HUMECOAL
PROJECT

VOLUME 7

Hume Coal Project

Environmental Impact Statement

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Prepared for Hume Coal Pty Limited
March 2017

EMM

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Noise and Vibration Assessment Report

Hume Coal Project

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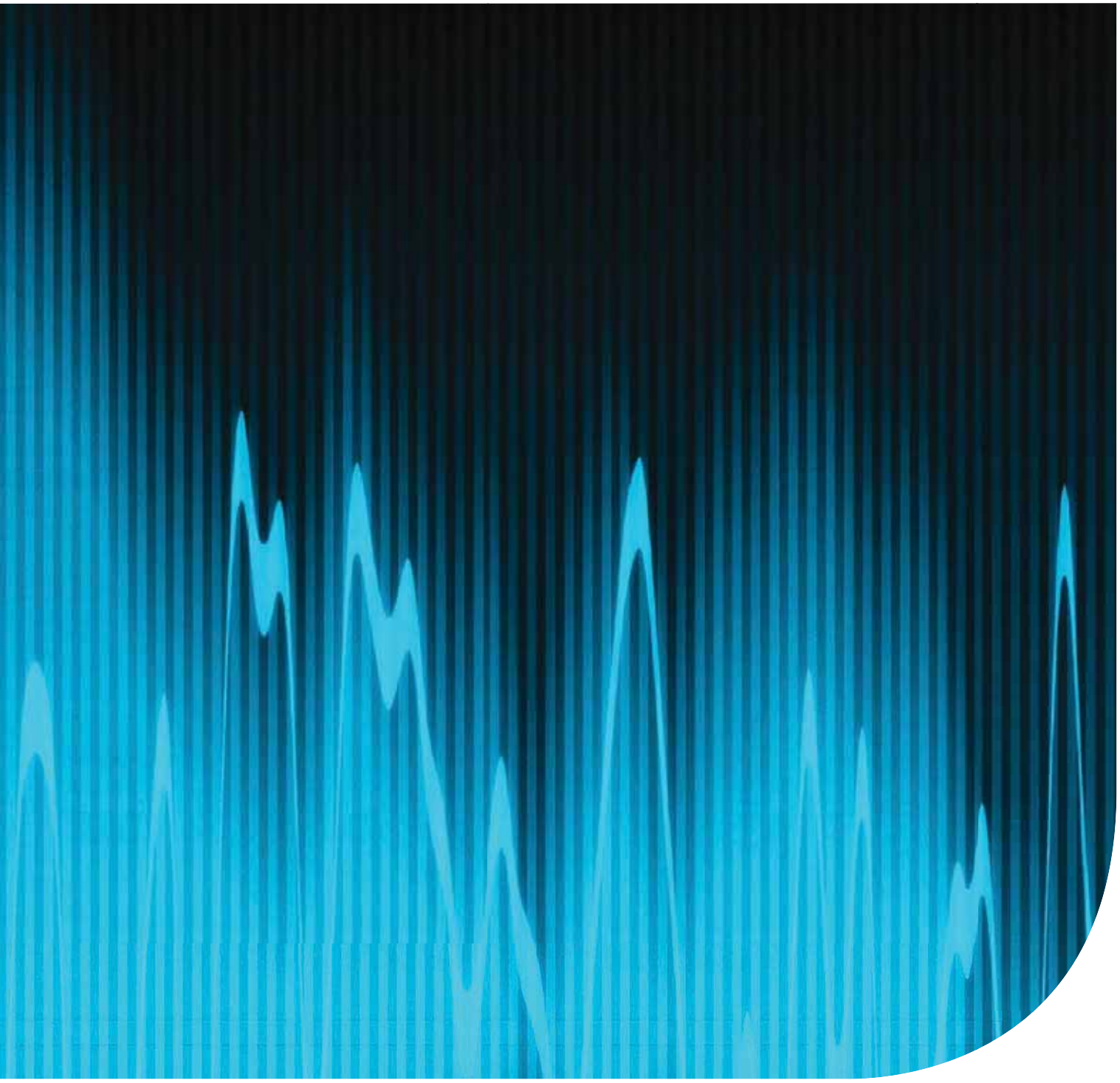
Prepared for Hume Coal Pty Limited | 13 February 2017



Hume Coal Project

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Prepared for Hume Coal Pty Limited | 13 February 2017

Ground Floor, Suite 01, 20 Chandos Street
St Leonards, NSW, 2065

T +61 2 9493 9500
F +61 2 9493 9599
E info@emmconsulting.com.au

www.emmconsulting.com.au

Hume Coal Project

Final

Report J12055RP1 | Prepared for Hume Coal Pty Limited | 13 February 2017

Prepared by	**Daniel Weston**	Approved by	**Najah Ishac**
Position	Associate	Position	Director
Signature		Signature	
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EMM

T +61 (0)2 9493 9500 | F +61 (0)2 9493 9599

Ground Floor | Suite 01 | 20 Chandos Street | St Leonards | New South Wales | 2065 | Australia

www.emmconsulting.com.au

Executive Summary

ES1 Introduction

Hume Coal Pty Limited (Hume Coal) proposes to develop, construct and operate an underground coal mine and associated mine infrastructure (the 'Hume Coal Project') in the Southern Coalfield of New South Wales (NSW). Hume Coal holds exploration Authorisation 349 (A349) to the west of Moss Vale, in the Wingecarribee local government area (LGA).

The Hume Coal Project has been developed following several years of technical investigations to define the mineable resource and identify and address potential environmental, social and economic constraints. Post-mining, all mine surface infrastructure will be decommissioned and areas rehabilitated to a state where they can support land uses similar to the current land uses.

EMM has completed a noise and vibration impact assessment for the construction and operations phase of the Hume Coal Project. This noise and vibration assessment has been prepared following the appropriate guidelines, policies and industry requirements, and in consultation with stakeholders including community members and relevant government agencies. Guidelines and policies referenced are as follows:

- NSW Environment Protection Authority (EPA) 2000, *NSW Industrial Noise Policy* (INP);
- NSW Environment Climate Change & Water 2011, *NSW Road Noise Policy* (RNP)*;*
- NSW Environment Protection Authority (EPA) 2015, *NSW Draft Industrial Noise Guideline* (draft ING);
- NSW EPA 2013, *Rail Infrastructure Noise Guideline* (RING);
- NSW Department of Environment Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP);
- NSW Department of Environment Climate Change (DECC) 2009, *The Interim Construction Noise Guideline* (ICNG);
- Australian and New Zealand Environment Council (ANZECC) 1990, *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration;* and
- Department of Environment and Conservation (DEC) NSW 2006*, Assessing Vibration: a technical guideline.*

ES2 Impact assessment

ES2.1 Operational noise

The proponent has committed to the following feasible and reasonable noise mitigation and management which were included in the operational noise model:

- overall site design to reduce the height of acoustically significant plant and equipment wherever practicable;
- automated coal handling using stackers and reclaimers to minimise the reliance on mobile plant and equipment (eg dozers);
- machined steel idlers on all conveyors;
- enclosures on conveyor drives, crushing plant, tertiary screens, paste plant, elevated conveyors and CPP;
- low frequency noise mitigation to the CPP, including variable voltage variable frequency (VVVF) drives, concrete platforms for screens, increased steelwork and cladding system;
- ventilation fan attenuation;
- dozer operation during the day time only;
- limited workshop activities during the evening and night periods;
- procurement of latest generation low emission AC locomotives with electronically controlled pneumatic brakes; and
- construction of a rail noise barrier to the north of the rail loop to attenuate noise level from loading and rail loop activity.

Operational noise was predicted at 74 assessment locations (75 dwellings) surrounding the project area. The operational noise assessment has identified that during calm and adverse weather conditions and with all feasible and reasonable mitigation and management measures applied:

- one assessment location within the area modelled is predicted to experience negligible residual noise levels between 1 to 2 dB above project specific noise levels (PSNLs);
- eight assessment locations (nine dwellings) within the area modelled are predicted to experience residual noise levels between 3 to 5 dB above PSNLs and therefore entitled to voluntary mitigation upon request; and
- two assessment locations within the area modelled are predicted to experience residual noise levels greater than 5 dB above PSNLs and are therefore entitled to voluntary acquisition upon request.

Alternatively, Hume Coal proposes to enter into amenity agreements with landholders who are entitled to voluntary mitigation or acquisition.

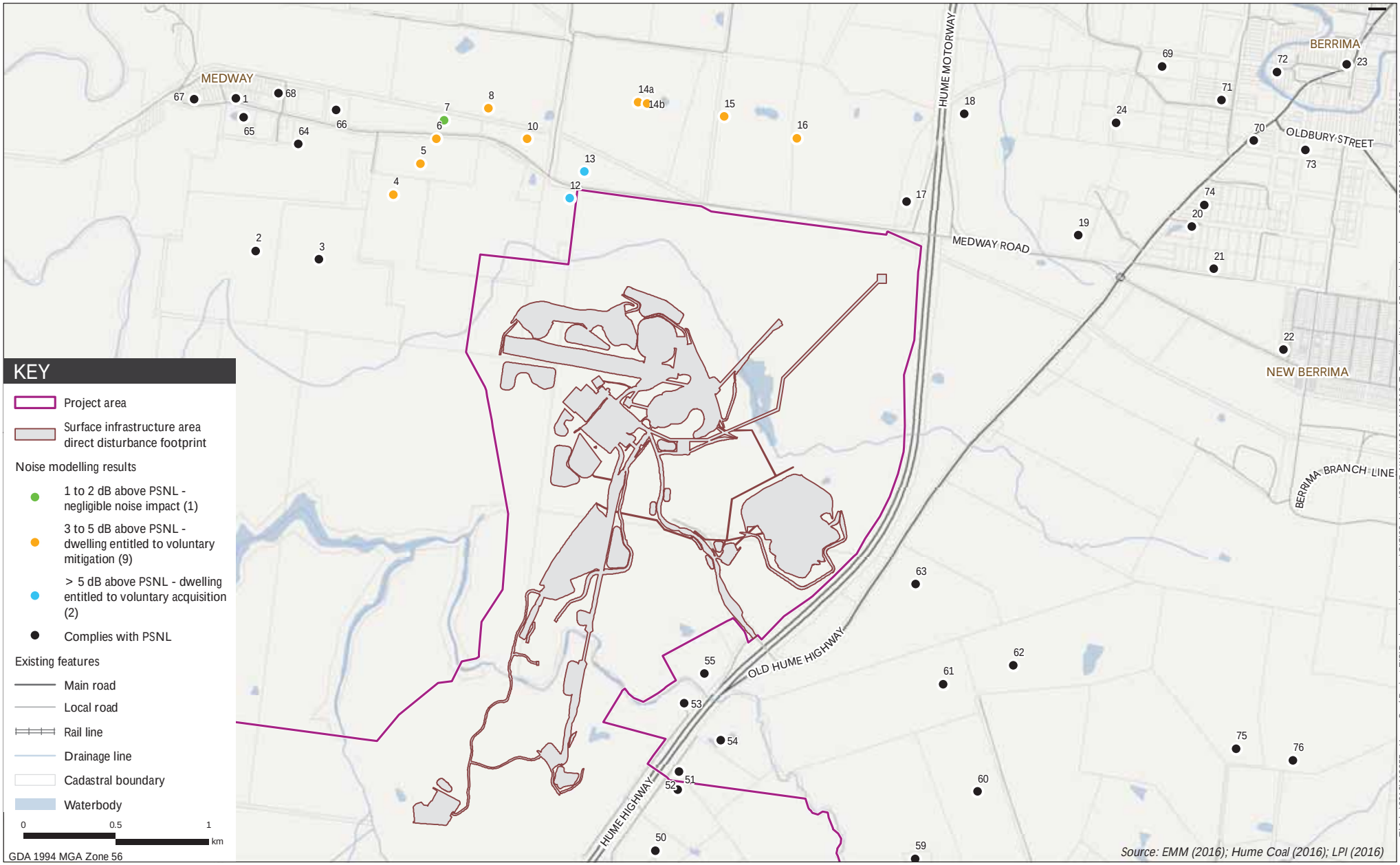
The greatest noise impacts are predicted during adverse weather conditions during the night period which are depicted in Figure E.1.

Noise over privately owned land parcels is predicted to satisfy the voluntary land acquisition criteria as defined in the *Voluntary Land Acquisition and Mitigation Policy* (VLAMP). Therefore, no privately owned land parcels are subject to voluntary acquisition due to predicted noise levels.

ES2.2 Low frequency noise

The potential for low frequency noise impacts has been reviewed using the method provided in the NSW Draft Industrial Noise Guideline (ING) (EPA 2015). This method is designed for compliance monitoring and not the environmental assessment stage, given limitations in available modelling software and the availability of accurate noise source emission data at low frequencies. Due to these limitations, it is reasonable to conclude that the draft ING LFN assessment procedure is best applied in the operational stage where direct measurement of energy at the frequency bands of interest can be completed.

Notwithstanding the above, the low frequency noise assessment found that increased impacts due to potential low frequency noise are generally contained to properties entitled to voluntary acquisition and mitigation due to operational noise impacts explained in Section ES2.1 and Figure E.1, and by virtue of these rights, would prevent any increased adverse impact on the internal amenity on these occupants from potential low frequency noise. The exception to this is assessment location 7, which would be positioned into a noise mitigation zone due to a potential 2 dB penalty to total noise level. It would be unduly stringent to apply mitigation rights as a result of this assessment due to the limitations of applying the draft ING LFN criteria at the environmental assessment stage. Hume Coal is committed to quantifying low frequency noise levels during the mine operation through regular compliance noise monitoring. If potential low frequency noise impacts are identified by Hume Coal in accordance with the Draft ING, entitlements commensurate with the level of impacts would be offered as per the VLAMP.



Summary of worst case operational noise impacts, night, adverse weather

Hume Coal Project

Noise Impact Assessment

Figure E.1

ES2.3 Sleep disturbance

The sleep disturbance assessment identified three assessment locations (15, 16 and 17) which exceed the INP screening criteria. The noise level predictions which exceed the INP screening criteria are caused by a train pass-by arrival event on the rail loop, which generates internal maximum noise levels of 36 dB, 38 to 41 dB and 42 to 43 dB, respectively when these properties have their windows open for natural ventilation. Two of these assessment locations (15 and 16) have been identified as being entitled to voluntary mitigation upon request due to operational noise impacts described in Section 5.1. The mitigation afforded to these assessment locations would provide an alternate means of ventilation allowing these occupants to leave windows closed when so desired, reducing internal maximum noise levels further to 26 dB and 28 to 31 dB, respectively. Calculated internal noise levels for both windows open and windows closed scenarios are well below those that are likely to cause awakening reactions (refer to Section 4.2). Further, a maximum of two trains are expected to be loaded in any night period and therefore the predicted maximum noise level event would occur for up to two times during the night only. On the basis of information summarised above and typical sleep disturbance maximum noise level thresholds described in Section 4.2, sleep disturbance noise impacts from operational noise are considered unlikely.

ES2.4 Cumulative noise

The application of the INP and the derivation of amenity criteria for all assessment locations take into account existing industrial noise levels and the potential for cumulative noise impacts from all industrial noise sources. Therefore, where PSNLs are satisfied, it can be inferred that cumulative impacts are highly unlikely as a result of the Hume Coal Project. There is no existing industrial noise contribution at assessment locations directly impacted by the Hume Coal Project (properties listed in Table 5.2). Therefore the potential for increased impacts due to cumulative noise levels is considered highly unlikely. The Berrima Rail Project will include a rail maintenance facility located to the east of the Hume Highway. Noise levels from this facility have been assessed with noise from the Hume Coal Project. The assessment found that total noise levels due to the operation of both facilities when combined would not lead to increased noise impacts. That is, properties identified as entitled to voluntary mitigation or acquisition would remain as those identified in this report (Table 5.2).

ES2.5 Construction noise and vibration

Construction noise levels from the Hume Coal Project are predicted to satisfy the ICNG highly affected NML of 75 dBA. Construction noise levels during standard ICNG construction hours will however exceed the noise affected Noise Management Levels (NML) at several assessment locations across the several construction stages. This outcome is not uncommon for construction projects, and it is important to note that the NML is not a criterion (as are operational noise limits). It is simply a trigger for when construction noise management is to be considered and implemented. The proponent will manage construction noise levels where exceedance of NMLs has been identified. The construction noise management methods will be detailed in a construction noise management plan as discussed further in Section 6.2.

Construction noise levels from the proposed out of hours activity are predicted to satisfy the evening and night NML at all assessment locations, with the exception of the ventilation shaft construction. Noise levels from this activity of up to 3 dB above the NML are predicted during the operation of a blind bore rig. Actual noise levels from this activity will be verified during the construction stage and noise mitigation in the form of localised noise barriers or similar will be adopted if noise levels exceed the NMLs which are identified. A localised noise barrier could provide a 5 to 10 dB of noise reduction and therefore with such mitigation in place this activity will satisfy the NML at all assessment locations.

Maximum noise levels (ie L_{max}) from general construction activity during out of hour periods are unlikely to be more than 10 dB above the predicted energy average construction noise level (ie L_{Aeq}). Therefore the minimum sleep disturbance screening criteria of 45 dB, L_{max} is also likely to be satisfied. Noise from the blind bore rig will generally be continuous in nature and therefore given the magnitude of predicted energy average construction noise level (ie L_{Aeq}), the maximum noise levels from this plant item is also likely to satisfy the relevant sleep disturbance screening criteria across all assessment locations. The proponent will monitor construction noise levels during out of hours periods during the initial construction stage and will implement noise management and mitigation measures where noise levels above relevant NMLs and sleep disturbance screening criteria are identified.

Based on the safe working distances for typical construction plant items and the location of surrounding privately owned residential properties, it is unlikely that human response to vibration criteria will be exceeded. Because the human response criteria are more stringent than cosmetic damage criteria, it is also highly likely that cosmetic damage criteria would be satisfied at privately owned residential properties. Notwithstanding, construction vibration will be managed by the proponent, which will include the preparation of a construction vibration management plan as discussed further in Section 7.2.

An assessment of potential structural vibration impacts on the Hume Highway as requested by the RMS has been conducted. Underground mine construction will occur at distances of approximately 110 m under the Hume Highway. Based on the structural vibration screening criteria of 7.5 mm/s and identified vibration levels from similar construction activities, it is highly unlikely that vibration levels would cause structural vibration impacts on the Hume Highway.

Minor blast activity will be required for a personnel and material portal, drift portal and ventilation shaft construction. There is capacity in the blast design process to limit certain parameters to prevent excessive blast overpressure and vibration levels. One of the key parameters used to control blast overpressure and ground vibration is the maximum instantaneous change (MIC), quantified in kilograms (kg), which can be modified based on the distance separating blasting and assessment locations. Assessment results convey that a range of MICs can be adopted based on the location of the blasting to the nearest assessment locations. For example, a maximum MIC of 180 kg for personnel and materials portal construction and 820 kg for drift portal construction is predicted to result in an overpressure level of ≤115 dB and a peak particle velocity vibration level of ≤5 mm/s at the nearest assessment location, both satisfying ANZECC blast criteria. As blast overpressure and ground vibration typically decrease over distance, emissions at other assessment locations located further away from the blast activity would also satisfy ANZECC blast criteria. In summary, with appropriate blast design and management measures there is minimal risk of exceeding ANZECC blast criteria during the construction phase.

ES2.6 Road traffic noise

Road traffic noise has been assessed for all public roads potentially used for the operation and construction phases of the Hume Coal Project. All roads that will be used to access the Hume Coal Project where adjacent assessment locations exist will experience zero to negligible (1-2 dB) noise level increases which satisfies RNP (EPA 2011) requirements.

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Glossary of acoustic and related terms

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 noise criteria	The amenity noise criteria relate to existing industrial noise. Where industrial noise approaches base amenity noise criteria, then noise levels from new industries need to demonstrate that they will not be an additional contributor to existing industrial noise. See Section 3.1.2 for more detail.
CEMP	Construction environment management plan
Day period	Monday–Saturday: 7.00 am to 6.00 pm, on Sundays and public holidays: 8.00 am to 6.00 pm.
dBA	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.
dBC	Noise is measured in units called decibels (dB). There are several scales for describing noise, with the 'C-weighted' scale typically used to assess low frequency noise.
DP&E	Department of Planning and Environment
EA	Environmental assessment
EMM	EMM Consulting Pty Limited
EP&A Act	*Environmental and Planning Assessment Act 1979* (NSW)
EPA	The NSW Environment Protection Authority (formerly the Department of Environment, Climate Change and Water).
Evening period	Monday–Saturday: 6.00 pm to 10.00 pm, on Sundays and public holidays
ICNG	Interim Construction Noise Guideline
INP	Industrial Noise Policy
Intrusive noise criteria	The intrusive noise criteria refers to noise that intrudes above the background level by more than 5 dB. The intrusiveness criterion is described in detail in Section 3.1.1.
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 15minute period.
Linear peak	The peak level of an event is normally measured using a microphone in the same manner as linear noise (i.e. unweighted), at frequencies both in and below the audible range.
L_{max}	The maximum sound pressure level received during a measuring interval.
Night period	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
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)

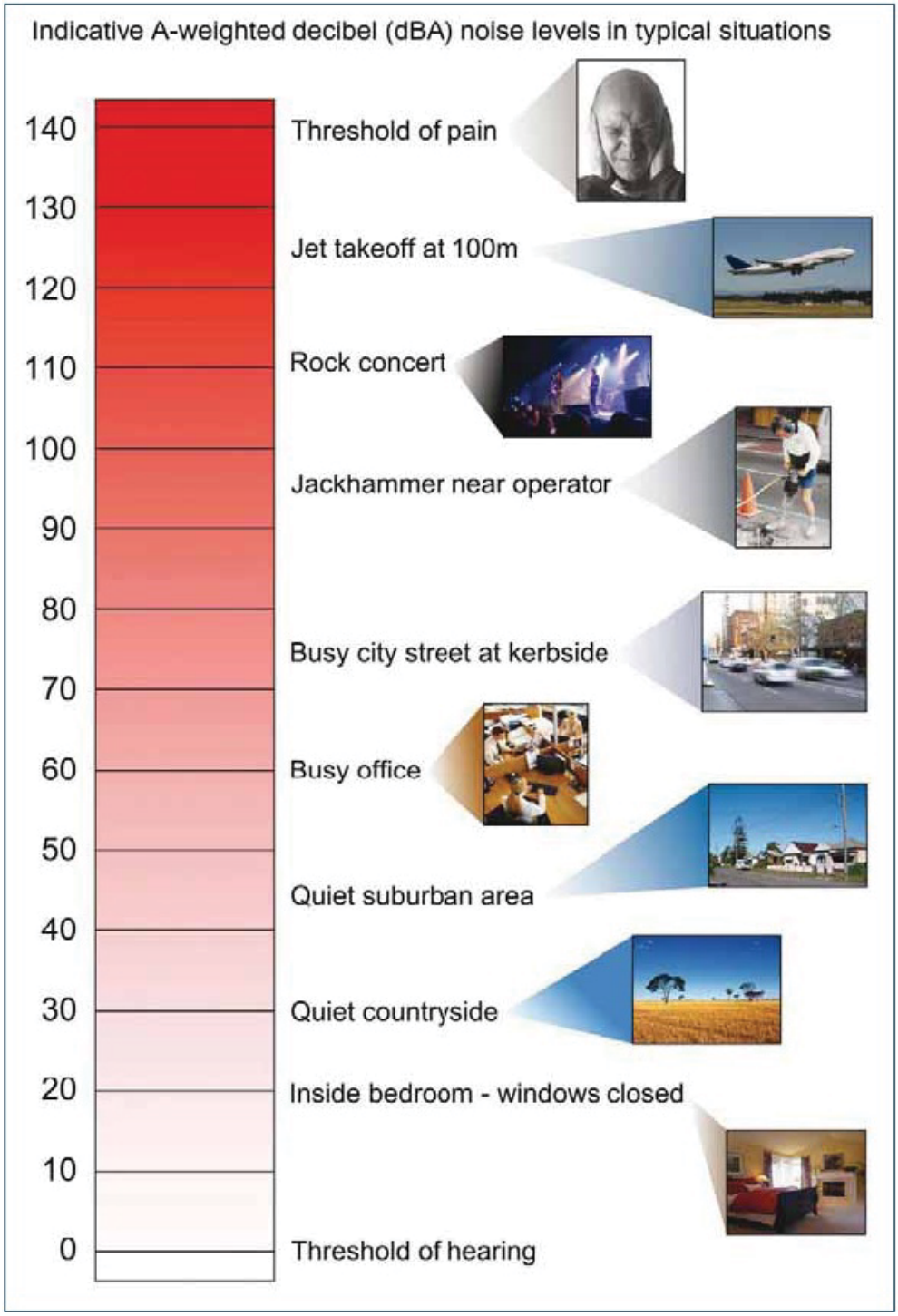
Abbreviation or term	Definition
PSNL	The project-noise trigger level (PSNL) is criteria for a particular industrial noise source or industry. The PSNL is the lower of either the intrusive noise criteria or amenity noise criteria.
RBL	The rating background level (RBL) is an overall single value background 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
SEARs	Secretary's environmental assessment requirements
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.

Common noise levels

The table below gives an indication as to what an average person perceives about changes in noise levels. Examples of common noise levels encountered on a daily basis are provided in the Figure below.

Perceived change in noise

Change in sound level (dB)	Perceived change in noise
1-2	generally indiscernible
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times as loud (or quarter) as loud



Source: *Road Noise Policy (DECCW 2011).*

Common sources of noise with levels

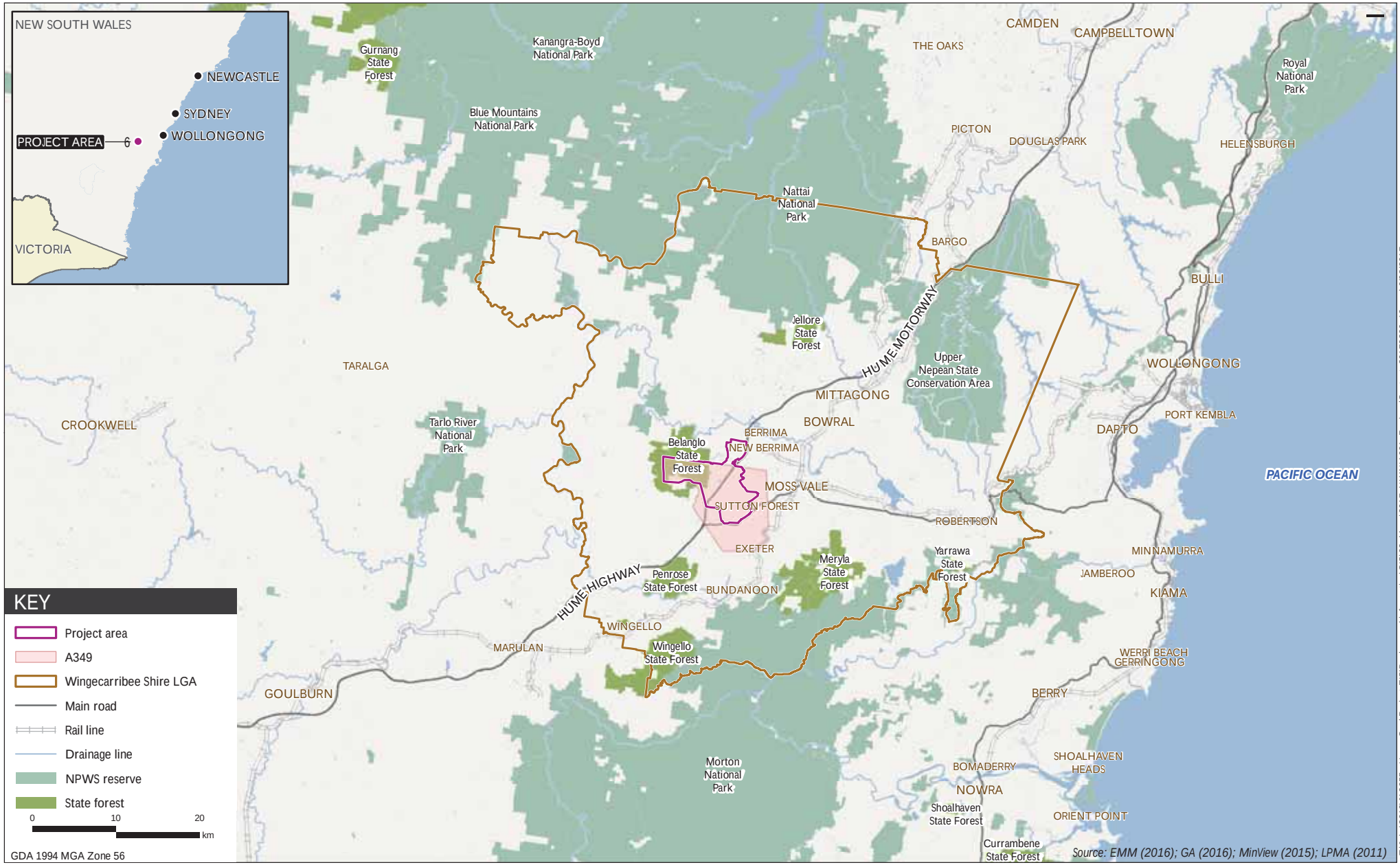
1 Introduction

1.1 Overview

Hume Coal Pty Limited (Hume Coal) proposes to develop and operate an underground coal mine and associated mine infrastructure (the 'Hume Coal Project') in the Southern Coalfield of New South Wales (NSW). Hume Coal holds exploration Authorisation 349 (A349) to the west of Moss Vale, in the Wingecarribee local government area (LGA). The underground mine will be developed within A349 and associated surface infrastructure facilities will be developed within and north of A349. The project area and its regional and local setting are shown in Figures 1.1 and 1.2.

The Hume Coal Project has been developed following several years of technical investigations to define the mineable resource and identify and address potential environmental, social and economic constraints. Low impact mining methods will be used which will have negligible subsidence impacts and thereby protect the overlying aquifer and surface features, and therefore allow existing land uses to continue at the surface. Post-mining, all mine surface infrastructure will be decommissioned and areas rehabilitated to a state where they can support land uses similar to the current land uses.

Approval for the Hume Coal Project is being sought under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An environmental impact statement (EIS) is a requirement of the approval processes. This noise and vibration assessment report forms part of the EIS. It documents the assessment methods, results and the initiatives built into the project design to avoid and minimise noise and vibration impacts, and the additional mitigation and management measures proposed to address residual impacts which cannot be avoided.

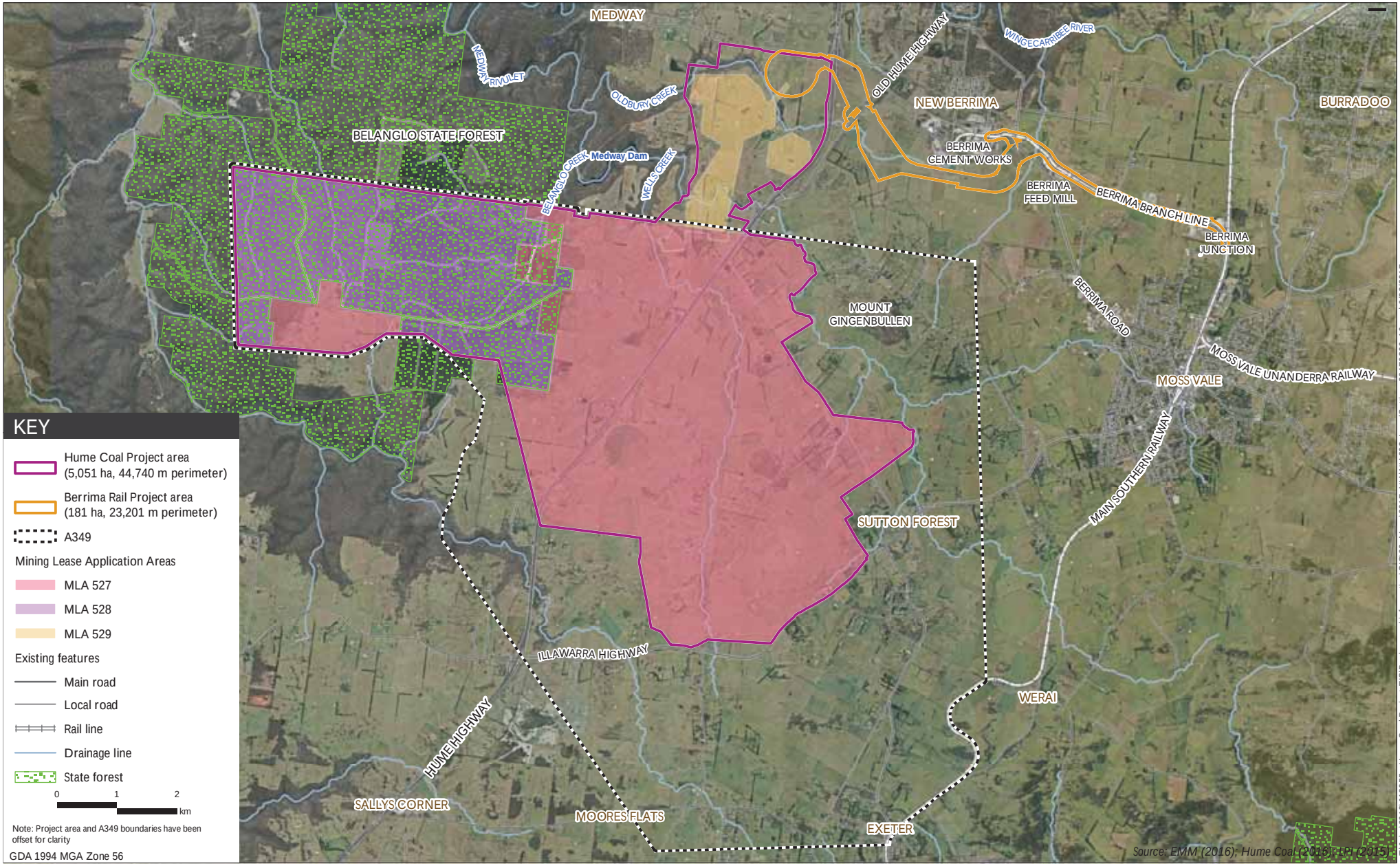


Regional context

Hume Coal Project

Noise Impact Assessment

Figure 1.1



Local context

Hume Coal Project

Noise Impact Assessment

Figure 1.2

1.2 Project description

The project involves developing and operating an underground coal mine and associated infrastructure over a total estimated project life of 23 years. Indicative mine and surface infrastructure plans are provided in Figure 1.3 and Figure 1.4. A full description of the project, as assessed in this report, is provided in Chapter 2 of the main EIS report (EMM 2017a).

In summary it involves:

- Ongoing resource definition activities, along with geotechnical and engineering testing, and other fieldwork to facilitate detailed design.
- Establishment of a temporary construction accommodation village.
- Development and operation of an underground coal mine, comprising of approximately two years of construction and 19 years of mining, followed by a closure and rehabilitation phase of up to two years, leading to a total project life of 23 years. Some coal extraction will commence during the second year of construction and hence there will be some overlap between the construction and operational phases.
- Extraction of approximately 50 million tonnes (Mt) of run-of-mine (ROM) coal from the Wongawilli Seam, at a rate of up to 3.5 million tonnes per annum (Mtpa). Low impact mining methods will be used, which will have negligible subsidence impacts.
- Following processing of ROM coal in the coal preparation plant (CPP), production of up to 3 Mtpa of metallurgical and thermal coal for sale to international and domestic markets.
- Construction and operation of associated mine infrastructure, mostly on cleared land, including:
    - one personnel and materials drift access and one conveyor drift access from the surface to the coal seam;
    - ventilation shafts, comprising one upcast ventilation shaft and fans, and up to two downcast shafts installed over the life of the mine, depending on ventilation requirements as the mine progresses;
    - a surface infrastructure area, including administration, bathhouse, washdown and workshop facilities, fuel and lubrication storage, warehouses, laydown areas, and other facilities. The surface infrastructure area will also comprise the CPP and ROM coal, product coal and emergency reject stockpiles;
    - surface and groundwater management and treatment facilities, including storages, pipelines, pumps and associated infrastructure;
    - overland conveyors;
    - rail load-out facilities;
    - a small explosives magazine;
    - ancillary facilities, including fences, access roads, car parking areas, helipad and communications infrastructure; and

- environmental management and monitoring equipment.

- Establishment of site access from Mereworth Road, and construction of minor internal roads.
- Coal reject emplacement underground, in the mined-out voids.
- Peak workforces of approximately 414 full-time equivalent employees during construction and approximately 300 full-time equivalent employees during operations.
- Decommissioning of mine infrastructure and rehabilitating the area once mining is complete, so that it can support land uses similar to current land uses.

The project area, shown in Figure 1.2 is approximately 5,051 hectares (ha). Surface disturbance will mainly be restricted to the surface infrastructure areas shown indicatively on Figure 1.4 though will include some other areas above the underground mine, such as drill pads and access tracks. The project area generally comprises direct surface disturbance areas of up to approximately 117 ha, and an underground mining area of approximately 3,472 ha, where negligible subsidence impacts are anticipated.

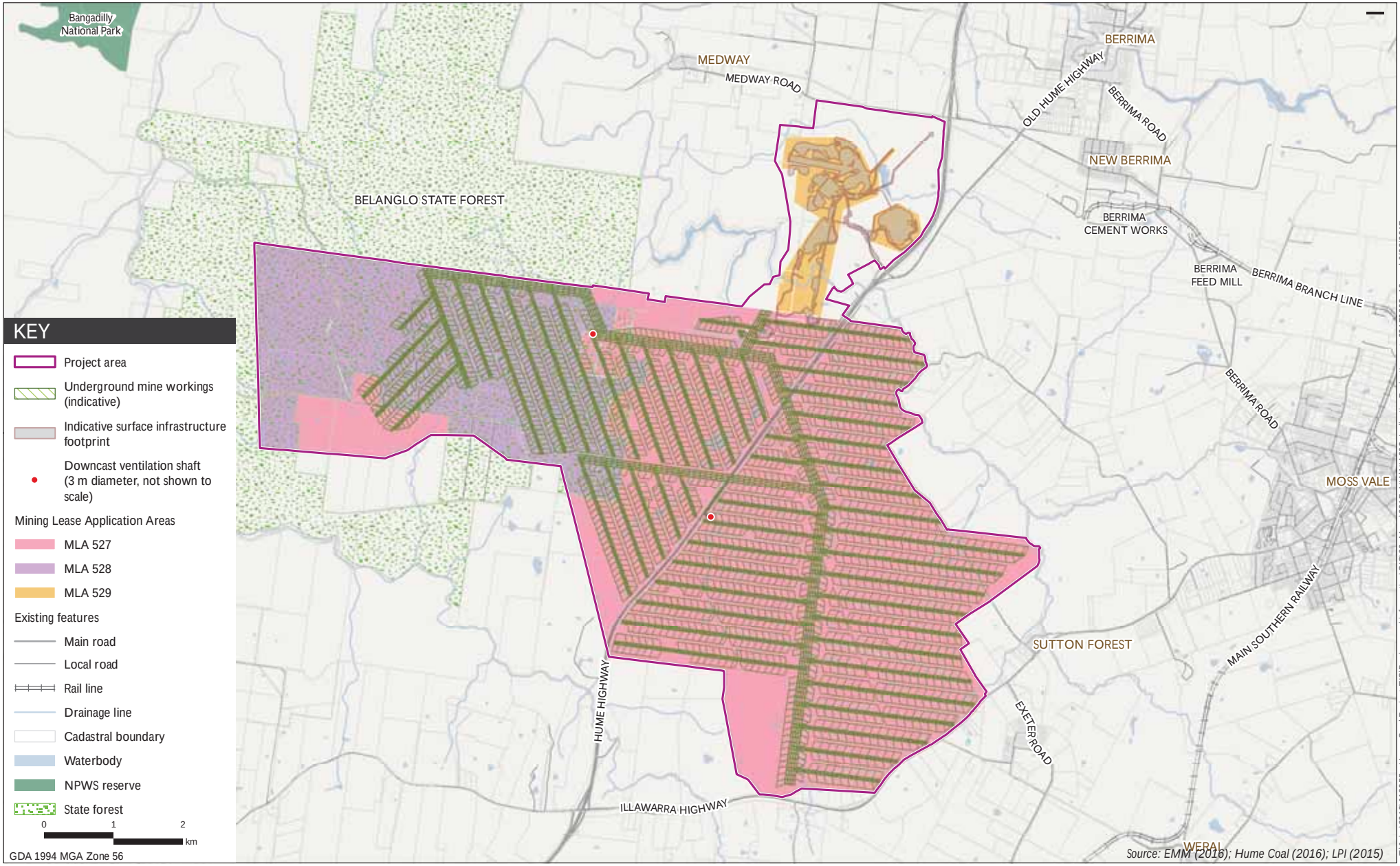
A construction buffer zone will be provided around the direct disturbance areas. The buffer zone will provide an area for construction vehicle and equipment movements, minor stockpiling and equipment laydown, as well as allowing for minor realignments of surface infrastructure. Ground disturbance will generally be minor and associated with temporary vehicle tracks and sediment controls as well as minor works such as backfilled trenches associated with realignment of existing services. Notwithstanding, environmental features identified in the relevant technical assessments will be marked as avoidance zones so that activities in this area do not have an environmental impact.

Product coal will be transported by rail, primarily to Port Kembla terminal for the international market, and possibly to the domestic market depending on market demand. Rail works and use are the subject of a separate EIS and State significant development application for the Berrima Rail Project.

1.3 Adoption of leading practices

Hume Coal is committed to adopting leading practices in the planning, construction, operation and closure of the project. This includes leading practice measures to avoid, minimise and/or mitigate potential environmental and social impacts. Some of the measures Hume Coal has committed to implement set a new benchmark for underground coal mining in NSW. The leading practice measures are described in the main report. Those measures specifically related to avoiding, minimising and/or mitigating potential noise and vibration impacts are also described in Section 7 of this report, including:

- latest generation rail locomotives and wagons will be used, which have isolated engine and operator cab mountings to reduce vibration and noise transmission;
- low noise idlers on all conveyors;
- low frequency noise mitigation to the CPP, including variable voltage variable frequency (VVVF) drives, concrete platforms for screens, increased steelwork and bespoke cladding system; and
- automated coal handling using stackers and reclaimers to minimise the reliance on mobile plant and equipment (eg dozers).

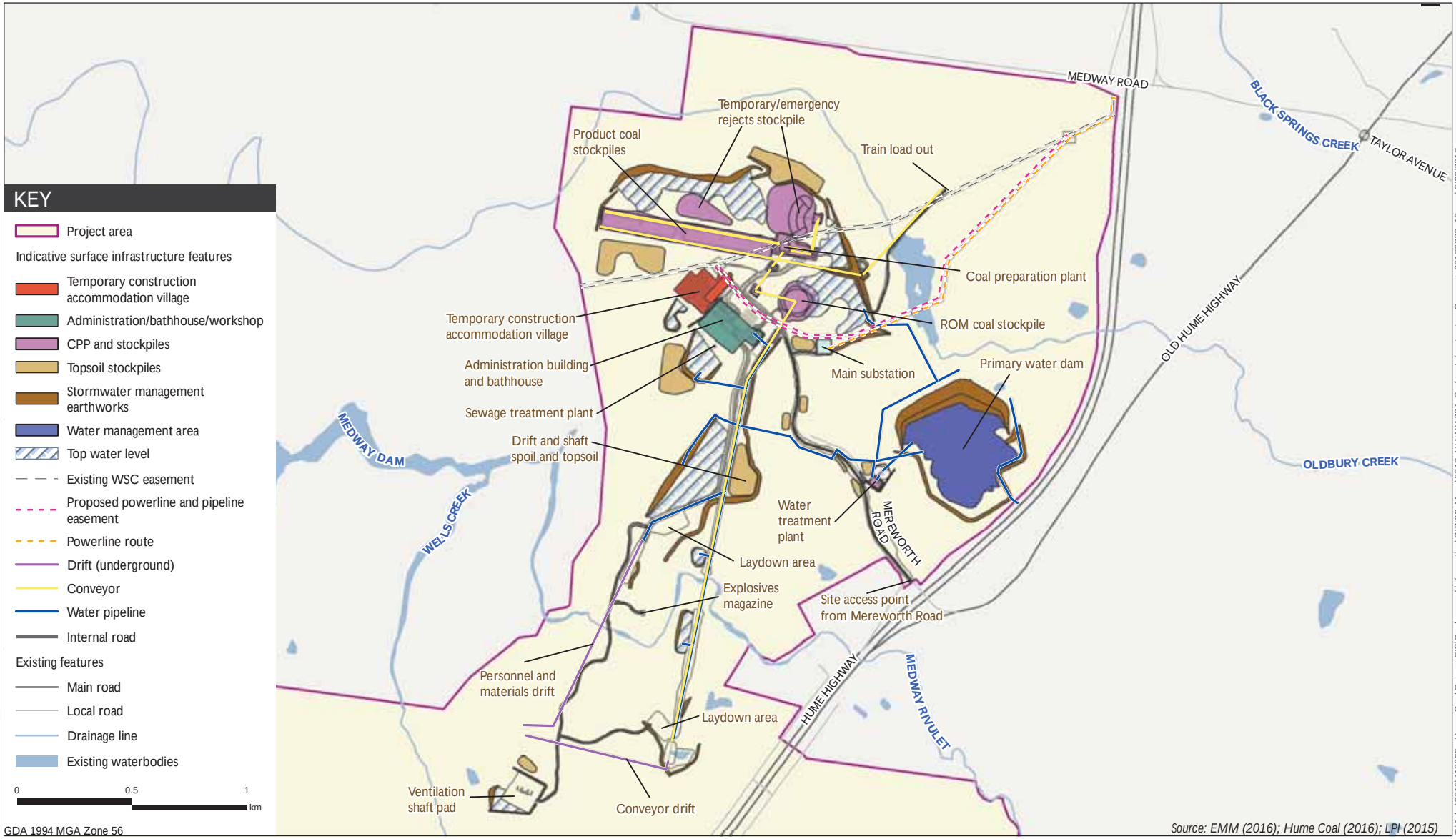


Indicative project layout

Hume Coal Project

Noise Impact Assessment

Figure 1.3



Indicative surface infrastructure layout

Hume Coal Project
Noise Impact Assessment

Figure 1.4

1.4 Assessment guidelines and requirements

This noise and vibration assessment has been prepared following the appropriate guidelines, policies and industry requirements, and following consultation with stakeholders including community members and relevant government agencies.

Guidelines and policies referenced are as follows:

- NSW Environment Protection Authority (EPA) 2000, *NSW Industrial Noise Policy* (INP);
- NSW Environment Protection Authority (EPA) 2015, *Draft Industrial Noise Guideline* (ING);
- NSW EPA 2013, *Rail Infrastructure Noise Guideline* (RING);
- NSW Department of Environment Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP);
- NSW Department of Environment Climate Change (DECC) 2009, *The Interim Construction Noise Guideline* (ICNG);
- Australian and New Zealand Environment Council 1990, *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration;* and
- Department of Environment and Conservation (DEC) NSW 2006*, Assessing Vibration: a technical guideline.*

This assessment has been prepared in accordance with requirements of the NSW Environment Protection Authority (EPA) and the NSW Department of Planning and Environment (DP&E). These were set out in the Secretary's Environmental Assessment Requirements (SEARs) for the Hume Coal Project, issued on 20 August 2015, and supplementary SEARs issued on 18 January 2016. The SEARs identify matters which must be addressed in the EIS and essentially form its terms of reference. Table 1.1 lists individual requirements relevant to this noise and vibration assessment and where they are addressed in this report.

Table 1.1 Noise and vibration related SEARs

Requirement	Section addressed
An assessment of the likely operational noise impacts of the development (including construction noise) under the NSW Industrial Noise Policy, paying particular attention to the obligations in chapters 8 and 9 of the policy, and the Voluntary Land Acquisition and Mitigation Policy (DP&E).	Section 3.1, Section 4.2, Section 5.1 and 5.6
If a claim is made for specific construction noise criteria for certain activities, then this claim must be justified and accompanied by an assessment of the likely construction noise impacts of these activities under the Interim Construction Noise Guideline.	Section 3.3, Section 4.3, Section 5.7–5.9
An assessment of the likely road noise impacts of the development under the NSW Road Noise Policy.	Section 3.4, Section 4.4, Section 5.10

To inform the preparation of the SEARs, DP&E invited other government agencies to recommend matters to be address in the EIS. These matters were taken into account by the Secretary for DP&E when preparing the SEARs. Copies of the government agencies' advice to DP&E were attached to the SEARs.

The Roads and Maritime Service (RMS) raised matters relevant to the noise and vibration assessment. The matters raised are listed in Table 1.2, and have been taken into account in preparing this assessment, as indicated in the table.

Table 1.2 RMS comments: project-specific assessment recommendations

Recommendation	Section addressed
The impacts of noise and vibration of the mine, including: • undermining or de-stabilisation of the Hume Highway through coal extraction operations or otherwise; and • vibration impacts on the Hume Highway through mine construction and operation.	Section 3.6, Section 5.8