



APPENDIX 10

Noise Impact Assessment



MANILDRA GROUP
100% AUSTRALIAN OWNED

INVINCIBLE SOUTHERN EXTENSION PROJECT

Noise Impact Assessment

FINAL

September 2016



INVINCIBLE SOUTHERN EXTENSION PROJECT NOISE IMPACT ASSESSMENT

Section 75W Modification

FINAL

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on behalf of
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Report No. 3622/R08/FINAL
Date: September 2016



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1.0 Introduction

Castlereagh Coal Pty Ltd (Castlereagh Coal) operates the Invincible Colliery (Invincible), an opencut coal mine, currently in care and maintenance, located approximately 25 kilometres north-west of Lithgow in NSW (refer to **Figure 1.1**). The township of Cullen Bullen is located approximately 3 kilometres north-west of the Invincible mine infrastructure area. Castlereagh Coal is the trading name for Shoalhaven Coal Pty Ltd which is part of the Manildra Group (Manildra), an integrated and diverse agribusiness.

Shoalhaven Coal purchased Invincible in 2015 to secure a continued supply of specialty nut coal for the Manildra's Shoalhaven Starches Plant at Bomaderry on the NSW south coast.

The Invincible Southern Extension Project (the Project) is an extension of open cut mining operations to the south of the existing approved mining area at Invincible.

The Project includes:

- Extending the period in which mining can continue for a period of 8 years from approval of the modification application.
- Extending the open cut mining area immediately south of the existing mining disturbance area (refer to **Figure 1.2**). Extraction of coal from all seams down to, and including the Lithgow seam. No highwall mining or open cut mining in any other areas of Invincible is proposed as part of the Project
- Continued use of existing Invincible infrastructure (including operation of, and maintenance work on, the existing Coal Preparation Plant)
- Use of existing open cut voids and former underground workings for water storage.
- No change to currently approved mining production rates
- 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 key features of the Project are shown on **Figure 1.2**.

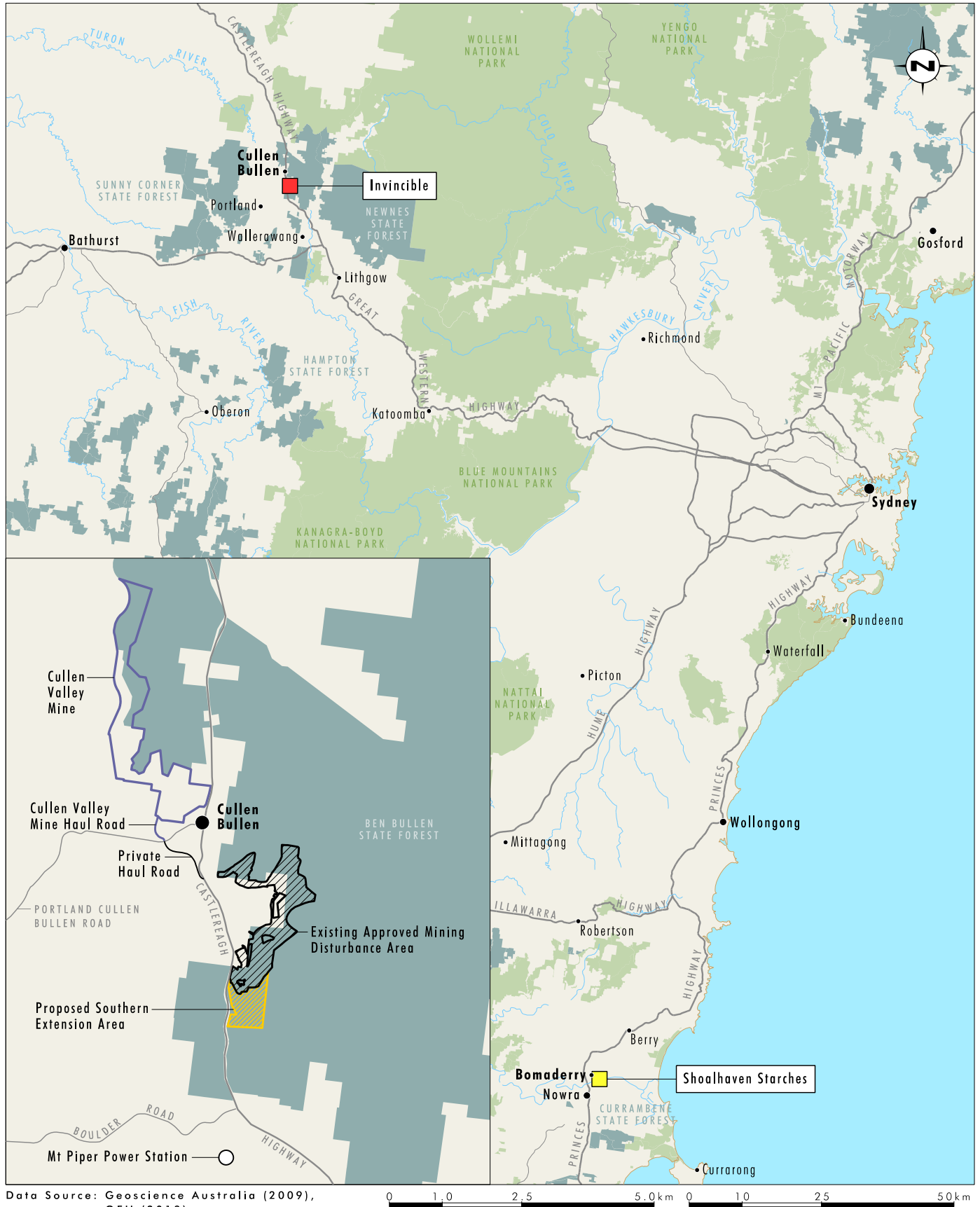


FIGURE 1.1
Locality Plan

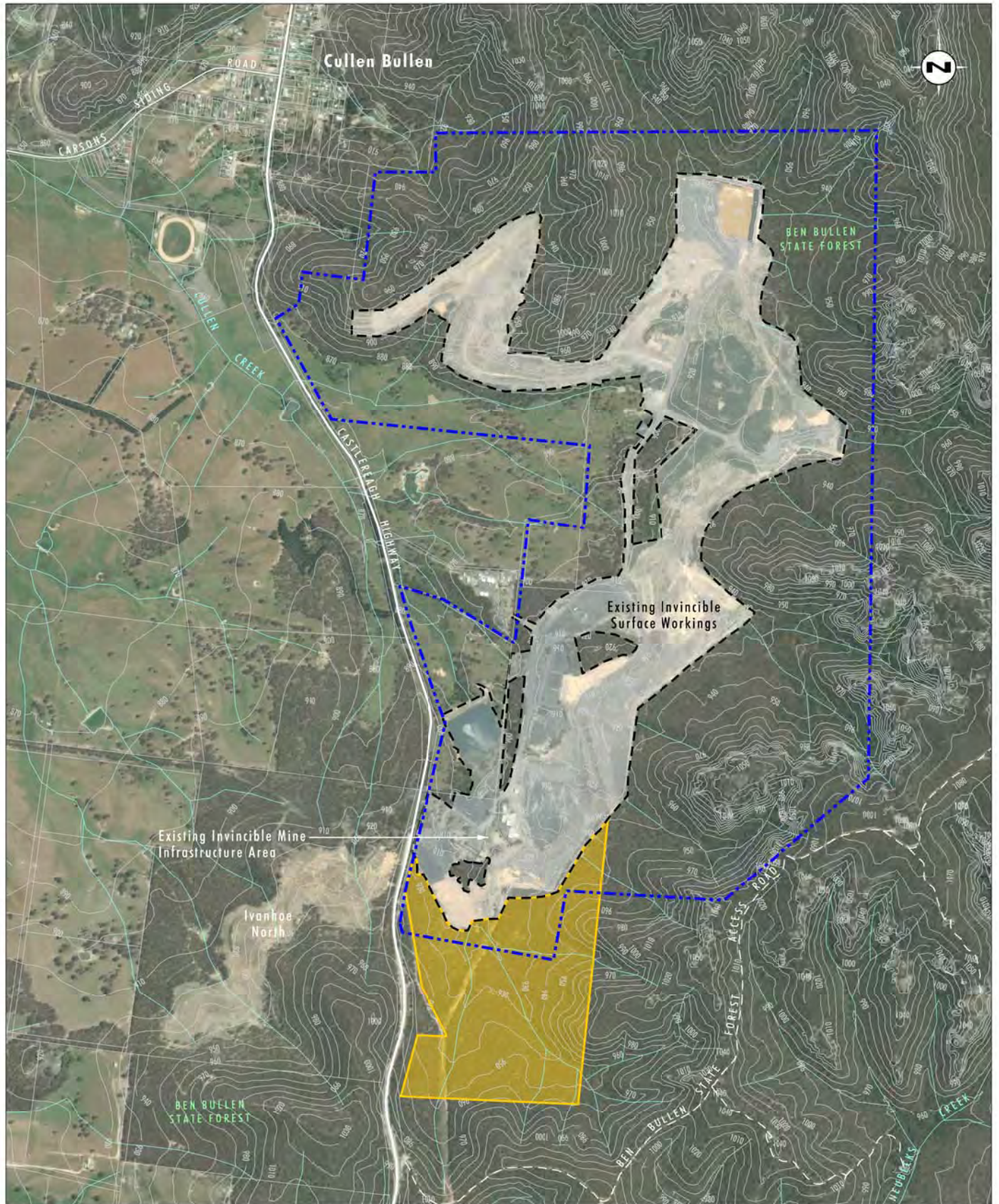


Image Source: Google Earth - CNES/Astrium (Nov 2014)
 Data Source: LPI (2016), Forest Corporation of NSW (2015)
 Note: Contour Interval 10m

0 0.25 0.5 1.0 km

Legend

- Existing Approved Mining Disturbance Area
- Proposed Southern Extension Area
- Invincible Project Approval Boundary (PA07/0127)

FIGURE 1.2

Invincible Southern Extension Project

The purpose of the Project is to provide Manildra's Shoalhaven Starches Plant with a reliable and cost effective source of specialty nut coal for its Bomaderry operations on the NSW South Coast. The Lithgow Seam resources, when washed, will provide approximately 300 kt of nut coal for the Shoalhaven Starches Plant. The current demand per annum for nut coal at Shoalhaven Starches is approximately 85 ktpa. The nut coal resource available in the Lithgow Seam in the Southern Extension Area equates to approximately 4 years supply of nut coal for the Shoalhaven Starches Plant if Invincible is the sole source of supply. Coal from the Lidsdale and Irondale seams which is unsuitable for use in Shoalhaven Starches plant will be sold to the Mt Piper Power Station.

Castlereagh Coal are seeking approval for the extension of mining to occur over a period of up to 8 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 this can be used at the Shoalhaven Starches Plant.

This assessment has assumed a conservative mining scenario of up to maximum limits of production to provide a conservative assessment of impacts over the life of the Project.

Table 1.1 summarises the key features of the Southern Extension Project and compares these to the existing approved operations at Invincible.

Table 1.1 Comparison of existing approved operations at Invincible and the Southern Extension Project.

	Existing Approved Operations	Southern Extension Project
Resource Tonnes	Defined by existing footprint. Approved reserves have been mined.	Approximately 2.7Mt ROM coal
Mining Methods	Highwall and Open Cut	Open Cut only
Target Seams	All seams down to Lithgow Seam (Irondale, Lidsdale and Lithgow).	All seams down to Lithgow Seam (Irondale, Lidsdale and Lithgow).
Mining Rate	Up to 1.2 Mtpa ROM Coal	Up to 1.2 Mtpa ROM Coal
Production Rate	Up to 1.2 Mtpa Product Coal	Up to 1.2 Mtpa Product Coal
Mining Life	To December 2016 (8 years from date of approval)	Up to 8 years from date of approval
Open Cut Mining Area	152 hectares (ha). 167 ha for total approved disturbance area.	Approximately 50 ha of additional disturbance.

	Existing Approved Operations	Southern Extension Project
Operational Workforce	35 full time personnel.	Approximately 35 full time personnel.
Hours of operations	7.00 am to 10.00 pm Monday to Saturday (excl. public holidays). Mining in south pits not permitted between 6.00 pm and 10.00 pm.	7:00 am to 10.00 pm Monday to Saturday (excl. public holidays). Mining and coal washery operations will not occur between 6.00 pm and 10.00 pm (operations limited to truck loading and maintenance activities only during this period).
Blasting	Blasting between 9:00 am and 5:00 pm Monday to Saturday, inclusive. No more than: • 2 blasts per day • 5 blasts per week averaged over a 12 month period.	Blasting between 9:00 am and 5:00 pm Monday to Saturday, inclusive. No more than: • 2 blasts per day • 5 blasts per week averaged over a 12 month period. Blasts sizes limited to manage potential risks to private residences, pagoda and cliff line formations, historical sites and other infrastructure.
Transport	Road Transport 7.00 am to 9:30 pm Monday to Saturday, excluding Sundays and public holidays. No more than 146 laden coal truck movements from the site per day (averaged over a week). No more than 16 laden coal truck movements per hour.	Road Transport 7.00 am to 9:30 pm Monday to Saturday, excluding Sundays and public holidays. No more than 146 laden coal truck movements from the site per day (averaged over a week). No more than 16 laden coal truck movements per hour.
Tailings Management	Coarse tailings are co-disposed with overburden. Fine tailings are dried in drying ponds; dry tailings are then either mixed with product coal or co-disposed with overburden.	Coarse tailings are co-disposed with overburden. Fine tailings are dried in drying ponds; dry tailings are then either mixed with product coal or co-disposed with overburden.

The approach to this assessment has been to assess the maximum operational and production scenario of the Project to provide an assessment of the potential worse case impacts, and identify relevant noise mitigation and management measures to be implemented as part of the Project.

1.1 Noise impact assessment

This NIA has been prepared by Umwelt (Australia) Pty Limited (Umwelt) as part of the Environmental Assessment (EA) for the Project. The EA has been developed to support an application to modify the existing Invincible project approval (07/0127) under Section 75W of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The NIA has been undertaken in accordance with the NSW Environmental Protection Authority (EPA) *Draft Industrial Noise Guideline* (Draft ING) and other current and relevant guidelines and policies relating to environmental noise resulting from the Project, including:

- *NSW Road Noise Policy (DECCW 2011)*
- *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) (NSW) (2007)*
- *Voluntary Land Acquisition and Mitigation Policy For State Significant Mining, Petroleum and Extractive Industry Developments (NSW Department of Planning and Environment 2014).*

The Draft ING has been used for the purpose of undertaking the NIA as it is expected that this will be the applicable policy for the management of noise over the life of the Southern Extension Project (refer to **Section 3.0**). The Draft ING is based on the latest research and consultation with planning and health industries and provides updates to the existing Industrial Noise Policy (INP). Notwithstanding this, given that the Project is a modification of the existing Invincible Project Approval, the existing approval requirements in relation to relevant noise criteria, which were developed in accordance with the INP, have been adopted for this assessment (refer to **Section 1.2**). As outlined in **Section 4.2**, the criteria derived in accordance with the Draft ING are consistent with the existing criteria contained within the Invincible Project Approval (refer to **Section 1.2**). As the assessment criteria determined under the methodology in the Draft ING and the existing Invincible Project Approval are the same for the day and evening periods in which the Southern Extension Project will be operational, the modification application does not seek and change to the existing noise criteria.

A glossary of terms and abbreviations used in this report is provided in **Appendix A**.

1.2 Existing project approval

The existing Invincible Project Approval (PA 07 0127) contains various environmental performance conditions, including conditions 2 and 3 in Schedule 3 which are reproduced below as they relate to noise considerations.

There are two properties, (Hillview (Receiver ID 394) and Billabong (Receiver ID 393), which are currently identified as having acquisition rights under the Invincible Project Approval due to predicted exceedances of the acquisition criteria under the Invincible Project Approval. The development which was predicted to have noise impacts at these residences above criteria has now been completed in accordance with the existing Invincible Project Approval.

Impact Assessment Criteria

2. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria set out in Table 2 at any residence on privately owned land, or on more than 25 percent of any privately owned land.

Table 2: Impact assessment criteria dBA

Residence / Location	Day LAeq,15 minute	Evening LAeq,15 minute	Night LAeq,15 minute
All privately owned land	40	35	35

However, if the Proponent has a written negotiated noise agreement with any landowner and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 2 on that land in accordance with the negotiated noise agreement.

Notes:

- To determine compliance with the LAeq,15minute noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 m of the dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the Department and DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.
- These limits apply under meteorological conditions of:
 - o wind speeds of 3 m/s at 10 metres above ground level; or
 - o up to 3°C/100 m temperature inversion strength for all receivers, plus a 2m/s source to receiver component drainage flow wind at 10 metres above the ground level for those receivers where applicable.

Land Acquisition Criteria

3. If the noise generated by the project exceeds the criteria in Table 3 at any residence on privately owned land, or on more than 25% of any privately owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in the conditions 6-8 of schedule 4.

Table 3: Acquisition criteria dBA

Residence / Location	Day LAeq,15 minute	Evening LAeq,15 minute
All privately owned land	45	40

2.0 Project description and operational noise control measures

2.1 The project and locality

The area surrounding the Southern Extension Area is rural in character with the mine processing plant and proposed extraction area located at the southern extremity of the existing mine boundary, over 3.0 km from the township of Cullen Bullen and some 25 km north-west of Lithgow. The nearest privately owned residences are located approximately 820 m in the area to the north west of the Southern Extension Area. Castlereagh Highway lies along the western boundary of the Southern Extension Area, which is bounded by the Ben Bullen State Forest in other directions.

The intention is to mine coal over a period of up to 8 years, using open cut methods, with the objective of producing up to 85,000 tonnes of nut coal per annum, which is a washed product from the base Lithgow seam, to supply the Shoalhaven Starches operations. Other coal produced as part of the Project will be trucked to Mt Piper Power Station, located approximately 3 km to the south of the Project. The nut coal would be transported by road to the Shoalhaven Starches plant located approximately 300 km from Invincible.

Open cut mining will occur in an area immediately south of the existing approved Invincible disturbance area, known as the Southern Extension Area. Mining will be undertaken by truck and shovel method and will move in a southerly direction away from the closest privately owned residences and the township of Cullen Bullen over the life of the Project. The proposed mining operations will be incorporated into the current rehabilitation works at Invincible with overburden from the Project being utilised to fill existing voids and meet the requirements of the final landform. As part of the Project, Castlereagh Coal is seeking approval for a revised final landform.

2.2 Mine plans

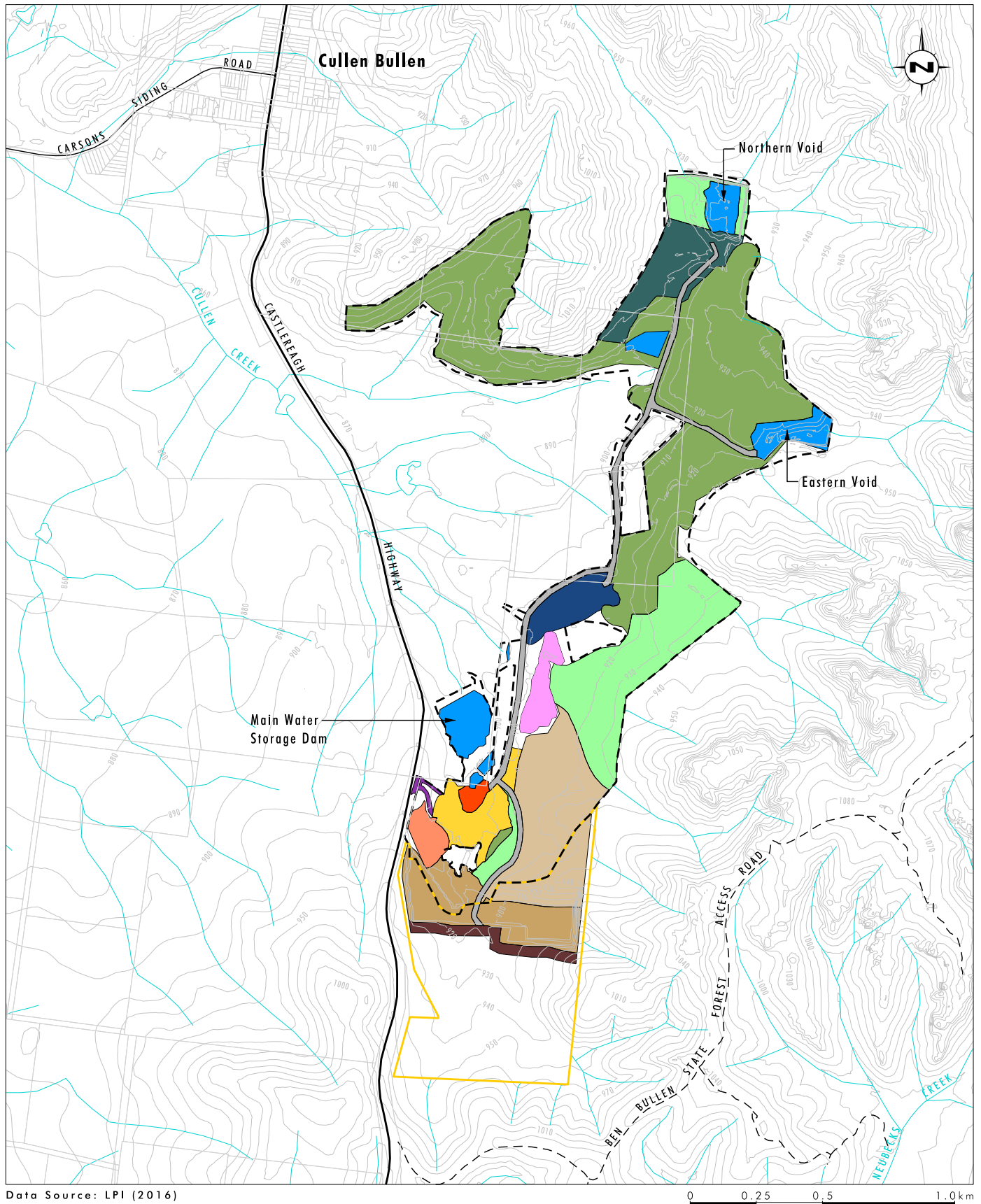
Figure 2.1 shows indicative mine plan stage 1 which represents the potential worse case operating conditions which form the basis of this assessment. As discussed further in **Section 5.1**, two operational scenarios relating to alternative overburden emplacement scenarios, have been modelled and assessed as part of this NIA.

2.3 Hours of operation

The proposed modification does not seek any change to the approved operating hours for Invincible which are Monday to Saturday, 7.00 am to 10.00 pm. Some prestart checks on machinery may occur prior to 7.00 am and all noise from operations prior to 7.00 am would be managed to meet night time noise criteria of 35 dB(A).

Mining extraction and CPP operations would be limited to 7.00 am to 6.00 pm. Transportation activities may also extend to 9.30 pm and maintenance activities may extend to 10.00 pm. Trucks would not be permitted into the site prior to 7.00 am and transport contractors would be subject to contractual controls which prevent queuing on the Castlereagh Highway prior to 7.00 am.

While mining and transport operations will not occur on Sundays or after 10.00 pm, some site maintenance activities such as water management activities and site security works will continue on the site outside these hours on an as needs basis.



Data Source: LPI (2016)
Note: Contour Interval 10m

0 0.25 0.5 1.0 km

Legend

- | | | |
|---|-------------------------------|------------------------------|
| Existing Approved Mining Disturbance Area | Coal Stockpile - Product | Tailings Drying Area |
| Proposed Southern Extension Area | Coal Stockpile - ROM | Temporary Stabilisation Area |
| Active Mining | Haul Road / Access Road | |
| Active Overburden Emplacement Area | Sealed Access Road | |
| Pre Strip | Infrastructure / Laydown Area | |
| Rehabilitation - Vegetated | MIA / Administration | |
| Shaped Not Seeded | Water Management Area | |

File Name (A4): R08/3622_041.dgn
20160916 10.21

FIGURE 2.1

Indicative Mine Plan
Stage 1

2.4 Mine plant and equipment

Existing fixed coal preparation plant (Invincible CPP) infrastructure would be utilised for the Project and no additional coal handling, processing or transport infrastructure will be required. Maintenance works at the Invincible CPP will be required to ensure the plant is operational. If future studies indicate Irondale or Lidsdale Seam coal can be used at the Shoalhaven Starches Plant if washed and/or blended with Lithgow Seam coal, some upgrade works may be required at the Invincible CPP. These upgrades will largely be internal within the existing Invincible CPP structure however some minor changes to the exterior of the Invincible CPP may be required. All upgrade works will be located within the existing infrastructure area and would be expected to be completed within 3 months of the upgrade works commencing.

Any upgrade works to the Invincible CPP would be carried out between 7.00 am and 6.00 pm Monday to Saturday. Ongoing maintenance works during the life of the Southern Extension Project may extend to 10.00 pm Monday to Saturday.

The Invincible CPP will only operate when enough Lithgow coal has been stockpiled to produce nut coal. This will occur on a regular basis over the life of the Project. This will occur on a regular basis over the life of the Southern Extension Project. The Invincible CPP will only operate between 7.00 am and 6.00 pm Monday to Saturday. For the purposes of the NIA, maximum production of the CHPP has been assumed as part of the maximum operational and production scenarios.

A representative list of equipment required for the Project, is provided in **Table 2.1**.

Table 2.1 Representative equipment required

Activity	Type	Model	Type of Equipment	Number
Overburden	Excavator	Hitachi	EX1800	2
	Trucks	Cat	777	7
Overburden / Coal	Excavator	Hitachi	EX1200	1
	Trucks	Cat	775F	1
	Trucks	Cat	773D	1
Coal Ancillary	Excavator	Hitachi	ZX850H	2
	Water Truck	Cat	777	1
	Grader	Cat	16	1
	Track Dozer	Cat	D11	1
	Track Dozer	Cat	D10	2
	Drill	Redrill	GDC2HP	1
	Front End Loader	CAT	980H or equivalent	1

Note: The table outlines typical numbers of equipment for the maximum production scenario. There may be variation in numbers, size and types of equipment used to suit operational needs, provided that the relevant limits and environmental impact criteria are maintained.

2.5 Site construction works

Given that existing mine infrastructure is already in place, any potential construction activities are expected to be relatively minor, particularly when compared with the overall mining operations on site. A short period of up to 3 months has been identified for the completion of required upgrades and maintenance. Inevitable CPP should this be required over the life of the Project.

2.6 Project incorporated noise control measures

The noise assessment and approval procedures (refer to **Section 3.7**) require that, reasonable and feasible measures should be incorporated into the design in order to minimise the received noise levels.

Accordingly, through an early iterative modelling process, noise associated with the CAT 785 trucks, which were originally proposed to haul overburden, was identified as being a dominant noise source. Therefore, alternative CAT 777 (or acoustically similar) haul trucks have been incorporated into the design as a reasonable and feasible measure adopted given that procurement is yet to occur. The CAT 777 truck (or similar) is approximately 10 dB(A) quieter than the CAT 785 and would therefore result in significantly reduced overall noise emission, to the benefit of the community. An optimised rate of haulage to the northernmost emplacement site was also incorporated into the design.

Further noise mitigation is of minimal benefit as the noise emissions from the site during the daytime are still largely controlled by noise associated with overburden haulage.

3.0 Methodology

3.1 Approach to assessment

3.1.1 Project approval

As detailed in **Section 1.2**, the existing Invincible Project Approval contains various environmental performance conditions, including conditions 2 and 3 in Schedule 3 which relate to relevant noise impact assessment and noise acquisition criteria that apply to privately owned land surrounding the Project. As the Project is a proposed extension of existing approved mining operations at Invincible, and that there has not been any significant changes to the background noise environment (i.e. no new significant industrial noise sources), the Project has been assessed against the existing criteria listed in the Invincible Project Approval (refer to **Section 1.2**).

Notwithstanding this, the Project has been assessed in accordance with the requirements of the Draft ING in order to provide an assessment of the potential noise impacts from the Project against contemporary guidelines. This is detailed further in the following sections.

3.1.2 Industrial noise policy and Draft Industrial Noise Guideline

The EPA's *Industrial Noise Policy* (INP) presents the NSW's Government's policy and guideline for the assessment of industrial noise. Using this policy, the EPA regulates premises that are scheduled under the *Protection of the Environment Operations Act 1997* (POEO Act). The original application and establishment of noise criteria under the Invincible Project Approval was undertaken in accordance with the INP.

The EPA released the *Draft Industrial Noise Guideline* (Draft ING) in September 2015. This document represents a revision and update to the INP based on the latest research and consultation with planning and health industries. The Draft ING also addresses issues with the implementation of the INP as identified by the EPA and users over the last 15 years.

For the Project, the Draft ING has been used for assessment purposes as it represents the most current assessment procedures and is expected to be the applicable policy for the management of noise over the life of the Project.

3.2 Objectives of the Draft ING

The objectives of the Draft ING are to:

- Provide the criteria that are used to assess changes to both more immediate noise levels and long-term noise levels.
- Provide a clear and consistent framework for assessing environmental noise impacts from industrial premises and industrial development proposals.
- Promote the use of best-practice noise mitigation measures where potential impacts have been identified.
- Support a process to guide the determination of achievable noise limits for planning approvals and/or licences that consider noise and other environmental impacts along with the economic and social benefits and impacts of industrial development.

The Draft ING is designed for large and complex industrial sources and outlines processes designed to strike a feasible and reasonable balance between the operation of industrial activities and the protection of the community from noise levels that are intrusive or unpleasant.

Where the Project Noise Trigger Levels (PNTLs) are predicted likely to be exceeded, Section 3.1 of the Draft ING states:

Where the project-noise trigger level is exceeded, assess the feasible and reasonable mitigation measures that could be implemented to reduce noise down towards the relevant project noise trigger level. If it is reasonable to achieve these levels, the proponents should do so. If not, then achievable noise levels should be identified. It is not mandatory to achieve the trigger levels, but the assessment should provided justification if they cannot be met. An assessment of the acceptability of residual impacts should also be provided.

The NIA has modelled the predicted noise impacts at the nearest and therefore potentially most affected noise sensitive receivers to the Project under significant meteorological conditions for the locality as required by the Draft ING.

3.3 Overview of the Draft ING assessment approach

Consistent with the Draft ING, this NIA has:

- identified the noise sensitive locations likely to be affected by activities associated with the Project and established appropriate background noise levels at the respective noise sensitive locations (refer to **Section 4.0**)
- determined PNTLs with reference to the Draft ING
- identified all significant noise sources from the Project and determined the expected noise levels and noise characteristics (e.g. tonality and impulsiveness) likely to be generated from the noise sources (refer to **Section 5.0**)
- identified the times of operation of the development and for all noise producing activities (refer to **Sections 2.0** and **5.0**)
- considered the influence of existing meteorological conditions such as wind and temperature inversions in the prediction models so as to provide a true representation of actual noise levels (refer to **Sections 4.0** and **5.0**). This has been achieved by:
 - o determining the noise levels at the most sensitive locations under the significant meteorological conditions required by the Draft ING
 - o providing noise contours for day-time and evening periods predicted under worst case significant meteorological conditions.
- assessed the effect of relevant noise mitigation measures incorporated into the predictive modelling. **Section 2.0** discusses the noise control measures that were investigated, **Section 5.0** outlines those measures that were incorporated into the noise model of the Project and **Section 8.0** discusses the noise management and monitoring practices that will be incorporated into the Project.
- compared the predicted noise levels with the appropriate PNTLs and existing noise criteria under the Invincible Project Approval (refer to **Section 6.1**)

- discussed the findings from the predictive modelling and, where relevant PNTL have not been met, recommended additional mitigation measures (refer to **Section 6.1**)
- quantified the residual level of noise impact where relevant noise criteria cannot be met after application of all feasible and cost effective (i.e. reasonable) mitigation measures, where relevant (refer to **Section 6.1**)
- quantified the most appropriate noise mitigation measures including noise controls and management of impacts (refer Sections **2.0**, **5.0** and **8.0**)
- provided details of a proposed noise monitoring program (refer to **Section 8.0**).

A glossary of terms and abbreviations used in this report is provided in **Appendix A**.

3.4 Determination of project noise trigger levels

3.4.1 Determining assessment background noise levels

In determining the assessment criteria, an evaluation of the background noise levels in the vicinity of the Project was undertaken (or alternatively, minimum background levels, based on Draft ING procedures, may be assumed where it is known that the background noise levels are low, for example in a rural environment). Noise levels are measured continuously for a period of time at selected localities that are representative of the background noise environment at the nearest potentially affected noise sensitive receivers. The recorded noise levels are analysed in accordance with the Draft ING procedures and the Assessment Background Levels (ABLs) are determined. ABLs are the single figure day, evening and night-time period background noise levels for each 24 hours of continuous noise monitoring.

Once the ABLs have been determined, the ABLs are combined into single figure noise levels representing the background noise levels, or Rating Background Level (RBL), for the combined day, evening and night time periods of continuous noise monitoring. The RBL is the median of the ABLs measured for each period. Where the RBL is found to be less than 35 dB(A) during the daytime period or 30 dB(A) during the evening or night-time periods, then the RBL is set at 35 dB(A) daytime and 30 dB(A) during evening and night-time periods, in accordance with the Draft ING.

3.4.2 Assessment criteria

The focus of the Draft ING is on the noise emitted from industrial sites and how this may impact nearby receivers. The Draft ING has two components for the assessment of industrial noise sources:

- controlling intrusive noise impacts in the short term for residences
- maintaining noise level amenity for particular land uses in the longer term.

When assessing the noise impact of industrial sources, both intrusive and amenity components are considered for residential receivers. For commercial and industrial noise receivers, only the amenity component is applied.

The criteria derived to assess intrusive and amenity noise impacts are:

- the intrusive noise trigger level, which is based on the background noise level (RBL) plus 5 dB
- the project amenity noise trigger level, which is based on the Draft ING recommended amenity noise level for prescribed land use, minus 5 dB(A).

3.4.3 Intrusiveness noise trigger level

The intrusive noise trigger level is based on the background noise level plus 5 dB, where the background noise level is defined in the Draft ING as the RBL. Where the RBL is found to be less than 35 dB(A) during the daytime period or 30 dB(A) during the evening or night-time periods, then the RBL is set at 35 dB(A) daytime and 30 dB(A) evening and night-time periods in accordance with the Draft ING. This therefore represents the minimum possible intrusive noise trigger level under the Draft ING and is therefore conservative.

3.4.4 Amenity noise levels

Table 3.1 presents the recommended amenity noise levels reproduced from the Draft ING for various noise receiver categories.

Table 3.1 Draft ING recommended amenity noise levels (Table 2.1 from the Draft ING)

Receiver	Noise amenity area	Time of day	L _{Aeq} dB(A)
(see Table 2.2)			Recommended amenity noise level
Residence	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day.
School classroom – Internal	All	Noisiest 1-hour period when in use	35 (see notes for table)
Hospital ward internal external	All	Noisiest 1-hour	35
	All	Noisiest 1-hour	50

Receiver	Noise amenity area	Time of day	L _{Aeq} dB(A)
Place of worship – Internal	All	When in use	40
Area specifically reserved for passive recreation (e.g. national park)	All	When in use	50
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5 dB(A) to recommended noise amenity area

Notes: The recommended amenity noise levels refer only to noise from industrial sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

For residences, the amenity noise levels apply at the reasonably most-affected point on or within the residential property boundary or, if this is more than 30 metres from the residence, at the reasonably most-affected point within 30 metres of the residence. This requirement should not be read to infer that the noise limit **only** applies at the 'reasonably worst affected location'.

In assessing amenity noise levels at commercial or industrial premises, the noise level is to be assessed at the reasonably most-affected point on or within the property boundary. Again, this requirement should not be read to infer that the noise limit **only** applies at the 'reasonably worst affected location'.

Where internal amenity noise levels are specified, they refer to the noise level at the centre of the habitable room that is most exposed to the noise and apply with windows opened sufficiently to provide adequate ventilation except where alternative means of ventilation complying with the Building Code of Australia are provided. In cases where the gaining of internal access for monitoring is difficult, then external noise levels 10 dB(A) above the internal levels apply.

In assessing amenity noise levels at passive and active recreational areas, the noise level is to be assessed at the most- affected point within the area that is reasonably expected to be used by people, for example picnic areas, walking tracks etc.

Types of receivers are defined in Draft ING

Time of day is defined as follows:

- day – the period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays
- evening – the period from 6 pm to 10 pm
- night – the remaining periods.

3.4.5 Assessing Low Frequency Noise

Fact Sheet C of the Draft ING provides for the assessment of low frequency noise through the addition of 'Modifying Factor' adjustments to the predicted noise levels at a receiver before comparison with the PNTLs. The test set out by the Draft ING for low frequency noise is to compare the difference between the C-weighted and A-weighted noise levels. The Draft ING requires that if the difference between the C-weighted and A-weighted noise levels is greater than 15 dB, a 'modifying factor' of 2 dB or 5 dB is added to the predicted noise level depending on the extent of exceedance above provided one-third octave low frequency noise threshold levels in the low frequency range 10 Hz to 160 Hz.

3.5 Mining SEPP and Voluntary Land Mitigation and Acquisition Policy

The *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* makes reference to the *Voluntary Land Acquisition and Mitigation Policy For State Significant Mining, Petroleum and Extractive Industry Developments (2014) (VLAMP)*. This document sets out the consent authorities triggers for voluntary mitigation or acquisition.

The document states:

- *A consent authority should only grant voluntary mitigation rights:*
 - *If the noise generated by the development would be equal to or greater than 3dB(A) above the INP project-specific noise level at any residence on privately-owned land; or*
 - *If the development would increase the total industrial noise level [that is the cumulative noise level] at any residence on privately-owned land by more than 1dB(A), and noise levels at the residence are already above the recommended amenity criteria in Table 2.1 of the INP; and*
- *A consent authority should only grant voluntary land acquisition rights where:*
 - *The noise generated by the development would be more than 5dB(A) above the project specific noise level at any residence on privately-owned land; or*
 - *The noise generated by the development would contribute to [the cumulative noise level] exceedances of the recommended maximum noise levels in Table 2.1 of the INP on more than 25% of any privately owned land, and a dwelling could be built on that land under existing planning controls*

In addition, Clause 12AB(3) of the Mining SEPP states:

Cumulative noise level

The development does not result in a cumulative amenity noise level greater than the acceptable noise levels, as determined in accordance with Table 2.1 of the Industrial Noise Policy, for residences that are private dwellings

For the purpose of this assessment, all of the above have been assumed to apply with reference to the Draft ING in lieu of the INP.

In relation to voluntary land acquisition rights, as the Draft ING only has recommended amenity levels and does not contain the maximum amenity levels referred to in Table 2.1 of the INP above. Noise levels 5 dB(A) higher than the Draft ING amenity criteria have been taken to be the equivalent, given that the maximum recommended noise levels in Table 2.1 of the INP are 5 dB(A) higher than the recommended amenity noise levels. This equates to maximum amenity noise levels (which should not be exceeded on more than 25% of land) of daytime 55 dB(A), evening 50 dB(A) and night-time 45 dB(A), i.e. numerically equal to the maximum noise levels in Table 2.1 of the INP.

3.6 Noise Modelling Methodology

3.6.1 Predicting Operational Noise Levels

Section 3.3 of the Draft ING requires the prediction of noise levels to take into account all possible noise sources that may reasonably be expected when the plant or facility in question is fully operational. The objective is to accurately predict the noise impact for the Project for comparison against the PNTLs. The methodology outlined by the Draft ING includes:

- identifying all possible source, site and receiver parameters, so that noise can be adequately predicted
- predicting noise levels from the source at receiver locations, taking into account all important parameters including the source noise levels and locations, operating times, receiver locations, weather conditions applicable to the site, site features and topography, as well as the PNTL
- comparing the predicted noise level with the PNTL to determine the noise impact.

When quantifying the potential effect on receivers, the Draft ING specifically notes that the noise levels predicted should correspond to the noise descriptor of the PNTL applicable to the Project, i.e. 15 minutes for PNTL based on the Intrusiveness Noise Level and day, evening and/or night periods for PNTLs based on the Amenity Noise Level.

3.6.2 Meteorological Conditions

The Draft ING requires the prediction of the noise impacts to take into consideration weather conditions that would be expected to occur at a particular site for a significant period of time.

The Draft ING notes that there are two approaches for the assessment of meteorological effects, such as gradient winds and temperature inversions, on propagating the noise from the source to the receiver. The simple method is to use default conditions outlined in the Draft ING. Alternatively, the 'detailed approach' outlined in the Draft ING involves analysing the meteorological data to determine whether inversion and/or wind effects are significant features of the region and warrant inclusion in the assessment. In accordance with the Draft ING, an inversion or wind is considered to be a feature of an area if it occurs for 30% of the time in any daytime, evening or night-time period, in any of the four seasons.

3.6.3 Computer Based Modelling Software

The computer-based modelling software package Environmental Noise Model (ENM), developed by RTA Technology Pty Ltd, has been used to predict the noise levels produced by the Project within the surrounding environment. ENM is recognised and accepted by the OEH/EPA as a computer modelling program suited to predicting noise impacts from industrial noise sources.

The ENM noise models for Invincible were based on plant and equipment sound power level (SWL) data from the Umwelt in-house database (selected with experience based on similar projects), digital terrain maps of the region surrounding the Southern Extension Area prepared by Umwelt and mine plans, which include the number and type of machines and representative positioning.

The details of the noise sources, mine plans and receiver locations are presented in **Section 5.0**.

This NIA is based on the noise levels predicted by the ENM model of the proposed operations for the Project. The assessment of the predicted noise levels against the PNTL's has been undertaken in accordance with the Draft ING (refer to **Section 6.0**).

The results of noise modelling and analysis of the predicted noise impacts are presented in **Section 6.0**.

3.6.4 Modifying Factors

Where the noise source contains annoying characteristics such as prominent tonal components, impulsiveness, intermittency, irregularity or dominant low frequencies, the Draft ING requires modifying factors to be applied to the predicted noise levels.

The assessment of modifying factors is discussed in **Section 6.0**.

3.6.5 Prediction of Construction Noise Levels

Any potential construction related activities associated with the Project are expected to be extremely minor particularly relative to the mining activities. Accordingly, no specific quantitative construction modelling has been undertaken for the purpose of this assessment given the low level of construction activity.

3.7 Assessment against Project Criteria

3.7.1 Determination of Impacts

The Draft ING requires the predicted noise levels to be compared with the appropriate PNTLs and the identification of feasible and reasonable mitigation measures where relevant PNTLs have not been met. As discussed in **Section 1.0**, the Project is comprised of a continuation of mining at the southern extent of the existing approved Invincible mine, the existing noise criteria listed in the Invincible Project Approval are considered valid for the Project. Notwithstanding, new PNTLs are established for the Project in accordance with Draft ING requirements.

3.7.2 Mitigating Noise Impacts

The Draft ING requires that, when predicted noise levels exceed the PNTLs a range of strategies should be considered to reduce the noise impact on offsite receivers. The three main strategies used to identify reasonable and feasible noise control and mitigation strategies are:

- **Controlling noise at the source** – There are three approaches to controlling noise generated by the source: source elimination; Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA).
- **Controlling the transmission of noise** – There are two approaches: the use of barriers and land-use controls which attenuate noise by increasing the distance between source and receiver.

- **Controlling noise at the receiver** – This is the least preferred option as it does not address external noise environment. There are two approaches: negotiating an agreement with the landholder and acoustic treatment of dwellings to control noise.

As outlined in **Section 2.6** and **Section 5.0**, a detailed assessment was undertaken of the reasonable and feasible control measures that could be incorporated into the Project. No additional measures were identified from those investigated during the design phase of the Project (refer to **Sections 2.0, 5.0** and **8.0**).

3.7.3 Acceptability of Residual Noise Levels

Residual noise impacts are identified after all source and pathway feasible and reasonable noise mitigation measures have been considered. The significance of the residual noise impact and the need for receiver based treatment options may need to be considered as part of an authority's determination/approval process.

Receiver based mitigation measures, including in the case of voluntary acquisition, is normally only applicable for isolated residences in rural areas.

In accordance with the Draft ING, as a general guide after all source and pathway feasible and reasonable noise mitigation measures have been applied, the significance of residual noise levels (i.e. noise levels above the project noise trigger level) will be considered as outlined in **Table 3.2**.

Table 3.2 Significance of Residual Noise Impacts

If the predicted noise level minus the project noise trigger level is	And the total cumulative industrial noise level is	Significance of residual noise level is
≤ 2dB(A)	≤ recommended amenity noise level or > recommended amenity noise level, but the increase in recommended amenity noise levels resulting from the development is less than 1dB	Negligible
≤ 2dB(A)	> recommended amenity noise level and the increase in amenity noise levels resulting from the development is more than 1dB	Marginal
≥ 3 but ≤ 5dB(A)	< recommended amenity noise level or > recommended amenity noise level, but the increase in recommended amenity noise level resulting from the development is less than 1dB	Marginal
≥ 3 but ≤ 5dB(A)	> recommended amenity noise level and the increase in recommended amenity noise levels resulting from the development is more than 1dB	Moderate
>5dB(A)	-	Significant

Table 3.3 (as per Table 4.2 of the Draft ING) shows the examples of noise mitigation at a residence that may be required by planning authorities to mitigate residual noise impacts.

Table 3.3 Example of Receiver based Mitigation Treatments (Draft ING Table 4.2)

Significance of residual noise level	Example of potential treatment
Negligible	The exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatments or controls
Marginal	Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.
Moderate	As for marginal but also upgraded façade elements like windows, doors, roof insulation etc. to further increase the ability of the building façade to reduce noise levels.
Significant	Offers of acquisition

The above requirements are consistent with the requirements of the VLAMP at potentially affected dwellings.

Noise Management Zone

The Noise Management Zone in this NIA is applicable where the predicted noise levels exceed the Project-Specific Noise Trigger Level by up to 5 dB. The noise impacts in this zone range from minor (up to 2 dB above) to marginal or moderate (greater than 2dB up to 5 dB).

Management procedures that can be implemented in the Noise Management Zone include:

- prompt response to any issues of concern raised by community
- noise monitoring on-site and within the community
- refinement of on-site noise mitigation measures and plant operating procedures where practical
- consideration of acoustic mitigation at receivers (taking into the consideration of the guidance provided in the Draft ING on mitigation measures dependent on level of exceedance of PNTLs as detailed in Table 3.3)
- the negotiation of private agreements with property holders.

Noise Affection Zone

The noise affection zone in this NIA is applicable where the predicted noise levels are more than 5 dB above the project noise trigger level. Noise emissions at this level are considered likely to be unacceptable by some property holders and implementation of the following measures may be required:

- discussions with relevant property holders to assess concerns and provide solutions
- implementation of acoustic mitigation at receivers or other negotiated agreement
- up front advice to property owners that they have right to request acquisition in accordance with terms of any development consent.

4.0 Existing Acoustic Environment and Assessment Criteria

4.1 Background Noise Levels

A number of noise surveys have been carried out in the area surrounding Invincible, including noise surveys associated with Cullen Valley Mine, Invincible Colliery and Baal Bone Colliery. These include:

- *Cullen Valley Mine Extension Environmental Impact Statement* (International Environmental Consultants, 2003) included *Noise and Vibration Impact Assessment, Open Cut Extension, Cullen Valley Mine* (Atkins Acoustics, April 2003).
- *Proposed Extension to the Invincible Colliery Environmental Impact Statement* (R. W. Corkery & Co. Pty Limited, 2008) included *Noise Impact Assessment of the Proposed Extension to the Invincible Colliery Open Cut Mine and Production Increase* (Environmental Resources Management Australia Pty Ltd, January 2008).
- *Environmental Assessment – Baal Bone Colliery* (AECOM, 2010) included *Noise Impact Assessment Baal Bone Colliery* (Atkins Acoustics, November 2009).
- Cullen Valley Mine Quarterly Noise Monitoring (Global Acoustic).
- Invincible Colliery Quarterly Noise Monitoring (Global Acoustics).
- *Coolpac Consolidation Project Environmental Assessment* (Hansen Bailey, March 2012) included *Acoustic Impact Assessment, Modifications to Cullen Valley Mine and Invincible Colliery Project Approvals, Environmental Impact Statement* (Bridges Acoustics 2014).

The last acoustic report in the above list prepared by Bridges Acoustics in 2014 represents the most recent study associated with Invincible. Within the report, background noise levels from the various surveys were collated and reviewed. Background noise levels tended not to lie below 30 dB(A) during the daytime but tend to be lower than 30 dB(A) during the evening and night-time periods. The assessment therefore adopted background noise levels of 30 dB(A) and 32 dB(A) daytime, dependant on the offset from Castlereagh Highway and 30 dB(A) during the evening and night-time periods.

4.2 Project Specific Noise Trigger Levels

4.2.1 Project Intrusiveness Noise Trigger Level

With reference to the Draft ING, a daytime RBL of 35 dB(A) and evening and night RBLs of 30 dB(A) have been adopted for this project. This is based on the Draft ING requirement to set the RBL at 35 dB(A) during the day, and 30 dB(A) during the evening and night where background levels are below these levels. These represent the minimum RBLs that can be used for assessment of a development based on the Draft ING and are considered to be appropriate given the rural character of the area and low level of ambient noise.

Accordingly, the appropriate day, evening and night intrusiveness criteria are $L_{Aeq,15\text{minute}}$ 40 dB(A), 35 dB(A) and 35 dB(A) respectively. These criteria are consistent with the approval limits that the mine previously operated within (refer to **Section 1.2**).

4.2.2 Project Amenity Noise Trigger Level

In accordance with the descriptions outlined in the Draft ING the acoustic environment in the vicinity of the Project Area is typically rural and therefore the rural assessment criteria have been adopted for those receivers nearest the Project Area (refer to **Section 3.4**). Based on this and given the rural category, the Project amenity noise levels are 45 dB(A) daytime, 40 dB(A) evening and 35 dB(A) night-time.

4.2.3 Summary of Adopted Project Noise Trigger Levels

Table 4.1 presents the project amenity noise levels at the potentially most affected non mine owned residences nearest the Project (refer to **Section 3.4**).

Table 4.1 Project Noise Trigger Levels, dB(A)

Noise Parameter	Day	Evening	Night
Intrusive Noise Level, LAeq(15min)	40	35	35
Project Amenity Noise Level, LAeq,period	45	40	35

4.3 Cumulative Noise Criteria

The Draft ING objective is that the combined noise levels from industrial noise sources should not exceed the specified amenity noise levels appropriate for the locality and land use as outlined in Table 2.1 of the Draft ING. The cumulative noise levels is measured as the LAeq, period noise level (where 'period' equals day, evening or night) from industrial noise sources.

In relation to industrial noise sources, the acceptable cumulative industrial noise criteria applying to the rural area in the region surrounding the Project Area from the combined operation of the Project and all other approved industrial developments including Cullen Valley Mine (approved activity although currently in care and maintenance), the neighbouring Baal Bone Colliery (currently in care and maintenance), the Mt Piper Power Station and Mt Piper Power Station Extension Project to the south. Other industrial developments which are considered too far to have any significant noise contribution include the Western Rail Coal Unloader south of Mt Piper Power Station, Angus Place and Springvale Collieries, Pine Dale Coal Mine including the Yarraboldy Extension and Wallerawang Power Station.

The cumulative amenity noise levels applicable to the potentially most affected rural category receivers, i.e. residential receivers, are outlined in **Table 4.2**.

Table 4.2 Cumulative Noise Amenity Levels, dB(A)

Period	Cumulative Noise Amenity Level LAeq, period
Day	50
Evening	45
Night	40

4.4 Road Traffic Noise Criteria

The Department of Environment, Climate Change and Water (DECCW) (now EPA's) NSW Road Noise Policy (RNP) (DECCW 2011) sets out criteria for road traffic noise through the provision of a framework that addresses traffic noise issues associated with new developments, new or upgraded road developments or planned building developments.

The main access route to and from the Project will be along Castlereagh Highway. The existing public road network that provides access to Invincible and Mt Piper Power Station includes Castlereagh Highway and Boulder Road. Boulder Road provides access to Mt Piper Power Station from Castlereagh Highway. There are no privately owned dwellings or other sensitive land uses located adjacent to Boulder Road.

The transport routes between Invincible and Bomaderry involve the RMS's State road and highway road network including Castlereagh Highway, Great Western Highway, State roads and Motorways in Sydney metropolitan area and Princes Highway.

With reference to the RNP, **Table 4.5** outlines the road traffic noise criteria applicable to the Project. Under the road category definitions provided in Table 2 of the RNP, Castlereagh Highway, which carries the majority of project related traffic, including heavy vehicle traffic, is considered an arterial road.

Table 4.3 Road Traffic Noise Criteria, dB(A)

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day (7.00 am – 10.00 pm)	Night (10.00 pm – 7.00 am)
Freeway/arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq, 15 hour 60 (external)	LAeq, 9 hour 55 (external)

Section 3.4 of the RNP notes that when assessing noise impacts and the effectiveness of feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

Furthermore, specifically relevant to traffic generated by new land use developments, Section 3.4.1 of the RNP states that for existing residences and other sensitive land uses affected by additional traffic on existing roads, any increase in the total noise level (i.e. where noise levels exceed the RNP criteria) should be limited to 2 dB above that of the corresponding level without the project.

Notwithstanding all of the above, the RNP also requires that any noise generated by a project should not exceed a 12 dB relative increase criterion (refer Section 2.4 of the RNP), even when noise levels are within the nominated RNP criteria. The relative increase criterion is primarily intended to protect existing quiet areas from excessive changes in noise amenity.

5.0 Noise Modelling Parameters

5.1 Noise Modelling

As discussed in **Section 3.6**, the computer-based modelling software package ENM was used to predict the contributed noise levels from the Project at the nearest potentially affected private receivers. The conceptual indicative mine plan stage 1 is considered representative of potential worse case mining operations in closest proximity to private residences located to the north west of the Southern Extension Area and forms the basis of the modelling.

Two daytime operational scenarios have been modelled to represent the indicative mine plan stage 1 with overburden emplacement scenarios including:

- haulage of waste for emplacement to the area just north of the extraction area, which will occur as part of the progression of mining
- haulage of waste for emplacement to the area approximately 2 km north-east of the extraction area, to the Eastern Void adjacent to the eastern boundary of the site – it is noted that this will likely only occur in the later stages of mining where the mining activity is located a further 500m away from private residences, however this has been included as part of Stage 1 mining to provide a potential worse case operational scenario with regards to potential noise impacts.

As discussed in **Section 2.6**, an optimised rate of haulage to the northernmost emplacement site has been incorporated into the mining process in combination with alternative and quieter haul trucks (i.e. CAT 777 fleet, or similar, in lieu of CAT 785), on the basis of reasonable and feasible noise mitigation, in accordance with the Draft ING procedures.

In addition, an operational scenario was modelled during the evening period, representing transportation of product from site, which is proposed to occur up to 9.30pm.

ENM calculates noise levels at either specified receiver locations (single point calculation) or generates noise level contours over a defined area (contour calculation). The single point calculation feature of ENM was used to assess the noise impacts from operational requirements of the Project (refer to **Section 3.6**), the proposed equipment fleets (refer to **Section 5.2**), and the relevant meteorological conditions for the area (refer to **Section 5.4**). The results are presented in **Section 6.0**.

5.2 Operational Noise Levels

5.2.1 Modelling Scenarios

The ENM noise models were run for daytime and evening operational scenarios of the Project, under calm and a prevailing noise enhancing northeast wind at 3m/s.

The assumptions used in modelling the operational phase of the Project include the following:

- all acoustically significant plant and equipment operating simultaneously in accordance with the conceptual mining and maximum production schedule of up to 1.2 Mtpa
- mobile noise sources, such as front-end loaders, excavators and haul trucks modelled at typical locations and assumed to operate in repetitive cycles.

The modelling for daytime operations incorporates the noise mitigation measures investigated and outlined in **Section 2.6**.

The evening modelling scenario reflects operations limited to transportation of product from site (i.e. product trucks, multi-product bin and front end loader).

The representative conceptual mine plan and details of the type and location of the mobile equipment are presented in **Appendix B**. The level of equipment attenuation, as indicated by the SWL's presented in **Appendix B**, are considered indicative rather than mandatory. The actual performance of the mining operation will be determined by monitoring the environmental noise levels over the life of the Project. While **Section 2.0** and **5.0** provides a guide to equipment selection, the actual performance of the mine as a whole will dictate equipment selection criteria.

5.2.2 Operational Noise Sources

Noise source modelling representative of the acoustically significant plant and equipment proposed for representative scenarios were developed for ENM.

The mining equipment and associated mining infrastructure modelled for the Project are presented in **Appendix B**.

5.3 Road Traffic Noise

Road traffic routes and potential volumes that may be generated by the project have been identified in the road traffic and transport assessment for the project undertaken by Transport and Urban Planning Pty Ltd.

Table 5.1 outlines a summary of the potential road traffic volumes.

Table 5.1 Daily Project Related Heavy and Light Vehicle Numbers

Item	Heavy Vehicles	Light Vehicles
Full Time Staff	-	35
Contractors	-	4
Visitors	-	5
Transportation to Mt Piper Power Station	146	-
Transportation to Bomaderry	10	-
Deliveries/ Maintenance	5	-
Maintenance of CHPP (3 month period)	-	10
Construction/Maintenance Related Transportation (3 month period)	1	-

Note: In addition to the above, up to 23 low loader deliveries are expected in the period prior to operation commencing.

The traffic study estimates a 25% and 75% split between light vehicle traffic along Castlereagh Highway to the north and to the south of the Project respectively. Also, in relation to light vehicle traffic associated with employees, visitors and contractors, the trip to the site is expected to peak between 6am and 7am on days of operation.

5.4 Meteorological Conditions

Meteorological data prepared by the Project's Air Quality Consultant (Jacobs) for the purpose of the Air Quality Assessment was analysed to establish the prevailing wind directions for the relevant daytime and evening periods, for each season.

It is noted that moderate and strong temperature inversions, particularly during the night-time period in winter, also have the potential to significantly enhance noise propagation, however no night-time operations are proposed for the Project, therefore no further analysis in relation to this has been undertaken.

Based on analysis of the wind data in accordance with Draft ING procedures, **Table 5.2** presents the prevailing wind directions and meteorological conditions used in the noise modelling (excluding identified prevailing WSW winds that blow away from the receivers and reduce noise). These are consistent with the day and evening modelling prevailing wind directions determined in the previous Modification acoustic report (*Acoustic Impact Assessment, Modifications to Cullen Valley Mine and Invincible Colliery Project Approvals, Environmental Impact Statement* (Bridges Acoustics 2014), based on analysis of site specific meteorological data derived from site monitoring undertaken in that study.

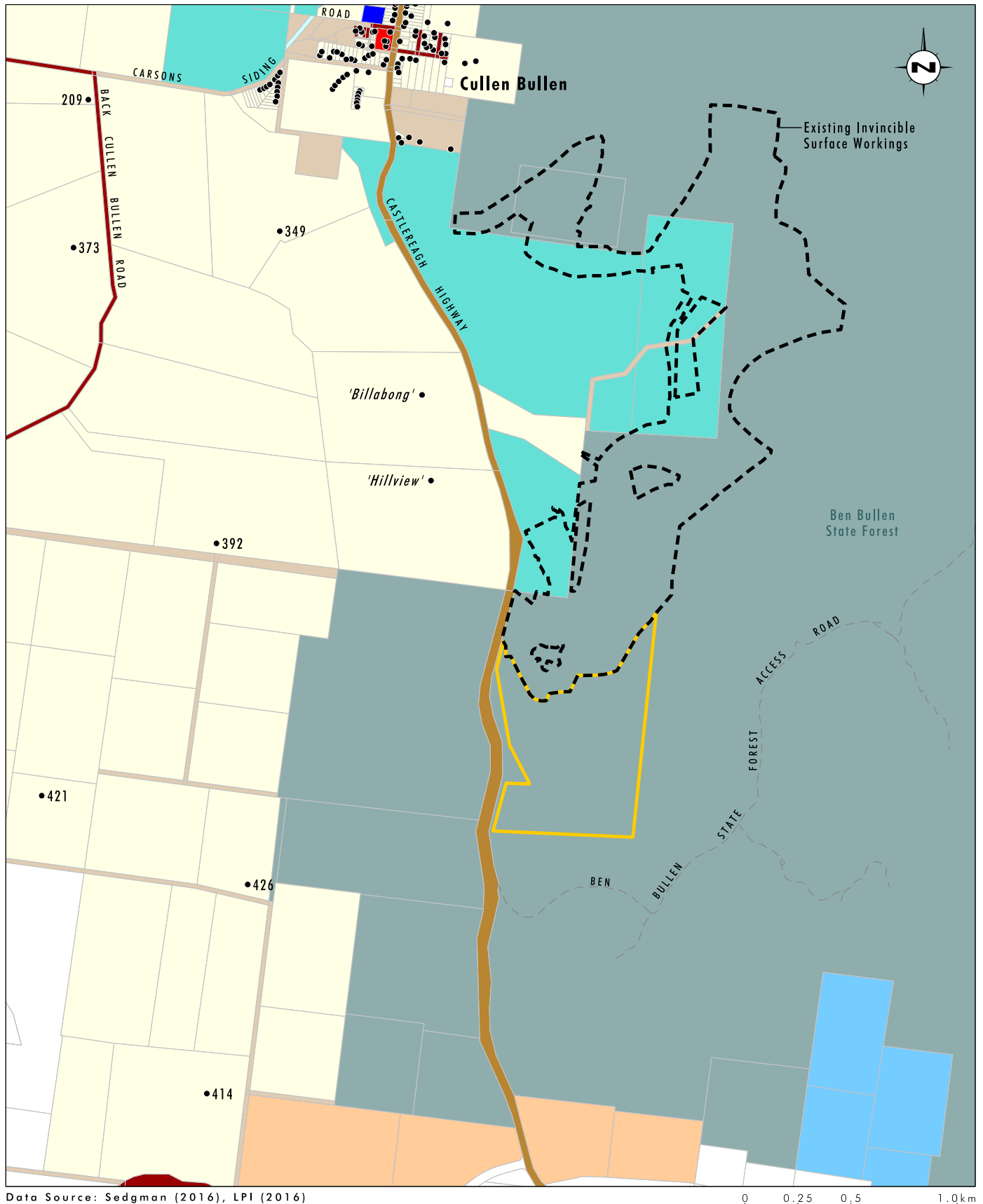
Table 5.2 Modelled Meteorological Conditions

Parameter	Prevailing Meteorological Conditions	
	Calm	North East Wind
Temperature, °C	20	20
Relative Humidity, %	70	70
Wind Speed, m/s	0	3
Temperature Gradient, °C/100m	0	0

Appendix C presents the wind roses for the Project based on analysis of the meteorological data for the project.

5.4.1 Receiver Locations

The nearest and potentially most affected privately owned residential/rural receivers that could potentially be affected by the Project are shown on **Figure 5.1**.



Data Source: Sedgman (2016), LPI (2016)

0 0.25 0.5 1.0 km

Legend

- | | | |
|---|------------------------|-------------------|
| Existing Approved Mining Disturbance Area | Delta Energy | Not searched |
| Proposed Southern Extension Area | Minister for Education | Private Residence |
| Castlereagh Highway | Private | |
| Centennial Pty Ltd | Rail Corporation NSW | |
| Council | Shoalhaven Coal Owned | |
| Crown | State Forest | |
| Crown/Council | State Government | |
| Cullen Bullen Primary School | Wallerawang Collieries | |

FIGURE 5.1
Receiver Locations

6.0 Noise Predictions

6.1 Operational Noise Levels

6.1.1 Predicted Operational Noise Levels

ENM's Single Point calculation feature was used to determine noise levels from the Project at the nearest privately owned residential receiver locations identified in **Section 5.4.1**, under the meteorological conditions described in **Section 5.4** for the schedule of equipment (or their equivalent) described in **Section 5.0** and **Appendix B**.

The predicted operational noise levels for the various daytime and evening scenarios are presented in **Table 6.1**. Application of modification factors, including low frequency noise was not deemed necessary based on review of modelling outputs with reference to the procedures of the Draft ING.

Table 6.1 Predicted Site Noise Emissions

Receiver No	Daytime, Stage 1 Mine Plan, Daytime LAeq,15min, dB(A)		Daytime, Stage 1 Mine Plan (includes Overburden Haulage to Eastern Void) Daytime LAeq,15min, dB(A)		Evening, Product Transportation Evening LAeq,15min, dB(A)	
	Calm	3m/s NE Wind	Calm	3m/s NE Wind	Calm	3m/s NE Wind
349	33	32	33	33	20	19
393	35	34	36	39	25	23
394	43	42	44	44	35	32
392	30	37	30	38	20	27
373	30	33	29	33	15	17
388	25	36	25	36	13	22
391	26	37	26	37	14	25
412	26	38	26	37	13	27
404	22	34	23	33	8	21
419	21	32	21	31	10	19
421	21	31	21	30	10	19
426	27	32	27	33	18	24
CRITERION (PA070127)	40	40	40	40	35	35
CRITERION (Draft ING)	40	40	40	40	35	35

Note: Noise levels above the noise criterion shown in bold text.

Table 6.1 shows that noise emissions are contained to within the noise criteria at all locations except for Residence 394. At this location, the modelling shows a potential minor to marginal exceedance of 2 dB(A) to 3 dB(A) under the maximum operational and production scenarios. During overburden haulage to the Eastern Void at the north-eastern boundary of the site, a 4 dB(A) exceedance (defined as a marginal exceedance in accordance with Table 4.1 of the Draft ING) is identified at Residence 394. It is important to note that it is likely that noise levels will in reality be lower, given the conservative approach of the noise modelling.

In light of the residual noise impacts at Residence 394, further noise management measures (refer **Section 8.0**) should be considered for implementation where feasible and reasonable, to minimise noise from site operations. In addition, at-property mitigation, such as comfort ventilation to enable windows to be closed to maintain amenity, may be offered to the property owner in accordance with the VLAMP guidance, or an alternative commercial agreement negotiated with the property owner.

Importantly, the predicted noise emissions for the Project remain within the land acquisition criteria of 45 dB(A) listed under PA070127 at all privately owned residences. This is consistent with the outcomes of the assessment under the Draft ING, whereby the predicted noise emissions are below the significant impact assessment criterion of greater than 45 dB(A).

The predicted operational noise level contours for the daytime and evening scenarios under calm and prevailing north-easterly wind conditions are presented in **Appendix D**. Please note that noise contours are an interpolation of point calculations to a grid and therefore represent a graphical estimate of noise levels which may differ marginally from the more accurate point calculated levels tabulated in **Table 6.1**.

As outlined in **Appendix D** no property would fall under the voluntary land acquisition category based on VLAMP requirements (refer to **Section 3.5**).

Some limited activities may occur on the site outside the proposed operating periods of 7.00am and 10.00pm Monday to Saturday. These activities include some pre-start checks and environmental management activities such as pumping from sedimentation dams to storage areas during wet weather. These activities will be managed to ensure compliance with night-time criteria (35 dB(A)).

6.2 Construction Noise Levels

Construction noise activities on site are expected to be minimal given that the infrastructure for the Project is already in place. For the purposes of assessment, a small construction period of up to three months has been identified, which would consist of upgrade and maintenance works on existing site infrastructure, including the Invincible CPP. This activity would require additional construction related employee traffic (up to 10 vehicles a day) and a number of equipment deliveries such as truck delivery of materials and equipment (expected to be up to 24 in total over this period). Noise emissions associated with such activities is relatively minimal, particularly when compared with the operational phase, which would be occurring concurrently with this construction period. All construction activities associated with the Project will be managed to ensure compliance with operational noise criteria applicable at the time the construction and maintenance activities are being undertaken. In addition, the traffic assessment indicates that construction related traffic would involve a minimal increase in traffic during this short term period.

6.3 Road Traffic Noise Assessment

The potential traffic related noise impacts are associated with employee traffic and heavy vehicle traffic associated with product coal transportation to Mt Piper power station and to Shoalhaven Starches. As part of the Southern Extension Project, the proposed employee levels and product coal transportation will be in accordance with existing approved levels. Accordingly, traffic related noise impacts associated with the Southern Extension Project will be consistent with existing approved operations.

The transport route for coal transported to Mt Piper Power Station does not pass any residences or sensitive receivers. The Project will also include the transportation of nut coal to the Shoalhaven Starches plant located at Bomaderry, approximately 300km to the south of Invincible. Based on maximum nut coal production levels, transport will be in the order of up to 10 additional heavy vehicle movements each way per day along the Castlereagh Highway and Great Western Highway between Invincible and Mount Victoria (from Mount Victoria to Bomaderry, the transport route for coal will be identical to that currently used for the transport of nut coal from Clarence and the Project will therefore not result in any change in traffic noise impacts along this section of the transport route). This will not be a significant increase in heavy vehicle traffic along the Castlereagh Highway, and will be an insignificant contribution to traffic on the major arterial roads between Invincible and Mount Victoria along the Castlereagh Highway and Great Western Highway. Based on this assessment, it is considered that the potential impacts associated with coal transportation on road traffic noise levels will not be significant.

7.0 Cumulative Noise Impact Assessment

In accordance with the Draft ING, whilst an individual operation should not exceed its respective project amenity noise level, the cumulative $L_{Aeq,period}$ noise levels from multiple industrial noise sources should not exceed the recommended amenity noise levels appropriate for the locality and land use. The acceptable L_{Aeq} noise amenity levels in relation to the simultaneous operation of mining and industrial operations in the region surrounding the Project are outlined in **Section 5.4**. Within the rural area, the cumulative daytime, evening and night time noise levels should not exceed 50 dB(A), 45 dB(A) and 45 dB(A) respectively (refer to **Table 5.10**).

A review of potential cumulative impacts has been undertaken for the daytime period when the mine is fully operational and noise associated with the Project will be the most intensive. The assessment includes what are considered the nearest and potentially most significant noise sources; namely Cullen Valley Mine (in care and maintenance), Mt Piper Power Station (MPPS) and Extension Project and Baal Bone Colliery (in care and maintenance).

Noise predictions for the MPPS and extension presented in the EA (*Mt Piper Power Station Extension Environmental Assessment* SKM, September 2009) noise assessment do not extend to the area of this Project. Noise levels were therefore extrapolated based on Location D, which is considered to provide a conservative result. The noise level predicted for Location D, approximately 2.7km from the estimated acoustic centre of power station (i.e. a nominal location within the site where the noise can be taken to emanate from), is 33 dB(A), including a +5 dB(A) low frequency modification adjustment. The property with the greatest potential to receive audible noise from both the Project and the expanded MPPS would be Residence 426, which is approximately 2.9 km north of the MPPS. It is estimated that Residence 426 would receive approximately 30 dB(A) $L_{Aeq,15minute}$ from the expanded MPPS during the daytime. Lower noise levels are expected at other receivers. Recent noise monitoring data indicates a received MPPS noise contribution of less than 25 L_{Aeq} at Location M4 Back Cullen Road which is consistent with an existing MPPS noise level below 30 L_{Aeq} at Residence 426.

The Cullen Valley Mine EA (*The Cullen Valley Mine Extension Environmental Impact Statement* International Environmental Consultants, 2003) includes specifically *Noise and Vibration Impact Assessment, Open Cut Extension, Cullen Valley Mine*, Atkins Acoustics, April 2003, which presents noise emission associated with the approved Cullen Valley operations. Noise predictions do not extend to the area in the vicinity of the Project. The noise contours at the southern end of Cullen Valley assessment were used to estimate the noise levels at the potentially most affected locations in the Project. Locations to the south and south-west of the Cullen Valley Mine and within the general vicinity of the Project benefit from acoustic shielding provided by the natural topography.

The noise report (*Noise Impact Assessment, Baal Bone Colliery*, Ben Bullen Atkins Acoustics 2009) contained as part of the EA for Baal Bone Colliery (*Environmental Assessment – Baal Bone Colliery* AECOM 2010) presents the noise levels associated with the approved Baal Bone Colliery operations. The predictions do not extend to the area in the vicinity of the Project, however an $L_{Aeq,15minute}$ noise level of 46 dB(A) was predicted at Location 349 approximately 0.9 km from the acoustic centre of the site during calm conditions (which represents worst case conditions given south-westerly prevailing wind) and has been used to estimate noise within the vicinity of the Project.

The estimated cumulative noise levels are presented in **Table 7.1** based on worst-case noise levels under prevailing wind conditions from the Invincible operations. These levels are considered to be conservative as they are based only on attenuation due to geometric spreading of the noise energy and do not account for the additional attenuation from ground effect, any acoustic shielding from intervening terrain or atmospheric absorption over the additional distance. Furthermore, the cumulative noise levels are generally based on worst-case meteorological conditions, which cannot occur at the same time at all locations, but for the purpose of this screening assessment has been conservatively assumed.

Table 7.1 Cumulative Noise Levels

Receiver	Daytime Noise Contribution	Contribution, LAeq, 11hour, dB(A)			
	Invincible	Mt Piper Power Station and Extension	Baal Bone	Cullen Valley	Total Cumulative Level
349	31	24	29	11	34
393	39	27	25	8	39
394	42	27	27	8	42
392A	36	27	27	8	37
391	35	26	26	9	36
412	36	27	25	8	37
404	22	25	25	7	29
13426	31	30	25	6	34

Notes: 1- In accordance with Draft ING, the LAeq,11hour daytime amenity noise levels have been estimated by subtracting 2 dB(A) from the LAeq,15minute noise levels. 2- Cullen Valley and Baal Bone are both in care and maintenance.

Table 7.1 shows that the cumulative noise levels are well within the relevant 50 dB(A) daytime cumulative amenity noise level recommended in the Draft ING for rural residential receivers.

8.0 Noise Management and Monitoring

The Draft ING requires that, when predicted noise levels exceed the PNTLs, a range of strategies should be considered where feasible and reasonable to reduce the noise impact on off-site receivers. The three main strategies that may be used to identify reasonable and feasible noise control and mitigation strategies have been outlined in **Section 3.7.2**.

8.1 Noise Management Measures

The identification and assessment of reasonable and feasible noise controls have been considered throughout the project design process and incorporated into detailed noise modelling (refer to **Section 2.6** and **Section 5.0**). The incorporation of these reasonable and feasible controls have reduced the predicted noise impacts of the Project as far as practicable.

Other general noise management measures that may be considered where feasible and reasonable include:

- consideration of noise minimisation when selecting new plant and equipment
- the maintenance of product stockpiles in strategic locations, where practicable, shielding product trucks and product loading equipment
- the use of broad band reversing alarms instead of beeper style alarms on all mobile equipment
- the management of mobile machines during adverse weather conditions when wind conditions enhance the noise propagation towards sensitive receiver locations which would likely include:
 - where possible, not operating a dozer for shaping during rehabilitation at the northernmost emplacement site in the final year of the mine life
 - moving extraction activities to locations deeper in the mine pit during adverse weather conditions
 - shut down of some equipment and activities during adverse weather conditions, if required, in particular haulage of overburden to the emplacement areas.

To ensure the ongoing effective operation of these noise control measures, Castlereagh Coal is committed to:

- regular inspection and maintenance of noise attenuation systems
- implementation of a process for periodic review of noise performance of equipment. This process will be outlined in a Noise Management Plan to be prepared for the Project (refer to **Section 8.2**).

Following the implementation of feasible and reasonable controls, only one property (Location 394) exceeds the target PNTL and existing Invincible Project Approval criteria. A negotiated agreement or an offer of comfort ventilation, or similar, that would allow the windows to be closed to maintain amenity without compromising ventilation would be undertaken.

If during the course of operations, individual residential receivers are found to exceed their PNTLs, in addition to the management of operational noise levels outlined above, additional management procedures that can be implemented include:

- prompt response to any issues of concern raised by community
- additional targeted noise monitoring on-site and within the community
- refinement of on-site noise mitigation measures and plant operating procedures where practical, specific to the transmission of noise to the affected receiver.

8.2 Noise Management Plan

It is recommended that a Noise Management Plan (NMP) be prepared and implemented for the Project. The NMP will detail the implementation of environmental management controls to be utilised to manage potential noise impacts associated with site operations. The NMP will, at a minimum, include:

- noise objectives and targets consistent with the modified Project Approval and EPL
- noise mitigation measures, referencing relevant operating procedures with documented controls. The suitability of the noise management controls is to be assessed on an annual basis as part of ongoing review of operational risks to the Project
- provision of general noise awareness training for operational staff, which identifies site specific objectives and targets for noise management, potential noise impacts, environmental commitments for the colliery and obligations in respect of noise management
- noise monitoring processes to be implemented over the life of the Project to provide for ongoing noise performance monitoring and determination of compliance with relevant noise criteria provided in the Project Approval and EPL (refer to **Section 8.3**)
- mechanisms for stakeholder consultation
- complaint handling processes including maintenance of a Community Contact Line which will be in operation 24hrs per day
- a roles and responsibilities matrix, with responsibilities being clearly defined through all levels within the operation as this relates to the control and management of noise.

8.3 Noise Monitoring

It is recommended that a noise monitoring program be undertaken on a quarterly basis comprising of day time operations and if/when undertaken, evening operations. Noise monitoring locations will be developed based on suitability and available land access, however, would ideally assess noise impacts at a number of the nearest sensitive receivers (for example Residences 394, 393 and 392). The monitoring program will include:

- attended noise monitoring to measure ambient noise levels in the surrounding region and determination of the Project's contribution to measured noise levels
- comparison of the attended noise monitoring results with predicted noise levels from the Project under similar meteorological conditions, and relevant consent and EPL noise limits
- assessment of performance of noise control measures and recommendations for additional measures if required.

The monitoring program would also be used to assess the noise performance of the Project as a whole. Equipment selection will be governed by the noise performance of the Project and not necessarily on individual items of equipment.

9.0 Conclusion

9.1 Operational Noise Levels

Umwelt has undertaken a NIA to assess the potential noise impacts associated with the Project. The NIA included the establishment of relevant noise criteria, assessment of the local meteorological conditions and modelling of worst case operational and production scenarios of the Project. The assessment of the noise impacts was undertaken in accordance with the *NSW Draft Industrial Noise Guideline* (Draft ING), (EPA 2015). Reasonable and feasible noise mitigation measures (including those outlined in **Section 2.6**) have been incorporated into the Project in order to minimise environmental noise.

During the daytime period, the Project will achieve the daytime target PNTL and existing Invincible Project Approval criteria at all residential receiver locations except Residence 394. Further noise management measures may be implemented where feasible and reasonable to minimise the noise from the site during adverse meteorological conditions. At Residence 394, an offer of voluntary at-property mitigation will be made to the property owner in accordance with the VLAMP. Castlereagh Coal may negotiate an alternative agreement with the property owner. The Project will not trigger voluntary property acquisition in accordance with requirements of the VLAMP at any property.

During the evening period the Project will achieve the evening target PSNL at all residential receiver locations.

Some limited activities may occur on the site outside the proposed operating periods of 7.00am and 10.00pm Monday to Saturday. These activities include some pre-start checks and environmental management activities such as pumping from sedimentation dams to storage areas during wet weather. These activities will be managed to ensure compliance with night-time criteria (35 dB(A)).

9.2 Cumulative Noise

A conservative cumulative noise assessment for the areas surrounding the Project indicates that the cumulative noise impacts assessment criteria will not be exceeded based on the Project and the relevant surrounding industrial noise sources (refer to **Section 7.0**).

9.3 Road Traffic Noise

The potential traffic related noise impacts are associated with employee traffic and heavy vehicle traffic associated with product coal transportation to Mt Piper power station and to Shoalhaven Starches. As part of the Southern Extension Project, the proposed employee levels and product coal transportation will be in accordance with existing approved levels. Accordingly, traffic related noise impacts associated with the Southern Extension Project will be consistent with existing approved operations.

The Southern Extension Project will also include the transport of nut coal to the Shoalhaven Starches plant located at Bombaderry, approximately 300km to the south of Invincible. Based on maximum nut coal production levels, transport will be in the order of up to 10 heavy vehicles each way per day along the Castlereagh Highway, which will occur in the daytime and evening periods. This will not represent a significant increase in heavy vehicle traffic along the Castlereagh Highway, and will be an insignificant contribution to traffic to the major arterial roads between the Castlereagh Highway and the Shoalhaven Starches Plant. Based on this assessment, it is considered that the potential impacts associated with additional coal transportation on road traffic noise levels will not be significant.

9.4 Construction Noise

Construction noise activities on site are expected to be minimal given that the infrastructure for the Project is already in place. For the purposes of assessment, a small construction period of up to three months has been identified, which would consist of upgrade and maintenance works on existing site infrastructure, including the Invincible CPP. This activity would require additional construction related employee traffic (up to 10 vehicles a day) and a number of equipment deliveries such as truck delivery of materials and equipment (expected to be up to 24 in total over this period). Noise emissions associated with such activities is relatively minimal, particularly when compared with the operational phase, which would be occurring concurrently with this construction period. All construction activities associated with the Project will be managed to ensure compliance with operational noise criteria applicable at the time the construction and maintenance activities are being undertaken. In addition, the traffic assessment indicates that construction related traffic would involve a minimal increase in traffic during this short term period.

9.5 Recommendations

The following recommendations are made in relation to the ongoing management, monitoring and reporting of noise emissions associated with the Project:

- the **noise mitigation and management measures** outlined in **Section 2.6 and 8.1** be implemented for the Project where feasible and reasonable
- a **noise management plan** be prepared and implemented for the Project as discussed in **Section 8.2**
- a **noise monitoring program** be undertaken quarterly, incorporating:
 - attended noise monitoring to measure ambient noise levels in the surrounding region and determination of the quarry's contribution to measured noise levels
 - comparison of the attended noise monitoring results with predicted noise levels from the Project noise models of the quarry under similar meteorological conditions, and relevant consent and EPL noise limits
 - assessment of performance of noise control measures and recommendations for additional measures if required.

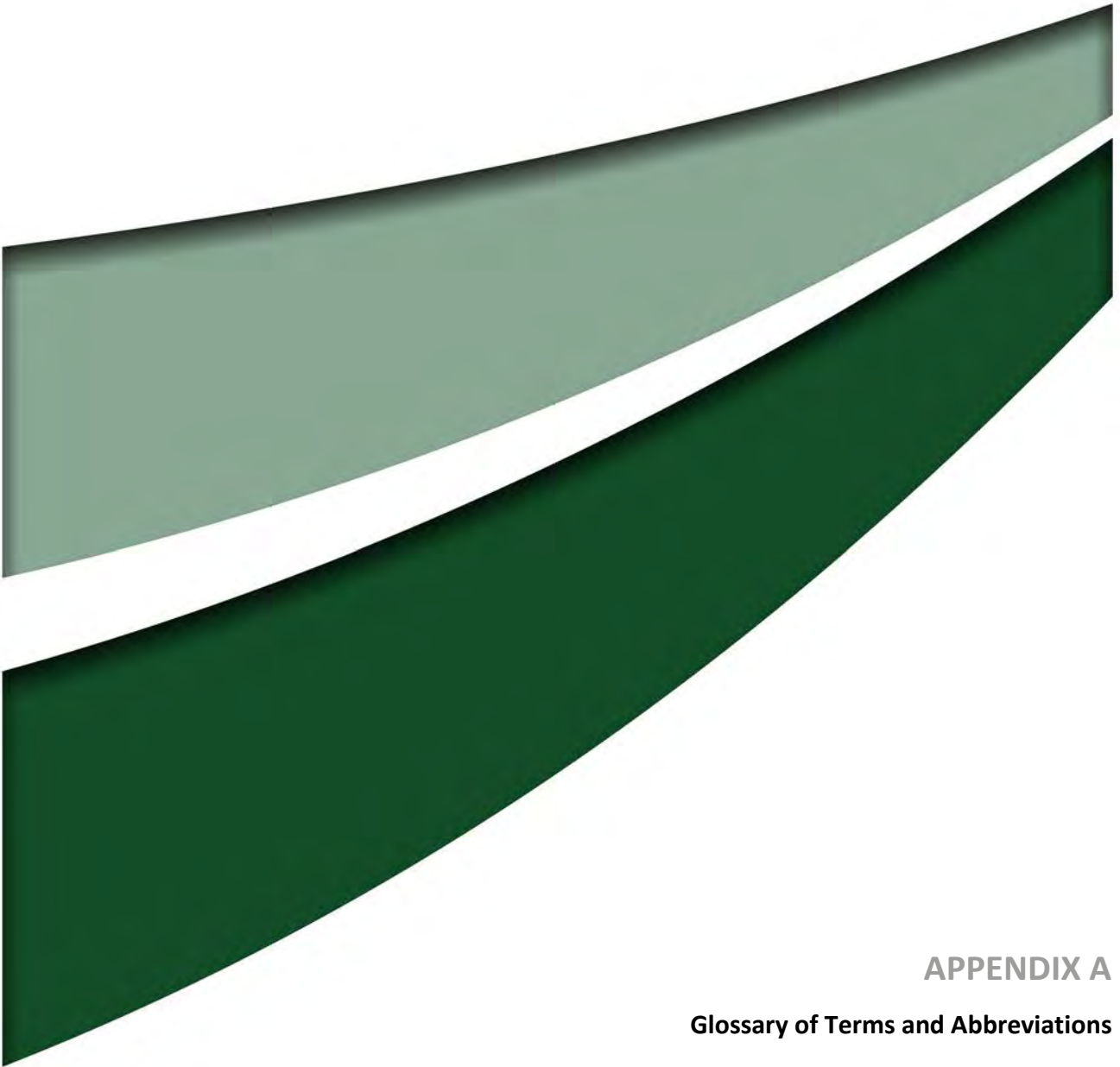
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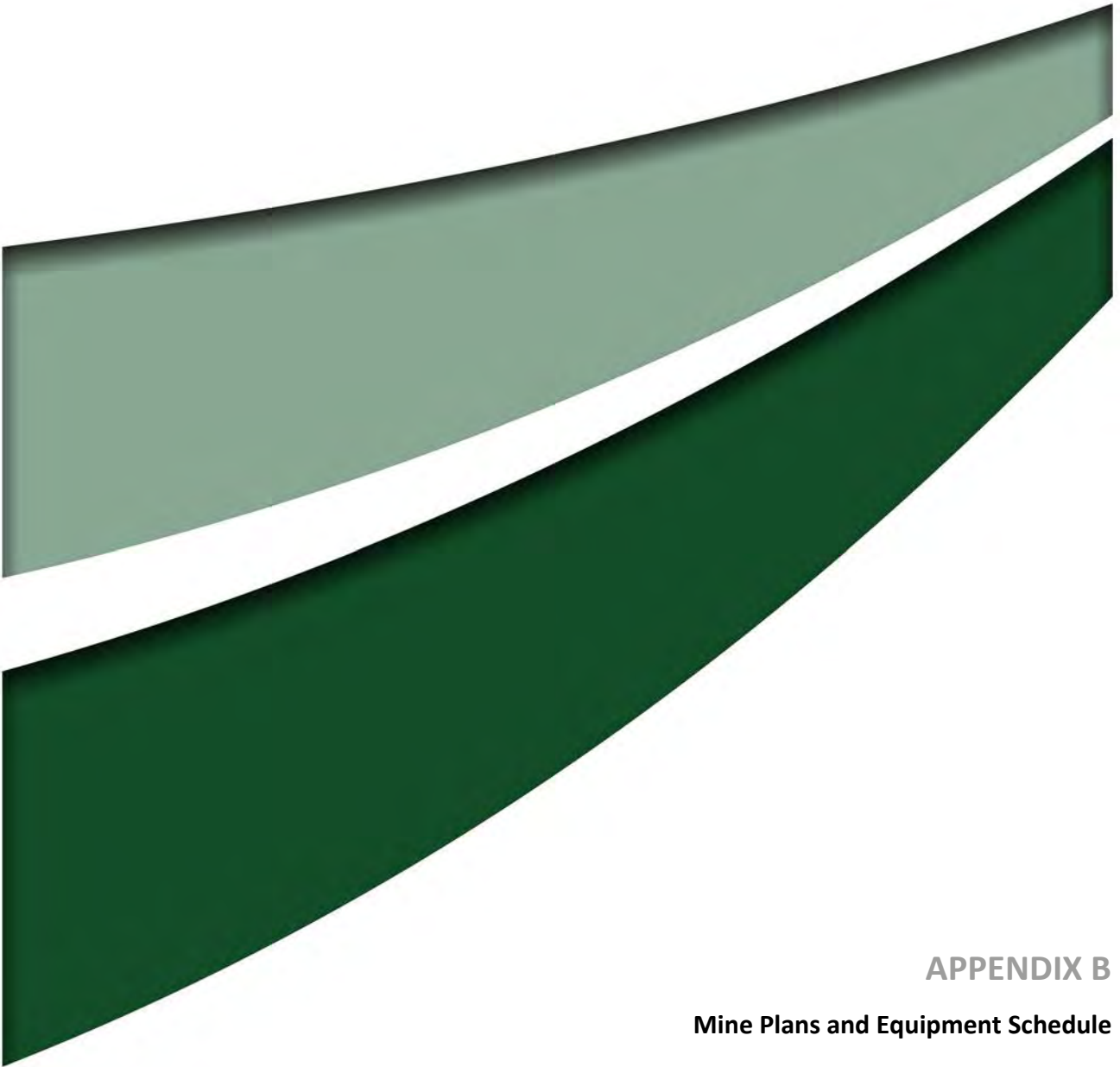
APPENDIX A

Glossary of Terms and Abbreviations

Glossary of Terms and Abbreviations

1/3 Octave	Single octave bands divided into three parts.
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment background level - A single-figure background noise level representing each assessment period – day, evening and night (that is, three assessment background levels are determined for each 24 hr period of the monitoring period). It is determined by taking the lowest 10th percentile of the L_{90} level for each assessment period.
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dB(A), dBA	Decibels A-weighted.
dB(C), dBC	Decibels C-weighted.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Decibel (dB)	The units of sound level and noise exposure measurement where a step of 10 dB is a ten-fold increase in intensity or sound energy and actually sounds a little more than twice as loud.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	The percentile sound pressure level exceeded for 10 per cent of the measurement period with 'A' frequency weighting calculated by statistical analysis. Typically used to assess the impact of an existing operation on a receiver area and is referred to as the cumulative noise levels at the receiver attributable to the noise source.
LA90	Background Noise Level. The percentile sound pressure level exceeded for 90 per cent of the measurement period with 'A' frequency weighting calculated by statistical analysis.
LAm _{ax}	The maximum of the sound pressure levels recorded over an interval of 1 second.
LA1,1minute	The measure of the short duration high-level noises that cause sleep arousal. The noise level is measured as the percentile sound pressure level that is exceeded 1 per cent of measurement period with 'A' frequency weighting calculated by statistical analysis during a measurement time interval of 1 minute.
LA _{eq,t}	Equivalent continuous sound pressure level - The value of the sound pressure level of a continuous steady noise that, a measurement interval of time (t), has the same mean square sound pressure as the sound under consideration whose level varies with time. Usually measured in dB with 'A' weighting.

LAN	Percentile level - A measure of the fluctuation of the sound pressure level which is exceeded 'n' per cent of the observation time.
PSNL	Project-specific noise levels - The target noise levels for a particular noise generating facility based on the most stringent of the intrusive criteria or amenity criteria.
RBL	Rating background level - The overall single figure background level representing each assessment period over the whole monitoring period determined by taking the median of the ABLs found for each assessment period.
SPL (dBA)	Noise: Sound pressure level - The basic measure of noise loudness. The level of the root-mean-square sound pressure in decibels given by: $\text{SPL} = 10 \cdot \log_{10} (p/p_0)^2$ where p is the rms sound pressure in pascals and p₀ is the sound reference pressure at 20 µPa. decibels.
SWL	Sound power level - a measure of the energy emitted from a source as sound and is given by: $\text{SWL} = 10 \cdot \log_{10} (W/W_0)$ where W is the sound power in watts and W₀ is the sound reference power at 10⁻¹² watts.



APPENDIX B

Mine Plans and Equipment Schedule

Many of the indicative machines and items of equipment presented in the following Tables are represented as multiple point sources in order to simulate:

- The possible alternate locations of the machine e.g. the use of alternate excavator locations
- The same machine doing two different activities e.g. a bulldozer pushing and reversing
- A fleet of trucks as a continuous circuit
- Conveyors as the equivalent of a line source
- Road trucks hauling product coal travelling along internal roads as the equivalent of a line source.

The sound power levels of the equipment modelled over the life of the mine and presented in **Tables B.1, B.2 and B.3** are considered indicative rather than mandatory and represent worst case operations over the life of the mine; day time operations including overburden emplacement in the northern void and evening operations during the life of the mine respectively. The actual performance of the mining operation will be determined by monitoring the environmental noise levels over the life of the Project. That is, while the representative sound power levels provide a guide to equipment selection, the actual performance of the mine as a whole will dictate equipment selection criteria.

The ENM models of the staged mine plans include a full suite of equipment operating in and around the mine. In addition to the mining activities the noise models include:

- The CHPP
- The clean coal handling system and road truck load-out facility.

The ENM model of the CHPP, conveyor systems and mobile equipment working in and around the CHPP were based on the representative equipment list and topographical layout of the facility. It was assumed that these activities would remain basically unchanged over the life of the mine.

The representative locations of the equipment are shown in **Figure B.1**.

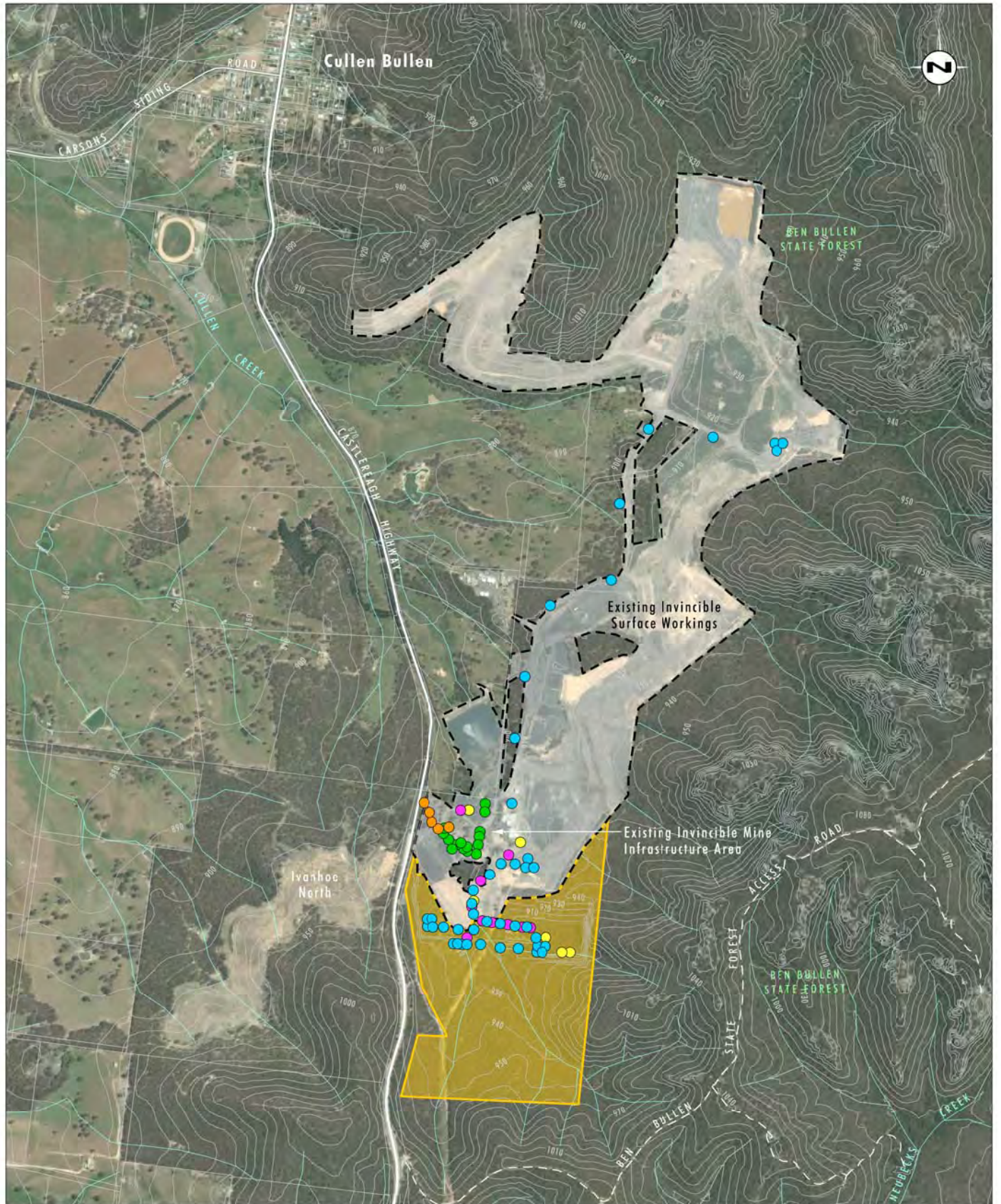


Image Source: Google Earth - CNES/Astrium (Nov 2014)
 Data Source: LPI (2016)
 Note: Contour Interval 10m

0 0.25 0.5 1.0 km

Legend

- Existing Approved Mining Disturbance Area
- Proposed Southern Extension Area

- Noise Model Source Locations:
- CHPP
 - Coal Extraction
 - Other Mobile Equipment
 - Overburden Emplacement
 - Road Truck

FIGURE B1

Noise Model Source Locations

Table B1 **Representative worst-case day time operations - Modelled Equipment List**

Source ID	Equipment Name	Activity	Acoustic Utilisation Factor	SWL, dB(A)	SWL, dB(Z)	Easting, MGA	Northing, MGA	Ground Elevation, m AHD
1	Ex01 Ex2400	Overburden	100%	113	118	224707	6308336	899
2	Ex02 Pre strip Ex2400	Pre Strip	100%	113	118	224430	6308365	918
4	Ex03 Ex1200	Coal	100%	107	108	224831	6308335	896
5	D11 D11	Forward	75%	112	122	224710	6308357	899
6	D11 D11	Reverse	25%	121	126	224739	6308357	897
7	D10 Pre strip D10	Forward	75%	113	122	224399	6308367	918
8	D10 Pre strip D10	Reverse	25%	118	124	224414	6308367	917
11	CAT 777 Truck 1 Ex01	Idle	67%	103	110	224727	6308335	898
12	CAT 777 Truck 1 Ex01	Pulling Away	33%	114	123	224703	6308389	897
13	CAT 777 Truck 3 Ex01	Uphill	25%	114	123	224626	6308432	899
14	CAT 777 Truck 3 Ex01	Downhill	25%	114	123	224571	6308441	900
15	CAT 777 Truck 2 Pre Strip Ex02	Idle	67%	103	110	224448	6308364	918
16	CAT 777 Truck 2 Pre Strip Ex02	Pulling Away	33%	114	123	224499	6308364	919
17	CAT 777 Truck 3 Pre Strip Ex02 Pre strip	Uphill	25%	114	123	224571	6308352	922
18	CAT 777 Truck 3 Pre Strip Ex02 Pre strip	Downhill	25%	114	123	224638	6308349	919
23	CAT 777 Truck 4 Overburden	Uphill	25%	114	123	224473	6308476	907
24	CAT 777 Truck 4 Overburden	Downhill	25%	114	123	224472	6308564	915
25	CAT 777 Truck 4 Overburden	Uphill	25%	114	123	224533	6308623	916

Source ID	Equipment Name	Activity	Acoustic Utilisation Factor	SWL, dB(A)	SWL, dB(Z)	Easting, MGA	Northing, MGA	Ground Elevation, m AHD
26	CAT 777 Truck 5 South Dump	Downhill	25%	114	123	224574	6308664	918
27	CAT 777 Truck 5 South Dump	Uphill	25%	114	123	224626	6308663	917
28	CAT 777 Truck 5 South Dump	Dumping	25%	112	123	224673	6308683	917
38	D10 2 South Dump D10	Forward	75%	113	122	224665	6308650	917
39	D10 2 South Dump D10	Reverse	25%	118	124	224695	6308650	918
42	775F 1 Coal	Idle	67%	103	110	224801	6308335	896
43	775F 1 Coal	Pulling Away	33%	112	123	224740	6308390	897
44	773D 1 Coal	Uphill	33%	114	119	224473	6308525	912
45	773D 1 Coal	Downhill	33%	114	119	224646	6308743	915
46	773D 1 Coal	Dumping	33%	114	119	224456	6308862	906
47	Drill 1 Drill Reedrill	Drilling	100%	114	119	224449	6308389	903
48	FEL 1	Loading Coal	100%	104	105	224425	6308862	906
49	Grader 1 Grader CAT 16H	Road Maintenance	25%	108	115	224467	6308504	910
50	Grader 1 Grader CAT 16H	Road Maintenance	25%	108	115	224541	6308445	901
51	Grader 1 Grader CAT 16H	Road Maintenance	25%	108	115	224599	6308438	900
52	Grader 1 Grader CAT 16H	Road Maintenance	25%	108	115	224683	6308426	898
53	Water Truck 1 Water Truck 777	Road Maintenance	25%	114	123	224602	6308697	918
54	Water Truck 1 Water Truck 777	Road Maintenance	25%	114	123	224499	6308600	917
55	Water Truck 1 Water Truck 777	Road Maintenance	25%	114	123	224506	6308451	902
56	Water Truck 1 Water Truck 777	Road Maintenance	25%	114	123	224653	6308428	898

Source ID	Equipment Name	Activity	Acoustic Utilisation Factor	SWL, dB(A)	SWL, dB(Z)	Easting, MGA	Northing, MGA	Ground Elevation, m AHD
61	ROM Coal Surge Bin	CHPP	100%	89	98	224515	6308856	907
62	Rom Conveyor 1	CHPP	100%	90	99	224496	6308783	906
63	Breaker	CHPP	100%	112	118	224494	6308764	907
64	Rom Conveyor 2	CHPP	100%	90	99	224490	6308734	907
65	CHPP Building	CHPP	100%	111	123	224483	6308701	909
66	Clean Coal Conveyor 1	CHPP	100%	90	99	224449	6308710	908
67	Transfer Tower	CHPP	100%	109	117	224436	6308720	908
68	Clean Coal Conveyor 2	CHPP	100%	90	99	224411	6308735	908
69	Clean Coal Conveyor 3	CHPP	100%	90	99	224394	6308719	911
70	Product Coal Bin	CHPP	100%	89	98	224381	6308753	909
71	Course Rejects Conveyor	CHPP	100%	90	99	224449	6308726	907
72	Course Rejects Bin	CHPP	100%	89	98	224426	6308742	908
73	Mutli product conveyor	CHPP	100%	90	99	224362	6308776	908
74	Mutli product bin	CHPP	100%	89	98	224366	6308796	907
75	Product Truck	Idle	100%	98	103	224382	6308799	907
76	Product Truck	Pulling Away	25%	118	123	224343	6308793	908
77	Product Truck	Pulling Away	25%	113	114	224317	6308818	910
78	Product Truck	Pulling Away	25%	113	114	224309	6308853	912
79	Product Truck	Pulling Away	25%	113	114	224289	6308889	915
80	CAT 777 Truck 6 South Dump	Uphill	33%	114	123	224670	6308429	898

Source ID	Equipment Name	Activity	Acoustic Utilisation Factor	SWL, dB(A)	SWL, dB(Z)	Easting, MGA	Northing, MGA	Ground Elevation, m AHD
81	CAT 777 Truck 6 South Dump	Downhill	33%	114	123	224522	6308449	902
82	CAT 777 Truck 6 South Dump	Uphill	33%	114	123	224467	6308515	911

Table B.2 Representative worst-case day time operations including overburden emplacement in northern void- Modelled Equipment List

Source ID	Equipment Name	Activity	Acoustic Utilisation Factor	SWL, dB(A)	SWL, dB(Z)	Easting, MGA	Northing, MGA	Ground Elevation, m AHD
1	Ex01 Ex2400	Overburden	100%	113	118	224707	6308336	899
3	Ex02 Location B Ex2400	Overburden	100%	113	118	224301	6308431	906
4	Ex03 Ex1200	Coal	100%	107	108	224831	6308335	896
5	D11 D11	Forward	75%	112	122	224710	6308357	899
6	D11 D11	Reverse	25%	121	126	224739	6308357	897
9	D10 In Pit D10	Forward	75%	113	122	224301	6308458	906
10	D10 In Pit D10	Reverse	25%	118	124	224318	6308458	905
11	CAT 777 Truck 1 Ex01	Idle	67%	103	110	224727	6308335	898
12	CAT 777 Truck 1 Ex01	Pulling Away	33%	114	123	224703	6308389	897
13	CAT 777 Truck 3 Ex01	Uphill	25%	114	123	224626	6308432	899
14	CAT 777 Truck 3 Ex01	Downhill	25%	114	123	224571	6308441	900
19	CAT 777 Truck 2 In Pit Ex02 In Pit	Idle	67%	103	110	224322	6308428	905
20	CAT 777 Truck 2 In Pit Ex02 In Pit	Pulling Away	33%	114	123	224362	6308428	905
21	CAT 777 Truck 3 In Pit Ex02 In Pit	Uphill	25%	114	123	224416	6308419	904

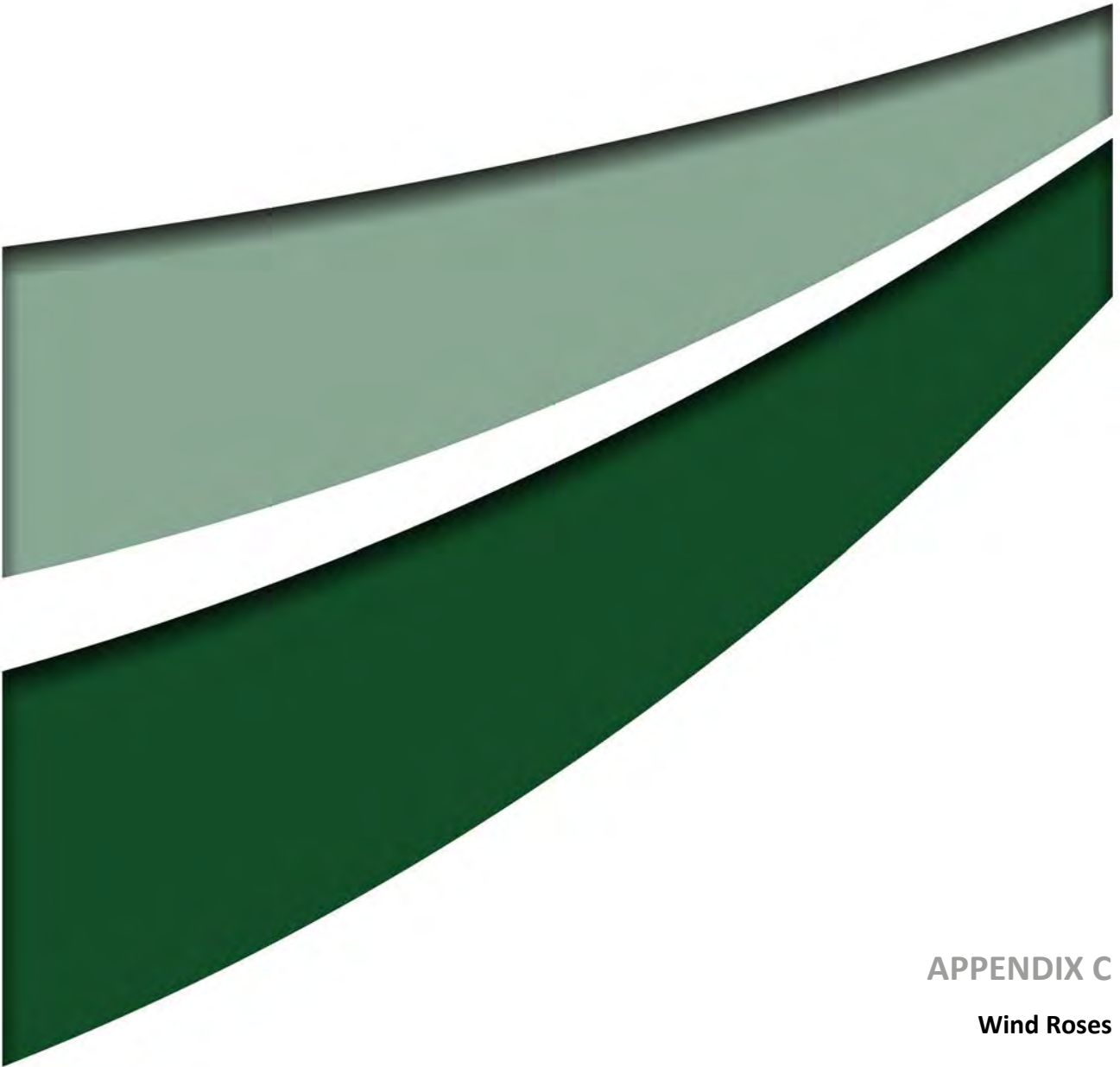
Source ID	Equipment Name	Activity	Acoustic Utilisation Factor	SWL, dB(A)	SWL, dB(Z)	Easting, MGA	Northing, MGA	Ground Elevation, m AHD
22	CAT 777 Truck 3 In Pit Ex02 In Pit	Downhill	25%	114	123	224474	6308419	903
23	CAT 777 Truck 4 Overburden	Uphill	25%	114	123	224473	6308476	907
24	CAT 777 Truck 4 Overburden	Downhill	25%	114	123	224472	6308564	915
25	CAT 777 Truck 4 Overburden	Uphill	25%	114	123	224533	6308623	916
26	CAT 777 Truck 5 South Dump	Downhill	25%	114	123	224574	6308664	918
27	CAT 777 Truck 5 South Dump	Uphill	25%	114	123	224626	6308663	917
28	CAT 777 Truck 5 South Dump	Dumping	25%	112	123	224673	6308683	917
29	CAT 777 Truck 6 North Dump	Uphill	6%	114	123	224614	6308887	913
30	CAT 777 Truck 6 North Dump	Downhill	6%	114	123	224625	6309129	910
31	CAT 777 Truck 6 North Dump	Uphill	6%	114	123	224662	6309357	909
32	CAT 777 Truck 6 North Dump	Downhill	6%	114	123	224758	6309621	911
33	CAT 777 Truck 6 North Dump	Uphill	6%	114	123	224983	6309716	909
34	CAT 777 Truck 6 North Dump	Downhill	6%	114	123	225014	6310000	901
35	CAT 777 Truck 6 North Dump	Uphill	6%	114	123	225121	6310275	903
36	CAT 777 Truck 6 North Dump	Downhill	6%	114	123	225361	6310245	913
37	CAT 777 Truck 6 North Dump	Dumping	6%	112	123	225589	6310222	911
38	D10 2 South Dump D10	Forward	75%	113	122	224665	6308650	917
39	D10 2 South Dump D10	Reverse	25%	118	124	224695	6308650	918
40	D10 2 North Dump D10	Forward	75%	113	122	225597	6310195	910
41	D10 2 North Dump D10	Reverse	25%	118	124	225620	6310222	911

Source ID	Equipment Name	Activity	Acoustic Utilisation Factor	SWL, dB(A)	SWL, dB(Z)	Easting, MGA	Northing, MGA	Ground Elevation, m AHD
42	775F 1 Coal	Idle	67%	103	110	224801	6308335	896
43	775F 1 Coal	Pulling Away	33%	112	123	224740	6308390	897
44	773D 1 Coal	Uphill	33%	114	119	224473	6308525	912
45	773D 1 Coal	Downhill	33%	114	119	224646	6308743	915
46	773D 1 Coal	Dumping	33%	114	119	224456	6308862	906
47	Drill 1 Drill Reedrill	Drilling	100%	114	119	224449	6308389	903
48	FEL 1	Loading Coal	100%	104	105	224425	6308862	906
49	Grader 1 Grader CAT 16H	Road Maintenance	25%	108	115	224467	6308504	910
50	Grader 1 Grader CAT 16H	Road Maintenance	25%	108	115	224541	6308445	901
51	Grader 1 Grader CAT 16H	Road Maintenance	25%	108	115	224599	6308438	900
52	Grader 1 Grader CAT 16H	Road Maintenance	25%	108	115	224683	6308426	898
53	Water Truck 1 Water Truck 777	Road Maintenance	25%	114	123	224602	6308697	918
54	Water Truck 1 Water Truck 777	Road Maintenance	25%	114	123	224499	6308600	917
55	Water Truck 1 Water Truck 777	Road Maintenance	25%	114	123	224506	6308451	902
56	Water Truck 1 Water Truck 777	Road Maintenance	25%	114	123	224653	6308428	898
61	ROM Coal Surge Bin	CHPP	100%	89	98	224515	6308856	907
62	Rom Conveyor 1	CHPP	100%	90	99	224496	6308783	906
63	Breaker	CHPP	100%	112	118	224494	6308764	907
64	Rom Conveyor 2	CHPP	100%	90	99	224490	6308734	907
65	CHPP Building	CHPP	100%	111	123	224483	6308701	909

Source ID	Equipment Name	Activity	Acoustic Utilisation Factor	SWL, dB(A)	SWL, dB(Z)	Easting, MGA	Northing, MGA	Ground Elevation, m AHD
66	Clean Coal Conveyor 1	CHPP	100%	90	99	224449	6308710	908
67	Transfer Tower	CHPP	100%	109	117	224436	6308720	908
68	Clean Coal Conveyor 2	CHPP	100%	90	99	224411	6308735	908
69	Clean Coal Conveyor 3	CHPP	100%	90	99	224394	6308719	911
70	Product Coal Bin	CHPP	100%	89	98	224381	6308753	909
71	Course Rejects Conveyor	CHPP	100%	90	99	224449	6308726	907
72	Course Rejects Bin	CHPP	100%	89	98	224426	6308742	908
73	Mutli product conveyor	CHPP	100%	90	99	224362	6308776	908
74	Mutli product bin	CHPP	100%	89	98	224366	6308796	907
75	Product Truck	Idle	100%	98	103	224382	6308799	907
76	Product Truck	Pulling Away	25%	118	123	224343	6308793	908
77	Product Truck	Pulling Away	25%	113	114	224317	6308818	910
78	Product Truck	Pulling Away	25%	113	114	224309	6308853	912
79	Product Truck	Pulling Away	25%	113	114	224289	6308889	915

Table B3 Evening operations - Modelled Equipment List

Source ID	Equipment Name	Activity	Acoustic Utilisation Factor	SWL, dB(A)	SWL, dB(Z)	Easting, MGA	Northing, MGA	Ground Elevation, m AHD
73	Mutli product conveyor	CHPP	100%	90	99	224362	6308776	908
74	Mutli product bin	CHPP	100%	89	98	224366	6308796	907
75	Product Truck	Idle	100%	98	103	224382	6308799	907
76	Product Truck	Pulling Away	25%	118	123	224343	6308793	908
77	Product Truck	Pulling Away	25%	113	114	224317	6308818	910
78	Product Truck	Pulling Away	25%	113	114	224309	6308853	912
79	Product Truck	Pulling Away	25%	113	114	224289	6308889	915



APPENDIX C

Wind Roses



WIND SPEED ANALYSIS

SUMMER

Wind Speed (m/s)

0.5 to < 0.9

0.9 to < 1.7

1.7 to < 3.0

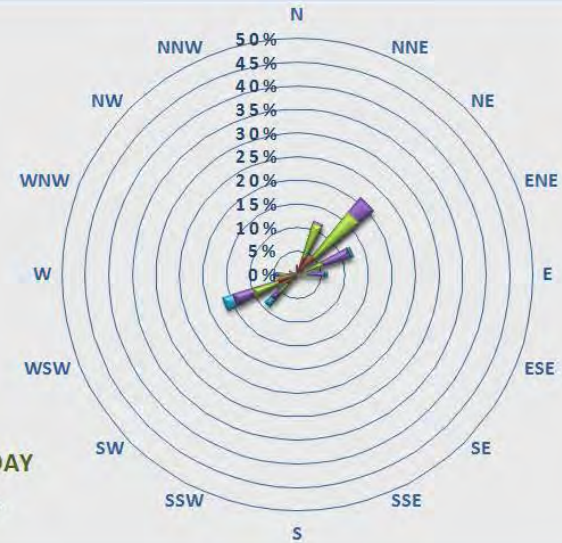
3.0 to < 4.5

4.5 to < 6.0

Data Source: 01 Jan 2014 to 31 Dec 2014

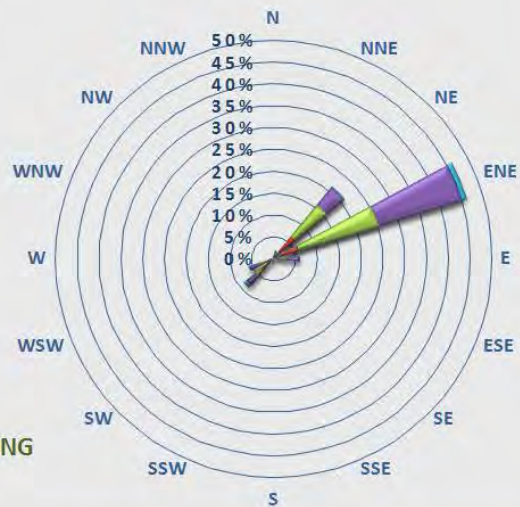
SUMMER DAY

Calm 5.7%



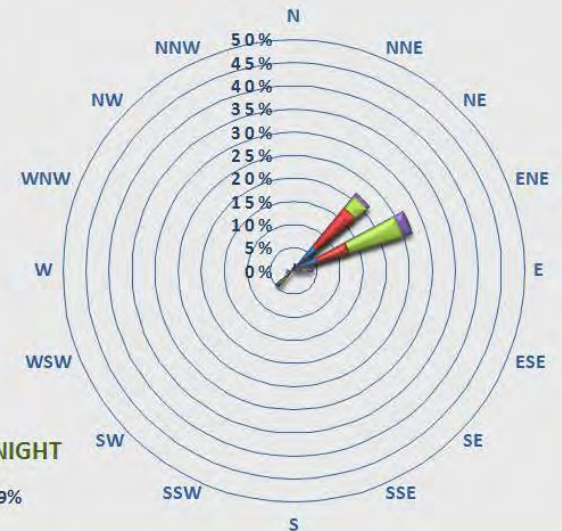
SUMMER EVENING

Calm 5.8%



SUMMER NIGHT

Calm 34.9%





WIND SPEED ANALYSIS

AUTUMN

Wind Speed (m/s)

0.5 to < 0.9

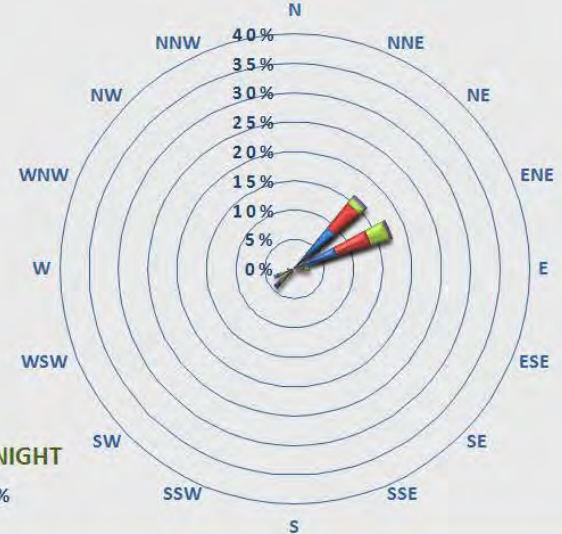
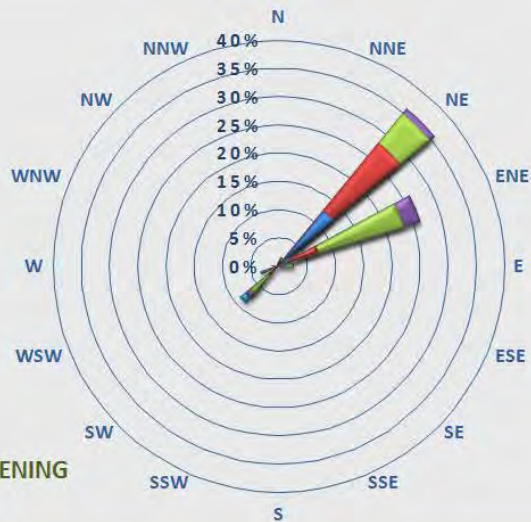
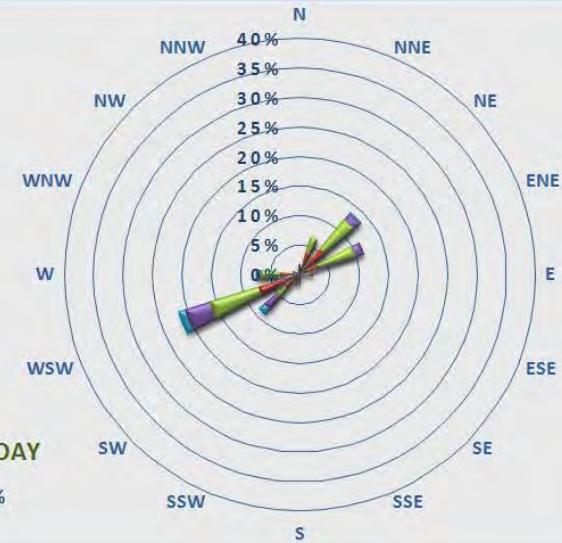
0.9 to < 1.7

1.7 to < 3.0

3.0 to < 4.5

4.5 to < 6.0

Data Source: 01 Jan 2014 to 31 Dec 2014





WIND SPEED ANALYSIS

WINTER

Wind Speed (m/s)

0.5 to < 0.9

0.9 to < 1.7

1.7 to < 3.0

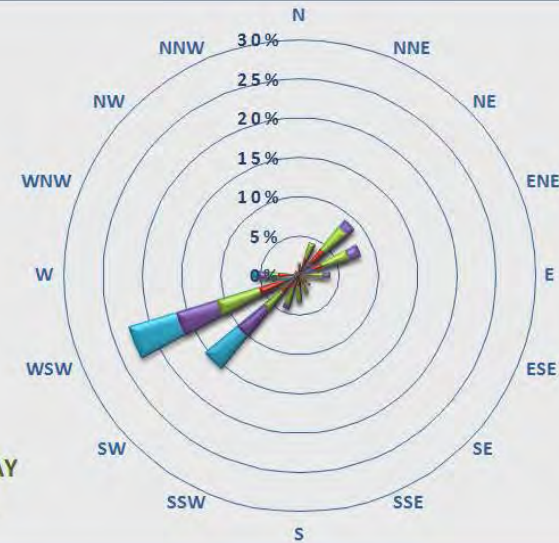
3.0 to < 4.5

4.5 to < 6.0

Data Source: 01 Jan 2014 to 31 Dec 2014

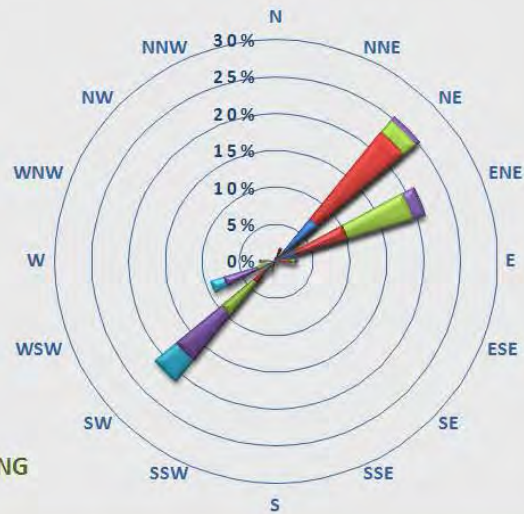
WINTER DAY

Calm 9.9%



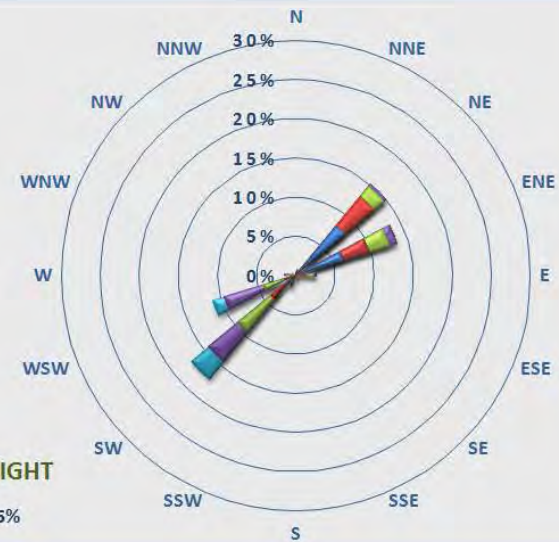
WINTER EVENING

Calm 9.5%



WINTER NIGHT

Calm 31.5%





WIND SPEED ANALYSIS

SPRING

Wind Speed (m/s)

0.5 to < 0.9

0.9 to < 1.7

1.7 to < 3.0

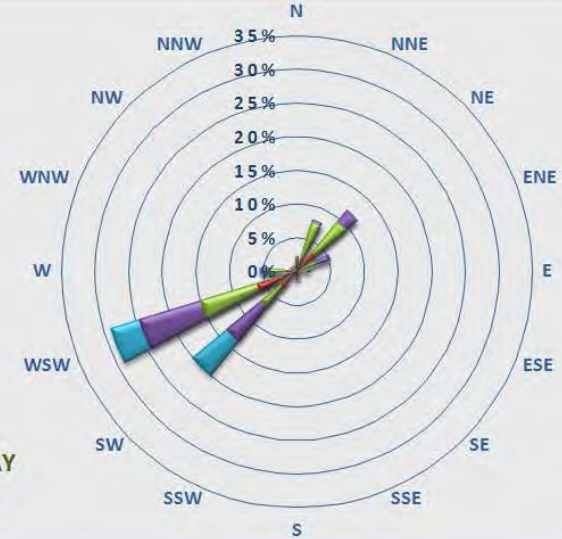
3.0 to < 4.5

4.5 to < 6.0

Data Source: 01 Jan 2014 to 31 Dec 2014

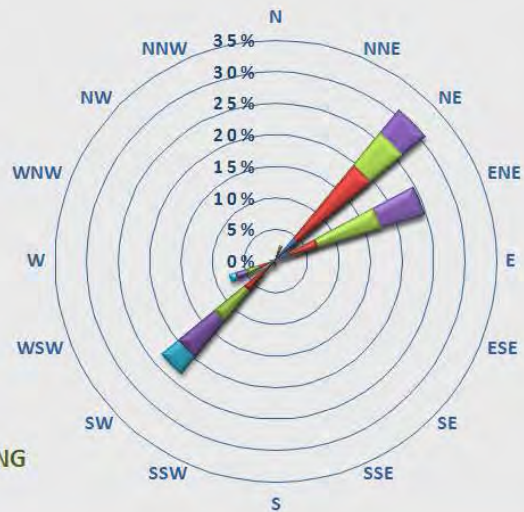
SPRING DAY

Calm 5.5%



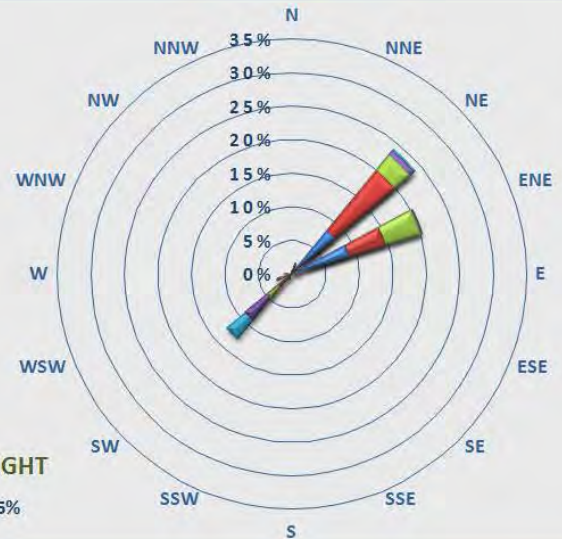
SPRING EVENING

Calm 4.1%



SPRING NIGHT

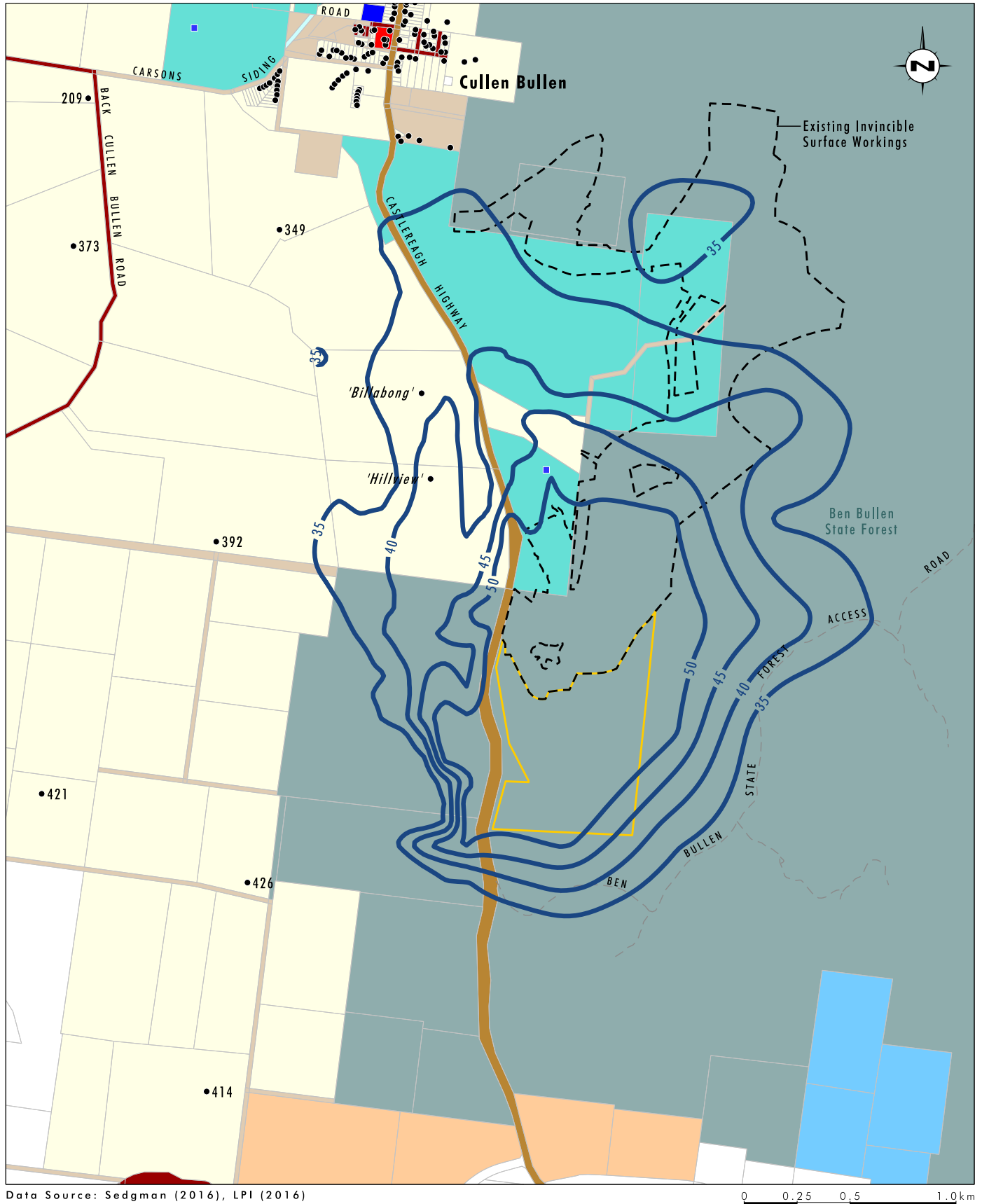
Calm 32.6%





APPENDIX D

Predicted Noise Contours



Data Source: Sedgman (2016), LPI (2016)

0 0.25 0.5 1.0 km

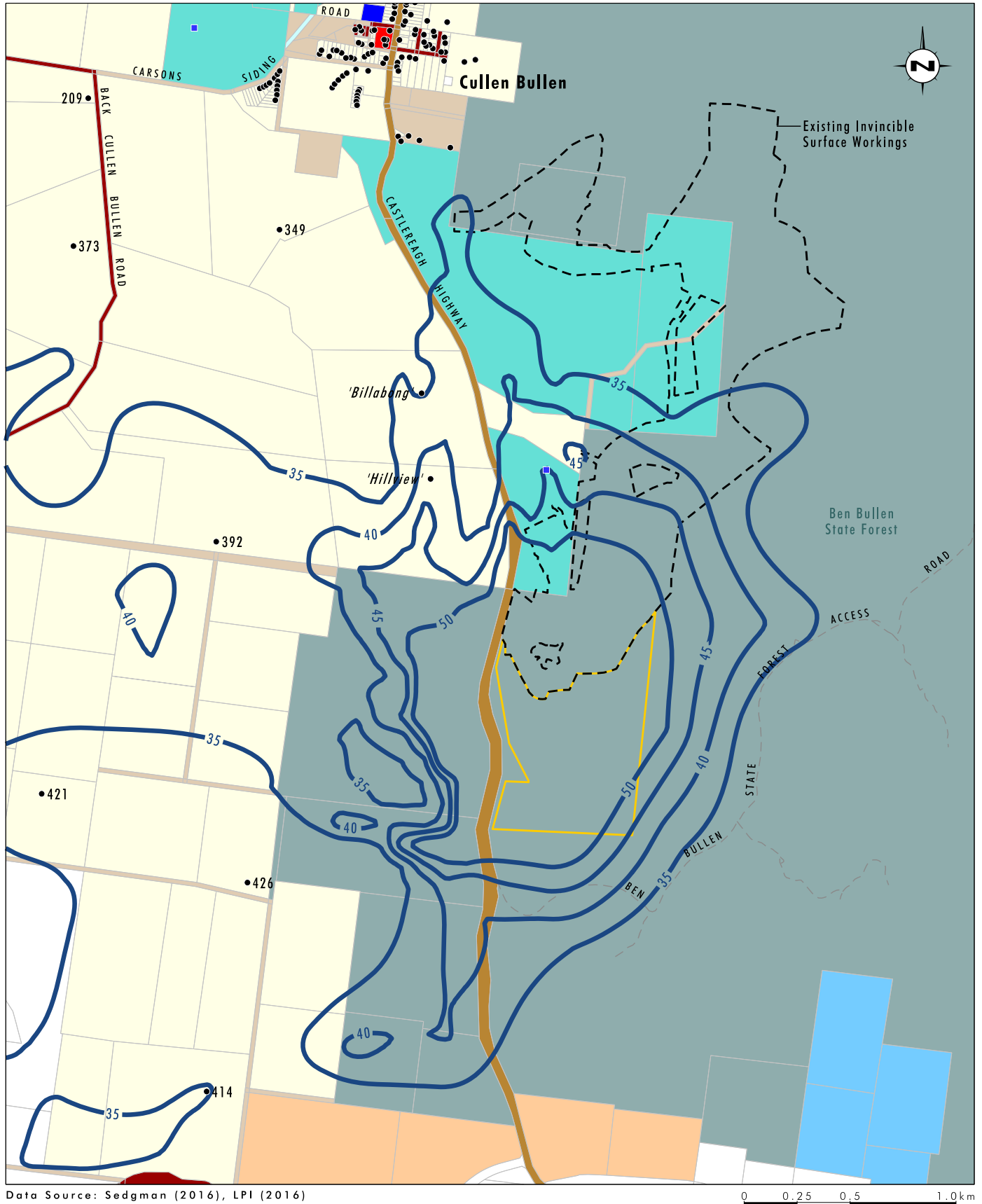
Legend

- | | | |
|---|------------------------|--------------------------------|
| Existing Approved Mining Disturbance Area | Delta Energy | Not searched |
| Proposed Southern Extension Area | Minister for Education | Predicted Noise Impact Contour |
| Castlereagh Highway | Private | Private Residence |
| Centennial Pty Ltd | Rail Corporation NSW | Mine Owned Building |
| Council | Shoalhaven Coal Owned | |
| Crown | State Forest | |
| Crown/Council | State Government | |
| Cullen Bullen Primary School | Wallerawang Collieries | |

File Name (A4): R08/3622_099.dgn
20160916 10.34

FIGURE D.1

Predicted Noise Impact Contours
Day Time Stage 1
Calm Neutral



Data Source: Sedgman (2016), LPI (2016)

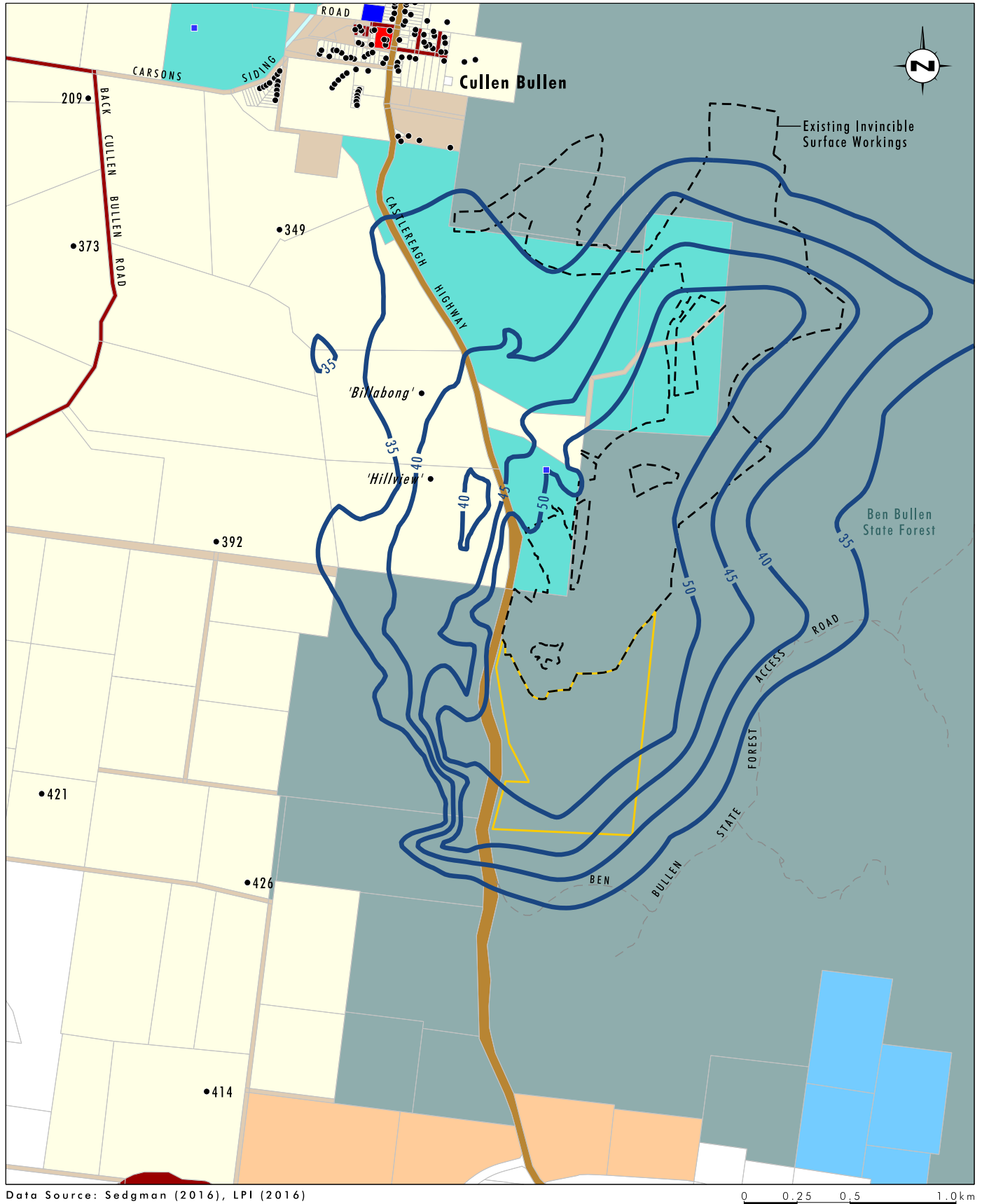
0 0.25 0.5 1.0 km

Legend

- | | | |
|---|------------------------|--------------------------------|
| Existing Approved Mining Disturbance Area | Delta Energy | Not searched |
| Proposed Southern Extension Area | Minister for Education | Predicted Noise Impact Contour |
| Castlereagh Highway | Private | Private Residence |
| Centennial Pty Ltd | Rail Corporation NSW | Mine Owned Building |
| Council | Shoalhaven Coal Owned | |
| Crown | State Forest | |
| Crown/Council | State Government | |
| Cullen Bullen Primary School | Wallerawang Collieries | |

FIGURE D.2

Predicted Noise Impact Contours
Day Time Stage 1
3m/s NE Wind

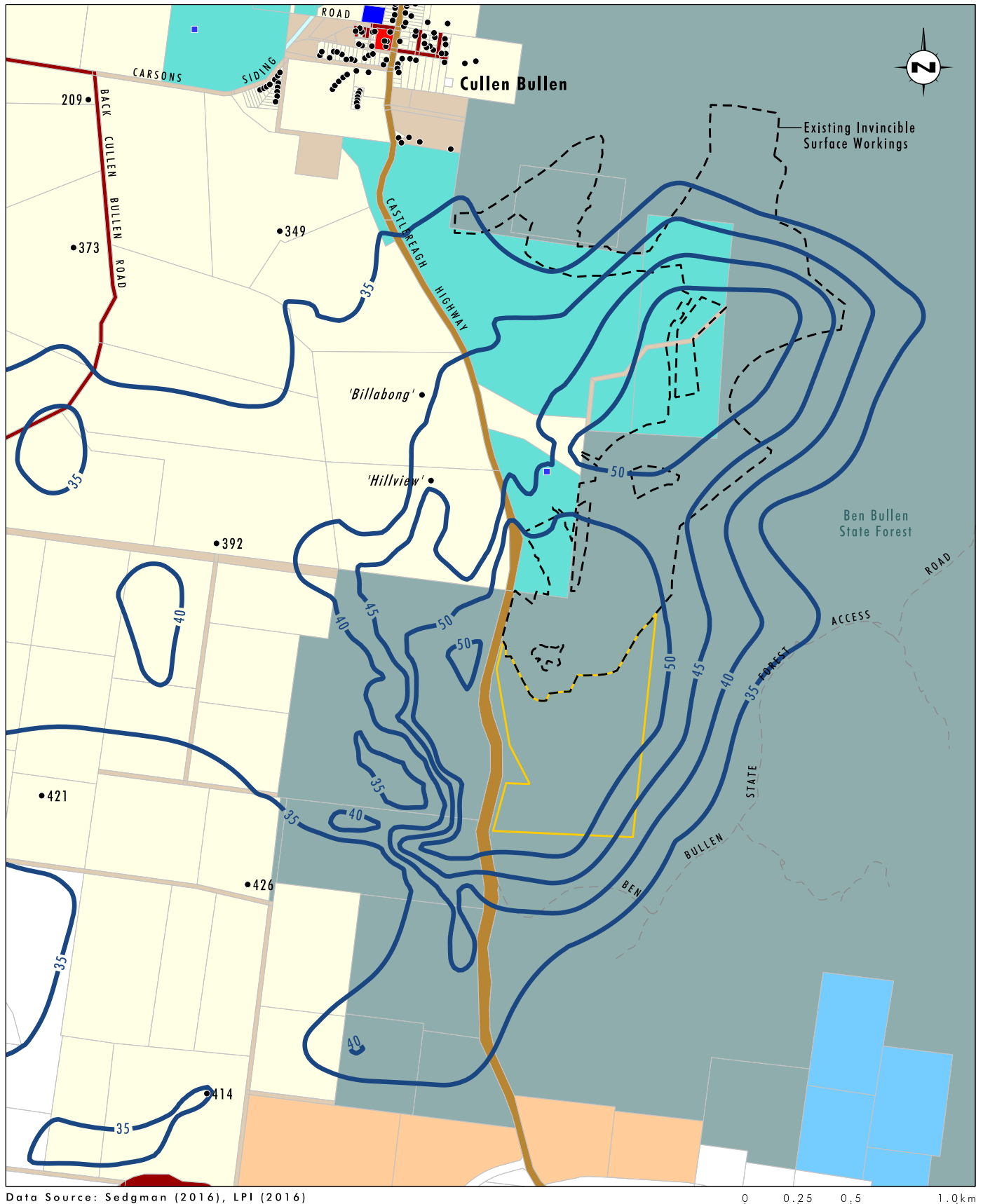


Legend

- | | | |
|---|------------------------|--------------------------------|
| Existing Approved Mining Disturbance Area | Delta Energy | Not searched |
| Proposed Southern Extension Area | Minister for Education | Predicted Noise Impact Contour |
| Castlereagh Highway | Private | Private Residence |
| Centennial Pty Ltd | Rail Corporation NSW | Mine Owned Building |
| Council | Shoalhaven Coal Owned | |
| Crown | State Forest | |
| Crown/Council | State Government | |
| Cullen Bullen Primary School | Wallerawang Collieries | |

FIGURE D.3

Predicted Noise Impact Contours
Day Time Northern Haul
Calm Neutral



Data Source: Sedgman (2016), LPI (2016)

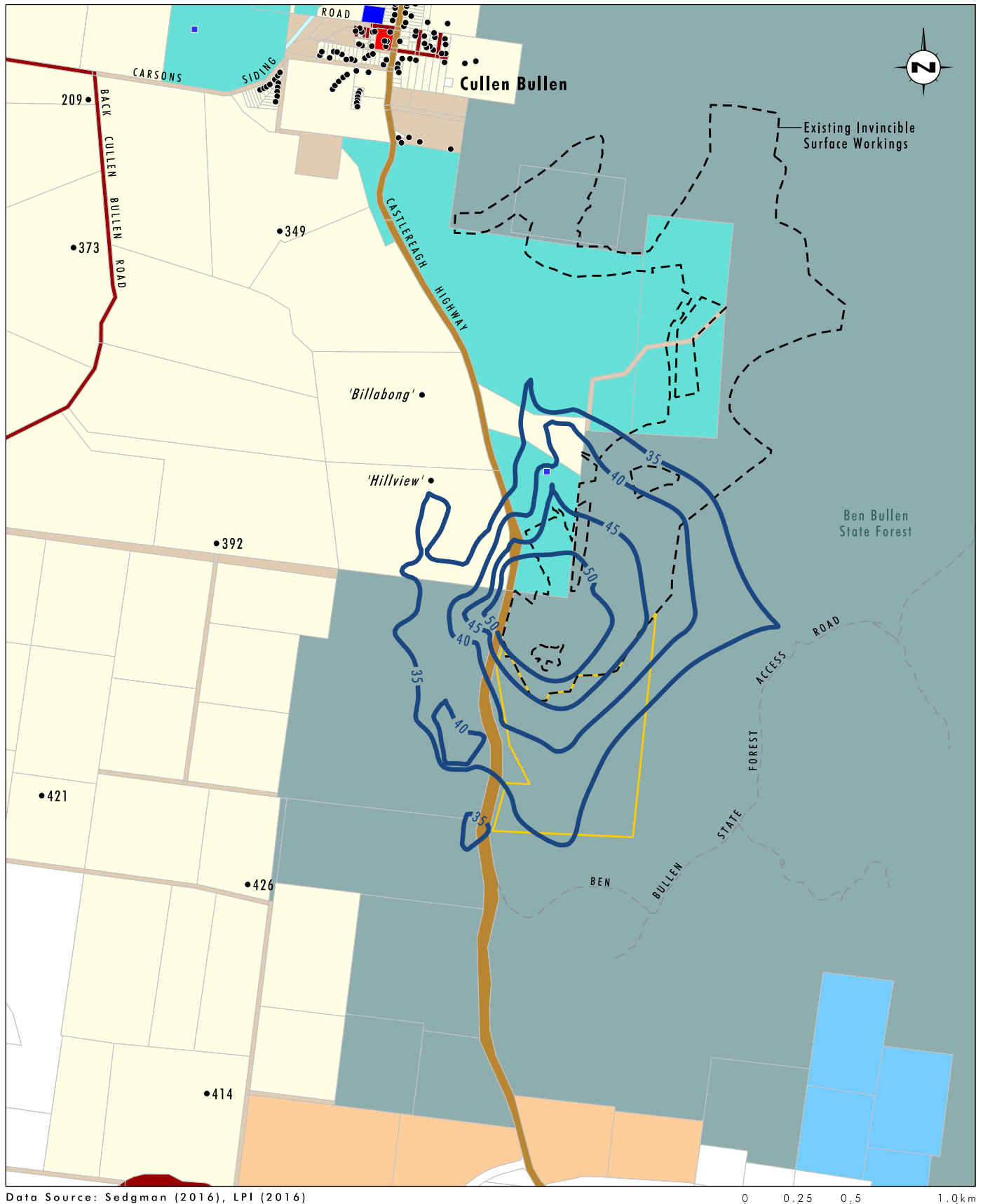
Legend

- | | | |
|---|------------------------|--------------------------------|
| Existing Approved Mining Disturbance Area | Delta Energy | Not searched |
| Proposed Southern Extension Area | Minister for Education | Predicted Noise Impact Contour |
| Castlereagh Highway | Private | Private Residence |
| Centennial Pty Ltd | Rail Corporation NSW | Mine Owned Building |
| Council | Shoalhaven Coal Owned | |
| Crown | State Forest | |
| Crown/Council | State Government | |
| Cullen Bullen Primary School | Wallerawang Collieries | |

File Name (A4): R08/3622_061.dgn
20160916 10.30

FIGURE D.4

Predicted Noise Impact Contours
Day Time Northern Haul
3m/s NE Wind



Data Source: Sedgman (2016), LPI (2016)

0 0.25 0.5 1.0 km

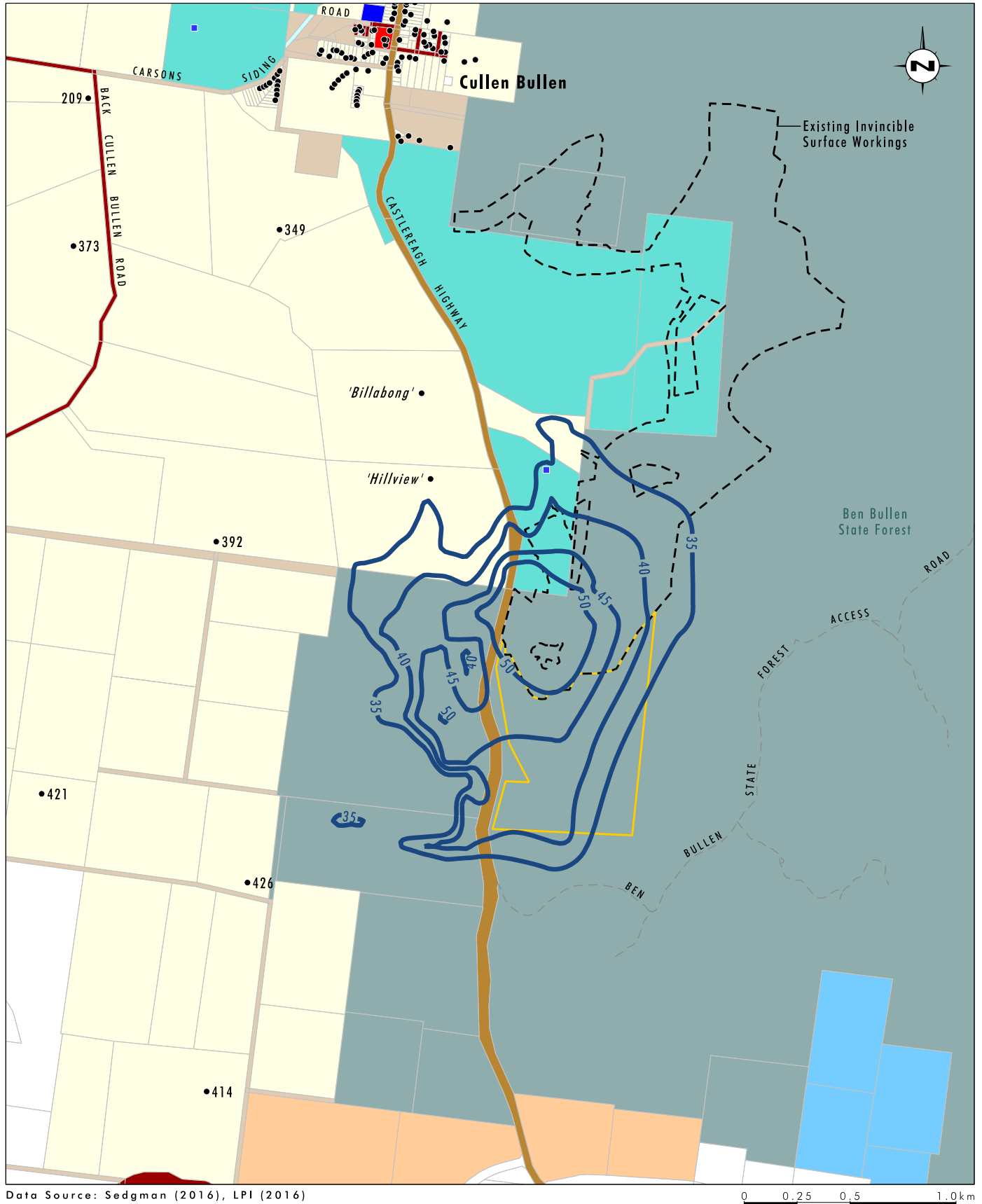
Legend

- | | | |
|---|------------------------|--------------------------------|
| Existing Approved Mining Disturbance Area | Delta Energy | Not searched |
| Proposed Southern Extension Area | Minister for Education | Predicted Noise Impact Contour |
| Castlereagh Highway | Private | Private Residence |
| Centennial Pty Ltd | Rail Corporation NSW | Mine Owned Building |
| Council | Shoalhaven Coal Owned | |
| Crown | State Forest | |
| Crown/Council | State Government | |
| Cullen Bullen Primary School | Wallerawang Collieries | |

File Name (A4): R08/3622_062.dgn
20160916 10.31

FIGURE D.5

Predicted Noise Impact Contours
Evening
Calm Neutral



Legend

- | | | |
|---|------------------------|--------------------------------|
| Existing Approved Mining Disturbance Area | Delta Energy | Not searched |
| Proposed Southern Extension Area | Minister for Education | Predicted Noise Impact Contour |
| Castlereagh Highway | Private | Private Residence |
| Centennial Pty Ltd | Rail Corporation NSW | Mine Owned Building |
| Council | Shoalhaven Coal Owned | |
| Crown | State Forest | |
| Crown/Council | State Government | |
| Cullen Bullen Primary School | Wallerawang Collieries | |

FIGURE D.6
Predicted Noise Impact Contours
Evening
3m/s NE Wind

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APPENDIX 11

Social Impact and Opportunities Assessment



INVINCIBLE SOUTHERN EXTENSION PROJECT

Social Impact and Opportunity
Assessment

FINAL

September 2016



INVINCIBLE SOUTHERN EXTENSION PROJECT

Social Impact and Opportunity Assessment

FINAL

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

Project Director: Tim Croisdale
Project Manager: David Holmes
Technical Director: Dr Sheridan Coakes
Technical Manager: Narelle Wolfe
Report No. 3622/R05/FINAL
Date: September 2016



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1.0 Introduction

Shoalhaven Coal Pty Ltd, trading as Castlereagh Coal (Castlereagh Coal), operates the Invincible Colliery (Invincible), an open cut coal mine. Located approximately 25 kilometres north-west of Lithgow in NSW (refer to **Figure 1.1**). The township of Cullen Bullen is located approximately 3 kilometres north-west of the Invincible mine infrastructure area. Invincible is currently in care and maintenance. Castlereagh Coal which is part of the Manildra Group, an integrated and diverse agribusiness.

Castlereagh Coal purchased Invincible in 2015 to secure a continued supply of specialty nut coal for the Manildra Group's Shoalhaven Starches Plant at Bomaderry on the NSW south coast.

Castlereagh Coal is proposing to modify the Invincible Project Approval under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to extend the life of mining operations at Invincible and obtain approval to extend the open cut mining operations to an area immediately south of the existing operations, referred to as the Southern Extension Area.

This Social Impact and Opportunity Assessment (SIOA) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) as part of the Environmental Assessment (EA) for the Southern Extension Project. The SIOA has been undertaken in accordance with the Indicative Secretary of the Department of Planning and Environment's Environmental Assessment Requirements (Indicative SEARs) for the Southern Extension Project as discussed within **Section 1.2**.

1.1 Project overview

The Invincible Southern Extension Project (the Southern Extension Project) is an extension of open cut mining operations to the south of the existing approved mining area at Invincible.

The Southern Extension Project includes:

- Extending the period in which mining can continue for a period of 8 years from approval of the modification application.
- Extending the open cut mining area immediately south of the existing mining disturbance area (refer to **Figure 1.2**). Extraction of coal from all seams down to, and including the Lithgow seam. No highwall mining or open cut mining in any other areas of Invincible is proposed as part of the Project
- Continued use of existing Invincible infrastructure (including operation of, and maintenance work on, the existing Coal Preparation Plant)
- Use of existing open cut voids and former underground workings for water storage.
- No change to currently approved mining production rates
- 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 eight year extension to the life of mining operations is to provide Shoalhaven Starches with flexibility of accessing nut coal from Invincible along with other suppliers or to source nut coal solely from Invincible. The eight year extension of mine life will also enable Castlereagh Coal and Shoalhaven Starches to fully investigate options of using coal from the Lidsdale and Irondale seams at the Shoalhaven Starches Plant. This assessment has assumed a conservative mining scenario of up to maximum limits of production to provide a conservative assessment of impacts over the life of the Project.

A comparison of the existing approved operations at Invincible and the Southern Extension Project is provided in **Table 1.1** below.

Table 1.1 Comparison of Existing Approved Operations at Invincible and the Southern Extension Project.

	Existing Approved Operations	Southern Extension Project
Resource Tonnes	Defined by existing footprint. Approved reserves have been mined.	Approximately 2.7Mt ROM coal
Mining Methods	Highwall and Open Cut	Open Cut only
Target Seams	All seams down to Lithgow Seam (Irondale, Lidsdale and Lithgow).	All seams down to Lithgow Seam (Irondale, Lidsdale and Lithgow).
Mining Rate	Up to 1.2 Mtpa ROM Coal.	Up to 1.2 Mtpa ROM Coal.
Production Rate	Up to 1.2 Mtpa Product Coal.	Up to 1.2 Mtpa Product Coal.
Mining Life	To December 2016 (8 years from date of approval).	Up to 8 years from date of approval.
Disturbance Area	165 ha	Approximately 50 ha of additional disturbance.
Operational Workforce	35 full time personnel.	Approximately 35 full time personnel.
Hours of operations	7.00 am – 10.00 pm Monday to Saturday (excl. public holidays). Mining in south pits not permitted between 6.00 pm and 10.00 pm.	7:00 am-10.00 pm Monday to Saturday (excl. public holidays). Mining and coal washery operations will not occur between 6.00 pm and 10.00 pm (operations limited to truck loading and maintenance activities only during this period).
Blasting	Blasting between 9:00 am and 5:00 pm Monday to Saturday, inclusive. No more than: • 2 blasts per day; or • 5 blasts per week averaged over a 12 month period.	Blasting between 9:00 am and 5:00 pm Monday to Saturday, inclusive. No more than: • 2 blasts per day; or • 5 blasts per week averaged over a 12 month period. Blasts sizes limited to manage potential risks to private residences, pagoda and cliffline formations, historical sites and other infrastructure.

	Existing Approved Operations	Southern Extension Project
Transport	Road Transport 7.00 am – 9:30 pm Monday to Saturday, excluding Sundays and public holidays. No more than 146 laden coal truck movements from the site per day (averaged over a week). No more than 16 laden coal truck movements per hour.	Road Transport 7.00 am – 9:30 pm Monday to Saturday, excluding Sundays and public holidays. No more than 146 laden coal truck movements from the site per day (averaged over a week). No more than 16 laden coal truck movements per hour.
Tailings Management	Coarse tailings are co-disposed with overburden. Fine tailings are dried in drying ponds; dry tailings are then either mixed with product coal or co-disposed with overburden.	Coarse tailings are co-disposed with overburden. Fine tailings are dried in drying ponds; dry tailings are then either mixed with product coal or co-disposed with overburden.

Castlereagh Coal also acquired the Cullen Valley Mine and associated assets from Coalpac in 2015. Cullen Valley is currently under care and maintenance. There are remaining approved resources at Cullen Valley however Castlereagh Coal does not have any immediate plans to recommence mining operations at Cullen Valley. The Southern Extension Project does not seek any changes to the approved operations at Cullen Valley.

1.2 Indicative Secretary’s Environmental Assessment Requirements

The SIOA has been undertaken in a manner consistent with the requirements of the Indicative SEARs for SIOA. Specifically, the Indicative SEARs relevant to the SIOA, and where these have been addressed in the report, are listed in **Table 1.2**.

Table 1.2 Indicative SEARs Requirements

SEARs Requirement	Location in Document
Social & Economic – including:	
Assess the social impacts of the proposal, having regard to the local and regional impacts of the development; and	Whole document, especially Section 5.0
Set out proposed measures and strategies to avoid, manage, or mitigate the project’s social impacts.	Section 5.10

1.3 Social Impact and Opportunity Assessment Framework

The SIOA program has been designed to:

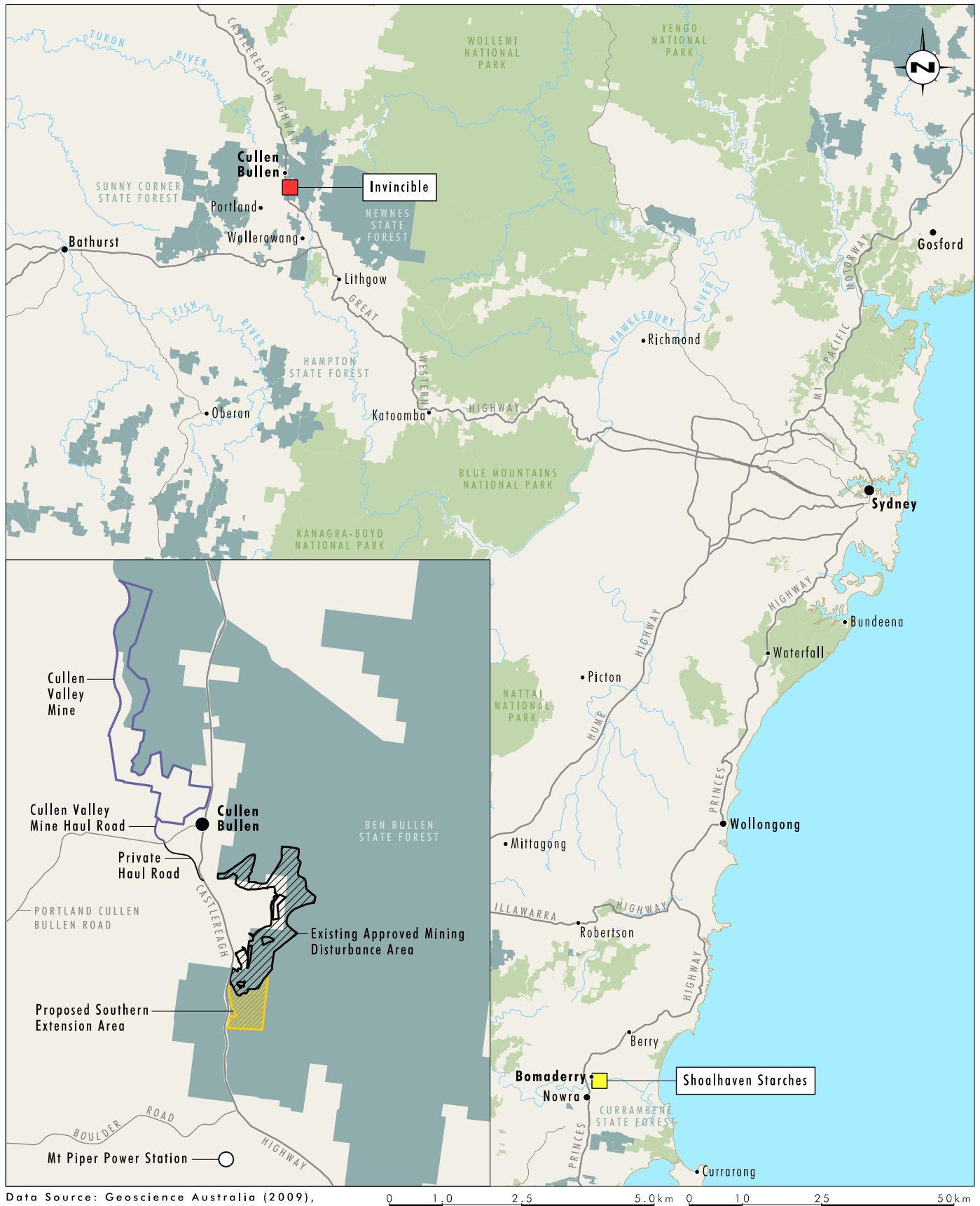
- Profile key communities both in proximity to and associated with the Southern Extension Project operations.
- Scope and assess the potential social issues/impacts and opportunities associated with the Southern Extension Project.
- Develop strategies to address the identified issues/impacts and opportunities, and monitor and manage social impacts associated with the Southern Extension Project.

Engagement with the community has been a key component of the program at key phases of the assessment, notably in the scoping of project issues and impacts and in the development of appropriate strategies to mitigate and/or enhance impacts.

1.4 Report Structure

Based on the above framework, this report has been structured according to a number of key sections as detailed below:

- **Section 1:** Provides an introduction and background to the proposed Southern Extension Project and a summary of its key components.
- **Section 2:** Details the methodologies employed as part of the social impact and opportunities assessment.
- **Section 3:** Comprises a socio-economic profile and community capitals analysis of the Lithgow Local Government Area (LGA) and the township of Cullen Bullen.
- **Section 4:** Provides an assessment of impacts and opportunities associated with the Southern Extension Project, including assessment for each of the nearby localities that may have a functional linkage to the Southern Extension Project.
- **Section 5:** Discusses recommended strategies to manage the predicted and perceived socio-economic impacts identified during the assessment process and enhance potential benefits of the Southern Extension Project.



Data Source: Geoscience Australia (2009),
OEH (2013)

FIGURE 1.1
Locality Plan

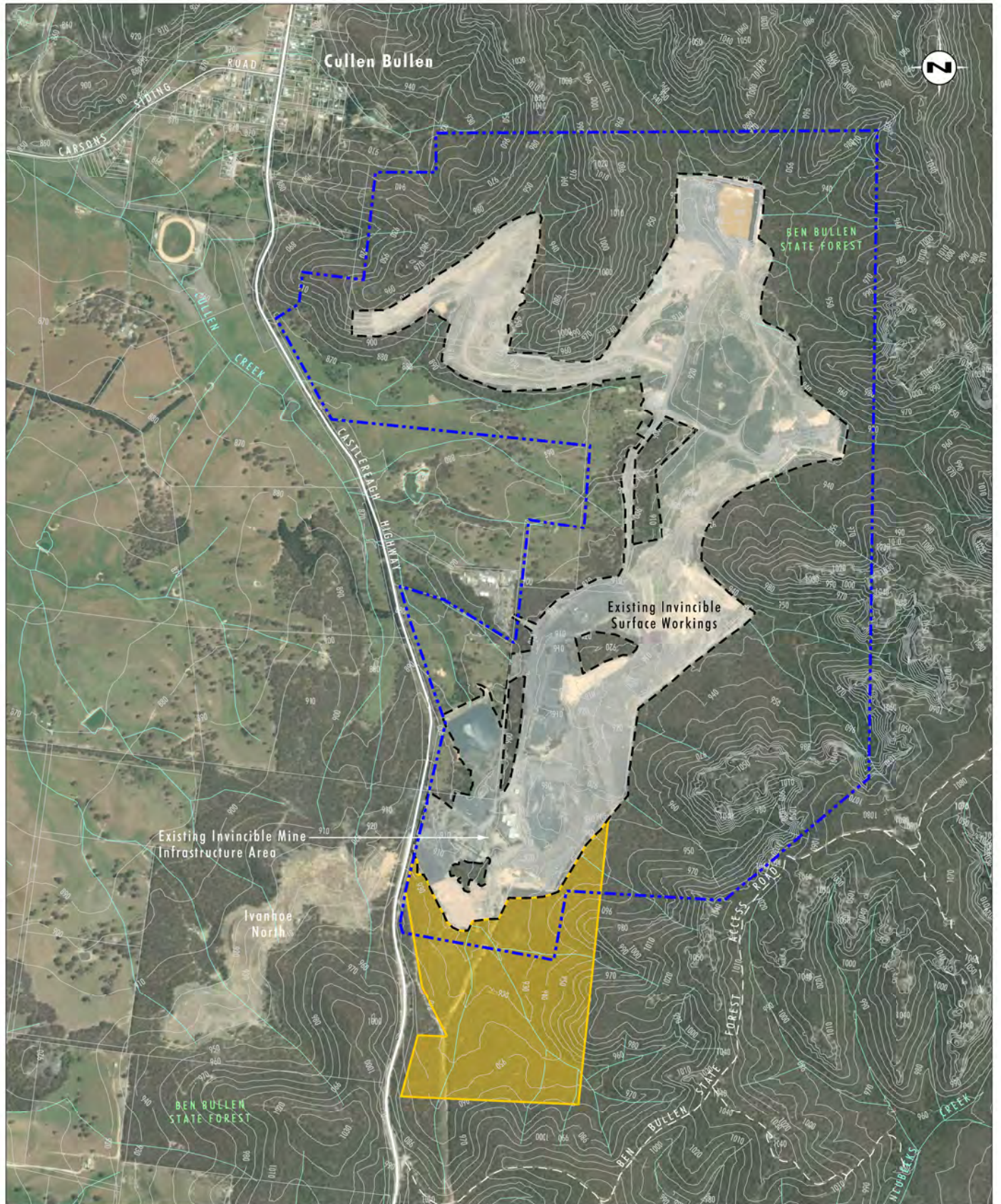


Image Source: Google Earth - CNES/Astrium (Nov 2014)
 Data Source: LPI (2016), Forest Corporation of NSW (2015)
 Note: Contour Interval 10m

Legend

- Existing Approved Mining Disturbance Area
- Proposed Southern Extension Area
- Invincible Project Approval Boundary (PA07/0127)

FIGURE 1.2

Invincible Southern Extension Project

2.0 Methodology

SIOA is an approach of predicting and assessing the likely consequences of a proposed action in social terms. While economic assessment emphasises the monetary effects of an action or proposal, social impact assessment is also concerned with assessing benefits and costs in non-monetary terms; this involves understanding impacts from the perspectives of those involved in a personal, community, social or cultural sense. Social assessment processes work together to provide a complete picture of potential impacts and their context and meaning.

2.1 International Principals for Social Impact Assessment

The International Association for Impact Assessment (IAIA) defines Social Impact Assessment (SIA) as:

“ the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions. Its primary purpose is to bring about a more sustainable and equitable biophysical and human environment.”
(Vanclay, 2003)

The IAIA identifies social impacts as issues affecting, directly or indirectly:

- People’s way of life, that is: how they live, work, play and interact with one another on a day to day basis.
- Their culture, that is: their shared beliefs, customs, values and language or dialect.
- The community, that is: its cohesion, stability, character, services and facilities.
- Their political system, such as: the extent to which people are able to participate in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose.
- Their environment, such as: the quality of the air and water people use, the availability and quality of the food they eat, the level of hazard or risk, dust and noise they are exposed to, the adequacy of sanitation, their physical safety, and their access to and control over resources.
- Their health and wellbeing: health is a state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity.
- Their personal and property rights: particularly whether people are economically affected or experience personal disadvantage which may include a violation of their civil liberties.
- Their fears and aspirations, that is: their perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children.

As is the case with any type of change, some individuals or groups within the community may benefit, while others may experience negative impacts. If negative impacts are predicted, it is the role of the SIOA to determine how such impacts may be addressed effectively to reduce the degree of social disruption to those affected. If positive impacts are predicted, the aim of the SIOA is to maximise these opportunities and identify how they might be further enhanced. Monitoring and evaluation is also a key component of an SIOA process to identify any unanticipated impacts that may arise as a result of the Southern Extension Project.

2.2 Assessment Activities

The SIOA for the Southern Extension Project has involved the following key phases:

- Developing a profile of the social and economic context in which the Southern Extension Project is located, at a local and regional scale, and summarising existing social and community issues of relevance.
- Identifying the impacts and opportunities associated with the Southern Extension Project that are most important to the local community through engagement and consultation with near neighbours, village residents (notably the community of Cullen Bullen) and regional stakeholders within the Lithgow LGA.
- Assessing and predicting the significance of impacts associated with the Southern Extension Project through the application of a 'risk-based' approach; integrating both perceived and technical assessments of risk. Where available, relevant data sets have been used to inform the assessment of impacts associated with the Southern Extension Project and to explore perceptions raised in consultation with the community. This approach affords greater integration with the broader environmental assessment work so that impacts of relevance to technical specialists and community members are adequately discussed and considered in the impact assessment process.
- Developing strategies that address and manage the predicted social impacts associated with the Southern Extension Project and which may enhance opportunities in a manner that values existing community aspirations and assets.
- Identifying what will require monitoring should the Southern Extension Project be approved and how any unanticipated social impacts that may result from the Southern Extension Project will be identified.

Table 2.1 summarises the social assessment mechanisms specifically utilised during each phase of the SIOA program. This consultation has been further complimented by engagement undertaken by the broader Project team with Government agencies and other key stakeholders in the course of other operational and Southern Extension Project assessment activities.

Table 2.1 Summary of Social Impact and Opportunities Assessment and Engagement Methods

<i>Phase 1 – Program Planning</i>	Development of a stakeholder engagement strategy for the Southern Extension Project.
<i>Phase 2 – Community Profiling</i>	Examination of a range of secondary data sources e.g. census, social and community indicators, historical accounts of the region, local media sources; and collection of primary data through face to face interviews with key stakeholders.

<i>Phase 3 – Scoping of Issues and Opportunities</i>	Review and analysis of previous stakeholder consultation outcomes and complaints data from relevant recent state significant project assessments at Invincible and the local area to obtain an understanding of perceived issues and opportunities in the locality. Face to face meetings with neighbours of the Southern Extension Project to identify perceived issues and opportunities relating to the Southern Extension Project, followed by ranking of perceived issues and opportunities relative to frequency of response. Briefings with NGOs, business groups and other interested stakeholders to identify perceived Southern Extension Project issues and opportunities.
<i>Phase 4 – Assessment of Impacts and Opportunities</i>	Assessment of unmitigated social risks and prediction of social impacts associated with the Southern Extension Project.
<i>Phase 5 – Prediction of Impact and Strategy Development</i>	Plotting of impacts to prioritise social risk rankings and guide management strategy development. Identification and development of appropriate strategies to address predicted Southern Extension Project impacts and to monitor change.

2.3 Program Participants

Social impact assessment involves the cooperation and coordination of a number of ‘social partners’ or ‘stakeholders’. As Burdge (2004) outlines, stakeholders may be affected groups or individuals that:

- Live nearby the resource/project
- Have an interest in the proposed action or change
- Use or value a resource
- Are interested in its use
- Are forced to relocate.

As part of the SIOA program for the Southern Extension Project, a wide range of stakeholders have been identified and involved in the program. These stakeholders have been grouped as follows:

- Local landholders and residents residing in proximity to the Southern Extension Project operations
- Local community groups and organisations
- Regional environment and recreational groups
- State and Commonwealth Government agencies
- Local Government representatives
- State and Federal Elected Representatives
- Local business and business chambers/groups
- Service providers, including education and emergency services.

Table 2.2 provides an overview of the number of stakeholders consulted across each stakeholder group category. A total of 140 stakeholders, including agencies and groups, have directly participated in the consultation process to date via interviews, personal letters, briefings and discussions. In relation to the SIOA, the engagement mechanisms utilised have varied and, where possible, have been matched to stakeholder groups to facilitate participation in the assessment program (refer to **Section 2.4**).

Table 2.2 Consultation Summary

Stakeholder Category	Number Direct Consultation
Local Landholders and Residents (incl 44 interviews)	78
Local Community Groups, Businesses and Service Providers	10 groups
Local industry	4
State/Federal Government Agencies, committees or boards	11 (incl 7 agencies)
Local Government	10
Infrastructure Service Providers	1
Regional and State Environment and Recreation Groups	10 groups
Other interest parties and groups	4
Aboriginal stakeholders Registered Aboriginal Parties	6 groups
Media	6
Total	140

The 44 interviews with local landholders and residents form the basis of the analysis of impacts and opportunities undertaken in **Section 4.0**.

2.4 Engagement Methods

As noted above, engagement with the community has been a key component of the SIOA program. Consultation has been undertaken at key phases of the assessment, namely in the scoping of Southern Extension Project issues and impacts and the development of appropriate strategies to address and/or mitigate impacts.

A range of mechanisms have been utilised to obtain the input of the differing stakeholder groups. **Table 2.3** outlines the mechanisms used to engage with local landholders, key stakeholders and the wider community.

Table 2.3 Consultation and Communication Methods

Method	Description
Engagement	
Near neighbour and landholder interviews	Personal interviews with near neighbours and landholders to outline Project aspects and document project issues and opportunities.
Regional stakeholder consultation	Personal meetings with key regional stakeholders drawn from across key community service sectors within the Lithgow LGA.
Regional and State Environment and Recreation Groups	Personal meetings with interested regional and state environment and recreational groups i.e. conservation and bushwalking.
Government briefings and consultation	Briefings and personal meetings with relevant government representatives (local, state and federal) to present the Southern Extension Project and obtain feedback on Project aspects.
Community Information Displays	Facilitation of a community information day in Cullen Bullen held on 12 March, 2016, to present the Southern Extension Project and document perceived community issues and opportunities - 29 in attendance. Further information session held in Cullen Bullen on 18 June 2016 to provide an update of key outcomes of the environmental and social assessment studies – 24 in attendance.
Community Consultative Committee (CCC) presentations	Presentations on the Southern Extension Project to CCC meetings in August 2015, March 2016 and September 2016.
Information Provision	
Project Information Sheets	Development of two (2) Project information sheets summarising key aspects of the Southern Extension Project and progress/outcomes of the environmental and social assessment program – 400 distributed to neighbouring community residents and relevant stakeholders.
Community Information Display – Invitations	Development of two (2) Invitations to attend Community Information Display – 400 distributed
Environmental Assessment Summary	Development of a document summarising the Environmental Assessment outcomes – 200 distributed

Discussions with stakeholders have been guided by the use of structured interview guides and have focused on a range of topics including, but not limited to, the following:

- Awareness of the Manildra Group
- Concerns and perceptions regarding potential impacts associated with the proposed Southern Extension Project
- Perceived costs and benefits of mining more broadly in the region
- Key strengths and assets within local communities within the assessment area
- Suggestions of groups, programs or activities for future social investment activities, based on existing community needs and values
- Preferences for receipt of Southern Extension Project information and mechanisms for engagement.

3.0 Socio-Economic Context and Profile

3.1 Overview

A baseline social profile gathers knowledge of primary and secondary data sources to increase levels of understanding of the existing social and economic environment in which a project is proposed. The profile is a necessary component of the SIOA, and provides a foundation of data/information from which impacts associated with the Southern Extension Project may be predicted.

Data sources utilised in the preparation of the profile include:

- ABS Australian Census of Population and Housing (ABS, 2011¹)
- Local and State Government reports
- Relevant research reports and publications
- Other social indicator datasets e.g. Social Health Atlas (PHIDU, 2015) and Bureau of Crime Statistics and Resources (BOCSAR, 2015)
- Review of relevant print and selected online media.

The following components have been assessed in the development of this social profile.

- **Development context and geographic scope** – description of the context and identification of the communities / villages of interest relevant to the current assessment.
- **Historical context** – review of the history of the local area and communities, including their culture and local values.
- **Governance** – outline of relevant administrative and political structures at local, state and federal levels.
- **Community Capitals** – natural, physical, human, social and economic.
- **Community values, issues and concerns** – documentation of current community issues in the Lithgow LGA, as identified in key planning documents, regional studies, previous consultation records and through local and regional media sources.

3.2 Geographic location

The Southern Extension Area is located approximately 25 km north-west of Lithgow in NSW. The town of Cullen Bullen is located approximately 3 km north-west of the Invincible mine infrastructure area and at the time of the 2011 ABS Census, the population of Cullen Bullen totalled 183 people. Portland, the nearest service centre to Cullen Bullen, is located 7.5km to the south west and has a population of 2307 (ABS, 2011).

¹ Note longitudinal analyses was not considered feasible as the geographic boundaries for the local areas have changed between the 2006 and 2011 census'

The Statistical Areal Level 1 (SA1) for Cullen Bullen, as defined by the ABS (2011), has been profiled in order to understand the local context and enable assessment of impacts at a local scale, as discussed in **Section 3.5**. It should be noted that the last ABS census was undertaken in 2011, and given 2016 is the last year of the 5 year ABS data cycle, the 2011 data is likely to be somewhat outdated, given change within the region during this time period.

To afford comparative analysis, the Cullen Bullen SA1 data has been compared with:

- **Lithgow LGA:** as the LGA in which the existing operations are based and where a large proportion of future employees are likely to reside
- **The state of NSW:** to afford comparison with the State as a whole.

3.3 Local History

Prior to European settlement of the region, the Portland and Cullen Bullen areas were traditionally inhabited by the Wiradjuri people. The Wiradjuri people are the people of the three rivers - the Wambool (Macquarie), the Calare (Lachlan) and the Murumbidgee.

Early European exploration of the region began with the exploration of the Blue Mountains by Blaxland, Wentworth and Lawson in 1813. European settlement of the Portland area began in 1828 when Peter McPherson took up a grant of 260 Ha at Piper's Flat. He was followed by William Russell who purchased a portion of land on the site which later became Portland.

European settlement of Cullen Bullen began when Robert Dulhunty took up the first land grant of 2000 acres to build a homestead and graze sheep and cattle. Dulhunty, also purchased the first land grant at neighbouring Ben Bullen. The village of Cullen Bullen developed during the 1840's as a stop along the road to Mudgee.

The region has a strong mining history. Following the opening of the railway line in 1880, coal resources became more commercially viable. The first coal mine opened in 1880, with additional mines opening throughout the beginning of the 20th century. The Invincible Colliery began operations in 1901 and had continued over time through to being placed on care and maintenance in 2013. Coal mining in the area has continued through to recent times, with mining still remaining a key industry in the area, despite recent downturn in the sector, resulting in a number of surrounding mines also being placed on care and maintenance. Given the history of mining in this area, there is a range of skilled and experienced mining labour residing in the local area.

3.4 Governance

The Lithgow LGA is governed by the Lithgow City Council. The Mayor, Maree Statham, is directly elected by the residents of the Lithgow LGA, with the additional eight councillors elected proportionally as a single ward.

Lithgow City Council is part of the Bathurst state electoral district, and is represented by Paul Toole of the National Party.

The federal electoral division is Calare, currently held by National Party member, Andrew Gee.

With regard to planning for the LGA, in 2006, Lithgow Council released a Vision Statement outlining the goals for the Council over the next 20 years. The focus areas include community, transport, employment, heritage, education, health, environment, arts and culture, youth, growth and governance and administration services. The overarching goal is to bring the rural and remote areas of the community together in order to encourage social inclusion, health and wellbeing and community support. Particular emphasis is on the development of a range of job opportunities that provide opportunities for all ages and abilities, while maintaining a diverse society and culture.

The 'Our place, Our Future' community strategic plan was developed by Lithgow Council in May 2013 to reflect the Vision Statement and align with community needs for the next decade. Employment and growth were identified as key areas focus. As part of the release of the plan, the Mayor, Marie Statham, released a statement on the Council website discussing the impact of the closure of the Angus Place Colliery, and noted the Council's commitment to the mining industry in general.

In early 2016, community consultation was undertaken to inform the Rural and Rural Residential Strategy, that aims to review planning and management of the Lithgow LGA area. The objective of the Strategy is to:

- Review the land use policy framework of the Lithgow Land Use Strategy 2010 - 2030 and the Lithgow Environmental Plan 2014
- Gain a clear understanding of the values and land use planning issues of the rural areas of the LGA
- Develop a vision and strategy for management of rural land to ensure sustainable resource use, environmental enhancement and rural landscape protection
- To improve management of rural land fragmentation / subdivision
- To review existing planning controls (Lithgow Council, 2016)

The strategy is due to be on public exhibition in the second half of 2016.

Lithgow Council is also currently developing Village Improvements Plans for the rural village communities in the Lithgow Local Government Area. The aim of the plans is to develop a strategic direction for the future of each the villages. The plans will: build on the strengths of the rural village communities and help to grow community capacity; guide decision making on services and service standards; promote economic development and tourism opportunity; identify and promote natural and cultural heritage; build social capital; and identify opportunities for corporate, state and federal funding. However, no specific reference to Cullen Bullen was evident in the plans reviewed.

3.5 Community Capitals Profile

In order to provide sufficient detail regarding the Southern Extension Area, a Community Capitals analysis of the local area and wider region was undertaken. The Capitals analysis utilises a 'Sustainable Livelihoods' approach to social profiling (Beckley et al., 2008; Ellis, 2000; Hart, 1999) which focuses on five interrelated 'community capitals' or assets – natural, economic, human, physical, and social – which together, are seen to comprise a holistic picture of a community as shown in **Figure 3.1**.



Figure 3.1

Community Capitals Framework

Source: (Coakes & Sadler, 2011)

The Sustainable Livelihoods approach centres on people rather than resources with the intent of empowering individuals and communities. The approach emphasises understanding a community and the relationships of which it consists, and then using this understanding to predict areas of community sensitivity and conversely resilience and adaptive capacity.

3.5.1 Natural Capital

Natural capital refers to natural assets and resources that contribute to community strength and sustainability. Natural capital can include the presence and use of resources such as minerals, productive agricultural soil, oil and gas, and forests; which provide commercial and practical benefit to the community. Natural capital can also include other environmental assets and ecosystem services, which generate tourism or provide other social, cultural, and recreational value, such as waterways or lakes.

Assigning definite values to natural capital is difficult and may be considered controversial. Additionally, as natural landscape values are not confined to socially defined boundaries (such as suburb or LGA boundaries), different values of natural capital often co-exist between different communities in different places. For example, privately owned bushland may have one value for the landholder who seeks to run cattle, different values for local environmental protection groups, other values for local government authorities who rate the land, and different values again for the resource extraction industry who may seek to mine the land in the future. Aspects which give some indication of the natural capital of the local area and wider region, as relevant to the Southern Extension Project, are detailed below.

The Lithgow LGA has a number of nature reserves, such as Lake Lyell and Lidsdale State Park and is surrounded by seven national parks including Wollemi National Park and the Blue Mountains National Park. Other notable places of significance, such as the Hassans Walls Lookout, and the Megalong and Kanimbla Valleys are also located within the Lithgow LGA. The city of Lithgow itself is situated at the foothills of the Blue Mountains, a world heritage area that is a major tourist attraction renowned for its scenery, pristine forests and geological significance, including the Three Sisters in Katoomba and the Gardens of Stone National Park.

The Lithgow LGA also offers many tourist attractions including the Lithgow State Mine Heritage Park and railway, Lake Wallace and the Escbank House Museum. Adventure sports in the area include bushwalking, abseiling and four wheel driving, which attract a range of tourists. Yearly community events are also held in Lithgow such as the Waste2Art festival, Ironfest, Yulefest, Tractor Trek and the Daffodils Festival at Rydale (Lithgow Council, 2016).

While it is difficult to ascertain the number of those employed in tourism in Lithgow, 5 per cent of residents were employed in accommodation and food services at the time of the 2011 ABS Census (ABS, 2011). However, it is likely that the proportion of residents employed in tourism is much higher than this, given tourist numbers to the region. For example, for the year ending September 2014, there were 451,000 total visitors to the Lithgow LGA, including 139,000 overnight visitors with a total spend of \$79 million dollars, which includes \$52 million in overnight visitor spend.

The Lithgow LGA is also rich in coal reserves, as Lithgow lies in the centre of the Western Coalfields, which extend from Katoomba to Ulan, near Mudgee, covering approximately 240 kilometres and comprising six separate coal seams - the 'Lithgow' seam being the most significant and productive. Of the 13 mines in the Lithgow Valley², only three, Airly, Clarence and Springvale are currently operational.

The Draft Lithgow Land Use Strategy 2010 – 2030 identifies the recognition and protection of primary resource lands including agricultural, forestry, and mineral and extractive resources as a priority. The Strategy also maps environmentally sensitive areas within the LGA as well as coal bearing and coal title areas. The reliance on the mining industry has been noted as a key issue, and the identification of land to cater for modern industrial uses and reuse of commercial areas with high vacancies, is a key priority in the future (Lithgow Council, 2011).

² (<http://www.lithgow.com/coaltogold/coal.html>).

The town of Cullen Bullen is located 25km north-west of Lithgow, and is surrounded on three sides by Ben Bullen State Forest. The Wolgan State Forest is located approximately 6 kilometres to the north east and the Gardens of Stone National Park is approximately 5.5 kilometres to the north of Cullen Bullen. Sunny Corner State Forest is situated to approximately 6 kilometres to the west of the town.

At its peak, there were six coal mines in operation around the township, including Invincible. There are currently no coal mines which are operational in close proximity to Cullen Bullen.

Cullen Bullen is less well known as a tourist destination, and it was difficult to find data related to tourism in Cullen Bullen itself. In terms of attractions, the area around Cullen Bullen is known for its sandstone pagoda rock formations (refer to **Section 3.5.1.3**). There is also a motorway race track, where eight race meetings are held each year. The Royal Hotel is the only available accommodation in town, and is only open sporadically during the week.

3.5.1.1 National Parks

The Lithgow LGA includes part of the western extent of the Greater Blue Mountains World Heritage Area (GBMWH), listed as a world heritage site with the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in 2000 for the diversity of eucalypt species in the area across the seven national parks and Jenolan Caves Karst Conservation Reserve.

National parks nearby include the Blue Mountains, Gardens of Stone, and Wollemi National Parks, as well as Turon and Marangaroo National Parks, Mugi-Murum-Ban State Conservation Area and Winburndale Nature Reserve. The natural value of the area is considered to be of local, regional, state, national and international significance, given the UNESCO listing of the GBMWH.

3.5.1.2 Pagoda Formations – Cullen Bullen

Sandstone pagodas are sandstone formations found in the Lithgow / Blue Mountains region, including the Gardens of Stone National Park, and also in areas around Cullen Bullen.

The pagodas were formed by erosion of sandstone outcrops originating from the Triassic period. With regard to the Southern Extension Project the pagodas of interest are located to the east of the Southern Extension Area and some distance away from proposed mining areas. As an important geological feature in proximity to the Southern Extension Area, the impact of the Southern Extension Project on the pagodas has been considered in this assessment and in detail as part of the EA (refer to **Section 5.7.2**).

3.5.2 Economic Capital

Economic Capital is defined as the extent of financial or economic resources within a town or community, including access to credit (Black and Hughes, 2001). Examining a community's economic capital involves consideration of a number of indicators, including industries of employment, workforce participation and unemployment, income levels and cost of living pressures, such as weekly rent or mortgage repayments.

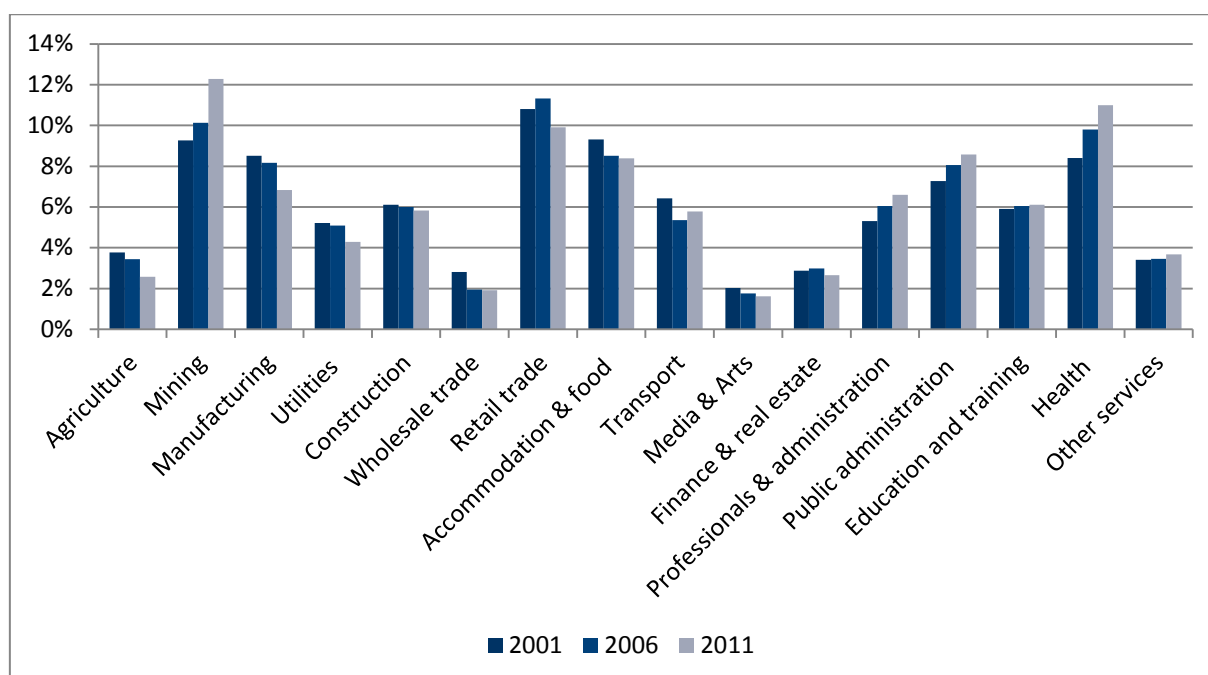
3.5.2.1 Lithgow LGA

As previously noted, the Lithgow economy has strong historical ties to coal mining, as Lithgow lies in the centre of the Western Coalfields. It is worth noting that the Lithgow LGA has seen the closure of a number of mines in the area in the last six years, which has had an obvious impact on employment levels in the region. The mines closed or placed in care and maintenance include:

- Invincible
- Ivanhoe North
- Pine Dale
- Baal Bone
- Angus Place
- Cullen Valley.

The Herfindahl index for Lithgow is high at 2.4 indicating limited industry diversity. Indeed, Lithgow Council has identified the reliance on the mining industry as a key issue (Lithgow Council, 2016).

Graph 3.1 below details the longitudinal change in employment by industry type in the Lithgow LGA over three Census periods from 2001 to 2011, and shows a marked increase in employment in the mining sector over this period. However, this is likely to have changed from 2011 to the present, given a significant downturn in the coal sector during this time. For this period, there was also an increase in employment in the health and public administration sectors. Manufacturing, retail trade and accommodation and food are also key areas of employment within the LGA. The median household income in Lithgow is \$896 per week (ABS 2011).

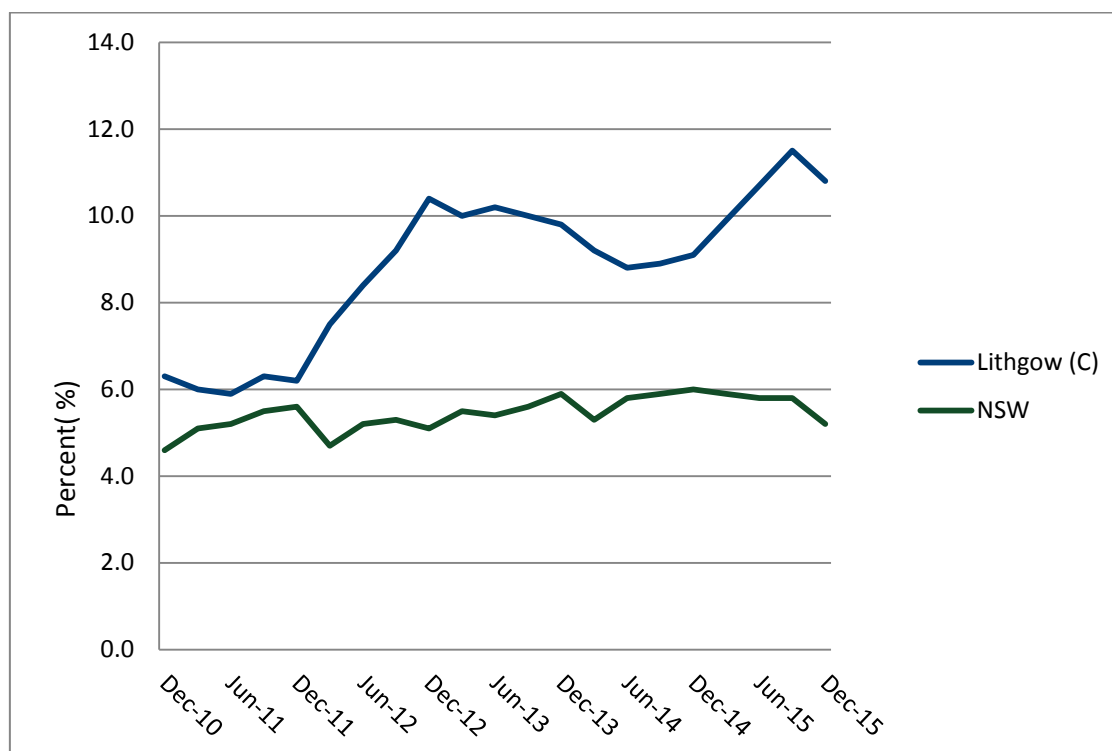


Graph 3.1

Industry of employment, Lithgow LGA (ABS Census 2001-2011)

The top three occupations in the Lithgow LGA were technicians and trade workers (17.7 per cent), machinery operators and drivers (13.1 per cent), and clerical and administrative workers (13 per cent) (ABS, 2011).

The unemployment rates for Lithgow have increased from 2011 - 2015, compared with steadier unemployment rates for NSW. As **Graph 3.2** illustrates, unemployment figures increased substantially from December 2011 to December 2012, which may be the result of mine closures in the region during this period (the Invincible mine went on care and maintenance in 2013). Unemployment rates in Lithgow continue to be considerably higher than the state average, despite a slight decrease in late 2015.

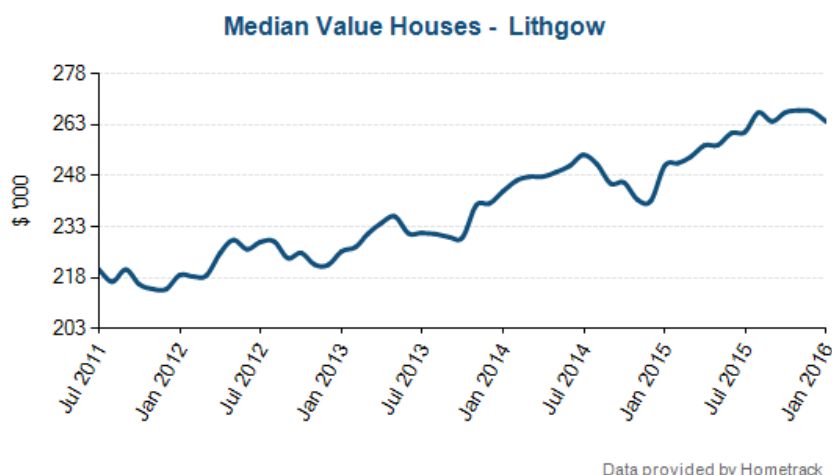


Graph 3.2

© Umwelt, 2016

Unemployment rates for Lithgow and NSW, (ABS, 2015)

Median house values for Lithgow from 2011 to 2016 are presented in **Graph 3.3**. Median house values have increased by approximately 18% in Lithgow (2011 – 2016) and where house values have fluctuated greatly, this is most likely driven by a low number of overall property sales each quarter. The current median house price for Lithgow is \$263,395.



Graph 3.3

Median House Price 2011-2016 Lithgow (Hometrack, 2016)

© Umwelt, 2016

In addition, the median monthly mortgage repayment in Lithgow at the time of the 2011 Census was \$1,452. Home ownership was high with 40.2% owning their own home and 31.2% holding a mortgage. The median weekly rent was \$170 (ABS, 2011).

Lithgow Council has identified the diversification of housing to be a priority area in the future, given the increase in lone person households and couples without children. This may include a move toward more medium and high density housing (Lithgow Council, 2016).

3.5.2.2 Cullen Bullen

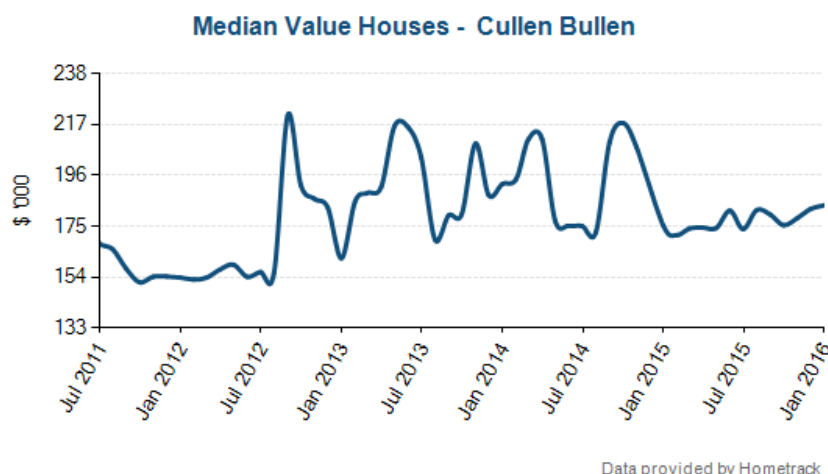
In relation to Cullen Bullen specifically, as noted above the town has historically had strong links to the mining industry. At the turn of the last century there were three mines in operation in the area: the Cullen Bullen Coal and Coke Company (opening 1885), the Invincible Mine (circa 1900), and the Great Western Mine at Tyldesley (1899) just west of the town. Three other open cut mines were established after World War Two. Invincible was the longest operating mine in the locality, going into care and maintenance in 2013.

At the time of the 2011 Census, the largest industry of employment in Cullen Bullen was mining (25.4%), with the largest occupation being Machinery Operators and Drivers (23.4%). However, it is likely this number will have decreased due to mine closures since 2011. Other industries of employment during this time included health care and social assistance (9 residents), accommodation and food services (8 residents) and administration and support services (6 residents). The median weekly income was \$833 (ABS, 2011).

Unemployment rates for Cullen Bullen at the time of the 2011 Census were similar to the state average (5.7 per cent, compared to 5.9 per cent for NSW). However, as there have been a number of mine closures in the areas since this time, it is likely that unemployment rates would have increased since 2011 (ABS, 2011).

The Herfindahl index for Cullen Bullen is also very high at 11.5, indicating a lack of industry diversity, reflective of the past economic reliance on mining.

Median House values for Cullen Bullen are presented in **Graph 3.4**. House prices have risen approximately 9% in Cullen Bullen (2011 – 2016). The current median home price is \$183,148 (Hometrack, 2016).



Graph 3.4

© Umwelt, 2016

Median House Price 2011-2016 Cullen Bullen (Hometrack, 2016)

The median monthly mortgage repayment in Cullen Bullen at the time of the 2011 Census was \$1430. Home ownership was high with 44.9% owning their own home, and 31.9% holding a mortgage. The median weekly rent was \$125 (ABS, 2011).

3.5.3 Human Capital

Human Capital refers to the health, welfare, knowledge and skills of members in a community (Coakes and Sadler, 2011). The status of a community's human capital is assessed by considering population size, age distribution, education and skills, general population health and the prevalence of at-risk groups.

In 2011, the Lithgow LGA had a population of 20,160, with a median age of 42 years (ABS, 2011). The proportion of residents with post-secondary education was 29.4%, lower than the state average (37%).

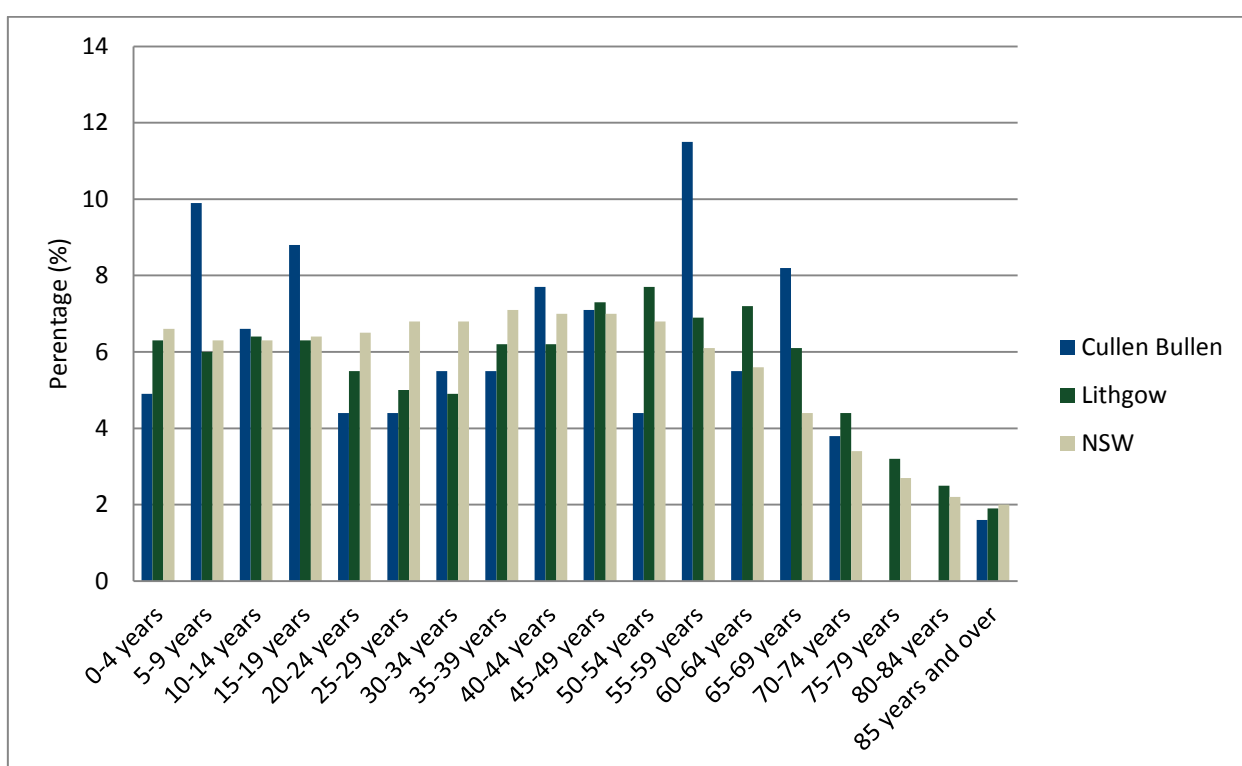
A community forum was held in 2012 with 91 residents of Lithgow, facilitated by the Interim Joint Health Consumer Committee of the Nepean-Blue Mountains, Medicare Local and the Nepean Blue Mountains Local Health District. An online survey was distributed in conjunction with the forum to gather feedback from residents. A key finding from the study was that there is a high level of concern about Lithgow's economic stability and unemployment levels, and further concern about the perceived impact on mental health in the community. Delays in decisions to reopen mines were also referenced as a source of stress and uncertainty (NBMML 2013).

The health and wellbeing of residents of Lithgow LGA is comparable to state averages. Positively, the proportion of overweight people in Lithgow is lower than the state average (Age standardised rate - ASR 30.7 per 100 compared to ASR 34.6 per 100 respectively) (PHIDU, 2015). However, rates of smoking were higher in Lithgow (ASR 20.3 per 100 compared to NSW ASR 16.2 per 100) (PHIDU, 2015), with one study reporting that over a third of all pregnant women smoked (NBMML, 2013). Asthma rates were also higher in Lithgow (ASR 11.8 per 100 compared to ASR 9.6 per 100).

In general, more people rate themselves as having fair or poor assessed health in Lithgow (ASR 17.3 per 100 compared to ASR 14.3 per 100) (PHIDU, 2015).

Lithgow Council has identified a number of key demographic issues facing the Lithgow LGA, including a static to declining population, smaller household sizes and a rapidly ageing population. These issues are also of particular relevance to Cullen Bullen (Lithgow Council, 2016), which has seen a decline in population over the last ten years from 209 in 2001 to 183 in 2011 (ABS, 2001-2011). It is also very likely that the 2016 Census will show further population decline for the Cullen Bullen township. Furthermore, the family composition in Cullen Bullen is 38.8% families with children and 34.7% without (ABS, 2001-2011). Specific data related to the health of residents of Cullen Bullen was not available.

Graph 3.5 compares the age profile of residents in Lithgow and Cullen Bullen with NSW. As illustrated within **Graph 3.5**, there were a lower proportion of persons aged 20-50 years in Cullen Bullen than in Lithgow LGA or NSW, with notably more people in the 5-9 years, 15-19 years and 55-59 year age cohorts. Note that due to the small overall population of Cullen Bullen, these differences only relate to approximately 20 people overall.



Graph 3.5

Age population, Cullen Bullen, Lithgow and NSW (ABS, 2011)

3.5.4 Physical Capital

Physical capital includes the provision of built infrastructure and services to the community. Within this capital, it is important to consider the type, quality and degree of access to public, built and community infrastructure (including amenities, services and utilities) and housing and accommodation.

Lithgow LGA is well connected to the state via three main routes, including:

- The Great Western Highway - which connects Lithgow to Cullen Bullen and Bathurst in the North West direction and to Sydney via Katoomba and Penrith in a south east direction
- Chifley Road - which connects Lithgow to Sydney via Richmond.

As a regional hub and key location between the Blue Mountains and Bathurst, the public transportation system of Lithgow is relatively comprehensive. There is a train service to Sydney and Bathurst, with additional services in the mornings for commuters. There is also a bus service to Bathurst every 4 hours, which stops at Wallerwang, Mount Lambie, Meadow Flat, Yetholme, Raglan, Kelso then Bathurst. Local buses follow seven different routes within Lithgow. Independent transport services are also available, that cater to the elderly and disabled.

Cullen Bullen is connected to Lithgow and Portland via the following links:

- Cullen Bullen is 28 kilometres north of Lithgow on Mudgee Road by the Ben Bullen State Forest off the Castlereagh Highway
- Cullen Bullen and Portland are 10 kms apart and are connected by Cullen Bullen Rd
- Cullen Bullen no longer has a train station, as it closed in 1976.

Transport links from Cullen Bullen to Lithgow run by a bus service twice daily, once in the morning and once at night, servicing Cullen Bullen, Wallerwang, and Portland. The most frequent mode of travel to work for Cullen Bullen residents is car, as driver 76.2% (ABS, 2001-2011).

There are two coal-powered power stations located near to Lithgow - Mt Piper and Wallerawang – which are owned by Energy Australia. Wallerawang was built in 1957 and is capable of providing power to 950,000 homes in NSW yearly, however the power station, has been in closure planning since 2014 due to inefficiency and high operating costs (Energy Australia, 2016).

Mt Piper is located 25 km from Lithgow and has the capacity to service 1.8 million homes per year in NSW. The coal is sourced from the local Springvale mine (being the only current supply of coal to the Mt Piper power station), providing approximately 15% of NSW's electricity. Purpose built Lyell Dam and Thompson creek provides the water to the Mt Piper power station (Energy Australia, 2016).

Lithgow LGA and surrounding areas are serviced by Lithgow Hospital. The hospital consists of three specialist centres, with 46 public beds and a 24 hour emergency department, with on call medical services. An Isolated Patients Travel and Accommodation Assistance Scheme (IPTAAS) are available to subsidise transport and accommodation costs for patients who have to travel from remote areas for access to health services (NBMMML, 2013). Lithgow LGA is also supported by over 38 Local General Practitioners.

In terms of public infrastructure, Lithgow has a public library that offers internet access, an aquatic centre featuring a play area for children and a heated indoor pool. Over 10 outdoor spaces and ovals in the area are available to the public for hire.

Lithgow Council provides public utilities to its residents such as town sewerage services; domestic general waste and recycling collection services, while energy is provided by Energy Australia (Energy Australia, 2016). In terms of housing and accommodation, 85.6 per cent of private dwellings are occupied (ABS, 2011).

The following table lists the primary and secondary schooling options in Lithgow and the surrounding towns of Cullen Bullen, Portland and Wallerawang.

Table 3.1 Educational Facilities Lithgow LGA (Umwelt, 2016)

Level	School / Facility	Enrolments in 2016
Primary	Cooerwull Public School	302
	Zig Zag Public School	81
	Cullen Bullen Public School	22
	Portland Central School	179
	Lithgow Public school	421
	The Scots School Lithgow (Preschool to Year 6)	229
	Wallerawang Public School	289
Secondary	Lithgow High School	829
	La Salle Academy (Lithgow)	271 (2013)

Source: NSW Department of Education website; La Salle academy Website

Lithgow College (TAFE) has a campus in Lithgow which offers courses across a range of areas including mining, manufacturing, agriculture, construction, conservation, community services, and tourism and transport sectors.

Other physical capital features specific to Cullen Bullen include:

- The Cullen Bullen Hall where the Cullen Bullen Progress Association holds meetings every month. The Hall is also offered to the community and hosts events such as public dances and fundraising events.
- Two practicing GPs located in Portland and in Wallerwang. For emergencies and all other medical services, residents of Cullen Bullen utilise the Lithgow hospital.
- One primary school located in Cullen Bullen – Cullen Bullen Primary School – which had a total of 22 enrolments in 2016.
- A Hotel/Pub that is open sporadically, but does provide accommodation.
- A speedway that meets eight times a year.
- A Rural Fire Service (RFS) station.

3.5.5 Social Capital

Social capital refers to community cohesion and the strength of relationships within a community. Various indicators are used to examine social capital, including the level of volunteering, population mobility, crime rates and the cultural composition of the community (percentage of people born overseas, language spoken at home). The influx of visitors to an area and the extent of a transient workforce population can also contribute to varying levels of social capital and resilience within a community.

With regard to Lithgow LGA, the social capital profile can be defined as follows:

- 17.5 per cent of residents participate in volunteering, slightly higher than the state average of 16.9 per cent
- Population mobility is slightly lower than the state average with 30.2 per cent noting a different address at the time of the last Census, compared to 39.2 per cent for NSW
- The number of residents born overseas is 15.2 per cent, much lower than the state average of 31.4 per cent. The top three countries of birth after Australia include England, New Zealand and Scotland
- 9.3 per cent of residents spoke a language other than English at home, much lower than the state average of 27.5 per cent. The top three languages spoken other than English include Italian, German and Cantonese
- The Aboriginal and Torres Strait Islander population totalled 4.5 per cent (ABS, 2011).

Crime rate data from 2010 to 2015 shows some notable reductions in crime in Lithgow in relation to non-domestic violence related assaults (an 11.4 per cent reduction); and a 50 per cent reduction in malicious damage to property. However, there were increases in fraud rates (14.8 per cent increase) and non-dwelling break and enter (16.6 per cent increase) (BOSCAR 2015).

In contrast, there are a number of differences between Lithgow LGA and Cullen Bullen. For instance:

- Volunteering is equivalent to the broader LGA at 16.5 per cent; however volunteering in Cullen Bullen has increased 12.1 per cent from the 2006 Census.
- Population mobility was considerably lower than the state average, with 19.2 per cent of residents noting a different address at the time of the last Census, compared to 39.2 per cent for NSW.
- The number of residents born overseas is low at 11.4 per cent, much lower than the state average of 27.5 per cent. The top three countries of birth after Australia were Canada, England and Germany.
- 1.6 per cent of residents spoke a language other than English at home, far lower than the Lithgow and state average of 9.3 per cent and 27.5 per cent. The only language other than English spoken at home was German.
- The Aboriginal and Torres Strait Islander population in Cullen Bullen was 1.6 per cent (ABS, 2011); lower than the Lithgow LGA Aboriginal and Torres Strait Islander population.

3.6 Media Overview

A media review has been conducted in relation to the current Southern Extension Project, and this is summarised in **Table 3.3**. The tone of most of the articles is neutral to positive, and most feature background knowledge about the Manildra group and the Southern Extension Project, though there was also a strong focus on the perceived economic and employment benefits that the Project could potentially provide.

Table 3.2 Media Review

Date	Source	Excerpt
February 4, 2016	Manildra Group Media Statement	Manildra Group Media Statement <i>We highly value our relationships with our regional communities that the Manildra Group currently operates in, with some of these relationships spanning the full six decades and four generations of our family company's history.</i>
February 3, 2016	Station unknown	Richard Stiles Comments on Radio <i>Interview with Dr Richard Stiles, Lithgow Environment Group about coal mining. Handkey says that Castlereagh Coal is putting together an application to mine an area of the Invincible and Cullen Valley mines that used to be owned by Coalpac, with various applications not approved by the NSW Government in 2014 due to potential environmental impacts. Handkey says the new proposal, the Southern Extension Project, will create 30 jobs, and deliver nut coal to a starch processing plant. Stiles says the mine is next to the Gardens of Stone region, which has unique flora and fauna, but says they have downsized the mine, and moved it further away from the pagodas, but it is still very close to the state forest, and Cullen Bullen. Stiles says that Cullen Bullen has been noted by the Health Department as carrying a large health burden, which was one of the reasons why the original project was rejected.</i>
February 3, 2016	WIN News	Castlereagh Coal clip <i>Residents neighbouring the Castlereagh mine site near Lithgow are yet to voice their opinion on the development. The meeting came as the mining company begins consultation with stakeholders in the region. Lithgow's Mayor Maree Stratham said the proposal was different to those that came before it and will deal with environmental matters in a different way and should have good result. Local residents highlighted the importance of local employment and the potential for an economic boost to the town.</i>
February 2, 2016	Central Western Daily	Cullen Bullen mining revival <i>The Manildra Group through Castlereagh Coal has proposed a mining revival near Cullen Bullen. The plans come after a long and bitter battle between miners, local opponents and environmentalists scuttled Coalpac's plans for a massive open cut operation in the Cullen Bullen area.</i> <i>The size of the Coalpac proposal and its subsequent environmental footprint is believed to be the cause for refusal. Now the project is to be revived, on a much smaller scale that proponents believe will overcome previous objections.</i>

Date	Source	Excerpt
February 1, 2016	Western Advocate	Mining revival at Cullen Bullen <i>It was a long and bitter battle between miners, local opponents and environmentalists that scuttled Coalpac's plans for a massive open cut operation near Cullen Bullen. Now the project is to be revived, albeit on a much smaller scale that proponents believe will overcome previous objections. And, to many, the new kid on the block is an unlikely one - one of Australia's most successful companies but one best known for flour milling.</i>
February 1, 2016	Mudgee Guardian & Gulgong Advertiser	Extension proposed for Cullen Bullen mines <i>If approved an extension to the newly acquired Invincible and Cullen Valley mines near Cullen Bullen is expected to bring economic benefits to the region. Previous mining proposals by Coalpac in relation to the Invincible mine were not progressed or were not approved by NSW Government due to potential environmental impacts. Castlereagh Coal said its Extension Project is unlike previous unapproved applications, with significantly reduced environmental impacts.</i>
February 1, 2016	Colong Foundation	New Invincible open-cut proposal – Lazarus back from the dead <i>The Colong Foundation for Wilderness has renewed calls for the NSW Government to declare Ben Bullen State Forest a conservation area after hearing of plans to expand the Invincible open-cut coal mine at Cullen Bullen north of Lithgow in the state's Central West.</i>
January 30, 2016	Channel 7	Cullen Bullen mining revival <i>Manildra announced plans to say that the acquisition, in the long term and subject to approval, will provide economic benefits for the community of Lithgow and supply nut and thermal coal.</i>
January 30, 2016	Lithgow Mercury	Cullen Bullen mining revival proposed by Manildra Group <i>It was a long and bitter battle between miners, local opponents and environmentalists that scuttled Coalpac's plans for a massive open cut operation near Cullen Bullen. Many believe it was the size of the Coalpac proposal and its subsequent environmental footprint that dashed its hopes. Now the project is to be revived, albeit on a much smaller scale that proponents believe will overcome previous objections.</i>
Jan, 29 2016	ABC News Online	'Modest' plans to re-open Lithgow district coal mine <i>A company has announced plans to reopen and extend the Invincible coal mine near Lithgow in the New South Wales central tablelands. Castlereagh Coal said its proposal would generate 30 jobs and deliver speciality nut coal to a starch processing plant, owned by its parent company Manildra Group, as well as thermal coal to local power stations. Invincible and Cullen Valley mines remain in care and maintenance mode, and former owner Coalpac folded after it failed in its bid to reopen and expand them.</i>

3.7 Summary of Capitals Analysis

Table 3.4 summarises the key demographic statistics for Cullen Bullen and the Lithgow LGA, compared to NSW as a whole.

Table 3.3 Demographic Summary Statistics of Cullen Bullen, Lithgow LGA and NSW (2011)

	Cullen Bullen	Lithgow LGA	NSW
Economic Capital			
Largest industry of employment (at 2011)	Coal Mining (25.4%)	Coal mining (11.6%)	School Education (4.4%)
Occupation of employment	Machinery Operators and Drivers (23.4%)	Technicians and Trades Workers (17.7%)	Professionals (22.7%)
Herfindahl Index (%)	11.5	2.4	0.83
Unemployed (%)	5.7	7.2	5.9
Median weekly household income (\$)	833	896	1,237
Tenure – owned (%)	44.9	40.2	33.2
Tenure – mortgage (%)	31.9	31.2	33.4
Tenure – rented (%)	18.8	24.3	30.1
Median weekly rent (\$)	125	170	300
Median monthly mortgage repayment (\$)	813	1,452	1,993
Human Capital			
Population	183	20,160	6,917,658
Median age	40	42	38
Post secondary education (%)	24.0	29.4	37.0
Family composition (families with children %/ families without children %)	38.8/34.7	38.5/41.6	45.5/36.6
Physical Capital			
Occupied private dwellings	81.7	85.6	90.3
Travel to work – one method (largest %)	Car, as driver (76.2%)	Car, as driver (67.4%)	Car, as driver (57.6%)
Social Capital			
Marital status (married %)	43.7	47	49.4

	Cullen Bullen	Lithgow LGA	NSW
Born overseas (%)	11.4	15.2	31.4
Aboriginal and Torres Strait Islander (%)	1.6	4.5	2.5
Volunteering (%)	16.5	17.5	16.9
Different address 5 years ago (%)	19.2	30.2	39.2

As **Table 3.4** indicates, there are some notable differences between the demographic data for Cullen Bullen compared to the Lithgow LGA and wider NSW. Such differences include:

- The Aboriginal and Torres Strait Islander population is proportionally higher in the Lithgow LGA than in Cullen Bullen or wider NSW.
- There is a lower proportion of occupied properties in Cullen Bullen than in Lithgow LGA or NSW more broadly, with almost 21% of properties being unoccupied in 2011. This may be indicative of a declining population.
- The cost of housing in Cullen Bullen and Lithgow is relatively low, as is the median weekly household income. Housing occupancy was also lower for Cullen Bullen in comparison to Lithgow and NSW.
- Post-secondary education is lower in Cullen Bullen and Lithgow compared to the NSW average.
- Coal mining is the dominant industry of employment in Lithgow and in Cullen Bullen, with almost one in four people in the workforce being employed as machinery operators and drivers.
- There were lower levels of population mobility in Cullen Bullen and Lithgow compared to the state average. In Cullen Bullen specifically, only 19.2 per cent of the population lived at a different address five years ago, indicating a relatively stable community.

4.0 Community issues in relation to the Project

Mining has been undertaken at the Invincible Mine since the early 1900s, however recent proposals to extend mining at Invincible and Cullen Valley has been prominent in the community including from key stakeholders and the local community in relation to the past two project development proposals.

A review of relevant media relating to the past two projects was conducted and revealed largely negative media coverage from the period just prior to the withdrawal of the 2011 Coalpac Consolidation Project proposal and government refusal of the 2013 Coalpac Modification 4 proposal. Much of the opposition to these projects came from outside the local area given an interest in the potential impacts of the proposals on the natural features of the area – namely the Pagodas. Opposition from conservation and environmental groups was strong for both projects with repeated calls for the areas of Ben Bullen State Forest, around the existing mining footprint at Invincible, to be made into a State Conservation Area.

The following table summarises the stakeholder submissions received for the two prior applications. As outlined in **Table 4.1** is the reduction in local community opposition to the smaller 2014 Coalpac Modification 4 proposal relative to the earlier iterations of the 2012 Coalpac Consolidation Project, which was predicted to have more significant noise, air quality and blasting impacts on the local community.

Table 4.1 Stakeholder submissions received for the two prior applications

Project	Date	Total number of submissions received	Submissions by stakeholder group		
			Regulators	Special Interest Groups	Private individuals
Consolidation Project	2011-2012	938	15	24 (5 supportive)	899 (133 supportive)
Modification 4 Project	2014	753	8	21 (4 supportive)	724 (200 supportive)

Table 4.2 identifies the key issues raised by broad stakeholder groups in the submissions on the Modification 4 Project, being the most contemporary of the previous applications. **Section 5.0** of the EA expands upon how these issues have been considered as part of the design and assessment of the Southern Extension Project.

Table 4.2 Issue by Stakeholder Group – Modification 4 Project

Regulators	Special Interest Groups	Private Landholders
Air Quality	Economics	Economics
Noise and Blasting	Geology / Pagodas	Ecology
Visual and Lighting	Ecology	Geology / Pagodas
Highwall Mining and Subsidence*	Ben Bullen State Forest Conservation	Health

Regulators	Special Interest Groups	Private Landholders
Rehabilitation and Final Landform	Rehabilitation and Final Landform	Air Quality
Surface Water	Air Quality	Ben Bullen State Forest Conservation
Traffic and Transport	Aboriginal Archaeology & Cultural Heritage	Rehabilitation and Final Landform
Economics	Social	Visual and Lighting
General Support	Health	Aboriginal Archaeology & Cultural Heritage
Ecology	Biodiversity Offset Strategy	Biodiversity Offset Strategy

*As outlined in **Section 1.1**, the Southern Extension Project does not propose any high wall mining

In addition to providing insight into key community and stakeholder issues associated with future mining at Invincible, the analysis of previous submissions also informed the refinement of the project scope outlined in **Section 1.1** which included but was not limited to the following changes:

- A smaller mining area
- No highwall or other underground mining
- Mining away from sensitive features such as pagodas and sensitive habitat.

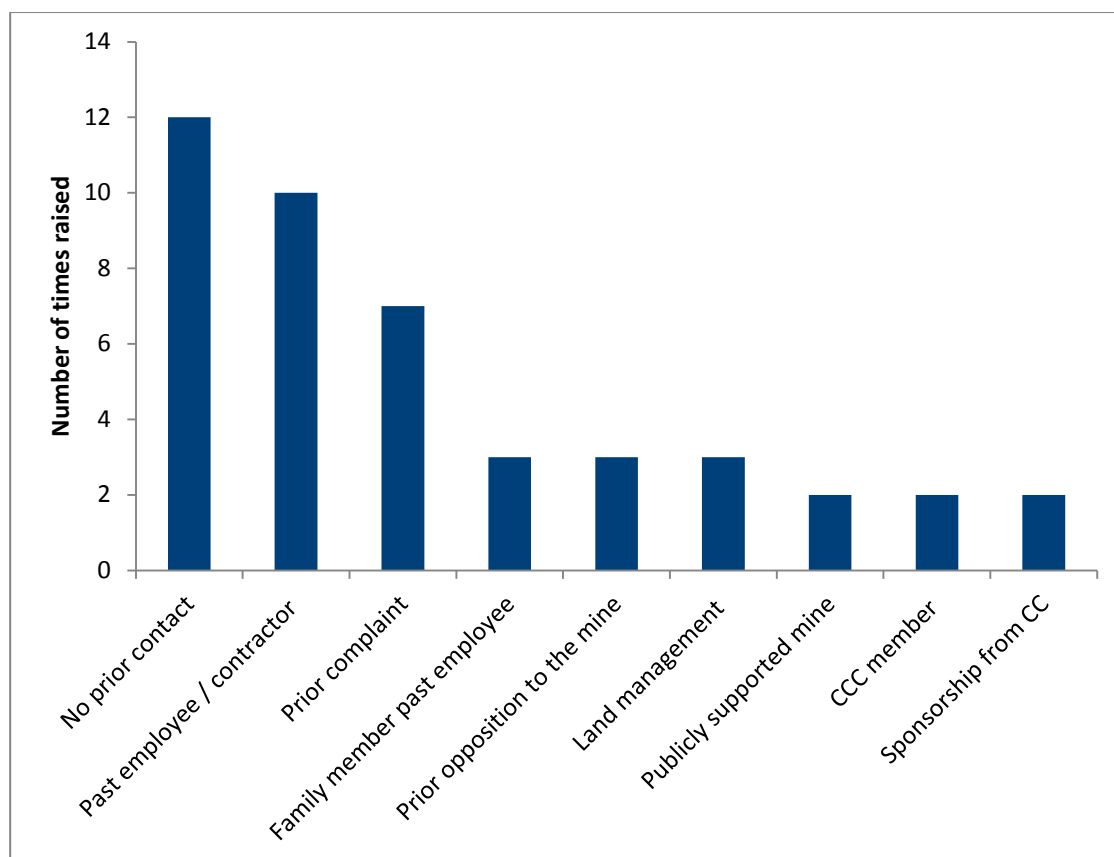
The feedback received through the engagement process in relation to the Southern Extension Project is detailed in the following sections.

4.1 Community Issues in relation to the Southern Extension Project

This section analyses the outcomes of consultation with landholders located in proximity to the Southern Extension Area (as noted in **Section 2.4**). Stakeholders were asked a range of questions that related to their knowledge of the proponent – the Manildra Group – and their perceptions relating to the proposed Southern Extension Project.

Awareness of the Manildra Group was fairly high, with over two-thirds of those consulted (68 per cent or 33 landholders) having heard of the company previously. Awareness of the Manildra Group's ownership of Castlereagh Coal and Invincible was slightly lower, as only half of the landholders (22) were aware of this connection.

In terms of prior contact with Castlereagh Coal, almost three quarters (32) had previously had some form of contact with the company. For those who had prior contact, the most common reason was through an employee or contractor, and a number had also had a family member who had been employed by Castlereagh Coal. Other common reasons for contact included: as a complainant, involvement in opposing or supporting the mine in prior development applications, contact regarding land management issues, membership on the Community Consultative Committee and involvement with an organisation that has received sponsorship from Castlereagh Coal. **Graph 4.1** summarises this information.



Graph 4.1

© Umwelt, 2016

Prior contact with Castlereagh Coal (multiple responses allowed)

4.1.1.1 Previous Issues Management

When asked whether things could have been done differently in relation to the past operation of the mine, three-quarters of the landholders consulted felt that improvements could be made, indicating a degree of dissatisfaction with past operational practice.

When asked to detail suggested improvements; delivering on promises, greater community support and involvement, accounting for local opinions, ensuring local employment and land rehabilitation were most commonly cited.

“We need local employment, especially greenskins (inexperienced).”

“Continue rehab at Cullen Valley, we can already see the improvement from early seeding.”

“Support the school and other community activities.”

“Make sure local views are heard, and that it is not outsiders speaking on our behalf.”

“Local knowledge is important.”

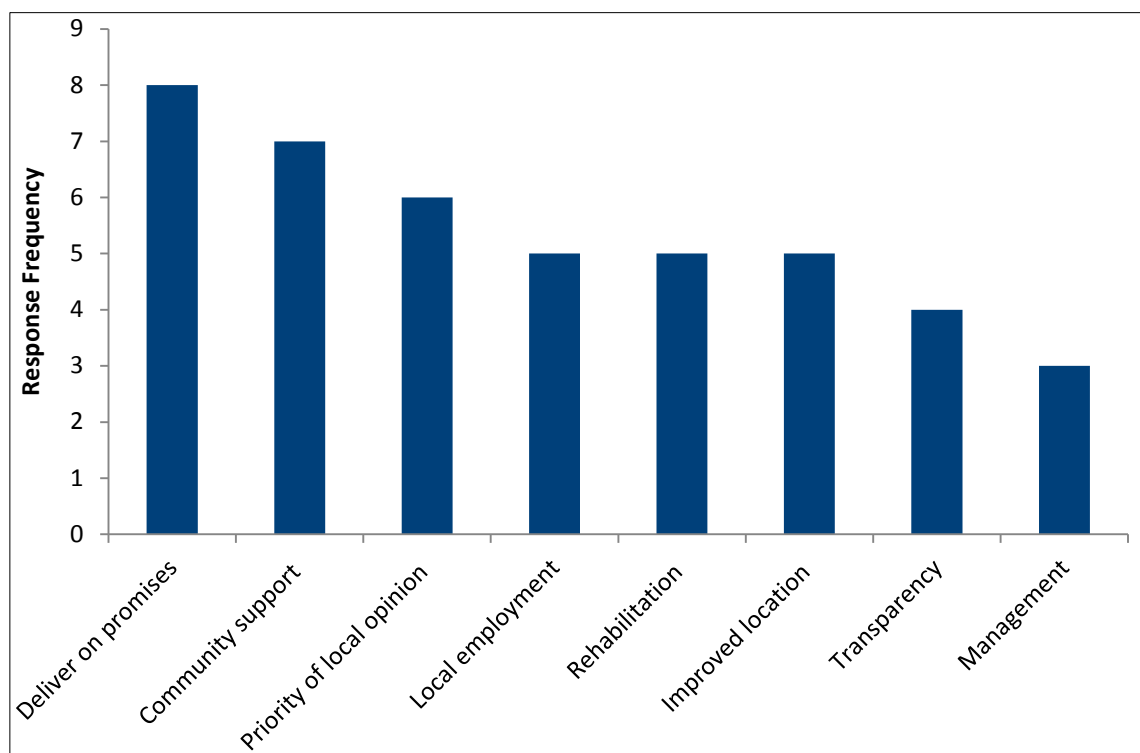
Transparency, location and a change in the management team were also noted, though less frequently.

“Respond to concerns - don’t let the squeaky wheels ruin it for others and address real problems.”

"This [Southern Extension Project] is much better as it is further away."

"It is located further away so the proximity to the town has been addressed."

This information is summarised in **Graph 4.2**.



Graph 4.2

© Umwelt, 2016

Suggested practice improvements (multiple responses allowed)

Other respondents identified a number of characteristics of the Southern Extension Project that were considered more acceptable than previous operational and project fundamentals. For example:

"I don't imagine that the size or location of the project will create the same problems."

"It's positive that it's not 24 hours."

"I previously opposed the development, but I have no problem with this one."

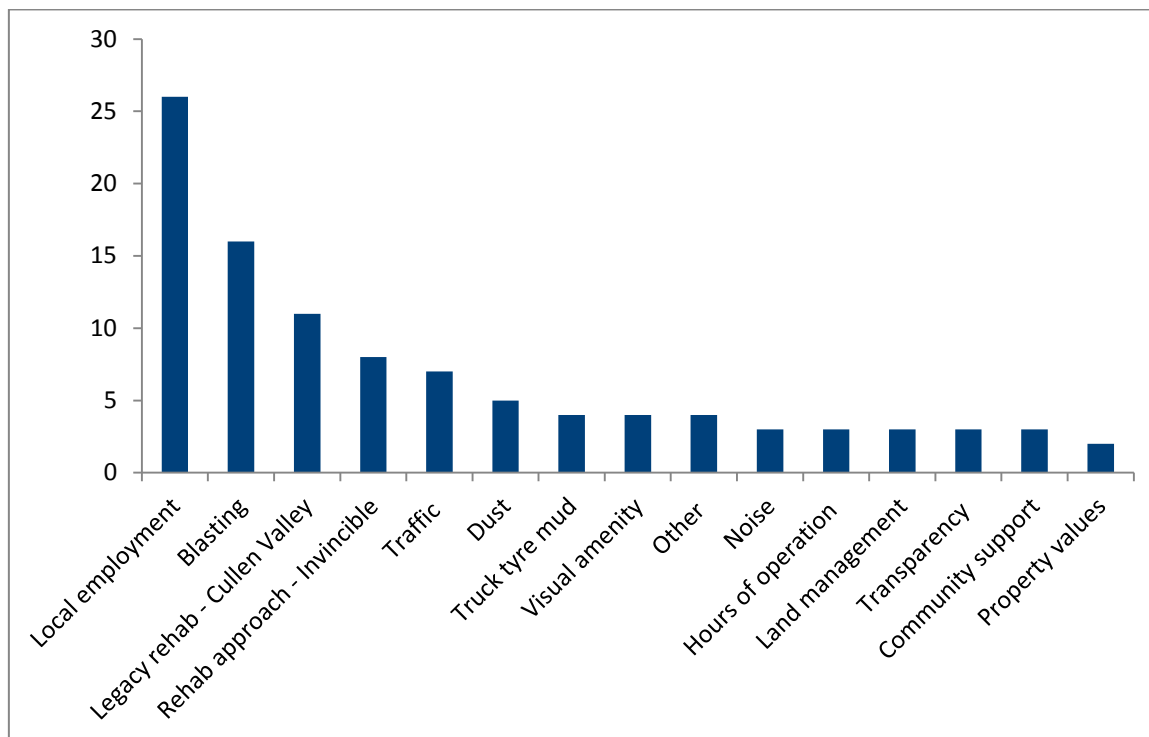
"Don't let out-of-towners views stop it, we want it."

"It's Important that it [the Project] goes ahead."

"I was in full support of the previous applications."

4.1.1.2 Current Project Issues

Landholders were asked to identify any issues or concerns they had in relation to the Southern Extension Project, with this information summarised in the **Graph 4.3**.



Graph 4.3

© Umwelt, 2016

Issues raised by landholders (multiple responses allowed).

As the graph demonstrates, local employment was by far the most common issue raised by landholders, with a desire to see economic benefits of the Project flow to the local area:

“The down-turn has had a financial impact on families.”

“When will it be operating and able to support local suppliers?”

This issue was followed by a concern about potential blasting, mostly in regard to property damage, followed by the issue of rehabilitation of the Cullen Valley and Invincible sites. In relation to this later issue, there was a concern that previous companies had not undertaken appropriate rehabilitation on the site, leaving a legacy that required rectification by the new owners.

“The blasting needs to be done well.”

“The new owner will need to fix the rehab legacy issue.”

Issues relating to traffic and transport e.g. truck routes and dirt/mud associated with heavy vehicle movements and dust were also raised, with other issues including noise, potential visual impacts and land management less frequently noted. Only one local landholder noted the potential impact to the pagodas and water quality, despite this issue being of high importance to regional and state environmental and recreational groups.

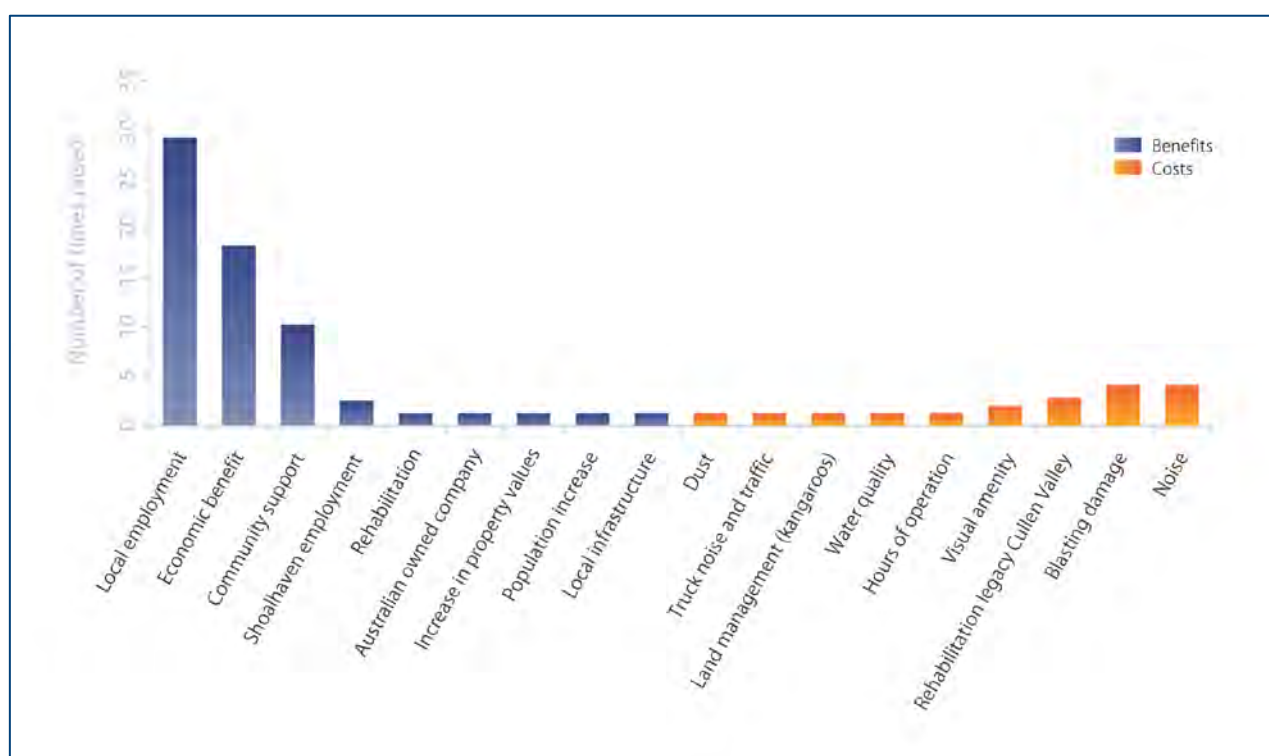
Eighteen per cent of those surveyed did not identify any concerns with the Southern Extension Project; with 10 landholders not wishing to proceed with an interview due to their limited level of concern.

4.1.1.3 Perceived benefits and costs of mining

Significantly, a large majority of landholders (84 per cent or 37 landholders) felt that the benefits of the Southern Extension Project outweighed the costs. When asked to detail benefits and costs, the majority of landholders (89 per cent) were able to identify benefits, compared to 36 per cent who identified a number of costs. The key benefits identified once again reflected the economic contribution of the project not only within the locality but further afield at the processing centre in the Shoalhaven region and potential community support.

"The economy needs it."/ "I hope it goes ahead."

Identified costs included noise, potential damage from blasting and the rehabilitation issue. Costs and benefits identified during the interviews are shown in **Graph 4.4**.



Graph 4.4

Perceived costs and benefits of mining (multiple responses allowed)

Those who felt that the disadvantages of the Southern Extension Project outweighed the advantages were asked for their suggestions for potential management strategies, with the following noted:

- Ensuring a supportive relationship with the local community (4): *“Be involved and engage with the community”*
- Utilising local employment and suppliers
- Restricting hours to avoid operation during the night and on weekends.

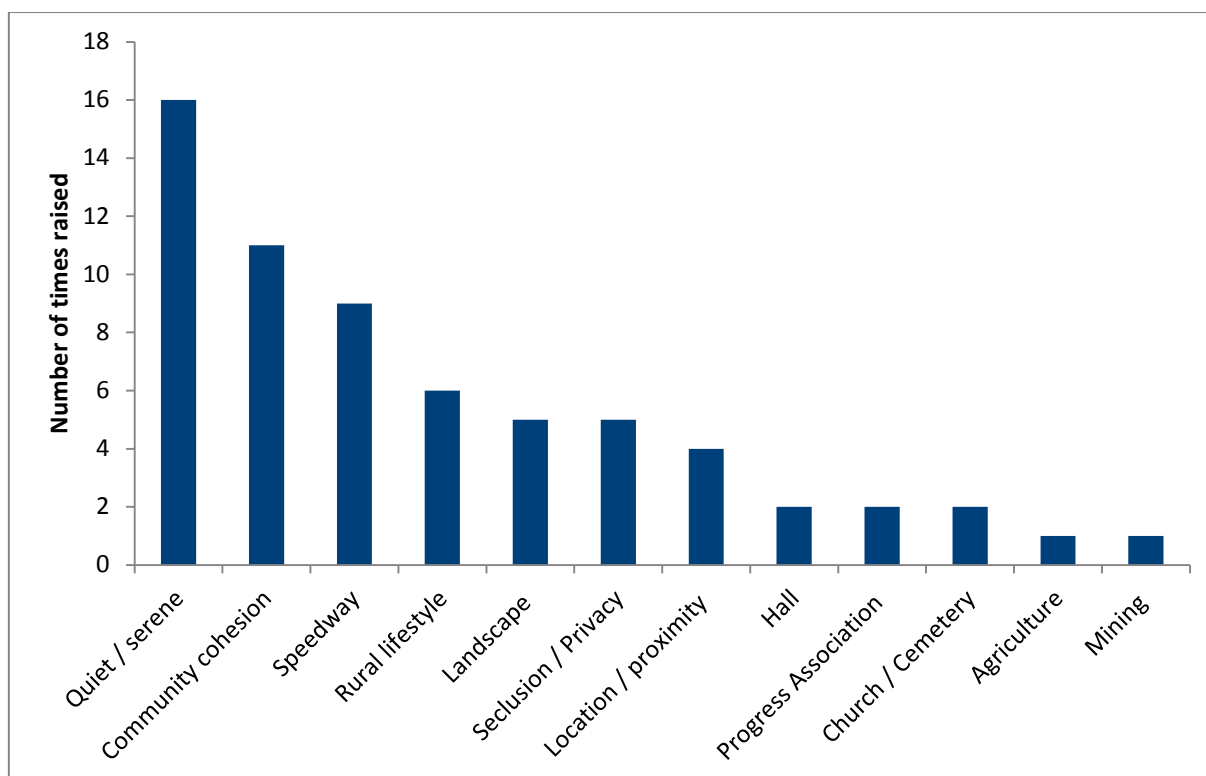
4.1.1.4 Post-mining land use

When asked about post-mining land use, there was a clear preference for land to be returned to its natural state (73 per cent or 32 landholders). In this regard, a number of landholders specified a desire for varied vegetation to avoid the area being comprised solely of wattle. This suggests that education about rehabilitation practices is required, as there is limited understanding of the seeding and vegetation process. Other suggestions for post-mining land use included:

- Recreation / camping (4)
- Motorbike / BMX track (2)
- Business / industry e.g. plantation wood, industry (2)
- Landfill (2)
- Cleared for grazing
- Resort development
- Maintained for historic / educational purposes
- Residential housing

4.1.1.5 Sense of community

A further component of the consultation was to consider resident perceptions of the strengths and assets of the Cullen Bullen community. **Graph 4.5** summarises this information:



Graph 4.5

Landholder identified strengths of Cullen Bullen (multiple responses allowed)

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As **Graph 4.5** illustrates, the rural lifestyle, including the quiet, seclusion and the landscape of Cullen Bullen were highly valued by landholders.

“The way of life here is great.”

Community cohesion was also highly valued, suggesting a sense of connectedness among local residents.

“[Cullen Bullen is] resilient and hard working. It’s a community that cares.”

“We maintain a lot with a little.”

The speedway was also noted as an asset, as was the proximity to services in other regional centres such as Portland. Local physical infrastructure within the Cullen Bullen township such as the Hall, the Church and the cemetery were noted, though by fewer landholders. Reference was also made to the work of the Progress Association. The presence of key industries e.g. agriculture and mining were also noted by one landholder. Other commonly identified locations and activities that were noted included:

- Motorbike tracks (8)
- Four-wheel drive tracks (5)
- Bushwalking (3)
- Natural springs (2)

- Appreciation of views (general) (2)
- Whitewash caves (2)
- Yabbying
- Landscape artists
- Dam fishing.

While people found it difficult to identify on a map, these activities were largely described as being located east of the town, accessed behind the Cullen Bullen Hotel on the fringes of Ben Bullen State Forest, and via fire trails located around Invincible. Other activities were undertaken on private properties. Commonly all activities were described in the context as being undertaken in the past.

A number of landholders found it difficult to identify any strengths of the community, outlining that the community was in a period of decline due to limited employment opportunities, dwindling population numbers and loss of service provision; though the loss of services was contrasted with comments about the provision of new and cheap local housing.

“It’s not like it used to be, the town is dying, and cheap housing is bringing different types of people.”

“Cheap housing is bringing lower socio-economic, disadvantaged families.”

“People are friendly but the town is dying out.”

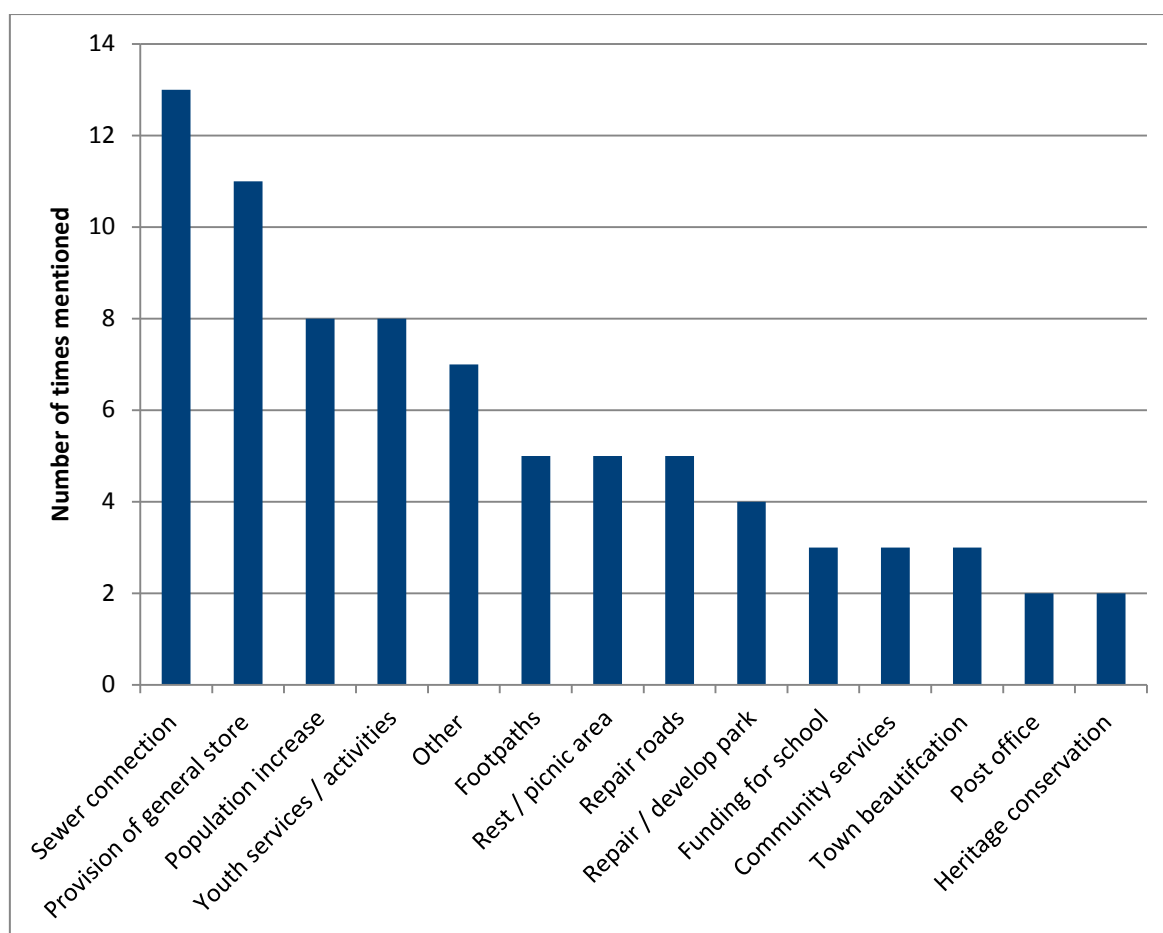
“The town used to be alive, but is now dying out.”

Given this climate of downturn, the Southern Extension Project was linked to renewed hope that the reopening of the mine may inject greater economic prosperity and life into Cullen Bullen through local employment, and associated direct and indirect flow on effects. There was also a sense of fear that if the Southern Extension Project was not approved, the town may decline further:

“Without it [the Project] the town will die.”

4.1.1.6 Opportunities for Community Development

A key area of discussion with landholders was to understand current community needs and opportunities for further community development. In relation to this question, there were many opportunities identified to provide support at the local level as shown in **Graph 4.6**.



Graph 4.6

Identified community needs (multiple responses allowed)

© Umwelt, 2016

Connection to the sewer line was the most commonly identified community need, followed by the provision of a general store. Opportunities to increase the community population were also identified:

“We need employment so that more people will live here, and then the rest will flow.”

Other commonly mentioned needs included funding for youth services, footpaths, a rest / picnic area and the repair of local roads including Cottage Road, Windy Gully Road and the Castlereagh Highway.

“We need activities for the youth. We never see them around.”

Suggestions included in the ‘other’ category comprised funding a local cafe, support for the hall and the pub, sponsoring a cement works, sponsoring the Portland Easter Show, connecting the three springs and providing access to firewood at the mine site.

4.1.1.7 Information and Engagement Preferences

When asked about communication mediums, the majority of landholders identified the newsletter as their preferred source of information about the company, although a small number of people also identified phone calls, personal meetings and provision of information through the Community Consultative Committee (CCC). Just under two-thirds (23 landholders) were aware that Castlereagh Coal has a CCC, and of those, over half (13) were aware that the CCC currently meets monthly.

When asked about the effectiveness of this group as a medium for information:

- 29 per cent (7) felt the group was ineffective
- 17 per cent (4) felt that the group was effective
- 54 per cent (13) were neutral.

When asked for suggestions on how information provision from the CCC could be improved, only a few responses were given including: circulating CCC minutes to the community through a mail out or publication on the community noticeboard (2); inviting new members to attend; and appointing a 'stronger' chairperson.

Landholders were asked if there was any specific information they would like to receive about the Project, with the majority not identifying any particular preference for information provision. For those who did respond, requests included further information relating to the:

- Environmental Assessment (EA) and outcomes of assessment studies (2)
- Project Timing, if approved (2)
- The Manildra Company and its direction (2).

4.1.2 Consultations with environmental and recreation groups

As part of the assessment, a number of environmental and recreational groups have been consulted in relation to the Southern Extension Project, given concerns expressed in previous mining applications.

Concerns in relation to the Southern Extension Project have centred on: the economic justification of further coal development in the region; the incompatibility of open cut mining with other land uses including the Gardens of Stone Stage Two proposal and the pagodas; the quality of rehabilitation of the existing mine site; impacts of the project on water and wildlife in the area; and the sustainability of mining and mining related jobs. These issues are further discussed in **Section 5.5.2**.

5.0 Assessment of Social Impacts

Acknowledging the constantly changing nature of communities, the aim of the current assessment is to consider any changes to the baseline social environment as a result of the Southern Extension Project proceeding. To do so, the SIOA integrates assessment of all the data presented throughout this document, including Project details, data relating to the existing community, and issues and concerns of local landholders and other key stakeholders to develop a layered picture of the potential social risks, impacts and opportunities that arise as the result of the Project.

Social risks extend beyond merely ‘technical’ risks (i.e. hazards), to include potential for ‘outrage’ - that is people’s perceptions (including fears/aspirations) of the risk/hazard (Sandman, 1993). The integration of the outcomes of the hazard ranking with stakeholder perceived ranking of risks thus affords an integration of expert and local knowledge in impact assessment, and enables risk to be addressed holistically, leading to the development of more effective impact minimisation, mitigation, amelioration and enhancement strategies (refer to **Section 5.10**).

Impact themes have been separated into two broad categories: social amenity impacts and impacts relating to community sustainability, values and place. Social amenity impacts are those that relate primarily to the change in land use within the immediate locality and subsequent impacts, such as dust, noise, blasting, land management etc. These impacts are largely localised and nearby residents are usually the most significantly impacted.

Impacts to community sustainability, values and place include impacts felt more widely, such as those due to population movements or changes to the economy, as well as less tangible psychosocial aspects of change, such as the impacts of the stress of change, to how people value their homes and surroundings to the sustainability of communities as a whole (refer to **Table 5.1**)

Table 5.1 Assessed Impact Themes

Social Amenity Impacts	Community sustainability, values and place Impacts
Land management and future land use	Population change
Blasting	Impacts on housing availability and community infrastructure
Traffic	Economic impacts
Air quality (dust)	Sense of community
Noise	Recreational and environmental values
Visual impacts	Community sustainability
Other environmental impacts, such as those to water, biodiversity and greenhouse gases	

Each assessed impact theme is presented in a social impact plot³, comparing the technical and stakeholder perceived risks assessed. The impact plot is used as a way of prioritising impacts based on a ranking of both technical and stakeholder perceived impact (i.e. hazard, and matters of importance to the community – perceived risk) using a scale of ‘low’, ‘medium’, or ‘high’.

Technical risks relate to the level of impact assessed within the EA that have the potential to impact on the social fabric of the locality and wider region. Stakeholder perceived risks relate to the perception and experience of these technical risks within a given community. For example, while a technical risk may be considered low, if it is experienced in a subjectively significant way, further work to improve mitigation, management and communication of the risk would be required, even if the technical impact is predicted to be low. Each impact theme has been assessed within this SIOA considering:

- The importance of each theme for stakeholders as identified through the consultation program, with the level of perceived stakeholder concern rated according to the following categories:
 - o High (red) - high level of current or potential for future concern
 - o Moderate (amber)– moderate level of current or potential for future concern
 - o Low (green) – low level of current or potential for future concern.
- The assessment of social risks and impacts, including review and analysis of relevant secondary data, and identification of any opportunities that arise within each theme.
- The outcomes of specialist environmental studies that have implications for the SIOA.
- Current and proposed mitigation and management measures to improve project design and operation and social/community impact outcomes.

As detailed in **Figure 5.1**, the most commonly cited concerns were local employment, blasting and land management and future use.

³ Social Impact plots are a methodology developed by Coakes Consulting (2009) as a means of integrating social and technical perspectives of risk/impact in project development.

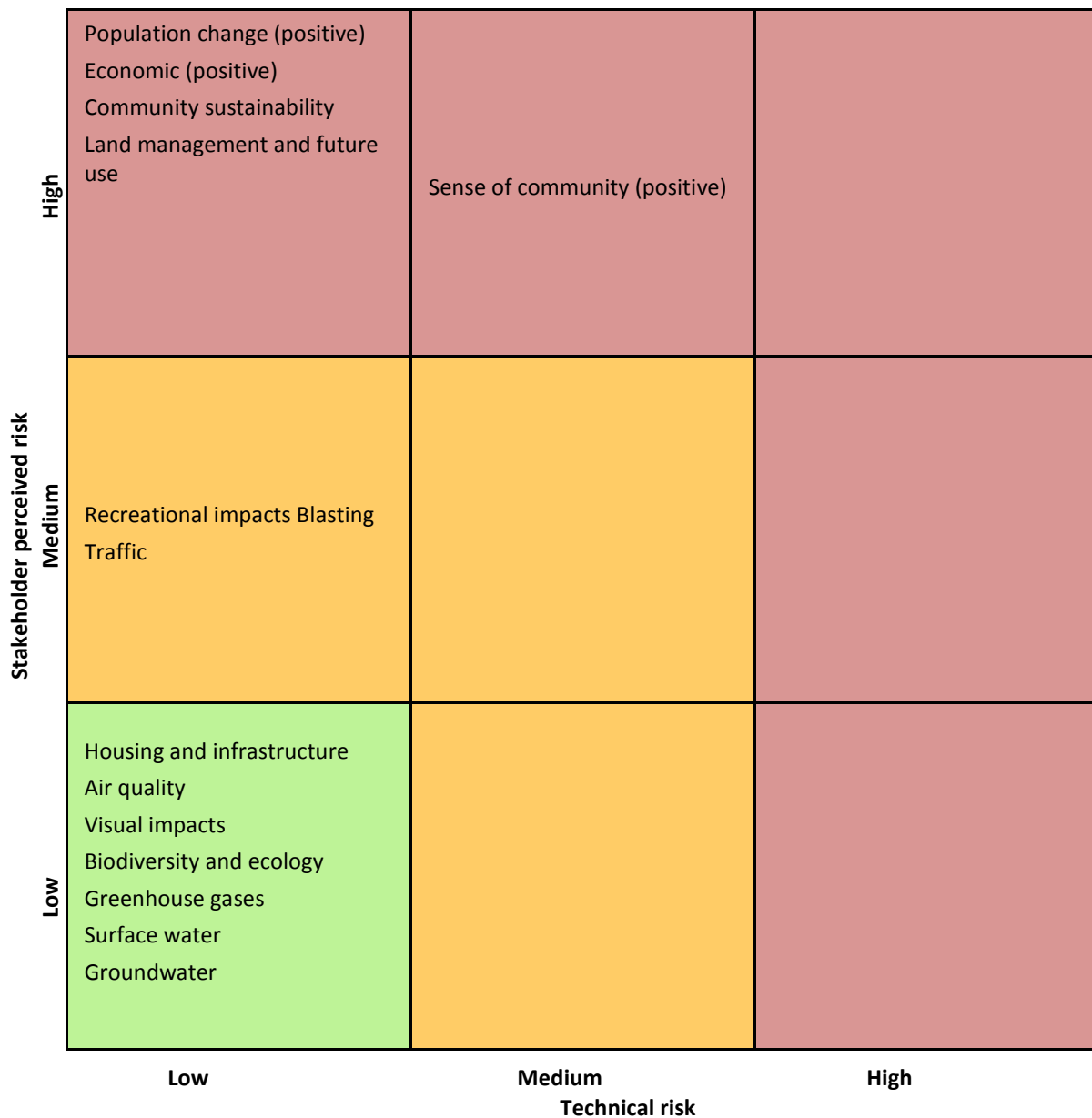


Figure 5.1

Social Impact Plot – Assessed Impacts

5.1 Community Sustainability, Values and Place

The following section describes the potential impacts of the Project on sense of community, social cohesion, community connectedness (to people and place) and overall community sustainability, as a result of the Southern Extension Project. There are two core drivers for these changes; being population change, which influences a range of factors such as housing, infrastructure and economic sustainability; and the more intangible or psychosocial aspects of the Southern Extension Project within affected stakeholders. These impacts include those such as changes to the character of a locality, people's lifestyles, fears and aspirations.

5.2 Population change

Changes to population are a fundamental impact within SIOA, given that the size, diversity and behaviours of a community are underpinned by its population and characteristics. Population change is usually described as a first order social impact which has the potential to create a number of second order social impacts such as impacts on community infrastructure and services, change in sense of community and social cohesion.

It is generally regarded in the SIOA literature that a project can influence population change by impacts emerging from three main factors:

- An influx of construction workers
- A change to the current operational workforce
- Acquisition of residential land in proximity to the operations.

As **Table 5.2** illustrates, as part of a maximum production scenario, there are anticipated to be up to a peak of 35 operational employees through years one to three, plus four (4) part-time contractors. This will reduce slightly to 33 employees by year five.

Table 5.2 Estimated employee numbers

Year	Estimated Employee Numbers (FTE)				Contractors (Part time)
	Production	Staff	Maintenance	Total	
1	22	7	6	35	4
2	22	7	6	35	4
3	22	7	6	35	4
5	21	7	5	33	4

The assessment of population change as a result of the Southern Extension Project considers whether or not new workers are anticipated to come from outside the local area and will need accommodation, or if they are already living close enough to operations to commute from home; the family size and structure of these employee families, as well as these families additional needs. These have been assessed in a series of different scenarios, from a 'lowest impact' scenario, where there are no population flows into the region to service the project; to a 'highest' impact, where no employees or contractors are sourced locally, and all are required to move into the region from further away.

Due to the stabilisation of the mining related economy following the decline in coal price during 2013-2014, it is difficult to predict the potential uptake of recruitment locally. Ongoing redundancies, such as those associated with the cessation of mining activities within the Lithgow LGA, are indicative of a suitably trained and available workforce ready to commence employment at the Project. Consequently in assessing the population change associated with the project, a number of different workforce scenarios have been assessed. The four scenarios that have been assessed are as follows:

- **Scenario 1:** All workers are absorbed from the local area
- **Scenario 2:** 80 per cent of the workforce are absorbed from the local region, with a 20 per cent influx from outside the region
- **Scenario 3:** 20 per cent of the workforce are absorbed from the local region, with an 80 per cent influx from outside the region
- **Scenario 4:** All of the workforce is sourced from outside the region.

For reference, the 'local area' refers to the Lithgow LGA. These scenarios are outlined in **Table 5.3**.

Table 5.3 Workforce modelling scenarios

Level of local recruitment scenario	Approximate operational workforce to be recruited from outside the local area	Total persons moving into the area (operational workforce plus families)
Scenario 1: 100% local (lowest change)	0	0
Scenario 2: 80% local	7	16
Scenario 3: 20% local	28	64
Scenario 4: 0% local (highest change)	35	81

Table 5.4 shows the predicted breakdown of the age of new residents based on the highest potential population change Scenario (Scenario 4 resulting in an additional 81 residents from outside the local area), though it is unlikely that this scenario would occur in full, due to the likelihood that at least some of the workforce will be recruited from the Lithgow LGA. This has been calculated using current ABS Census data of the actual resident age profile of the Lithgow LGA.

Table 5.4 Age breakdown of new residents – highest change (scenario 4)

Age	# of residents
0-4	7
5-12 years	12
13-17 years	8
18-24 years	8
25-34 years	11
35-44 years	14
45-54 years	13
55-64 years	9
Total	81

Of particular relevance, is the number of school aged children that would potentially move to the Lithgow LGA. As modelled, the highest change scenario this results in a total of 20 school aged children, 12 of which would be primary school age.

It is very likely that the schools in the Lithgow LGA would be able to absorb this number of students, however in the unlikely scenario that all 12 students resided in Cullen Bullen, it also very likely that these could be absorbed into Cullen Bullen Primary School, as the current teacher student ratio is 1:9, and the projected ratio with the additional 12 students would be 1:14. If this scenario were to occur, it is likely that the school would need to recruit another teacher on staff.

As a result, in relation to the total population of the Lithgow LGA and surrounding region, the technical impact of the possible quantum of incoming persons is assessed as *low*.

Given that population numbers in Cullen Bullen and the Lithgow LGA more broadly are in decline; interviewed landholders and community group representatives were generally positive regarding potential growth at the micro scale. In addition, one of the key areas of interest is in relation to local employment, specifically employment of people who live in, or are related to people who live in, Cullen Bullen. Therefore, there are benefits to all population modelling scenarios. As such stakeholder perceived concern is assessed as *high (positive)* within **Table 5.5**.

Castlereagh Coal has indicated a desire to maximise local recruitment with, ideally, at least 20 per cent of the workforce recruited from Cullen Bullen, and a further 80 per cent from Portland / Lithgow. Castlereagh Coal acknowledges that for some of the positions required for the future operation of Invincible, it would be necessary to source the relevant skills and experience from outside of the local area. Strategies to assist in maximising local employment are presented in **Section 5.10**.

Impacts associated with changes in population also include impacts to housing availability and infrastructure capacity, economic growth and, where significant, changes to sense of community and community sustainability. It is considered that the numbers of persons potentially moving into the area for the Project are unlikely to affect the sense of community or community sustainability at a local or LGA scale of analysis. Potential changes to these aspects, at a township or micro level of analysis, are discussed more fully in **Section 5.6**. Impacts to housing availability; infrastructure capacity and economic growth are presented in **Sections 5.3.1** and **5.3.2**.

Table 5.5 Summary of Project impacts – Population Change

Project Aspect	Geographic scope	Stakeholders impacted	Perceived Stakeholder risk	Mitigated technical risk
Population Change	Lithgow LGA Wider region	Local residents Regional stakeholders	High (positive)	Low

5.3 Impacts on housing availability and community infrastructure

5.3.1 Housing availability

Housing availability and infrastructure capacity was discussed with stakeholders, however, it was noted by interviewees that given decreases in population numbers in Cullen Bullen and the Lithgow LGA more broadly, there is a perception of sufficient capacity within existing housing markets to accommodate any additional population change. As such stakeholder perceived concern for this factor is assessed as being *low*.

An assessment of available housing for purchase or rent was undertaken using data from SQM Research (2016). Given the likely availability of housing from the data analysed, it was assumed that all incoming employees would relocate to within the Lithgow LGA. Housing available for purchase or rent in the Lithgow LGA (Postcode 2790) is presented in **Table 5.6**.

Table 5.6 Conservative Estimates of Accommodation Available in Lithgow LGA

Category of accommodation	Number of properties available
Purchase	120
Rental	30

As the table above indicates, there is sufficient capacity to house employees and their families in the highest change scenario (influx of 81 residents or 35 families into the Lithgow LGA), with a predicted uptake of approximately 21 per cent of housing for purchase and 33 per cent of housing for rent. Consequently, there is considered to be a *low* impact on housing availability due to the Project.

5.3.2 Community Infrastructure and Services

A project's impact on community infrastructure and services is often one of the more tangible social impacts of a project to the wider community and is considered a secondary order impact largely influenced by population change. Project factors that can impact community services and infrastructure include:

- changing demand due to an increase in temporary or permanent population
- changing behaviours of users, such as workforce rosters determining patterns of peak service utilisation
- direct impacts on physical infrastructure during project construction and/or operation.

The incoming workforce (and their families) will require infrastructure and services to be provided. Given the overall modest levels of population increase and the availability of existing accommodation and housing stock, there is unlikely to be any additional community infrastructure or services required to cater for the incoming population.

With regard to the provision of health services for the incoming workforce, as noted in **Section 5.4**, Lithgow has substantial service infrastructure, with many medical services, GPs and the Lithgow Hospital. For those who choose to settle in Cullen Bullen, there is one GP in town, and several in Portland, which would adequately service the incoming workforce, even under the highest population change scenario. For emergency health services, residents will be required to travel to the Lithgow Hospital.

The incoming workforce and their families are anticipated to increase overall participation in local community life through volunteering and participation in schools, sporting and community groups and informal social networks. These broader influences within the wider community are discussed further in relation to community sustainability in **Section 5.6**.

Given this, the perceived stakeholder risk and technical risk associated with the impact on community infrastructure and services has been ranked as *low*.

Table 5.7 Summary of Project impacts – Housing and Community Infrastructure

Project Aspect	Geographic scope	Stakeholders impacted	Perceived Stakeholder risk	Mitigated technical risk
Housing and Community Infrastructure	Local area Lithgow LGA Wider region	Local residents Regional stakeholders	Low	Low

5.4 Economic impacts

The positive economic impacts associated with the presence of Castlereagh Coal in the region were raised consistently by landholders and regional stakeholders during consultation. Key benefits of the project were identified as the generation of local employment, opportunities for procurement of local and regional businesses, social investment (i.e. funding for community groups, programs and/or infrastructure), as well as in kind participation or volunteering. Flow on effects to the wider region were also noted.

An economic impact assessment of the Project has been undertaken and is included as **Appendix 14** of the EA.

Table 5.8 Summary of Project impacts – Economics

Project Aspect	Geographic scope	Stakeholders impacted	Perceived Stakeholder risk	Mitigated technical risk
Economic Impacts	Local area Lithgow LGA Wider region	Local residents Regional stakeholders	High (positive)	Low

5.5 Impact on Sense of Community

Sense of community is a psychological concept related to the experience of community over and above the structure of a community. Coakes (1995) discusses many different elements of sense of community including the need for shared value, social interaction and connection to a common structure (e.g. geography, gender, culture, history). Changes to a sense of community can come about through many factors, including population changes as well as changes to land use in an area.

Large scale population changes can have significant impacts to sense of community within a particular place (Burge 2004). In the Southern Extension Project context, it is considered that the level of population change associated with the Project is not large enough to substantially impact the sense of community within the neighbouring localities or within the wider LGA or region. Nonetheless, there may be smaller changes that are only noticeable at a micro level of analysis. For example, the highest impact scenario modelled in **Section 5.2**, where a total of 81 persons moving into the region is predicted, would result in some informal contribution to local community organisations and schools, in addition to the use of local infrastructure.

Cullen Bullen itself has an individual sense of community which was identified through interviews with local residents (refer to **Section 4.1.1.5** and **Graph 4-5**). When asked to identify places of value and importance, some of the most commonly identified locations and activities noted by Cullen Bullen residents included:

- Motorbike and four-wheel tracks
- Enjoyment of the natural environment through bushwalking, appreciation of views, enjoying the natural springs and whitewash caves
- Yabbying / Dam fishing.

Some residents found it more difficult to identify strengths of the community, outlining that the community was in a period of decline due to limited employment opportunities, dwindling population numbers and loss of service provision.

In relation to the Project, many interview participants were hopeful about Castlereagh Coal and their presence in the community, particularly with regard to opportunities for local employment. In addition, many interviewees either worked in the mining industry, were related to someone who worked in the industry, or were hopeful of gaining employment within the industry.

Overall in relation to sense of community, it is considered that the Project may provide opportunities to improve the sense of community, particularly in Cullen Bullen. Given the previous presence of mining in the area and the scale of the current project, the project is considered to have a *medium* positive effect on sense of community, as outlined in **Table 5.9**.

Table 5.9 Summary of Project impact – Sense of Community

Project Aspect	Geographic scope	Stakeholders impacted	Perceived Stakeholder risk	Mitigated technical risk
Sense of Community	Local area	Local residents	High (positive)	Medium (positive)
	Lithgow LGA	Wider community		

5.5.1 Impacts to archaeological and historical heritage

As part of the EA for the Project an Aboriginal Cultural Heritage and Archaeology Assessment and a historic heritage assessment have been undertaken. A total of 6 identified Aboriginal archaeological sites are located in the Southern Extension Area and will be directly impacted by the Southern Extension Project. In addition the potential risks of indirect impacts to identified sites of archaeological / cultural significance (rock shelter located 1.1km from the Southern Extension Area) and / or cultural significance (pagoda structures in proximity to the Southern Extension Area) have been assessed, and with appropriate mitigation measures in place will not be impacted by the Southern Extension Project.

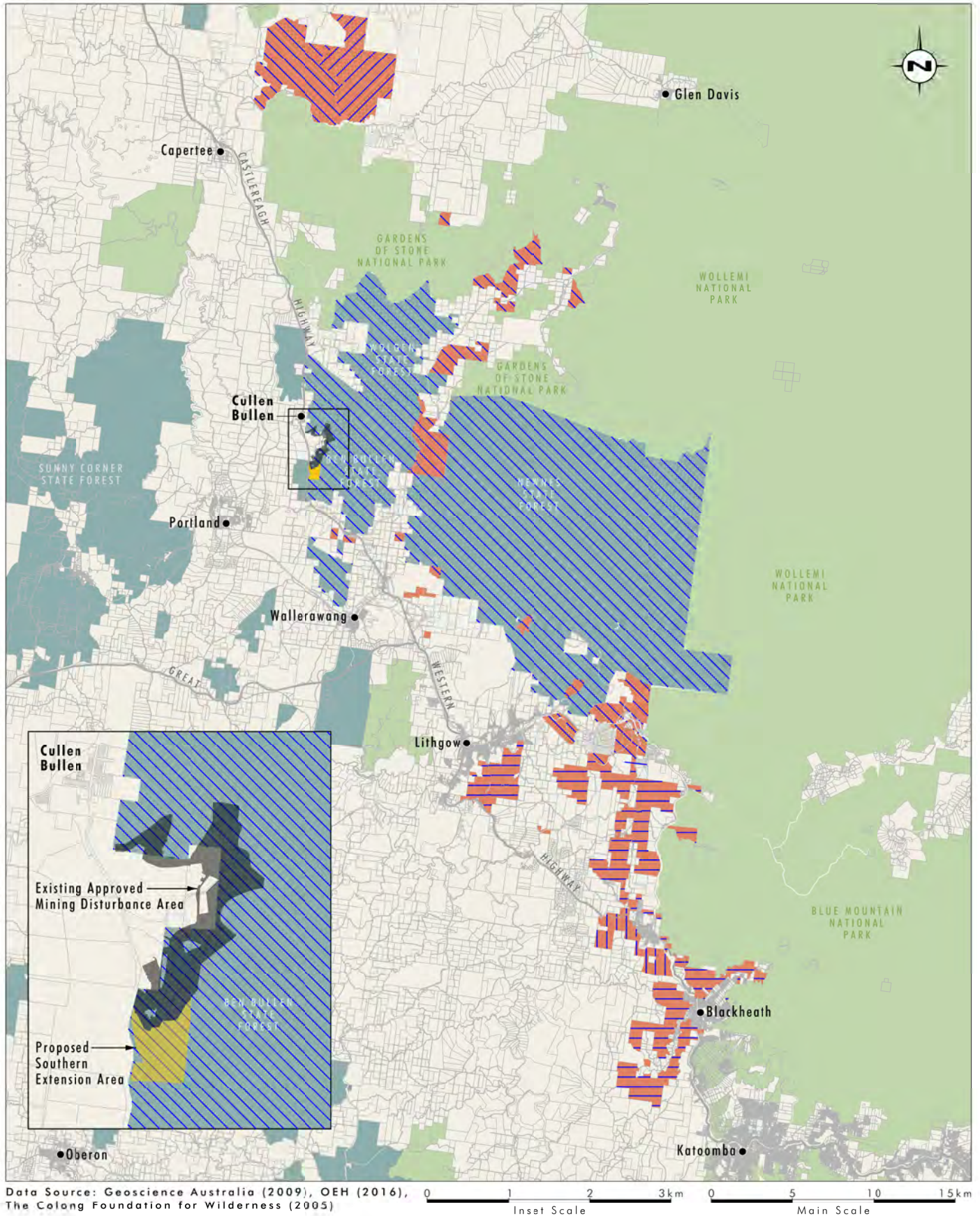
There are no historic heritage sites that will be directly impacted by the Southern Extension Project. Blasting will be managed to ensure that impacts from vibration and overpressure at historic heritage sites will not cause harm to these sites.

5.5.2 Impact on Recreational and Environmental Values

Engagement with state and regional recreation and environmental groups, as well as some residents, illustrated the high value placed on natural capital in Cullen Bullen and the Ben Bullen State Forest. Specifically, there was concern about the impact of the Project to the sandstone pagodas, and the flow-on effect that this might have on tourism and recreational use of these sites.

Environmental groups acknowledged the reduced scope of the project and efforts to minimise impacts. However, they highlighted that the location and mining method were at odds with their values and struggled to see the economic value of a short mine life in relation to the associated benefits and costs. Whilst recreation groups identified a varied membership base they highlighted a strong alignment with environmental values and sustainable practices.

Discussions with recreation (bushwalking) groups indicated that use of the area was moderate to high, with one group noting that there are up to three weekly walks (of approximately 20 people per walk) undertaken within 50 kilometres of the Project / pagoda's site; although it was noted that these walks tended to be within the Gardens of Stone National Park accessed via Ben Bullen rather than Cullen Bullen and were located approximately 10km from the Southern Extension Area itself. The other group was more conservative, identifying approximately 6-10 visits per year (approximately 12 people in each walking party), again predominately within the Gardens of Stone National Park. It is noted that the Southern Extension Area is located approximately 10km outside of the boundaries of the Gardens of Stone National Park (refer to **Figure 5.2** below).



Legend

- Existing Approved Mining Disturbance Area
- Proposed Southern Extension Area
- State Forest
- National Park
- Crown Land
- Proposed Extension to Gardens of Stone National Park

- Proposed Extension to Blue Mountain National Park
- Proposed Gardens of Stone State Conservation Area
- Proposed Western Escarpment State Conservation Area

FIGURE 5.2

Conservation Areas and
Gardens of Stone Stage 2 Proposal

Notwithstanding, it has been acknowledged throughout the EA, the importance of the pagoda structures in proximity to the Southern Extension Area. This has been acknowledged in the site selection for the Southern Extension Project in order to minimise potential impacts, and also through appropriate detailed project design and mitigation initiatives. This includes detailed assessment and implementation of initiatives such as appropriate blast design, commitment to establishing biodiversity offsets, and rehabilitation of the Invincible and the Southern Extension Area.

While it has been difficult to gather relevant tourism data specific to Cullen Bullen, analysis of data at the Lithgow LGA level indicates that tourism to the area is significant, given proximity to the Blue Mountains, with tourists drawn to the renowned natural assets of the area. Tourist statistics reflect around 451,000 total visitors yearly to the Lithgow LGA; with a total tourist spend of approximately \$79 million dollars per annum. Recreational groups acknowledged they spent little time in Cullen Bullen itself largely due to is limited facilities and restricted access. However, there was openness to visit should services become available. Most visits tended to be day trips only with occasional overnight stops outside of Cullen Bullen.

Irrespective of the economic value of tourism to the Lithgow LGA; the pagodas are a highly valued natural capital asset and an important geological feature within the region.

Locally, while there was acknowledgement of the appeal of the pagodas, they appeared to be accessed infrequently and not seen to hold great importance when compared to the development and associated benefits that the town require. Concern was also raised that stakeholder views from outside the area may be held in greater regard than local perspectives. Consequently, the perceived stakeholder risk has been ranked as *medium*.

In terms of the mitigated technical risk to such values, this has been ranked as *low*, given that the area's most frequently accessed by local groups are located in a radius of approximately 50 km or via Ben Bullen State Forest entry 10km from the Southern Extension Area.

There may, however, be opportunities for the recreational and environmental value of the area to be enhanced through the Project through contribution to tourism promotion (e.g. increase signage) and/or establishment of recreational facilities e.g. parking, development of rest/picnic areas etc. at key areas accessed by the public. Such strategies are further discussed in **Section 5.10**.

Table 5.10 Summary of Project impact – Recreational impact

Project Aspect	Geographic scope	Stakeholders impacted	Perceived Stakeholder risk	Mitigated technical risk
Recreational and Environmental Values	Local area Lithgow LGA NSW	Wider community	Medium	Low

5.6 Community sustainability

As defined by Hempel (1999), a sustainable community is one in which:

“...economic vitality, ecological integrity, civic democracy, and social well-being are linked in a complementary fashion, thereby fostering a high quality of life and a strong sense of reciprocal obligation among its members.”

Analysis conducted as part of the SIOA has indicated there is concern amongst residents from Cullen Bullen about the long term viability of the town due to a declining population, limited employment opportunities and reduced infrastructure provision. Interviews with local residents and landholders indicated that there is a view in the community that the re-establishment of Invincible may lead to both social and economic benefits for the Cullen Bullen community, such as local employment, an increase in population, increased service provision, and a general revitalising of the town.

The wider Lithgow LGA is considered to have a fairly sound level of community sustainability, although there has been a slight population decline and ageing of the population over the last ten years (ABS, 2011). As outlined in **Section 3.5.2**, the mining industry still plays a key role in the region, as mining is the highest industry of employment in the Lithgow LGA. Aside from mining, the Lithgow economy is also sustained through the tourism, health, retail trade and public administration industries (ABS, 2011). In addition, volunteering levels in the Lithgow LGA are higher than the state average, and mobility levels are lower than the state average. These statistics indicate that the community of Lithgow is reasonably sustainable.

Consequently, while the impact of the Project on community sustainability in the Lithgow LGA is minimal, this has been ranked as *low* in terms of the perceived stakeholder risk and mitigated technical risk. However, the perceived stakeholder impact of the Project on the sustainability of Cullen Bullen has been assessed as *high (positive)* due to the perceived associated benefits to Cullen Bullen such as employment and increased population. The mitigated technical risk has been assessed as *medium*.

Table 5.11 Summary of Project impact – Community sustainability

Project Aspect	Geographic scope	Stakeholders impacted	Perceived stakeholder risk	Mitigated technical risk
Community sustainability	Local area	Cullen Bullen	High (positive)	Medium (Positive)
		Lithgow LGA	Low	Low
		Regional stakeholders Wider community		

5.7 Impacts on Social Amenity

Social amenity is the inherent liveability or attractiveness of a social environment and is often a critical factor that affects people's quality of life. A number of Project aspects have been identified as potentially impacting social amenity, these include:

- Land management and future land use
- Noise impacts (including blasting)

- Traffic and road safety
- Air quality impacts (in particular dust emissions)
- Visual impacts
- Other environmental aspects.

5.7.1 Land management and future land use

Landholders identified rehabilitation as a key issue of concern, both with regard to the Cullen Valley Mine legacy rehabilitation (third most commonly identified concern by landholders) and rehabilitation of the Southern Extension Area post mining (fourth most commonly identified concern.)

With regard to the concern regarding the legacy issues of the rehabilitation of the Cullen Valley mine site, there were several key issues raised. Firstly, there were concerns about the quality of the rehabilitation conducted at the site, with some suggestion that the amount of topsoil placed on the site was inadequate making it difficult to grow substantial vegetation. Also, as previously outlined in **Section 4.1.1.2**, many landholders did not like that the extensive use of wattle for rehabilitation on the site, as it was felt that this planting was not in keeping with the natural environment of the area, which constitutes more substantial trees. The use of wattle was also considered to be a 'quick fix, demonstrating the need for improved communication and engagement with the community about the process of regeneration of plant life as part of land rehabilitation practice.

In addition, the spontaneous combustion that has occurred underground at the site was perceived to have created some issues in terms of odour and smoke, and it was felt that this had also hampered the rehabilitation of the Cullen Valley Mine site. There was concern that no one was taking responsibility for funding the current rehabilitation (including the perceived correction of existing rehabilitation) due to the former owner filing for bankruptcy. Given these issues, there were further concerns expressed as to how rehabilitation would be managed by Castlereagh Coal in relation to Invincible and the Southern Extension Project.

Due to the frequency of comments received regarding land management, this issue has been ranked as a *high* perceived stakeholder risk relating to the Project.

A Site Verification certificate, which confirms that the land is not classified as Strategic Agricultural Land was issued for the parts of the Southern Extension Area which are not subject to a surface mining lease in 2014. As part of the Southern Extension Project, rehabilitation will be undertaken progressively over the life of the Southern Extension Project to achieve a free draining final land form consisting of woodland and forest communities representative of the surrounding area. As detailed in Section 6.19 of the EA, the revegetation of this area will utilise natural succession processes. This includes stages where a range of fast growing pioneer species, such as wattles, can dominate the landscape. This is a temporary, but necessary aspect of establishing functioning native vegetation communities in the medium to long term. Moreover, Castlereagh Coal will commit to the establishment of an ongoing monitoring program designed to track progress to achieving the desire final land use against a number of performance criteria. This program will be defined in management plans required under the Project Approval and the Mining Operations Plan (MOP) for Invincible and will therefore be regulated by relevant agencies over the life of the Southern Extension Project. On this basis, the technical risk to current land management is considered to be *low*.

Table 5.12 Summary of Project impacts – Land use and management

Project Aspect	Geographic scope	Stakeholders impacted	Perceived Stakeholder risk	Mitigated technical risk
Land management and future land use	Local area Lithgow LGA	Local Landholders and other Land users Regional stakeholders	High	Low

5.7.2 Blasting

Blasting was identified as a key concern in regard to the Project, with the major concern identified as structural damage to residences, given previously perceived impacts of blasting from the site during past operations. Consequently, the overall perceived impact of blasting from a stakeholder perspective is rated as *medium*.

A technical blasting report prepared for the EA has used a ground vibration and blast overpressure (also sometimes referred to as air blast) predictive model to assess the impact of proposed blasting on a range of receptors, including local residences. The report found that:

- Modelling of the ground vibration impacts for the residential receivers confirmed that vibration impacts can be managed effectively within the specified blasting parameters. The estimated vibration exposure for all residential receivers within a 3 km radius (for the specified blast design parameters) is predicted to be in the range of 0.1 to 4.6 mm/s, which is below the applicable vibration limit of 5 mm/s. Impacts beyond the 3 km radius are considered negligible.
- The air blast modelling for the private residential receivers within a 1 km radius (ID 394 at 820m) identified that air blast impacts can be managed effectively below the applicable limits of 115 dBL (for 95% of blasts) and 120 dBL (not to be exceeded), by the application of lower charge masses. The estimated air blast exposure within a 1 to 3 km radius (for the specified blast design parameters) is predicted to be in the range of 89 to 112 dBL. Impacts beyond the 3 km radius are considered negligible (i.e. below 100 dBL).

In terms of the impact on public infrastructure:

- The modelling confirmed that vibration impact on the closest public roadway, Castlereagh Highway (located a minimum of approximately 30 m from the pit boundary), can be managed effectively below the applicable vibration limit of 100 mm/s via the application of lower charge masses.
- Boulder Road and the concrete overpass bridge will be exposed to vibration levels no higher than 2 mm/s. This is well below the vibration criteria for public roads and bridges of 100 mm/s.
- Ground vibration modelling for the 11 kV powerline revealed that the ground vibration impact can be managed effectively below the applicable vibration limit criteria of 50 and 100 mm/s (for tension and transmission towers respectively) via the application of lower charge masses.

A technical blasting report was also prepared for the EA with regard to the impact on the sandstone pagodas. The findings were that:

- The expected vibration exposure for the sandstone pagodas located between 210 and 370 metres from the Southern Extension Area is no higher than 36 mm/s. This is below the assessment criteria of 50 mm/s.
- The modelling confirmed that the vibration exposure for the cliffline can be managed effectively below the applicable assessment criteria of 25 mm/s via the application of lower charge masses.

For further detail refer to Section 6.9 of the EA.

Table 5.13 Summary of Southern Extension Project impact - blasting

Project Aspect	Geographic scope	Stakeholders impacted	Perceived Stakeholder risk	Mitigated technical risk
Blasting - impact on social amenity	Cullen Bullen	Local residents	Medium	Low- Pagodas and clifflines
				Low – Local residences

5.7.3 Traffic and road safety

A number of perceived issues with regard to traffic and road safety were raised by landholders, with the two most commonly raised issues including mud from truck tyres and the issue of the transport route used by trucks when travelling to and from Invincible.

In relation to mud from truck tyres, there was concern that the mud left on roads could create dangerous driving conditions for residents, and it was suggested that this could easily be avoided by using a truck tyre wash.

In terms of the traffic route, there was concern that the Southern Extension Project may lead to an increase of trucks using a traffic route directly through the township, causing traffic congestion, damage to roads and safety issues (e.g. hazards for school children given the school is located on the main road). Two landholders specifically noted concern about poor driver behaviour as a risk to school aged children. As a result, this impact has been ranked as *medium* from a perceived stakeholder perspective.

As part of the EA, a technical assessment of the impact of the Southern Extension Project on traffic on the road network was undertaken. The assessment found that the existing road network, including principal intersections adjacent to the Southern Extension Area, is constructed to a high standard and can accommodate the expected employee and coal truck trips generated by the Southern Extension Project. The assessment of the traffic impacts of the Southern Extension Project has concluded that these impacts will be satisfactory and no mitigation measures are required.

All coal truck movements to and from Invincible will be to south of the current access road which will not involve travelling through Cullen Bullen. It is acknowledged that heavy vehicle movements associated with deliveries and other intermittent activities may access Invincible from the north and therefore require travel through Cullen Bullen. In addition, as part of the traffic assessment it has been assumed that approximately 25% of employee related (light vehicle) traffic will access the site from the north either

travelling from or through Cullen Bullen. As part of the Southern Extension Project, Castlereagh Coal will ensure all employees and drivers are appropriately trained in road safety awareness.

In recognition of the issue of tyre mud on the Castlereagh Highway, Castlereagh Coal will maintain the existing commitment and requirement under the Project Approval to operating appropriate wheel wash facilities on site as part of the Southern Extension Project.

As discussed in **Section 5.7.2**, blasting as part of the Southern Extension Project will be managed to comply with the relevant criteria so that no damage occurs to the Castlereagh Highway or other public roads. To manage safety risks associate with fly rock, the Southern Extension Project will require periodic closures of the Castlereagh Highway due to blasting near the road. Road closure periods are typically in the order of 15 minutes in duration and the Project will involve no more than 5 blasts per week (averaged over the year) and no more than two blasts per day.

Blasting at Invincible is restricted to 9.00 am to 5.00 pm Monday to Saturday. Accordingly, road closures associated with blasting do not coincide with the morning (8.00 am to 9.00 am) traffic peak and will not impact on commuters travelling home after 5.00 pm.

The existing Road Closure Management Plan will be updated for the Southern Extension Project in consultation with the RMS and Lithgow Council. Planned road closure times will be notified on the existing blast notification signs to on Castlereagh Highway. The blast schedule will also be provided to local emergency services and contact details will be provided to these services to enable blasts to be delayed or rescheduled if emergency access along the Castlereagh Highway is required during a scheduled blast. The blast schedule will also be published on the Castlereagh Coal website to enable road users to plan trips to avoid delays associated with road closures.

Shoalhaven Coal will also manage truck haulage times to minimise traffic impacts associated with truck queuing following road closures.

As a result, the technical risk of traffic associated with the Southern Extension Project has been ranked as *low*.

Table 5.14 Summary of Southern Extension Project impact – traffic

Southern Extension Project Aspect	Geographic scope	Stakeholders potentially impacted	Perceived Stakeholder risk	Mitigated technical risk
Traffic – impacts on social amenity and safety	Lithgow LGA and local area	Local residents Travellers	Medium	Low

5.7.4 Air quality

While air quality (dust) was identified as an issue of concern, it was only identified by a small number of landholders (five in total). Specific concerns related to health impacts associated with dust. Given the lack of response frequency for this issue, air quality has been ranked as a *low* impact from a stakeholder perspective.

Outcomes of the air quality assessment concluded that air quality impacts were below EPA criteria based on model predictions; and therefore the Southern Extension Project will not cause adverse air quality impacts at any off-site sensitive receptor location.

Emissions from diesel exhausts, associated with off-road vehicles and equipment, were also investigated with modelled levels demonstrated compliance with air quality criteria. Consequently, the technical risk associated with air quality in relation to the Southern Extension Project, has been ranked as *low*.

Table 5.15 Summary of Southern Extension Project impact – air quality

Southern Extension Project Aspect	Geographic scope	Stakeholders impacted	Perceived Stakeholder risk	Mitigated technical risk
Dust emissions – impact on social amenity	Local area	Local residents	Low	Low

5.7.5 Visual impacts

Impacts to visual amenity were raised by only a small number of landholders (four in total), and largely related to concerns about the effect of open cut mining on the landscape, with references to the legacy issues association with the Cullen Valley Mine and Invincible. As a result, the perceived stakeholder risk to visual amenity has been ranked as *low*.

A visual assessment was conducted which found that areas of the existing Invincible site and the Southern Extension Area can be viewed by passing traffic on the Castlereagh Highway. In addition views of the Southern Extension Project will be possible from elevated areas of the adjacent Ben Bullen State Forest, which is consistent with views of the existing Invincible mine site at this location. The Southern Extension Project will not be seen from surrounding private residences due to the effect of local topography and vegetation screening in the local area (see Section 6.13 of the EA for further details). Consequently, the technical risk in terms of the visual impact of the Southern Extension Project has been rated as *low*.

Table 5.16 Summary of Southern Extension Project impact – visual amenity

Southern Extension Project Aspect	Geographic scope	Stakeholders potentially impacted	Perceived Stakeholder risk	Mitigated technical risk
Visual changes – impacts to social amenity	Lithgow LGA	Local residents and Commuters	Low	Low

5.7.6 Noise

While noise was a perceived impact of the Southern Extension Project, again the frequency of response was low (being noted by only three landholders). Perceived impacts with regard to noise related to general operational noise and concerns about extended hours of mine operation. Given these views, this impact has been ranked as *low* from a perceived stakeholder perspective.

A detailed noise impact assessment (NIA) was completed for the Southern Extension Project. The NIA included the establishment of relevant noise criteria, assessment of the local meteorological conditions and modelling of worst case operational and production scenarios for the Southern Extension Project, in accordance with the NSW *Draft Industrial Noise Guideline* (Draft ING), (EPA 2015). Reasonable and feasible noise mitigation measures have been incorporated into the Southern Extension Project in order to minimise environmental noise.

During the daytime period, the Southern Extension Project will achieve the daytime criteria at all residential receiver locations except at one residence. Under the *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (2014) (VLAMP) this residence 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. Castlereagh Coal may negotiate an alternative agreement with the property owner.

The Southern Extension Project will not however trigger voluntary property acquisition. The property where mitigation measures are required currently has land acquisition rights under the existing Invincible Project Approval. Accordingly the noise impacts associated with the Southern Extension Project is a reduction on the noise impacts associated with the existing approved Invincible operations.

During the evening period the Southern Extension Project will achieve the evening criteria at all residential receiver locations.

A conservative cumulative noise assessment for the areas surrounding the Southern Extension Project also indicated that the cumulative noise impact assessment criteria will not be exceeded, as a result of the Southern Extension Project and relevant surrounding industrial noise sources.

Similarly, given that most of the mine infrastructure is in place; construction activities are expected to be limited and are expected to comply with the relevant construction noise criteria.

Therefore, the technical risk of noise for residences has been assessed as *low*.

Table 5.17 Summary of Southern Extension Project impact – noise

Southern Extension Project Aspect	Geographic scope	Stakeholders potentially impacted	Perceived Stakeholder risk	Mitigated technical risk
Noise emissions – impact on social amenity	Local area	Local residents	Low	Low

5.8 Other environmental aspects

A range of other environmental aspects are also considered within the broader EA. These include potential impacts to surface and groundwater, biodiversity, and greenhouse gases and climate change. Issues relating to these aspects of the Southern Extension Project were also discussed during landholder interviews. The relevance of each of these aspects is summarised below.

5.8.1 Water

No stakeholder concerns were raised regarding the impact of the Southern Extension Project on water resources. Technical assessments of surface and groundwater systems were conducted as part of the EA, with the report indicating that water resources can be appropriately managed through the Southern Extension Project.

Consequently, water has been ranked as both a *low* perceived stakeholder issue and a *low* technical risk.

5.8.2 Biodiversity

Engagement with landholders did not identify any major concerns regarding biodiversity as a result of the Southern Extension Project. When ecology or biodiversity was raised by landholders it was usually discussed in the context of an overall need to have respect for the natural environment and in relation to concerns about general environmental degradation, land management and rehabilitation of the post mining landscape. Consequently, biodiversity has been ranked as a *low* perceived stakeholder risk.

From a technical perspective the potential impacts on biodiversity have been appropriately assessed and managed in accordance with the Framework for Biodiversity Assessment (FBA) for major mining projects. In accordance with the FBA, Castlereaugh Coal have committed to implementing a Biodiversity Offset Strategy to capture the required credits to effectively offset the residential impacts of the Southern Extension Project on biodiversity.

5.8.3 Greenhouse gases

Climate change and greenhouse gases were not widely discussed during stakeholder consultations, with neighbouring landholders not raising this issue. Accordingly, greenhouse gas has been ranked as a *low* stakeholder perceived risk.

It is noted, however, that the Southern Extension Project is situated within the context of ongoing wider concern regarding greenhouse gas emissions and the link to climate change, with a key focus on new and/or expanding coal mining operations. Regardless, the greenhouse gas assessment for the Southern Extension Project identifies that the greenhouse gases associated with the Southern Extension Project are unlikely to significantly affect Australia's ongoing commitment to reduction in emissions over the medium to long term.

Table 5.18 Summary of Southern Extension Project impact – other environment aspects

Southern Extension Project Aspect	Geographic scope	Stakeholders potentially impacted	Perceived stakeholder risk	Mitigated technical risk
Impact on Ecological values	Local area Lithgow LGA	Local residents Regional stakeholders Environmental NGOs Government agencies	Low	Low
Impact on Water (ground and surface)	Local area Lithgow LGA	Local residents Water users Wider community	Low	Low
Greenhouse gases	Global	Residents Business Government	Low	Low

5.9 Social Impact and Opportunity Assessment Summary

The social risks assessed in the above sections are summarised in **Table 5.19**, which outlines the Southern Extension Project aspect, geographic scope, potentially impacted stakeholders and mitigated technical risk for each assessed Southern Extension Project risk factor. It is noted that one private resident falls within a noise management zone, which is a reduction in noise impacts relative to the previously approved Invincible operations. The analysis in **Table 5.19** focuses on the impacts on the community excluding this resident.

Table 5.19 Summary of Southern Extension Project impacts

Southern Extension Project Aspect	Geographic scope	Stakeholders impacted	Perceived Stakeholder risk	Mitigated technical risk
Population Change	Lithgow LGA Wider region	Local residents Regional stakeholders	High (positive)	Low
Housing and Infrastructure	Lithgow LGA Wider region	Local residents Regional stakeholders	Low	Low
Economic Impacts	Local area Lithgow LGA Wider region	Local residents Regional stakeholders	High (positive)	Low
Sense of Community	Local area Lithgow LGA	Local residents Wider community	High (positive)	Medium (positive)
Recreational and Environmental Values	Local area Lithgow LGA NSW	Wider community	Medium	Low
Community sustainability	Local area	Local residents	High (positive)	Medium (Positive)
	Lithgow LGA	Regional stakeholders Wider community	Low	Low
Land management and future land use	Local area Lithgow LGA	Local Landholders and other Land users Regional stakeholders	High	Low
Blasting - impact on social amenity	Cullen Bullen	Local residents	Medium	Low- Pagodas

Southern Extension Project Aspect	Geographic scope	Stakeholders impacted	Perceived Stakeholder risk	Mitigated technical risk
				Low – Local residences
Traffic – impacts on social amenity and safety	Lithgow LGA and local area	Local residents Travellers	Medium	Low
Dust emissions – impact on social amenity	Local area	Local residents	Low	Low
Visual changes – impacts to social amenity	Lithgow LGA	Local residents and Commuters	Low	Low
Noise emissions – impact on social amenity	Local area	Local residents	Low	Low
Impact on Ecological values	Local area Lithgow LGA	Local residents Regional stakeholders Environmental NGOs Government agencies	Low	Low
Impact on Water (ground and surface)	Local area Lithgow LGA	Local residents Water users Wider community	Low	Low
Greenhouse gases	Global	Residents Business Government	Low	Low

5.10 Management and Mitigation

This section provides a summary of the predicted social impacts / risks associated with the Southern Extension Project, in particular those that have been rated as a medium (or greater) impact in **Section 5.9**.

Table 5.20 summarises the key strategies that are recommended for Castlereagh Coal to implement, in order to address negative impacts or enhance the positive impacts associated with the Southern Extension Project.

Table 5.20 Strategies to address key impacts associated with the Southern Extension Project.

Impact / Opportunity area	Strategies
Population	Increase to population is seen as a positive impact of the Southern Extension Project. It is recommended that Castlereagh Coal make a commitment to either of the following scenarios: Scenario 1 – all workers absorbed from the local area Scenario 2 – 80% absorbed from the local region, 20% influx from outside the region To compliment these scenarios the following strategies are also recommended: • Develop a mechanism for locals to register their interest in employment opportunities • Develop a ‘green skins’ training program for those without prior mining experience • Identify apprenticeship opportunities for both mining and processing roles. Encourage those from outside the area to reside locally via an Employee Recruitment Policy
Economic	The economic contribution is seen as a positive impact of the Southern Extension Project. It is recommended that where possible Castlereagh Coal support local business by: • Identifying local suppliers and services providers • Hosting an information session to outline company needs and procurement processes • Where possible using local and regional suppliers.
Sense of Community	The Southern Extension Project was seen as a positive impact on the sense of community. It is recommended that Castlereagh Coal: • Focus and invest in local employment • Maximise local and regional spend • Engage regularly with the CCC and community to ensure sense of community is maintained e.g. quiet and peaceful • Contribute to local community initiatives via their community investment program.
Recreational and Environmental Values	The scope of the Southern Extension Project has taken into account issues raised in previous applications including: • site selection and mine planning to avoid areas of higher biodiversity value • minimising potential impacts on threatened species habitat through set backs from pagodas • size of blasts designed to avoid impacts on pagodas • offsetting residual biodiversity impacts in accordance with the NSW Framework for Biodiversity Assessment. In addition to these considerations is it recommended that Castlereagh Coal provide environment groups and recreation groups with regular updates regarding proposed mining activities that may impact on access to parts of Ben Bullen State Forest. This engagement would include notification of the proposed blast schedule and associated exclusion zones and periods.
Community sustainability	Given the local impacts of the Southern Extension Project, further management measures will be focussed on the Cullen Bullen community

Impact / Opportunity area	Strategies
Land management and future land use	A number of plans apply including the Landscape Management Plan and the Rehabilitation Strategy (refer to 6.19 of the EA). In addition there will be: • No final voids • Disturbed areas will be revegetated using local endemic species. Ongoing review of planting mixes including consideration of percentages of acacia species or increased percentages of other potential pioneer species which can be used in the rehabilitation seed mix. In addition it is recommended that site visits are undertaken regularly by the CCC and general community to track project progress and inform the community of the key stages of rehabilitation of the site.
Blasting - impact on social amenity	A series of onsite and other management protocols will be observed as per Appendix 10 of the EA. In addition to these, management practices that may impact the general community will include periodic road closures as discussed within Section 6.9 of the EA. Blasting will be limited to 9.00 to 5.00 pm Monday to Saturday. No more than 2 blasts per day and 5 per week averaged over 12 months. Castlereagh Coal will offer all private landholders located within two kilometres of the Southern Extension Area a property inspection prior to the commencement of blasting for the Southern Extension Project in order to establish the condition of private structures. Castlereagh Coal have also committed to implement a blast notification process so that the community can stay informed of upcoming blasts, this will include emergency services. In addition to the notification process it is strongly recommended that signage be placed at locations that enable traffic to detour prior to the closed road.
Traffic – impacts on social amenity and safety	A series of management protocols will be observed as per Appendix 13 of the EA in conjunction with Public Safety commitments. In addition to these, in accordance with existing Invinible Project Approval requirements, Castlereagh Coal will maintain the use of a wheel wash for trucks to reduce mud on the highway. Employee traffic will be dependent upon their place of residence, however driver education will be included as part of a broader safety program.

A number of opportunities exist that may have positive benefits to Cullen Bullen and other local communities surrounding the Southern Extension Project (refer to **Section 4.1.1.3** for further detail). Areas where Castlereagh Coal has an opportunity to directly or indirectly contribute are set out in **Table 5.21**. Not all of these opportunities can be delivered by Castlereagh Coal, nor is it Castlereagh Coal's responsibility to deliver services which are within the control of other organisations. However there remain avenues for Castlereagh Coal to either directly contribute or to engage with other stakeholders who have control over the delivery of services to assist in these opportunities being realised.

Table 5.21 Areas of Community Contribution Opportunity

Opportunity	Level of Control	Mechanism for evaluation
Encouragement of incoming workforce to settle in Cullen Bullen	Direct	Employee recruitment policy which gives priority to employment of people living in Cullen Bullen.
Youth services, such as sports and school programs	Direct	Castlereagh Coal community investment and involvement program.
Ongoing engagement and support of Cullen Bullen Primary School	Direct	Castlereagh Coal community investment and involvement program.
Additional community service infrastructure and facilities, including measures such as sewer line connection, provision of a general store, post office and other community services	Indirect	Liaise with Council regarding opportunities for VPA or other Council funds to be directed to these opportunities.
Installation of footpaths in Cullen Bullen	Indirect	Liaise with Council regarding opportunities for VPA or other Council funds to be directed to these opportunities.
Repair and beautification of town and park. This could include the establishment of a rest / picnic area for tourists.	Indirect	Liaise with Council regarding opportunities for VPA or other Council funds to be directed to these opportunities.

6.0 Monitoring and Evaluation

A key aspect of any social impact assessment is the development of a framework to monitor a project's impact over time – often referred to as a social impact management plan. Castlereagh Coal will collect social data to monitor commitments made in the social impact assessment namely:

- Key areas of predicted Southern Extension Project impact, including perceived and experienced social impacts, through consultation with neighbouring and other nearby landowners, to monitor if experienced impacts are in line with predicted impacts
- Evaluation of actions and investments to assess the outcomes of key projects and programs arising from:
 - o Commitments made within this SIOA
 - o Any wider community development or partnership programs at an operational or corporate level
 - o Voluntary Planning Agreement (VPA) for the Southern Extension Project.
- Development of a program for monitoring any other social impacts predicted in the current assessment and identification and management of any unforeseen social impacts, should they occur
- Consideration of SIOA outcomes in the preparation of the site specific engagement strategy so that relevant stakeholders, including neighbouring and nearby landholders, are properly informed regarding current and future operations.

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