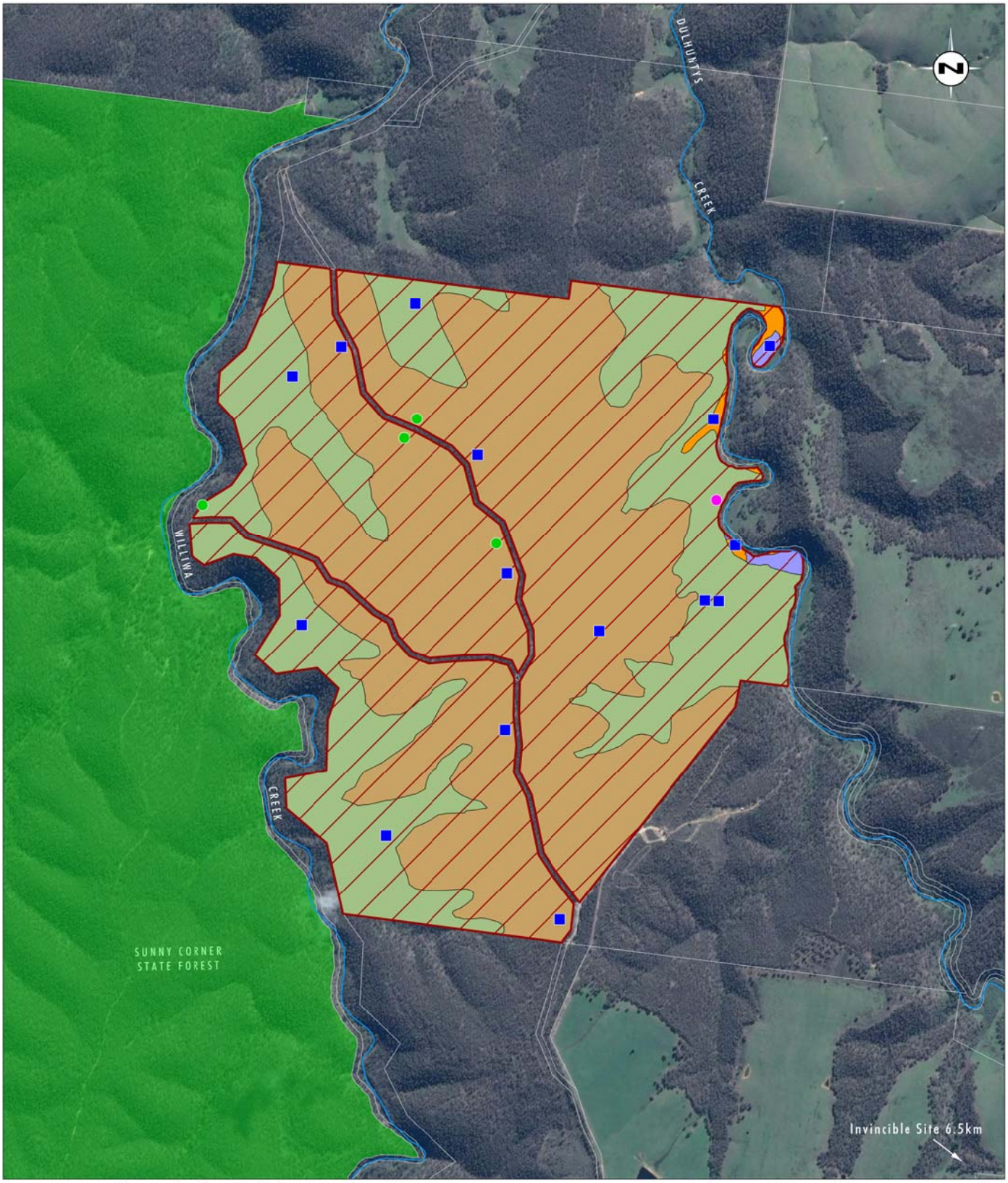


Image Source: Google Earth - CNES / Astrium (May 2014)
Data Source: LPI (2009)

0 0.25 0.5 1.0km
1:20 000

Legend

- Proposed Hillcroft BioBank Site
- CW117 - Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest in the north-western part (Yass to Orange) of the South Eastern Highlands Bioregion - Mod-Good_High
- CW196 - Snow Gum - Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion - Mod-Good
- CW206 - Wet tussock grasslands of cold air drainage areas of the tablelands - Mod - Good
- CW263 - Inland Scribbly Gum grassy open forest on hills in the Mudgee Region, NSW central western slopes - Mod-Good_High
- State Forest
- Plot Survey
- Squirrel Glider
- Potential *Eucalyptus Cannonii*

FIGURE 3.2

Proposed Hillcroft BioBank Site Vegetation Communities and Threatened Species

File Name (A4): R09/3622_138.dgn
20170217 11.39

3.4.1.2 DPI

The proponent should consult with the Department of Industry – Lands regarding possible synergies in bush fire management between the Invincible Coal Mine Biodiversity Offset Area and adjacent Crown land Lot 7314 DP 1142023.

The Invincible Coal Mine Biodiversity Offset Area is an existing commitment related to approved open cut operations. As part of the ongoing management of this area, Castlereagh Coal will consult with the Department of Industry – Lands in relation to management matters that are common to these adjacent landholdings.

3.4.2 Interest Group Submissions

3.4.2.1 The Colo Committee

The proposed biodiversity offsets cannot replace the unique Ben Bullen pagoda landscape.

The issues raised in relation to impacts on Ben Bullen and the pagoda landscape have been addressed in **Section 3.2**.

As discussed above, the NSW FBA has been designed to ensure that development in NSW is undertaken in a manner that conserves biodiversity. The FBA encourages impacts on biodiversity to be avoided but, where impacts are unavoidable, establishes a process for offsetting residual impacts.

Castlereagh Coal is committed to delivering a Biodiversity Offset Strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the Southern Extension Project. Details of the proposed Biodiversity Offset Strategy are discussed in **Section 3.4.1.1** above. The Biodiversity Offset Strategy will be further detailed and developed in consultation with OEH and DPE in accordance with the modified Project Approval, should approval be granted.

3.4.3 Community Submissions

Offsetting issues were raised in 284 community submissions. The issues raised and relevant response is provided below.

Biodiversity offsets can never compensate for the loss of this area – it is just too valuable.

The proposed biodiversity offsets for this area are not likely to replace the highly sensitive ecosystem in the amazingly beautiful Gardens of Stone.

The proposed biodiversity offsets will not replace the unique Ben Bullen pagoda landscape.

These submissions are substantially the same as submissions by the Colo Committee and are addressed in **Section 3.4.2.1** of the Response to Submissions Report.

3.5 Mine Closure and Rehabilitation

3.5.1 Agency Submissions

3.5.1.1 Roads and Maritime

Details of future decommissioning of the mining extension and management, including responsibilities for, ongoing risks.

Decommissioning activities associated with the Southern Extension Project will be identical to those of the current approved operations. A detailed mine closure plan will be developed as part of the closure process for the operations. The mine closure process is regulated by DRE, with the process well established to ensure that rehabilitation is adequately planned and implemented in accordance with DRE requirements. Notwithstanding, Castlereagh Coal will develop the mine closure plan in consultation with RMS and will include details of traffic impacts associated with decommissioning activities. It is envisaged that heavy vehicle movements associated with decommissioning activities will be less than during operations.

It is also noted that the pit area in the Southern Extension Area will be backfilled as part of rehabilitation of the site and no highwall will remain in pit area adjacent to the Castlereagh Highway. The emplacement of overburden against the highwall in this area will effectively eliminate any long term stability risks.

3.5.1.2 DP&E

Provide a material balance calculation to show how much material is available to rehabilitate the site and backfill all remaining voids.

Appendix 1 includes a dump balance for the Southern Extension Project that indicates that there is sufficient overburden available to backfill all voids.

3.5.1.3 DRE

Progressive rehabilitation of disturbed area should be a requirement of the activity approval.

As detailed in Section 3.5.9 and 6.18 of the EA, Castlereagh Coal will adopt a progressive approach to rehabilitation to ensure that completed areas are shaped and vegetated to provide a stable landform. It is also noted that activity approvals relate to exploration activities and are not required for operations that are carried out in accordance with a planning approval and mining lease.

Proponent to submit a Progressive Rehabilitation Proposal as part of Mining Operations Plan/Rehabilitation Management Plan outlining rehabilitation works to be undertaken during the term, including timeframes when activity will be undertaken. This should form part of a 'Statement of Commitments' for approval prior to commencement.

Rehabilitation of the proposed Southern Extension Area and all existing disturbance areas at Invincible (by reshaping mining areas to remove voids and revegetating the reshaped landform with locally endemic woodland and forest communities) is to be detailed in a new Mining Operations Plan (MOP)/Rehabilitation Management Plan (RMP) prepared in accordance with the Division's Guidelines

Noted.

Castlereagh Coal will update the Mining Operations Plan (MOP) and Rehabilitation Management Plan (RMP) to incorporate changes associated with the Southern Extension Project prior to recommencement of operations. The MOP/RMP will be prepared in accordance with the requirements of the modified project approval and any guidelines prepared by DRE.

3.5.2 Interest Group Submissions

3.5.2.1 Blue Mountains Conservation Society

Open cut mining will completely destroy the unique landscape the PAC said should be preserved. Rehabilitation will not restore this. If pagodas and cliffs are damaged, they cannot be patched up.

As detailed in **Sections 3.1** and **3.2**, the project design includes features to avoid impacts on pagoda features. Detailed geotechnical assessments have been undertaken using conservative blast criteria on the pagoda formations closest to the Southern Extension Area (refer to Section 6.8 of the EA) that have determined that there should be no impacts on the pagodas with these controls in place. Unlike previous proposals, the Southern Extension Project does not include highwalll mining and there will be no subsidence impacts from the Southern Extension Project.

The Rehabilitation Strategy detailed in Section 6.18 of the EA is designed to restore the rehabilitated areas to vegetation communities consistent with those which existed in the area pre mining disturbance. Based on current rehabilitation experience at Invincible, there is a high degree of confidence that the proposed revegetation strategies will be successful.

The detailed Rehabilitation Strategy will be documented in the MOP/RMP which must be approved by DRE prior to implementation. Annual monitoring and reporting of rehabilitation progress is required under the terms of the current Invincible Project Approval and mining leases. The rehabilitation strategies will be reviewed over the life of the Southern Extension Project to incorporate relevant research findings and any recommendations from the annual monitoring program.

The security held by DRE will also be required to be updated to reflect the rehabilitation commitments for the Southern Extension Project.

The EA exaggerates what rehabilitation can achieve. For instance, It says that rehabilitation "will return the majority of the Invincible site to native woodland and forest generally consistent with ecological communities that would have historically occurred in the area". The statement is qualified but it still overstates what has been shown can be done. The 2012 PAC concluded that "rehabilitation to mature woodland is unproven for open cut mines in NSW" "rehabilitation cannot restore the existing vegetation associations or ecological balance of the area". It cannot reproduce the existing land or soil profile; and it takes a long time to determine whether it has been successful.

The revegetation strategy is discussed in detail in Section 6.18 of the EA and includes consideration of recent research into mine site rehabilitation, including strategies to improve soil biodiversity. The rehabilitation strategy has been specifically designed to simulate natural succession patterns and include species that will improve the long term resilience of the communities created. The proximity of the areas to be rehabilitated to remnant vegetation in Ben Bullen State Forest also improves the likelihood of successful rehabilitation due to the ability for species to recolonise from adjoining vegetated areas. The rehabilitation strategies proposed for the Southern Extension Project build on the previous experience at Invincible and Cullen Valley which include successful revegetation of disturbed areas through aerial seeding. There is a high level of confidence that disturbed areas at Invincible will be successfully rehabilitated. Once rehabilitated, the Southern Extension Project and existing Invincible open cut will not have any impacts on the long term conservation values of the areas.

EA says that the IEP lands and the three current voids on the Invincible mine site will be re-landscaped within the life of the project. 24 Mining companies have made such claims before only to apply for further mining, therefore postponing the need to complete rehabilitation under the current approval. For instance this is what was proposed in the two Coalpac proposals which were rejected. The EA does foreshadow the Cullen Valley may be re-opened. Policing rehabilitation is outside the control from the consent conditions and instead managed in a less visible process by the Department of Resources and Energy (DRE). This process did not prevent Coalpac from being so far behind with its rehabilitation. Orphan voids are a common legacy of mining in Australia and become a financial liability to governments and, therefore, to citizens.

The operations at Invincible are currently on care and maintenance and are managed in accordance with the current *Invincible Colliery Care and Maintenance Mining Operations Plan* (MOP) (Sedgman 2016), which was approved by the DRE in 2016. The MOP covers a two year period from February 2016 to February 2018. The MOP encompasses all activities undertaken at Invincible such as water management and sediment control, rehabilitation and maintenance works, maintenance of existing site infrastructure and the storage of mining plant.

Should the Southern Extension Project not be approved, Castlereagh Coal will still be required to meet its ongoing existing rehabilitation objectives at the site. This would be expected to take several years and due to the insufficient overburden in emplacement areas, would involve the disturbance of areas that have already been rehabilitated to achieve the currently approved final landform.

As discussed above, if the Southern Extension Project is approved, the MOP/RMP will be updated to reflect the rehabilitation strategy identified in the EA. Compliance with the MOP/RMP is enforceable under both the Project Approval and the Mining Leases applicable to Invincible. DRE will also hold security which has been assessed at an amount which will successfully implement the rehabilitation strategy identified in the approved MOP/RMP.

As a point of clarification, the EA does not assert that Cullen Valley will reopen, rather it noted that there are existing approved mining areas under the current Cullen Valley development consent.

The EA claims that the "Progressive rehabilitation … mitigates ecological impacts associated with the (IEP) as woodland areas are progressively established across Invincible". However, as the PACs pointed out rehabilitation which restores similar vegetation is unproven and, if it did occur, would be over a very long time. Much longer than the eight years of the approval being sought. As well, the new vegetation will not be the same as what was removed. This is far too late for any animals that relied on the vegetation which has been removed by mining. Previous PACs have discredited the argument that a mining project can deliver biodiversity outcomes. The 2012 PAC Report looked into the rehabilitation issues extensively and concluded at recommendation, "Given the considerable uncertainties concerning the likelihood of rehabilitation on this project area being capable of delivering a satisfactory biodiversity outcome, rehabilitation not be given credence as a mitigation strategy in the assessment."

Previous rehabilitation on Invincible Site has been slow to start and produced impoverished vegetation which is contrary to the EA's assertion that "the existing rehabilitation strategies employed at Invincible have largely been successful to date. In 2014 the Department of Planning found that there were six final voids (three at Invincible and three at Cullen valley) and that rehabilitation of these voids together was only 28% complete. This was far from satisfactory progress given Invincible Mine's consent expired in 2016. In 2015 a new rehabilitation plan was to be prepared. Soon after that, ownership of the mine passed to a new owner, Manildra. The current proposal, if approved, would lead to yet another different rehabilitation plan. The current 'rehabilitation' areas on the invincible mine site where mining has been completed have limited vegetation which seems to do little more than hold the overburden slopes together. As the PAC observed (see above), the success of this planting will not be known for many years.

Coalpac has admitted that "it is difficult to predict the composition and structure of vegetation beyond ten years" and "there is little information currently available on the long term ecological development of rehabilitated communities'" Rehabilitation on Invincible site is at most eight years old.

The previous PAC reports related to significantly more extensive development areas at Invincible than the Southern Extension Project and include disturbance in areas identified as having greater biodiversity values than have been assessed as occurring in the Southern Extension Area. Notwithstanding this, the claim that rehabilitated areas cannot deliver biodiversity outcomes is incorrect. The fauna surveys undertaken during 2016 at the rehabilitation areas in Cullen Valley Mine and Invincible Colliery resulted in a total of 53 and 32 species being recorded for each area, respectively (Umwelt 2017). Given that the sites are rehabilitation areas, the fauna diversity is considered high.

The likely reasons for this high diversity is the range of ages and therefore habitat complexity of rehabilitated areas combined with the proximity of the rehabilitation sites to the established offset areas. The habitat within the rehabilitation areas was primarily comprised of woody debris, which provides habitat for small ground species such as small reptiles and mammals. As the trees within the rehabilitation areas are still quite young, there are no hollows available for arboreal fauna. However, the established nest boxes provide an artificial substitute for species including sugar gliders (*Petaurus breviceps*), which have been shown to consistently use the boxes based on annual fauna and flora surveys at Invincible and Cullen Valley. As discussed in Section 6.18 of the EA, the rehabilitation Strategy for un-rehabilitated areas of Invincible and the Southern Extension Area will be revised to include a species mix which reflects the vegetation communities found in the area pre mining; any infill planting areas in existing rehabilitation areas will utilise the revised species mix.

As can be seen from aerial imagery of the Invincible mine site, significant parts of the areas that have been rehabilitated are now heavily vegetated with the vegetation containing a wide variety of succession species such as acacias but also a large number of canopy species. Observations from areas where topsoil has been spread but not yet seeded indicate that the seed bank contained in the soil is also germinating. **Section 3.4** in this Response to Submission Report is a report on recent flora and fauna monitoring undertaken at Invincible which shows that some areas of rehabilitation are well advanced, despite their relatively young age.

As discussed in Section 6.18.3.3 of the EA, rehabilitation of the West Pit area has been hampered through difficulties associated with handling topsoil on the steep rehabilitated slopes in this area. The learnings associated with the rehabilitation of this area will be carried through to the Southern Extension Project which will avoid steep slopes being retained in the final landform.

The lag in rehabilitation providing biodiversity values is recognised in the EA and the Economic Impact Assessment of the Southern Extension Project. The progressive rehabilitation of the existing Invincible disturbance area in the early stages of the Southern Extension Project will however mitigate disturbance impacts associated with the Southern Extension Project.

The biodiversity offset strategy for the Southern Extension Project (refer to **Section 3.4**) has been prepared in accordance with the FBA. Biodiversity offsets associated with the Southern Extension Project do not rely on any credits derived from the rehabilitation of the mine site, but will be provided through land based offsets and other supplementary measures in accordance with the FBA.

3.5.2.2 The Colong Foundation for Wilderness Ltd

Revegetation efforts do not replant or replace native ecosystems. Efforts to improve rehabilitation are welcome but the proposed open-cut mining will destroy the most of the plant diversity found in the mining area. Vegetation replanted after mining is a human artefact, not a native ecosystem. Such vegetation is without a fully functional soil profile that can recycle nutrients and water, and has no ecological complexity. The re-establishment of soil profiles takes millennia. Adequate establishment of manmade ecosystems is also very long-term.

The primary objective of site revegetation and regeneration is to create a stable final landform with acceptable post-mining land use and suitability.

Disturbed areas within the mining leases will be progressively revegetated and regenerated to self-sustaining native vegetation communities. As discussed in Section 3.18 of the EA, the rehabilitation strategy will utilise stockpiled topsoil and is designed to recreate a function soil ecosystem through the utilisation of natural succession processes. Revegetation works will use a species mix based on the communities impacted by the Southern Extension Area and previous mining at Invincible (refer to Table 6.40 in the EA). This strategy is informed be recent research at other mine sites in New South Wales and will be revised where necessary to reflect current best practice. The proposed final land use aims to emulate the pre-mining environment and enhance local and regional ecological linkages across the site.

Annual monitoring and management of the rehabilitated areas will be undertaken in accordance with the Landscape Management Plan and Environmental Monitoring Program until the areas become self-sustaining.

3.5.2.3 The Colo Committee

Further, ecosystems cannot be replanted after open-cut mining. The proposed biodiversity offsets cannot replace the unique Ben Bullen pagoda landscape.

This issue is addressed in the responses in **Section 3.5.2.1** and **3.5.2.2**.

3.5.3 Community Submissions

Mine closure and rehabilitation issues were raised in 288 community submissions. The issues raised and relevant response is provided below.

3.5.3.1 Form Letter

Further, ecosystems cannot be replanted after open-cut mining. The proposed biodiversity offsets cannot replace the unique Ben Bullen pagoda landscape.

The response to this identical to the Colo Committee Submission in this issue (refer to **Section 3.5.2.3**) and is addressed in the responses in **Section 3.5.2.1** and **3.5.2.2**.

3.5.3.2 Other Community Submissions

I urge the rejection of the Invincible southern extension proposal, as the destruction by open-cut coal mining is total and permanent. Large areas at the Invincible and Cullen Valley mines have already been totally destroyed, and as yet are have not been rehabilitated. Coalpac declared bankruptcy and walked away several years ago and have done zero to fix the area that they ripped up. Castlereagh Coal, the new owners, should be rehabilitating the existing damage, but have also done nothing so far.

Castlereagh Coal acquired the Invincible Colliery assets in mid-2015. Castlereagh Coal is committed to meeting the rehabilitation obligations under the Mining Leases and Project Approval applicable to Invincible. As discussed in Section 2.3.2.1 of the EA, operations at Invincible are currently subject to a care and maintenance MOP consistent with the requirements of the mining lease and DRE. The purpose of the Care and Maintenance MOP is to ensure appropriate environmental management of the site while investigations regarding the Southern Extension Project and the associated approval process are ongoing.

As far as I am aware Bond money held by DRE for both mines for rehabilitation is inadequate to do the job. Shoalhaven Coal Pty Ltd trading as Castlereagh Coal is only a minor subsidiary of the Manildra Group and if the approval does not go their way they could walk away (like Coalpac) and cut their losses. DRE has also been slack regarding the amount of Bond money held and not keeping rehabilitation more up to date under Coalpac ownership. I would also like to make reference to Planning Assessment Commission of main report dated 17/10/2014 (remainder of submission missing).

DRE has advised in their submission for the Southern Extension Project that a sufficient security bond is currently held by them for the mine's rehabilitation. Castlereagh Coal accepts its obligations in this regard and understands that should the Southern Extension Project not be approved that it will still be required to meet its ongoing existing rehabilitation objectives at the site.

Paragraph 3 of Page 20 of the PAC report refers to the argument that additional mining is needed to provide rehabilitation of the site and that this may create a precedent for other mining companies in the future. As discussed in Section 3.7.1.1 of the EA, there is sufficient material available at Invincible to meet the current rehabilitation commitments however the earthworks required to fill existing voids would require the disturbance of areas where rehabilitation has already commenced. This would significantly delay the successful rehabilitation of these areas and the further rehandle of emplaced topsoil in these areas increases risks associated with erosion and degradation of the biological resources in the soil material. As discussed in the EA and previous responses, the Southern Extension Project proposes an integrated final landform that enables the rehabilitation of the Southern Extension Area and the existing Invincible open cut area.

The justification for the Southern Extension Project is not based upon the need for mining to fill existing voids, the Southern Extension Project is justified on the basis that the benefits of the project outweigh any environmental, social and economic impacts as discussed in the EA.

3.6 Aboriginal Cultural Heritage

3.6.1 Agency Submissions

3.6.1.1 OEH

Aboriginal Scarred Tree

The ACH assessment report describes a traditional Aboriginal scarred tree (Umwelt 2016: 47-48 & Appendix A, Aboriginal cultural assessment report) and presents a recommendation of salvage. OEH supports the salvage and protection of Aboriginal scarred trees particularly in circumstances as described in the report where the tree is identified as dead and laying in a spoil heap. However OEH note that the Aboriginal Scarred Tree Identification Field Manual (DEC 2005) has not been referred to when making an identification of the tree as an Aboriginal scarred tree. The evidence presented in the ACH assessment is lacking in sufficient detail to conclude supporting evidence for registering the scarred tree onto the OEH Aboriginal Heritage Information System (AHIMS).

Recommendation

8. OEH recommends that the identification of the potential scarred tree be tested against the Aboriginal Scarred Tree Identification Field Manual (DEC 2005).

The identification of the scarred tree (now registered as AHIMS #45-1-2794) was undertaken with reference to the key criteria established in the Aboriginal Scarred Tree Identification Field Manual (DEC 2005), although it is recognised that this was not explicitly stated in the report. The identification of the scarred tree is discussed with reference to key criteria established in the manual.

- **Species of tree** – the species of tree could not be identified as the tree is dead and does not exhibit any bark or remnant foliage to allow for identification of genus or species. Based on vegetation communities within the area, it is likely that the tree may have been a species of eucalypt but it is not possible to provide any further information.

- **Scar form** – as discussed in the report and shown in the images of the site, the scar consisted of an elongated oval shape that was broadly symmetrical, rounded at both ends. The base of the scar was approximately 1.12m from exposed root system, indicating that the scar was above the ground surface when the tree was upright. The scar measured approximately 42cm long and up to 13cm in maximum width although these measurements (particularly the width) are affected by the substantial callus regrowth surrounding the scar, implying that the scar would have been larger when originally cut. Based on this information, it is considered likely that the scar is the result of the removal of bark/wood at suitable dimensions for use as a container.

- **Scarring by non-Aboriginal people** – there is no evidence suggestive of scarring by non-Aboriginal people such as the presence of a surveyor's blaze, clear saw marks, damage from timber-getting etc.

- **Other damage** – there were no other visible scars on the tree (although tree was on its side in a pile of felled timber and the entirety of the trunk could not be inspected). There was no evidence of comparable scarring as a result of insect infestation, fire, storm damage, ring barking or faunal damage. The tree had obviously been felled but this occurred substantially after the period in which it was scarred based on the extent of callus regrowth and the condition of the tree which indicated that it was dead prior to felling.

Based on all of the above factors, it was agreed by the archaeologists and Aboriginal party representatives undertaking the survey that the tree should be recorded as an Aboriginal scarred tree and managed accordingly, as outlined in the archaeological assessment.

Intangible Finds

The assessment of cultural significance is more than a component of an archaeological assessment or investigation and in some cases additional expertise is required. OEH expect professional services are made available to the RAPs to assist in articulating intangible values in order to verify the significance of the feature so that it is better understood and appropriately managed (OEH 2010:5) especially, in circumstances where intangible values are at threat and require a different approach to mitigating those threats. OEH is unable to form a view on the claims of a birthing tree and the culturally sensitive pagodas because of the lack of information provided in the assessment report, beyond those descriptions provided by some members of the registered Aboriginal parties involved in the fieldwork.

The cultural values associated with the pagodas were not subject to detailed review and recording as these formations are not subject to direct or indirect impact from the Southern Extension Project and therefore detailed assessment on their intangible values was not triggered.

In relation to the birthing tree and the provision of adequate resources to allow for the assessment of the Aboriginal cultural value of the potential site, no such request was received from the Aboriginal parties. Conversely, the party who identified the site requested that the information provided by that party should not be made available to anyone other than the relevant archaeologists, the proponent and OEH.

The relevant Aboriginal party was advised that, as there are no archaeological grounds for recording the potential birthing tree as a site on AHIMS, any such registration should come from the Aboriginal party to ensure that the cultural information was appropriately documented, including any access restrictions. This satisfied one of the key recommendations made by the Registered Aboriginal party. The second recommendation made by the Aboriginal party related to undertaking archaeological excavation in the vicinity of the potential site. However, as the site is not associated with archaeological features and its suggested cultural values are unlikely to be linked to extant archaeological material, the second recommendation for archaeological excavation in the vicinity of the tree was not considered justified and is not supported. No other Aboriginal party provided comment on the potential birthing tree nor did they make specific recommendations for its management.

The ACHMP for the Invincible Project Approval will be revised in consultation with the registered Aboriginal parties. The revised ACHMP will be updated, in consultation with registered Aboriginal parties to reflect the outcomes of the current assessment and will include the management activities listed in Section 6.5.7 of the EA. Consideration will also be given in the ACHMP to ongoing consultation mechanisms such as regular consultation meetings with Aboriginal parties, as requested by Wellington Valley Wiradjuri Aboriginal Corporation.

3.6.2 Interest Group Submissions

No issues were raised by any interest groups in relation to Aboriginal cultural heritage.

3.6.3 Community Submissions

Aboriginal cultural heritage issues were raised in one community submission. The issue raised and the relevant response is provided below.

This area also includes, within one kilometre or less within the mine, a number of significant Aboriginal Heritage sites. Book 5 of the 'Gardens of Stone and beyond' series (680pp) is dedicated to this area and contains full descriptions and photos of the above features and many others. I am one of the co-authors of this series.

A comprehensive Aboriginal Cultural Heritage and Archaeological Assessment was completed for the Southern Extension Project in consultation with six registered Aboriginal parties (refer to Appendix 7 of the EA). This assessment considered the potential impacts on Aboriginal cultural heritage within and outside the Southern Extension Area.

A pedestrian survey was conducted as part of the assessment and was conducted in accordance with the requirements of the OEH Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW. A total of four representatives from the registered Aboriginal parties participated in the survey conducted on 26, 27, 28 and 29 April 2016, accompanied by Umwelt archaeologists. All of the landforms within the Southern Extension Area were inspected as part of the survey and an additional survey was also undertaken to include areas within 500m of the Southern Extension Area in order to identify any sites that may potentially be susceptible to indirect impacts from mining. In addition, the ACHAA acknowledged a previously recorded rock shelter site approximately 1.1 km from the Southern Extension Area.

The assessment found that the Southern Extension Project will impact on six Aboriginal sites located in the Southern Extension Area, consisting of isolated finds and artefact scatters. The Southern Extension Project avoids impacts to significant archaeological sites. Management measures developed in consultation with the registered Aboriginal parties and detailed within the EA will be implemented in relation to these sites as well as any additional sites which may be identified during the life Southern Extension Project. The detailed Blast Impact Assessment (refer to Appendix 9 of the EA) assessed potential blast impacts on landforms and the rock shelter site. This assessment determined that with the proposed mitigation measures in place blasting will not impact these sites. The Southern Extension Project is not predicted to impact on any sites located outside of the Southern Extension Area.

3.7 Air Quality

3.7.1 Agency Submissions

No issues were raised by any agencies in relation to air quality.

3.7.2 Interest Group Submissions

No issues were raised by any interest groups in relation to air quality.

3.7.3 Community Submissions

Air quality issues were raised in two community submissions. The issues raised and relevant response is provided below.

The Lithgow region carries the burden of poor social and health statistics. Further mining, especially open cut mining will have adverse health impacts for local residents - as was concluded by the Department of Health in its previous submission for the Coalpac - with projected increased morbidity and mortality impacts. These relate particularly to blasting impacts (noise, vibration and dust), pollution effects of heavy machinery and road haulage, and effects on local waterways. The local residents have remarked on the increased air quality in their town since the mining operations of Coalpac have ceased.

There should be no airborne soil particles from the open cut mining activities carried by the wind and falling onto the Gardens of Stone NP. It changes the microsystems there.

A comprehensive assessment of the potential air quality impacts has been prepared for the Southern Extension Project in accordance with the EPA's *Approved Methods of the Modelling and Assessment of Air Pollutants in New South Wales* (DEC, 2005) (refer to Section 6.7 and Appendix 8 of the EA). Modelling indicates that no privately owned residences are expected to experience PM_{10} concentrations above EPA criteria and that maximum 24-hour average $PM_{2.5}$ and annual average $PM_{2.5}$ concentrations meet the national standards set by the National Environmental Protection Council. Further, no private residences are predicted to experience annual average TSP or dust deposition levels above the air quality assessment criteria.

Castlereagh Coal understands that air quality is an important issue for the community and has designed a number of measures to mitigate and manage impacts. Measures that will be introduced include the progressive rehabilitation of the site, minimising the length of haul roads and the area of disturbed land, the use of temporary rehabilitation and stabilisation measures on disturbed land and the implementation of the dust controls.

There have been no objections been raised by the EPA in relation to this proposal in regards to the air quality assessment or predicted impacts.

3.8 Blasting

3.8.1 Agency Submissions

3.8.1.1 Roads and Maritime

The RMS Submissions raised a number of issues related to blasting including potential for damage to the Castlereagh Highway and road closures associated with planned blasting. This section deals with the issues raised in relation to physical impacts on the road associated with blasting. **Section 3.10.1.2** of this Response to Submissions Report addresses issues associated with planned road closures associated with proposed blasting activities.

These resources are located as close as 30 metres from the Castlereagh Highway (HW18). Construction and operation of the Southern Extension will require explosive blasting. The applicant has identified that blasting within 150 metres of the Castlereagh Highway will pose a low risk to subsidence and vibration occurring on the highway. As a precautionary measure, any blasting within 500 metres of the highway will necessitate a 15 minute closure of the highway for each blast. A maximum of 2 blasts per day are proposed with no more than five blasts per week averaged over a 12 month period.

The Southern Extension Project involves open cut mining only and will not have any subsidence impacts. In all cases the Castlereagh Highway is more than 50m from the crest of the highwall (refer to **Appendix 1**).

To supplement the Blasting Impact Assessment included as part of the EA (Appendix 9), a supplementary report has been prepared by Enviro Strata Consulting which reviews the risks related to close range blasting to the Castlereagh Highway. This Report, attached as **Appendix 2** to this Response to Submissions, was provided to RMS in January 2017. RMS has indicated that it is satisfied that the proposed vibration criteria identified in the Blasting Impact Assessment are appropriate for the section of Castlereagh Highway adjacent to the Southern Extension Area.

Castlereagh Coal will include an additional blast monitoring point immediately adjacent to the Castlereagh Highway which measures vibration impacts. This additional commitment has been discussed in detail with RMS. Details regarding this monitoring will be included in the Blast Management Plan which will be prepared in consultation with the RMS.

3.8.2 Interest Group Submissions

No issues were raised by any interest groups in relation to blasting.

3.8.3 Community Submissions

No issues were raised by the community in relation to blasting.

3.9 Noise

3.9.1 Agency Submissions

3.9.1.1 Lithgow City Council

One private residence is expected to be affected by noise during the day time, with the intrusive noise limits modelled to be exceeded over the 40dB(A). It is requested that council be advised of any mitigation measures requested or indicated by the landowner as part of the approval process.

During the daytime period, the Southern Extension Project will achieve the daytime target PNTL at all residential receiver locations except Receiver 394 (Hillview). Under the VLAMP 2014, Receiver 394 (Hillview) will qualify for voluntary mitigation measures if requested by the landowner. The mitigation measures would be implemented in accordance with the procedure set out in the VLAMP 2014. Castlereagh Coal may negotiate an alternative agreement with the property owner.

Subject to any confidentiality provisions required by the landholder, Castlereagh Coal will advise Lithgow City Council of any mitigation measures requested by the landowner.

3.9.1.2 EPA

The EPA notes that project noise impacts presented in the Noise Impact Assessment (NIA) were undertaken in accordance with the NSW Environment Protection Authority (EPA) Draft Industrial Noise Guideline (draft Guideline). The Draft Industrial Noise Guideline is not current Government policy. The EPA advises that until further notice all noise assessments should be undertaken by referring to the NSW EPA Industrial Noise Policy (INP). The EPA does however note that the modification application is not seeking to change the existing noise criteria, and will meet the existing noise criteria determined under the INP.

With reference to the potential for the generation of low frequency noise, Section 6.1.1 of the EIA states that "application of modification factors, including low frequency noise was not deemed necessary on review of modelling outputs with reference to the procedure of the draft Guideline. While as previously indicated the draft Guideline is not appropriate for NIA, on the basis that the existing approval noise criteria were developed in accordance with the INP, and that the proposed project is not seeking to modify the existing noise criteria, the EPA has determined that the assessment against the draft guideline is for information only.

Licence Conditions to Apply

The EPA reiterates that the noise limits in the current version of the Environment Protection Licence 1095 (EPL 1095) for the premises must not exceed:

a) 40dB(A) LAeq(15 minute) during the day (7 am to 6 pm); and

b) 35dB(A) LAeq(15 minute) at all other times except as expressly provided by this licence.

Comments are noted.

3.9.2 Interest Group Submissions

No issues were raised by any interest groups in relation to noise.

3.9.3 Community Submissions

No issues were raised by the community in relation to noise.

3.10 Traffic and Transport

3.10.1 Agency Submissions

3.10.1.1 Lithgow City Council

A management program is undertaken by the operator's to ensure that all coal trucks are covered and have been through the truck wash prior to exiting onto the highway. This has been a problem with previous operations and should be dealt with appropriately with more stringent conditions of consent.

Castlereagh Coal will enforce a covered load policy for all trucks transporting coal from the Invincible Colliery and will require truck loading to occur in the Invincible Mine Infrastructure Area, with a wheel wash operated to wash tyres, where required, prior to leaving the site.

3.10.1.2 Roads and Maritime

The Castlereagh Highway is a State classified road under the care and control of Roads and Maritime. I note the applicant has not approached Roads and Maritime to discuss this project and in particular, the proposed disruptions on or risks to the highway generated by this development proposal. The information submitted in support of the proposed modification is inadequate and Roads and Maritime, at this time, objects to the proposal. Roads and Maritime recommends that a meeting be arrange between the Department, the applicant and Roads and Maritime to discuss the proposed extension, the impacts on and risks to the Castlereagh Highway, and measures to be employed to address those impacts and risks.

Following receipt of the submission from the Roads and Maritime Service (RMS), Castlereagh Coal has consulted with the RMS regarding the concerns raised in their submission. As discussed with RMS, specific consultation earlier in the development process in the EA was not considered necessary based on the review of the submissions by RMS in relation to the previous Coalpac proposals (which would have similar or greater impacts on the local road system than the Southern Extension Project) which did not identify any concerns with those proposals.

The following responses relate to the following additional information requested by RMS in their submission:

A geotechnical engineering assessment of the proposed mining extension. The geotechnical engineering assessment is to assess and report the existing local geotechnical environment and the Castlereagh Highway including its road formation, pavement and ancillary structures.

Appendix 1 includes details of the location of the highwall relative to the Castlereagh Highway and highwall design. Further details regarding geotechnical assessments of existing highwalls at Invincible were provided to the RMS. These highwalls have all been identified as being geotechnically stable. As discussed with the RMS, there is no indication that the geology adjacent to the Castlereagh Highway in the Southern Extension Area is geotechnically different to the existing highwalls at Invincible and there is a high degree of confidence in the stability of the proposed highwall adjacent to the Castlereagh Highway. It is noted that highwall stability is a key workplace health and safety issue for operations and is required to be managed in accordance with applicable NSW safety legislation.

Castlereagh Coal will develop a Ground Control Management Plan in consultation with RMS which includes details of the location of the highwall, the inspection program to be implemented to detect any signs of highwall stability and notification procedures in the event of any identified instability.

RMS have indicated that this proposed approach, together with entry in to the requested deed with RMS (as discussed further below) satisfactorily addresses the concerns identified in their submission in relation to this issue.

Development of a road closure/Traffic Management Plan for blasting activities within 500 metres of the Castlereagh Highway.

An estimation of the number of blasting occurrences required within 500 metres of the Castlereagh Highway and measures to be employed to minimise the frequency and number of closures of the Castlereagh Highway. Closures extending for 15 minutes are not acceptable.

Given the location of the Southern Extension Project, a large proportion of blasts in the Southern Extension Area will be within 500 metres of the Castlereagh Highway and will require temporary closure of the road. This is consistent with previous mining operations at Invincible, with an associated well developed road closure and blast management plan. This has previously included road closures for up to 15 minutes which is standard practice for mining operations.

In response to the issues raised by RMS the following additional operational measures will be employed to reduce the frequency and duration of road closures:

- Use of dozers to rip overburden and coal rather than blasting where conditions permit.
- Undertaking two blasts in close succession as part of a single road closure using a short (less than one minute) spacing between blasts.
- Undertaking the final road clearance checks during the 2 minute countdown period prior to blasts.
- Shortening the section of road closed to the 500 metre exclusion radius except where safe stopping distances warrant a longer closure distance (e.g. road closure points being over the brow of a hill).

With these measures in place, road closures could be limited to a period of close to five minutes with a maximum closure period of no more than 10 minutes (unless there is a need to remove flyrock material from the road surface). Discussions with RMS indicate this level of impact is acceptable. Additional management controls discussed with RMS and considered appropriate include:

- Road closures associated with blasts will avoid times when school buses may be travelling along the Castlereagh Highway.
- Advanced notice of blasts will be published on the Castlereagh Coal website and the blast advisory signs located on the Castlereagh Highway. This notice will assist road users in planning trips to avoid interruptions associated with road closures.
- Notice of planned road closures and emergency contact details will also be provided to emergency services to enable blasts to be delayed should emergency services require access along the road during the planned closure period.

The above management measures will all be documented as part of the Blast Management Plan and associated Traffic Control Plan which will be implemented for all blasts. Both plans will be prepared in consultation with RMS.

It is noted that while approval is sought for up to 5 blasts per week and up to two per day (consistent with existing approvals), it is highly unlikely that there would be more than one closure required per day and on average, only two closures per week would be required. The additional blasts sought as part of the application are to allow for misfires or other operational circumstances that require additional blast frequency.

Please note that as the proposed extension area is within 30 metres of the Castlereagh Highway, a deed between the mine operator, Lithgow City Council and Roads and Maritime will need to be entered into to assign and confirm responsibilities and obligations for each party and to protect and maintain the structure, safety and efficiency of the Castlereagh Highway. The deed will need to include (but not limited to) the following:

- The proponent's responsibility to prepare and implement a Ground Control Management Plan, Blasting Management Plan and survey controls demonstrating how the development will be carried out in a manner that does not adversely impact on the Castlereagh Highway.
- The proponent's responsibilities in relation to monitoring and rehabilitating any impacts of the development on the Castlereagh Highway.
- The proponent's obligation to take out adequate insurance coverage for any impacts of the development on the Castlereagh Highway.
- The liability of the proponent for any damage or adverse impact the Castlereagh Highway.
- Relevant indemnities.
- The procedure for communicating any information relevant to the protection of the Castlereagh Highway to Roads and Maritime Services.

Castlereagh Coal has no objection to entering into a deed with RMS consistent with the stated principles above. It is noted that the management of geotechnical risks to be addressed by the Ground Control Management Plan is a workplace health and safety obligation in addition to an asset management measure. As such, Castlereagh Coal is under a statutory responsibility to manage risks associated with the stability of the high wall regardless of location in proximity to the Castlereagh Highway.

As discussed in Section 6.8 of the EA, a detailed blast management plan will be prepared for the Southern Extension Project which will include measures to protect the Castlereagh Highway from vibration impacts and risks associated with flyrock. The Blast Management Plan will be prepared in consultation with RMS.

3.10.2 Interest Group Submissions

No issues were raised by any interest groups in relation to traffic and transport.

3.10.3 Community Submissions

Traffic and transport issues were raised in one community submissions. The issue raised and relevant responses are provided below.

Should be restricted to 7am and 6pm daylight saving and 7am to 5pm non daylight saving so that drivers on the highway are not distracted by lights and other activities.

The Southern Extension Project in its operational phase will operate between 7.00am and 6.00pm. Measures to limit distractions to drivers will include all lighting associated with mining operations being turned off by 7.00pm and all lighting associated with infrastructure on site being turned off by 10.30 pm unless required for emergency, safety and/or security reasons. Night lighting will also be kept to the minimum needed for operational management and safety and shields will be used on any mobile lighting.

Further, all lighting associated with the Southern Extension Project will be installed and maintained in accordance with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting*

The previous operations at Invincible included the same operating hours as proposed for the Southern Extension Project and there are no reported incidents on the Castlereagh Highway associated with distractions from lighting from Invincible. It should be noted that these past operations were significantly more visible than the operations proposed as part of the Southern Extension Area.

It is noted that RMS have not raised any concerns in relation to road safety associated with operational lighting.

Castlereagh Highway is a major highway. Ivanhoe North mine just across the highway was conducted without blasting with no highway closure. Where Invincible mining is conducted done? on the other side of the highway blasting should be avoided. Due to heavy traffic on highway Fridays and Saturdays no blasting requiring highway closure should occur. In any case blasting should not occur after 3pm (School buses etc.).

Management measures to be implemented in related to blasting related closures and other measures to minimise the need for road closures are discussed above in **Section 3.8.1.1**.

3.11 Greenhouse Gas and Energy

3.11.1 Agency Submissions

No issues were raised by any agencies in relation to greenhouse gas and energy.

3.11.2 Interest Group Submissions

No issues were raised by any interest groups in relation to greenhouse gas and energy.

3.11.3 Community Submissions

Greenhouse gas issues were raised in three community submissions. The issues raised and relevant response is provided below.

Awareness that ALL coal production is contributing to CO2 emissions and global warming. Manildra should also be required to take action to offset the emissions they have caused.

"The Paris Climate Agreement, although flawed, locks in the end of coal. Such a geopolitical agreement could not have been reached in the absence of the growing civil society and market signals that coal's demise was already happening. Why is the NSW government allowing further expansion of coal production when it needs to be pursuing a planned, orderly contraction of coal production? If a conservative organisation like Engineers Australia is now publicly supporting and endorsing the issues then should decision-makers continue to ignore it and carry on with business as usual? It's clear to me, emergency action is required, not just to mitigate for climate change, but also for energy security reasons. The proposed Invincible Coal Mine Southern Extension Project is another case of continuing

business as usual, contributing to increasing greenhouse gas emissions. It is a contributor to increasing a global existential risk. This proposal must be denied; otherwise it conflicts with Australia's commitments given in the Paris Climate Agreement to make substantial reductions to our carbon emissions."

"Extracting coal is known to be a dangerous exercise. Australia must take back the lead in harnessing alternate sources of energy. As a species, we have already locked in 1.75 degrees of global warming, and should we trigger one of the major tipping point events, then warming of 6 to 7 degrees will become inevitable. This will make large tracts of the planet inhospitable to complex life."

A greenhouse gas and energy assessment for the Southern Extension Project is included in Section 6.13 of the EA. This assessment determined that the Southern Extension project would contribute approximately 0.000046 per cent to global emissions per annum. The report acknowledges that although the Southern Extension Project is likely to increase the mitigation effort required to reach the 2020 target. The Southern Extension Project itself is unlikely to prevent the Australian Government achieving its national GHG targets. Castlereagh Coal will also implement a range of measures found to be both technically feasible and financially reasonable to minimise GHG emissions.

3.12 Bushfire

3.12.1 Agency Submissions

3.12.1.1 DPI

The proponent should consult with the Department of Industry – Lands regarding possible synergies in bush fire management between the Invincible Coal Mine Biodiversity Offset Area and adjacent Crown land Lot 7314 DP 1142023.

Castlereagh Coal will consult with the Department of Industry – Lands regarding possible synergies in bush fire management between the Invincible Coal Mine Biodiversity Offset Area and adjacent Crown land Lot 7314 DP 1142023.

3.12.2 Interest Group Submissions

No issues were raised by any interest groups in relation to bushfire.

3.12.3 Community Submissions

No issues were raised by the community in relation to bushfire.

3.13 Visual

3.13.1 Agency Submissions

3.13.1.1 Lithgow City Council

It is requested that the operation ensure that visual impacts from viewpoints are minimised through progressive rehabilitation and screening when required. This should include monitoring points in relation to predicted landforms and impacts and actual as part of the development process.

Castlereagh Coal has committed to a number of project design features to assist in minimising the visual impacts of the Southern Extension Project, including:

- appropriate design, construction and rehabilitation of the emplacement areas to minimise visual impacts during construction and to blend into the surrounding landform
- topsoiled areas will be vegetated as soon as practicable to minimise the period of lighter coloured material being visible
- progressive rehabilitation will be undertaken of all shaped and topdressed areas to reduce the duration of visible soil exposure
- planting of appropriate vegetation or other screening to reduce views of mining infrastructure where required to reinforce existing vegetation screening
- activities in periods of the year when day shift extends beyond dusk will be managed to limit lighting impacts
- all lighting associated with mining operations will be turned off by 7.00 pm unless required for emergency, security and/or safety purposes
- all lighting associated with the MIA will be turned off by 10.30 pm at night unless required for emergency, safety and/or security reasons
- success rates for canopy species in rehabilitation areas at Invincible will be assessed to determine whether lower percentages of acacia species or increased percentages of other potential pioneer species can be used in the rehabilitation seed mix without compromising the timely establishment of woodland communities in the rehabilitated landform
- ongoing management of mobile lighting to reduce the impacts of lighting at dusk, including the use of shields as required and the ongoing implementation of procedures about the appropriate placement of mobile lighting plant
- night lighting will be kept to the minimum needed for operational management and safety to limit the extent of night lighting glow
- all lighting associated with the Southern Extension Project will be installed and maintained in accordance with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting*.

Annual reporting of the status of rehabilitation is required by DRE as part of the annual compliance reporting required by the mining lease. This reporting will include details of established landform and revelation progress and success. These reports are published on the Castlereagh Coal website following submission to DRE.

3.13.2 Interest Group Submissions

3.13.2.1 Blue Mountains Conservation Society

Currently, the southern part of [Ben Bullen State Forest] provides several kilometres of wooded landscape from the highway for visitors and tourists which alleviates the industrial landscape of power stations and mining further south (Blackmans Flat to Lidsdale) and further north with more mines starting with

Invincible open cut mining, coal piles and machinery, sparse revegetation on slopes and denuded cliff faces. Yet, this highway is the gateway to tourism areas such as Mudgee. The IEP would worsen the visual impact from the highway. It would also increase and bring closer the coal mine views from southern BBSF, in particular, along Gardners Gap Trail.

Minimising visual impacts was one of the key considerations in the selection of the Southern Extension Area as the preferred mining area.

Section 6.15 of the EA includes an assessment of visual impacts associated with the Southern Extension Project. Views of mining in the Southern Extension Area will be possible from a number of vantage points along the Castlereagh Highway however the Southern Extension Project will not remove any roadside vegetation. The views from the Castlereagh Highway are presently filtered and transient and it is expected that views of the Southern Extension Area would be similar in nature, although less prominent than views of the northern areas of Invincible for vehicles travelling north. The views from the highway are expected to be short term given that the speed limit is 100 km/h. The relatively short duration of the Southern Extension Project and the commitment to progressive rehabilitation will reduce the time in which visual impacts from the Southern Extension Project from the Castlereagh Highway are prominent.

Castlereagh Coal has committed to a number of project design features to assist in minimising the visual impacts of the Southern Extension Project and these are discussed in detail in Section 6.15.8 of the EA. Commitments include the appropriate design, construction and rehabilitation of the emplacement areas, undertaking and assessing progressive rehabilitation and revegetation in addition to a number of measures to minimise lighting impacts.

The only views of the Southern Extension Area from roads within Ben Bullen State Forest are from the ridgeline to the immediate south of the Southern Extension Area along the transmission line easement. There are pre-existing views of the Invincible Open Cut from this location. Additionally as documented in the EA, there are publically accessible elevated areas to the east of the Southern Extension Area in Ben Bullen State Forest. As outlined in the EA, the views from this location will not be significantly different from that of the existing Invincible open cut area.

3.13.3 Community Submissions

Visual amenity issues were raised in five community submissions. The issues raised and relevant response is provided below.

"I recently walked in this region and was overwhelmed with its beauty and the rarity of its landscape; I can't imagine how anyone could even think of mining in such a beautiful place."

"Every time I drive past, the sight of it distresses me as I know the local environmental negative impacts upon vegetation, wildlife, air and water quality."

"I regularly hike in this beautiful area i.e. Ben Bullen State Forrest and am quite disgusted by the mess made by the old Coalpac Invincible Mine, it has been closed for several years and nothing has been done to clean up this horrible eyesore. There are outstanding pagodas right next to this mine site, which I have accessed from the Rest Area just up the hill from Point Piper and it was alarming to see such blatant destruction of such a unique and beautiful area."

"The Castlereagh Highway that comes through Cullen Bullen affords one of the principle gateways in or out of the Lithgow region. As such, the visual landscape on this route offers a resonance and symbolism for this area. Given the importance of diversifying the Lithgow region's economy, the picture of a large open cut mine in a visually dominant part of one of its transport corridors is hardly an assistance to this larger goal for the area."

"I have spent many occasions in the Gardens of Stone. Camping, Orienteering, Rogaining, Biking, Canyoning, Climbing and Bush Walking. I consider this area to be incredibly unique and beautiful and should be preserved for all the nation."

Minimising visual impacts was one of the key considerations in the selection of the Southern Extension Area as the preferred mining area.

Section 6.15 of the EA includes an assessment of visual impacts associated with the Southern Extension Project. The Southern Extension Project is not predicted to have a significant visual impact on surrounding publicly accessible areas. It is acknowledged that the majority of the Southern Extension Area can be seen from an elevated position in Ben Bullen State Forest to the east however this view is no more significant than that of the existing approved operations at this location. As discussed in the EA, the visual impacts associated with the Southern Extension Project are not significantly different to the visual impacts associated with the existing approved operations. While the Southern Extension Project will extend the period of visual impact in the area, these impacts will reduce over the life of the Southern Extension Project as the existing operations and Southern Extension Area are progressively rehabilitated. The relatively short duration of the Southern Extension Project and the commitment to progressive rehabilitation will reduce the time in which area of disturbance and infrastructure associated the Southern Extension Project and existing Invincible Open Cut disturbance area are visually intrusive. The Southern Extension Project will not result in any long term visual impacts.

The potential visual impacts to the Castlereagh Highway are discussed in **Section 3.13.2.1** above.

3.14 Social

3.14.1 Agency Submissions

3.14.1.1 Lithgow City Council

The applicants are open to discussions on a Voluntary Planning Agreement (VPA) with council and it is suggested that this be placed on the approval documentation to ensure that the VPA is entered into as part of the approval process.

As part of the modification application Castlereagh Coal recognises the opportunity to contribute to the future development of the local area through entering into a Voluntary Planning Agreement (VPA) with Lithgow City Council for the Southern Extension Project. Based on the assessed low levels of impact on the population and community infrastructure, this contribution will focus on the provision of local infrastructure. As committed to in the EA, Castlereagh Coal will enter into discussions with Lithgow City Council to determine the form and content of the VPA for the Southern Extension Project.

3.14.2 Interest Group Submissions

No issues were raised by any interest groups in relation to social impacts.

3.14.3 Community Submissions

Social issues were raised in two community submissions. The issue raised and relevant response is provided below.

While the coal industry in Lithgow suggests that the mining industry has been a backbone of social stability for the region, the problematic social demographic statistics point to an alternate view. That is, mining in this region has been a significant contributor to long-term social disadvantage - in health, educational standards, community mental health problems and violence. Looking at the health and socioeconomic figures for the Lithgow region, it is hard to see how one could conclude that mining has had a net benefit for the residents of the town.

A social impact and opportunity assessment was conducted as per the EA (refer to Section 6.10 and Appendix 11 of the EA). A total of 140 stakeholders, including agencies and groups participated in the consultation process. Of these 44 local landholders and residents were also interviewed for an analysis of impacts and opportunities associated with the Southern Extension Project. Significantly, a large majority of landholders felt that the benefits of the Southern Extension Project outweighed the costs with the generation of local employment being the most common issue raised by landholders. This would support the argument that mining is considered a net benefit to the town.

It is acknowledged that social issues exist within the Lithgow region; however these issues are not exclusive to this region alone. There is no specific data linking mining, or the Southern Extension Project, to these types of social issues.

I object to the proposed modification of the Invincible coal mine. I have been using this area for outdoor recreation for close to twenty years so I have a more than keen interest in maintaining the existing area in its current state.

The Southern Extension Project is wholly within the development footprint of previous proposals with a substantially smaller disturbance area. The additional disturbance proposed for the Southern Extension Project is located in an area that is currently utilised for firewood gathering and recreational use for trail bike riding. Prior to this, the area has been subject to impacts from historical mining, forestry and infrastructure activities.

3.15 Hazard

3.15.1 Agency Submissions

3.15.1.1 Roads and Maritime

Refer to responses in **Section 3.8** and **3.10**.

3.15.2 Interest Group Submissions

No issues were raised by any interest groups in relation to hazards.

3.15.3 Community Submissions

No issues were raised by the community in relation to hazards.

3.16 Cumulative Impacts and Incremental Approval

3.16.1 Agency Submissions

No issues were raised by any agencies in relation to cumulative impacts.

3.16.2 Interest Group Submissions

3.16.2.1 Blue Mountains Conservation Society

Approving the destruction of these lands would set a very bad precedent for the future of this unique pagoda land system of the Gardens of Stone region. Approval will open up a path for incremental destruction of other parts of BBSF, which is in better condition than parts of Newnes State Forest (also in the Gardens of Stone region).

Reopening Cullen Valley mine has been foreshadowed in the EA as mentioned above. While Mount Piper Power Station (MPPS) is a major customer of Castlereagh coal, Invincible coal will also be needed for blending. Cullen Valley colliery, with its many years of consent still to run, will be very tempting. Mining might also extend further south or west closer to pagodas and cliffs which were part of the previous Coalpac applications. Castlereagh Coal has applied for a mining lease for the area west of existing disturbed Invincible mine area. It should be noted that DPE has already said that it would not support a series of incremental increases to the open cut footprint of either of Invincible mine (or CV Mine).

Castlereagh Coal does not have any immediate plans to recommence mining operations at Cullen Valley and the reopening of the mine has not been foreshadowed in the EA. The Cullen Valley Mine (along with other nearby mines currently on care and maintenance) was assumed to be operational only for the purposes of assessing potential cumulative impacts (refer to Section 2.2.1 of the EA) as there are existing approvals in place for those operations.

The Cullen Valley Mine does not form part of this application in any form and the Southern Extension Project does not seek any changes to the existing approved operations at that site. Any future applications in relation to Cullen Valley will require assessment on their merits.

3.16.2.2 The Colong Foundation for Wilderness Ltd

This proposal is a downsized version of earlier rejected Coalpac proposals. Its assessment should consider cumulative losses of significant environmental values. If this were done then the proposal would be rejected for the reasons the Coalpac proposal was withdrawn in 2013, and then modified, reduced and rejected in 2014.

Potential cumulative impacts for the Southern Extension Project have been assessed as part of the EA.

If the Department believes that mining must stop due to impacts on the significant conservation values of the broader area, why allow mining to restart? The political reality is that stopping an operating mine at the end of eight years will be difficult, even if it were foreshadowed in an assessment report. The time to prevent further open-cut mining in the Gardens of Stone region is now, not in eight years at the expiry of the requested development consent.

Extensive agency consultation including briefings with key government agencies have been undertaken to discuss key issues and outcomes of key studies to ensure that any potential for impacts by the Southern Extension Project have been appropriately mitigated.

The primary purpose for the Southern Extension Project is the requirement for a reliable and cost effective source of energy which is critical to the ongoing operation of Manildra's Shoalhaven Starches plant located at Bomaderry on the NSW South Coast. In comparison to the previously proposed Invincible South area, the relatively small scale of the Southern Extension Project will result in reduced amenity (noise, air quality, traffic and blasting) impacts. Further, the Southern Extension Project will create employment and investment opportunities in the area and minimise the need for a new area to be mined.

The Southern Extension Project limits all extraction activities to the Southern Extension Area and the area between the existing Southern Void and the Southern Extension Area. The majority of the Southern Extension Area has been previously undermined and will require a high level of disturbance in the future regardless of whether the Southern Extension Project is approved to ensure that the area can be rehabilitated and made safe for any future use.

The Southern Extension Project is seeking up to an eight year extension of the life of mining at Invincible to enable the investigation potential for coal from other seams being utilised at the Shoalhaven Starches plant. The results of the investigation will also inform decisions regarding the investment by Shoalhaven Starches in new boilers that would be designed to maximise usage of coal from other seams at Invincible. Attempting to maximise the life of the footprint makes economic sense and eight years is considered to be sufficient time to investigate boiler and coal options and utilise a mix of supply options from other sources of nut coal.

Employment will not decrease if the Manildra modification proposal is refused development consent as several other coal producers could produce and supply nut coal to meet the needs of their Bomaderry plant. Refusing consent is likely to increase employment as the high quality thermal nut coal required will then probably be provided from underground coal mines. Such production would employ more local miners. Carbon dioxide emissions would be reduced by more efficient coal extraction rather than open-cut mining Ivanhoe Number 2's remnant Lithgow seam. Refusal of Manildra's environmentally damaging mine will benefit workers, the terrestrial environment, the health and amenity of the Lithgow community as well as reduce greenhouse gas emissions. No unique coal resources will be 'sterilised' and the security of Manildra's Bomaderry plant will not be affected if the Invincible modification is refused consent.

The coal price being paid for the specialty nut coal from the Clarence operation is significantly higher than Castlereagh Coal's expected costs of production for the same product as part of the Southern Extension Project. This is partly as a result of the small number of suppliers of the product and partly as a result of nut coal being considered a niche product which requires different production and handling requirements which increase costs.

The lack of suppliers of the product creates a level of uncertainty as market forces have the potential to negatively impact these operations. Should these impacts occur, the implications for Shoalhaven Starches have the potential to be significant. Approval for the Southern Extension Project and the creation of 35 new full time jobs in the area is seen as a positive development for the local community. Further, the characteristics of specialty nut coal from Invincible meet the specific coal quality requirements for use in the Shoalhaven Starches plant. Any change in the quantity or quality of this particular energy input would require significant capital and plant upgrades, in addition to material operational impacts.

A greenhouse gas and energy assessment was undertaken as part of the assessment process which determined that the Southern Extension project would contribute approximately 0.000046 per cent to global emissions per annum. The report acknowledges that although the Southern Extension Project is likely to increase the mitigation effort required to reach the 2020 target, the Southern Extension Project itself is unlikely to prevent the Australian Government achieving its national GHG targets. Castlereagh Coal will also implement a range of measures found to be both technically feasible and financially reasonable to minimise GHG emissions. Energy Australia has given full support for the Southern Extension Project and acknowledges the robust and thorough assessment process for the Southern Extension Project and believes that there will be strong beneficial environmental and social outcomes should it be approved.

The Colong Foundation does not consider the proposed recommencement of the Invincible Coal Mine by its new owner Castlereagh Coal should be a modification, as it is really a start-up proposal for new major project. The proponent's subsidiary company, Shoalhaven Coal, is investigating further coal resources around the Invincible mine by applying for coal exploration licences (ELAs) No. 5289 and 5290 over areas of high conservation value in Ben Bullen State Forest. These ELAs cover a total of 1,369 hectares, an area almost 300 hectares larger than the integrated Coalpac open-cut mining proposal (1088 hectares).

The determining authority must consider this modification as potentially a small component of a much larger proposal which is intended to be presented in piecemeal fashion. Any proponent when lodging a development application is required to present the entire project, not a small element of it. Unless Manildra is prepared to give a written undertaking that it gives up all interest in future expansion of the Invincible mine, the Department of Planning and Environment should require Manildra to resubmit a new proposal for the entire project so that this may be determined.

The Colong Foundation believes this proposal is a 'foot in the door' to establish a larger mine. The proponent will continue to seek sequential approvals for what would never be approved if presented as one large project. The Department of Planning and Environment has previously made the observation that a modification should not be construed to support a series of incremental increases to this mine or other mines.

The approval pathway and approach to assessment was confirmed through correspondence from the DPE when the EA was prepared.

As discussed in Sections 1.0 and 3.6 of the EA, Castlereagh Coal's interest in the Invincible and Cullen Valley assets is to ensure the Manildra Group's Shoalhaven Starches plant has a reliable and cost effective source of thermal energy. This is critical to the ongoing operation of Manildra's Shoalhaven Starches plant. Based on the currently known coal quality attributes of resources at Invincible, Castlereagh Coal acknowledges that the Southern Extension Area only provides a short to medium term supply option for the Shoalhaven Starches plant. As detailed in the EA further investigations in the use of other coal sourced from Invincible (that does not currently meet the specific quality requirements for the Shoalhaven Starches plant), which would increase the supply life from the Southern Extension Project, are currently being investigated.

The current application only relates to the Southern Extension Project and does not relate to the existing approved operations at Cullen Valley. Any further options for sourcing required coal from areas owned by Manildra would likely necessitate a further development application (or modification of existing approved operations). Any such an application would necessarily include a full assessment of social and environmental impacts and would be subject to assessment on its merits in accordance with the EP&A Act.

This proposal for a resource that hardly seems worth mining will restart open-cut mining in the public forests of the Gardens of Stone region where it has already been twice rejected on environmental grounds. If approved, it will set precedent for open-cut mining in areas that have previously been mined by low intensity underground methods. It is hardly credible that such wasteful and environmentally destructive mining is being attempted for a third time.

In terms of the viability of the Southern Extension Project, the ability to provide increased certainty in supply of speciality nut coal is to ensure ongoing competitiveness of Manildra's Shoalhaven Starches plant. Given the objective of providing this supply of specialty coal to Shoalhaven Starches, this can be achieved in a smaller mining footprint and from a lower total level of resource which is unique in terms of the viability of mining projects in NSW.

3.16.2.3 The Colo Committee

Open-cut coal mining should not recommence in this sensitive part of the Gardens of Stone region. It is inappropriate to reverse the 2013 and 2014 decisions by the Planning Assessment Commission that rejected open-cut mining in this 50 hectare area. I strongly oppose this proposal to expand the open-cut area and continue production for eight years.

Any approval is likely to lead to incremental development of this mine, and the Department of Planning and Environment has said it is opposed to a series of incremental increases in open-cut coal mining in the Ben Bullen State Forest.

As discussed in detail in Section 3.6 of the EA and discussed in **Section 3.1** above, the primary purpose for the Southern Extension Project is the requirement for a reliable and cost effective source of thermal energy for Manildra's Shoalhaven Starches plant.

In comparison to previous proposals for expansion of operations at Invincible, the relatively small scale of the Southern Extension Project and its location will result in reduced amenity (noise, air quality, traffic and blasting) impacts. Extensive agency consultation including briefings with key government agencies has been undertaken to discuss key issues and outcomes of key studies to ensure that any potential for impacts by the Southern Extension Project have been appropriately mitigated.

The Southern Extension Project limits all extraction activities to the Southern Extension Area and the area between the existing Southern Void and the Southern Extension Area. The majority of the Southern Extension Area has been previously undermined and 3.2ha is impacted significantly by existing subsidence as a result of those activities. These areas will experience a high level of disturbance in the future regardless of whether the Southern Extension Project is approved to ensure that the area can be rehabilitated and made safe for any future use. A further 1.6 ha in the Southern Extension Area has also been cleared for the powerline easements which run through the area.

The Southern Extension Project is seeking up to an eight year extension of the life of mining at Invincible to enable the investigation potential for coal from other seams at Invincible being utilised in the Shoalhaven Starches boilers. The results of the investigation will also inform decisions regarding the investment by Shoalhaven Starches in new boilers that would be designed to maximise usage of coal from other seams at Invincible. Eight years is considered to be sufficient time to investigate boiler and coal options and utilise a mix of supply options from other sources of nut coal.

3.16.3 Community Submissions

Cumulative impacts were raised in two community submissions. The issue raised and relevant response is provided below.

3.16.3.1 Form Letter

Open-cut coal mining should not recommence in this sensitive part of the Gardens of Stone region. It is inappropriate to reverse the 2013 and 2014 decisions by the Planning Assessment Commission that rejected open-cut mining in this 50 hectare area. I strongly oppose this proposal to expand the open-cut area and continue production for eight years. Any approval is likely to lead to incremental development of this mine, and the Department of Planning and Environment has said it is opposed to a series of incremental increases in open-cut coal mining in the Ben Bullen State Forest.

This issue is covered by the response to the submission on this issue made by the Colo Foundation (refer to **Section 3.16.2.3**).

3.16.3.2 Other Community Submissions

Cumulative impacts were raised in one community submission. The issue raised and relevant response is provided below.

If this current proposal is approved, then they have a precedent to justify further extensions. The previous PAC determinations did consider the merit of cumulative impacts of the mining proposals in the region – and this was stated as being a factor in their rejections of the previous proposals. This should apply no less in this case. Small incremental extensions will have small incremental adverse impacts for the health and social amenity for local residents and the natural environment. Progressive incremental extensions will have, over time, a large adverse impact. The potential for such an outcome should be avoided at the outset.

This issue has been previously discussed to as part of **Section 3.16.2.3** above.

3.17 General

3.17.1 Agency Submissions

3.17.1.1 DP&E

Provide an update on the progress of the company's negotiations with Lithgow City Council on a Voluntary Planning Agreement.

As part of the modification application Castlereagh Coal recognises the opportunity to contribute to the future development of the local area through entering into a VPA for the Southern Extension Project. Based on the assessed low levels of impact on the population and community infrastructure, this contribution will focus on local level infrastructure provision.

Castlereagh Coal is currently in discussions with Lithgow City Council to determine the form and content of the VPA for the Southern Extension Project with an outcome expected in 2017.

3.17.2 Interest Group Submissions

There were no submissions from Interest Groups which were characterised as being of a general nature.

3.17.3 Community Submissions

Three general issues were raised in two community submissions. The issues raised and relevant response is provided below.

Manildra uses coal to power its distillery at its starch processing plant in Nowra. It has a history of promoting the use of its ethanol (one of the bi---products of its starch processing plant) as an environmentally friendly additive to petrol. They have used these environmental credentials to gain government favour in a variety of regulations around the sale of ethanol 'enhanced' petrol.

It would thus seem problematic if the government were to offer business concessions for the sale of Manildra's ethanol (to assist possible environmental benefits) while also approving an open cut coalmine with a big environmental footprint to produce this ethanol! Would this then need to be factored into the government's considerations in regard to its previous concessional agreements to Manildra because of the stated environmental benefits derived from its ethanol--- mixed petrol?

If Manildra were to be serious about its environmental credentials in this regard, it would power its distillery by lower carbon emission technologies – such as green power, biomass, or gas. Or at least it could source coal closer to home from existing mines, where the emissions costs from transport would be lower.

The primary objective of this project is to ensure the certainty of supply of nut coal to the Shoalhaven Starches plant in Bomaderry NSW to assist the plant in remaining internationally competitive. Presently the plant utilises three main sources of energy being electricity, gas and coal. The Southern Extension Project will help to achieve this objective of international competitiveness through the provision of a reliable supply of nut coal which has been also been identified as the energy source with the lowest cost per gigajoule (GJ) in use at the plant. The characteristics of specialty nut coal from Invincible meet the specific coal quality requirements for use in the Shoalhaven Starches Plant. Any change in the quantity or quality of this particular energy input would require significant capital and plant upgrades, in addition to material operational impacts.

Extensive agency consultation including briefings with key government agencies, has occurred throughout the assessment process to discuss key issues and outcomes of key studies to ensure that any potential for impacts by the Southern Extension Project have been appropriately mitigated. A greenhouse gas and energy assessment was undertaken as part of the assessment process which identified that the small contribution the Southern Extension Project would make to global emissions would be unlikely to prevent the Australian Government achieving its national GHG targets. Further, Energy Australia has given its strong support and acknowledged the robust and thorough assessment process that has been undertaken for the Southern Extension Project.

Restrictions on the adjacent Springvale underground mine have been set aside in expansions- damage bonds and current remediation of damage are grossly inadequate. As the Government Department with a duty to safeguard the environment your inaction is non-professional.

The Southern Extension Project has no association with the Springvale mine. The existing rehabilitation strategies employed at Invincible have largely been successful to date in meeting the rehabilitation plan which is approved and managed by DRE. These practices will be applied to the Southern Extension Project with appropriate modifications as necessary. To reinforce this point, when conducting interviews with local residents for the social impact and opportunity assessment one of the responses was "*Continue rehab at Cullen Valley, we can already see the improvement from early seeding."*

The primary objective of revegetation and regeneration efforts at Invincible is to create a stable final landform with acceptable post-mining land use and suitability. Disturbed areas within the mining leases will be progressively revegetated and regenerated to self-sustaining native vegetation communities. Further, stockpiled soil will be used on site and revegetation works will use local provenance species wherever possible. The proposed final land use aims to emulate the pre-mining environment and enhance local and regional ecological linkages across the site.

Annual monitoring and management of the rehabilitated areas will be undertaken in accordance with the Landscape Management Plan and Environmental Monitoring Program until the areas become self-sustaining.

Should the Southern Extension Project not be approved, Castlereagh Coal will still be required to meet its ongoing existing rehabilitation objectives at the site. This would be expected to take several years and due to the insufficient overburden in emplacement areas, would involve the disturbance of areas that have already been rehabilitated.

This proposal is not about environmental benefit. The proposed social advantages are more likely out---weighed by the associated social disadvantages. It is mainly about corporate profitability. Manildra was a stakeholder in Coalpac. When Coalpac went bankrupt after its mining bid in Cullen Bullen failed, Manildra acquired the old Coalpac mining leases around Cullen Bullen, at likely minimal cost.

An Economic Impact Assessment (EIA) undertaken for the Southern Extension Project estimated the net benefit of the Southern Extension Project to New South Wales at $79.7 million in net present value terms (NPV). In terms of local area effect, the Southern Extension Project is estimated to confer a net benefit of $8.8 million to the Lithgow-Mudgee area in NPV terms with the bulk of these benefits going to local suppliers and employees. The local benefits are particularly important at this level as it is occurring during a period when the area has been experiencing the effects of the closure of a number of large employers in the region. The Southern Extension Project is expected to provide up to approximately 35 full time equivalent jobs of which 80 per cent are expected to be sourced from the local area.

A social impact and opportunity assessment was also undertaken for the Southern Extension Project which identified and involved a wide range of stakeholders including community members, interest groups and government agencies. The assessment identified a number of key strategies in order to address negative impacts or enhance the positive impacts associated with the Southern Extension Project, these included:

- sourcing employees from the local area where possible and encouraging those from outside the area to reside locally via an Employee Recruitment Policy
- identifying and utilising local and regional suppliers and service providers wherever possible
- engaging with the community and contributing to them via Castlereagh Coal's community investment program
- engaging with environment and recreation groups and taking into consideration areas of high biodiversity value, threatened species habitat and the size of blasts to avoid impacts on pagodas.
- rehabilitation and revegetation efforts to use locally endemic species and leave no final voids and regular engagement with the local community regarding key stages of rehabilitation
- management practices that will minimise impacts to social amenity from blasting, and
- management practices that will minimise impacts to social amenity and safety from traffic.

3.18 Management and Mitigation

3.18.1 Agency Submissions

No issues were raised by any agencies in relation to management and mitigation.

3.18.2 Interest Group Submissions

No issues were raised by any interest groups in relation to management and mitigation.

3.18.3 Community Submissions

Management and mitigation issues were raised in one community submission. The issue raised and relevant response is provided below.

Invincible and Cullen Valley mines. Since Castlereagh Coal has purchased both mines only minimal maintenance has been done despite a lot of erosion occurring (Refer Cullen Valley AEM 2015 5-3-1).

The 2015 AEMR identified that there was moderate to severe erosion, particularly in Steep Areas. The issues associated with the rehabilitation of steep areas at Invincible (particularly the West Pit area) were acknowledged in Section 6.18.3.3 of the EA. As acknowledged in Section 6.18.3.3 of the EA, the final landform developed for the Southern Extension Area and remaining areas of the existing open cut areas will take into account learnings from the rehabilitation in West Pit and will avoid slope designs which pose problems for topsoil spreading. Contour banks will be established on slopes to prevent runoff from reaching high velocities that may cause erosion.

4.0 Revised Management and Mitigation Measures

In addition to the management and mitigation measures outlined in Section 7 of the EA, Castlereagh Coal commits to the implementation of the following additional measures for the Southern Extension Project.

4.1 Blasting

Castlereagh Coal will include an additional blast monitoring point immediately adjacent to the Castlereagh Highway which measures vibration impacts. This additional commitment has been discussed in detail with RMS. Details regarding this monitoring will be included in the Blast Management Plan which will be prepared in consultation with the RMS.

Castlereagh Coal will employ the following additional operational measures to reduce the frequency and duration of road closures:

- Use of dozers to rip overburden and coal rather than blasting where conditions permit.
- Undertaking two blasts in close succession as part of a single road closure using a short (less than one minute) spacing between blasts.
- Undertaking the final road clearance checks during the 2 minute countdown period prior to blasts.
- Shortening the section of road closed to the 500 metre exclusion radius except where safe stopping distances warrant a longer closure distance (e.g. road closure points being over the brow of a hill).

With these measures in place, road closures could be limited to a period of close to five minutes with a maximum closure period of no more than 10 minutes (unless there is a need to remove flyrock material from the road surface).

Castlereagh Coal will implement the following additional road closure management controls:

- Road closures associated with blasts will avoid times when school buses may be travelling along the Castlereagh Highway.
- Advanced notice of blasts will be published on the Castlereagh Coal website and the blast advisory signs located on the Castlereagh Highway. This notice will assist road users in planning trips to avoid interruptions associated with road closures.
- Notice of planned road closures and emergency contact details will also be provided to emergency services to enable blasts to be delayed should emergency services require access along the road during the planned closure period.

Castlereagh Coal will document the above management measures as part of the Blast Management Plan and associated Traffic Control Plan which will be implemented for all blasts. Castlereagh Coal will prepare both plans in consultation with RMS.

Castlereagh Coal will enter into a deed with RMS consistent with the principles stated above. It is noted that the management of geotechnical risks to be addressed by the Ground Control Management Plan is a workplace health and safety obligation in addition to an asset management measure. As such, Castlereagh Coal is under a statutory responsibility to manage risks associated with the stability of the high wall xx of xx in proximity to the Castlereagh Highway.

Castlereagh Coal will prepare a blast management plan for the Southern Extension Project which will include measures to protect the Castlereagh Highway from vibration impacts and risks associated with flyrock. The Blast Management Plan will be prepared in consultation with RMS.

5.0 References

Cumberland Ecology (2012). *Ecological Assessment for the Coalpac Consolidation Project.*

Department of Environment and Conservation (2005). *Aboriginal Scarred Trees in New South Wales: Identification Field Manual.* Published by the DEC (now EPA), August 2005

Department of Environment and Conservation (2005). *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW.* Published by the DEC (now EPA), December 2005.

Office of Environment and Heritage (2016). *NSW Guide to Surveying Threatened Plants.* Published by OEH, February 2016.

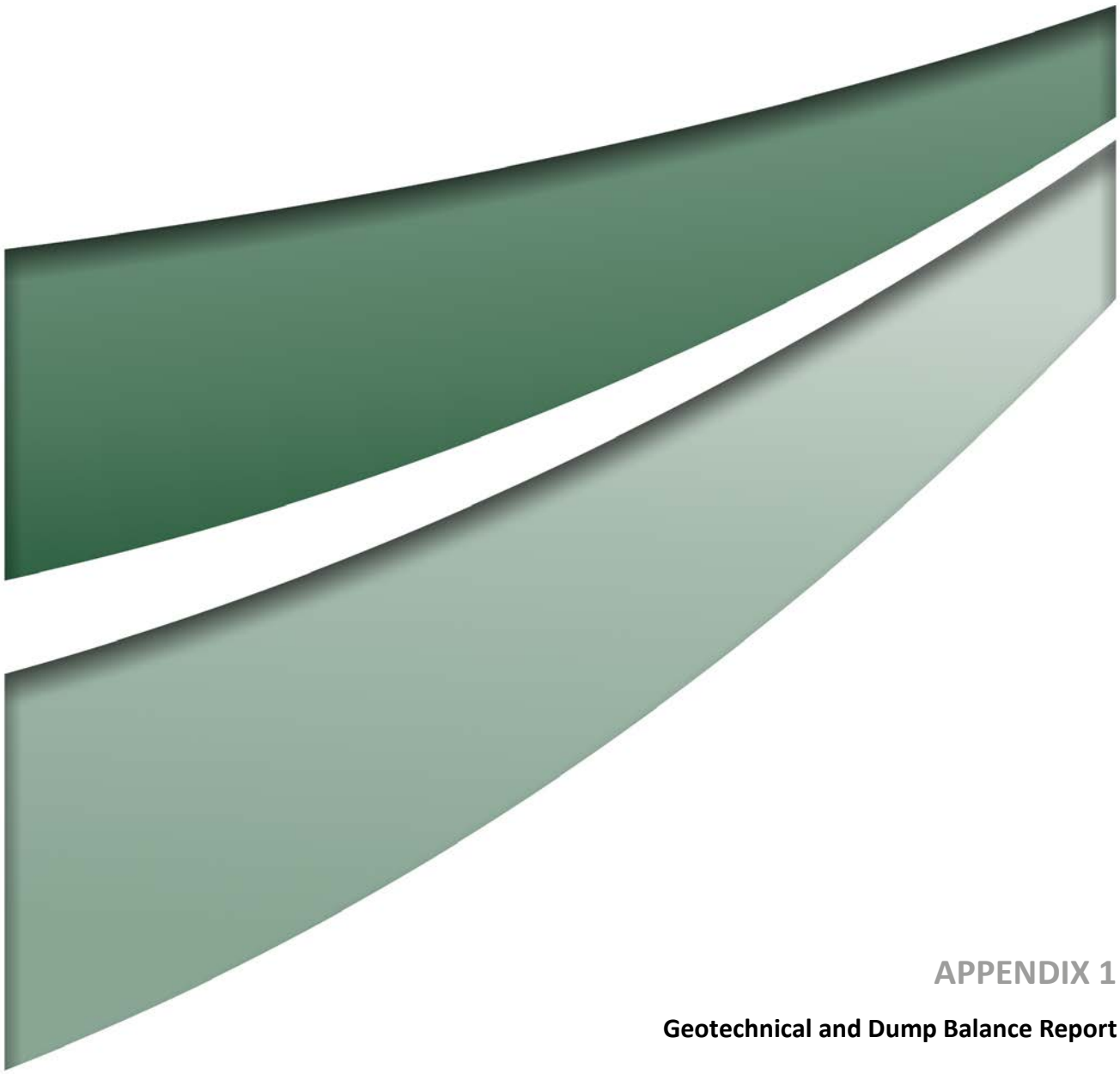
Sedgman (2015). *Cullen Valley AEM Annual Environmental Management Report 2015*

Sedgman (2016). *Invincible Colliery Care and Maintenance Mining Operations Plan (MOP).*

Standards Australia (1995). *Australian Standard AS 4282 (INT) Control of Obtrusive Effects of Outdoor Lighting.* Standard Australia, Sydney

Umwelt (Australia) Pty Ltd (2016). *Aboriginal Cultural Heritage and Archaeological Assessment.*

Umwelt (Australia) Pty Ltd (2017, 2016). Biodiversity Offset Monitoring of Cullen Valley Mine and Invincible Colliery (In Draft).



APPENDIX 1

Geotechnical and Dump Balance Report

Report DRAFT

Invincible Extra Data

Company	Shoalhaven Coal Pty Ltd
Site	Invincible
Date	Dec 2016
Doc No	SHC2600-01

palaris

Important Notice

The Client

This document has been produced by or on behalf of Palaris Australia Pty Ltd ("*Palaris*") solely for use by and for the benefit of the Client. Use of this document is subject to the provisions of Palaris' Terms and Conditions of Service.

Palaris owns copyright in this document. Palaris grants the Client a non-transferable royalty-free licence to use this report for its internal business purposes only and to make copies of this report as it requires for those purposes.

Third Parties

If the Client wishes to make this document or information contained herein, available to a third party, it must obtain Palaris' prior written consent.

Palaris will not be responsible for any loss or damage suffered by any third party who relies on anything within this report; even if Palaris knows that the third party may be relying on this report, unless Palaris provides the third party with a written warranty to that effect. The full extent of Palaris' liability in respect of this report, if any, will be specified in that written warranty.

Scope of the Document

This document should only be used for the purpose it was produced. Palaris will not be liable for any use of this document outside its intended scope. If the Client has any queries regarding the appropriate use of this document, it should address its concerns in writing to Palaris.

Currency of Information

Palaris has used its best endeavours to ensure the information included in this report is as accurate as possible, based upon the information available to Palaris at the time of its creation. Any use of this document should take into account that it provides a 'point in time' based assessment and may need to be updated. That is, any information provided within this document may become outdated as new information becomes available. Before relying upon this document, the Client, or an approved third party, should consider its appropriateness based upon the currency of the information it contains. Palaris is under no obligation to update the information within this document at any time.

Completeness of Information

This document has been created using information and data provided by the Client and third parties. Palaris is not liable for any inaccuracy or incompleteness of the information or data obtained from, or provided by, the Client, or any third party.

Reliance on Information

Palaris is proud of its reputation as a provider of prudent and diligent consultancy services when addressing risks associated with its Clients' operations. Nevertheless, there are inherent risks which can never totally be removed. As such the contents of this document, including any findings or opinions contained within it, are not warranted or guaranteed by Palaris in any manner, expressed or implied. The Client and each approved third party should accommodate for such risk when relying upon any information supplied in this report. Such risks include, but are not limited to:

- environmental constraints or hazards and natural disasters
- plant and equipment constraints
- capability and availability of management and employees
- workplace health and safety issues
- availability of funding to the operation
- availability and reliability of supporting infrastructure and services
- efficiency considerations
- variations in cost elements
- market conditions and global demand
- industry development
- regulatory and policy changes

1 Castlereagh Highway

A geotechnical report was not completed on the western side of the pit.

A series of five cross sections have been completed to show the distance and stratigraphy between the highway and the pit. Note that the cross sections are in the areas closes to the highway.

The five cross sections are shown on the topography and total pit shell in Figure 1.1 and Figure 1.2 below. The co-ordinate grid is shown at 100m spacing and the location of cross sections one to five is shown from south to north.

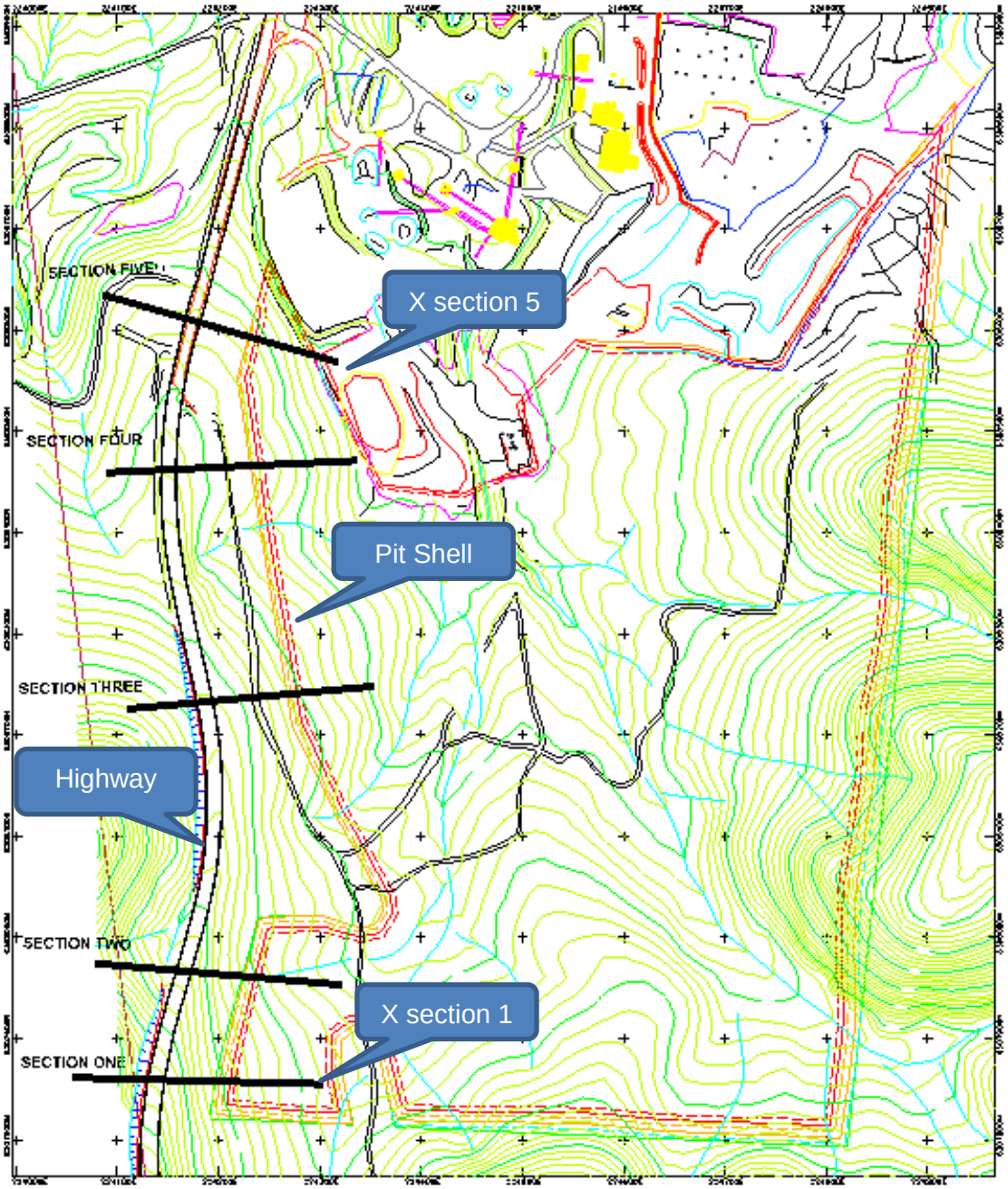


Figure 1.1 Sections with pit shell and topography

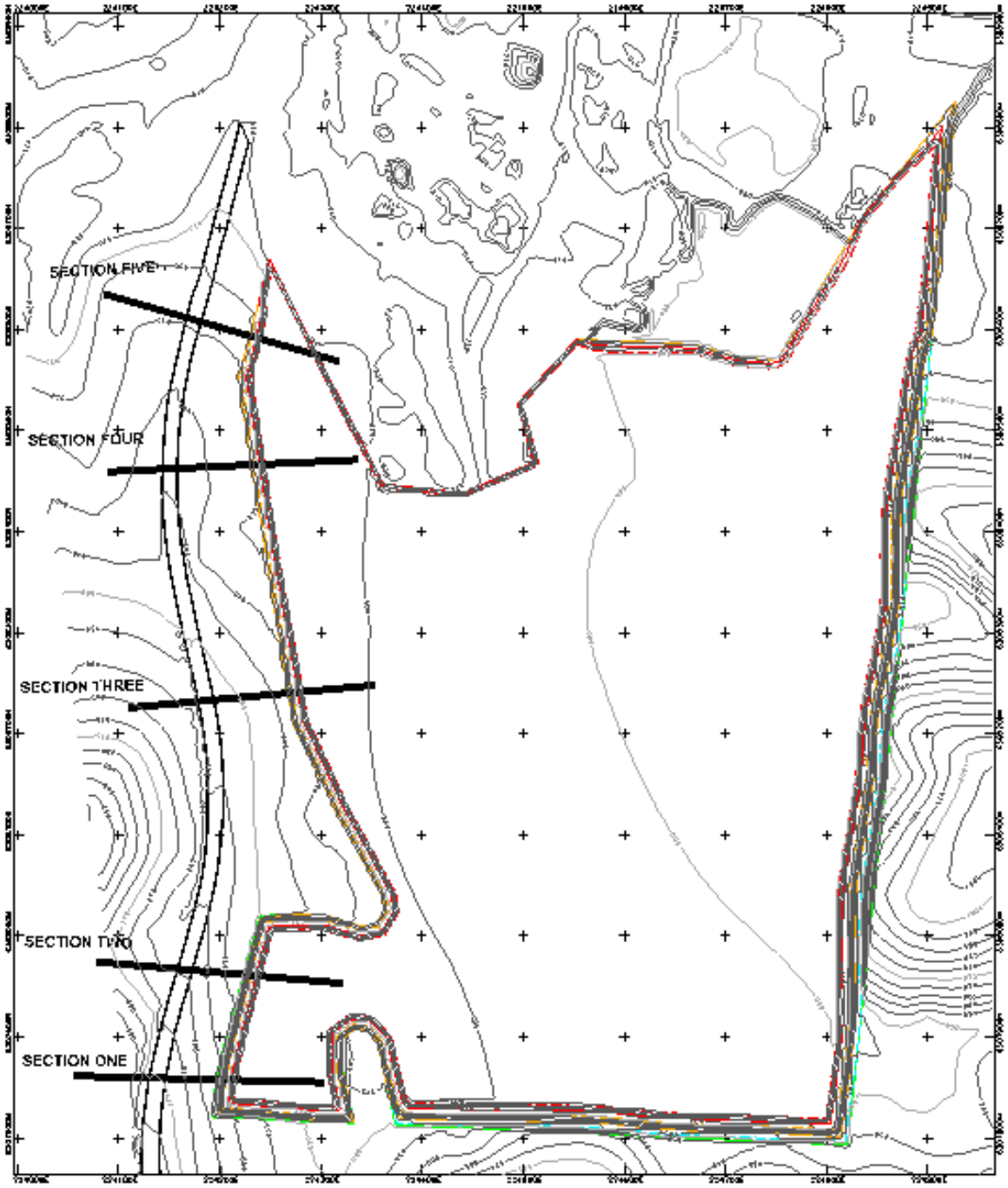


Figure 1.2 Sections with pit shell

The five cross sections are shown below in Figure 1.3 to Figure 1.7. The co-ordinate grid is every 50m. In all cases the highway is more than 50m from the crest of the highwall.

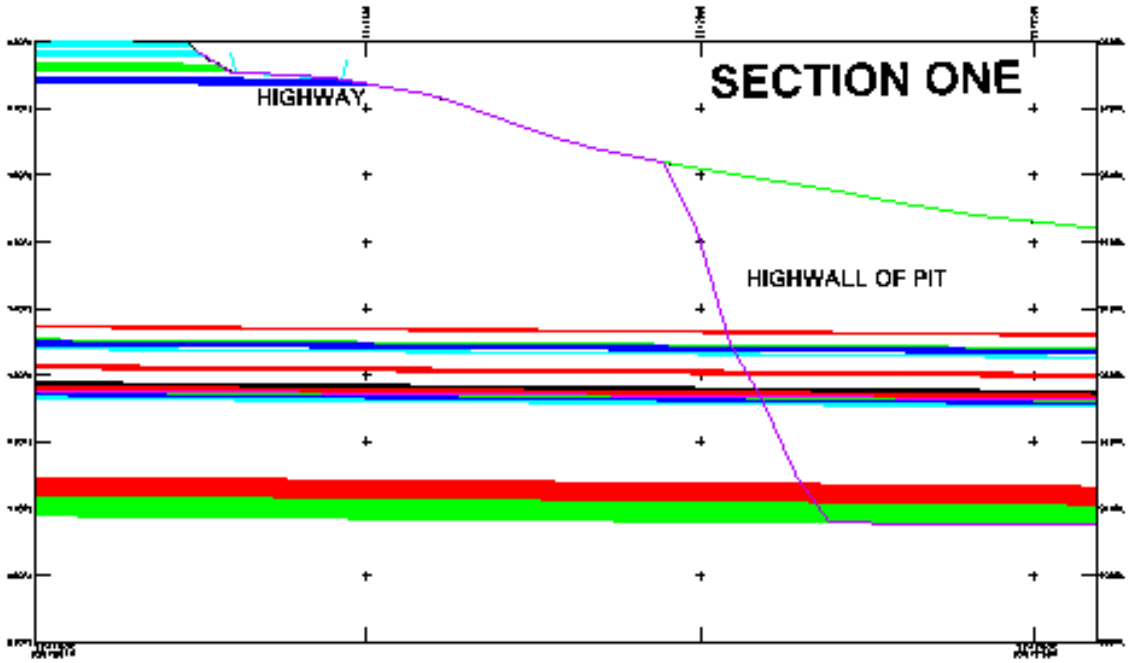


Figure 1.3 Section one (far south)

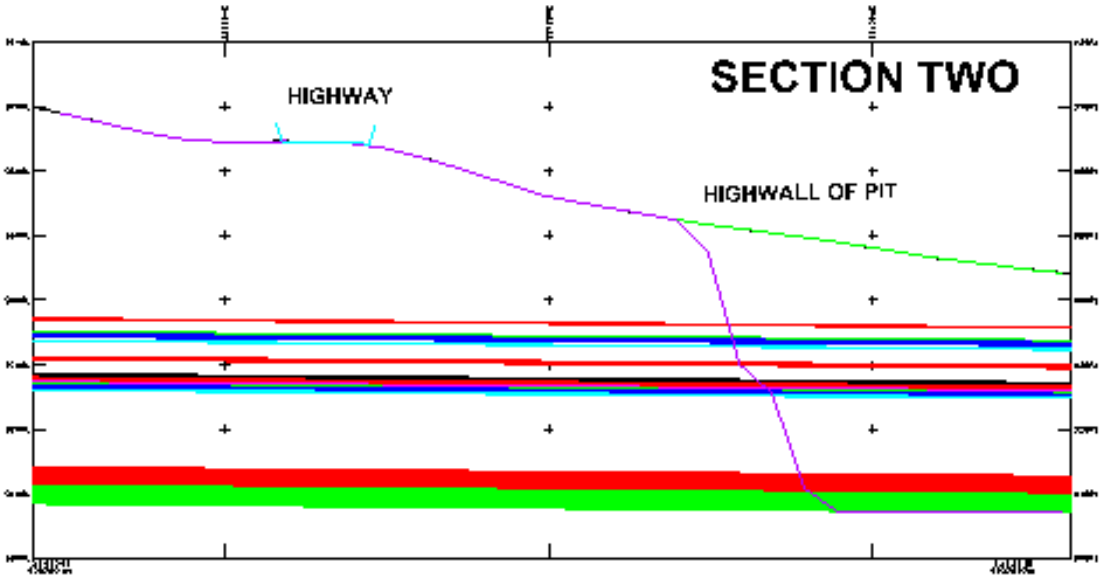


Figure 1.4 Section two (second from south)

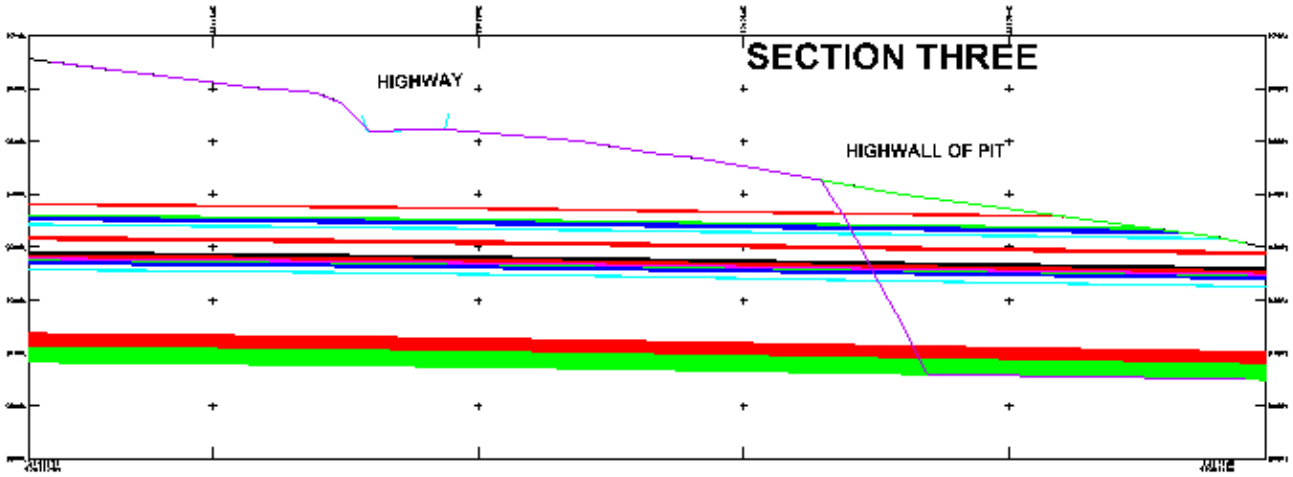


Figure 1.5 Section three (middle)

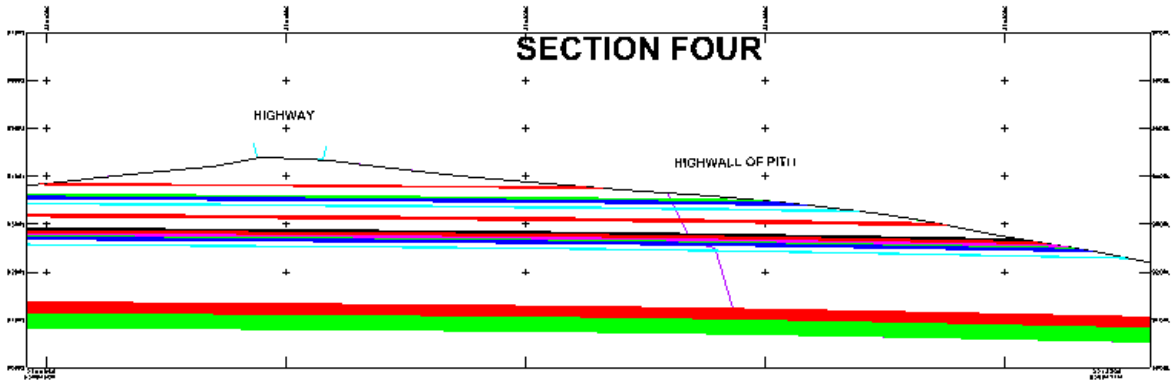


Figure 1.6 Section four (2nd from north)

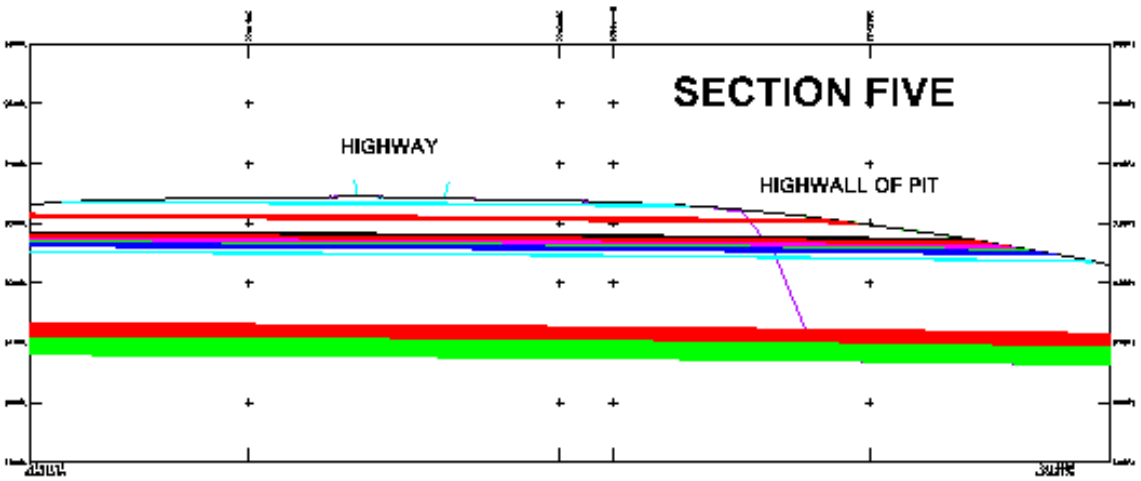


Figure 1.7 Section five (futherest north)

2 Dumping

The void areas are shown below in Table 2.1 and the dump balance per annum is shown in Table 2.2.

Table 2.1 Void Areas

Area	Dump Capacity Mlcm	Comment
In-Pit	14.0	
Pit 9	1.3	
Area A	0.9	Majority can be dozer pushed
Area B	0.5	
Total	**16.7**	

Table 2.2 Dump Balance

Year	Scheduled Volume Mbcm	Dump Room Required Mlcm	Dump Capacity Mlcm
1	3.6	4.5	4.6
2	3.8	4.8	4.8
3	3.8	4.8	5.1
4	1.7	2.1	2.2
Total	13.0	16.2	16.7

APPENDIX 2

Blasting Report – Castlereagh Highway

ENVIRO STRATA CONSULTING Pty Ltd
A.B.N. 35 122 301 795

24 Albert Street
Valentine NSW 2280
T/F: (02) 4946 1864
Mob: (0407) 005 352
Email: enviro.strata@gmail.com

Thomas Lewandowski
B.E. (Mining), M.M.Mgt,
M.Aus.I.M.M.,
M.I.S.E.E.,
M.EFEE.

UMWELT (AUSTRALIA) PTY LIMITED
on behalf of
CASTLEREAGH COAL

INVINCIBLE SOUTHERN EXTENSION PROJECT – REVIEW OF RISKS RELATED TO CLOSE RANGE BLASTING ON THE CASTLEREAGH HIGHWAY

FINAL

REPORT NO. UM-1624-280117

Thomas Lewandowski
28th January 2017

UMWELT (AUSTRALIA) PTY LIMITED
on behalf of
CASTLEREAGH COAL

INVINCIBLE SOUTHERN EXTENSION PROJECT – REVIEW OF RISKS RELATED TO CLOSE RANGE BLASTING ON THE CASTLEREAGH HIGHWAY

FINAL

REPORT NO. UM-1624-280117

TABLE OF CONTENTS

ENVIRO STRATA CONSULTING Pty Ltd
A.B.N. 35 122 301 795

24 Albert Street
Valentine NSW 2280
T/F: (02) 4946 1864
Mob: (0407) 005 352
Email: enviro.strata@gmail.com

Thomas Lewandowski
B.E. (Mining), M.M.Mgt,
M.Aus.I.M.M.,
M.I.S.E.E.,
M.EFEE.

1. INTRODUCTION

Enviro Strata Consulting Pty Ltd (ESC) was engaged by Umwelt (Australia) Pty Limited (Umwelt) to assist with a detailed review of risks from blasting for the proposed Invincible Southern Extension Project (the Project) on the adjacent Castlereagh Highway (HW18).

The request was instigated by an objection from the Roads and Maritime Services (RMS), in a letter dated the 08.11.16. The letter highlighted the potential high risk for the public infrastructure from the Project's close range blasting and possible geotechnical impacts.

This report addresses the following issues:

- Assessment of the potential impacts of blasting on the adjacent Castlereagh Highway,
- Provide blasting limit guidelines and a review of relevant literature studies,
- Identify and provide details on risks and risk management related to the adjacent blasting,
- Provide guidelines on blast control measures and monitoring programs which will assist with blast design issues and limit blasting impacts.

2. OVERVIEW OF PUBLIC INFRASTRUCTURE AND PROPOSED BLASTING AREA

The proposed extraction plans for the Invincible Southern Extension Project are highlighted in **Figure 1**. The mine proposes to undertake open cut extraction activities to the south of the old Invincible open cut area.

The open cut mine will operate using a standard drill and blast method. The method, in brief, can be described as follows.

The Invincible Southern Extension Project will employ open cut extraction utilising drill and blast methods for coal recovery. The operation sequence commences with a bench survey and blast design. Bench drilling in accordance with the blast design parameters follows. A typical bench is rectangular in shape with approximately no more than 100

holes and a uniform drilling pattern. The holes are loaded with explosive material such as standard ammonium nitrate fuel oil (ANFO) for dry strata conditions or Heavy ANFO and emulsion blends for wet conditions. The top part of the loaded holes is filled with a gravel material (i.e. stemming material) to contain the energy release and achieve a low airblast emission (i.e. lower environmental impact) and minimise the possibility of flyrock. The loaded explosives are then initiated through a detonating cord, connected to each hole, which delivers a signal to the primer / booster, placed within each hole. The primer / booster then initiates the explosives.

A delay system (i.e. NONEL system), which allows for single hole initiation, results in a small delay between each blasted hole. This system controls the ground and air vibration impacts (i.e. facilitates a lower environmental impact). Alternatively, pre-programmed electronic detonators can also be used with similar effect, but with higher accuracy. Following the firing of a blast, the blasted and fractured rock strata (i.e. overburden or interburden material) is then removed using a truck and shovel method for further rock strata stockpiling. Depending on the strength of the coal, the same blasting process can be undertaken for coal strata blasting. Following coal blasting the coal material is then transported for further processing.

The anticipated lifespan of the Invincible Southern Extension Project is in the order of 8 years. Based on the proposed mining plans, and an 8 year life of the mine, the following three stages are assigned to represent specified years of operation:

- Stage 1 – representing the early stages of the Project with mining occurring immediately south of the existing Invincible disturbance area
- Stage 2 – representing a later stage of the Project with mining occurring in the southern extent of the Southern Extension Area
- Stage 3 – representing the conceptual final landform

The operational activities will be conducted under a Blast Management Plan (BMP) and Road Closure Management Plan (to be developed with the infrastructure owner). This will allow for the management of inherent risks related to blasting activities as discussed later in this report.

The boundary of the proposed Invincible Southern Extension Project and the infrastructure facilities (including Castlereagh Highway), identified to be located at variable distances to the project boundary, are highlighted in **Figure 1**.

As shown, Castlereagh Highway is located to the West of the Project boundary. As estimated by Palaris (2016) the minimum distance between the highway and the highwall is no less than 50 metres. The minimum distance is highly variable and is estimated as follows:

- for the north-western section in the range of 50 – 63m,
- for the western (central) section in the range of 57 – 160m,
- for the south-western section in the range of 50 – 58m.

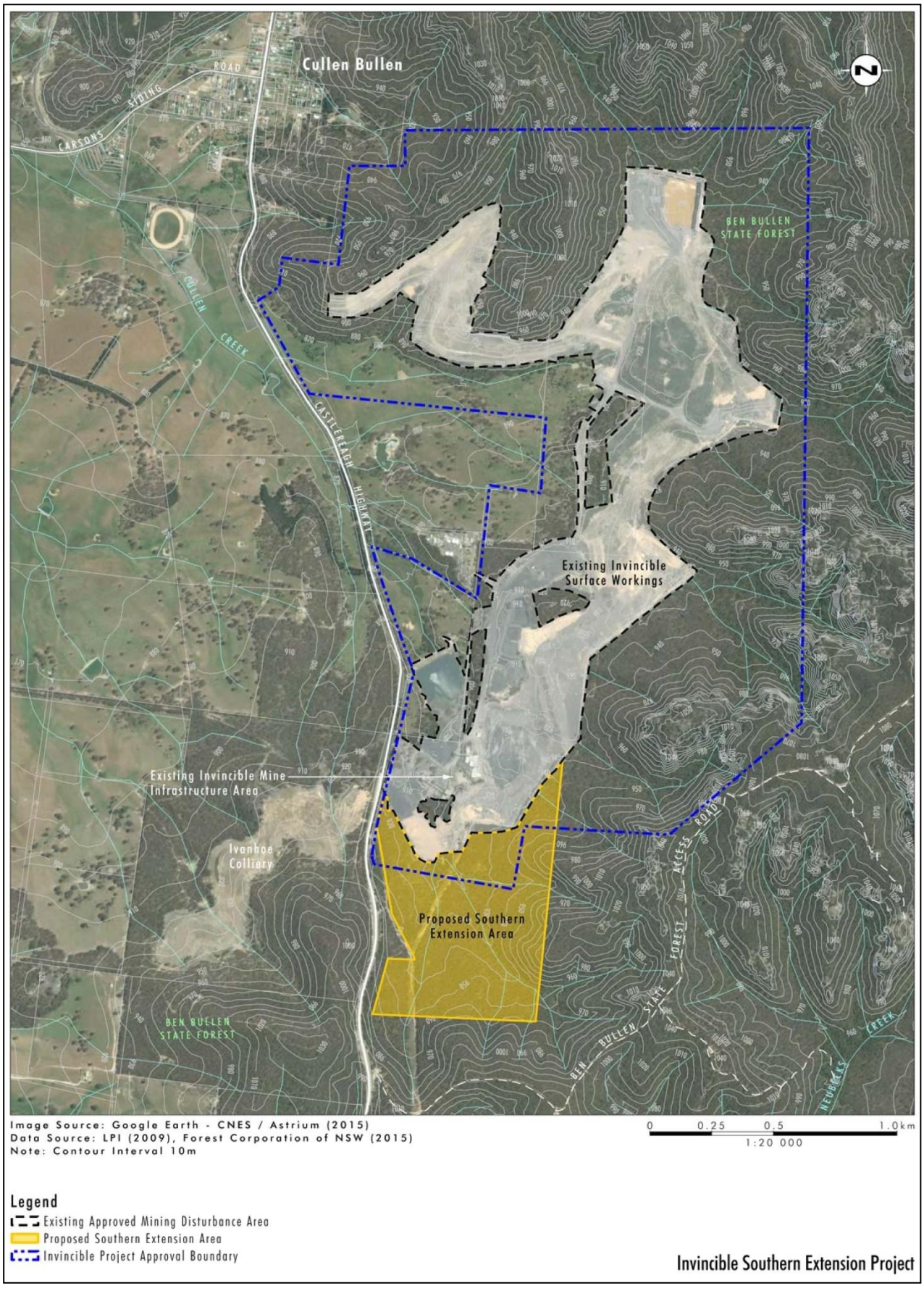


Figure 1 – Invincible Southern Extension Project and Castlereagh Highway (Umwelt 2016)

3. VIBRATION LIMITS AND RELEVANT LITERATURE STUDIES

The existing and proposed ground vibration and airblast emission criteria for the identified infrastructure (including public roads and bridges) and relevant historical sites and private residences were discussed in detail in another ESC report (2016). The limits for public roads and bridges are also summarised below.

Infrastructure including Public Roads and Bridges

A comprehensive overview of the existing allowable vibration limits for various infrastructure (including public roads and concrete bridges) was presented in ACARP Report No. C14057. The recommendations in regards to vibration exposures for concrete bridges are also provided in Australian Standard AS2187.2-2006 (i.e. for unoccupied structures of reinforced concrete or steel construction). Vibration levels for roadways / concrete bridges are specified as follows:

- Public roads – 100 mm/s
- Concrete bridges – 100 mm/s

These vibration limits are used as the assessment criteria for the Project.

The following is a review of relevant cases related to close range blasting near public roads.

Case 1

ACARP Project C14057 is a research project sponsored by the coal mining industry. The publications from each project are recognised as reference materials. This type of study provides an independent opinion on various technical subjects.

Project No. C14057 produced general guidelines on allowable vibration limits for various infrastructure facilities. Among the recommendations are limits for various infrastructures, including public roads. The report recommends a limit of 100 mm/s. As indicated, this is only an initial limit recommended without further study being undertaken by a specialist. The report indicates that higher vibration limits can be considered upon the completion of such a study.

In conclusion, one can infer a significant factor of safety in this recommendation.

Case 2

Rorke and Thabethe (2004) described large scale open cut blasting in South Africa immediately adjacent to the main national road. The road was positioned between two open cut voids (forming a road bearing pillar) creating a risk of potential bulk displacement (i.e. rock strata displacement) due to a lack of confinement on both sides of the road. **Figure 2** presents a simplified section showing the risk of bulk displacement of the pillar (bearing the road) as a result of reaction forces from the blast. The large scale blast was undertaken within 110 metres of the road at the narrowest point. The risks were identified and included flyrock, vibration damage and bulk displacement. Each risk was dealt with appropriately.

To manage the risks the mine employed a smaller drill rig diameter (i.e. reduced from 250 to 200 mm) to reduce the charge mass of the explosives for the blast. The risk of flyrock was dealt with via the application of an adequate stemming column and air decks (including 3 metres of stemming column applied above 1 metre of air deck) to suppress potential flyrock occurrence. The mine also utilised quality stemming material including 19 mm screened hard rock aggregate.

For the road and subsurface (referred to as a well compacted material) a limit of 150 mm/s was considered safe and was used as a target vibration limit for the blast. The mine opted to utilise deck charges to minimise and control vibration levels. The maximum instantaneous charge mass (MIC) was reduced to 215 kg per deck. The mine also utilised a non-reinforcing (non-destructive wave interference) initiation sequence based on a single wave study. This was combined with the use of electronic detonators to ensure the accuracy of the initiation sequence and eliminate wave interactions.

To minimise any potential bulk displacement the number of rows was reduced to eight and deck charges employed with an appropriate initiation sequence. This was to minimise the amount of shock wave (minimise reaction forces to the block) delivered to the strata.

As a result of these blast design control measures the blast produced a low vibration impact well below the specified limit of 150 mm/s. The back damage (behind the blast) was limited and there was no evidence of bulk ground displacement. No damage to the road was detected.

In conclusion the applied blast control measures were adequate for control of the various risks identified to the main national road immediately adjacent to the open cut operations.

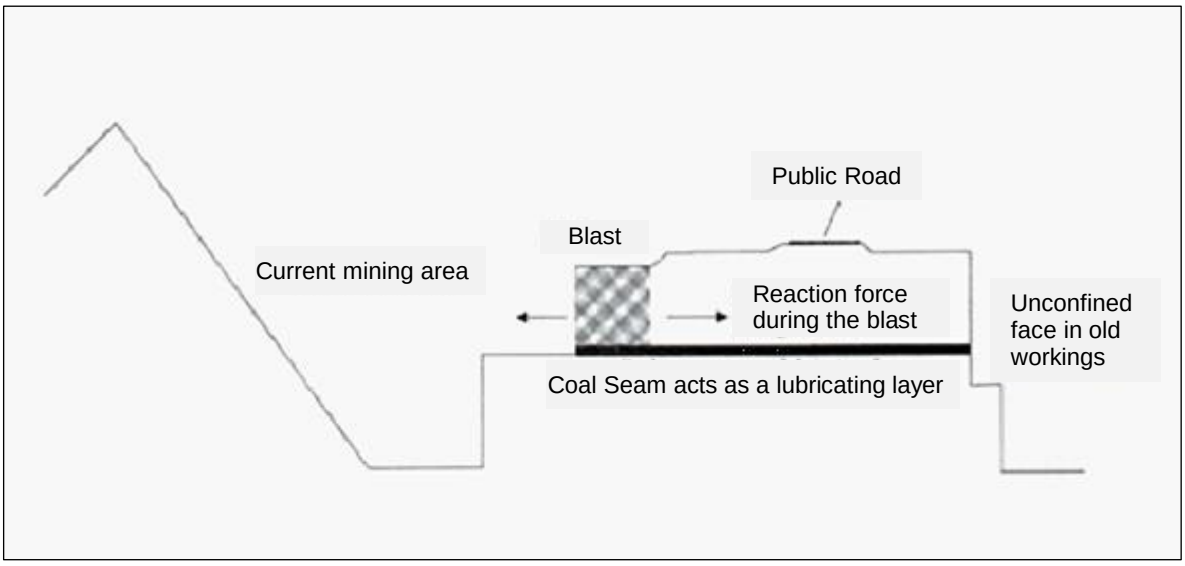


Figure 2 – A simplified Cross-section Showing the Risk of Bulk Displacement of the Road Bearing Pillar as a Result of Reaction Forces from the Blast on the West Side (left) of the Road (after Rorke and Thabethe, 2004)

Case 3

Achuff and Aimone-Martin (2005) presented a case study related to close range highway blasting (i.e. within 10 - 20 metres of the highway), see **Figure 3**. The project included widening of the Highway US 70 in Hondo, New Mexico USA.

Due to the close proximity of various structures, animal species and habitat a high number of environmental constraints were imposed. Pre-construction condition surveys for structures / private properties within 60 metres of the highway were undertaken. The vibration limits were mainly applicable to structures, i.e. mainly private houses / dwellings (i.e. using (USBM) RI 8507 vibration limit criteria – frequency dependent criteria applicable to houses). The other limits included 0.3 ips (8 mm/s) for historic retaining walls (located 3 metres away). The close distances between the blasting areas and the highway are highlighted in **Figure 3**. There was no vibration limits applicable to the adjacent highway, however, to adhere to the other imposed vibration limits low charge masses and a minimal charge per delay / lower bench sizes were used.

The blasting was undertaken immediately adjacent to the existing two way highway. The broken material was spilling / thrown onto the highway. Very often the rock needed to be cleaned off the road. It is inferred that any created damage by the falling rock on the adjacent highway was insignificant, i.e. potential minor dents but no substantial damage otherwise the project would need to utilise blasting mats (widely used in construction blasts in cities) to prevent the impact of flyrock.

The road had been closed for the duration of the blast. Following each blast the road was cleaned of debris and re-opened as soon as possible.

Cushion blasting was employed (instead of presplit blasting) to prevent back break. Also, different blast control measures were implemented when blasting next to historic infrastructure to limit flyrock, i.e. blasting undertaken within 3 metres of the historic retaining wall and 60 metres from a historic structure.

The study identified that various risks such as flyrock, airblast and ground vibration can be fully controlled by the drill and blast operator by appropriate adjustment and flexibility in blast design.

Figure 3 – Blasting next to Road (after Achuff and Aimone-Martin, 2005)

Case 4

Domotor (2011) summarised construction blasting activities on the Brisbane airport link – largest infrastructure project in Queensland. The paper describes the removal of remnant pillars by the drilling and blasting method next to a major arterial road and within a 100 m of infrastructure including a number of heritage listed buildings and private residences. The work included various requirements including precise design, modelling, loading and blasting, clearance and others. The imposed limit of 100 mm/s was chosen. This is the

limit used to control damage to structures such as reinforced concrete construction. The ground vibrations from the undertaken blasting were well under the imposed limit.

Case 5 - ESC's experience (2008)

ESC's experience includes blast vibration monitoring of power pole behaviour and assessment for one of the Hunter Valley mines when large scale blasting (MIC 2,924kg) was conducted immediately adjacent to Putty Road (NSW), i.e. within approximately 40 - 45 metres.

The ground vibration measurements from the power poles on the other side of Putty Road revealed high vibration exposures, in the order of 150 - 280 mm/s with the public road in between, see **Appendices 1A-D**. Based on the measurements, the inferred vibration exposure for Putty Road was in the order of 200 – 300 mm/s. It is stressed that the study was focused on power pole monitoring, however no damage to the pubic road was observed, as the road was inspected and re-opened to the public. Note that as a precautionary measure the mine also had a road sweeper on standby to remove any potential flyrock generated by the blast.

4. DISCUSSION

There are some potential risks related to open cut blasting immediately adjacent to road infrastructure. As indicated above, the risks can be managed effectively via the application of various techniques and methods.

The identified infrastructure (i.e. Castlereagh Highway), constructed of bitumen and concrete, is located at variable distances from the edge of the proposed Invincible Southern Extension Project, i.e. within 50 to 160 metres. The closest potential Invincible Southern Extension blasting activities to the Castlereagh Highway could be located within 50 metres, however, this represents an extreme scenario and would only apply to blasting undertaken near the top of the highwall closest to the road, and in areas where overburden ripping is not possible; with the majority of blasting activities located more than 250 metres from the highway.

Some of the risks identified and related to blasting include:

- Ground vibration
- Flyrock
- Fumes
- Airblast

Ground Vibration

- The vibration limit for public roads was identified as 100 mm/s. As discussed in the report, the specified level is conservative when considering inducing damage to

road pavement (bitumen and concrete materials). The limit is also well below the damage criteria for the assessed public infrastructure, such as a public road.

- The recommended allowable vibration limit is in agreement with other studies' recommendations when blasting next to public roads as well as other published studies of a similar nature as presented in section 3.
- Ground vibration can be managed effectively via the application of lower charge masses, and or deck charges, and an appropriate initiation sequence. These procedures will be documented in the BMP
- It is recommended to undertake vibration monitoring for the close range blasts (i.e. within 250 metres) and appropriate reporting. The monitoring unit is to be located on the surface of the shoulder of the road. Monitoring locations and procedures are to be documented in the BMP.
- It is recommended to undertake pre-blast surveys of the critical areas of the roadway and undertake at least annual surveys and appropriate reporting.
- The road will be visually inspected for any damage due to vibration after each critical blast.

Flyrock

Flyrock can be managed via the application of an appropriate technique / method as discussed in the report.

In regards to potential risks of personal injury, Invincible Southern Extension Project will operate on a 500 metre exclusion zone to minimise/ eliminate the risk of a person being injured due to flyrock. The exclusion zone is consistent with exclusion zones at other operations in New South Wales.

Procedures associated with the implementation of the exclusion zone (which would include road closures when the blasting is within 500 metres of the road) will be documented in the BMP and Road Closure Management Plan. These procedures would include the use of sentries responsible for ensuring that the areas are adequately checked for the presence of persons. The BMP and Road Closure Management Plan will also include procedures for inspecting the road for any damage from flyrock and the removal of any flyrock on the road after each blast within 500 metres of the Castlereagh Highway.

In summary, the risk of personal injury due to flyrock or injury associated with debris on the Castlereagh Highway is considered highly unlikely due to the use of a BMP, Road Closure Management Plan, the operation of exclusion zones, placement of sentries and other measures.

Fumes

The risks of fumes can effectively be managed through the application of the appropriate BMP and Road Closure Management Plan, and using a 500 metre exclusion zone for blasting.

The mine will undertake appropriate steps to manage any potential fume exposure to the public via an appropriate procedure, i.e. taking into consideration wind speed and wind direction. This would eliminate any potential human exposure to fumes when passing through Castlereagh Highway.

Airblast

There are no airblast overpressure criteria for the considered structure as airblast overpressure would have negligible impact for the considered Castlereagh Highway.

5. CONCLUSIONS AND RECOMMENDATIONS

The report includes an assessment of the risks related to close range blasting activities associated with the proposed Invincible Southern Extension Project on the adjacent public infrastructure, i.e. Castlereagh Highway (HW18).

The outcomes of the assessment are summarised as follows:

- The vibration criteria for public roads was identified as 100 mm/s.
- The recommended allowable vibration criteria (i.e. for bitumen and concrete elements) is in agreement with other studies dealing with blasting next to public roads as reviewed in this report and is considered to be a conservative criteria.
- Blasting will be undertaken at variable distances from Castlereagh Highway, with the minimum distance to Castlereagh Highway being in the range of 50 to 160 metres. The majority of blasting activities will be located at a distance of more than 250 metres.
- Ground Vibration Risk
    - Blasting will be executed in accordance with a BMP and Road Closure Management Plan which will define the impact criteria to features which are potentially susceptible to vibration impacts. Blasts will be designed to ensure vibration (and overpressure) impacts can be maintained below the imposed criteria. This will be achieved via the application of lower charge masses, and or deck charges, and an appropriate initiation sequence.
    - It is recommended to undertake vibration monitoring for the close range blasts (i.e. within 250 metres) with appropriate reporting of the monitoring to RMS as the relevant roads authority.
    - It is recommended that the road be visually inspected for any damage due to vibration after each blast within 500 metres of the road.
    - It is recommended to undertake pre-blast surveys of the critical areas of the roadway and undertake at least annual surveys.

- Flyrock Risk
  - Flyrock can be managed via the application of an appropriate technique / method as discussed in this report. The Project will operate using a standard 500 metre exclusion zone for flyrock management. The impact on Castlereagh Highway will be managed in accordance with a Road Closure Management Plan and BMP to be developed in consultation with the infrastructure owner as part of the Project.
- Fume Risk
  - Fumes risk can be managed through the application of the appropriate BMP and Road Closure Management Plan and the use of a 500 metre blast exclusion zone.
- Airblast Risk
  - There will be negligible effect of airblast on the Castlereagh Highway.

Thomas Lewandowski
ESC
28th January 2017

REFERENCES

ACARP Report Reference No. C14057 'Effect of Blasting on Infrastructure' Alan Richards, Adrian Moore, 2008

Achuff, F., Aimone-Martin, C. (2005) "Highway blasting – a design / build case study". Published in The Journal of Explosives Engineering. Volume 22 Number 1, January / February 2005. pp. 10 -19.

Australian Standard AS 2187.2:2006, Explosives – Storage and use, Part 2 – Use of explosives (AS 2187 Part 2).

Domotor, R. (2011) "Controlled blasting for civil construction in urban environment" In proc. Explo Conference Melbourne 2011. pp. 107 – 117.

ESC, (2016) "Invincible Southern Extension Project – Blasting Impact Assessment" ESC Report No. UM-1606-050816, p.46.

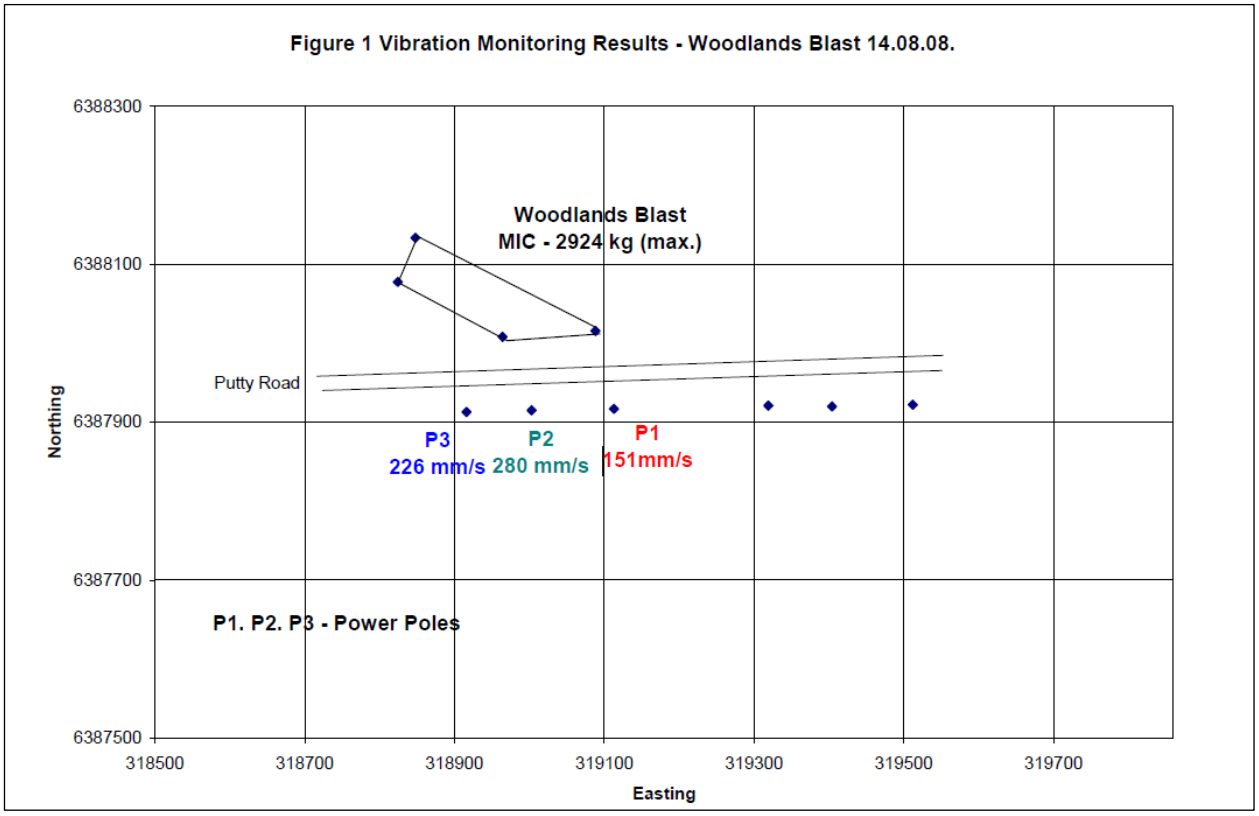
Palaris (2016) Internal Report, document number SHC2600-01.

Rorke, T., Thabethe, S. (2004) "Blasting next to an unsupported road using electronic detonators" Published in the Journal of Explosives Engineering. Volume 21 Number 6, November / December 2004.

US Bureau of Mines, USBM RI8507.

APPENDICES

Appendix 1A – Schematic of Blast Location, Power Poles, Putty Road and Vibration Monitoring Points



Appendix 1B - Sample of Vibration and Strain Monitoring Set up

Appendix 1C - View of Timber Power Pole, Monitoring Unit and Adjacent Mine

Appendix 1D - Sample of Vibration Monitoring Record, Showing PPV of 151 mm/s

Instantel

Date/Lheure	Vert a 13:23:45 Aout 14, 2008	Numero serie	BE12694 V 8.12-8.0 MiniMate Plus
Source enclencheur	Geo.: 0.910 mm/sec.	Niveau de la pile	6.2 Volts
Portee	Geo.:254 mm/sec.	Calibration	Aout 17, 2007 by Instantel Inc.
Periode d'enregistrement	10.0 sec. a 1024 echant. a la sec.	Nom de filiere	N694CBR3.VL0

Notes

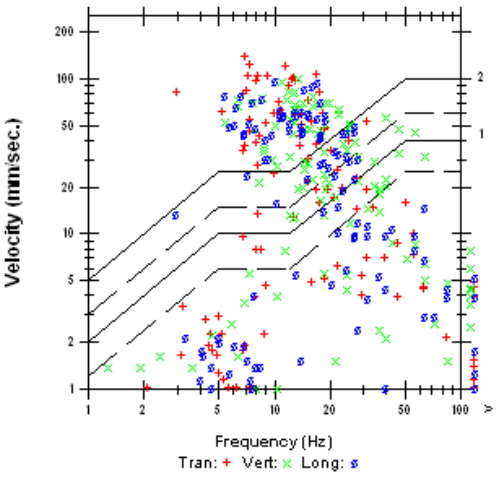
Notes post-evenements.

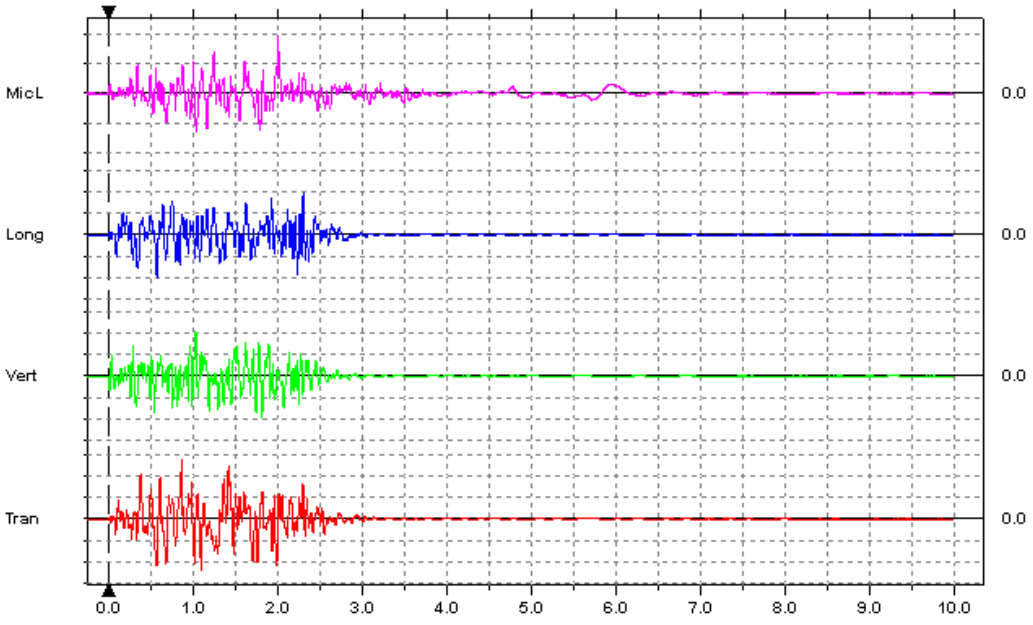
Microphone	Micro. de poids lineaire.
NPAM	133.6 dB(L) 95.5 Pa.(L) a 2.003 sec.
Freq. ZC	6.6 Hz.
Verif. de canal	Reussi. (Freq. = 20.1 Hz Amp. = 521 mv.)

	Tran	Vert	Long	
VMP	138	103	97.8	mm/sec.
VMP	93.8	91.2	90.8	dB
Freq. ZC	7.0	13	10	Hz.
Temps (Relatif eclech.)	0.864	1.025	0.573	sec.
Acceleration Max.	6.03	3.39	3.02	g
Deplacement Maximal	3.47	1.76	1.86	mm
Verif. sonde	Reussi.	Reussi.	Reussi.	

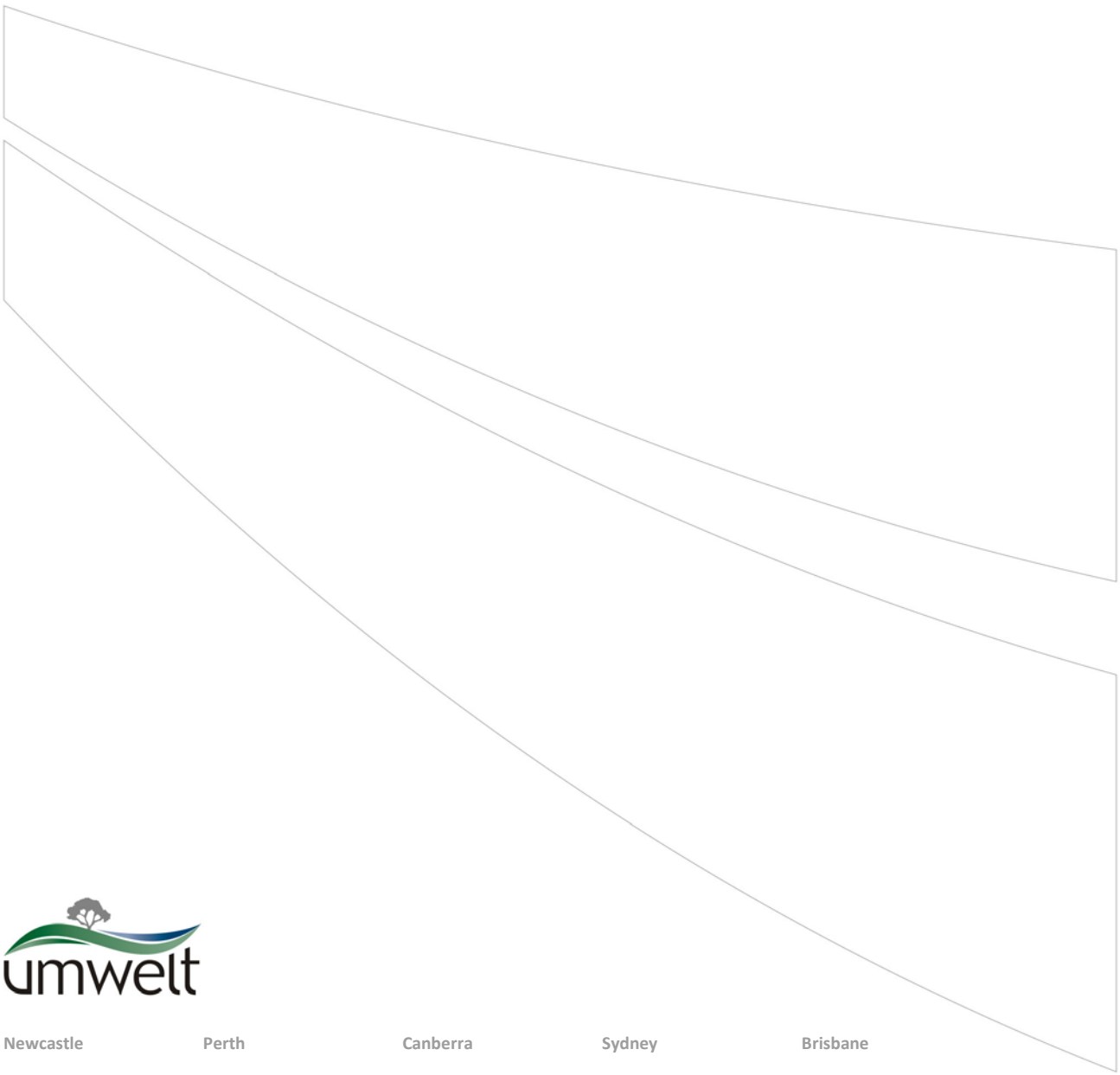
Somme vecteur maximale 151 mm/sec. a 0.864 sec.

RECOMMANDATION GFEE





Echelle de temps: 0.50 sec./div. Echelle amplitude: Geo.: 50.0 mm/sec./div. Micro: 50.0 Pa.(L)/div.
Declencheur =



umwelt

Newcastle	Perth	Canberra	Sydney	Brisbane
75 York Street Teralba NSW 2284	PO Box 8177 Subiaco East WA 6008 33 Ventnor Avenue West Perth WA 6005	PO Box 6135 56 Bluebell Street O'Connor ACT 2602	50 York Street Sydney NSW 2000	GPO Box 459 Brisbane QLD 4001
Ph. 02 4950 5322	Ph. 08 6260 0700	Ph. 02 6262 9484	Ph. 1300 793 267	Ph. 1300 793 267

www.umwelt.com.au