APPENDIX N

Noise and vibration assessment

Cobbora Holding Company Pty Limited

EMM EMGA Mitchell McLennan

Noise and vibration assessment

Cobbora Coal Project

Prepared for Cobbora Holding Company Pty Limited | 17 September 2012

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Noise and vibration assessment

Final

Report J11030RP15 | Prepared for Cobbora Holding Company Pty Limited | 17 September 2012

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Executive Summary

ES1 Introduction

EMGA Mitchell McLennan Pty Limited (EMM) has completed a noise and vibration assessment of emissions associated with the proposed Cobbora Coal Project (the Project). The Project is an open-cut coal mine proposed by Cobbora Holding Company Pty Limited (CHC) near Cobbora in the central west of New South Wales (NSW).

The assessment considered the following noise-related aspects of the Project:

- operations noise;
- sleep disturbance;
- construction related noise;
- traffic noise generated by the Project;
- offsite rail noise emissions; and
- blasting overpressure and vibration.

The assessment has been undertaken in accordance with the following policies and guidelines:

- Environment Protection Authority (EPA) 2000, *NSW Industrial Noise Policy*;
- NSW EPA 2011, *Road Noise Policy (RNP)*;
- EPA and Department of Planning and Infrastructure (DP&I) joint document 2007, *The Interim Guideline for Assessment of Noise from Rail Infrastructure Projects*;
- EPA February 2006, *Assessing Vibration: A Technical Guideline;*
- Australian and New Zealand Environment Conservation Council (ANZECC) 1990; *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration;* and
- DECC 2009, *Interim Construction Noise Guideline (ICNG)*.

The following provides a summary of CHC mitigation and management commitments based on outcomes of the noise and blasting impact assessment:

- CHC has comprehensively modelled noise and has, or will, either acquire properties or reach noise amenity agreements to achieve relevant EPA criteria;
- CHC will mitigate noise along the rail spur with acoustic barriers to achieve EPA criteria at two privately-owned homes where the owners do not want to sell or enter into amenity agreements;
- management plans will reduce noise during adverse wind or weather conditions;
- CHC will fit equipment with contemporary noise suppression measures;

- CHC will conduct regular compliance noise monitoring which will provide input to adaptive management strategies;
- infrastructure has been centralised to minimise offsite effects;
- CHC will work with ARTC and affected residents to assess and mitigate any significant impacts along the Tallawang to Ulan section of the railway;
- rail noise impacts will continue to be managed along the entire rail transport route according to ARTC and RailCorp Environmental Protection Licences; and
- CHC has, or will, buy properties or reach amenity agreements with all willing landowners along the on-site spur line if EPA noise criteria are exceeded.

ES1.1 Overview of noise and blasting impact assessment

ES1.1.1 Operations

The operations noise assessment indicates that during adverse weather conditions for the day, evening and night assessment periods, for all stages of the mining life, eight privately owned residential receptors are predicted to experience noise levels above the *Industrial Noise Policy* strict operational criteria of 35 dB(A). Three additional privately owned residential receptors are predicted to experience noise levels above the typical acquisition criterion of 40 dB(A). Two of the 11 exceedances above the PSNL are directly attributable to mining extraction operations, nine exceedances are attributable to the rail spur with six maximum and three planned train movements per night. CHC will either acquire these properties or enter into amenity agreements acceptable to the landholders. CHC is committed to implementing reasonable and feasible mitigation measures if agreements cannot be reached.

The vacant land assessment has identified that seven private land holders own 43 of the vacant land parcels that fall into the acquisition criteria over the life of the Project. CHC has entered into discussions with the seven owners with a view to acquisition.

The assessment of low frequency noise demonstrates that all privately owned receptors satisfy current guidelines.

ES1.1.2 Sleep disturbance

Potential sleep disturbance impacts from operational maximum noise level events have been assessed and are expected to satisfy EPA criteria for the majority of private receptors. Noise modelling identified L_{max} noise levels associated with the rail spur to be above the strict sleep disturbance criteria at several receptors. Despite this, L_{max} noise levels from the rail spur remain below levels that are likely to awaken occupants based on well known international research (WHO, 1999) on sleep disturbance, provided in the EPA's Road Noise Policy (RNP). CHC is however committed to providing acoustic barriers, acoustic treatment of dwellings, acquiring properties or entering into amenity agreements with private owners where sleep disturbance are predicted to be exceeded.

ES1.1.3 Construction

Construction noise is expected to be greatest at receptors situated on land owned by CHC. Despite this, noise levels during construction will remain below the EPA's highly affected criteria of 75 dB(A) at all receptors. Noise management measures including the completion of a construction noise and vibration management plan (CNVMP) will be implemented to minimise construction noise impacts on the surrounding community.

ES1.1.4 Road traffic

Road traffic noise generated from the Project's operations and construction is expected to comply with the EPA's RNP for privately owned receptors.

ES1.1.5 Offsite rail traffic

Offsite planned train movements on the main line from the Cobbora spur to Ulan are predicted to satisfy the relevant daytime noise criteria at all receptors. The night L_{eq} criteria would be satisfied at all but six receptors that are situated within 30 m of the track during the planned train movement scenario. The L_{max} criteria (day and night) would be satisfied at all but two receptors that are situated within 25 m of the track.

For the Bylong-Mangoola line the daytime criterion would be met for receptors at distances 25 m (and greater) from the track, the night L_{eq} criterion will be met for noise receptors 80 m (and greater) from the track and L_{max} criterion (day and night) will be met for noise receptors situated 25 m (and greater) from the track.

For the Bengalla-Muswellbrook line the daytime criterion will be met for all noise receptors at distances 40 m (and greater) from the track, the night L_{eq} criterion will be met for noise receptors 140 m (and greater) from the track and the L_{max} criterion (day and night) will be met for noise receptors situated 25 m (and greater) from the railway.

Noise mitigation options have been provided in this report such as barriers, acoustic treatment of dwellings and provision of ventilation to dwellings.

ES1.1.6 Blasting

Calculated blast overpressure and vibration levels identify that a Maximum Instantaneous Charge (MIC) of 1,500 kg would satisfy the airblast overpressure criteria of 115 dB (L_{peak}) and ground vibration criteria of 5 mm/s at the minimum distance of 1,250 m. It is noted that for blasts with a maximum instantaneous charge (MIC) of 3,500 kg, there is one privately owned receptor within the required 1,650 m minimum distance (receptor 3177). Therefore the lower MIC should be adopted for blasting when within 1,650 m of this receptor or the proposed MIC blast patterns should be designed specifically to meet the relevant ANZECC guidelines at this receptor.

Several heritage receptors including Laheys Creek cemetery, the Potential Cobb and Co stopping place and the Brick clamp are within the required 700 m minimum distance for blasts with an MIC of 3,500 kg. Of these only the Laheys Creek cemetery contains vibration sensitive items (grave stones), the Potential Cobb and Co stopping place and the Brick clamp do not contain structures or vibration sensitive items. Notwithstanding, proposed MIC blast patterns should be designed specifically to meet the relevant structural criteria at heritage receptors that contain structures or items that may be sensitive to blast vibration.

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B Sound power levels

C Wind roses

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Abbreviations

Abbreviation or term	Definition
ABL	The assessment background level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Amenity criteria	The amenity criteria relate to existing industrial noise. Where industrial noise approaches base amenity criteria, then noise levels from new industries need demonstrate that they will not be an additional contributor to existing industrial noise. See Section 2.1.2 for more detail.
ANZECC	Australian and New Zealand Environment Conservation Council
CHC	Cobbora Holding Company Pty Limited
CNMP	Construction noise management plan
Day period[1]	Monday–Saturday: 7.00 am to 6.00 pm, on Sundays and public holidays: 8.00 am to 6.00 pm.
dB(A)	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
DGRs	Director General environmental assessment requirements
DP&I	Department of Planning and Infrastructure
EA	Environmental assessment
EMM	EMGA Mitchell McLennan Pty Limited
EP&A Act	*Environmental and Planning Assessment Act 1979* (NSW)
Evening period[1]	Monday–Saturday: 6.00 pm to 10.00 pm, on Sundays and public holidays: 6.00 pm to 10.00 pm.
ICNG	Interim Construction Noise Guideline
IGANRIP	Interim Guideline for Assessment of Noise from Rail Infrastructure Projects
INP	Industrial Noise Policy
Intrusive criteria	The intrusive criteria refers to noise that intrudes above the background level by more than 5 dB. The intrusiveness criterion is described in detail in Section 2.1.1.
L_1	The noise level exceeded for 1% of the time.
L_{10}	The noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level.
L_{90}	The noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
L_{eq}	The energy average noise from a source. This is the equivalent continuous sound pressure level over a given period. The $L_{eq(15min)}$ descriptor refers to an L_{eq} noise level measured over a 15-minute period.
Linear peak	The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.
L_{max}	The maximum sound pressure level received during a measuring interval.
Night period[1]	Monday–Saturday: 10.00 pm to 7.00 am, on Sundays and public holidays: 10.00 pm to 8.00 am.
NMP	Noise management plan
EPA	The NSW Environmental Protection Authority (formerly the Environment Protection Authority and the Department of Environment, Climate Change and Water).

Abbreviation or term	Definition
PSNL	The project-specific noise levels (PSNL) are criteria for a particular industrial noise source or industry. The PSNL is the lower of either the intrusive criteria or amenity criteria.
RBL	The rating background level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the average background levels.
RNP	Road Noise Policy
Sound power level (Lw)	A measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.
the Project	Cobbora Coal Project
Vibration	A motion that can be measured in terms of its displacement, velocity or acceleration. The common unit for velocity is millimetres per second (mm/s).

Note: 1. Excludes road traffic noise where Day: 07.00 am to 10.00 pm; Night: 10.00 pm to 07.00 am.

1 Introduction

EMGA Mitchell McLennan Pty Limited (EMM) has been commissioned by Cobbora Holding Company Pty Limited (CHC) to undertake a noise and vibration assessment for the proposed Cobbora Coal Project (the Project).

The Project is an open-cut coal mine that will be developed near Dunedoo in the central west of New South Wales (NSW). The Project Application Area (PAA) is approximately 274 square kilometres (km^2). The primary purpose of the Project is to provide coal for five major NSW power stations.

The mine will extract 20 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal, of which 9.5 Mtpa of product coal will be sold to Macquarie Generation, Origin Energy and Delta Electricity under long-term contract. Some 2.5 Mtpa will also be produced for export or for the spot domestic market.

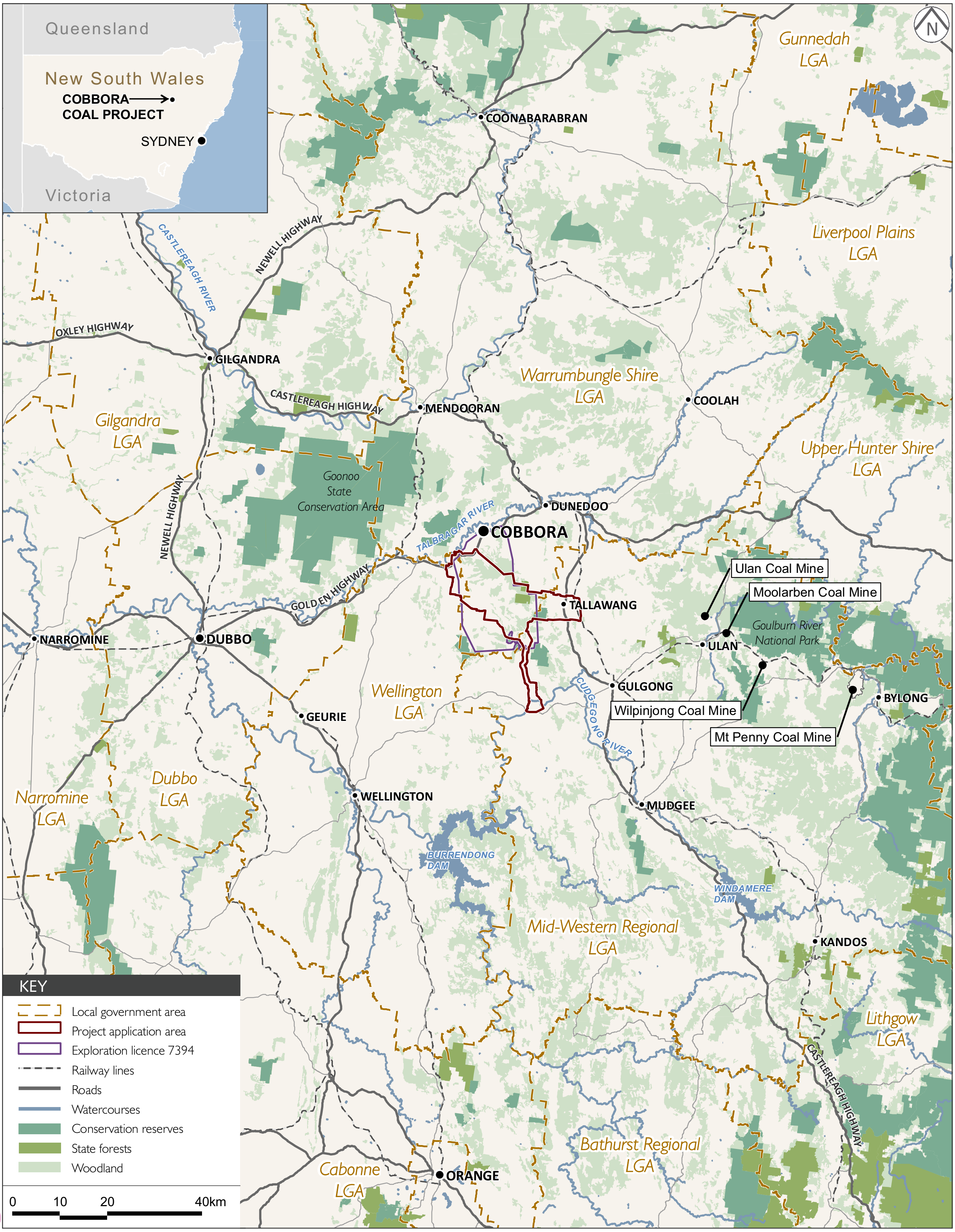
The Project is located 5 km south of Cobbora (see Figure 1.1), 22 km south-west of Dunedoo, 64 km north-west of Mudgee and 60 km east of Dubbo in the central west of NSW.

The Project's key elements are:

- an open-cut mine;
- a coal handling and preparation plant (CHPP);
- a train loading facility and rail spur;
- a mine infrastructure area; and
- supporting infrastructure, including access roads; water supply and storage; and electricity supply.

It is envisaged that construction activities will commence in mid-2013, with coal supplied to customers from the second half of 2015. The mine life will be 21 years.

A Major Project application under Part 3A of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) was submitted to the NSW Department of Planning on 5 January 2010 (application number MP 10_0001). The Director General's environmental assessment requirements (DGRs) for the Project were issued on 4 March 2010. In response to changes in the proposed Project and government assessment requirements, revised DGRs were issued for the Project on 23 December 2011.



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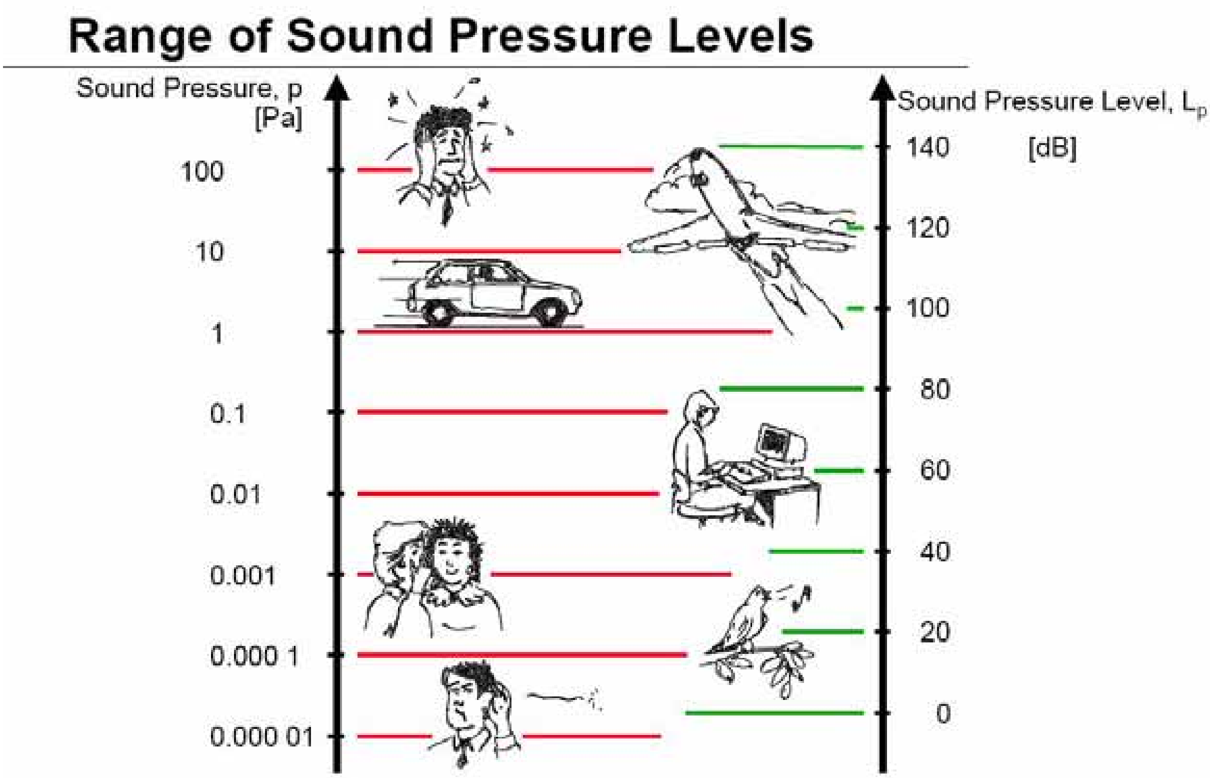
Local Government Areas

Cobbora Coal Project - Noise Assessment

Figure 1.1

1.1 Common noise levels

Examples of common noise levels encountered on a daily basis are provided in Figure 1.2.



Source: Basic concepts of sound (Brüel and Kjær 1998)

Figure 1.2 Common Noise Levels

It is useful to have an appreciation of decibels, the unit of noise measurement. Table 1.1 gives some practical indication of what an average person perceives about changes in noise levels.

Table 1.1 Perceived change in noise

Change in sound level (dB)	Perceived change in noise
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times as loud (or quarter) as loud

1.2 Project overview

The Project's key elements include the following:

1.2.1 Open-cut mine

Multiple open-cut mining pits will be developed within three mining areas:

- Mining Area A north of the infrastructure area;
- Mining Area B south of the infrastructure area; and
- Mining Area C north-east of the infrastructure area.

There will be three out-of-pit waste rock emplacements:

- AC-OOP between mining areas A and C;
- B-OOP E adjacent to Mining Area B on the east side of Laheys Creek; and
- B-OOP W adjacent to Mining Area B on the west side of Laheys Creek.

A conventional load and haul operation is proposed using excavators, front-end loaders and trucks. Initially, trucks will haul waste rock to out-of-pit emplacements. Following this, the majority of the waste rock will be placed in the mined-out voids.

Trucks will haul excavated ROM coal to the CHPP where it will be tipped into dump hoppers above the primary crushers or onto secondary ROM stockpiles for later rehandling.

1.2.2 Coal handling and preparation plant

The coal handling and preparation plant (CHPP) will treat up to 20 Mtpa of run-of-mine (ROM) coal to produce coal that meets the sizing and quality requirements of the customers. Subject to the level of impurities (rejects) in the coal and washability characteristics, the ROM will be either crushed and bypassed or treated (washed) in the preparation plant. The rejects from the washing process will typically include waste rock from above and below the coal seam as well as material dispersed within the coal.

The CHPP processes will be typical of those used in the majority of CHPPs in NSW, with product coal separated from rejects in a series of coal-cleaning circuits. The CHPP area will also contain a truck dump station; crushing plants; coal stockpiles; and the infrastructure to move and stockpile the coal. Rejects from the CHPP will be disposed within the footprint of the mining area.

1.2.3 Train loading facility and rail spur

Coal will be transported by rail to the Project's customers, including Bayswater and Liddell power stations in the Upper Hunter Valley and Eraring, Vales Point and Munmorah power stations on Lake Macquarie on the NSW Central Coast.

Product coal will be loaded onto trains from an overhead train loading bin located on a rail spur balloon loop. Approximately five trains will be loaded daily. The rail spur will be some 28 km long and will join the Dunedoo-Gulgong railway near Tallawang. A locomotive provisioning facility and a siding for fuel delivery may be located adjacent to the balloon loop.

1.2.4 Mine infrastructure area

The mine infrastructure area will be located adjacent to the mining areas. It will include workshops; hardstand and lay-down areas; bulk storage buildings; bulk fuel storage and a fuelling station; office buildings; an operations building and change-house; parking; an explosives magazine; and vehicle washdown bays.

1.2.5 Supporting infrastructure

i Access roads

The main access to the mine will be from the Golden Highway to the north of the operations, via a road diversion that will replace an existing section of Spring Ridge Road. There will be limited light vehicle access from the south via Spring Ridge Road.

Internal roads will connect the access road to the workshop, administration buildings and to the mine infrastructure area. Internal roads will also connect the various areas of the Project.

ii Electricity supply

The Project will require approximately 20 megawatts (MW) of electrical power. The Project will be connected to the grid at a small switching yard adjacent to the Castlereagh Highway. A power line, generally running parallel to the rail spur, will deliver the electricity to a substation in the mine infrastructure area.

An 11 kV powerline will supply the Cudgegong River pump station from the existing grid about 2 km south of the pump station site.

1.2.6 Workforce and operating hours

The proposed mine construction workforce will average 350 people, peaking at around 550 people over a 26-month period covering Q3 2013 to Q2 2016.

The proposed mine operation workforce is estimated to be 300 people during the first two years of full production in 2016 and 2017. This will increase steadily over the next ten years to reach a peak level of some 590 people between 2027 and 2030.

Mine construction is expected to occur up to 12 hours a day. However, construction may occur up to 24 hours a day at times (eg during major concrete pours).

The mine will operate up to 24 hours a day, 7 days a week, 52 weeks a year.

2 Noise criteria

2.1 Operational noise

Industrial sites in NSW, including open-cut mines, are regulated by the Department of Planning and Infrastructure (DP&I) or the NSW Environmental Protection Authority (EPA) and usually have a set of conditions for operations that include noise limits. These limits are normally derived from operational noise criteria that apply at sensitive receptors. They are based on guidelines stipulated in the *Industrial Noise Policy* (INP) (EPA 2000) or noise levels that can be achieved at a specific site following the application of all reasonable and feasible noise mitigation.

The INP provides guidelines for assessing industrial facilities and has been adopted for this assessment. It states the following with respect to the criteria:

> 'They are not mandatory, and an application for a noise producing development is not determined purely on the basis of compliance or otherwise with the noise criteria. Numerous other factors need to be taken into account in the determination. These factors include economic consequences, other environmental effects and the social worth of the development.'

Assessment criteria depend on the existing amenity of areas potentially affected by a proposed development. Assessment criteria for sensitive receptors near industry are based on the following objectives:

- protection of the community from excessive intrusive noise; and
- preservation of amenity for specific land uses.

To ensure these objectives are met, the EPA provides two separate criteria: namely the intrusiveness criteria and the amenity criteria. A fundamental difference between the intrusiveness and the amenity criteria is the time period they relate to:

- intrusiveness criteria — apply over 15 minutes in any period; and
- amenity criteria — apply to the entire assessment period (day, evening and night).

2.1.1 Intrusiveness

The intrusiveness criteria require that $L_{eq(15\text{-}min)}$ noise levels from a newly introduced source during the day, evening and night do not exceed the existing rating background level (RBL) by more than 5 dB. This is expressed as: $L_{eq(15\text{-}min)} \leq RBL + 5 - K$

where $L_{eq(15\text{-}min)}$ is the L_{eq} noise level from the source (ie site), measured over a 15 minute period and K is a series of adjustments for various noise characteristics.

A minimum RBL of 30 dB(A) has been used for this assessment.

Table 2.1 presents the base intrusive criteria for the Project.

Table 2.1 Base intrusive criteria

Location	Time period	RBL, dB(A)	Intrusive criteria dB(A), Leq(15-min)
Residential properties	Day	30	35
	Evening	30	35
	Night	30	35

Source: INP (EPA, 2000)

2.1.2 Amenity

The amenity assessment is based on noise criteria specific to the land use. The criteria relate only to industrial noise and exclude non-related site noise, including road or rail noise. Where measured existing industrial noise approaches base amenity criteria, it needs to be demonstrated that noise levels from new industries will not be an additional contributor to existing industrial noise.

Residential receptors potentially affected by the Project are covered by the EPA's suburban or rural amenity categories. For receptors located in and around the Project, the rural residential category is suitable. For the Dapper church, which is used on occasion, the amenity criterion for places of worship is relevant. The base residential amenity criteria for this Project are given in Table 2.2. Amenity criteria for other receptor types also exist; however, the site does not have non-residential neighbours that are likely to be disturbed by operations.

Table 2.2 Base amenity criteria

Receptor	Indicative area	Time period	Recommended noise level dB(A), $L_{eq,period}$	
			Acceptable	Maximum
Residential	Rural	Day	50	55
		Evening	45	50
		Night	40	45
Place of worship – internal	All	When in use	40	45

Source: INP (EPA, 2000)

2.1.3 Project specific noise level

The project-specific noise level (PSNL) is the lower of the calculated intrusive or amenity criteria. The intrusive criteria (Table 2.1) is therefore adopted as the PSNL. For the Dapper Union church, the amenity criteria are applicable. The PSNL are presented in Table 2.3.

Table 2.3 Project specific noise levels (PSNL)

Receptor	Time period	RBL dB(A)	Intrusive criteria dB(A), $L_{eq(15\text{-min})}$
All receptors	Day	30	35
	Evening	30	35
	Night	30	35
Receptor	**Time period**	**RBL dB(A)**	**Amenity criteria dB(A), Leq(period)**
Dapper church	When in use	N/A	40 (internal)

2.2 Zones of impact

Section 1.4.8 of the INP describes zones of impact. The commonly applied approach to zones of impact accepted by DP&I and EPA is provided below.

2.2.1 Noise management zone

The noise management zone is where modelled noise levels are above the PSNL but below the acquisition criteria (see Section 2.2.2). Within the management zone, receptors may experience noise levels up to 5 dB(A) above the PSNL. Depending on the degree of exceedance of the PSNL (1–5 dB), noise impacts in the noise management zone could range from minor (1–2 dB) to moderate (3–5 dB). DP&I recommended management procedures to implement in this zone, including:

- prompt response where issues of concern are raised by community;
- noise monitoring onsite and within the adjacent community;
- that mine operations planning considers on-site noise mitigation measures and plant maintenance procedures and where appropriate includes sound suppression components and preventative maintenance;
- investigation of, and where practical and cost-effective, acoustical treatment/mitigation at receptors where levels are 3–5 dB above PSNL; and
- consideration of negotiated agreements with property owners who are situated above the PSNLs; this process is initiated when the:
    - regulatory authority is satisfied that no further reduction in noise levels can be made through a viable mitigation strategy; and
    - proponent demonstrates that even when using its best economically viable, reasonable and feasible strategies it cannot achieve the PSNLs.

This negotiation is designed to be available to those whose acoustic amenity is potentially affected by not achieving the PSNLs. While negotiations of an agreed PSNL can occur at this time, further negotiations will be triggered when site noise exceeds the recommended PSNLs. See Appendix A for an extract from the INP providing more detailed explanation and examples of negotiated agreements.

2.2.2 Noise affectation zone

The noise affectation zone is where modelled noise levels are more than 5 dB over the PSNL. Implementation of the following measures may be required:

- discussions with relevant property owners to assess concerns and provide solutions;
- implementation of acoustical mitigation at receptors; and
- negotiated agreements with property owners, or acquisition of the property by the project proponent.

While the INP does not specifically deal with acquisition, an acquisition criteria of >40 dB(A)$L_{eq(15\text{-}min)}$ for daytime, evening and night-time periods has been adopted in this assessment for privately owned dwellings.

It is noted that a recent Planning Assessment Commission *'Determination Report for the Boggabri Coal Mine Expansion Project'* (PAC, 2012) identified that an acquisition option should be provided for receivers situated at a PSNL of 35dB(A). However, the PAC noted that its "approach to noise impacts for this project [Boggabri Coal Mine Expansion Project] is limited to the specific characteristics of this project."

Therefore, this assessment used an acquisition zone and management zone as has been widely applied in NSW.

CHC is committed to managing noise emissions and/or acquiring residences where noise levels are modelled above the applicable criteria.

2.3 Vacant lands

The acquisition zone for vacant lands has been considered in this assessment for land parcels where more than 25% of the property is affected by an $L_{eq(15\text{-}min)}$ of >40 dB(A) for daytime, evening and night-time periods.

2.4 Low frequency noise

Section 4 of the INP (EPA, 2000:28) provides guidelines for applying 'modifying factor' adjustments to account for low frequency noise emissions. The INP states that where there is a difference of 15 decibels or more between 'C' weighted and 'A' weighted levels, then a correction factor of 5 dB is applicable. Section 4.4 of this report provides an assessment of low frequency noise for the Project. Furthermore, industry accepted practice suggests that low frequency noise is not likely to result in impacts unless received levels are above 60 dB(C). Therefore, this assessment has also considered 60 dB(C) as the criterion for the assessment of low frequency noise.

2.5 Cumulative noise criteria

Cumulative noise emissions from multiple industrial sources may have a significant impact on the acoustic amenity of communities. There are no existing significant industrial sources near the Project, therefore cumulative operational noise is not expected to be relevant, and has not been considered in this assessment.

2.6 Sleep disturbance criteria

The operational criteria described in Section 2.1, which consider the average noise emission of a source over 15 minutes, are appropriate for assessing noise from steady-state sources, such as engine noise from mobile plant and other pit equipment. However, noise from sources such as reversing alarms or track plates is intermittent (rather than continuous) in nature and, as such, needs to be assessed using the L_1 or L_{max} noise metrics.

The most important potential impact of intermittent noise that needs to be considered is disturbing the sleep of nearby residents. While the INP does not specify a criterion for assessing sleep disturbance, various studies including the EPA's *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA, 1999) policy indicate that levels below 50-55 dB(A) inside homes are unlikely to wake sleeping occupants. If bedroom windows are open, this corresponds to an external maximum noise level of approximately 60–65 dB(A) L_{max}. Similarly, the World Health Organisation (WHO, 1999) suggest that levels below 45 dB(A) inside homes are unlikely to wake sleeping occupants.

Based on an RBL of 30 dB(A), this assessment has adopted an external sleep disturbance criterion of 45 dB(A) L_{max} for all residences.

Where screening tests identify noise events above 45 dB(A) L_{max}, further investigation to quantify the extent of impacts, including levels of exceedance above the criterion and the duration and the number of events that may occur (see Section 4.3) has been conducted.

2.7 Construction noise criteria

Noise associated with construction activities for extractive industries are often assessed as operational noise, as the emissions from plant and associated equipment are similar. However, construction works away from the mining area include the pipeline route, power easement, rail spur line and road diversions. These activities have several differences when compared to mining activities, including a short duration compared with the proposed mining life. They are separate from mining areas and involve some machinery unique to construction that will not be used during mining.

Therefore, this assessment has considered construction noise from pipeline, power easement, rail spur and road diversion construction activities.

Construction activities associated with the coal mine infrastructure and CHPP have not been reviewed separately in this assessment, as the noise associated with the processing and mining activities are similar to the associated construction emissions in these areas. Furthermore, noise from Spring Ridge Road construction has not been considered in this assessment. Impacts associated with construction of the road would be similar to that of the pipeline construction for receptors to the south. Where the road construction deviates south of Dapper Road, the works will be in an area where mining operations will occur. Therefore, compliance with operational noise criteria will demonstrate compliance with the construction noise criteria, which are 5 dB(A) higher.

The construction of the temporary construction accommodation village has not been independently assessed as it is situated in an area where mining operations will eventuate. Therefore, compliance with the operational noise criteria will again demonstrate compliance with construction noise criteria.

2.7.1 Construction noise objectives

Construction noise objectives aim to minimise the noise impacts from the Project on surrounding receptors. This section provides a summary of noise objectives that are applicable to the Project.

Section 2.2 of the ICNG recommends the following standard hours for construction where noise from these activities is audible at residential premises:

- Monday to Friday 7.00 am to 6.00 pm;
- Saturday 8.00 am to 1.00 pm; and
- No construction work is to take place on Sundays or public holidays.

i Interim construction noise guideline

The ICNG provides two methodologies to assess construction noise emissions:

- quantitative, which is suited to major construction projects with typical durations of more than three weeks; and
- qualitative, which is suited to short-term infrastructure maintenance of less than three weeks.

A quantitative assessment requires noise emission predictions from construction activities at the nearest receptors, while the qualitative assessment is a simplified approach that relies more on noise management strategies.

This study has adopted a quantitative assessment approach. The qualitative aspects of the assessment include identification of receptors, description of works involved and proposed management measures that include a complaints handling procedure.

ii Noise management level

Table 2.4 provides noise management levels for residential receptors reproduced from the ICNG (EPA 2009).

Table 2.4 Construction noise criteria for residences

Time of day	Management level $L_{eq(15\text{-}min)}$	Application
Recommended standard hours: Monday to Friday 7.00 am to 6.00 pm, Saturday 8.00 am to 1.00 pm, No work on Sundays or public holidays	Noise-affected RBL + 10 dB	The noise-affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{eq(15\text{-}min)}$ is greater than the noise-affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise-affected level represents the point above which there may be strong community reaction to noise.

Table 2.4 Construction noise criteria for residences

Time of day	Management level $L_{eq(15\text{-}min)}$	Application
		• Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: i) times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences); ii) if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise-affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise-affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see Section 7.2.2 of the ICNG.

Source: ICNG (EPA, 2009)

The Project specific construction noise criteria for recommended standard hours based on an RBL of 30 dB(A), is 40 dB(A) $L_{eq(15\text{-}min)}$.

2.8 Road noise criteria

2.8.1 Assessment criteria

The principle guidance to assess the impact of road traffic noise on noise sensitive receptors is in the NSW EPA's *Road Noise Policy* (RNP, 2011).

The freeway/arterial/sub-arterial road type has been adopted for the Golden Highway. Table 2.5 presents the road noise assessment criteria reproduced from Table 3 of the RNP.

Table 2.5 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria, dB(A)	
		Day (07.00 am to 10.00 pm)	Night (10.00 pm to 07.00 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	$L_{eq(15\text{-}hr)}$ 60 (external)	$L_{eq(9\text{-}hr)}$ 55 (external)

Additionally, the RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB.

2.8.2 Relative increase criteria

In addition to meeting the assessment criteria, any significant increase in total traffic noise at receptors must be considered. Receptors experiencing increases in total traffic noise levels above those presented in Table 2.6 should be considered for mitigation.

Table 2.6 Relative increase criteria for residential land uses

Road Category	Type of project/development	Total traffic noise level increase - dB(A)	
		Day (07.00 am to 10.00 pm)	Night (10.00 pm to 07.00 am)
Freeway/arterial/sub-arterial roads and transitways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic $L_{eq(15\text{-}hr)}$+12 dB (external)	Existing traffic $L_{eq(9\text{-}hr)}$+ 12 dB (external)

2.9 Offsite rail noise criteria

Offsite rail operations noise (ie movements on the main or public line) is assessed separately from onsite noise. Whilst not strictly applicable to rail traffic generating developments, the *Interim Guideline for Assessment of Noise from Rail Infrastructure Projects* (IGANRIP) is nominated in the DGR's for this Project and is a joint EPA and DP&I document. It describes the environmental benefits of rail, objectives for noise and related assessment procedures. The IGANRIP provides trigger values for rail traffic noise, airborne and ground borne.

It is noted that the draft version of the *Rail Infrastructure Noise Guideline* (RING) has been issued by the EPA for industry comment, although not applicable to this project, the RING will supersede both the IGANRIP and the existing EPA policy on rail traffic generating developments when finalised (planned for late 2012). The IGANRIP is however the current rail noise guideline in NSW that applies to rail developments and has been used to assess offsite rail traffic for the Project to directly address the DGR's.

Furthermore, the Australian Rail Track Corporation (ARTC) Environmental Protection Licence (EPL, 2009) number 3142 provides rail noise emission criteria that are relevant to the Project, Condition L6.1 is reproduced below and is consistent with the IGANRIP:

'L6.1.1 General Noise Limits:

It is an objective of this Licence to progressively reduce noise levels to the goals of 65 dB(A) $L_{eq(15\text{-}hr)}$, *(day time from 7am – 10pm), 60 dB(A)* $L_{eq(9\text{-}hr)}$, *(night time from 10pm – 7am) and 85dB(A)* L_{max} *(24 hr) pass-by noise, at one metre from the façade of affected residential properties through the implementation of the Pollution Reduction Programs.'*

i Airborne noise trigger levels for heavy rail

The airborne noise trigger levels address an increase in rail noise due to rail infrastructure projects and absolute levels of rail noise. The IGANRIP requires that if both rail noise and the absolute level of rail noise meet or exceed the trigger values, an assessment of rail noise impacts should be undertaken (see Section 4.6).

IGANRIP noise trigger levels relevant to the Project are provided in Table 2.7 along with trigger levels for rail traffic generating developments provided in the RING for comparison purposes.

Table 2.7 Airborne rail traffic noise trigger levels for residential land uses

Policy	Type of development	Noise trigger levels dB(A)		
		Day (7.00 am to 10.00 pm)	Night (10.00 pm to 7.00 am)	Comment
IGANRIP	Redevelopment of existing railway	Development increases existing rail noise levels and resulting rail noise levels exceed: 65 $L_{eq(15\text{-}hr)}$ 85 L_{max}	60 $L_{eq(9\text{-}hr)}$ 85 L_{max}	These numbers represent external levels of noise that trigger the need for an assessment of the potential noise impacts from a rail infrastructure project. An 'increase' in existing rail noise levels is taken to be an increase of 2 B(A) or more in L_{eq} in any hour or an increase of 3 dB(A) or more in L_{max}[1]

Note: 1. The trigger levels presented in this table should be read with the technical notes of Tables 1 and 2 of the IGANRIP.

For land uses other than residential, the IGANRIP trigger values are shown in Table 2.8.

Table 2.8 Airborne rail traffic noise trigger levels for sensitive land uses other than residential

Sensitive land use	Noise trigger levels dB(A)	
	New railway development	Redevelopment of existing railway
	Development increases existing rail noise levels by 2 dB(A) or more in L_{eq} in any hour and resulting rail noise levels exceed:	
Schools, educational institutions - internal	40 $L_{eq(1\text{-}hr)}$	45 $L_{eq(1\text{-}hr)}$
Places of worship - internal	40 $L_{eq(1\text{-}hr)}$	45 $L_{eq(1\text{-}hr)}$
Hospitals	60 $L_{eq(1\text{-}hr)}$	60 $L_{eq(1\text{-}hr)}$
Hospitals - internal	35 $L_{eq(1\text{-}hr)}$	35 $L_{eq(1\text{-}hr)}$
Passive recreation	55 $L_{eq(1\text{-}hr)}$	60 $L_{eq(1\text{-}hr)}$
Active recreation (eg golf course)	65 $L_{eq(24\text{-}hr)}$	65 $L_{eq(24\text{-}hr)}$

Note: The trigger levels presented in this table should be read with the technical notes that follow Tables 1 and 2 of the IGANRIP.

ii Groundborne noise trigger levels

Groundborne noise is noise generated inside a building by groundborne vibration from trains passing by. The IGANRIP (EPA&DP&I, 2007:8) states:

> '*Groundborne noise level values are relevant only where they are higher than the airborne noise from railways (such as in the case of an underground railway) and where the groundborne noise levels are expected to be, or are, audible within habitable rooms.*'

The Project will use an above-ground rail network and does not include an underground section of rail. As the proposed rail movements are not expected to generate groundborne noise in a receiving building that is higher than airborne noise, the issue does not require further consideration.

2.10 Blasting criteria

The limits adopted by EPA for blasting are provided in the Australian and New Zealand Environment Conservation Council (ANZECC) guidelines *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZECC 1990).

The blasting limits address two main effects of blasting:

- airblast noise overpressure; and
- ground vibration.

2.10.1 Airblast

The recommended maximum vibration level for airblast is 115 dB linear peak. The vibration level of 115 dB may be exceeded on up to 5% of the total number of blasts over 12 months. However, the level should not exceed 120 dB linear peak at any time.

2.10.2 Ground vibration

Peak particle velocity (PPV) from ground vibration should not exceed 5 mm/s for more than 5% of the total number of blasts over 12 months. However, the maximum level should not exceed 10 mm/s at any time.

A summary of blast limits are provided in Table 2.9.

Table 2.9 Airblast overpressure and ground vibration limits

Airblast overpressure level dB(L_{inpeak})	Allowable exceedance
115	5% of the total number of blasts over 12 months
120	0%
Ground vibration	
Peak particle velocity (mm/s)	**Allowable exceedance**
5	5% of the total number of blasts over 12 months
10	0%

2.11 Heritage structures

2.11.1 Structural damage from blasting

i Blast overpressure

Blast noise overpressure may cause damage to some building elements such as windows if levels are relatively high. The Australian Standard AS2187.2 – 2006 *Explosives - Storage and Use Part 2 Use of Explosives (Appendix J)* states that:

"*From Australian and overseas research, damage (even of a cosmetic nature) has not been found to occur at airblast levels below **133dBL***".

Vibration associated with blasting is the limiting parameter for this assessment and where vibration criteria are met the airblast criterion would be satisfied. Therefore, the airblast criterion has not been considered further in this assessment.

ii Blast ground vibration

For assessment of damage from blast ground vibration AS2187.2 – 2006 (Appendix J) provides frequency based criteria, derived from British Standard 7385-2 and US Bureau of Mines Standard RI 8507. Such criteria are less stringent than for human comfort levels of 5mm/s described earlier.

The guide values from this standard for transient vibration judged to result in a minimal risk of cosmetic damage to residential buildings and industrial buildings are presented numerically in Table 2.10 and graphically in

Figure 2.1.

Table 2.10 Transient vibration guide values for cosmetic damage

Line	Building type	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

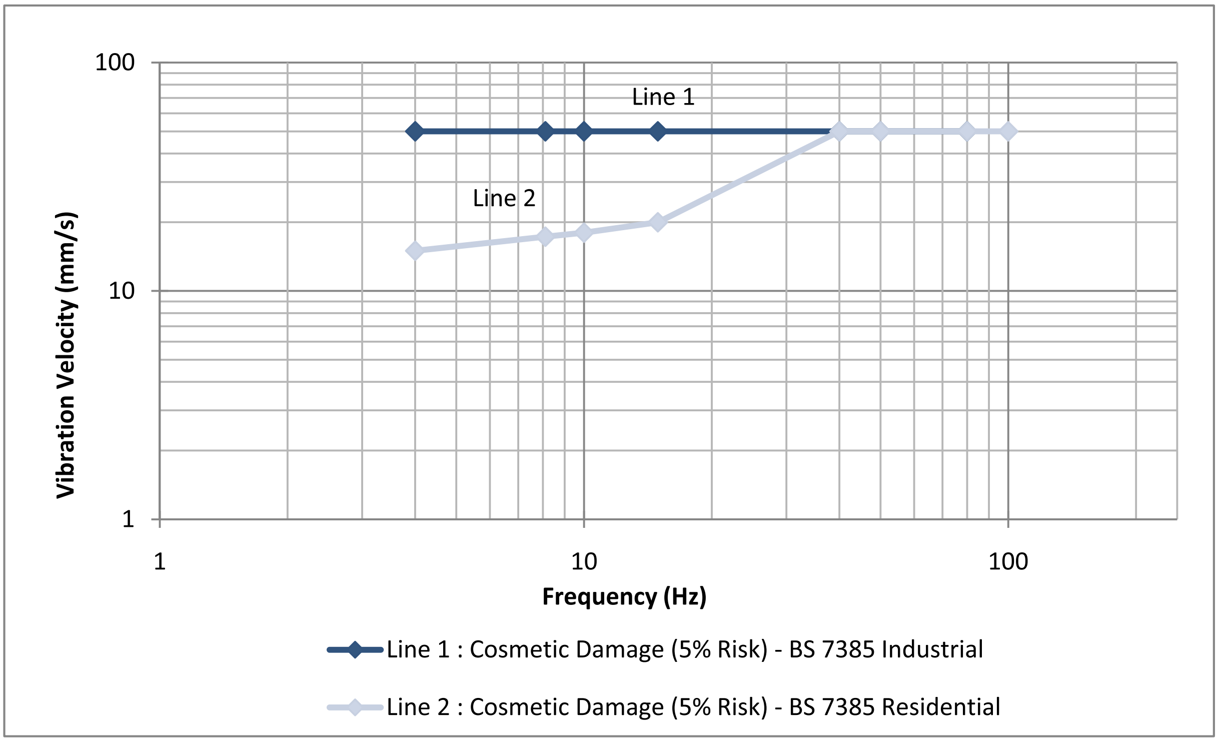


Figure 2.1 Vibration Guide Values for Cosmetic Damage

Historical monitoring data identifies that blast vibration typically occur between the frequencies of 10 Hz to 30 Hz. Therefore, the criteria on Line 2 for residential building has been adopted for heritage receptors as 10 mm/s for a frequency of 15 Hz.

3 Noise modelling methodology and parameters

This section presents the methods and base parameters used to model noise emissions from the Project, including the effect of prevailing meteorological conditions. The assessment was conducted in accordance with the following policies and guidelines:

- *The NSW Industrial Noise Policy* (EPA 2000);
- *The Road Noise Policy* (EPA 2011);
- *The Interim Guideline for Assessment of Noise from Rail Infrastructure Projects* (EPA and DP&I 2007);
- *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZECC 1990); and
- The Interim Construction Noise Guideline (EPA 2009).

Noise modelling was based on three-dimensional digitised ground contours of the surrounding land, mine pits and overburden emplacement areas for five stages of the Project. The mine plans represent snapshots, with equipment placed at various locations and heights, representing realistic operating scenarios for each stage of the mine.

Noise predictions were carried out using the ISO 9613 and CONCAWE algorithms in Brüel and Kjær Predictor Version 8.11 noise prediction software. 'Predictor' calculates total noise levels at receptors from the concurrent operation of multiple noise sources. The model considers factors such as:

- the lateral and vertical location of plant;
- source-to-receptor distances;
- ground effects;
- atmospheric absorption;
- topography of the mine and surrounding area; and
- applicable meteorological conditions.

3.1 Modelled meteorological conditions

The INP provides procedures for identifying and combining prevailing meteorological conditions at a site (referred to as a 'feature' of the area) and assessing the noise levels against the relevant criteria.

During wind and temperature gradient conditions (eg temperature inversions), mining noise levels at receptors may increase or decrease compared with noise during calm conditions. This change is due to refraction caused by the varying speed of sound with increasing height above ground. The noise level received increases when the wind blows from source to receptors or under temperature inversion conditions. Conversely, the noise level decreases when the wind blows from receptors to source or under temperature lapse conditions.

Site specific data was obtained from CHC's onsite meteorological station from 1 September 2009 to 21 September 2010 and analysed in accordance with INP methodologies. Appendix C provides the analysed data in the form of wind roses. Temperature inversion data was not available and the INP default inversion parameters have been adopted.

The analysis identified the following four meteorological scenarios that were considered in the noise modelling:

1. calm: zero wind speed and nil temperature gradient;

2. prevailing: a west-south-west (WSW) wind scenario with a modelled 2.3 m/s wind speed (from a bearing of 247.5^{o}); the feature wind direction, determined in accordance with the INP, included winds that prevail from the west-south-west (WSW) directions ($\pm 45^{o}$) with the bearing of 247.5^{o} being significant and generally above 30% occurrence for all seasons and periods, with the highest wind speed for this quadrant WSW ($\pm 45^{o}$) being 2.3 m/s;

3. temperature inversion: night time 'F' class stability; and

4. temperature inversion: night time 'G' class stability.

The potential for drainage flows to occur around the site was reviewed but determined as irrelevant. This is because Project noise sources are at a lower elevation during the relevant night periods than nearby receptors, or there is intervening topography between the Project noise sources and nearby receptors.

3.2 Operational noise

The mine plans used for modelling (Years 1, 2, 8, 16 and 20 of mining) were supplied by CHC. These years represent potential mining operations over the life of the Project. The noise model was configured to predict the total L_{eq} noise levels from mining operations. The operation stages were modelled to determine the potential acoustic impact from the Project on surrounding receptors for the three meteorological conditions identified in Section 3.1. Noise from all sources that contribute to the total noise level from the Project were assessed. Figure 3.1 to Figure 3.5 provide the pit plans and plant item locations for each modelled stage.

The results presented assume the maximum number of plant and equipment are operating simultaneously and at full duty. In practice, such an operating scenario would not occur. The noise predictions are therefore conservative.

3.2.1 Noise sources

Table 3.1 summarises the main operations noise sources and associated indicative sound power levels for the Project. Appendix B provides indicative plant make and model details and total single octave sound power levels.

Table 3.1 Indicative operations plant and equipment sound power levels

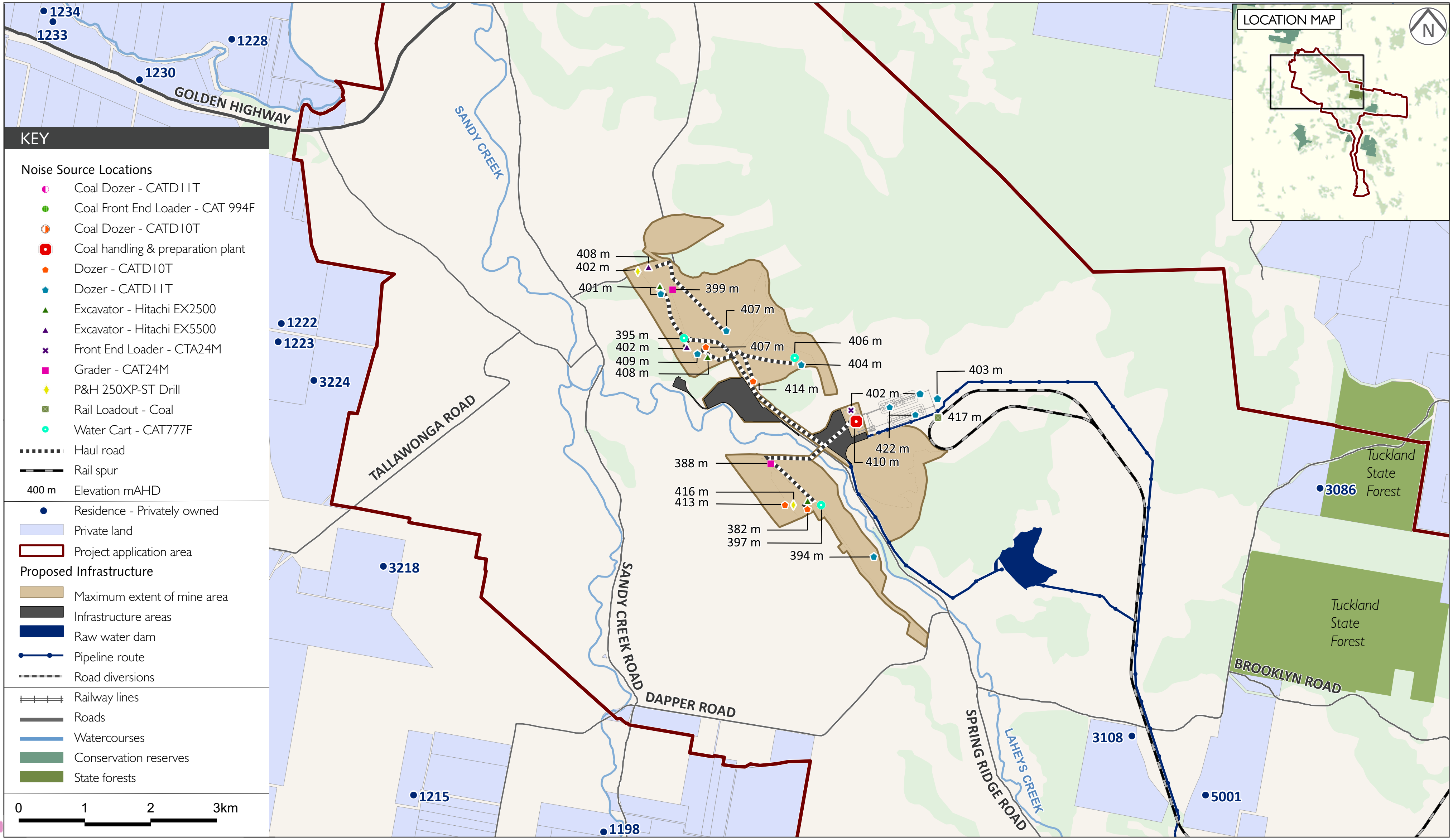
Item	Lw, $L_{eq(15\text{-}min)}$, dB(A)	Year 1	Year 2	Year 8	Year 16	Year 20
Excavator (EX5500)	118	2	2	4	5	5
Excavator (EX2500)	116	3	4	7	6	6
Dozers (D11 tractors – rail load out)	115	2	2	2	2	2
Dozers (D11)	115	6	7	12	14	14
Dozers (D10)	113	5	6	10	9	9
Drilling rigs	114	2	2	4	4	4
Water carts	114	3	4	6	6	6
Graders	108	2	3	5	5	5
Haul trucks (CAT793F)	116	11	11	21	26	26
Haul trucks (CAT789D)	116	11	12	25	26	26
Coal conveyors	83 (per metre)	1	1	1	1	1
Conveyors and drives (CHPP)	98	1	1	1	1	1
Front end loader	114	1	1	1	1	1
CHPP	110 (enclosed)	1	1	1	1	1
Coal rail load out	108	1	1	1	1	1
Rail locomotives and wagons	83 (per metre)	3	3	3	3	3

3.3 Construction noise

Table 3.2 summarises the main construction noise sources and associated sound power levels of indicative plant items to be used during construction. Figure 3.6 shows modelled construction plant locations. Appendix B provides indicative plant make and model details and total single octave sound power levels.

Table 3.2 Indicative construction plant and equipment sound power levels

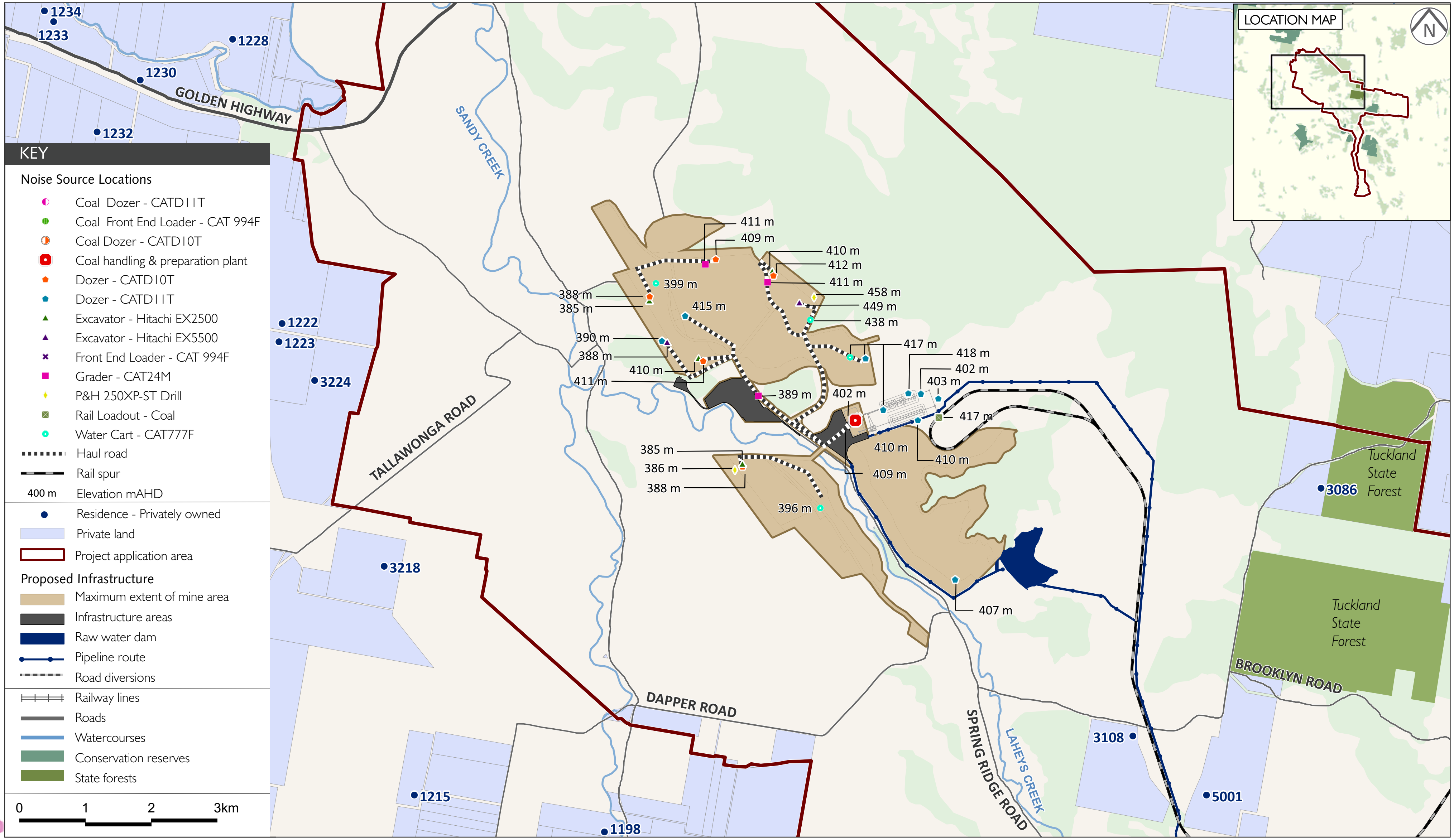
Item	Lw, $L_{eq(15\text{-}min)}$, dB(A)
Trucks (deliveries, tippers and general movements)	103
Augers	100
Crane	109
Power tools	95
Drilling/grinding	98
Hammering	99
Chainsaw	105
Excavator/backhoe	104
Concrete trucks	108
Whacker	111
Impact hammer (small)	112
Concrete agitator	111
Generator	98
Compressor	91



Year 1 - Modelled Plant Locations

Cobbora Coal Project - Noise Assessment

Figure 3.1

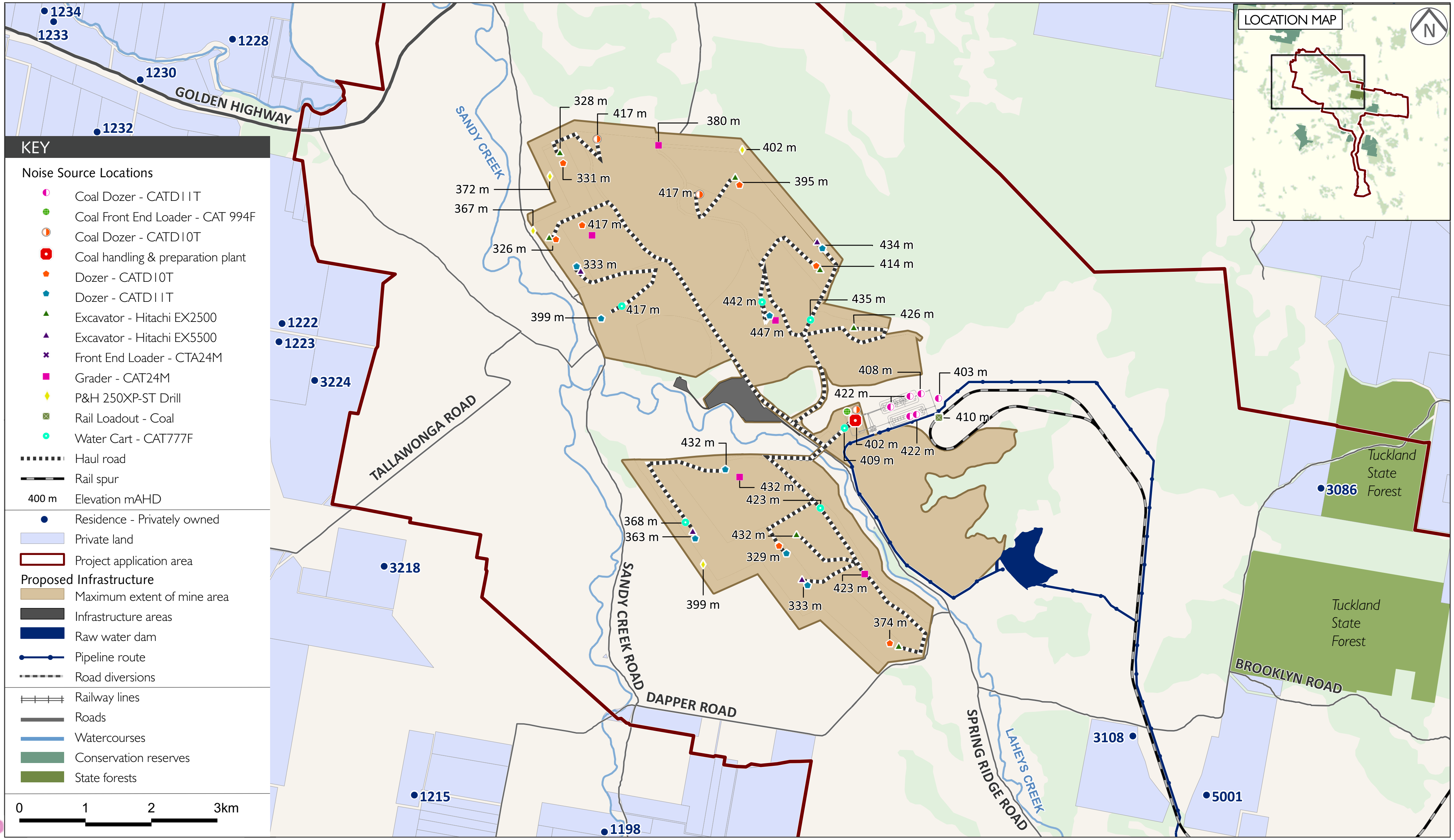


Year 2 - Modelled Plant Locations

Cobbora Coal Project - Noise Assessment

Figure 3.2

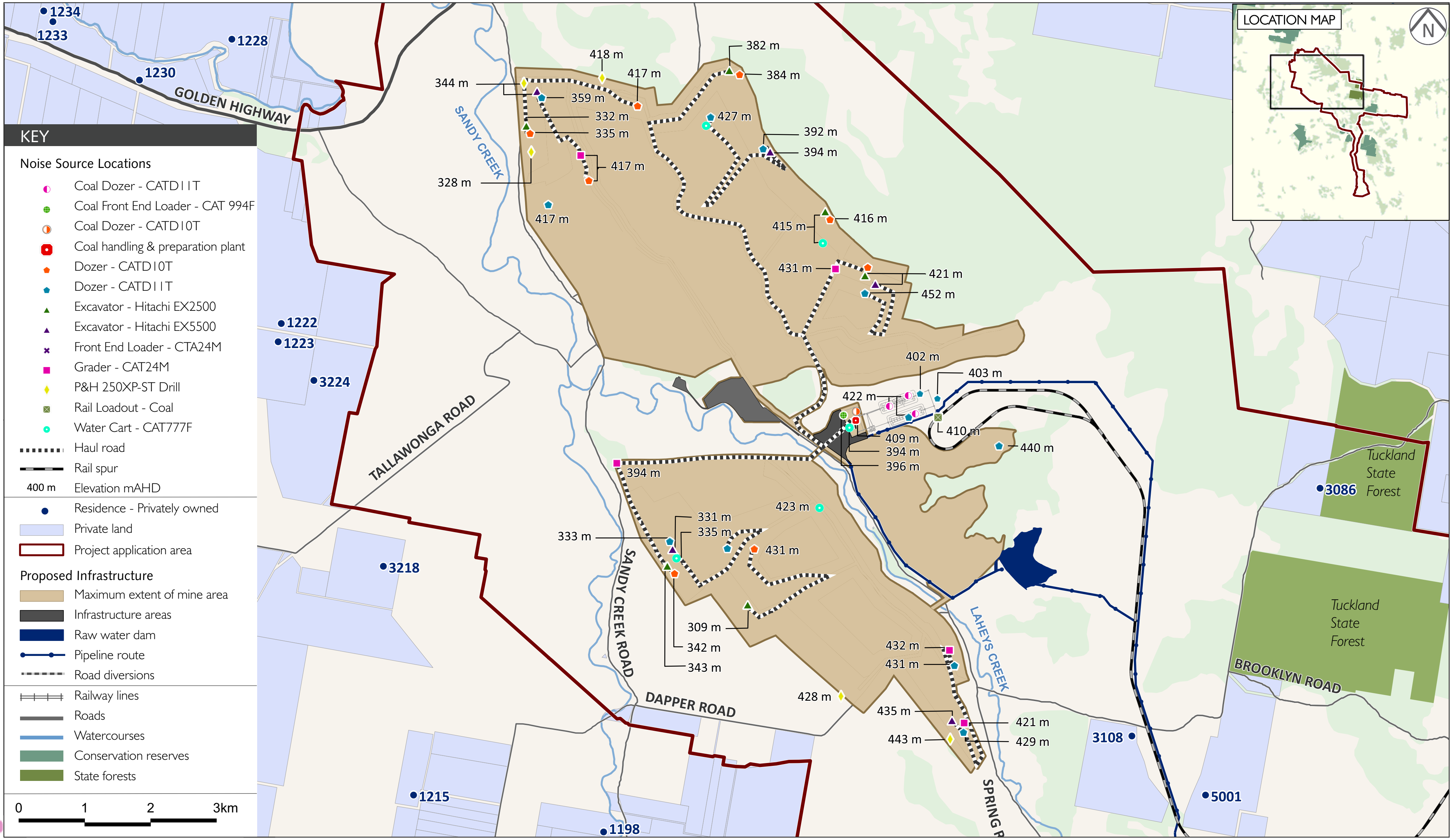
Integrated Design Solutions | 030518 Cobbora Coal Project - NA F1 Rev A - 18 September 2012



Year 8 - Modelled Plant Locations

Cobbora Coal Project - Noise Assessment

Figure 3.3

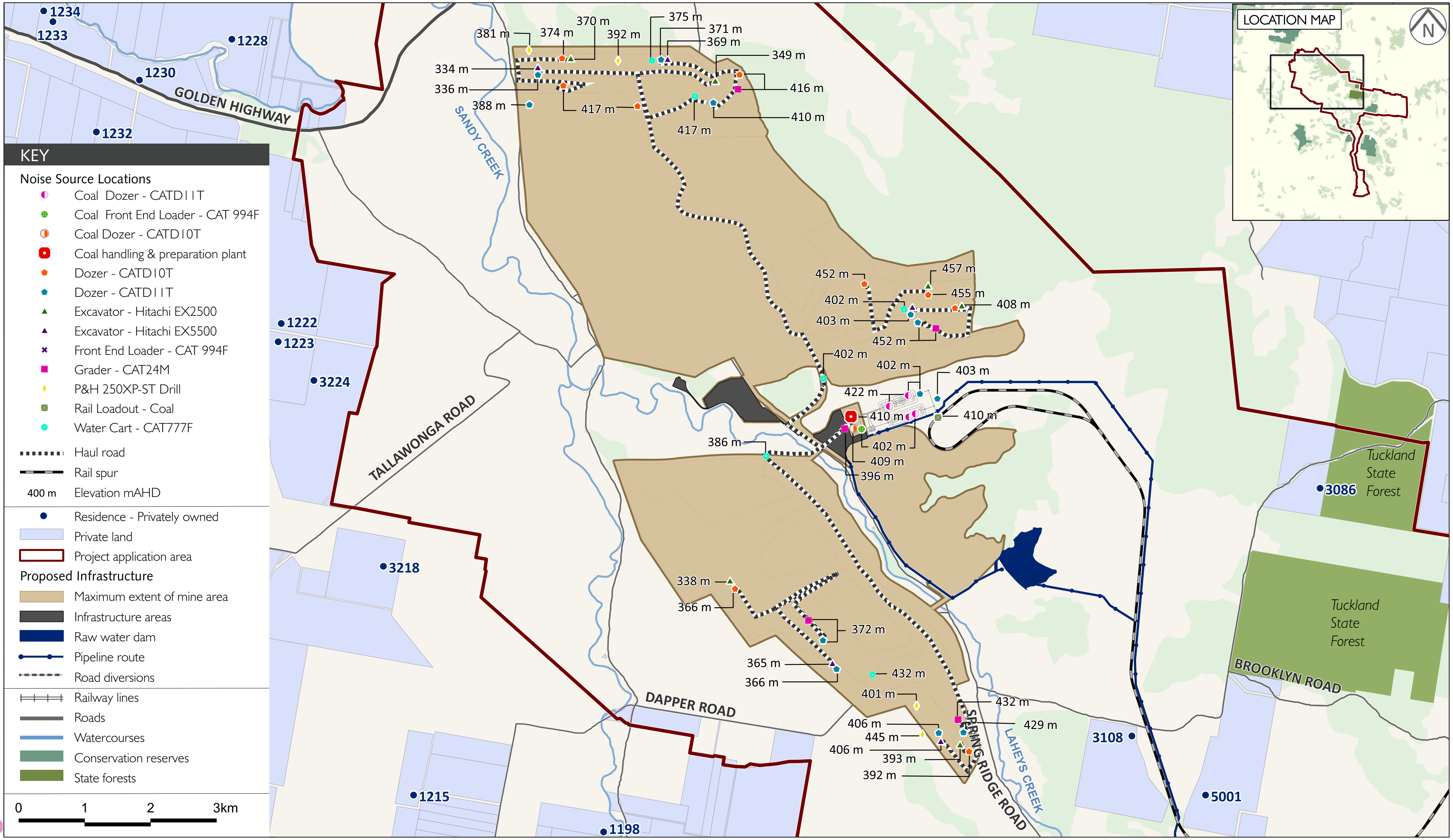


Year 16 - Modelled Plant Locations

Cobbora Coal Project - Noise Assessment

Figure 3.4

Integrated Design Solutions | 030518 Cobbora Coal Project - NA F1 Rev B - 18 September 2012



Integrated Design Solutions | 030518 Cobbora Coal Project - NA F1 Rev A - 18 Sep 2012

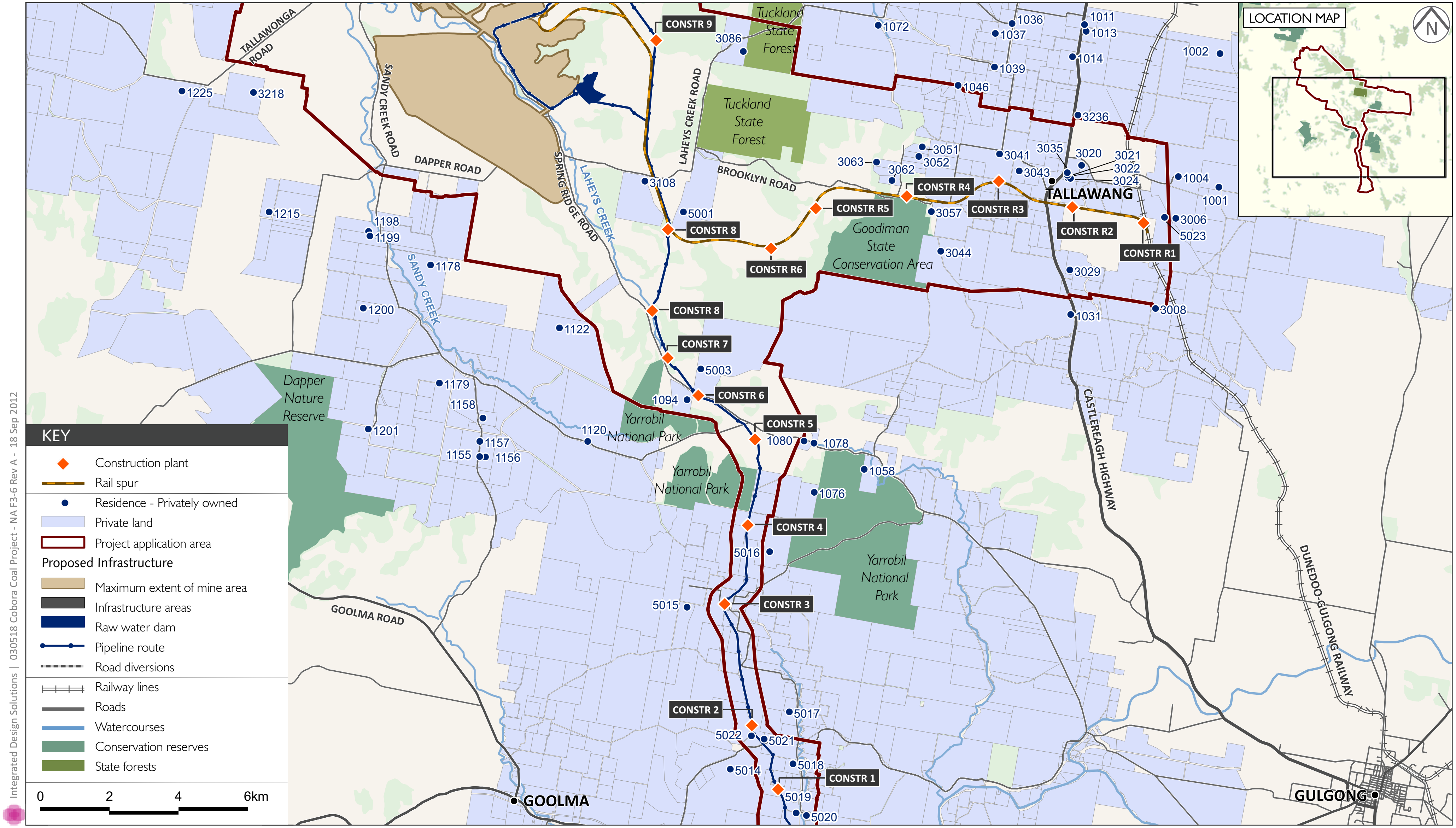
EMM

Cobbora Holding Company Pty Limited

Year 20 - Modelled Plant Locations

Cobbora Coal Project - Noise Assessment

Figure 3.5



Modelled Construction Plant Locations

Cobbora Coal Project - Noise Assessment

Figure 3.6

EMM
Cobbora Holding Company Pty Limited

3.4 Modelled receptor assessment locations

Noise from mining operations has been predicted for privately owned and CHC owned residences surrounding the Project. No other sensitive land uses were identified in its noise catchment. Dapper church, which is situated to the south-west of the Project, has been included in the assessment although it is rarely used.

A total of 190 noise receptor locations have been identified within the potential noise catchment for the Project and are presented in Table 3.3 and in Figure 3.7.

Table 3.3 Noise receptor assessment locations

Receptor ID	Easting[1]	Northing[1]	Ownership
Dapper church	709108	6435394	Trustees
1001	733712	6434049	Private land
1002	733743	6437922	Private land
1004	732537	6434356	Private land
1011	729820	6438754	Private land
1013	729868	6438562	Private land
1014	729470	6437822	Private land
1031	729421	6430358	Private land
1036	727722	6438784	Private land
1037	727237	6438503	Private land
1039	727213	6437526	Private land
1046	726159	6436991	Private land
1058	723439	6425868	Private land
1059	723424	6426827	Private land
1072	723846	6438741	Private land
1075	722783	6426971	Private land
1076	721990	6425212	Private land
1077	722123	6426385	CHC owned land
1078	721983	6426632	Private land
1080	721694	6426692	Private land
1083	718938	6427624	CHC owned land
1088	717589	6448933	Private land
1089	717566	6448869	Private land
1093	717743	6428507	CHC owned land
1094	718307	6427895	Private land
1111	716652	6451684	Private land
1120	715430	6426685	Private land
1122	714612	6429973	Private land
1133	714961	6449372	Private land
1134	714244	6452522	Private land
1138	713584	6453051	Private land
1140	713261	6451018	Private land
1141	713194	6450906	Private land
1142	713461	6450817	Private land

Table 3.3 Noise receptor assessment locations

Receptor ID	Easting[1]	Northing[1]	Ownership
1143	713378	6450733	Private land
1144	713276	6450758	Private land
1145	713147	6450690	Private land
1146	712909	6450837	Private land
1147	713919	6450085	Private land
1149	713106	6449745	Private land
1155	712468	6426232	Private land
1156	712302	6426243	Private land
1157	712303	6426685	Private land
1158	712393	6427361	Private land
1165	712784	6450851	Private land
1166	712674	6450791	Private land
1167	712621	6451032	Private land
1168	712776	6451119	Private land
1169	711372	6452608	Private land
1170	710956	6450243	Private land
1171	710758	6450235	Private land
1172	711425	6448680	Private land
1178	710879	6431794	Private land
1179	711134	6428374	Private land
1180	709713	6433819	CHC owned land
1185	710047	6452605	Private land
1187	708684	6451340	Private land
1198	709084	6432771	Private land
1199	709119	6432633	Private land
1200	708931	6430539	Private land
1201	709077	6427040	Private land
1203	707290	6431403	CHC owned land
1213	706755	6434459	Private land
1215	706203	6433330	Private land
1222	704200	6440473	Private land
1223	704154	6440196	Private land
1225	703677	6436827	Private land
1228	703451	6444784	CHC owned land
1230	702052	6444167	Private land
1232	701400	6443376	Private land
1233	700741	6445052	Private land
1234	700603	6445211	Private land
1238	722881	6445569	Private land
1239	723258	6442753	Private land
1240	719940	6446205	Private land
1241	722482	6442697	Private land
1242	723592	6440865	Private land

Table 3.3 Noise receptor assessment locations

Receptor ID	Easting[1]	Northing[1]	Ownership
1243	720766	6444830	Private land
1244	726158	6441665	Private land
1246	724070	6439658	Private land
1250	725993	6441404	Private land
1251	724706	6439859	Private land
1252	719923	6443593	Private land
1253	720799	6443797	Private land
2087	718971	6441108	CHC owned land
2097	717465	6425399	CHC owned land
2128	714298	6446320	CHC owned land
2174	711020	6447784	CHC owned land
2176	710920	6446198	CHC owned land
2189	708803	6447616	CHC owned land
2208	706856	6446077	CHC owned land
2209	706818	6445124	CHC owned land
2221	705274	6445295	CHC owned land
3006	732467	6433150	Private land
3008	731878	6430537	Private land
3018	729509	6435703	Private land
3020	729732	6434678	Private land
3021	729345	6434312	Private land
3022	729416	6434302	Private land
3024	729325	6434399	Private land
3029	729391	6431651	Private land
3035	729322	6434467	Private land
3041	727357	6435010	Private land
3043	727929	6434517	Private land
3044	725657	6432189	Private land
3048	724485	6435690	CHC owned land
3049	724799	6435462	CHC owned land
3050	725180	6435362	Private land
3051	725120	6435218	Private land
3052	725023	6434939	Private land
3055	724839	6433777	CHC owned land
3057	725382	6433345	Private land
3062	724240	6434241	Private land
3063	723797	6434779	Private land
3065	724291	6434887	Private land
3066	723999	6435184	Private land
3067	724205	6435284	Private land
3086	719935	6437979	Private land
3098	717196	6429001	CHC owned land
3099	717172	6429343	CHC owned land

Table 3.3 Noise receptor assessment locations

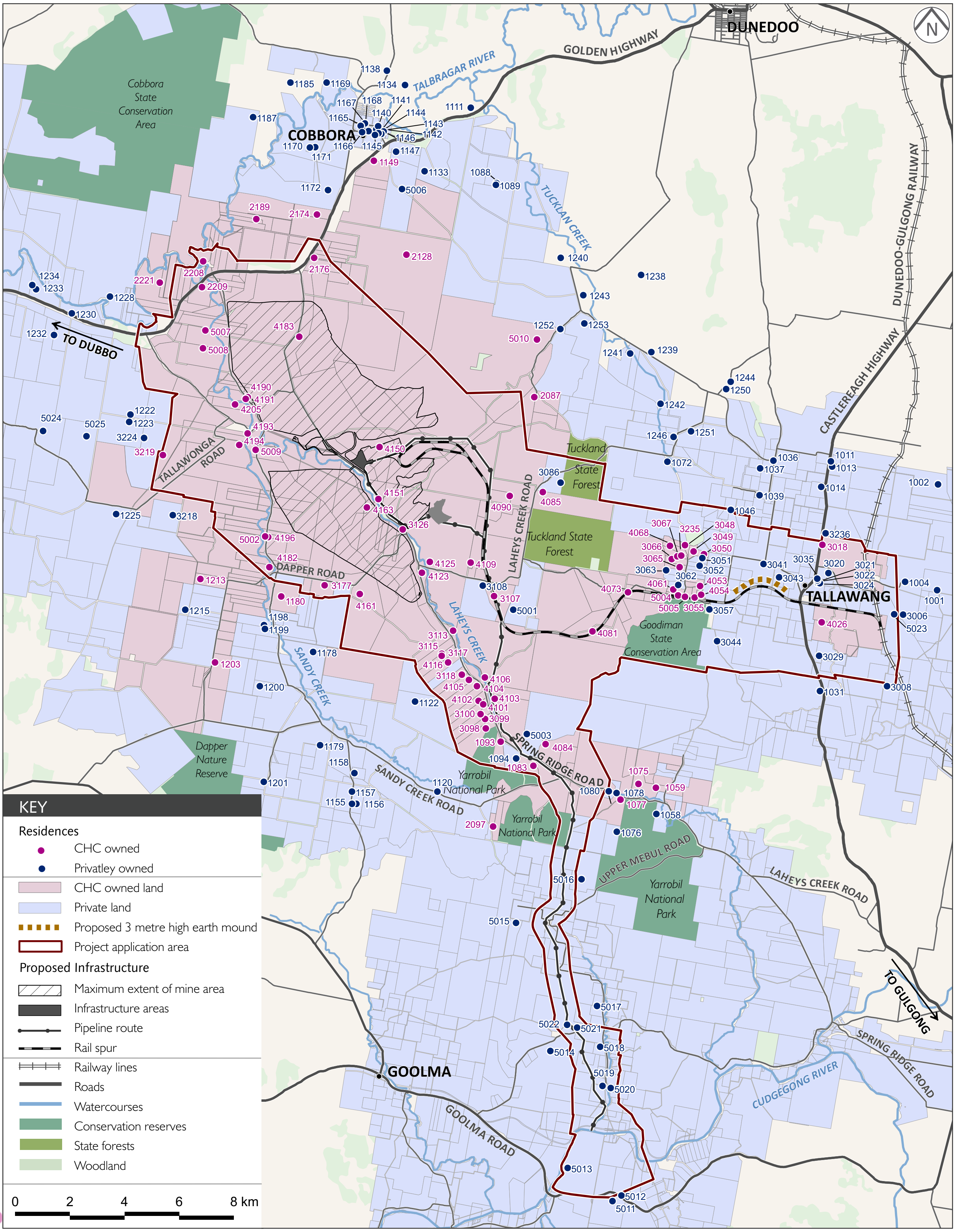
Receptor ID	Easting[1]	Northing[1]	Ownership
3100	717006	6429515	CHC owned land
3107	717502	6433827	CHC owned land
3108	717086	6434221	Private land
3113	716002	6432563	CHC owned land
3115	715590	6431720	CHC owned land
3117	715583	6431647	CHC owned land
3118	716319	6430961	CHC owned land
3126	714159	6436269	CHC owned land
3177	711297	6434229	CHC owned land
3218	705747	6436795	Private land
3219	705388	6438986	CHC owned land
3224	704695	6439614	Private land
3235	724349	6435316	Private land
3236	729629	6436131	Private land
4026	729485	6432872	CHC owned land
4053	725038	6434202	CHC owned land
4054	725080	6433879	CHC owned land
4061	724055	6434072	CHC owned land
4068	723940	6435672	CHC owned land
4073	722403	6433966	CHC owned land
4081	721098	6432540	CHC owned land
4084	719383	6428415	CHC owned land
4085	719283	6437633	CHC owned land
4090	718073	6437495	CHC owned land
4101	717104	6429868	CHC owned land
4102	716933	6429999	CHC owned land
4103	717524	6430077	CHC owned land
4104	716876	6430543	CHC owned land
4105	716581	6430764	CHC owned land
4106	717165	6430858	CHC owned land
4109	716641	6435057	CHC owned land
4116	715817	6431404	CHC owned land
4123	714863	6434685	CHC owned land
4125	715153	6435083	CHC owned land
4150	713311	6439282	CHC owned land
4151	713270	6437374	CHC owned land
4161	712591	6433905	CHC owned land
4163	712850	6437075	CHC owned land
4182	709279	6434885	CHC owned land
4183	710373	6443311	CHC owned land
4190	708487	6441108	CHC owned land
4191	708414	6441046	CHC owned land
4193	708483	6439783	CHC owned land

Table 3.3 Noise receptor assessment locations

Receptor ID	Easting[1]	Northing[1]	Ownership
4194	708176	6439365	CHC owned land
4196	709235	6435986	CHC owned land
4205	708023	6440837	CHC owned land
5001	718201	6433329	Private land
5002	709125	6436014	CHC owned land
5003	718703	6428783	Private land
5004	724235	6433862	CHC owned land
5005	724485	6433801	CHC owned land
5006	714134	6448718	Private land
5007	706939	6443551	CHC owned land
5008	706851	6442889	CHC owned land
5009	708778	6439174	CHC owned land
5010	719070	6443217	CHC owned land
5011	721830	6411713	Private land
5012	722159	6411919	Private land
5013	720194	6412923	Private land
5014	719560	6417192	Private land
5015	718306	6421881	Private land
5016	720699	6423483	Private land
5017	721268	6418843	Private land
5018	721379	6417348	Private land
5019	721468	6415917	Private land
5020	721766	6415842	Private land
5021	720538	6418057	Private land
5022	720173	6418153	Private land
5023	732137	6433172	Private land
5024	701001	6439875	Private land
5025	702590	6439680	Private land

Notes: *1. All coordinates are presented as Map Grid Australia (GDA 1996), Zone 55.*

2. Dapper Union Church is under the care of trustees originally from the local area.



Noise Receptor Assessment Locations

Cobbora Coal Project - Noise Assessment

Figure 3.7

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3.5 Heritage receptor assessment locations

Blast overpressure and ground vibration have been calculated at several heritage assessment locations surrounding the Project and are presented in Table 3.4 and in Figure 3.8.

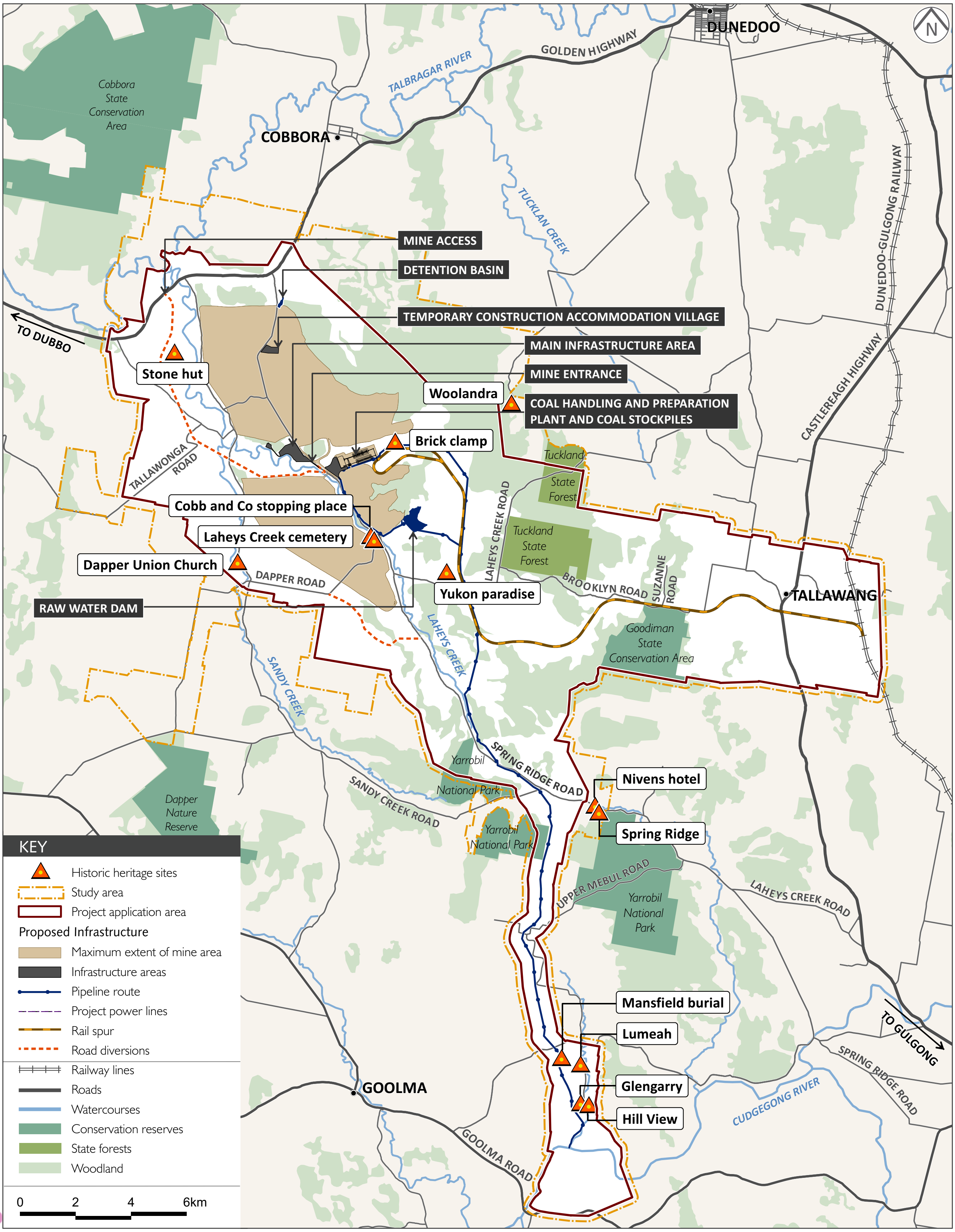
Table 3.4 Heritage receptor assessment locations

Item name	Closest approximate distance[3] to mine blasting	Item coordinates[1]	Item ownership
Laheys Creek cemetery	<300 m	713907E, 6436331N	CHC
Dapper Union church[2]	<1000 m	709108E, 6435394N	Trustees
Potential Cobb and Co stopping place	<200 m	714027E, 6436186N	CHC
Stone hut	<1000 m	706834E, 6442945N	CHC
Brick clamp	<500 m	714784E, 6439734N	CHC
Mansfield burial	<17 km	720780E 6417546N	Private
Nivens hotel	<10 km	721984E, 6426630N	Private
Yukon Paradise	<2 km	716640E, 6435038N	CHC
Spring Ridge	<10 km	722121E, 6426384N	CHC
Glengarry	<20 km	721468E, 6417316N	Private
Lumeah	<17 km	721461E, 6417316N	Private
Hill View	<20 km	721760E, 6415847N	Private
Woolandra	<3 km	718971E, 6441108N	CHC

Notes: 1. All coordinates are presented as Map Grid Australia (GDA 1996), Zone 55.

2. Dapper Union church is under the care of trustees originally from the local area.

3. Distances based on Year 20 mine scenarios.



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EMM
Cobbora Holding Company Pty Limited

Heritage Receptor Assessment Locations
Cobbora Coal Project - Noise Assessment
Figure 3.8

4 Noise impact assessment results

4.1 Operations noise modelling results

The predicted noise levels at each receptor location for each meteorological condition are provided in Table 4.1 for privately owned residential receptors.

Noise contours (Appendix D) have been prepared for the following mine stages and meteorological conditions:

- Year 1: calm, prevailing winds and inversion meteorological conditions, $L_{eq(15\text{-}min)}$ dB(A);
- Year 2: calm, prevailing winds and inversion meteorological conditions, $L_{eq(15\text{-}min)}$ dB(A);
- Year 8: calm, prevailing winds and inversion meteorological conditions, $L_{eq(15\text{-}min)}$ dB(A);
- Year 16: calm, prevailing winds and inversion meteorological conditions, $L_{eq(15\text{-}min)}$ dB(A); and
- Year 20: calm, prevailing winds and inversion meteorological conditions, $L_{eq(15\text{-}min)}$ dB(A).

Sections of the Year 16 and Year 20 mine plans were modified in August 2012 to reduce the sizes of voids and out-of-pit emplacements in the final landform. The disturbance footprint is unchanged and the modifications do not affect the number or location of the modelled noise sources. Therefore, the modifications will not lead to noise levels above those predicted in this report.

The noise contours provide a visual guide of potential operational noise. Table 4.1 provides a specific assessment of receptors in the noise management and affectation zones.

The bold text indicates receptors where noise predictions fall into the management zone (ie 1–5 dB above the PSNL) and shading indicates where noise predictions fall into the affectation zone (ie 5 dB above the PSNL).

The predicted mine noise levels for Dapper Union church are below 35 dB(A) which satisfies the relevant INP criteria. Therefore noise emissions for this receptor have not been considered further in this assessment.

Table 4.1 Predicted operational noise levels at privately owned receptors during calm, prevailing and inversion meteorology - dB(A), Leq(15-min)

Receptor ID	PSNL	Likely acquisition limits	Year 1				Year 2				Year 8				Year 16				Year 20			
	All periods		Calm	Winds	Inversion F/G		Calm	Winds	Inversion F/G		Calm	Winds	Inversion F/G		Calm	Winds	Inversion F/G		Calm	Winds	Inversion F/G	
1001 - 1172	35	40	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35
1178	35	40	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	**36**	**36**
1179	35	40	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35
1185 - 3020	35	40	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	≤35	≤35
3021	35	40	<35	**38**	**39**	**39**	<35	**38**	**39**	**39**	<35	**38**	**39**	**39**	<35	**38**	**39**	**39**	<35	**38**	**39**	**39**
3022	35	40	<35	**38**	**39**	**39**	<35	**38**	**39**	**39**	<35	**38**	**39**	**39**	<35	**38**	**39**	**39**	<35	**38**	**39**	**39**
3024	35	40	<35	**37**	**38**	**38**	<35	**37**	**38**	**38**	<35	**37**	**38**	**38**	<35	**37**	**38**	**38**	<35	**37**	**38**	**38**
3029	35	40	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35
3035	35	40	<35	**36**	**37**	**37**	<35	**36**	**37**	**37**	<35	**36**	**37**	**37**	<35	**36**	**37**	**37**	<35	**36**	**37**	**37**
3041	35	40	<35	<35	**36**	**36**	<35	<35	**36**	**36**	<35	<35	**36**	**36**	<35	<35	**36**	**36**	<35	<35	**36**	**36**
3043	35	40	<35	38	**39**	**39**	<35	**38**	**39**	**39**	<35	**38**	**39**	**39**	<35	**38**	**39**	**39**	<35	**38**	**39**	**39**
3044 - 3052	35	40	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35
3057	35	40	**38**	**39**	**43**	**44**	**38**	**39**	**43**	**44**	**38**	**39**	**43**	**43**	**38**	**39**	**43**	**43**	**38**	**39**	**43**	**43**
3062 - 3086	35	40	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35
3108	35	40	**43**	**45**	**48**	**48**	**43**	**45**	**48**	**48**	**43**	**45**	**48**	**48**	**43**	**45**	**48**	**48**	**43**	**45**	**48**	**48**
3218 - 3236	35	40	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35
5001	35	40	**38**	**43**	**44**	**44**	**38**	**43**	**44**	**44**	**38**	**43**	**44**	**44**	**38**	**43**	**44**	**44**	**38**	**43**	**44**	**44**
5003 - 5022	35	40	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35
5023	35	40	<35	**38**	**38**	**38**	<35	**38**	**38**	**38**	<35	**38**	**38**	**38**	<35	**38**	**38**	**38**	<35	**38**	**38**	**38**
5024 - 5025	35	40	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	<35	≤35

Notes: 1. Calm: no wind or temperature gradient; 2. Winds: 2.3 m/s 247.5° (WSW); 3. Inversion: F and G class stability; 4. Bold - receptors that fall into the management zone (>35 dB(A) and ≤40 dB(A); 5. Bold/grey - receptors that fall into the affectation zone (>40 dB(A)).

The noise model predictions have been assessed by comparing the higher of the calm, winds and temperature inversion results to the INP criteria. Receptors predicted to be within the noise management zone or within the noise affectation zone, during adverse weather conditions are presented in Table 4.2.

Table 4.2 Receptors above management zone and affectation zone criteria during adverse weather conditions

Noise management zone (>35 dB(A) to ≤40 dB(A))	Noise affectation zone (>40 dB(A))
Any year	Any year
1178	3057
3021	3108
3022	5001
3024	
3035	
3041	
3043	
5023	

Note: *Excludes duplicated receptors from each stage. Receptors owned by CHC have been excluded from this summary.*

During adverse weather conditions for all assessment periods, for all stages of the mining life, eight privately owned receptors within the area modelled are predicted to experience noise levels above the operational criteria (ie >35 dB(A)) and three of these receptors are predicted to experience noise levels above the likely acquisition criteria (ie >40 dB(A)).

The noise model for Year 20 was used to rank the noise sources above the PSNL. The results of the model identified that two of the 11 exceedances above the PSNL are directly attributable to mining extraction operations. The remaining nine exceedances were attributable to rail noise emissions along the rail spur. There are six maximum and three planned train movements per night. Table 4.3 provides a comparison of noise levels for extraction only (ie rail loadout, but no rail spur) against operational noise that includes extraction and rail spur noise.

Table 4.3 Comparison Year 20 extraction only versus operational (including rail spur) at privately owned receptors during inversion - dB(A), $L_{eq(15\text{-}min)}$

Receptors	Extraction only	Rail spur and extraction
1178	36	36
3021	<30	39
3022	<30	39
3024	<30	39
3035	<30	37
3041	<30	36
3043	<30	39
5023	<30	38
3057	<30	43
3108	39	48
5001	35	44

4.2 Vacant land noise assessment

Noise predictions identify that a total of seven land holders own 43 vacant land parcels that are above the acquisition criteria of 40 dB(A) on more than 25% of their land area. Table 4.4 provides a summary list of vacant lands identified to be within the affectation zone.

Table 4.4 Summary of vacant land identified to be within the affectation zone (private ownership)

Lot/DP Number		
2/180421	26/750751	177/750751
5/249194	40/750751	178/750751
1/528668	41/750751	179/750751
2/528668	42/750751	185/750751
1/618310	47/750751	187/750751
1/726827	49/750751	200/750751
2/726827	62/750751	79/750767
13/750751	63/750751	51/754305
14/750751	66/750751	52/754305
15/750751	97/750751	86/754305
18/750751	100/750751	116/754305
22/750751	103/750751	1/754329
23/750751	104/750751	2/1122475
24/750751	106/750751	
25/750751	175/750751	

The $L_{eq(15\text{-}min)}$ noise contours derived from all five operational stages for adverse weather conditions are presented in Appendix D.

4.3 Low frequency operational noise modelling results

Another consideration in assessing operational noise is the potential of 'low' frequency content. The INP includes a 5dB penalty if sources are perceived to exhibit low frequency noise at receptors, defined by received dB(C) noise being 15dB or more than received dB(A) noise levels. An assessment has therefore been undertaken to quantify low frequency impacts based on the Year 20 scenario, which represents the highest noise emissions from the Project. To quantify 'low' frequency noise a 'C' weighting correction is applied to the single octave sound power data for all operational sources, including the CHPP and excluding the rail spur. The noise predictions for receptors where the low frequency penalty was found to apply remained below the 35 dB(A) PSNL.

Appendix E provides results of the low frequency assessment (dB(C)) for all privately owned receptors with levels remaining below 60 dB(C).

4.4 Sleep disturbance assessment

People asleep in their homes may be disturbed by intermittent on site noises, such as bulldozer track plates, reversing alarms of heavy vehicles and rail activity on the rail spur. Typical noise levels from the loudest of these events are presented in Table 4.5 which has been obtained from measurements undertaken on similar projects.

Table 4.5 Maximum noise from intermittent sources

Noise source	Measured L_{max} noise level, dB(A)
Haul truck	125
Reverse alarm	105–115 (with maximum modifying factor adjustment)
Bulldozer with reversing alarm	115
Train shunting/pass-by (onsite)	120

Table 4.5 indicates the highest maximum noise levels expected at homes would likely result from haul trucks or rail pass-by noise. The maximum (at source) sound power level of unmitigated haul trucks has previously been measured to be typically 125 dB(A)L_{max}. Maximum noise levels at each residence were calculated under adverse meteorological conditions.

Predicted L_{max} noise levels from trucks at receptors were based on the typical equipment positions used for mining operations and a rail pass-by along the rail spur. Predictions were based on a single event, rather than the simultaneous operation of a number of plant items, because of the low probability of more than one maximum noise event occurring concurrently. The criterion used to assess sleep disturbance is based on the EPA's 'background noise level plus 15 dB' criteria for maximum (L_{max}) noise sources.

Noise modelling identified that L_{max} noise levels associated with the rail spur are above the strict EPA sleep disturbance criteria at several receptors. There are up to six planned train movements during the night time assessment period (10.00 pm to 7.00 am), therefore, in a worst case scenario there is the potential for six exceedances within the night-time period. Despite this, L_{max} noise levels from the rail spur remain below levels that are likely to wake sleeping occupants indoors, based on international research as published in the EPA's RNP.

Table 4.6 Maximum on-site noise from intermittent sources at privately owned residences

Receptor ID	L_{max} criterion, dB(A)	Modelled L_{max} noise level, dB(A)
3021	45	48
3022	45	48
3024	45	47
3035	45	46
3041	45	48
3043	45	50
3062	45	54
5023	45	49

CHC is committed to providing acoustic treatments to residences that are effected by on-site noise above the 45 dB(A)L_{max} criterion, especially in areas where barriers would not be a reasonable or feasible option. The potential treatments include acoustic insulation of roof/ceiling and walls, improved glazing, window and door seals. In addition, there would be a need to keep windows and doors closed meaning mechanical ventilation would be required. The level of noise mitigation should be applied on a case by case basis taking into account such aspects as dwelling orientation, distance to railway and the building materials of each structure.

4.5 Construction noise

Noise associated with constructing the water pipeline, power easement and railway has been quantified. These are different from mining activities: they are of a limited and relatively short duration (approximately 20 months from January 2014 to September 2015) compared with the proposed mining life; they are geographically separate from mine extraction areas; and they require machinery that generally will not be used in mining.

A combined construction scenario assuming the simultaneous construction of the water pipeline, power easement and railway was completed to quantify potential impacts. The results of the construction assessment should be considered conservative.

The construction noise modelling results are presented in Table 4.7 for the most affected receptors, ie where noise emissions are predicted to be above the construction noise criteria. Noise levels at the remaining receptors are predicted to be below the threshold and are not presented in Table 4.7.

Table 4.7 Noise levels from construction activities

Receptor ID	Daytime $L_{eq(15\text{-}min)}$ criteria, dB(A)	Modelled $L_{eq(15\text{-}min)}$ noise level, dB(A)	Ownership
3055	40	59	CHC owned land
5005	40	55	CHC owned land
4054	40	50	CHC owned land
4081	40	49	CHC owned land
5022	40	49	Private land
4106	40	47	CHC owned land
1094	40	47	Private land
5021	40	47	Private land
4103	40	47	CHC owned land
4053	40	46	CHC owned land
5023	40	45	Private land
4073	40	44	CHC owned land
3043	40	44	Private land
4104	40	44	CHC owned land
5001	40	44	Private land
5004	40	44	CHC owned land
1083	40	44	Private land
3041	40	42	Private land
5018	40	41	Private land
5019	40	41	Private land

Results presented in Table 4.7 identify that several receptors would experience noise levels above the ICNG criteria on occasions through the construction period. For the remaining receptors, noise levels from construction activities will satisfy the ICNG criteria.

Receptors with the potential for the greatest construction noise impact are those situated on CHC owned land including receptors 3055, 5005, 4054 and 4081. Even though noise levels during construction are predicted to satisfy the ICNG's highly affected criteria of 75 dB(A) at all locations, care will be taken to manage construction noise impacts. Noise management measures to limit impacts on the surrounding community are provided in Section 6.3.

4.6 Road traffic noise

A number of road realignments are required for the mine construction and operations traffic. The most significant for generating road traffic noise is the realignment of the northern section of Spring Ridge Road, which will provide mine access from the Golden Highway and will be the main access for road traffic to the mine. However, the nearest privately owned receptors to Spring Ridge Road is over 2 km, therefore road noise has not been assessed for Spring Ridge Road receivers.

Additionally, traffic movements associated with construction activities could contribute to road traffic noise emissions.

The Calculation of Road Traffic Noise (CORTN) (UK Department of Transport) method was used to predict the L_{eq} noise levels at adjacent receptors for additional traffic travelling along the Golden Highway. CORTN, which was developed by the UK Department of Transport, considers traffic flow volume, average speed, percentage of heavy vehicles and road gradient to establish noise source strength, and includes attenuation due to distance, ground, atmospheric absorption and screening from buildings or barriers.

4.6.1 Operational road traffic noise emissions

During peak years of operation, the predicted workforce is expected to be about 590 people. This consists of 30 management and technical staff plus four shift teams each of nominally 140 people but averaging 124 a shift once leave and other absences are accounted for. Generally the workforce will generate the following peak daily car and other light vehicle traffic:

- mine operations dayshift and nightshift staff, an estimated 63 cars each way (125 workers), generally arriving shortly before 7.00 am (night period) and 7.00 pm (day period) daily and departing shortly after 7.00 pm (day period) and 7.00 am (day period);

- mine management, technical and administration staff, an estimated 23 cars each way for 30 people, generally arriving at the mine between 7.00 am and 8.00 am (day period) and departing between 4.00 pm and 6.00 pm (day period); and

- typically about 15,200 truck deliveries per year (41–42 truck deliveries daily) over the majority of the mine life.

The overall cumulative traffic volumes have been used in CORTN calculations to predict noise emissions for the day and night assessment periods. Assumptions used for the traffic noise calculations include:

i Day assessment period (7.00 am to 10.00 pm):

- three shift changes (189 or 63 cars each shift);

- mine management, technical and administration staff, approximately 23 cars each way;

- all 42 truck deliveries, as all deliveries would occur only during daytime hours; and

- 30% heavy vehicles.

ii Night assessment period (10.00 pm to 07.00 am):

- one shift change (63 cars each way (before 07.00 am);
- to provide a 'worst case' outcome, all 42 truck deliveries occurring during night time hours; and
- 30% heavy vehicles.

The results of the traffic noise calculations for the Golden Highway are presented in Table 4.8 for the closest privately owned receptor between Medway and Cobbora which is 25 m from the road.

Table 4.8 Operational road traffic noise levels at Golden Highway receptors

Distance to nearest privately owned receptor (m)	Assessment criteria	Current calculated Golden Highway traffic noise	Calculated additional site traffic noise	Existing + future site combined Total
		Day $L_{eq(15\text{-hour})}$, dB(A)		
25	60	67.5[1]	51.9	67.6
		Night $L_{eq(9\text{-hour})}$, dB(A)		
25	55	65.2[1]	49.2	65.3

Note: Existing traffic volumes were obtained from the traffic impact assessment EMM (2012).

Existing ambient traffic noise levels for the Golden Highway were calculated to be above the day and night criteria. The CORTN calculations assumed all traffic to and from site would be from one direction on the Golden Highway, therefore, the results should be considered conservative.

The predicted traffic noise contribution from the Project along the Golden Highway is nominal compared to existing Golden Highway traffic. At the nearest privately owned residences, which are 25 m from the Golden Highway, the RNP criteria is satisfied as road traffic noise levels are not increasing by more than 2 dB.

4.6.2 Construction road traffic noise

During construction, the Project will generate vehicle traffic movements from both the workforce and site visitors. These are expected to occur mainly during daytime hours. A breakdown of vehicles associated with construction activities is as follows:

- 101 light trips each way will be associated with workers commuting from other regional centres each day;
- 38 each way trips will be associated with site visitors from other regional centres each day;
- 100 truck deliveries to the worksites will be required each day;
- 40 trips per day each way associated with service (eg food, drink, laundry, cleaning) staff car traffic movements;
- 18 truck deliveries a day will be associated with water supply and waste water removal;
- one bus trip each way a day for the fly-in-fly-out workforce; and

- 40 light trips each way a day for the drive-in-drive-out workforce.

The results of the construction traffic noise assessment are presented in Table 4.9 for the Golden Highway.

Table 4.9 Construction road traffic noise levels at Golden Highway receptors

Distance to nearest privately owned receptor (m)	Assessment criterion	Current calculated Golden Highway traffic noise	Calculated additional site traffic noise	Existing + future site combined total
Day $L_{eq(15\text{-hour})}$, dB(A)				
25	60	67.5[1]	57.3	67.9

Note: Existing traffic volumes were obtained from the traffic impact assessment conducted by EMM (2012).

Existing ambient traffic noise levels were calculated to be above the day criteria for Golden Highway receptors. The CORTN calculations assumed all traffic to and from site would be from one direction on the Golden Highway, therefore, the results should be considered conservative.

The predicted traffic noise contribution from the Project travelling along the Golden Highway is nominal compared to existing Golden Highway traffic, satisfies the RNP criteria at the nearest privately owned receptors 25 m from the Golden Highway, and would meet criteria as road traffic noise levels are not increasing by more than 2 dB.

4.7 Offsite rail noise emissions

Product coal will be loaded onto trains from an overhead loading bin located on the rail spur balloon loop. Approximately five trains will be loaded daily. The rail spur will join the Ulan railway line near Tallawang. A locomotive provisioning facility and a siding for fuel delivery may be located adjacent to the balloon loop.

The number of rail movements for the Project is limited by available paths on the rail network. Two coal train passby scenarios have been completed representing maximum movements and planned movement scenarios. Each represent potential rail movement scenarios, the latter is more likely for the Project based on the current availability of railway paths. In each case the total number of daily movements is 10 (ie five trains).

The three sections of the rail line include :

- a comparison of existing movements and future contracted (2021) coal trains along the Dunedoo-Gulgong railway;
- an assessment of future cumulative impacts for the Bylong-Mangoola line; and
- an assessment of future cumulative impacts for the Bengalla-Muswellbrook line.

Table 4.10 provides the adopted number of train movements for each scenario.

Table 4.10 Potential additional Cobbora train movements

Period	Scenario		
	Maximum day movements	Maximum night movements	Planned movements
Day	8	4	7
Night	2	6	3
Total 24hr	10	10	10

The emission levels used for the offsite calculations were taken from an EMM measurement database and are considered representative of typical coal trains. The calculations adopted a typical sound exposure level (SEL) of 97 dB(A) at 40 m for coal train passbys, while the L_{max} calculation is based on a typical train noise emission of 82 dB(A) at 30 m from the train line.

4.7.1 Dunedoo-Gulgong

The Dunedoo-Gulgong railway currently has two train movements per week that have the potential to occur during one period. There is potential for between four to eight Cobbora trains to be loaded during the day assessment period (7.00 am to 10.00 pm) and between two to six Cobbora trains to be loaded during the night-time (10.00 pm to 7.00 am) assessment period.

i Noise increases relating to additional maximum train movements

Table 4.11 provides the calculated $L_{eq(15\text{-}hour)}$, $L_{eq(9\text{-}hour)}$ and L_{max} noise levels from existing and proposed maximum CHC rail movements. It is noted that currently the L_{max} noise level is above the IGANRIP for receptors within 20 m of the railway.

Table 4.11 Existing and potential noise increases relating to additional maximum train movements

Distance[1] (m)	Existing train noise, dB(A)[2]			Cobbora train noise, dB(A)[3]			Total train noise, dB(A)[4]		
	Day, $L_{eq(15\text{-}hour)}$	Night, $L_{eq(9\text{-}hour)}$	L_{max}	Day, $L_{eq(15\text{-}hour)}$	Night, $L_{eq(9\text{-}hour)}$	L_{max}	Day, $L_{eq(15\text{-}hour)}$	Night, $L_{eq(9\text{-}hour)}$	L_{max}
15	57	59	88	63	64	88	64	65	88
20	56	58	86	62	63	86	63	64	86
25	55	57	84	61	62	84	62	63	84
40	53	55	80	59	60	80	60	61	80
50	52	54	78	58	59	78	59	60	78
80	50	52	74	56	57	74	57	58	74
100	49	51	72	55	56	72	56	57	72
140	47	49	69	53	54	69	54	55	69
IGANRIP or EPL3142 Trigger	**65**	**60**	**85**	**65**	**60**	**85**	**65**	**60**	**85**

Note: *1. Assumed distance to nearest privately owned receptor.*

2. Based on two existing non-CHC train movements assumed for all periods.

3. Based on eight maximum CHC movements during the day and six maximum CHC movements during the night.

4. Based on 10 total movements during the day and eight total movements during the night (ie existing trains + CHC trains).

ii Noise increases relating to additional planned train movements

Table 4.12 provides the calculated $L_{eq(15\text{-hour})}$, $L_{eq(9\text{-hour})}$ and L_{max} noise levels from existing and proposed planned CHC rail movements of seven day and three night movements.

Table 4.12 Existing and potential noise increases relating to additional planned train movements

Distance[1] (m)	Existing train noise, dB(A)			Proposed Cobbora train noise, dB(A)			Total train noise, dB(A)		
	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}
15	57	59	88	62	61	88	63	63	88
20	56	58	86	61	60	86	62	62	86
25	55	57	84	60	59	84	61	61	84
40	53	55	80	58	57	80	59	59	80
50	52	54	78	57	56	78	58	58	78
80	50	52	74	55	54	74	56	56	74
100	49	51	72	54	53	72	55	55	72
140	47	49	69	53	51	69	53	53	69
IGANRIP or EPL3142 Trigger	**65**	**60**	**85**	**65**	**60**	**85**	**65**	**60**	**85**

Note: 1. Assumed distance to nearest privately owned receptor.
2. Based on two existing non-CHC train movements assumed for all periods
3. Based on seven proposed CHC movements during the day and three proposed CHC movements during the night
4. Based on nine total movements during the day and five total movements during the night (ie existing trains + CHC trains).

The review of the maximum train movement scenario shows that:

- day criteria will be met for all noise receptors at distances 15 m (and greater) from the track;
- night L_{eq} criteria will be met for noise receptors 50 m (and greater) from the track; and
- L_{max} criteria will be met for noise receptors situated 25 m (and greater) from the railway.

The review of the planned train movement scenario shows that:

- day criteria will be met for all noise receptors at distances 10 m (and greater) from the track;
- night L_{eq} criteria will be met for noise receptors 30 m (and greater) from the track; and
- L_{max} criteria will be met for noise receptors situated 25 m (and greater) from the railway.

4.7.2 Bylong-Mangoola

The latest available data for the Bylong - Mangoola line has been analysed by EMM (EMM, 2012) to calculate future train movements for CHC and non CHC trains.

The daily coal transport calculation is based on a potential 365 days operation per year but ARTC allows 46 days per year for the line to be not operational due to maintenance which is equal to 319 days net per year for operations. The results of the calculations are presented Table 4.13.

Table 4.13 Predicted future line coal train movements per day in 2021, Bylong to Mangoola

Line section	Cobbora train movements per day	Coal train movements per day for contracted volume (excluding CHC)
Bylong to Mangoola	10	29

i Noise increases related to additional maximum train movements

Table 4.14 provides the calculated $L_{eq(15\text{-hour})}$, $L_{eq(9\text{-hour})}$ and L_{max} noise levels from proposed maximum CHC rail movements along the Bylong – Mangoola line and compared against predicted future train movements for the line based on the projected contracted volumes for 2021. It is noted that currently the L_{max} noise level is above the IGANRIP for receptors within 20 m of the railway.

Table 4.14 Existing and potential noise increases relating to additional maximum train movements

Distance[1]	Contracted train noise, dB(A)[2]			Cobbora train noise, dB(A)[3]			Total train noise, dB(A)[4]		
(m)	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}
15	66	66	88	63	64	88	68	68	88
20	65	65	86	62	63	86	67	67	86
25	64	64	84	61	62	84	66	66	84
40	62	62	80	59	60	80	64	64	80
50	61	61	78	58	59	78	63	63	78
80	59	59	74	56	57	74	61	61	74
100	58	58	72	55	56	72	60	60	72
140	57	57	69	53	54	69	58	59	69
IGANRIP or EPL3142 Trigger	**65**	**60**	**85**	**65**	**60**	**85**	**65**	**60**	**85**

Note: *1. Assumed distance to nearest privately owned receptor.*

2. Based on 2021 data for 18 non CHC contracted movements during the day and 11 non CHC contracted movements during the night.

3. Based on hypothetical eight maximum CHC movements during the day and six maximum CHC movements during the night.

4. Based on 26 total movements during the day and 17 total movements during the night (ie contracted trains + CHC trains).

4.7.3 Noise increases relating to additional planned train movements

Table 4.15 provides the calculated $L_{eq(15\text{-}hour)}$, $L_{eq(9\text{-}hour)}$ and L_{max} noise levels from proposed planned CHC rail movements along the Bylong – Mangoola line and compared against predicted future CHC train movements for the line based on the projected non CHC contracted volumes for 2021. It is noted that currently the L_{max} noise level is above the IGANRIP for receptors within 20 m of the railway.

Table 4.15 Existing and potential noise increases relating to additional planned train movements

Distance[1] (m)	Contracted train noise, dB(A)[2]			Proposed Cobbora train noise, dB(A)			Total train noise, dB(A)		
	Day, $L_{eq(15\text{-}hour)}$	Night, $L_{eq(9\text{-}hour)}$	L_{max}	Day, $L_{eq(15\text{-}hour)}$	Night, $L_{eq(9\text{-}hour)}$	L_{max}	Day, $L_{eq(15\text{-}hour)}$	Night, $L_{eq(9\text{-}hour)}$	L_{max}
15	66	66	88	62	61	88	67	67	88
20	65	65	86	61	60	86	66	66	86
25	64	64	84	60	59	84	65	65	84
40	62	62	80	58	57	80	63	63	80
50	61	61	78	57	56	78	62	62	78
80	59	59	74	55	54	74	60	60	74
100	58	58	72	54	53	72	59	59	72
140	57	57	69	53	51	69	58	58	69
IGANRIP or EPL3142 Trigger	**65**	**60**	**85**	**65**	**60**	**85**	**65**	**60**	**85**

Note: 1. Assumed distance to nearest privately owned receptor.

2. Based on 2021 data for 18 non CHC contracted movements during the day and 11 non CHC contracted movements during the night.

3. Based on seven proposed CHC movements during the day and three proposed CHC movements during the night.

4. Based on 25 total movements during the day and 14 total movements during the night (ie contracted trains + CHC trains).

The review of the maximum train movement scenario for the Bylong – Mangoola line shows that:

- day criteria will be met for all noise receptors at distances 30 m (and greater) from the track;
- night L_{eq} criteria will be met for noise receptors 100 m (and greater) from the track; and
- L_{max} criteria will be met for noise receptors situated 25 m (and greater) from the railway.

The review of the planned train movement scenario shows that:

- day criteria will be met for all noise receptors at distances 25 m (and greater) from the track;
- night L_{eq} criteria will be met for noise receptors 80 m (and greater) from the track; and
- L_{max} criteria will be met for noise receptors situated 25 m (and greater) from the railway.

4.7.4 Bengalla - Muswellbrook

The latest available data for the Bengalla – Muswellbrook line has been referenced from the ARTC strategy for the Hunter Valley Corridor for 2012 (EMM, 2012) and analysed by EMM to calculate future train movements for CHC and non CHC trains.

The daily coal transport calculation is based on a potential 365 days operation per year but ARTC allows 46 days per year for the line to be not operational due to maintenance which is equal to 319 days net per year for operations. The results are presented Table 4.16.

Table 4.16 Predicted Future Line Coal Train Movements Per Day in 2021, Bengalla - Muswellbrook

Line section	Cobbora train movements per day	Coal train movements per day for contracted volume (excluding CHC)
Bengalla to Muswellbrook	10	47

i Noise increases related to additional maximum train movements

Table 4.17 provides the calculated $L_{eq(15\text{-hour})}$, $L_{eq(9\text{-hour})}$ and L_{max} noise levels from proposed maximum CHC rail movements along the Bengalla – Muswellbrook line and compared against predicted future train movements for the line based on the projected contracted volumes for 2021. It is noted that currently the L_{max} noise level is above the IGANRIP for receptors within 20 m of the railway.

Table 4.17 Existing and potential noise increases relating to additional maximum train movements

Distance[1]	Contracted train noise, dB(A)[2]			Cobbora train noise, dB(A)[3]			Total train noise, dB(A)[4]		
(m)	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}
15	68	68	88	63	64	88	69	69	88
20	67	67	86	62	63	86	68	68	86
25	66	66	84	61	62	84	67	67	84
40	64	64	80	59	60	80	65	65	80
50	63	63	78	58	59	78	64	64	78
80	61	61	74	56	57	74	62	62	74
100	60	60	72	55	56	72	61	61	72
140	59	59	69	53	54	69	60	60	69
IGANRIP or EPL3142 Trigger	**65**	**60**	**85**	**65**	**60**	**85**	**65**	**60**	**85**

Note: *1. Assumed distance to nearest privately owned receptor.*

2. Based on 2021 data for 29 contracted non CHC movements during the day and 18 contracted non CHC movements during the night.

3. Based on hypothetical eight maximum CHC movements during the day and six maximum CHC movements during the night.

4. Based on 37 total movements during the day and 24 total movements during the night (ie contracted trains + CHC trains).

ii Noise increases relating to additional planned train movements

Table 4.18 provides the calculated $L_{eq(15\text{-hour})}$, $L_{eq(9\text{-hour})}$ and L_{max} noise levels from proposed planned CHC rail movements along the Bengalla - Muswellbrook line and compared against predicted future train movements for the line based on the projected contracted volumes for 2021. It is noted that currently the L_{max} noise level is above the IGANRIP for receptors within 20 m of the railway.

Table 4.18 Existing and potential noise increases relating to additional planned train movements

Distance[1] (m)	Contracted train noise, dB(A)[2]			Proposed Cobbora train noise, dB(A)			Total train noise, dB(A)		
	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}	Day, $L_{eq(15\text{-hour})}$	Night, $L_{eq(9\text{-hour})}$	L_{max}
15	68	68	88	62	61	88	69	69	88
20	67	67	86	61	60	86	68	68	86
25	66	66	84	60	59	84	67	67	84
40	64	64	80	58	57	80	65	65	80
50	63	63	78	57	56	78	64	64	78
80	61	61	74	55	54	74	62	62	74
100	60	60	72	54	53	72	61	61	72
140	59	59	69	53	51	69	60	60	69
IGANRIP or EPL3142 Trigger	**65**	**60**	**85**	**65**	**60**	**85**	**65**	**60**	**85**

Note: 1. Assumed distance to nearest privately owned receptor.
2. Based on 2021 data for 18 contracted movements during the day and 11 contracted movements during the night.
3. Based on seven proposed movements during the day and three proposed movements during the night.
4. Based on 25 total movements during the day and 14 total movements during the night (ie contracted trains + CHC trains).

The review of the maximum train movement scenario for the Bengalla - Muswellbrook line shows that:

- day criteria will be met for all noise receptors at distances 40 m (and greater) from the track;
- night L_{eq} criteria will be met for noise receptors 140 m (and greater) from the track; and
- L_{max} criteria will be met for noise receptors situated 25 m (and greater) from the railway.

The review of the planned train movement scenario shows that:

- day criteria will be met for all noise receptors at distances 40 m (and greater) from the track;
- night L_{eq} criteria will be met for noise receptors 140 m (and greater) from the track; and
- L_{max} criteria will be met for noise receptors situated 25 m (and greater) from the railway.

4.8 Quantifying rail noise impacts - Cobbora rail spur to the Ulan mine

A detailed review of buildings within the vicinity of the railway located between the Cobbora rail spur to the Ulan mine rail loop has been completed. This section of line has the most significant potential cumulative impact pertaining to offsite train noise. The review determined the number of potential dwellings between Tallawang and Ulan within a buffer of 50 m for the maximum train movement scenario and a buffer of 30 m for the planned train movement scenario.

4.8.1 Maximum train movement scenario

Table 4.19 presents the structures/dwellings and the predicted total train noise level compared against IGANRIP (or ARTC's EPL3142) trigger noise levels for the maximum train movement scenario. Receptors with predicted offsite rail noise levels above the RING trigger levels has also been provided for comparison purposes only (ie 31 additional receivers). The predicted exceedances are shown in bold.

Table 4.19 Structures/dwellings affected by rail noise, maximum train movement scenario[1]

Lot/DP number	Structures/dwellings	Distance from rail[2]	Total train noise, dB(A)		
			Day, $L_{eq(15\text{-}hour)}$	Night, $L_{eq(9\text{-}hour)}$	L_{max}
1/808892	House	20 m	63	**64**	**86**
320/755434	House	20 m	63	**64**	**86**
341/755434	House	24 m	62	**63**	84
1/1006126	Structures	25 m	62	**63**	84
1/1016478	Structures/Houses	25 m	62	**63**	84
135/755434	House	25 m	62	**63**	84
202/1164834	House	30 m	61	**62**	82
1/1130766	House/Structure	40 m	60	**61**	79
118/1089468	House	42 m	60	**61**	79
388/755434	House	43 m	60	**61**	79
354/755434	House	45 m	60	**61**	78
IGANRIP trigger levels			**65**	**60**	**85**

Source [1]: Chelace GIS Pty Ltd

Note [2]: Receptor distance to approximate centre of the railway with data obtained from GIS spatial database not actual site observations

Bold - receptors that fall above the night off site rail noise criteria

Bold/grey - receptors that fall above the L_{max} criteria

4.8.2 Planned train movement scenario

Table 4.20 presents the structures/dwellings and the predicted total train noise level compared against IGANRIP (or EPL3142) trigger noise levels for the planned train movement scenario. Receptors with predicted offsite rail noise levels above the RING trigger levels has also been provided for comparison purposes only (ie 19 additional receivers). The predicted exceedances are shown in bold.

Table 4.20 Structures/dwellings affected by rail noise, planned train movement scenario[1]

Lot/DP number	Structures/dwellings	Distance from rail[2]	Total train noise, dB(A)		
			Day, $L_{eq(15\text{-}hour)}$	Night, $L_{eq(9\text{-}hour)}$	L_{max}
1/808892	House	20 m	62	**62**	**86**
320/755434	House	20 m	62	**62**	**86**
341/755434	House	24 m	61	**61**	84
1/1006126	Structures	25 m	61	**61**	84
1/1016478	Structures/Houses	25 m	61	**61**	84
135/755434	House	25 m	61	**61**	84
IGANRIP trigger levels			**65**	**60**	**85**

Source [1]: Chelace GIS Pty Ltd

Note [2]: Receptor distance to approximate centre of the railway with data obtained from GIS spatial database not actual site observations

Bold - receptors that fall above the night off site rail noise criteria

Bold/grey - receptors that fall above the L_{max} criteria

The review of the maximum train movement scenario assessed against the IGANRIP or EPL3142 criteria shows that:

- rail noise levels at all receptors are expected to satisfy the daytime offsite L_{eq} criteria;
- rail noise levels at 11 receptors are expected to be above the night time offsite L_{eq} criteria; and
- rail noise levels at two receptors are expected to be above the offsite L_{max} criteria.

The review of the planned train movement scenario assessed against the IGANRIP or EPL3142 criteria shows that:

- rail noise levels at all receptors are expected to satisfy the daytime offsite L_{eq} criteria;
- rail noise levels at six receptors are expected to be above the night time offsite L_{eq} criteria; and
- rail noise levels at two receptors are expected to be above the offsite L_{max} criteria.

Section 5 provides recommendations for noise management and mitigation options.

4.9 Blast calculations

Blast design will be actively managed by the project, and hence corresponding airblast overpressure and ground vibration can be controlled. Blast overpressure and vibration results have been calculated using the method given in the AS2187-2: Explosives – Storage and use Part 2: Use of explosives, 2006 and ICI Explosives Blasting Guide, as applicable to blasting in hard rock. This formula has been shown to be conservative in calculating overpressure and vibration.

The relevant formulae are as follows:

PVS = $500 (R/Q^{0.5})^{-1.6}$

dB = $164.2 - 24(\log_{10} R - 0.33 \log_{10} Q)$

Where,

PVS = peak vector sum ground vibration level (mm/s)

dB = peak airblast level (dB Linear)

R = distance between charge and receptor (m)

Q = charge mass per delay (kg) or maximum instantaneous charge (MIC)

The Project's proposed blast parameters identify a maximum instantaneous charge (MIC) range of between 1,500 kg and 3,500 kg. Table 4.21 provides the derived overpressure and vibration levels based on 1,500 kg and 3,500 kg MICs.

4.9.1 Blast overpressure and vibration receptors

The nearest distance at which blast overpressure and vibration criteria will be achieved are summarised in Table 4.21.

Table 4.21 Predicted blast overpressure and vibration levels - privately owned receptors

Approximate minimum distance from blast to privately owned receptors (m)	Derived overpressure (dB(L)peak)	Derived vibration PPV (mm/s)	MIC (kg) range
1,250	115	2	1,500
1,650	115	2	3,500

Note: Airblast overpressure criteria 115 dB(L_{inpeak}). Ground vibration criteria 5 (mm/s) PPV.

The predicted blast overpressure and vibration levels identify that a maximum MIC of 1,500 kg would comply with ANZECC criteria at distances of greater than 1,250 m. Adopting a maximum MIC of 3,500 kg would comply with ANZECC criteria at distances of greater than 1,650 m. It is noted that there is one privately owned receptor within the 1,650 m minimum distance (3177) for blasts with an MIC of 3,500 kg. Therefore the lower MIC should be adopted when within 1,650 m of this receptor, or alternatively the proposed MIC blast patterns should be designed specifically to meet the relevant ANZECC guidelines at this receptor.

4.9.2 Heritage receptor assessment locations

The calculated blast vibration levels are summarised in Table 4.22 for the nearest distance to achieve the structural criteria for heritage receptors.

Table 4.22 Predicted blast vibration levels - heritage receptors

Approximate minimum distance from blast to heritage receptors (m)	Heritage assessment criteria (mm/s)	Derived vibration PPV (mm/s)	MIC (kg) range
450	10	9.9	1,500
700	10	9.6	3,500

The blast vibration level predictions satisfy the heritage vibration assessment criteria at all heritage receptors at a distance of more than 450 m when using an MIC of 1,500 kg or more than 700 m when using an MIC of 3,500 kg. There are several heritage receptors including, Laheys Creek cemetery, the Potential Cobb and Co stopping place and the Brick clamp within the 700 m minimum distance for blasts with an MIC of 3,500 kg. It is noted that of these, the Laheys Creek cemetery is the only site that contains structures or items (ie grave stones) that are sensitive to blast vibration. Notwithstanding where blasting occurs within 700 m from heritage receptors that contain structures, the proposed MIC blast patterns should be designed specifically to meet the relevant structural criteria at these heritage receptors.

4.9.3 Livestock

There is limited literature or evidence of the impacts of noise from blasting on livestock. Where blasting is within 1km (arbitrary) of known commercial livestock properties, notification will be provided to such livestock operators prior to blasting. Where required livestock should be relocated prior to commencement of a blast.

5 Noise management

5.1 Operational noise

5.1.1 Reasonable and feasible measures

The INP (EPA 2000:06) states the following with respect to feasible and reasonable noise management measures:

> Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgment in arriving at a decision, taking into account the following factors:
>
> - noise mitigation benefits (amount of noise reduction provided, number of people protected);
> - cost of mitigation (cost of mitigation versus benefit provided);
> - community views (aesthetic impacts and community wishes); and
> - noise levels for affected land uses (existing and future levels, and changes in noise levels).

The assessment of the Project under the INP will enable noise monitoring and management at the mine in accordance with contemporary standards.

The following items constitute relevant feasible and reasonable measures that will be adopted in the mine's operation and were included in noise modelling:

- CHC will use coal stockpiles to attenuate noise emissions especially around the coal processing plant; and
- CHC will provide for a 3 m barrier on the northern side of the rail spur adjacent to receptors to reduce train pass-by noise.

CHC is committed to managing noise emissions to all receptors identified to fall within the noise management zone (between 35 dB(A) and ≤40 dB(A)) and procuring four residences identified to be above acquisition levels (>40 dB(A)). These landowners will be provided with the opportunity for upfront acquisition.

Amenity agreements have been made, or are in progress with several landowners who wish to remain in the area. A summary of these commitments is presented in Table 5.1.

Table 5.1 Summary of commitments for privately owned residences and vacant land

Receptor ID	Zone	Commitment status
3177	affectation	acquisition agreement reached or in progress
1180	management	acquisition agreement reached or in progress
1178	management	discussions in progress
3108[1]	affectation	best endeavours to acquire and negotiated agreement unsuccessful, continued consultation and noise management will be maintained
5001[1]	affectation	best endeavours to acquire and negotiated agreement unsuccessful, continued consultation and noise management will be maintained
3057	affectation	acquisition agreement reached or in progress
3041	management	acquisition agreement reached or in progress
3043	management	acquisition agreement reached or in progress
3021	management	amenity agreement reached or in progress
3022	management	amenity agreement reached or in progress
3024	management	amenity agreement reached or in progress
3035	management	amenity agreement reached or in progress
5023	management	acquisition agreement reached or in progress
Vacant land		
24/750751	affectation	acquisition agreement reached or in progress
25/750751	affectation	acquisition agreement reached or in progress
97/750751	affectation	acquisition agreement reached or in progress
62/750751	affectation	acquisition agreement reached or in progress
26/750751	affectation	acquisition agreement reached or in progress
47/750751	affectation	acquisition agreement reached or in progress
22/750751	affectation	acquisition agreement reached or in progress
15/750751	affectation	acquisition agreement reached or in progress
185/750751	affectation	acquisition agreement reached or in progress
177/750751	affectation	acquisition agreement reached or in progress
116/754305	affectation	discussions in progress
50/754305	affectation	acquisition agreement reached or in progress
20/754305	affectation	acquisition agreement reached or in progress
6/754305	affectation	acquisition agreement reached or in progress
41/754305	affectation	acquisition agreement reached or in progress
1/754329[1]	affectation	best endeavours to acquire and negotiated agreement unsuccessful, continued consultation and noise management will be maintained
178/750751	affectation	acquisition agreement reached or in progress
104/750751	affectation	acquisition agreement reached or in progress
40/750751	affectation	acquisition agreement reached or in progress
66/750751	affectation	acquisition agreement reached or in progress
175/750751	affectation	acquisition agreement reached or in progress
200/750751	affectation	discussions in progress
106/750751	affectation	amenity agreement reached or in progress
13/750751	affectation	amenity agreement reached or in progress
14/750751	affectation	amenity agreement reached or in progress
79/750767	affectation	amenity agreement reached or in progress

Table 5.1 Summary of commitments for privately owned residences and vacant land

Receptor ID	Zone	Commitment status
1/528668	affectation	amenity agreement reached or in progress
1/586695	affectation	amenity agreement reached or in progress
1/618310	affectation	amenity agreement reached or in progress
1/726827	affectation	amenity agreement reached or in progress
1/795846	affectation	amenity agreement reached or in progress
2/1122475	affectation	amenity agreement reached or in progress
2/180421	affectation	amenity agreement reached or in progress
2/528668	affectation	amenity agreement reached or in progress
2/726827	affectation	amenity agreement reached or in progress
2/795846	affectation	amenity agreement reached or in progress
3/795846	affectation	amenity agreement reached or in progress
5/249194	affectation	amenity agreement reached or in progress
104/750751	affectation	amenity agreement reached or in progress
116/754305	affectation	amenity agreement reached or in progress
14/754305	affectation	amenity agreement reached or in progress
178/750751	affectation	amenity agreement reached or in progress
179/750751	affectation	amenity agreement reached or in progress
18/750751	affectation	amenity agreement reached or in progress
187/750751	affectation	amenity agreement reached or in progress
200/750751	affectation	amenity agreement reached or in progress
23/750751	affectation	amenity agreement reached or in progress
24/750751	affectation	amenity agreement reached or in progress
26/750751	affectation	amenity agreement reached or in progress
28/754305	affectation	amenity agreement reached or in progress
33/754312	affectation	amenity agreement reached or in progress
41/754305	affectation	amenity agreement reached or in progress
42/750751	affectation	amenity agreement reached or in progress
49/750751	affectation	amenity agreement reached or in progress
50/750751	affectation	amenity agreement reached or in progress
79/750767	affectation	amenity agreement reached or in progress
90/754301	affectation	amenity agreement reached or in progress

Notes: 1. Additional mitigation options will be offered to these property owners.

5.2 Noise management plan

A noise management plan (NMP) will detail activities to manage noise emissions from operations. The NMP will:

- identify noise affected properties consistent with the environmental assessment and any subsequent assessments;
- outline mitigation measures to use to achieve the noise limits established;

- outline measures to reduce the impact of intermittent, low frequency and tonal noise (including truck reversing alarms);
- specify measures to document any higher level of impacts or patterns of temperature inversions, and detail actions to quantify and ameliorate enhanced impacts if they occur; specify protocols for routine, regular attended and unattended noise monitoring of the Project, including permanent real-time noise monitoring at selective areas surrounding the site;
- outline the procedure to notify property owners and occupiers that could be affected by noise from the mine;
- establish a protocol to handle noise complaints that includes recording, reporting and acting on complaints;
- specify procedures for undertaking independent noise investigations; and
- describe proactive and predictive modelling and management, and protocols for managing noise during adverse meteorological conditions.

5.3 Sleep disturbance (on-site sources)

On-site train noise along the rail spur is the main contributor to noise levels above the sleep disturbance criteria. Controlling noise emissions at the source (locomotive and wagons) is the preferred noise reduction measure to minimise L_{max} emissions and contractors will be selected that satisfy the ARTC EPL for rail locomotives. The selected contractors will use locomotives that comply with the ARTC EPL noise levels, and, if necessary, CHC may consider noise management and mitigation options such as scheduling to minimise train movements during the more sensitive night periods whenever possible, construction of acoustic barriers along the tracks between the residence and the railway or architectural treatment to dwellings to reduce noise indoors. Several properties that are identified to be above the sleep disturbance criteria are spread over a length of the on-site rail spur and an extensive acoustic barrier would be required to target all properties which may not be a feasible option. Acoustic treatments to individual properties such as acoustic insulation of roof/ceiling and walls, improved glazing, window and door seals would be considered more suitable. In addition, as windows and doors would have to be kept closed mechanical ventilation would be required.

5.4 Construction noise

A construction noise and vibration management plan (CNVMP), to provide management and mitigation options where required, will be completed before construction activities start.

The main objective of noise management plan would be to:

- ensure that as far as practicable construction activities meet construction noise and vibration goals across the allowed hours of operation; and
- implement reasonable and feasible best practice noise controls to minimise noise emissions and/or exposure duration at affected receptor s where noise and vibration levels are above relevant goals.

5.5 Offsite rail noise

This section considers mitigation measures for receptors where predicted total train noise levels are above the IGANRIP trigger or ARTC's EPL3142 noise criteria.

The offsite rail noise assessment identified that for the planned rail movement scenario, which is the most likely scenario for trains associated with the Project, the daytime criteria would be satisfied, up to six receptors would potentially be above the night time offsite L_{eq} rail noise criteria and two receptors that would be above the L_{max} offsite rail noise criteria. For offsite rail noise, the ARTC has an EPL that includes noise limits that would apply in such situations.

The ARTC also have in place noise abatement programs for their network infrastructure. Ideally controlling noise emissions at the source (locomotive and wagons) would be the preferred noise reduction measure. However, this is not feasible at this stage of the Project, as rail contractors have not yet been selected by the Project customers. Nonetheless, it is preferred that selected contractors utilise locomotives that comply with the ARTC EPL noise levels. Additionally, the Project may consider noise management and mitigation options such as scheduling to minimise train movements during the more sensitive night periods whenever possible, construction of acoustic barriers along the tracks between the residence and the railway or architectural treatment to dwellings to reduce noise indoors.

The identified properties are spread over a length of the corridor and an extensive acoustic barrier would be required to target all properties which may not be a feasible option. Acoustic treatments to individual properties such as acoustic insulation of roof/ceiling and walls, improved glazing, window and door seals would be considered more suitable with the provision of mechanical ventilation required to allow for windows and doors to remain closed.

The level of noise mitigation should be applied on a case by case basis taking into account such aspects as dwelling orientation, distance to railway and the building materials of each structure, such measures are not normally borne by one user of the public track and that negotiations will continue with ARTC to determine appropriate actions and responsibilities.

5.6 Blasting

Mitigation measures to minimise vibration emissions during blasting will include the following:

- conduct dilapidation audits on neighbouring properties most likely to be affected by blast overpressure and vibration;
- blast design will be actively managed by CHC, and hence corresponding airblast overpressure and ground vibration will be controlled;
- minimise the impact of blast overpressure and vibration on livestock, and relocation of livestock where required prior to commencement of a blast;
- initial blasts will be monitored intensively at nearby infrastructure, heritage receptors or private residences to assess the response of the ground to blasting. This will allow the calibration of blast vibration calculations that will allow subsequent blasts to be sized and designed to minimise offsite impacts;
- a schedule of blasts will be distributed to privately owned residences as required. The schedule will notify land owners and residents as to the time and location of blasts and road closures. Telephone contact with those residents within 5 km of the blasting area will be made prior to blasting; and
- the noise and vibration management plan will detail blast monitoring requirements for the site.

6 Conclusions

The noise assessment shows that during adverse weather conditions for all assessment periods and all stages of the mine life, eight receptors are predicted to experience noise levels above the strict operational criterion of 35 dB(A) and three additional receptors are predicted to experience noise levels above the acquisition criterion of 40 dB(A). Two of the 11 exceedances above the PSNL are directly attributable to mining extraction operations, nine exceedances are attributable to the rail spur with six maximum and three planned train movements per night.

CHC intends to acquire these properties or to enter into amenity agreements. Reasonable and feasible mitigation measures will be implemented if agreements cannot be reached.

The vacant land assessment has identified 43 privately owned land parcels that fall into the acquisition criteria over the life of the Project. CHC has entered into discussions with the seven owners of these parcels of land with a view to acquisition.

The low frequency assessment identified that all privately owned receptors satisfy the low frequency noise criteria. Furthermore, results identified that for relevant receptors where the application of the low frequency modifying factor was applicable, corrected emissions remained below the 35 dB(A) PSNL.

Potential sleep disturbance impacts from operational maximum noise level events have been assessed and are expected to satisfy the relevant criteria for the majority of private receptors. Noise modelling identified L_{max} noise levels associated with the rail spur above the sleep disturbance criteria at several adjacent receptors. Assuming the worst-case, that all six proposed rail movements occur at night, there could be up to six exceedances of the sleep disturbance criteria. Modelling shows that this can be mitigated by noise barriers if required. However, L_{max} noise levels from the rail spur remain below levels that are likely to wake sleeping occupants based on more recent international research.

Receptors with the potential for the greatest construction noise impact include those situated on CHC owned land, particularly receptors 3055, 5005, 4054 and 4081. It should be noted that noise levels at all receptors during construction are shown to remain below the ICNG's highly affected criterion of 75 dB (A). Noise management measures will be applied to minimise construction noise impacts on the surrounding community.

The road traffic noise associated with the Project's operation and construction is expected to comply with relevant goals for receptors within 25 m of the Golden Highway.

Review of proposed train movements on the main railway from Cobbora spur to Ulan identifies that for the planned movement scenario, the daytime L_{eq} criterion would be met for all receptors. Similarly, the night L_{eq} criterion would be met for most receptors with the exception of six that are situated within 30 m of the track. The L_{max} criterion would be met for nearly all receptors with the exception of two that are situated within 25 m of the track. Noise mitigation strategies have been identified for these receptors.

For the Bylong – Mangoola line the daytime criterion would be met for receptors at distances 25 m (and greater) from the track, the night L_{eq} criterion will be met for noise receptors 80 m (and greater) from the track and L_{max} criterion will be met for noise receptors situated 25 m (and greater) from the track.

For the Bengalla – Muswellbrook line the daytime criterion will be met for all noise receptors at distances 40 m (and greater) from the track, the night L_{eq} criterion will be met for noise receptors 140 m (and greater) from the track and the L_{max} criterion will be met for noise receptors situated 25 m (and greater) from the track.

The predicted blast overpressure and vibration levels identify that a MIC of 1,500 kg would comply with ANZECC criteria at distances of greater than 1,250 m. Adopting a MIC of 3,500 kg would comply with ANZECC criteria at distances of greater than 1,650 m. One privately owned receptor is within the 1,650 m minimum distance (receptor 3177) for blasts with a MIC of 3,500 kg. Therefore the lower MIC should be adopted when within 1,650 m of this receptor, or alternatively the proposed MIC blast patterns should be designed specifically to meet the relevant ANZECC guidelines at this receptor.

For heritage receptors the blast vibration level predictions will satisfy the heritage vibration criteria at all heritage receptors at a distance of more than 450 m when an MIC of 1,500 kg is used. These criteria will be satisfied at distances of more than 700 m when a MIC of 3,500 kg is used. There are three heritage receptors within the 700 m minimum distance for blasts with an MIC of 3,500 kg, one of which, the Laheys Creek cemetery contains items (ie grave stones) that are vibration sensitive. Therefore, proposed MIC blast patterns should be designed specifically to meet the relevant structural criteria at heritage receptors where structures or sensitive elements are present.

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Appendix A

Negotiated agreement (INP extract)

8 Negotiation process

8.1 The process leading to negotiation

This chapter deals with that part of the overall process shown in *Figure 1.1* in the box under the heading 'Decision-making process'.

Any unacceptable impacts from a development proposal that are likely to persist after noise-mitigation action has been taken can be dealt with through negotiation—either by improved mitigation or by trade-offs with benefits.

Negotiation can be:

- between the proponent and the regulator—the traditional approach
- between the proponent and the affected community (which is in the best position for evaluating the trade-offs).

In the latter case negotiation is designed to be available to those people whose amenity is potentially affected by non-achievement of the project-specific noise levels. This type of negotiation process, which leads to the determination of an achievable noise limit, is in addition to the type of direct consultation that typically occurs between the proponent and the community throughout the impact assessment process in defining the important project parameters.

8.2 Negotiation between proponent and regulator

Where proposed mitigation measures will not reduce noise levels to the project-specific noise levels, the proponent should seek to negotiate with the regulatory / consent authority to demonstrate that all feasible and reasonable mitigation measures have been applied. The regulatory / consent authority can choose to accept the level of impact proposed, or negotiate for a better level of control where this is considered achievable.

Where, in the final analysis, the level of impact would still exceed the project-specific noise levels, the economic and social benefits flowing from the proposed development to the community should be evaluated against the undesirable noise impacts.

Where it can be demonstrated by the proponent that the development offers net benefits, a regulatory / consent authority may consider these as grounds for applying the achievable noise levels, rather than the project-specific noise levels, as the statutory compliance limit.

Negotiation on what represents the best achievable level that is practicable for a development is often an iterative process involving both the proponent and regulator / consent authority and the proponent and affected community. Where the proponent is seeking to demonstrate to the regulator / consent authority that all feasible and reasonable noise mitigation measures have been applied, the proponent should include the results of their discussions with the affected community in the package of proposed noise mitigation measures. Beyond this point, the proponent might want to initiate additional community-based negotiation where there is potential for trade-offs attractive to the affected community. Typically, where the amenity criteria set the project-specific noise levels for a project, negotiations between the proponent and the regulator would occur when site noise levels are between the acceptable and recommended maximum L_{Aeq} levels presented in *Table 2.1*.

The section below outlines a checklist that can be used as a guide by EPA officers to determine an acceptable level of residual noise impacts when setting statutory noise conditions, based on the consideration of social and economic costs and benefits.

8.2.1 Residual level of impact: checklist

It is important that, as far as possible, the noise assessment quantifies any remaining or residual impacts that exceed the project-specific noise levels, after applying feasible and reasonable mitigation strategies.

The acceptability of the residual noise impacts should be evaluated by taking into consideration factors such as:

1. Characteristics of the area and receivers likely to be affected, for example:

—the extent of the areas (including existing, developing or proposed residential, health or education sites) and number of receivers (including groups that may be especially sensitive to noise, such as pre-schoolers, students, the aged, hospital and nursing home patients) likely to be affected by noise levels above the project-specific noise levels

—the daily activities of the community (in particular, effects such as sleep disturbance, speech interference, level of annoyance or effects on physical or physiological health)

—property values

—zoning of land uses affected by noise and the appropriateness of the zoning or land use

—the potential change in the ambient noise levels as a result of the proposal; cumulative noise impacts in the area; and whether parts of the area that are already moderately or badly affected by noise will be more or less affected

—the extent to which biodiversity (especially native birds and other animals) will be affected

—the likely variation between individuals in response to the noise

—the amenity of areas used for outdoor recreational activities or conservation, heritage or wilderness areas

—other industry in the area (including agriculture).

2. Characteristics of the proposal and its noise or vibrations, such as:

—the noise characteristics of the activity

—the extent to which any remaining noise impact exceeds the project-specific noise levels

—the circumstances and times when the project-specific noise levels are likely to be exceeded

—the circumstances and times when the source noise levels are likely to be below the project-specific noise levels (for example, when wind blows source noise away from the receiver)

—the accuracy with which impacts can be predicted, and the likelihood that the impacts will occur in the manner predicted

—the degree to which the character of the noise is new to an area and differs from existing noise sources

—the economic benefit and social worth of the proposal for the local area, the region or the nation.

3. The feasibility of additional mitigation or management measures:

—alternative sites or routes for the development

—the technical and economic feasibility of alternative noise controls or management procedures.

4. Equity issues in relation to:

—the costs borne by a few for the benefit of others

—the long-term cumulative increase in noise levels

—the opportunity to compensate effectively those affected.

8.3 Negotiated agreements between the proponent and the affected community

An alternative mechanism that could be applied is the more inclusive approach of a negotiated agreement between the affected community and the proponent, with traditional regulatory / consent authorities playing a supporting role. Negotiation is designed to be available to those people whose amenity is potentially affected by non-achievement of the project-specific noise levels. While negotiation on agreed noise levels between the proponent and the community can occur at any time, this should occur when site noise levels exceed the recommended maximum L_{Aeq} levels presented in *Table 2.1*.

The affected community is in the best position to know how much noise it is prepared to bear for a package of benefits that would flow from the operation of the facility creating the noise. As this approach is new, a model for the process has not been established. The process could be initiated when the proponent has demonstrated that the project-specific noise levels could not be met.

Features of a negotiated agreement process

How the process might be initiated

The process might be initiated when:

- the regulatory / consent authority is satisfied that no further reduction in noise levels can be made through a viable mitigation strategy that would seek to achieve the project-specific noise levels; and
- the proponent demonstrates that—even when using the best of their economically viable strategies—the project-specific noise levels cannot be achieved.

Who participates

The principal parties would be the proponent and the affected community, with regulatory authorities and the council participating in an advisory capacity.

There is a need to define the 'affected community': this could comprise occupiers of residences and of other noise-sensitive land uses identified as being potentially affected.

The proponent would need to employ an effective means (for example, advertising) of reaching all people who are potentially affected. Advice may include how individuals could register as 'interested and affected parties' and become participants in the negotiation process.

What is negotiated

The principal trade-off would probably be additional noise impact in return for a package of benefits. Additional noise could be defined in terms of extended times of operation, higher noise levels, and a defined time period for annoying noise characteristics to operate and for more noise to occur in the less sensitive parts of the day. Benefits could include less noise at sensitive times, treatment of residences, contributions to improve community facilities and infrastructure or acquisition of residences. The *NSW Industrial Noise Policy* could act as a framework for negotiations regarding a set of acceptable noise conditions.

The impact-assessment process may identify areas of noise-source management where concessions are practicable. The proponent may not be able to reduce noise further. In these circumstances, other benefits might be negotiated unrelated to better management of the noise source but related to material benefits for the community.

It is important for the negotiating community to understand the implications of its negotiations regarding the additional noise impacts. Either the proponent or an independent specialist should present an analysis of the impacts from the options being canvassed, in such a way that the lay community can appreciate the likely implications of their negotiations.

The community would need to be well informed, to safeguard against a position being reached where the agreed noise level represents an unreasonable impact that, ultimately, is likely to be regretted by that community.

How agreement might be negotiated

Representatives of the community could have equal status in the negotiating process with the proponent, and with any other parties (such as the EPA, councils and DUAP) acting in an advisory capacity.

Meetings could be chaired by an independent facilitator and, depending on the circumstances, the costs of the process may be borne solely by the proponent or may be shared equitably between the proponent and the community.

How agreement could be reached

'Agreement' would need to be defined for the community so that a single community view could be regarded as representative. This could mean a number of things—including a simple majority vote by the 'affected community', or a majority vote at a meeting held to reach an agreement; 'majority' could be defined to extend to a higher than 51 per cent level (for example, 60 per cent or 80 per cent). The many options would need to be evaluated. The community should determine for itself its preferred method for indicating its views when negotiating its position.

Treatment of 'affected' community members who do not support the agreement

Proponents could propose a package of assistance to be considered by these community members.

How future affected landowners would be treated

The council may act on behalf of future owners of these properties. The existence of an agreement affecting such land may be in the form of information provided on Section 149 Certificates routinely obtained by purchasers of properties.

The effect on property values of any agreement may in itself be part of the negotiations.

How the agreement could be enforced

The agreement would need to be enforced to the extent that it imposed obligations on the proponent. This could be achieved by making these obligations either development consent conditions or licence conditions. **The obligations would need to be expressed clearly and unambiguously**. The conditions may also need to specify a way of measuring clearly whether the proponent has fulfilled these obligations.

Further, the conditions must be reasonable from the point of view of existing and future landowners.

Mediation

An integral part of the process may need to be a mediation and dispute resolution process, as there is the potential for contentious issues to be raised.

Review

The consent or licence conditions could also provide for a review after a certain period. The conditions could then set out the method of review and the fact that the licence conditions may be changed as a result of that review.

The conditions could provide for the review period to be shortened where the original conditions forming the basis for negotiations had changed. Any review period should be of sufficient duration to give certainty to the proponent for the operation of the facility.

Appendix B

Sound power levels

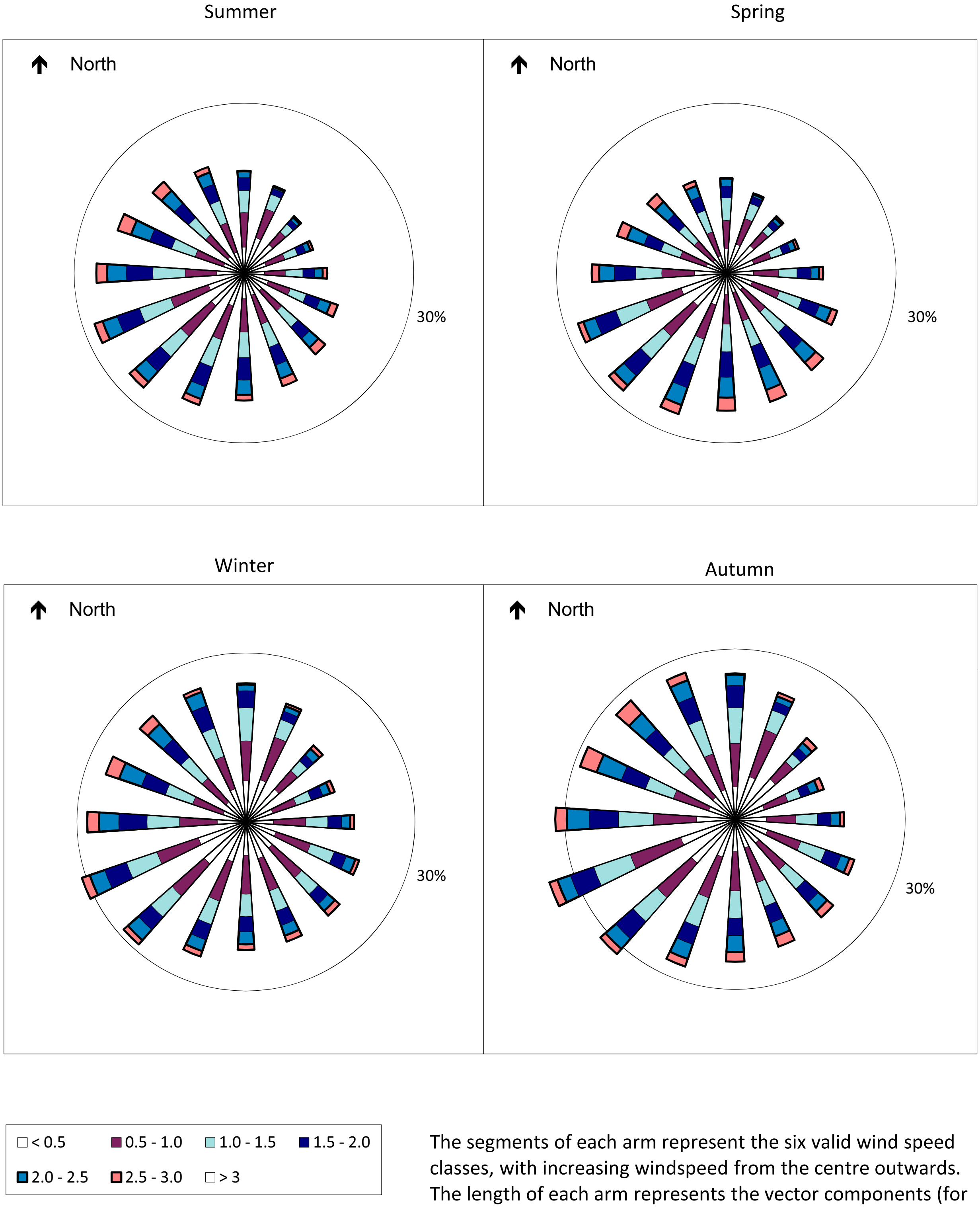
Table B1 $L_{eq(15\text{-}min)}$ dB(A) sound power level spectrum

Noise Source	'A' Weighted frequency (Hz)								Total
	63	125	250	500	1000	2000	4000	8000	dB(A)
Excavator (EX5500)	99	104	104	114	114	110	100	88	118
Excavator (EX2500)	89	100	106	111	111	110	104	96	116
Dozers (D11)	94	95	106	110	108	107	105	99	115
Dozers (D10)	92	93	104	108	106	105	103	97	113
Drilling rigs	81	103	104	106	109	108	100	92	114
Water carts	83	98	104	109	110	106	100	94	114
Graders	73	89	96	100	105	101	98	93	108
Haul trucks (CAT793F)	85	97	110	112	108	106	99	93	116
Haul trucks (CAT789D)	90	108	109	111	103	107	106	98	116
Coal conveyors	60	69	72	79	78	75	70	59	83 (per metre)
Conveyors and drives (CHPP)	75	84	87	94	93	90	85	74	98
Front end loader	87	103	108	107	103	108	102	96	114
CHPP	88	90	105	101	102	105	103	91	110 (enclosed)
Coal rail load out	73	85	92	101	104	102	98	91	108
Rail locomotives and wagons	56	63	69	75	78	75	76	70	83 (per metre)

Appendix C

Wind roses

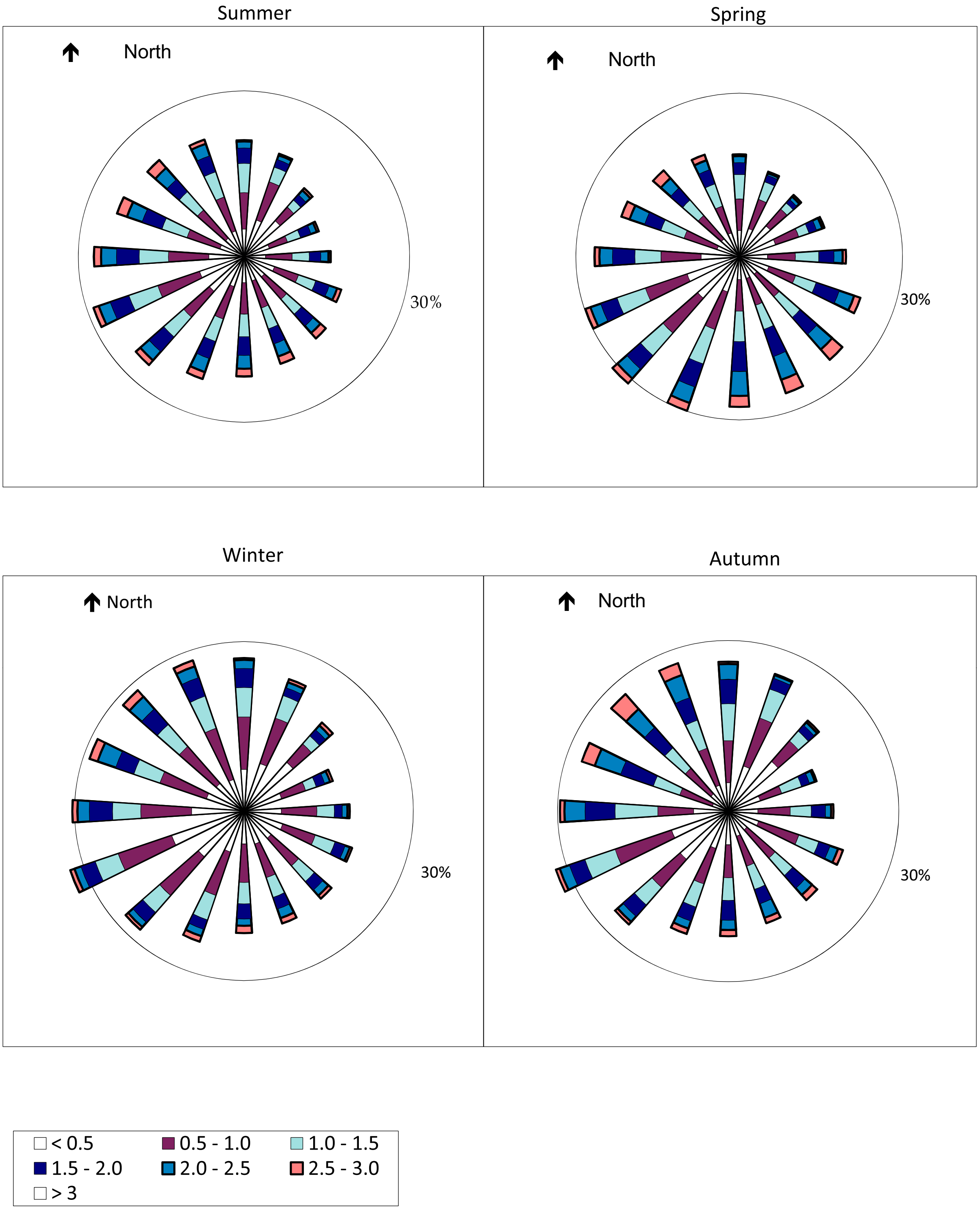
Day



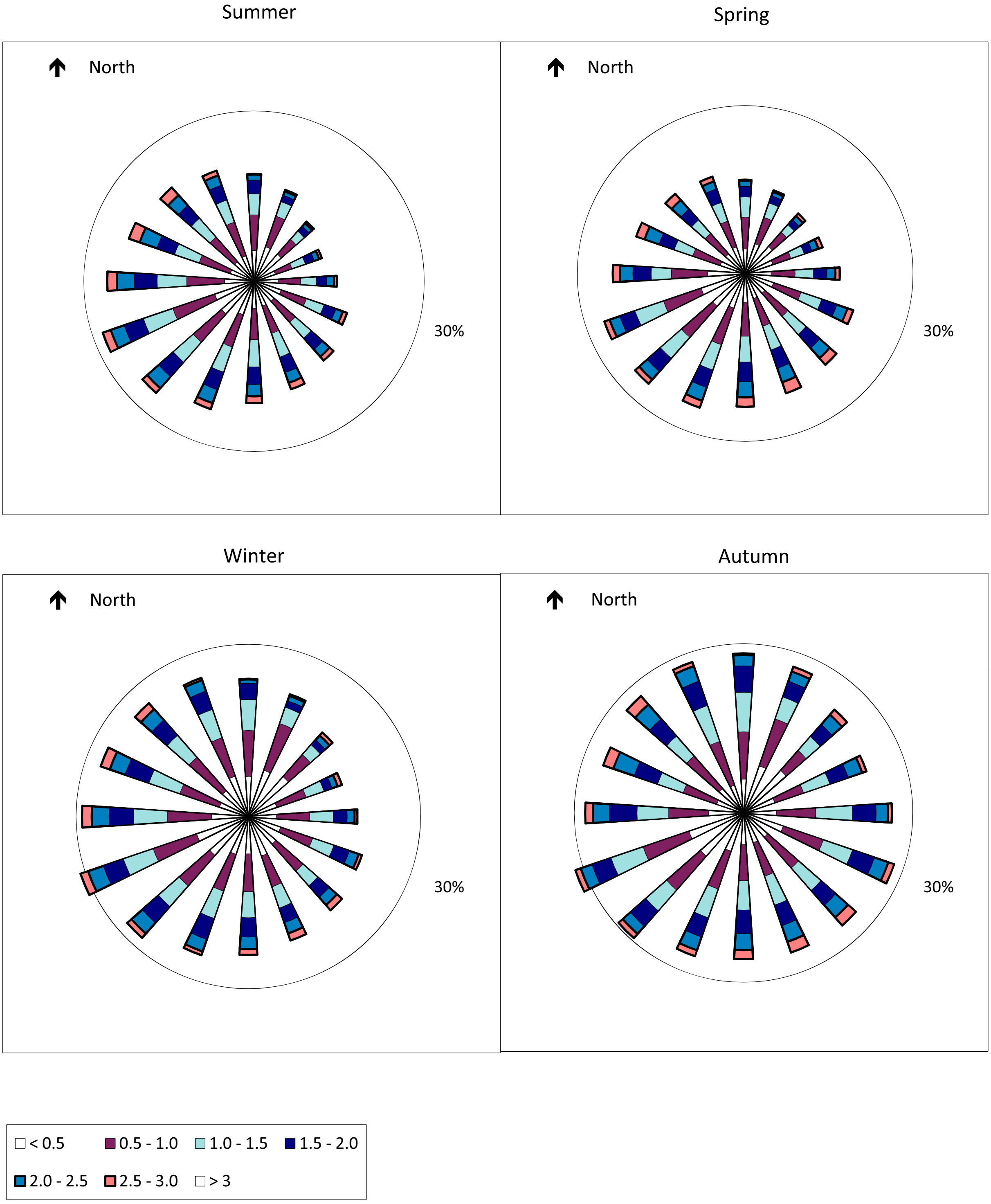
Data Source: Cobbora Site Weather Station
Data Range: 5 min, 01-09-09 to 21-09-10

The segments of each arm represent the six valid wind speed classes, with increasing windspeed from the centre outwards. The length of each arm represents the vector components (for each direction) of wind speeds 3m/s or below as a proportion of the total time for the period .
The circle represents the 30% occurrence threshold.

Evening


Summer
North
30%
Spring
North
30%
Winter
North
30%
Autumn
North
30%
< 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
2.0 - 2.5
2.5 - 3.0
> 3

Night


Summer
North
30%
Spring
North
30%
Winter
North
30%
Autumn
North
30%
< 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
2.0 - 2.5
2.5 - 3.0
> 3

Appendix D

Noise contours

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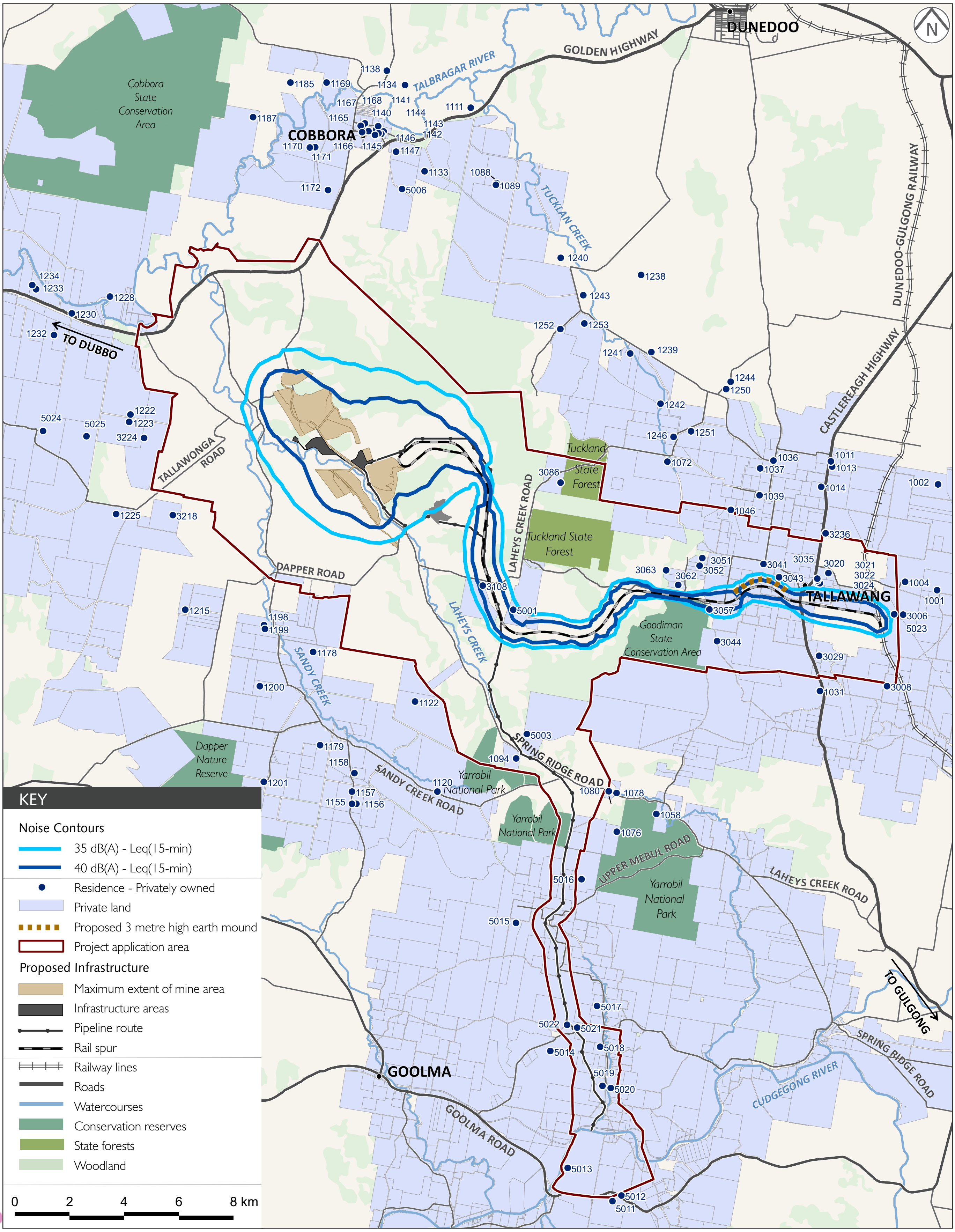


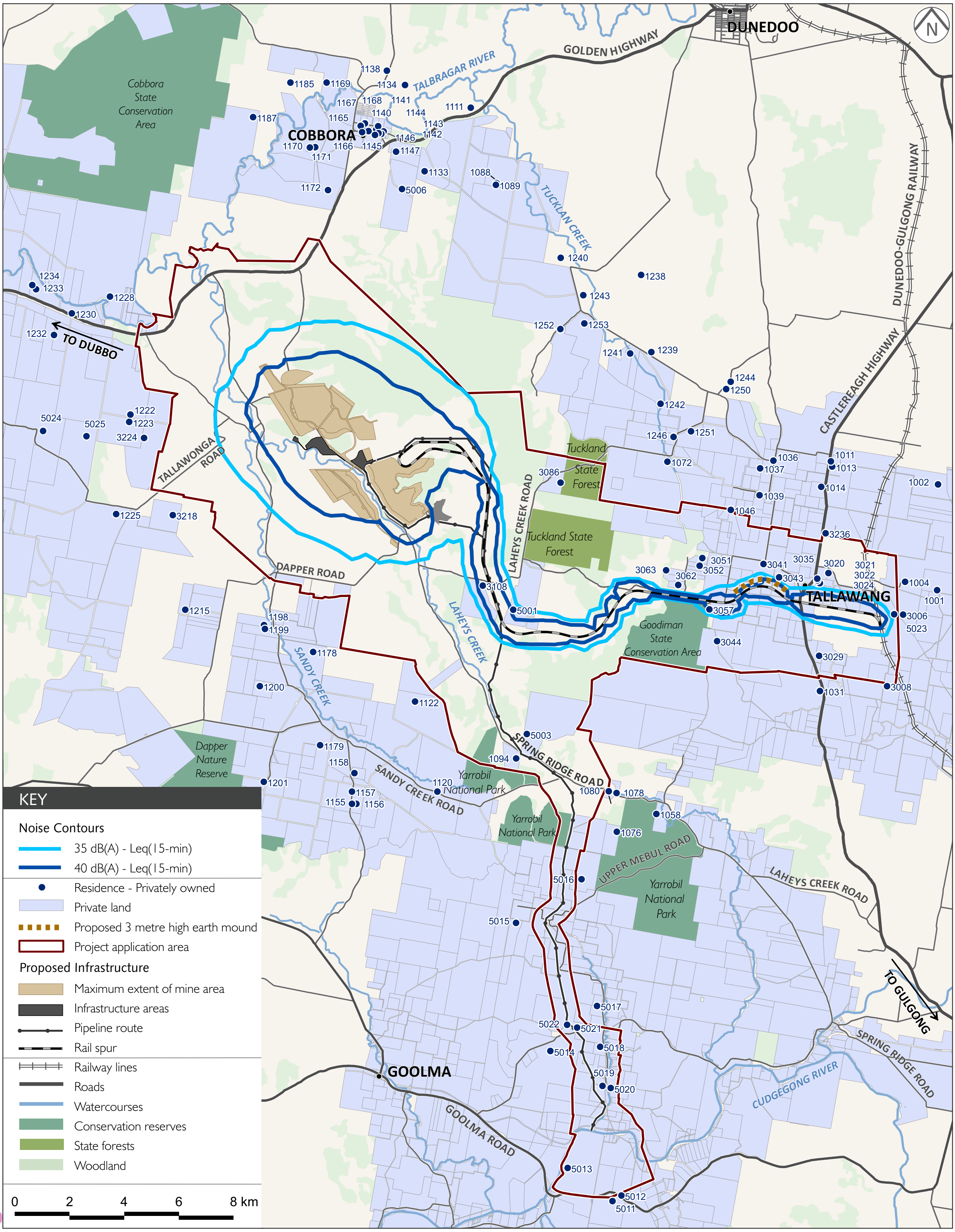
EMM

Cobbora Holding Company Pty Limited

Year 1: Operational Noise Emissions - Calm Meteorological Conditions

Cobbora Coal Project - Noise Assessment

Figure D1

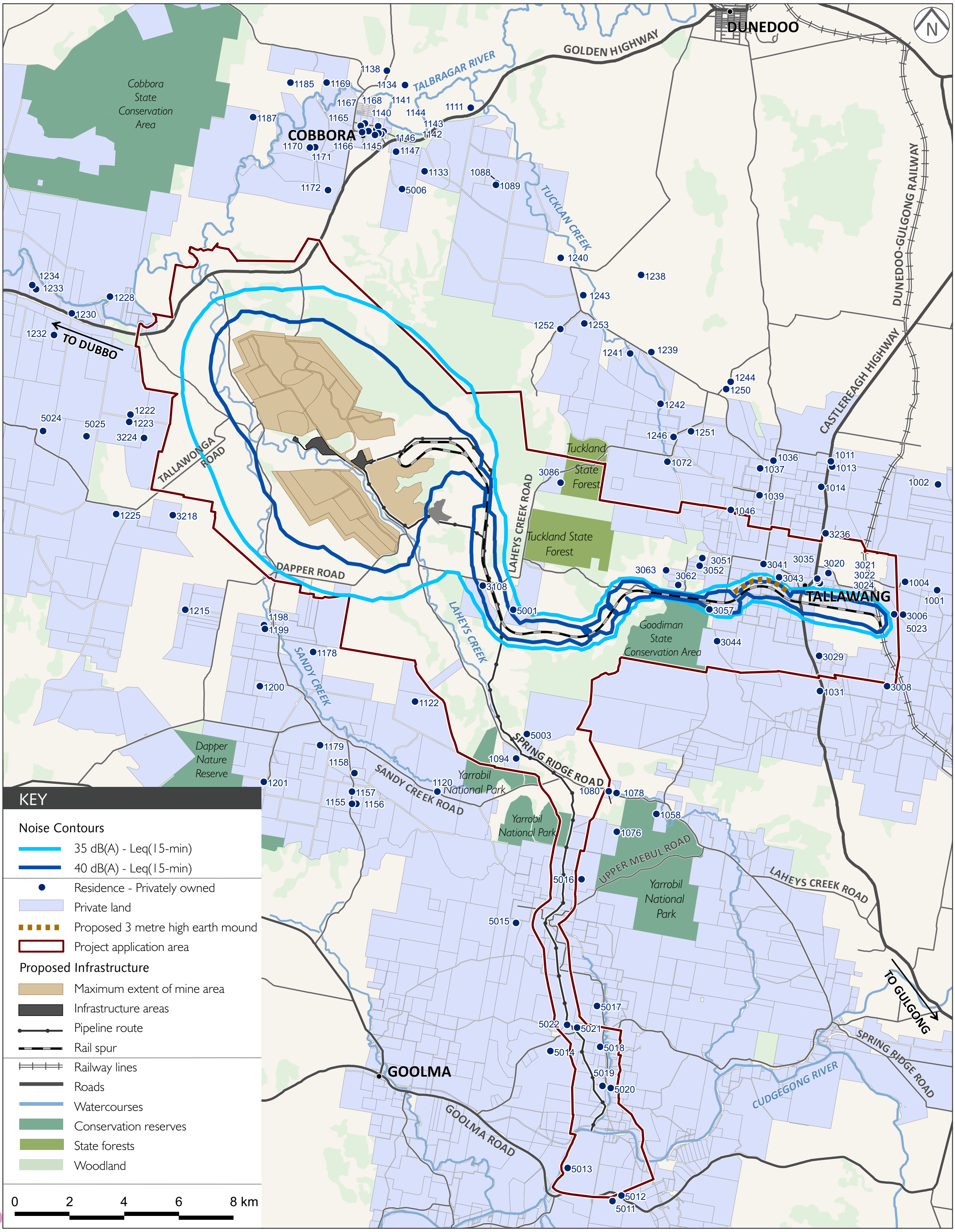


Year 2: Operational Noise Emissions - Calm Meteorological Conditions

Cobbora Coal Project - Noise Assessment

Figure D2

Integrated Design Solutions | 030518 Cobora Coal Project - NA FD2 Rev C - 17 September 2012

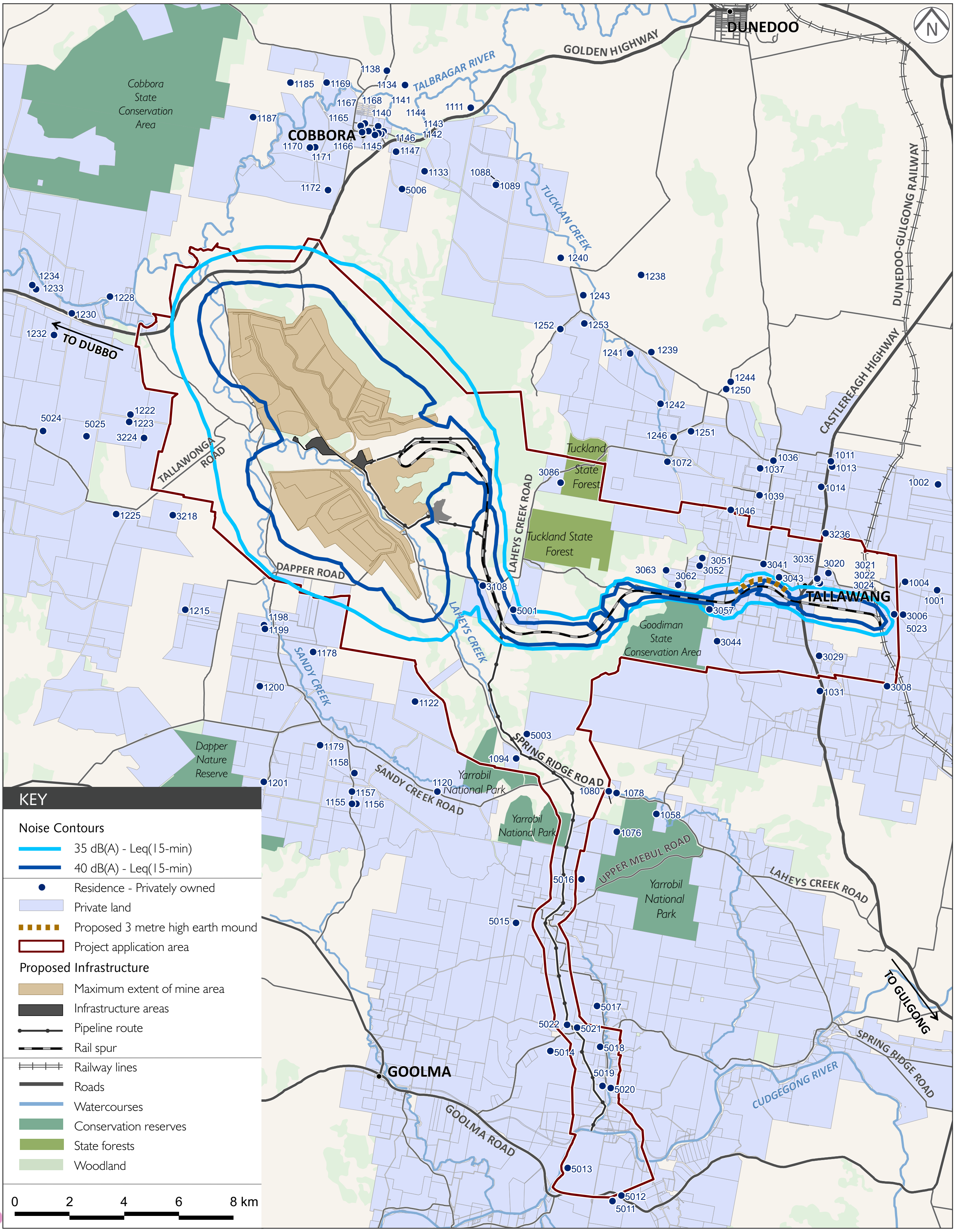


Integrated Design Solutions | 030518 Cobora Coal Project - NA FD3 Rev C - 17 September 2012

Year 8: Operational Noise Emissions - Calm Meteorological Conditions

Cobbora Coal Project - Noise Assessment

Figure D3

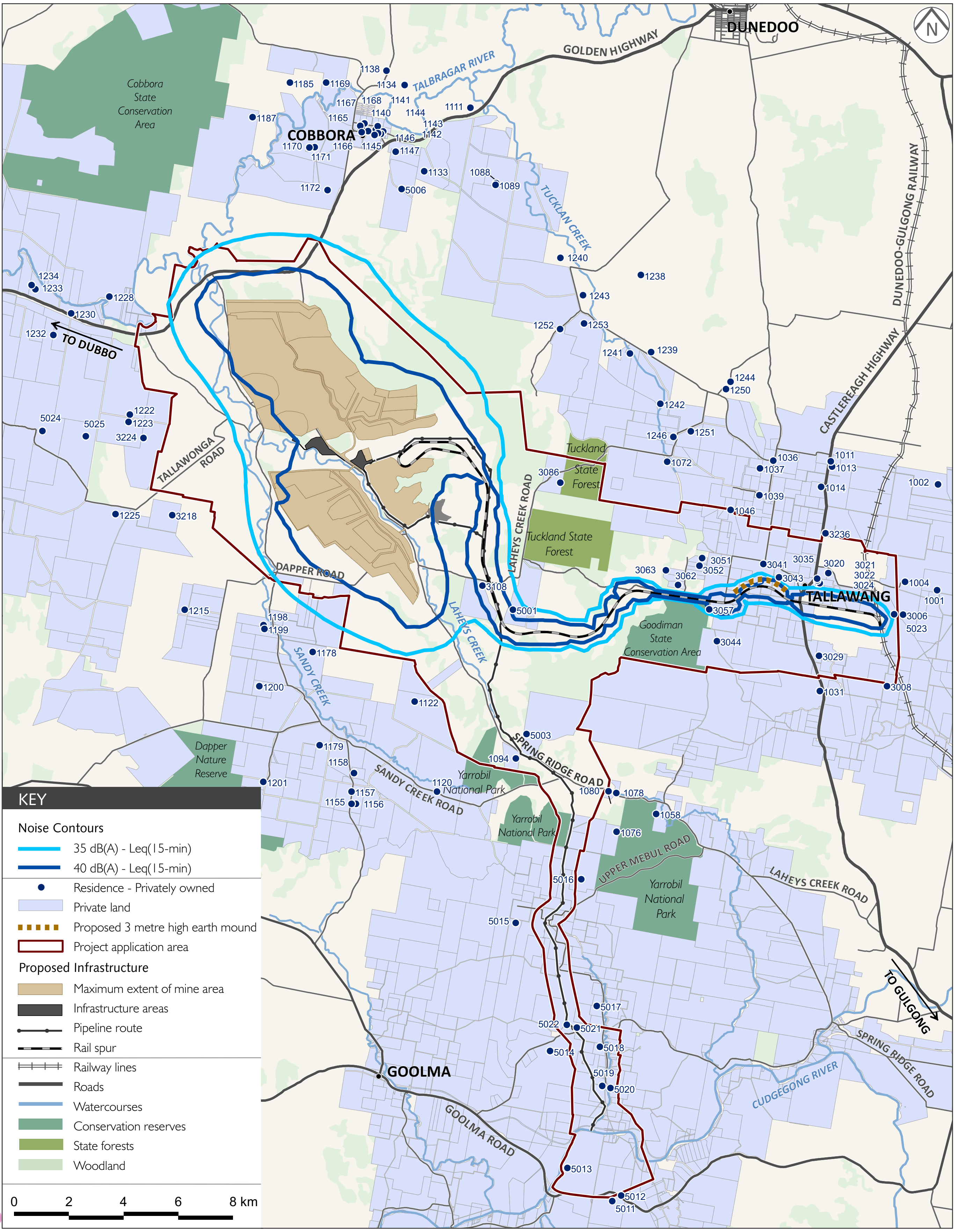


Integrated Design Solutions | 030518 Cobora Coal Project - NA FD4 Rev C - 17 September 2012

Year 16: Operational Noise Emissions - Calm Meteorological Conditions

Cobbora Coal Project - Noise Assessment

Figure D4



Year 20: Operational Noise Emissions - Calm Meteorological Conditions

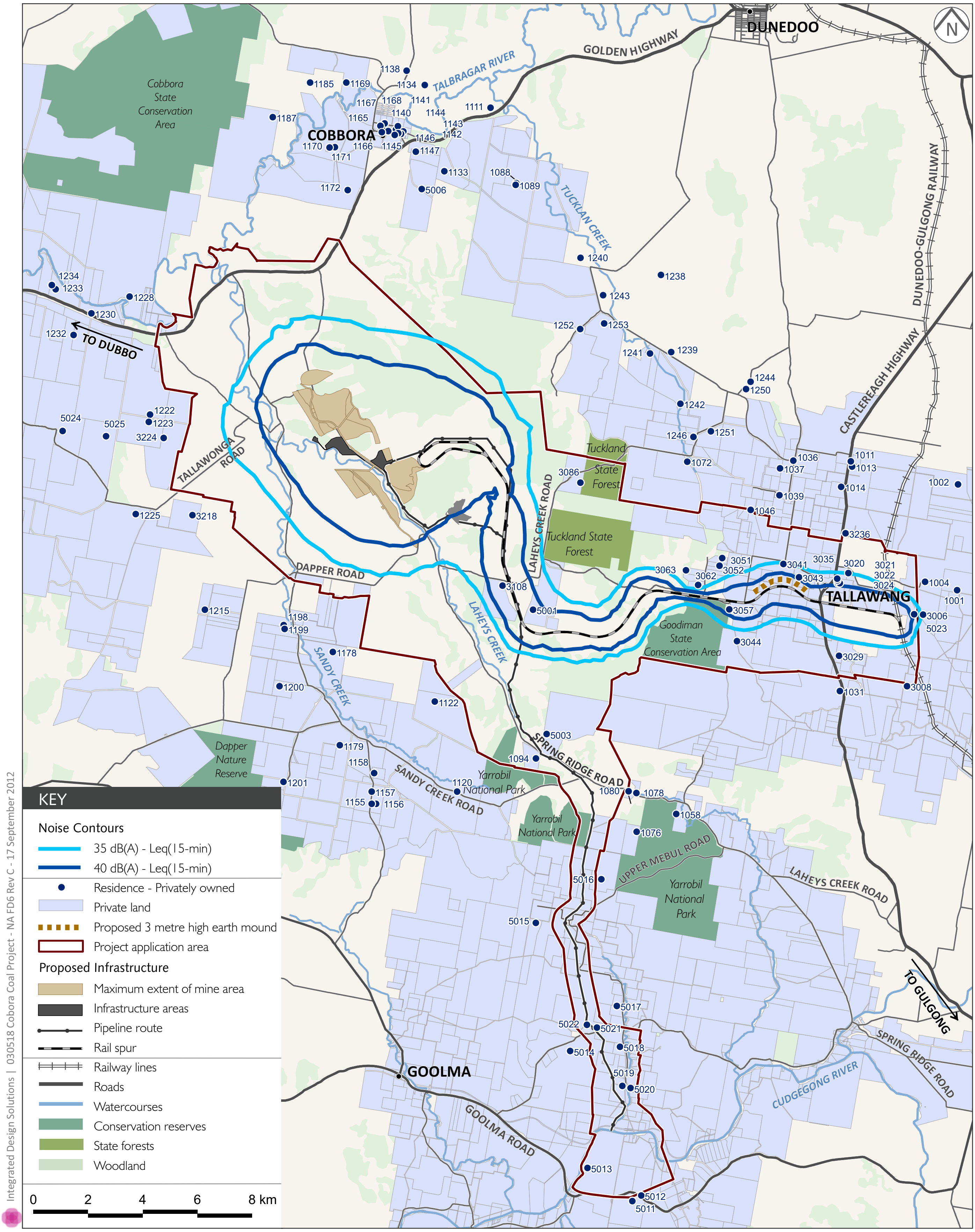
Cobbora Coal Project - Noise Assessment

Figure D5

Integrated Design Solutions | 030518 Cobora Coal Project - NA FD5 Rev C - 17 September 2012

EMM

Cobbora Holding

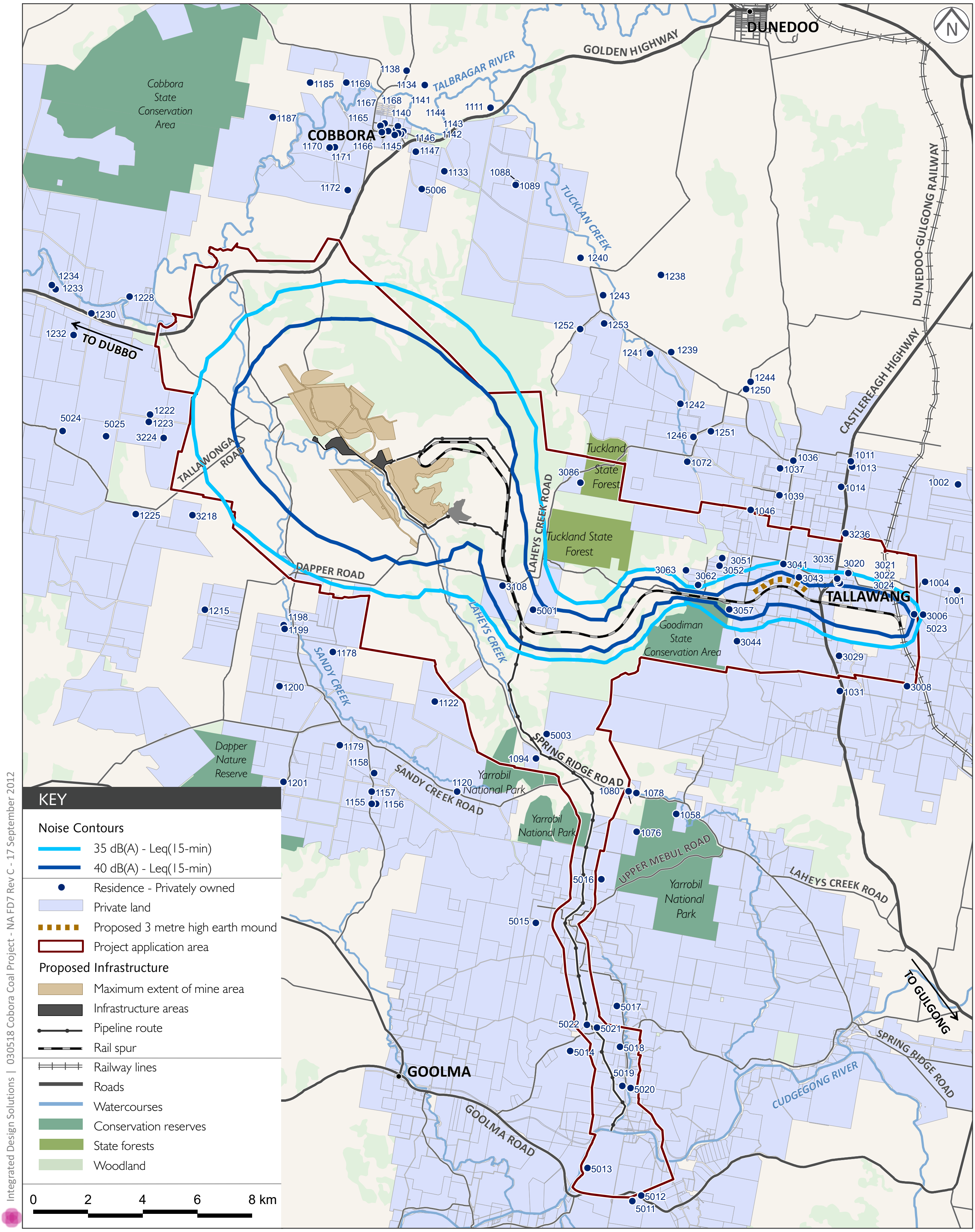


EMM
Cobbora Holding Company Pty Limited

Year 1: Operational Noise Emissions - Maximum Impact Adverse Meteorological

Cobbora Coal Project - Noise Assessment

Figure D6



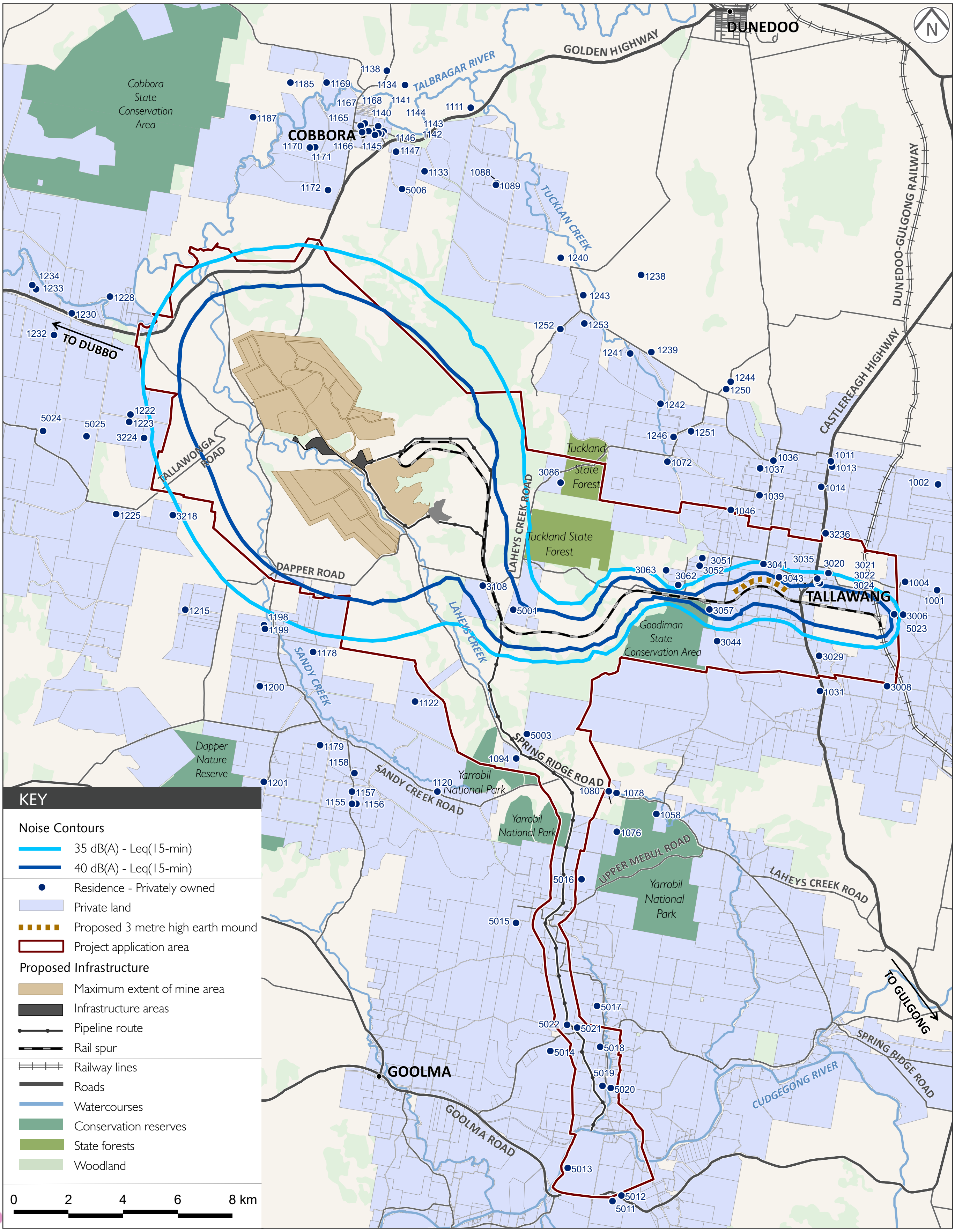
EMM

Cobbora Holding Company Pty Limited

Year 2: Operational Noise Emissions - Maximum Impact Adverse Meteorological

Cobbora Coal Project - Noise Assessment

Figure D7



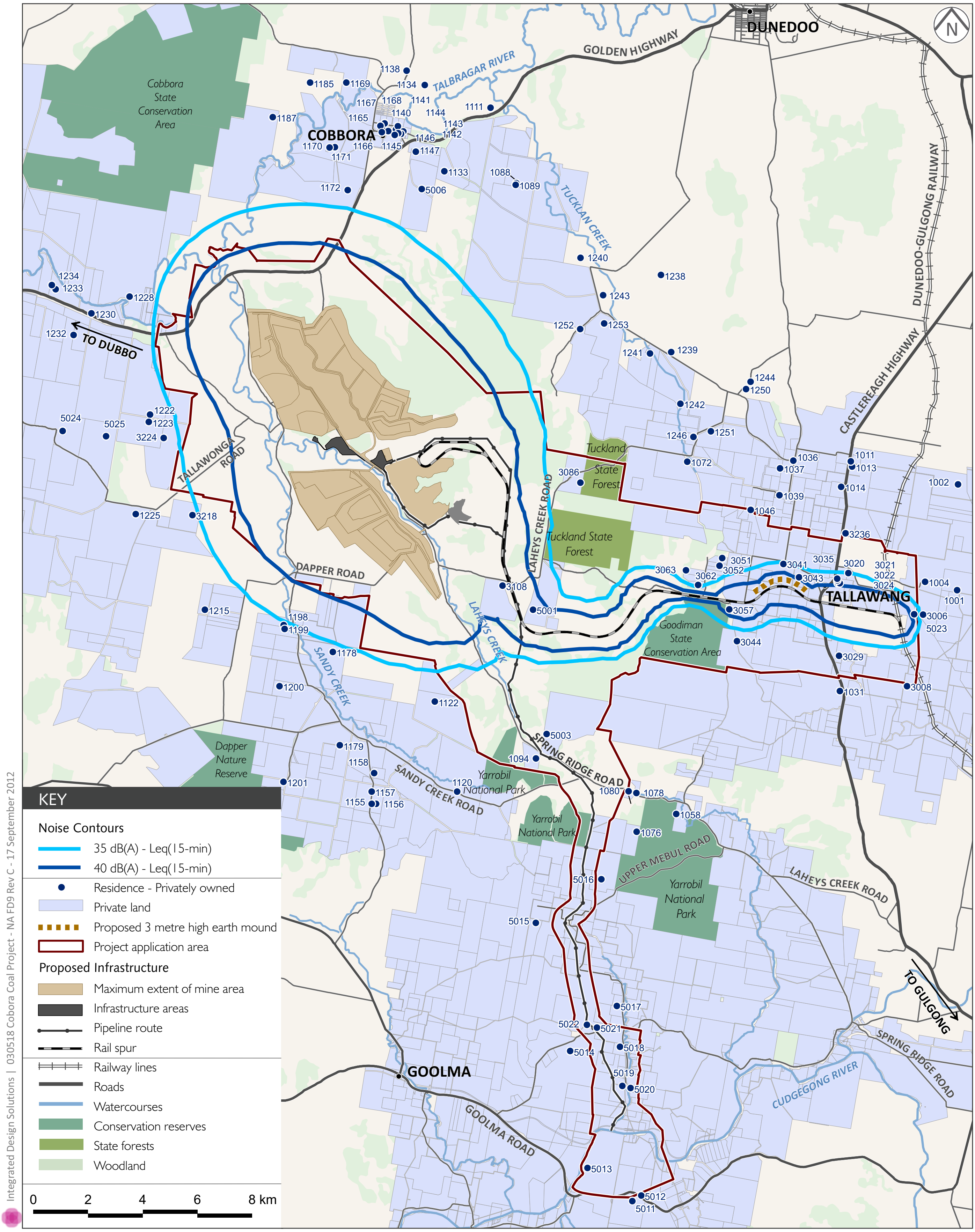
Integrated Design Solutions | 030518 Cobora Coal Project - NA FD8 Rev C - 17 September 2012

EMM Cobbora Holding Company Pty Limited

Year 8: Operational Noise Emissions - Maximum Impact Adverse Meteorological

Cobbora Coal Project - Noise Assessment

Figure D8

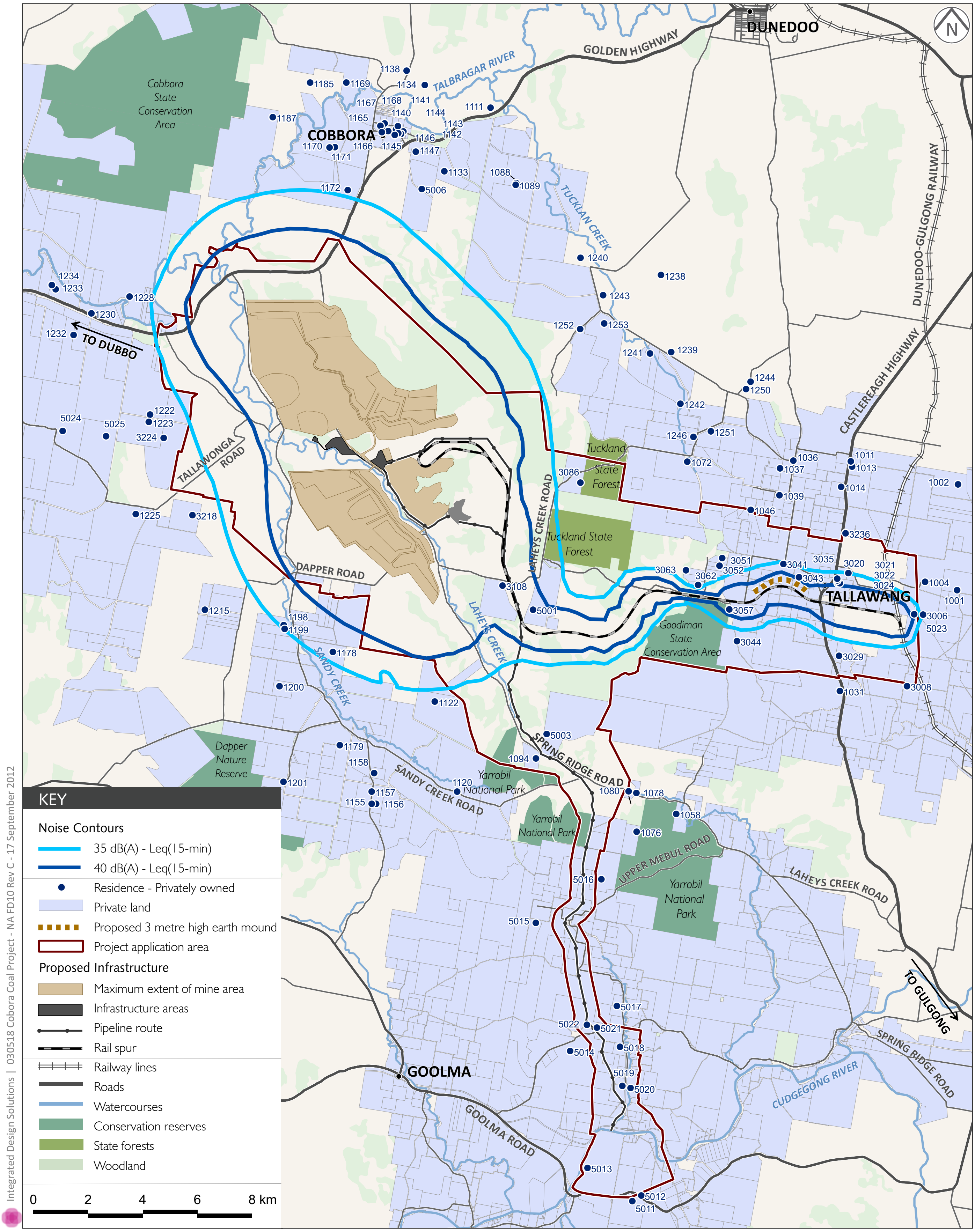


EMM Cobbora Holding Company Pty Limited

Year 16: Operational Noise Emissions - Maximum Impact Adverse Meteorological

Cobbora Coal Project - Noise Assessment

Figure D9



EMM Cobbora Holding Company Pty Limited

Year 20: Operational Noise Emissions - Maximum Impact Adverse Meteorological

Cobbora Coal Project - Noise Assessment

Figure D10

Appendix E

Low frequency noise assessment

Table E.1 Summary low frequency noise assessment results (private ownership)

Receptor ID	Predicted Level dB(C), $L_{eq(15-min)}$	Receptor ID	Predicted Level dB(C), $L_{eq(15-min)}$	Receptor ID	Predicted Level dB(C), $L_{eq(15-min)}$	Receptor ID	Predicted Level dB(C), $L_{eq(15-min)}$	Receptor ID	Predicted Level dB(C), $L_{eq(15-min)}$	Receptor ID	Predicted Level dB(C), $L_{eq(15-min)}$	Receptor ID	Predicted Level dB(C), $L_{eq(15-min)}$	Receptor ID	Predicted Level dB(C), $L_{eq(15-min)}$
1001	30	1078	36	1145	42	1178	48	1232	43	3008	31	3063	40	5013	26
1002	30	1080	36	1146	42	1179	43	1233	42	3018	34	3065	39	5014	29
1004	32	1088	41	1147	42	1180	51	1234	42	3020	37	3066	39	5015	33
1011	33	1089	41	1149	44	1185	42	1238	39	3021	40	3067	39	5016	34
1013	33	1094	44	1155	40	1187	44	1239	40	3022	40	3086	47	5017	30
1014	33	1111	39	1156	40	1198	48	1240	41	3024	39	3108	53	5018	28
1031	32	1120	40	1157	40	1199	48	1241	41	3029	34	3177	56	5019	27
1036	35	1122	46	1158	41	1200	46	1242	40	3035	38	3218	47	5020	27
1037	36	1133	43	1165	42	1201	41	1243	42	3041	38	3224	46	5021	29
1039	36	1134	40	1166	42	1213	48	1244	37	3043	40	3235	39	5022	29
1046	38	1138	40	1167	42	1215	46	1246	39	3044	37	3236	34	5023	38
1058	34	1140	41	1168	42	1222	46	1250	37	3050	38	5001	50	5024	42
1059	35	1141	42	1169	41	1223	46	1251	39	3051	38	5003	45	5025	43
1072	40	1142	42	1170	44	1225	46	1252	44	3052	39	5006	44	--	--
1075	35	1143	42	1171	44	1228	46	1253	42	3057	44	5011	24	--	--