APPENDIX A

NOISE AND BLASTING ASSESSMENT

global environmental solutions

Wilpinjong Extension Project

Noise and Blasting Assessment

Report Number 610.10806.00400-R3

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Wilpinjong Coal Pty Ltd

Version: Revision 0

Wilpinjong Extension Project

Noise and Blasting Assessment

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1 INTRODUCTION

1.1 Background

Wilpinjong Coal Pty Limited (WCPL), a wholly owned subsidiary of Peabody Energy Australia Pty Limited (Peabody), is the owner and operator of the Wilpinjong Coal Mine, which operates in accordance with Project Approval 05-0021 granted in 2006 (as modified). The existing open cut coal mining operation is situated in the Western Coalfield approximately 40 kilometres (km) north-east of Mudgee, within the Mid-Western Regional Local Government Area, in central New South Wales (NSW). The Wilpinjong Coal Mine is approved to produce 16 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal and 12.6 Mtpa of thermal coal products. Up to 12.5 Mtpa of product coal is currently transported by rail to domestic customers for use in electricity generation and to port for export.

WCPL is seeking development consent to extend Wilpinjong Coal Mine. This includes both physical extensions to the mine footprint to gain access to additional ROM coal reserves, as well as an extension to the approved life of the mine for an additional operational life of approximately seven years. The proposal is herein referred to as the Wilpinjong Extension Project (the Project). Further description of the Project and the approval context is provided in the main text of the Environmental Impact Statement (EIS).

SLR Consulting Australia Pty Ltd (SLR) has been engaged by WCPL to evaluate and assess the potential noise and blasting impacts associated with the Project.

1.2 Assessment Requirements

The assessment of noise and blasting impacts for the Project has been guided by the NSW Department of Planning and Environment (DP&E) Secretary's Environmental Assessment Requirements (SEARs) for the Project, dated 9 December 2014, as presented in **Table 1**.

Table 1 DP&E Secretary's Environmental Assessment Requirements

SEARs Specific Issues	Report Reference
The EIS must address the following specific issues: Noise - including:	
• an assessment of the likely operational noise impacts of the development (including construction noise) the NSW Industrial Noise Policy, paying particular attention to the obligations in chapters 8 and 9 of the policy;	Section 7
• 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;	Sections 3 and 7
• an assessment of the likely road noise impacts of the development under the NSW Road Noise Policy; and	Section 10
• an assessment of the likely rail noise impacts of the development under the Rail Infrastructure Noise Guideline.	Section 11
Environmental Planning Instruments, Policies, Guidelines & Plans • NSW Industrial Noise Policy (INP) (EPA, 2000); • Interim Construction Noise Guideline (ICNG) (EPA, 2009); • NSW Road Noise Policy (RNP) (DECCW, 2011); • Rail Infrastructure Noise Guideline (RING) (EPA, 2013); and • Voluntary Land Acquisition and Mitigation Policy: For State Significant Mining, Petroleum and Extractive Industry Developments (NSW Government, 2014).	Refer Table 2

Note: The Environment Protection Authority (EPA) existed as a legal entity and operated within the NSW Office of Environment and Heritage (OEH) which came into existence in 2011. The EPA became a separate statutory authority on 29 February 2012. The OEH was previously part of the NSW Department of Environment, Climate Change and Water (DECCW). The DECCW was also recently known as the NSW Department of Environment and Climate Change (DECC), and prior to that the NSW Department of Environment and Conservation (DEC).

The NSW EPA and Mid-Western Regional Council (MWRC) have also provided input to the SEARs with extracts shown in **Appendix A1** and **Appendix A2** respectively and the noise and vibration issues raised are considered in this assessment. In accordance with the SEARs and the input of the EPA and MWRC, the Project noise and vibration emissions have been comprehensively evaluated based on the assessment methodology and procedure guidelines presented in **Table 2**.

Table 2 Assessment Methodology and Procedure Guidelines - Report Cross-references

Assessment Guideline	Representative Assessment Scenario	Assessment Criteria	Impact Assessment
Project Construction Noise Impact			
Guided by the requirements of the ICNG.	Not applicable[1].	Not applicable[1].	Not applicable[1].
Project Operating Noise			
Guided by the requirements of the NSW INP and associated Application Notes dated 12 June 2013 in relation to setting project specific noise levels (PSNLs) and assessing noise impacts from the modification, expansion or upgrade of existing industrial premises.	Year 2018; Year 2020; Year 2024; Year 2028; and Year 2031.	Section 5.1	Section 7
Cumulative Industrial Noise			
Guided by the requirements of the NSW INP in relation to existing and successive industrial developments by setting cumulative $L_{Aeq(period)}$ amenity levels for all industrial (i.e. non-transport related) noise in a receiver area.	Existing and approved industrial developments in the vicinity of the Project.	Section 5.1	Section 8
Project Blasting Emissions			
Guided by the requirements of the Australian and New Zealand Environment Council's *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC, 1990) in relation to setting acceptable human comfort blast emission levels.	Blasting assessment.	Section 9.1	Section 9.3 to 9.6
Off-site Road Transport Noise			
Guided by the requirements of the RNP and associated Application Notes dated 15 February 2013 in relation to setting acceptable $L_{Aeq(period)}$ noise levels for sub-arterial roads and assessing any impacts.	Year 2017; and Year 2024.	Section 10.1	Section 10.3
Off-site Rail Transport Noise			
Guided by the requirements of the RING (Appendix 2) in relation to land-use developments (other than rail projects) likely to generate additional rail traffic on an existing rail network.	Rail noise assessment.	Section 11.1	Section 11.4

Note 1: In accordance with the ICNG Section 1.2, the Project construction noise has been assessed in accordance with the INP including off-site construction activities associated with the Ulan-Wollar Road realignment in 2018 and 2024.

1.3 Other Relevant Approved or Proposed Developments

Other relevant approved or proposed developments in the vicinity of the Project are summarised in **Table 3**. The Moolarben Coal Project Stage 2 and Ulan Continued Operations Project are considered cumulatively in the operational noise assessment (refer to **Section 8**) for the Project.

Table 3 Other Relevant Approved or Proposed Projects

Proponent	Project[1]	Status
Moolarben Coal Mines Pty Ltd (MCMPL)	Moolarben Coal Project Stage 1	Project Approval (05_0117) dated 6 September 2007 (as modified) with Stage 1 MOD 10 approved by the NSW Minister for Planning on 17 April 2015.
	Moolarben Open Cut 4 (OC4) Southwest Modification (MOD 11)	The Moolarben OC4 Southwest Modification (MOD 11) was lodged with the NSW Minister for Planning on 5 May 2015. Yet to be determined.
	Moolarben Optimisation Modification (MOD 12)	The Moolarben Optimisation Modification (MOD 12) was lodged with the NSW Minister for Planning on 3 July 2015. Yet to be determined.
	Moolarben Coal Project Stage 2 Preferred Project Report (PPR)	Project Approval (08_0135) with the PPR approved by the NSW Minister for Planning on 30 January 2015. The Moolarben Coal Complex (i.e. Stage 1 & Stage 2) is approved to extract a maximum of 20 Mtpa of ROM coal.
	Moolarben OC4 Southwest Modification (MOD 1)	The Moolarben OC4 Southwest Modification (MOD 1) was lodged with the NSW Minister for Planning on 5 May 2015. Yet to be determined.
	Moolarben Optimisation Modification (MOD 2)	The Moolarben Optimisation Modification (MOD 2) was lodged with the NSW Minister for Planning on 3 July 2015. Yet to be determined.
Ulan Coal Mines Ltd (UCML)	Ulan (Mine Complex) Continued Operations Project (MOD 2)	Project Approval (MP 08_0184) dated 15 November 2010 (as modified), which was last modified in May 2012 (MOD 2). The Ulan Mine Complex is approved to operate to a maximum coal export capacity (from the site) of 20 Mtpa.
	Ulan West Modification (MOD 3)	The Ulan West Modification (MOD 3) was lodged with the NSW Minister for Planning on 20 March 2015. Yet to be determined.

Note 1: Modification (MOD).

2 EXISTING WILPINJONG COAL MINE

2.1 Overview

The Wilpinjong Coal Mine has an approved ROM coal mining rate of approximately 16 Mtpa and saleable product railing rate of 12.5 Mtpa and operates 24 hours a day.

Mining of ROM coal involves conventional drill and blast, truck and shovel open cut extractive methods with on-site coal handling, washing and stockpiling. Mining operations are supported by existing on-site facilities including a Coal Handling and Preparation Plant (CHPP), infrastructure area, water management storages and rail loading facilities.

All product coal from Wilpinjong Coal Mine is transported by rail to domestic electricity generation customers and to the Port of Newcastle for export.

2.2 Approvals

With respect to noise and blasting emissions, WCPL recently received consent for Modification 6 and operates in accordance with the following project approval and licence conditions:

- NSW Department of Planning and Infrastructure Project Approval 05-0021, dated 1 February 2006 (as modified), with the relevant sections attached as **Appendix A3**.
- EPA Environment Protection Licence (EPL) No 12425, anniversary date 8 February, with the relevant sections attached as **Appendix A4**.

In accordance with Project Approval 05-0021 Table 1, property number 30 is subject to acquisition upon request. In addition, in accordance with Project Approval 05-0021 Table 3, dwellings on property numbers 69, 129, 135 and 137 are subject to additional noise mitigation (i.e. double glazing, insulation and/or air conditioning) upon request. It is noted that properties 30, 129, 135 and 137 are now owned by Peabody, while property 69 remains privately owned.

2.3 Noise Management and Compliance

2.3.1 Noise Management Plan

The Noise Management Plan (NMP) dated May 2014 describes the current noise management regime, which consists of up to seven off-site operator-attended monitoring sites, three off-site continuous real-time monitors together with an on-site Automatic Weather Station (AWS) and 60 metres (m) high Permanent Temperature Tower (PTT) as shown on the Noise Monitoring Location Plans **Appendices B1** and **B2**. In accordance with the NMP, operator-attended noise monitoring is used for demonstrating compliance with noise criteria, whilst continuous real-time monitoring is used as a noise management tool to assist WCPL to take pre-emptive noise management actions to prevent or minimise potential exceedances or non-compliances.

A summary of the 2014 noise monitoring sites and associated monitoring frequency is presented in **Table 4** together with a cross reference to the Land Ownership Details presented in **Section 3.2** (and **Appendices C1, C2** and **C3**). The three real-time monitors are periodically relocated (i.e. hence more than three sites are listed in **Table 4**).

Table 4 Noise Monitoring Programme Summary

Locality	Receiver ID[1]	Site	Parameter	Frequency
Cumbo	1_WF	N4 "Hillview", Cumbo Road	Operator-attended monitoring January to July 2014	Every 2 months
Wollar	900	N6 St Laurence O'Toole Catholic Church		
Araluen	1_45	N7 Smith, Ulan-Wollar Road		
Slate Gully	1_58	N9 Maher, Slate Gully Road		
Moolarben	32_32C	N12 Ulan Mine Complex, Ulan-Wollar Road		
Wollar	900	N6 St Laurence O'Toole Catholic Church	Operator-attended monitoring August to July 2015	Every 1 month
Moolarben	69	N13 DJ & JG Stokes		
Tichular	153	N14 TW Marskell		
Wollar	-	N15 Wollar Public School		
Araluen	1_135	N16 Wilpinjong Coal Pty Ltd		
Mogo	102	N17 W Filipczyk		
Barrigan Valley	N/A	N18 Located approximately 20 km south-southeast of Wilpinjong		
Araluen	1_143	SentineX30 Araluen Lane	Real-time monitoring	Continuous
Wollar	1_WR	SentineX31 ("Wandoona")		
	942	SentineX33 ("Wollar Central")		
Mogo	200	SentineX55 and SentineX58 ("Hughes")		1 month sample

Note 1: Refer **Section 3.2** and **Appendix C3**.
ID = Identification.

Due to recent property acquisitions, WCPL now owns a number of previous privately held landholdings where operator-attended monitoring is conducted (i.e. N4, N7 and N9), while N12 is owned by UCML (refer **Appendix B1**). WCPL also owns the land on which continuous real-time monitoring is undertaken in some cases.

2.3.2 Operator-attended Noise Compliance Results 2014 and 2015

As summarised in WCPL's EPL 12425 Licence Monitoring Data Monthly Summary Reports (EPL Summary Reports), operator-attended noise monitoring was undertaken on a bi-monthly basis at five locations from January to July 2014 and on a monthly basis at seven locations from August 2014 to July 2015 at the locations presented in **Table 4**. Due to the implementation of the Wilpinjong noise management strategy as described in **Section 2.3.3**, WCPL has maintained a strong record of recent compliance with the approved noise limits. A review of the EPL Summary Reports for January 2014 to July 2015 indicate no exceedance of the relevant intrusive $L_{Aeq(15minute)}$ and/or $L_{Aeq(1minute)}$ noise limits at privately owned receivers.

2.3.3 Noise Management Strategy

WCPL implements a noise management strategy at Wilpinjong that includes general noise management measures, continuous real-time noise monitoring, implementation of noise investigation triggers and modification of operations as required.

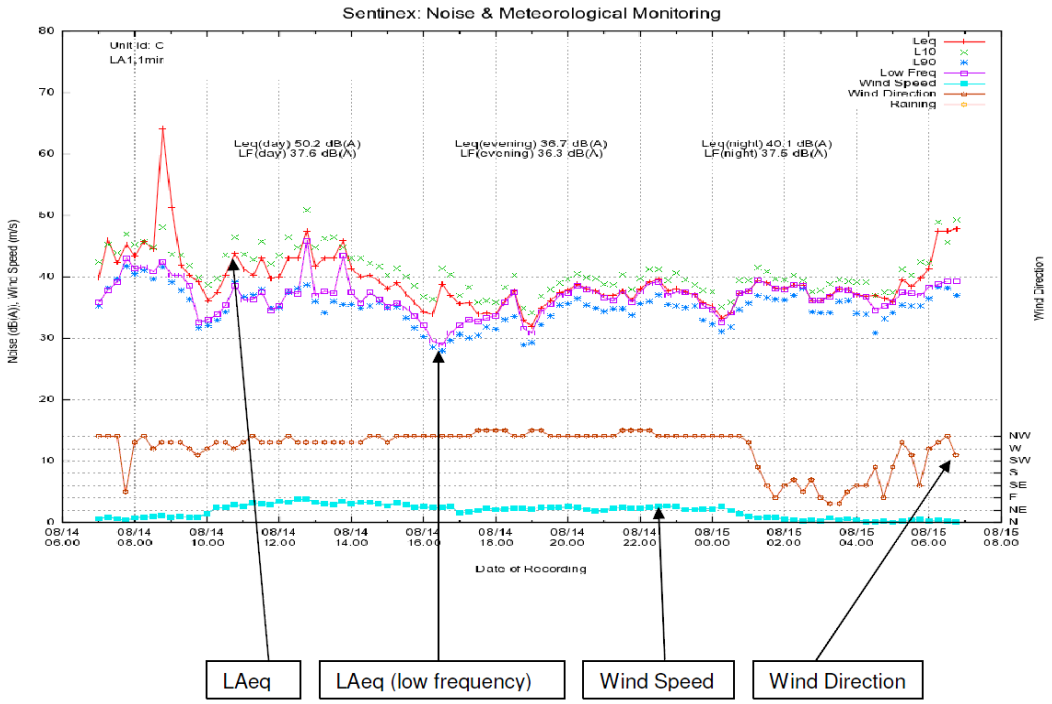
2.3.3.1 General Noise Management Measures

WCPL implements general noise management measures as part of typical operations, including:

- Coordinating shift changes on site with the shift changes of Moolarben Coal Operations Pty Ltd and UCML to minimise the potential cumulative traffic impacts (including noise impacts).
- Developing an awareness and understanding of noise issues through site inductions for all staff and contractors.
- Maintaining all machinery and plant used on site, in order to minimise noise generation.
- Operating all machinery and plant used on site in a proper and efficient manner (e.g. at correct speed) in order to minimise noise generation.
- Sound power testing of new mobile fleet, and on an annual basis, a sample of mobile equipment and fixed plant operating under dynamic conditions.
- Using the results of continuous real-time noise monitoring to assist in the implementation of pre-emptive management actions to avoid potential non-compliances.
- Communicating the previous 24 hours' noise levels (**Figure 1**) to key WCPL personnel at operational and management meetings.
- Employing a dedicated person (Control Room Operator) for monitoring real-time noise levels during day and night shifts.
- Monitoring weather conditions via the on-site AWS and PTT and where acoustically adverse conditions are experienced or predicted, operational changes are made to avoid or reduce noise impacts.

In addition, noise complaints and noise management are regularly discussed during the Wilpinjong Coal Mine Community Consultative Committee sessions.

Figure 1 Sample 24 Hour Real-time Noise Monitoring Chart



Source: WCPL

2.3.3.2 Continuous Real-time Noise Monitoring

Continuous real-time noise monitoring is used by WCPL as an ongoing noise management tool to assist in maintaining noise levels from the Wilpinjong Coal Mine below relevant noise criteria. As described above, the real-time monitoring is not used for compliance monitoring.

Noise Investigation Triggers

Noise investigation triggers are set at a suitable level below the approved noise limit, and are used between the hours of 2000 hours and 1000 hours (to minimise false triggers). The focus of real-time monitoring is therefore on periods when adverse weather conditions (e.g. temperature inversions) are likely to occur, and sources of extraneous (non-mine generated) noise are less prevalent.

In the event of noise, as recorded by the real-time noise monitors, exceeding a noise investigation trigger, an SMS and email message is sent to the Control Room Operator and relevant management (including Environmental Managers and Open Cut Examiner [OCE]), who would then implement the response protocol described in the NMP, as summarised below:

Step 1: Download audio file from relevant noise monitor to determine noise source.

Step 2: If found to be extraneous noise then no further action is taken other than noting the source of noise on the response sheet.

Step 3: If found to be mine noise then monitor noise levels.

Step 4: If mine noise equals noise limits systematically stand-down machinery.

Step 5: Continue to stand-down machinery until mine noise reduces to at least 2 decibels A weighted (dBA) below the limit.

Step 6: Continue to monitor situation and repeat Steps 1 to 5 if re-triggered.

Step 7: Record details of the investigation, type of response and real-time noise monitor level.

Step 8: Implement a review of data and response by Environmental Manager (or delegate).

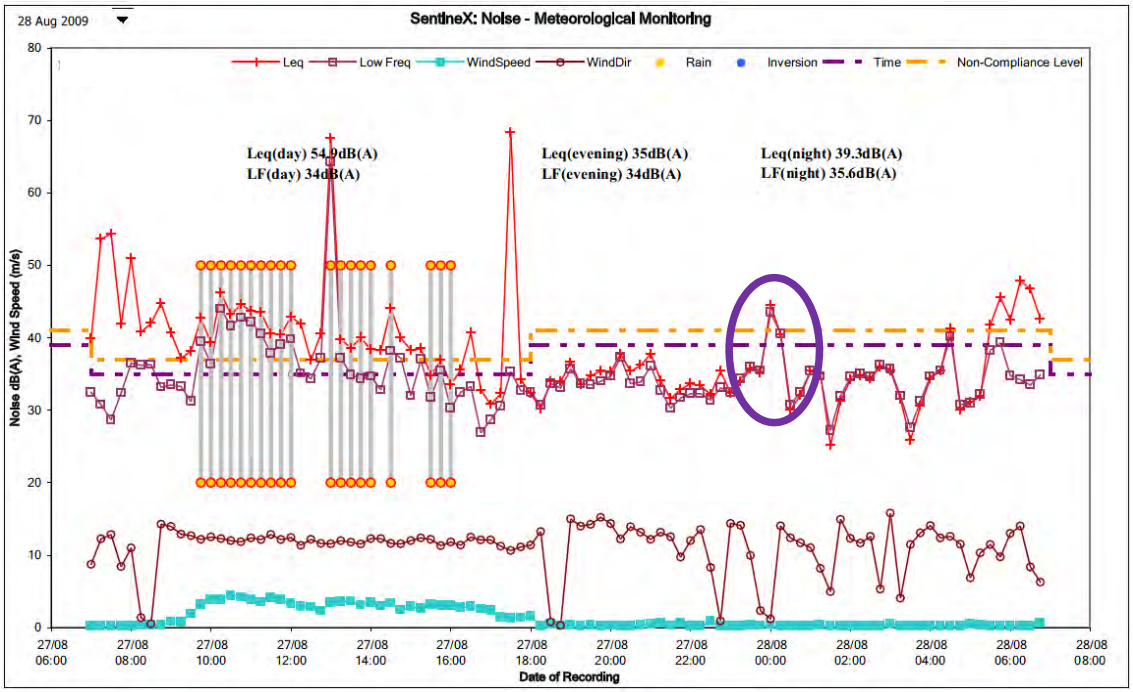
The relevant trigger and response measures in the NMP are periodically updated to reflect relevant improvements to site operating procedures.

Response Protocol Example

Figure 2 presents a sample period (27-28 August 2009) which demonstrates the effectiveness of the Wilpinjong noise management strategy in maintaining mine noise level below the approved limits. This example is from real-time monitoring in Slate Gully. The approximate sequence of events can be summarised as follows:

- Around midnight the noise investigation trigger was exceeded and a consequent SMS message sent to notify the control room of the exceedance.
- Having listened to the real-time audio recording, the Control Room Operator confirmed that the trigger was due to Wilpinjong activities.
- The control room advised the OCE of the confirmed trigger event.
- The OCE stood-down mobile equipment operating in Pit 2, including one excavator, three haul trucks and one dozer, plus one dozer operating on a waste emplacement area.
- The next noise level update indicated that the ambient noise level had reduced to just below the noise limit (of 39 dBA) for the nearby private receiver, but was still above the trigger level (of 37 dBA). Subjectively, the real-time audio stream indicated that the ambient noise level was controlled by Wilpinjong activities.
- The OCE proceeded to stand-down all mobile equipment.
- The next noise level update indicated that the ambient noise level had reduced to 30 dBA and only the Wilpinjong Coal Mine CHPP hum was discernible on the real-time audio.
- The OCE gradually brought equipment back on-line starting with equipment operating in Pit 5 and ROM area, followed by Pit 2 and dozer fleets.
- Both the real-time audio and ambient noise levels were monitored by the control room and OCE for the remainder of the night-time period, with equipment turned-off and on (primarily equipment in Pit 2 and dozers on waste in Pit 5), as required, throughout the period based on both subjective and objective observations by the control room and OCE.

Figure 2 Real-time Noise Management Example and Recorded Mine Noise Levels



Source: WCPL

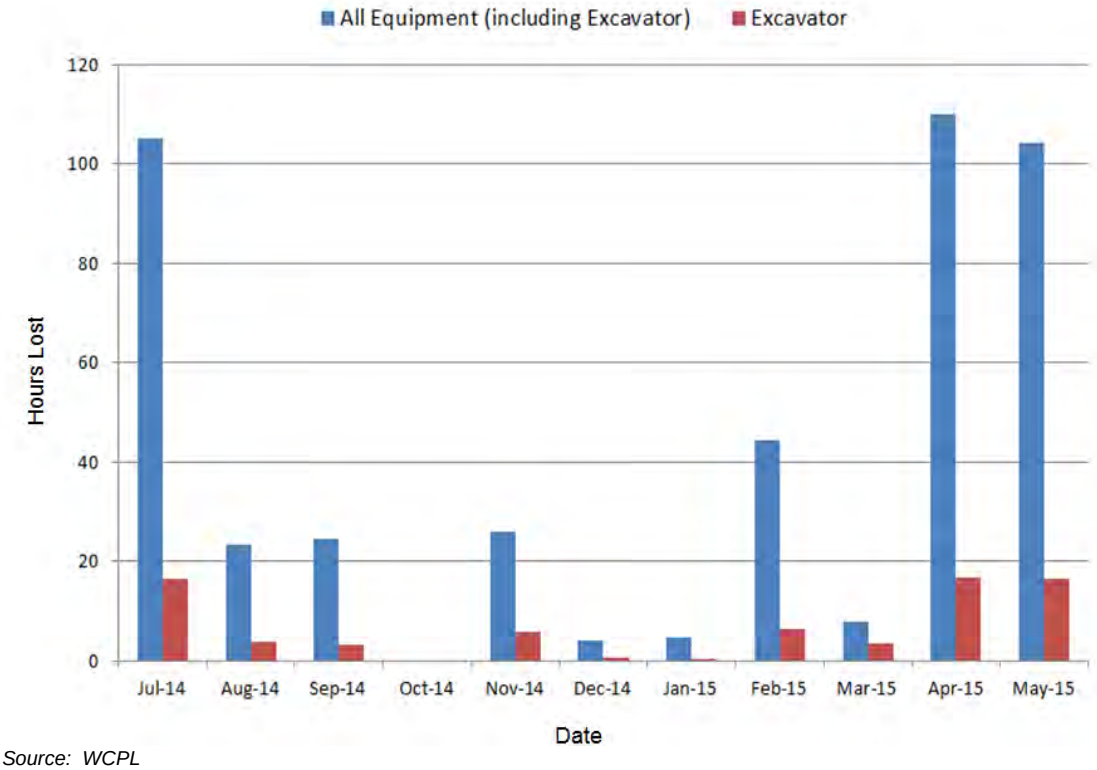
The above example demonstrates how Wilpinjong noise levels are actively managed to maintain mine noise levels below approved limits.

Equipment Stand-downs during Implementation of Response Protocols

As described above, in response to Wilpinjong noise levels exceeding noise investigation triggers, equipment is stood-down as required. During the period July 2014 to May 2015 a total of 454 shutdown hours (including 73 hours associated with the use of excavators) were accumulated as a direct response of implementation of the noise management strategy, including responses to noise investigation triggers.

Figure 3 presents the monthly equipment shutdown hours accumulated due to noise investigation triggers and associated stand-downs (between 2000 hours and 1000 hours) during the 11 month period. **Figure 3** generally shows the concentration of equipment shutdown hours during the cooler seasons coinciding with the increased strength and frequency of temperature inversions.

Figure 3 Equipment Shutdown Hours due to Noise Trigger Investigations July 2014 to May 2015



Source: WCPL

2.4 Blast Management and Compliance

2.4.1 Blast Management Plan

The Blast Management Plan (BMP) dated May 2014 has been developed to ensure that ground vibration and overpressure impacts are minimised on the local community, proximal infrastructure (e.g. Ulan-Wollar Road and associated road closures) and cultural heritage sites to the extent required. The BMP has been developed to describe the current blast management regime, which consists of:

- Monitoring of blast vibration and overpressure at a range of locations as presented in **Table 5**;
- Blast management strategies used to manage impacts from blasting (including temporary road closures);
- Communication with the local community and regulators regarding WCPL's blasting activities;
- Measures to be implemented for compliance; and
- Protocols for managing and reporting any blast related exceedances or non-compliances.

In accordance with the BMP, blast emission monitoring is used for demonstrating compliance with relevant blast fume, ground vibration and airblast limits. In addition, blast emission monitoring is conducted at the Wollar Primary School in accordance with Condition M8.1 of EPL 12425.

Table 5 Blast Emissions Monitoring Programme Summary

Monitoring Parameter	Monitoring Sites[1]	Frequency
Ground vibration	• Aboriginal Rock Art sites 72 (V1), 152 (V2) and 153 (V3)	• Every blast within 1 km of sites
	• Power poles Railway culverts Railway bridge	• Every blast within 350 m of sites
	• Railway line	• Every blast within 100 m of sites
Ground vibration and airblast	• Privately owned residences	• Every blast within 3 km of residences

Source: WCPL

Note 1: Refer **Section 3.2** and **Appendix C3**.

2.4.2 Blast Emission Compliance Results 2014

Based on the blasting monitoring results provided by WCPL, the information presented in **Table 6** relates to blast emission monitoring results during the 12 month period January to December 2014.

Table 6 Blast Emissions Monitoring Results Summary 2014

Site	Vibration (mm/s)[1]					Airblast (dBLpk)[2]				
	Max.	Min.	50% Exceedance	5% Exceedance	Criteria[3]	Max.	Min.	50% Exceedance	5% Exceedance	Criteria[3]
V1 - Rock Art (Site 72)[4]	4.6	1.1	2.5	4.4	460	n/a				
Rock Art (Site 152)[4] Pit 5 South (Southern Site)	2.7	0.0	0.2	1.2	460	n/a				
Rock Art (Site 153)[4] Pit 5 South (Northern Site)	9.3	0.0	0.3	2.6	460	n/a				
TD6[4]	18.5	0.9	3.8	10.3	50	n/a				
Wollar Public School	0.8	0.0	0.1	0.3	5	113	73	87	101	115
Main Rail Culvert Pit 4[4]	44	1.9	9.5	41.1	100	n/a				

Source: WCPL

Note 1: Vibration Velocity Peak Vector Sum (PVS) - millimetres per second (mm/s).

Note 2: Airblast Level Linear Peak - decibels linear peak re 20 micropascals (dBLpk re 20 µPa).

Note 3: WCPL blast criteria as per the BMP.

Note 4: Airblast limit not applicable (n/a).

As described in the Annual Review and Environmental Management Report 2014 (AR&EMR 2014) (WCPL 2015), there were no exceedances of the relevant ground vibration and airblast limits at the respective blast emission monitoring sites during the 2014 reporting period.

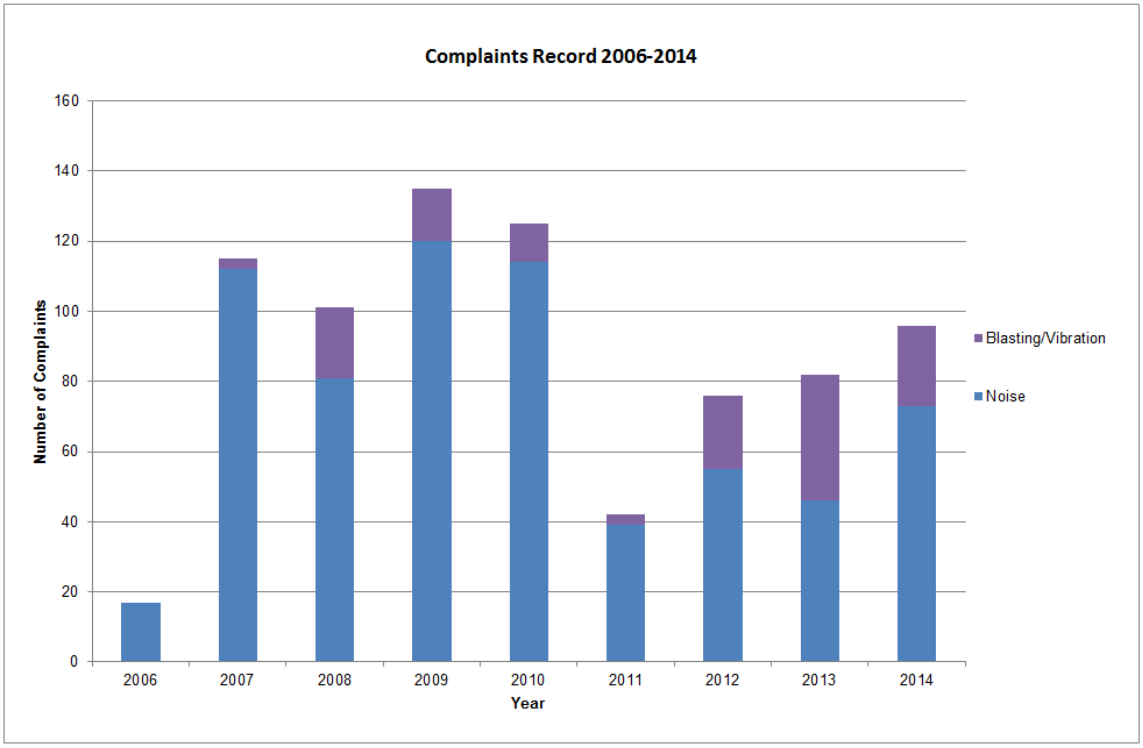
2.5 Noise and Blasting Complaints Summary

WCPL maintains a complaints register in accordance with Project Approval 05-0021. A summary of the complaint records from 2006 to 2014 is presented in **Figure 4** including operating noise and blast complaints. **Figure 4** shows the number of noise related complaints has diminished from a peak recorded in 2009/2010. The reduction in noise-related complaints coincides with the continued implementation of WCPL's proactive noise management strategy as described in **Section 2.3.3**.

All complaints received by WCPL relating to noise or blasting were responded to in accordance with the Complaint Response Protocol detailed in both the NMP and BMP. Following each noise related complaint the source and noise levels were determined or verified. In some instances, mining operations were altered in response to a complaint lodged with WCPL during adverse weather conditions. However, there were no reportable environmental incidents relating to noise in the 2014 reporting period.

Similarly, all blasting complaints were responded to and investigations undertaken. There were no reportable incidents relating to blasting in the 2014 reporting period.

Figure 4 Noise and Blasting Complaints Register Summary 2006 to 2014



Source: WCPL

3 PROPOSED PROJECT

3.1 Approved and Proposed Hours of Operation

There would be no change in the approved operating hours of Wilpinjong Coal Mine due to the Project as presented in **Table 7**.

Table 7 Approved Wilpinjong Coal Mine and Project Hours of Operation

Operation	Description	Currently Approved[1]	Project
On-Site Operation	Construction works	Generally daytime (0700 hours to 1800 hours, 7 days per week)	Unchanged
	Mine maintenance, operation and coal handling	24 hours, 7 days per week	Unchanged
	Blasting	0900 hours to 1700 hours, Monday to Saturday A maximum of 2 blasts per day and 5 blasts per week on average over any 12 month period	Unchanged
Off-Site Operation	Rail Traffic	24 hours, 7 days per week	Unchanged
	Road Traffic	Wilpinjong main access road via Ulan-Wollar Road 24 hours, 7 days per week	Unchanged

Note 1: As per Project Approval 05-0021, dated 1 February 2006 (as modified). Refer **Appendix A3**.

3.2 Wilpinjong Site and Land Ownership

The Land Ownership Plan (**Appendices C1 and C2**) identifies the nearest receivers together with the Land Ownership Details (**Appendix C3**) including a list of property ID numbers, landowners and dwelling co-ordinates. The Mid-Western Regional Council Land Zoning Plan (**Appendix C4**) shows the land use zones in the vicinity of the Project being dominated by Primary Production and Environmental Management zones. In addition, Wollar is zoned as 'Village', and there is a large area zoned as National Parks or Nature Reserve (i.e. the Goulburn River National Park and Munghorn Gap Nature Reserve).

3.3 Project Overview

The Project is a proposed extension of open cut operations at the approved Wilpinjong Coal Mine (**Appendix D1**) for an additional operational life of approximately seven years. The Project General Arrangement Plan (**Appendix D2**) shows the open cut extension areas located within Mining Lease (ML) 1573, Exploration Licence (EL) 6169 and EL 7091 and key infrastructure relocations. The Project would include the following activities:

- Open cut mining of ROM coal from the Ulan Coal Seam and Moolarben Coal Member in ML 1573 and in new Mining Lease Application areas in EL 6169 and EL 7091;
- Approximately 800 hectares (ha) of open cut extensions including:
  - approximately 500 ha of incremental extensions to the existing open cut pits in areas of ML 1573 and EL 6169; and
  - development of a new open cut pit of approximately 300 ha in EL 7091 (Pit 8);
- Continued production of up to 16 Mtpa of ROM coal;
- Continued use of the Wilpinjong Coal Mine CHPP and general coal handling and rail loading facilities and other existing and approved supporting mine infrastructure;
- Rail transport of approximately 13 Mtpa of thermal product coal to domestic and export customers (within existing maximum and annual average daily rail limits);
- Relocation of a section of the TransGrid Wollar to Wellington 330 kilovolt (kV) electricity transmission line (ETL) to facilitate mining in Pit 8;
- Various local infrastructure relocations to facilitate the mining extensions (e.g. realignment of Ulan-Wollar Road and associated rail level crossing, relocation of local ETLs and services);
- Construction and operation of additional mine access roads to service new mining facilities located in Pits 5 and 8;

- Construction and operation of new ancillary infrastructure in support of mining including: mine infrastructure areas, ROM pads, haul roads, electricity supply, communications installations, light vehicle roads, access tracks, remote crib huts, upslope diversions, dams, pipelines and other water management structures;
- Extension of the approved mine life by approximately seven years (i.e. from approximately 2026 to 2033);
- A peak operational workforce of approximately 625 people;
- Ongoing exploration activities; and
- Other associated minor infrastructure, plant and activities.

The Project General Arrangement Plan (refer **Appendix D2**) may be varied over the life of the mine to take account of localised geological features, coal market volume and quality requirements, mining economics and detailed engineering design. Such variations would be documented in the relevant Mining Operations Plan that is approved by the NSW Department of Industry, Skills and Regional Development (Division of Resources and Energy).

3.4 On-site Mine Development and Operations

The Project would include all activities approved for the existing Wilpinjong Coal Mine and the continued use of all relevant existing or approved supporting infrastructure and facilities including the CHPP. The Project would largely comprise open cut extensions that would extend the life of the Wilpinjong Coal Mine by seven years. These open cut extensions would require the relocation of some existing public and private infrastructure and the development of general facilities and infrastructure in support of mining.

Relevant to the on-site activities, the main development works associated with the Project would include:

- Extension to approved relocations of Ulan-Wollar Road;
- Extension to approved relocations of local ETLs and services;
- Relocation of the Wollar to Wellington TransGrid 330 kV ETL;
- Pit 3/8 haul road;
- Satellite ROM coal stockpiles; and
- Additional satellite mine infrastructure areas.

These development activities would be conducted generally during the daytime only and largely utilising contractor supporting fleet. This supporting daytime mobile equipment would include a range of supplementary equipment as presented in **Table 8**, which provides a comparison of the approved Wilpinjong contractor mobile equipment support fleet with the Project. While development activities would occur at a number of stages over the life of the operation, the major construction period would be in the first 12 to 18 months of the Project.

Table 8 Approved Wilpinjong and Project Contractor Support Fleet - Daytime Only Operation

Activity	Equipment	Approved Wilpinjong	Project[1]
Topsoil Removal	Scraper	2 x CAT 637	1 x CAT 637
	Trucks	4 x CAT 777	-
	Dozer	1 x CAT D9R, 2 x CAT D10	1 x CAT D10
	Watercart	1 x CAT 769	1 x CAT 773, 1 x 18,000 Litre
	Grader	-	1 x CAT 16H - Shared with "Road Maintenance"
Additional Watering/Road Maintenance	Excavator	-	1 x 25 tonne
	Dozer	-	1 x CAT D6R
	Roller	-	1 x 10 tonne
	Watercart	1 x CAT 775D	1 x 18,000 Litre
	Grader	1 x CAT 14M, 1 x CAT 16H	1 x CAT 16H - Shared with "Topsoil Removal"
Construction fleet for the Ulan-Wollar Road realignment.[2]	Excavator	1 x 120 tonne	1 x CAT 324D
	Loader	1 x Front-end loader	1 x CAT 950K
	Bobcat	1 x Bobcat	-
	Crane	2 x Crane	-
	Concrete truck	1 x Concrete truck	-
	Semi-trailer	1 x Semi-trailer	-
	Tip Truck	-	4 x 10 tonne
	Articulated Truck	-	4 x CAT 725C
	Scraper	-	6 x CAT 621H
	Watercart	-	2 x 10 tonne
	Grader	-	1 x CAT 140M
	Dozer	-	1 x CAT D10
	Compactor	-	2 x CAT 825
	4WD	-	3 x 4WD

Note 1: The Project fleet represents the **total** equipment required for the Project, not additional equipment to the approved Wilpinjong fleet.

Note 2: Equipment numbers for road construction activities are indicative only, as the road realignment would be managed by an external contractor or the MWRC.

Since transitioning to an owner-operator mine in 2013, WCPL has been implementing a continuous improvement programme for materials handling/mining. While there have been appreciable gains in efficiency recently, the longer haul distances to the central mine facilities area and the increased rate of waste rock production associated with the Project would require increases to the current mobile fleet. **Table 9** provides a comparison of the Wilpinjong Coal Mine owner-operated mobile equipment fleet with the proposed fleet for the Project.

Table 9 Wilpinjong and Project Mobile Equipment Fleet - 24 Hour Operation

Description	Approved Wilpinjong	Project[1]
Excavators	4 x R9350, 1 x R9400	4 x R9350, 2 x R9400
Haul Trucks	22 x CAT 789	32 x CAT 789
Dozers	7 x CAT D10, 15 x CAT D11	8 x CAT D10, 11 x CAT D11, 3 x CAT 854
Front End Loaders	1 x CAT 993K, 1 x CAT 994K	2 x CAT 994H
Graders	5 x CAT 16M	4 x CAT 16M
Water Trucks	3 x Haulmax 3900, 1 x Volvo Water Cart	3 x Haulmax 3900
Drills	2 x ROCD65, 2 x PitViper235	3 x ROCD65, 3 x PitViper235

Note 1: The Project fleet represents the **total** equipment required for the Project, not additional equipment to the approved Wilpinjong fleet.

The Project mine schedule and comparison to the previously assessed production rates (i.e. from Modification 6) from 2017 onwards are provided in **Table 10**.

Table 10 Wilpinjong Coal Mine and Proposed Project Mine Schedule 2017 to 2033[1]

Year	Project Year	Waste Rock (Mbcm)		ROM Coal (Mt)		Product Coal (Mt)	
		Wilpinjong	Project[2]	Wilpinjong	Project[2]	Wilpinjong	Project[2]
2017	1	32.2	36.2	14.5	15.5	12.5	12.6
2018	2	24.2	41.0	12.5	16.0	12.2	13.0
2019	3	18.2	41.7	7.7	15.3	8.2	12.5
2020	4	19.1	41.7	6.5	14.5	6.2	11.3
2021	5	20.0	42.7	6.6	12.4	6.3	10.2
2022	6	18.7	40.8	5.6	12.4	5.3	9.8
2023	7	16.9	41.9	7.1	10.8	6.7	8.7
2024	8	12.5	42.1	6.7	11.1	6.4	8.6
2025	9	7.6	37.1	2.4	10.8	2.2	8.6
2026	10	3.7	29.4	3.1	8.6	2.8	6.2
2027	11	-	25.0	-	8.4	-	6.3
2028	12	-	28.4	-	8.0	-	6.0
2029	13	-	26.5	-	6.9	-	5.2
2030	14	-	23.9	-	5.5	-	3.9
2031	15	-	21.0	-	5.3	-	3.9
2032	16	-	27.2	-	5.3	-	3.9
2033	17	-	3.1	-	1.7	-	1.0

Note 1: Mining sequence and rate of mining would continue to be subject to review on the basis of market conditions or unforeseen change to mining conditions. Relevant changes to the mining sequence, mining activities and mine landforms would be approved by the NSW Department of Industry, Skills and Regional Development (Division of Resources and Energy) via revision of the Mining Operations Plan as required.

Note 2: The Project mine schedule represents the **total** material handling for the Project, and includes the amounts to be extracted/produced for the approved Wilpinjong Coal Mine.

Note: Mbcm = million bank cubic metres; Mt = million tonnes.

3.5 Off-site Construction Works

While the relocation of some public infrastructure would occur off the ML, these activities would be within the Project Development Application area, and hence no off-site construction activities require assessment.

3.6 On-site Blasting

The method of hard rock overburden material removal at the Wilpinjong Coal Mine is by drill and blasting techniques. A mixture of ammonium nitrate and fuel oil (ANFO) (dry holes) and emulsion blends (wet holes) is used. Potential impacts associated with blasting in the Project extension areas to the existing open cut pits (**Appendix D2**) with projected blast design parameters are assessed in this report.

Blasting would only occur between the hours of 0900 hours and 1700 hours, Monday to Saturday (excluding public holidays). There would be no change to the current maximum of 2 blasts per day and the number of blasts in any week would remain limited to 5 blasts per week (averaged over a calendar year in accordance with Project Approval 05-0021).

3.7 Off-site Road Transport

The existing access road off Ulan-Wollar Road would remain the primary Project site access while additional mine access roads would service the mine infrastructure facilities in Pits 5 and 8.

The existing Wilpinjong Coal Mine operational workforce of approximately 550 WCPL employees and full-time equivalent on-site contractors would require augmentation with approximately 75 additional people (i.e. total of approximately 625 people in peak periods). During specific activities over the life of the Project additional contract construction and maintenance workforces would also be required. It is currently estimated that this may require approximately 100 people at peak times in the first 12 to 18 months of the Project.

The additional construction and operating personnel would result in additional light vehicle movements on the local road network. There would also be increases in the delivery of materials and consumables associated with operations and with construction activities.

Two scenarios were adopted for road traffic noise assessment comprising 2017 (peak construction) and 2024 (peak operations).

3.8 Off-site Rail Transport

The Project would not appreciably change the approved rate of maximum product transport (i.e. rail transport would increase from 12.5 Mtpa to 13.0 Mtpa) and as a result there would be no change to the approved number of average (6) and maximum (10) daily trains dispatched from the Wilpinjong Coal Mine. Train loading would continue to be conducted 24 hours per day, 7 days per week.

However, as discussed in **Section 3.3**, the Project involves an extension of the approved mine life by approximately seven years. In this context, while there would be no change to currently approved rail movements or rail loading hours at Wilpinjong Coal Mine, it is appropriate to consider the potential off-site rail transport cumulative noise impact for the extended period of mine life.

4 EXISTING METEOROLOGICAL AND NOISE ENVIRONMENT

4.1 Meteorological Environment

An assessment of the Project meteorological environment is presented in **Appendix E** based on the analysis of the wind velocity and temperature gradients derived from the on-site AWS and PTT (refer **Section 2.3.1**). The introduction of the PTT and associated direct temperature gradient measurements (refer **Appendix E**) has provided additional data in order to characterise the temperature gradients that occurred in the Wilpinjong area during the 3 year period from August 2011 to July 2014. The resulting INP assessable meteorological noise modelling parameters are presented in **Table 11**.

Based on analysis of available data, it was determined that noise impacts under temperature gradients of up to 5.2 degrees Celsius (°C)/100 m were assessable, in accordance with the INP, as these temperature inversions occur at least 10 percent (%) of the time during the evening/night periods during winter. The wind conditions under which the INP requires noise impacts to be assessed are generally consistent with Project Approval 05-0021, Appendix 10 (refer **Appendix A3**).

Table 11 INP Assessable Meteorological Noise Modelling Parameters

Period	Meteorological Parameter	Air Temperature	Relative Humidity	Wind Speed and Direction	Temperature Gradient
Daytime	Calm	20ºC	50%	0 m/s	0°C/100 m
	Autumn Wind 30% (occurrence)	19ºC	55%	E 3 m/s	0°C/100 m
Evening	Calm	19ºC	56%	0 m/s	0°C/100 m
	Autumn Wind 30% (occurrence)	18ºC	63%	ESE 3 m/s	0°C/100 m
	Winter Wind 30% (occurrence)	10ºC	71%	WNW, NW 3 m/s	0°C/100 m
Night-time	Calm	14ºC	76%	0 m/s	0°C/100 m
	Summer Wind > 30% (occurrence)	19ºC	68%	ESE, SE, E 3 m/s	0°C/100 m
	Strong Inversion (10% exceedance)[1]	6ºC	86%	0 m/s	5.2°C/100 m

Note 1: Winter evening/night-time 10% exceedance temperature gradient in accordance with INP Appendix E Table 4.
Note 2: m/s = metres per second.

4.2 Noise Environment

The existing Wilpinjong Coal Mine operations have an effect on local noise levels and, therefore, it is appropriate to review the pre-mining background noise data (from 2004) to determine the relevant Rating Background Levels (RBLs) and noise amenity levels ($L_{Aeq(period)}$) in accordance with the INP procedures. In addition, supplementary ambient noise monitoring, as well as measurement of existing road traffic noise off Ulan Road, was conducted in December 2012.

4.2.1 Background Noise August - September 2004

Comprehensive background noise surveys to characterise and quantify the pre-mine noise environment in the area surrounding the Wilpinjong Coal Mine were conducted in August and September 2004. The measurement methodology and analysis procedures are described in the Wilpinjong Coal Project EIS. The unattended background noise logger data from each monitoring location, together with the on-site weather conditions are presented graphically on a daily basis in Report 30-1313R1 *Wilpinjong Coal Project, Construction, Operation and Transportation Noise and Blasting Impact Assessment* (Heggies Pty Ltd, 2005). The ambient noise data was then processed in accordance with the requirements of the INP to derive the ambient noise levels presented in **Table 12**.

The pre-mine background noise levels are summarised in **Table 12** where daytime, evening and night-time are defined as 0700 hours to 1800 hours, 1800 hours to 2200 hours and 2200 hours to 0700 hours respectively.

Table 12 Unattended Noise Monitoring Results 2004 (dBA re 20 µPa)

Locality	2004 Reference/ Landowner	Rating Background Level[1,2] All Noise Sources			LAeq(period)[2] All Noise Sources		
		Daytime	Evening	Night-time	Daytime	Evening	Night-time
Cumbo	6 Langshaw (dwelling)	27	22	22	51	41	41
	6 Langshaw (25 m from road)	27	23	23	51	44	41
Wollar	900 St Laurence O'Toole Catholic Church (boundary)	31	26	27	64	42	50
Araluen	139 Woolford (dwelling)	25	24	24	43	39	41
Slate Gully	WG Cumbo Pty Ltd (potential dwelling site)	25	22	22	50	44	40
Wilpinjong	WB Cumbo Pty Ltd (dwelling)	27	28	23	52	41	39
Wilpinjong	WF Cumbo Pty Ltd (75 m from Railway)	28	34[3]	27	53	51	51
Murragamba	42 Little/Salter (dwelling)	26	24	24	54	38	42
	34 Birt/Hayes (dwelling)	28	43[3]	23	46	49	30

Note 1: In accordance with the NSW INP (2000), if the RBL is below 30 dBA, then 30 dBA shall be the assumed RBL.
Note 2: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours, Night-time 2200 hours to 0700 hours.
Note 3: Affected by insect noise or diesel generator in the evening period.

4.2.2 Ambient Noise December 2012

Supplementary noise surveys to quantify ambient noise levels (i.e. all noise sources) and to estimate industrial noise only (i.e. in the absence of transport, natural and domestic noise) were conducted in December 2012. Four unattended noise loggers were positioned at 160 (Smiles, Smiles-Schmidt), 102 (Filipczyk), 1_155 (Peabody) and 32_32 (Cascade) properties for periods of up to 14 days.

In order to supplement the unattended logger results and to assist in identifying the character and duration of the noise sources, operator-attended night-time measurements were also conducted in the vicinity of the logging locations. The Site Noise Measurement Methodology and analysis procedures are described in Appendices F2 to F5 from Report 610.10806.00200-R1 *Wilpinjong Coal Mine Modification, Noise and Blasting Impact Assessment* (SLR, 2013). The operator-attended measurement results are summarised in **Table 13**.

Table 13 Operator-Attended Ambient Noise Survey Results 2012 (dBA re 20 µPa)

Locality	Project Reference/ Landowner	Measured LA90(15minute)[1] All Noise Sources			Measured LAeq(period)[1] All Noise Sources			Estimated LAeq(period)[1] Industrial Noise Only		
		Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
Wollar	160 Smiles/ Smiles-Schmidt	-	-	21	-	-	54	-	-	<34
Mogo	102 Filipczyk	-	-	34	-	-	48	-	-	<34
Tichular	1_155 Peabody	-	-	21	-	-	58	-	-	<34
Coggan	32_32 Cascade	-	-	26	-	-	47	-	-	<34

Note 1: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours and Night-time 2200 hours to 0700 hours.

The unattended ambient noise logger data from each monitoring location and the on-site weather conditions were analysed on a daily basis and presented graphically as statistical 24 hour ambient noise profiles. The ambient noise data were then processed in accordance with the requirements of the INP to derive the ambient noise levels presented in **Table 14**.

Table 14 Unattended Noise Ambient Monitoring Results 2012 (dBA re 20 µPa)

Locality	Project Reference/ Landowner	Measured RBL[1,2] All Noise Sources			Measured LAeq(period)[2] All Noise Sources			Estimated LAeq(period)[2] Industrial Noise Only		
		Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
Wollar	160 Smiles/ Smiles-Schmidt	13	23	12	57	56	46	<44	<39	<34
Mogo	102 Filipczyk	22	30	12	41	51	45	<44	<39	<34
Tichular	1_155 Peabody	23	22	18	44	43	45	<44	<39	<34
Coggan	32_32 Cascade	19	24	13	54	53	52	<44	<39	<34

Note 1: In accordance with the NSW INP (2000), if the RBL is below 30 dBA, then 30 dBA shall be the assumed RBL.
Note 2: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours, Night-time 2200 hours to 0700 hours.

During the monitoring period, existing Wilpinjong Coal Mine noise was either barely audible or inaudible; however the INP data analysis procedure tends to minimise the potential for very low level intrusive mine noise to influence resultant RBLs. Moreover, insect noise was common and likely to be a regular seasonal feature of the noise environment, particularly in the warmer months.

4.2.3 Background Noise and Amenity Levels for INP Assessment Purposes

The RBLs adopted for assessment purposes are representative of the background noise environment, with all RBLs at 30 dBA, except for Wollar which has a daytime RBL of 31 dBA which is reflective of some daytime activity in the village. Furthermore, industrial noise amenity levels (i.e. non-transport related noise) from other mines in the locality are minimal at non-mine owned residences. The RBLs are typical for a rural environment where there is minimal industrial noise and relatively low use transport corridors. In view of the foregoing, the RBLs and noise amenity levels (LAeq(period)) are presented in **Table 15**, which form the basis of establishing the Project-specific noise assessment criteria (**Section 5.1**).

Table 15 Background Noise and Amenity Levels for Assessment Purposes

Locality	Estimated RBL[1,2] All Noise Sources			Estimated LAeq(period)[1,2] Industrial Noise Only		
	Daytime	Evening	Night-time	Daytime	Evening	Night-time
Wollar Village Residential	31	30	30	<44	<39	<34
All other Privately Owned Land	30	30	30	<44	<39	<34

Note 1: Estimated RBLs and noise amenity levels in the absence of the Wilpinjong Coal Mine operation.
Note 2: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours and Night-time 2200 hours to 0700 hours.

The established background noise levels presented in **Table 15** are consistent with the two localities of Wollar Village Residential and other Privately Owned Land contained in the Project Approval 05-0021 (**Appendix A3**).

5 NOISE ASSESSMENT CRITERIA

5.1 Project Operating Assessment Criteria

The EPA has regulatory responsibility for the control of noise from "scheduled premises" under the *Protection of the Environment Operations Act, 1997*. In implementing the INP, the EPA has two broad objectives:

- Controlling intrusive noise levels in the short-term; and
- Maintaining noise amenity levels for particular land uses over the medium to long-term.

The INP prescribes detailed calculation routines for establishing PSNLs (i.e. $L_{Aeq(15minute)}$ intrusive criteria and $L_{Aeq(period)}$ amenity criteria) at potentially affected receivers for an industrial development. Ideally, the intrusive noise level should not exceed the background level by more than 5 dBA. Similarly, the noise amenity level should not exceed the specified INP "acceptable" or "maximum" noise level appropriate for the particular land use. The applicable acceptable and maximum noise amenity levels for receivers in the vicinity of the Wilpinjong Coal Mine are shown in **Table 16**.

Table 16 INP Acceptable and Maximum Noise Amenity Levels (dBA re 20 µPa)

Locality	LEP Zone[1]	INP Noise Amenity Zone	Amenity $L_{Aeq(period)}$[2] Acceptable			Amenity $L_{Aeq(period)}$[2] Maximum		
			Day	Evening	Night	Day	Evening	Night
Wollar Village	Village	Rural Residential	50	45	40	55	50	45
Other Privately Owned Land	Primary Production, Large Lot Residential, Environmental Management	Rural Residential	50	45	40	55	50	45
Any	Village	School, Hall[3]	External 45 when in use			External 50 when in use		
Any	Primary Production	Church[3]	External 50 when in use			External 55 when in use		
Any	National Parks and Nature Reserves	Passive Recreation	External 50 when in use			External 55 when in use		

Note 1: LEP = Local Environmental Plan.

Note 2: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours, Night-time 2200 hours to 0700 hours.

Note 3: Internal criteria equivalent to external criteria minus 10 dBA.

In accordance with the INP's Chapter 2 Industrial Noise Criteria and associated Application Notes (12 June 2013), the PSNLs for the residential and other localities in the vicinity of the Wilpinjong Coal Mine are presented in **Table 17** for both intrusive noise and amenity. These criteria are nominated for the purposes of assessing potential noise impacts from the Project.

Table 17 Project-specific Noise Levels and Assessment Criteria (dBA re 20 µPa)

Locality	Land Use	Intrusive $L_{Aeq(15minute)}$[1]			Amenity $L_{Aeq(period)}$[1]		
		Day	Evening	Night	Day	Evening	Night
Wollar Village	Rural Residential[2]	36	35	35	50	45	40
Other Privately Owned Land	Rural Residential[2]	35	35	35	50	45	40
Any	School[3]	Intrusive noise criteria not applicable			External 45 when in use		
Any	Church, Hall[3]	Intrusive noise criteria not applicable			External 50 when in use		
Any	Passive Recreation	Intrusive noise criteria not applicable			External 50 when in use		

Note 1: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours, Night-time 2200 hours to 0700 hours.

Note 2: At the most-affected point within 30 m of the residential area.

Note 3: Internal criteria equivalent to external criteria minus 10 dBA.

The amenity criteria for Wollar Village and Other Privately Owned Land as nominated in **Table 17** are reflective of the general rural area following review of the Mid-Western Regional Council Land Zoning Map (**Appendix C4**). The intrusiveness criterion is met if the $L_{Aeq(15minute)}$ is less than or equal to the RBL plus 5 dBA, where the RBL is determined from monitoring data following the INP procedures discussed in **Section 4.2**. Thus, the most stringent PSNLs for the Project at rural residential receivers would be the $L_{Aeq(15minute)}$ intrusiveness criterion.

As the INP Acceptable noise amenity level sets the maximum total noise level from all industrial noise sources, cumulative impacts from the Project are assessed against the amenity $L_{Aeq(period)}$ acceptable noise levels specified in **Table 16**. The DP&E's SEARs for the Project (refer **Section 1.2**) reference the Voluntary Land Acquisition and Mitigation Policy (VLAMP) and the amenity criteria are also used to determine any need for acquisition rights over vacant land as further discussed in **Section 5.4**.

The INP states that the PSNLs are based on preserving the amenity of at least 90% of the population living in the vicinity of industrial noise sources by limiting the adverse effects of noise for at least 90% of the time. Provided the PSNLs are achieved, then most people would consider the resultant noise levels acceptable. In those cases where the PSNLs are not achieved, it does not automatically follow that all people exposed to the noise would find the noise "unacceptable". In subjective terms, the VLAMP characterises noise impacts resulting from residual noise exceedances of the PSNLs generally as follows:

- If the residual noise exceedance is 0-2 dBA above the PSNL, then noise impacts are considered to be negligible (i.e. not noticeable by all people).
- If the residual noise exceedance is 3-5 dBA above the PSNL, and the development would contribute less than 1 dB to the total industrial noise level, then noise impacts are considered to be marginal (i.e. not noticeable by most people).
- If the residual noise exceedance is 3-5 dBA above the PSNL, and the development would contribute more than 1 dB to the total industrial noise level, then noise impacts are considered to be moderate (i.e. not noticeable by some people but may be noticeable by others).
- If the residual noise exceedance is >5 dBA above the PSNL in the INP, then noise impacts are considered to be significant (i.e. noticeable by most people).

5.2 Low Frequency Noise Modifying Adjustment Factors

5.2.1 INP's Chapter 4 Modifying Factor Adjustments

In accordance with the INP's Chapter 4 Modifying Factor Adjustments, where a noise source contains certain characteristics, such as a dominant low frequency content, the INP states that there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. The modifying factors (if applicable) are to be applied to the measured or predicted noise level at the receiver and then assessed against the PSNLs. In the case of low frequency (20 hertz [Hz] to 250 Hz) noise, the INP requires a 5 decibel (dB) correction to be applied to the measured or predicted noise levels where the difference between the A and C weighted level is 15 dB (or more) at the receiver.

5.2.2 Warkworth Continuation Project Environmental Assessment Report (DP&E May 2015)

The significant issues and associated shortcomings with the assessment of low frequency noise from large scale mining operations is comprehensively discussed in Section 2.3 Noise of the Warkworth Continuation Project Environmental Assessment Report (DP&E May 2015). The report includes the findings of the Planning Assessment Commissions (PAC) Review Report (SSD-6464) and the Acoustics Review (Broner, 2015) prepared by the DP&E's independent noise expert (Dr Broner), with an extract from the report (Section 2.3.9) as follows:

> *"… the PAC acknowledges that there are issues associated with the LFN methodology in the INP, and recommends that if a new INP is adopted before determination of the project, then the new methodology and criteria should apply.*
>
> *The current INP provides that a +5dB penalty (or modifying factor) should be applied to the noise source level if the dBC noise level minus the dBA noise level is 15dB or more - that is, where the noise has a significant low frequency component. This methodology is also known as the 'C - A method', and has been around since the introduction of the INP in 2000. It was originally developed for assessing LFN impacts associated with train locomotives in close proximity to the noise source.*

> *The EPA, the Department and the Department's independent noise expert all agree that the C - A method has significant limitations, particularly when assessing LFN impacts in areas distant from the noise source. This is because mid and higher frequencies are naturally attenuated as distance from the noise source increases, resulting in larger differences between dBC and dBA levels due to distance alone.*
>
> *To illustrate, Dr Broner notes that a C - A difference of 7dB for a nominal noise source at 1 kilometre increases to a difference of 15dB at a distance of 3 kilometres from the noise source …"*

The Warkworth Continuation Project has recently received updated draft consent conditions prior to final determination by the PAC. In particular, draft Development Consent SSD-6464 Appendix 7 Noise Compliance Assessment (Condition 5), in recognition of concerns with the current INP's "dBC - dBA noise difference" methodology, has further qualified the INP's noise compliance assessment requirements to exclude modifying factor adjustments for dominant low frequency content, where it is demonstrated that the dBC - dBA noise difference is caused by distance attenuation only (i.e. a perverse outcome).

In addition, Dr Broner in the technical paper entitled *A Simple Outdoor Criterion for Assessment of Low Frequency Noise Emission* (Broner, 2011) indicates that a greater difference may be permissible at low A weighted noise levels, as the difference between A and C weighted noise levels for low background noise levels may exceed 20 dB to 25 dB without causing complaints.

Based on a comprehensive review of many case histories and literature, Dr Broner's technical paper recommends criteria for the assessment of low frequency noise ranging from 60 dB to 80 dB, with a night-time (desirable) criterion of Leq 60 C-weighted decibels (dBC) and (maximum) criterion of L_{eq} 65 dBC for residential receivers.

5.2.3 Consideration of Potential Project Low Frequency Noise Impacts

Two weeks of unattended noise monitoring targeting potential low frequency noise from the Wilpinjong Coal Mine to receivers in Wollar Village (coinciding with temperature inversions) were conducted by SLR in December 2012 using a full spectrum noise monitor located at receiver 900 (St Laurence O'Toole Catholic Church - representative of Wollar Village).

The noise data were then analysed in accordance with the INP requirements to derive the intrusive $L_{eq(15minute)}$ A and C weighted noise levels of Wilpinjong operations and this coincided with strong temperature inversions (up to approximately 5.5°C/100 m) between 0000 hours and 0500 hours.

The measurement results at receiver 900 (St Laurence O'Toole Catholic Church) show a mean difference of 13 dB between the (mine-contributed) mean intrusive $L_{Aeq(15minute)}$ noise level 33 dBA and the mean $L_{Ceq(15minute)}$ noise level of 46 dBC (i.e. below the INP's low frequency modifying threshold of 15 dB).

Considering the measured noise level results and previous attended noise monitoring results (**Section 2.3.2**) from the existing Wilpinjong Coal Mine, it is concluded that noise emissions from the existing mining operation do not contain "dominant low frequency content" in accordance with the INP's assessment procedures.

The CHPP and other major fixed plant located near the rail loop would be unchanged by the Project, and the mobile fleet would continue to be dominated by Caterpillar dozers and haul trucks as were also being utilised during the previous monitoring that targeted low frequency noise in Wollar.

Based on the results of the previous targeted monitoring that resulted in a mean intrusive $L_{Aeq(15minute)}$ noise level of 33 dBA and a mean $L_{Ceq(15minute)}$ noise level of 46 dBC in Wollar (i.e. well below the 60 dBC (desirable) criterion recommended by Broner [2011]), and in consideration of the modest increases in predicted intrusive $L_{Aeq(15minute)}$ noise levels for the Project (**Section 7**) in comparison to previous assessments, and recent attended monitoring results, it is concluded that no further assessment of low frequency noise is warranted for the Project.

5.3 Project Sleep Disturbance Assessment Criteria

When mobile equipment and fixed plant operate simultaneously during the night-time, some noise sources (including the operation of trains on the rail loop) have the potential to emerge audibly above the overall mine noise and disturb the sleep of nearby residents.

The EPA's INP Application Notes dated 12 June 2013 (refer **Appendix F**) recognise that the current $L_{A1(1minute)}$ sleep disturbance criterion of 15 dBA above the prevailing $L_{A90(15minute)}$ level is not ideal. The assessment of potential sleep disturbance is complex and not fully understood; however the EPA believes that there is insufficient information to determine a suitable alternative criterion.

Appendix B (Technical Background to Road Traffic Noise Criteria) of the *Environmental Criteria for Road Traffic Noise* (EPA, 1999) contains a comprehensive review of research into sleep disturbance and traffic noise. The review has been more recently updated in the NSW RNP (DECCW, 2011) (Section 5.3 Sleep Disturbance) however the EPA's conclusion remains unchanged as follows:

- Maximum *internal* noise levels below 50 to 55 dBA are unlikely to cause awakening reactions; and
- One or two noise events per night, with maximum *internal* noise level of 65 to 70 dBA, are not likely to affect health and wellbeing significantly.

It is noteworthy that conditions of approval generally include external noise limits. The internal noise levels (presented above) can be conservatively transposed to an external noise level by adding 10 dBA (or 12.5 dBA when measured 1 m from the dwelling facade). It follows, that an external $L_{A1(1minute)}$ noise criteria of 60 dBA would appear to be consistent with the current research in relation to this matter.

The EPA continues to review research on sleep disturbance as it becomes available and in the interim, the EPA suggests that the $L_{A1(1minute)}$ level of 15 dBA above the RBL is a suitable screening criterion for sleep disturbance for the night-time period. This approach is generally consistent with Project Approval 05-0021 (**Appendix A3**). The Project night-time $L_{A1(1minute)}$ Sleep Disturbance Noise Levels (SDNLs) are presented in **Table 18** together with the comparable approved $L_{A1(1minute)}$ noise limit.

Table 18 Night-time $L_{A1(1minute)}$ Sleep Disturbance Criteria (dBA re 20 µPa)

Locality	Wilpinjong $L_{A1(1minute)}$ Night-time[1] Limit	Project $L_{A1(1minute)}$ Night-time[1] Criteria
Wollar Village	45	45
Other Privately Owned Land	45	45

Note 1: Monday to Saturday 2200 hours to 0700 hours; Sundays and Public Holidays 2200 hours to 0800 hours.

The night-time operator-attended noise measurement results (refer **Section 2.3.2**) have been examined to determine the mean difference between the intrusive $L_{Aeq(15minute)}$ and the corresponding $L_{A1(1minute)}$ noise levels. The results of night-time noise measurements for the 36 month period ending December 2014 are summarised in **Table 19** including the measured mean (mine-contributed) intrusive $L_{Aeq(15minute)}$ and the $L_{A1(1minute)}$ noise levels.

Table 19 Measured Night-time $L_{Aeq(15minute)}$ and $L_{A1(1minute)}$ Noise Levels (dBA re 20 µPa)

Locality	Receiver ID[1]	Site	Mean $L_{Aeq(15minute)}$	Mean $L_{A1(1minute)}$	Mean Difference[2]
Cumbo	1_WF	N4 "Hillview", Cumbo Road	29 dBA	36 dBA	8 dBA
Wollar	900	N6 St Laurence O'Toole Catholic Church	24 dBA	32 dBA	8 dBA
Araluen	1_45	N7 Smith, Ulan-Wollar Road	31 dBA	37 dBA	6 dBA
Slate Gully	1_58	N9 Maher, Slate Gully Road	31 dBA	37 dBA	6 dBA
Moolarben	32_32C	N12 Ulan Mine Complex, Ulan-Wollar Road	31 dBA	36 dBA	6 dBA
Moolarben	69	N13 DJ & JG Stokes	28 dBA	33 dBA	6 dBA
Wollar	-	N15 Wollar Public School	24 dBA	26 dBA	2 dBA
Araluen	1_135	N16 Wilpinjong Coal Pty Ltd	22 dBA	32 dBA	10 dBA
Mogo	102	N17 W Filipczyk	21 dBA	30 dBA	9 dBA
Overall			27 dBA	33 dBA	7 dBA

Note 1: Refer **Section 3.2** and **Appendix C3**.

Note 2: May be minor inconsistencies due to whole number rounding.

The night-time operator-attended noise measurement results show a mean difference of 7 dBA between the (mine-contributed) intrusive $L_{Aeq(15minute)}$ and the $L_{A1(1minute)}$ noise levels and are therefore consistent with similar mining operations where the difference is typically <10 dBA. Hence, if the intrusive PSNLs (refer **Section 5.1**, i.e. RBL plus 5 dBA) are achieved, then the SDNLs (i.e. RBL plus 15 dBA) would also be met. This relationship enables the noise assessment process to focus on the setting and assessment of INP-based intrusive noise and amenity levels which aim to minimise annoyance at noise sensitive receiver locations.

Notwithstanding the foregoing, the predicted $L_{A1(1minute)}$ night-time noise levels are presented in **Section 7.4** together with an assessment of potential sleep disturbance impacts from the Project.

5.4 Voluntary Land Acquisition and Mitigation Policy

The recently released VLAMP describes the NSW Government's policy for voluntary mitigation and land acquisition to address noise (and dust) impacts from State Significant Mining, Petroleum and Extractive Industry Developments. The NSW Government has had long-standing processes in place for land acquisition and mitigation associated with mining developments and these procedures have now been formalised in the VLAMP, including:

- That industry needs to apply all reasonable and feasible measures to minimise noise (and dust) impacts;
- When noise and dust impacts are considered to be significant enough to warrant mitigation at the receiver or acquisition upon request;
- Requirements for negotiated agreements between proponents and landowners; and
- The measures that need to be offered to affected landholders when impacts are marginal or moderate (but within approval limits).

An extract from the VLAMP is attached as **Appendix G** that details how the policy applies to noise impacts and the key sections are reproduced as follows:

Table 1 Characterisation of Noise Impacts and Potential Treatments

Residual Noise Exceeds INP Criteria By	*Characterisation of Impacts*	*Potential Treatment*
0-2 dBA above the project specific noise level (PSNL)	*Impacts are considered to be **negligible***	*The exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatments or controls*
3-5 dBA above the PSNL in the INP but the development would contribute less than 1 dB to the total industrial noise level	*Impacts are considered to be **marginal***	*Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity*
3-5 dBA above the PSNL in the INP and the development would contribute more than 1 dB to the total industrial noise level	*Impacts are considered to be **moderate***	*As for marginal impacts but also upgraded facade elements like windows, doors, roof insulation etc to further increase the ability of the building facade to reduce noise levels*
>5 dBA above the PSNL in the INP	*Impacts are considered to be **significant***	*Provide mitigation as for moderate impacts and see voluntary land acquisition provisions below*

Voluntary mitigation rights

A consent authority should only apply voluntary mitigation rights where, even with the implementation of best practice management:

- *The noise generated by the development would be equal to or greater than 3dB(A) above the INP project-specific noise level at any residence on privately owned land; or*
- *The development would increase the total industrial noise level at any residence on privately owned land by more than 1dB(A), and noise levels at the residence are already above the recommended amenity criteria in Table 2.1 of the INP; or*
- *The development includes a private rail line and the use of that private rail line would cause exceedances of the recommended acceptable levels in Table 6 of Appendix 3 of the RING (see Appendix B) by greater than or equal to 3dB(A) at any residence on privately owned land.*

All noise levels must be calculated in accordance with the INP or RING (as applicable).

The selection of mitigation measures should be guided by the potential treatments identified in Table 1 above.

Voluntary land acquisition rights

A consent authority should only apply voluntary land acquisition rights where, even with the implementation of best practice management:

- *The noise generated by the development would be more than 5dB(A) above the project specific noise level at any residence on privately owned land; or*
- *The noise generated by the development would contribute to exceedances of the recommended maximum noise levels in Table 2.1 of the INP on more than 25% of any privately owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls[2]; or*
- *The development includes a private rail line and the use of that private rail line would cause exceedances of the recommended maximum criteria in Table 6 of Appendix 3 of the RING at any residence on privately owned land.*

All noise levels must be calculated in accordance with the INP or RING (as applicable).

[2] *Voluntary land acquisition rights should not be applied to address noise levels on vacant land other than to vacant land specifically meeting these criteria.*

It is also noteworthy that:

> *A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce:*
>
> - *Operational noise impacts of a development on privately owned land; and*
> - *Rail noise impacts of a development on privately-owned land near non-network rail lines (private rail lines) on or exclusively servicing industrial sites (see Appendix 3 of the RING);*
>
> *But not:*
>
> - *Construction noise impacts, as these impacts are shorter term and can be controlled;*
> - *Noise impacts on the public road or rail network; or*
> - *Modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts. In such cases, these legacy noise issues should be addressed through site-specific pollution reduction programs under the Protection of the Environment Operations Act 1997.*

5.5 Project and Cumulative Noise Impact Assessment Methodology

In view of the foregoing, **Table 20** presents the generalised methodology for assessing the Project operating noise levels against the intrusive and amenity PSNLs (**Table 17**) and the $L_{A1(1minute)}$ SDNLs (**Table 18**) together with cumulative amenity noise levels (**Table 16**) for assessing operating noise levels from existing, approved and proposed mining developments in the vicinity of the Project.

Table 20 Project and Cumulative Noise Impact Assessment Methodology (dBA re 20 µPa)

Receiver Land Use	Assessment Parameter	Assessment Criteria	Noise Management Zone[1]		Affectation Zone[2]
			Negligible	Marginal to Moderate	Significant
Project affected residential dwellings	PSNL Intrusive	RBL plus 5 dBA	1 to 2 dBA above assessment criteria	3 to 5 dBA above assessment criteria	> 5 dBA above assessment criteria
	PSNL Amenity	INP acceptable			
	SDNL $L_{A1(1minute)}$	RBL plus 15 dBA			
Project affected vacant land	PSNL Amenity	INP acceptable	Not applicable	Not applicable	> 5 dBA above assessment criteria[3]
All industrial affected residential dwellings	Cumulative Amenity Level	INP acceptable	1 to 2 dBA above assessment criteria	3 dBA above assessment criteria	> 3 dBA above assessment criteria

Note 1: Noise Management Zone - depending on the range of exceedance of the PSNL and or SDNL assessment parameters, potential project noise impacts range from negligible to moderate in accordance with the VLAMP.

Note 2: Noise Affectation Zone - noise exceedances greater than 5 dBA above the PSNL and or SDNL assessment parameters may result in significant project noise impacts in accordance with the VLAMP.

Note 3: Noise Affectation Zone - equivalent to a noise exceedance of the INP's maximum noise amenity level on more than 25% of any privately owned vacant land, and a dwelling could be built on that vacant land under existing planning controls in accordance with the VLAMP.

6 NOISE MODELLING METHODOLOGY

6.1 Wilpinjong Coal Mine and the Project Noise Model Validation

The noise model for Wilpinjong was prepared using RTA Software's Environmental Noise Model (ENM for Windows, Version 3.06), a commercial software system developed in conjunction with the NSW EPA. The acoustical algorithms utilised by this software have been endorsed by the Australian and New Zealand Environment Council (ANZEC) and all State Environmental Authorities throughout Australia as representing one of the most appropriate predictive methodologies available. ENM has been used for all major noise assessments at Wilpinjong including the *Wilpinjong Coal Mine Modification Noise and Blasting Impact Assessment* (SLR, 2013) and *Wilpinjong Modification 6 Noise and Blasting Impact Assessment* (SLR, 2014).

SLR conducted a noise investigation survey in December 2012 to update and validate the Wilpinjong noise model and reflect as-built noise emissions, as follows:

- On-site noise measurements to determine fixed plant sound power levels installed since Modification 3, including upgraded CHPP, new conveyors and drives (CV104, CV105, CV202, CV605, CV606, and CV802), ROM Bin 2, Sizing Station as well as locomotives operating on the rail loop.
- The digital terrain was updated to extend receiver area coverage as well as incorporating the existing mine plans and significant mobile equipment and fixed plant.
- Additional noise sources were added into the model to more accurately reflect the number of as-built noise emitting sources located at the CHPP and materials handling area.
- Far-field operator-attended noise surveys (2 validation locations) were conducted to determine Wilpinjong noise level contribution at each location. For each survey the ambient weather conditions and the location of operating plant and equipment were recorded.
- The outcome of the validation exercise resulted in no change to the previous noise model adjustment factor (of minus 1.8 dBA), which has been incorporated into the noise model for the proposed Project in all pits except Pit 8 (i.e. Slate Gully operations). In the absence of field validation noise measurements from Slate Gully operations, a conservative approach has been adopted and any mobile equipment operating in Pit 8 does not attract the model adjustment factor.

The five operational noise modelling scenarios (described below) include all existing and proposed plant items operating concurrently to simulate the overall maximum energy equivalent (i.e. $L_{Aeq(15minute)}$) intrusive noise level. A large proportion of the mobile equipment is operated in repeatable routines and a relatively smaller proportion of the emissions emanate from fixed plant items.

6.2 Mobile Equipment and Fixed Plant Sound Power Levels

The potential for machinery to emit noise is quantified as the sound power level (SWL) measured on the A-weighted scale in decibels re 1 picowatt (dBA re 1ρW). At the receptor, the received noise is quantified as the sound pressure level (SPL) measured on the A-weighted scale in decibels re 20 micropascals (dBA re 20 µPa). In general terms, any variation in the on-site plant and equipment SWLs would produce a similar variation in the off-site SPL at the receiver (e.g. an increase of 5 dBA in the SWL of equipment operating at a site may result in a corresponding 5 dBA increase in SPL of intrusive noise at the receiver, when averaged over the same 15 minute period).

Comparative mobile equipment, fixed plant and total SWLs are presented in **Table 21** for the existing Wilpinjong Coal Mine and the proposed Project. The Project daytime, evening and night-time total site SWL is up to approximately 1 dBA higher than the maximum estimated for the existing Wilpinjong Coal Mine for the comparative Year 2018 and Year 2020 operations. During Year 2024, Project daytime, evening and night-time total site SWL is up to approximately 5 dBA higher than the maximum estimated for the existing Wilpinjong Coal Mine during the comparative period. The Project daytime, evening and night-time total site SWLs are also shown for Year 2028 and Year 2031 without comparison to the existing and approved Wilpinjong Coal Mine as these years coincide with the extended life of the mine due to the Project.

A detailed breakdown of the daytime and evening/night-time SWLs for the Project are presented in **Appendix H1** and **Appendix H2** respectively.

The L_{Aeq} SWLs given for each item of mobile equipment do not include noise emissions which emanate from alarms or communication "horns". However, noise from alarms and horns is captured by attended noise monitoring, which has been used to validate the model. It is noted that WCPL have installed broad-band "quacker" reversing alarms on the majority of the Wilpinjong mobile equipment fleet (subjectively less intrusive than "beeping" alarms). Further, implementation of positive radio communication is being progressed in place of horns, where safe to do so.

6.3 Noise Modelling Scenarios

In accordance with INP requirements, the Project description was reviewed to determine representative operating scenarios to assess potential noise impacts. Scenarios representing typical Project operations in 2018, 2020, 2024, 2028 and 2031 were identified and selected to represent the Project. A summary is presented below and further information on each Project scenario is presented in **Appendices I1** to **I5**:

- 2018 - representative of single fleet operations in the far north of Pit 8, in combination with single fleet operations in Pits 1, 3, 4, 6 and 7 (**Appendix I1**);
- 2020 - representative of single fleet operations in the north of Pit 8, in combination with single fleet operations in Pits 2, 3, 5, 6 and 7 (**Appendix I2**);
- 2024 - representative of two fleets operating in central Pit 8, in combination with single fleet operations in Pit 3 and Pit 5 (far south) and two fleets operating in Pit 6 (**Appendix I3**);
- 2028 - representative of single fleet operations in southern Pit 8, in combination with single fleet operations in Pit 4 and two fleets operating in Pit 6 (**Appendix I4**); and
- 2031 - representative of single fleet operations in the far south of Pit 8, in combination with two fleets operating in Pit 6 (**Appendix I5**).

Note that a fleet as described above includes an excavator as well as associated dozers, haul trucks and drills as required. While each fleet can operate on either coal or waste, each fleet has been designated as operating either on coal or waste for the modelling scenarios as described in **Appendix I**. The different fleet types will have varying elevations and configurations (i.e. waste fleets generally modelled with a shorter haul distance than coal fleets).

For each of these scenarios, a dozer push element was included, where a dedicated waste dozer fleet was operating in the scenario, to evaluate the impact of dozer push operations that are undertaken at a specific stage within the open cut mining sequence (in most areas of the mine).

In addition, daytime infrastructure construction fleets and soil stripping operations were also incorporated in the scenarios where relevant.

Table 21 Comparative Numbers of Mobile Equipment and Fixed Plant and Total SWLs (dBA re 1ρW)

Wilpinjong	Year 2018			Year 2020			Year 2024			Year 2028			Year 2031		
	Number (Mobile)	Number (Total)	SWL (Total)	Number (Mobile)	Number (Total)	SWL (Total)	Number (Mobile)	Number (Total)	SWL (Total)	Number (Mobile)	Number (Total)	SWL (Total)	Number (Mobile)	Number (Total)	SWL (Total)
Existing Wilpinjong Coal Mine															
Daytime	94	114	141.8	69	99	140.7	40	70	137.7	-	-	-	-	-	-
Evening/Night-time	64	94	141.6	49	79	140.4	20	50	137.0	-	-	-	-	-	-
Project															
Daytime	110[1]	141[1]	142.5[1]	77	108	141.7	109[1]	140[1]	142.4[1]	64	95	140.9	51	82	139.9
Evening/Night-time	76	107	142.3	68	99	141.6	75	106	142.2	55	86	140.8	42	73	139.7
Difference															
Daytime	16	27	0.7	8	9	1.0	69	70	4.7	-	-	-	-	-	-
Evening/Night-time	12	13	0.7	19	20	1.2	55	56	5.2	-	-	-	-	-	-

Note 1: Number of items and SWL inclusive of the construction fleet for the Ulan-Wollar Road realignment in 2018 and 2024.

6.4 Noise Mitigation and Management Measures

6.4.1 Approved Wilpinjong Coal Mine

WCPL is currently obligated to manage noise levels from the Wilpinjong Coal Mine in accordance with the noise limits specified in Project Approval 05-0021 using feasible and reasonable mitigation measures. The obligation to meet the noise limits specified in Project Approval 05-0021 has been achieved through a combination of the following:

- Property acquisition which has had the effect of reducing the number of privately owned receivers that could potentially be affected by noise impacts from the Wilpinjong Coal Mine operations.
- For the remaining privately owned receivers, the implementation of the noise management strategy as per the NMP, including the use of real-time noise monitoring to actively manage noise levels during the night.

Modelling conducted for Modifications 5 and 6 at the Wilpinjong Coal Mine indicated that compliance with the noise limits specified in Project Approval 05-0021 at some private receivers (e.g. at the Village of Wollar) would require the operational stand-down of select mobile equipment during some adverse weather conditions in accordance with the NMP response protocol and relevant operational priorities at the time.

Further detail regarding the Wilpinjong Coal Mine noise management strategy and WCPL's recent compliance with the noise limits specified in Project Approval 05-0021 is provided in **Section 2.3**, including:

- A description of real-time noise investigation triggers and the response protocol (**Section 2.3.3**).
- An example of when a response protocol was implemented to reduce noise levels from the Wilpinjong Coal Mine following an exceedance of the noise investigation trigger level (**Section 2.3.3**).
- Demonstration that WCPL alters its operations to reduce noise levels from the Wilpinjong Coal Mine, (i.e. the stand-down of machinery) as a direct response to noise investigation triggers (**Section 2.3.3**).
- A summary of attended monitoring results showing WCPL was in compliance with the noise limits specified in Project Approval 05-0021 in the 2014 reporting period (refer **Section 2.3.2**).
- A summary of complaints received by WCPL showing that the number of noise related complaints has diminished from a peak recorded in 2009/2010 (**Section 2.5**).

Support for the mine's proactive acquisition of surrounding private land and also the recent operational noise compliance record of the Wilpinjong Coal Mine was highlighted by the DP&E in the Assessment Report of Modification 6 (DP&E, 2014), including the results of independent noise monitoring by the EPA.

6.4.2 The Project

As discussed in **Section 1.2**, the SEARs for the Project nominate several environmental planning instruments, policies, guidelines and plans. Guidelines for determining feasible and reasonable noise mitigation are presented in the INP and the EPA's RING (Appendix 6) which provides further definition of the key terms (refer **Appendix J**). In particular, the INP Section 1.4.5 Applying Noise Mitigation Strategies, states the following:

> *Where noise impacts are predicted, noise-source managers should seek to achieve the criteria by applying feasible and reasonable mitigation measures. In this context feasibility relates to engineering considerations and what can practically be built, and 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*
- *Noise levels for affected land uses - existing and future levels, and changes in noise levels.*

The INP focuses on achieving the desired environmental noise outcomes without prescribed management or mitigation strategy to achieve PSNLs. In this way, the proponent is given maximum flexibility when designing and implementing a program of noise management and control applicable to its operations. Furthermore, the more recent VLAMP (refer **Section 5.4**) provides guidance on the implementation of the NSW Government's voluntary land acquisition and mitigation policy.

The development of the Project would result in physical extensions to the currently approved mining operations, including development of the new Pit 8, which is located appreciably closer to the village of Wollar and east of one of the two ridges that currently provide some topographic shielding between the approved mine and Wollar village.

In view of the foregoing, investigation of feasible and reasonable noise mitigation measures for the Project were conducted in consultation with WCPL, particularly in relation to evening and night-time operations. Several noise mitigation measures were developed for the Project, along with extensive preliminary noise modelling of scenarios representative of the predicted maximum Project noise emissions at privately owned receivers in Wollar village to identify the potential for noise exceedances.

The preliminary modelling indicated that, in the absence of additional noise mitigation measures, Project intrusive noise levels at privately owned receivers in Wollar village could range between approximately 34 dBA and 42 dBA under the applicable adverse weather conditions. It was predicted that the highest (unmitigated) intrusive noise levels in Wollar village would coincide with two mining fleets (i.e. one coal and one waste) operating in Pit 8, which is expected to commence in approximately 2022. In particular, in 2024 the modelled highest (unmitigated) evening intrusive noise levels were up to 42 dBA in Wollar village (i.e. 7 dBA above the PSNL) under the applicable adverse weather conditions.

The potential frequency of the applicable adverse weather conditions and the magnitude of the potential exceedance were also considered. **Table 22** provides a comparison between predicted intrusive ($L_{Aeq(15minute)}$) noise levels and the relative estimated frequency of the noise exceedances between 2018 (when one mining fleet is operating in Pit 8) and 2024, when two mining fleets would be operating in Pit 8.

Table 22 Predicted Maximum Intrusive $L_{Aeq(15minute)}$ Noise Levels (dBA re 20 µPa)

Year	Wollar Predicted Maximum Intrusive Noise Level[1]	Wollar Maximum Exceedance of PSNL[2]	Estimated Frequency of INP Adverse Weather[3]
2018	39 dBA	4 dBA	10%
2024	42 dBA	7 dBA	12%

Note 1: 2018 evening 3 m/s west-northwest wind and 2024 evening 3 m/s west-northwest wind.
Note 2: Refer **Table 17** for Wollar Village PSNL 35 dBA.
Note 3: Estimated frequency of INP adverse weather on 24 hour annualised basis for exceedance of the PSNL 35 dBA.

Table 22 illustrates that both the *frequency* and more significantly the *magnitude* of the predicted exceedance of the PSNL would appreciably increase in 2024, in comparison to 2018.

Further iterative steps were therefore undertaken including the following:

- Ranking the highest noise contributors and progressively evaluating alternative noise mitigation measures to reduce noise associated with the Project at three (from a total of nine) residences that spanned the geographical spread of the privately owned dwellings in Wollar village at the time of assessment.

- Evaluating various combinations of feasible noise control and management measures to assess their relative effectiveness for various modelling scenarios.
- Agreement by WCPL to adopt a range of reasonable noise control and management measures (including the potential use of low noise equipment, mine operational controls and equipment shut-downs) to reduce noise emissions from the Project in Wollar village.

In order to establish what is a reasonable level of noise control in the context of the mining operations in Pit 8, potential alternative measures that would achieve the current evening and night-time PSNL of 35 dBA for 2024 under the applicable adverse weather conditions were evaluated for WCPL's consideration, including:

- Attenuating noise emissions from all CAT 789 trucks at the mine, plus shutting down one Pit 8 mining fleet and the satellite ROM pad front end loader (FEL); or
- Shutting down both mining fleets in Pit 8 and also the Pit 8 satellite ROM pad FEL; or
- Attenuating noise emissions from all major mobile plant at the mine site, supplemented with additional mobile plant shutdowns as required under adverse conditions.

While technically feasible, these options to achieve 35 dBA in 2024 either have significant capital costs plus operational shutdown costs, or significant operational costs.

The potential capital and operational costs of such measures therefore need to be considered in comparison to alternative measures that would potentially achieve noise levels that are within the range previously approved within the noise management zone at the Wilpinjong Coal Mine under Project Approval 05-0021 (i.e. 36 dBA to 40 dBA) - and that may incur less significant capital and/or operational costs.

The preliminary noise modelling was therefore further progressed for three representative privately owned receivers in Wollar village with WCPL evaluating relative potential noise mitigation benefits, capital and operating cost of mitigation, and impacts on related Project metrics. From this evaluation it was identified by WCPL that an appreciable Project noise reduction in the order of 5 dBA could potentially be achieved for 2024 (**Table 23**). This slightly lower target would incur significantly lower direct and indirect Project capital and operational costs than achieving a 7 dBA reduction.

The resulting achievable maximum intrusive noise level of 37 dBA in Wollar village would be only marginally (i.e. 2 dBA) above the evening and night-time PSNL of 35 dBA. This would also represent a marginal (i.e. 2 dBA) increase on the current operational evening and night-time noise limit for Wollar village of 35 dBA. A change in the permitted noise level of this magnitude (i.e. 2 dBA exceedance of the PSNL and current noise limit) is described as negligible, and not discernible by the "average listener" in the VLAMP.

Table 23 presents the unmitigated intrusive ($L_{Aeq(15minute)}$) levels for the 2018, 2020, 2024 and 2028 operating scenarios under the applicable adverse evening 3 m/s winds (**Table 11**) together with some potential noise mitigation measures to achieve 37 dBA that are considered reasonable and acceptable to WCPL (predicted 2031 noise levels were less than 37 dBA in Wollar village). Note, a potentially wide range of other alternative combinations of reasonable, cost-effective noise mitigation measures would be available to WCPL to achieve 37 dBA and the mitigation measures in the table below should not be seen as prescriptive. WCPL would validate the model predictions with attended and unattended monitoring as the mine expands before selecting a cost-effective mitigation strategy to achieve compliance relevant to operational requirements and priorities at the time.

Table 23 Reasonably Achievable Intrusive $L_{Aeq(15minute)}$ Noise Levels (dBA re 20 µPa)

Wollar Village	2018			2020			2024			2028		
Dwelling No	942	914	1_953	942	914	1_953	942	914	1_953	942	914	1_953
Unmitigated	39	37	38	38	37	40	41	42	40	38	37	36
Selected Example Mitigation Scenario	Shutdown Pit 8 one mobile fleet as required			Shutdown Pit 8 drills and 2 CAT 789 trucks as required			Attenuate Pit 8 coal and waste fleets Plus Shutdown Pit 8 satellite ROM FEL as required and dozer push, if running			Shutdown Pit 8 2 CAT 789 trucks as required		
Mitigation Scenario Noise Reduction	-2	-1	-3	-1	-2	-3	-4	-5	-5	-1	-1	-0
Reasonably Achievable Noise Level	37	36	35	37	35	37	37	37	35	37	36	36

Note 1: Representative receivers (private dwellings at the time of assessment): 942 - Schneider (central Wollar village), 914 - Nicod (southern Wollar village), 1_953 - Marshall & Muller (northern Wollar village).

Note 2: Predicted $L_{Aeq(15minute)}$ noise level complies with the intrusive PSNL 35 dBA.

Note 3: Predicted negligible noise exceedance 1 to 2 dBA above intrusive PSNL 35 dBA in accordance with the VLAMP.

Note 4: Predicted moderate noise exceedance 3 to 5 dBA above intrusive PSNL 35 dBA in accordance with the VLAMP.

Note 5: Predicted significant noise exceedance >5 dBA above intrusive PSNL 35 dBA in accordance with the VLAMP.

On this basis and in agreement with WCPL, the predictive noise modelling and associated noise impact assessments for the Project are presented in **Section 7**, which incorporate a range of reasonable noise control and management measures (including the potential use of low noise equipment, mine operational controls and equipment shut-downs) as required to appreciably reduce noise emissions from the Project to achieve a noise level of 37 dBA at Wollar village.

While the noise mitigation and management measures outlined above focussed on private receivers in Wollar village, the reasonable noise control and management measures adopted for the Project would also reduce noise levels at the other nearest private receivers to the east and north-east of the Project. With the implementation of the reasonable and cost-effective measures outlined above, only one private receiver located outside of Wollar village (102) would be predicted to exceed the PSNL of 35 dBA (by up to 3 dBA under adverse weather conditions at night-time in 2028).

7 OPERATING NOISE IMPACT ASSESSMENT

7.1 Daytime Operating Intrusive Noise Levels

The predicted daytime intrusive $L_{Aeq(15minute)}$ levels for the 2018, 2020, 2024, 2028 and 2031 operating scenarios are presented in **Table 24** for privately owned receivers in the vicinity of the Wilpinjong Coal Mine, together with the relevant PSNLs and consented noise limits (**Appendix A3)**.

Table 24 Daytime Intrusive $L_{Aeq(15minute)}$ Noise Levels (dBA re 20 µPa)[1]

ID No and Landholder	Year 2018		Year 2020		Year 2024		Year 2028		Year 2031		PSNL	Consented Noise Limit
	Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind		
Privately Owned Receivers (South, West and South-west)												
69[2] Stokes	15	33	15	33	15	33	14	32	14	32	35	36
170 Cox	12	31	12	30	12	28	11	30	11	29	35	35
175 Andrews	14	28	13	27	13	27	13	28	12	27		
215 Larkin & Monaghan	13	22	12	21	11	15	13	20	11	17		
216 Waugh	13	23	12	21	11	17	12	21	11	18		
217 Mcdonald	12	23	11	23	10	17	11	23	10	21		
220 Stankovic	10	23	9	23	7	16	9	23	7	21		
221 Von Bischoffshausen	9	22	8	22	7	15	8	23	7	21		
225 Campbell	9	15	8	18	7	10	8	19	7	18		
226 Ball	9	22	8	22	7	16	7	22	6	22		
227 Baker	9	21	8	22	8	14	8	22	7	22		
229 Smith	7	18	6	20	6	13	6	20	5	20		
248 Lang	6	11	6	11	5	9	5	11	5	11		
250 Ward	7	12	6	13	6	10	6	12	5	12		
251 French & Le Sattler	8	14	7	13	7	12	7	12	6	11		
255 Jones	14	26	13	26	13	25	14	26	13	26		
227_C1 Baker	8	23	7	22	6	16	7	22	6	21		
227_C2 Baker	6	14	6	16	5	9	7	17	6	17		
Privately Owned Receivers (North-east)												
101 Pierce	20	15	20	15	19	14	18	13	17	12	35	35
102 Filipczyk	22	18	22	17	21	16	19	15	18	14		
103 Molloy	19	15	18	14	17	12	17	13	16	11		
104 Hartig	20	16	20	16	18	14	19	14	17	13		
105_R1 Toombs	16	12	15	11	14	9	15	11	13	9		
105_R2 Toombs	18	14	17	13	16	11	17	13	15	11		
107 Lee	16	13	16	12	14	10	15	11	14	10		
109 Vaisey	17	14	17	14	16	12	17	13	16	12		
113 Brett & Hilt	13	9	12	9	11	8	12	9	11	7		
115 Audretsch	9	6	8	5	8	4	8	4	6	2		
160A Smiles & Smiles-Schmidt	11	6	10	5	9	4	9	4	7	3		
160B Smiles & Smiles-Schmidt	10	6	10	5	8	4	8	3	7	3		
167 Jaques	14	10	13	9	12	8	13	9	11	7		
176_R1 Rayner	13	9	12	8	11	7	12	8	10	6		
176_R2 Rayner	13	9	12	8	11	7	12	8	10	6		
200 Hughes, Beinssen & Aslett	10	8	10	7	9	6	10	7	8	5		
201 Cuthbert	10	7	10	6	8	5	9	6	7	4		

ID No and Landholder	Year 2018		Year 2020		Year 2024		Year 2028		Year 2031		PSNL	Consented Noise Limit
	Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind		
Privately Owned Receivers (East and South-east)												
153 Marskell	13	11	13	11	10	8	15	13	14	12	35	35
903 Hardiman & Hogan	20	17	21	19	21	19	23	20	21	17	36	36
908 Lynch	18	16	20	17	20	18	22	18	18	15		
914 Nicod	18	15	20	17	20	17	21	18	18	14		
921 Toombs	19	16	20	18	20	18	22	18	18	14		
933 Faulkner	19	16	20	18	20	18	21	18	18	14		
942 Schneider	19	16	21	18	21	18	22	18	18	14		
952 O'Hara	20	17	22	19	23	20	22	19	18	14		

Note 1: Highest predicted noise levels from the INP meteorological conditions in **Table 11** for each receiver.

Note 2: Properties subject to noise mitigation upon request in accordance with Project Approval 05-0021 Table 3.

Note 3: Predicted $L_{Aeq(15minute)}$ noise level complies with the intrusive PSNL.

No exceedances of the PSNLs (or the consented noise limits) are predicted at any privately owned receivers during the daytime in 2018, 2020, 2024, 2028 or 2031 (**Table 24**).

The predicted daytime intrusive noise levels at resource-company owned receivers are presented in **Appendix K1** and summarised in **Appendix K4**.

7.2 Evening Operating Intrusive Noise Levels

The predicted evening intrusive $L_{Aeq(15minute)}$ levels for the 2018, 2020, 2024, 2028 and 2031 operating scenarios are presented in **Table 25** for privately owned receivers in the vicinity of the Wilpinjong Coal Mine, together with the relevant PSNLs and consented noise limits (**Appendix A3)**.

Table 25 Evening Intrusive $L_{Aeq(15minute)}$ Noise Levels (dBA re 20 µPa)[1]

ID No and Landholder	Year 2018		Year 2020		Year 2024		Year 2028		Year 2031		PSNL	Consented Noise Limit
	Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind		
Privately Owned Receivers (South, West and South-west)												
69[2] Stokes	14	30	14	30	15	30	14	29	14	30	35	36
170 Cox	11	29	12	29	12	28	11	29	11	28	35	35
175 Andrews	12	24	13	25	13	24	13	24	13	24		
215 Larkin & Monaghan	12	26	12	27	11	26	12	27	11	26		
216 Waugh	11	25	11	25	11	24	12	26	11	25		
217 Mcdonald	11	25	10	25	10	23	11	26	10	25		
220 Stankovic	8	23	8	23	7	19	8	23	8	23		
221 Von Bischoffshausen	7	21	7	22	7	16	8	22	7	21		
225 Campbell	7	11	7	15	7	9	8	14	7	16		
226 Ball	7	17	7	20	7	14	7	19	7	20		
227 Baker	7	16	7	20	7	13	7	19	7	20		
229 Smith	5	15	5	18	6	8	5	18	5	19		
248 Lang	5	8	5	10	5	8	5	9	5	10		
250 Ward	6	10	6	11	6	9	5	10	5	10		
251 French & Le Sattler	7	11	7	12	7	11	6	10	6	11		
255 Jones	12	22	13	24	13	22	14	23	13	24		
227_C1 Baker	6	17	6	19	6	11	6	19	6	20		
227_C2 Baker	5	11	6	14	5	7	6	13	6	15		
Privately Owned Receivers (North-east)												
101 Pierce	18	32	19	31	18	30	18	31	17	29	35	35
102 Filipczyk	20	35	21	35	20	33	19	36	18	32		
103 Molloy	18	30	18	31	17	29	17	31	16	29		
104 Hartig	19	31	19	30	18	29	18	31	17	29		
105_R1 Toombs	14	25	14	23	14	23	14	22	13	22		
105_R2 Toombs	16	27	17	26	16	25	17	24	15	24		
107 Lee	15	27	15	26	14	25	15	25	14	24		
109 Vaisey	16	25	17	24	16	23	17	23	16	22		
113 Brett & Hilt	11	25	11	25	11	24	12	25	11	24		

ID No and Landholder	Year 2018		Year 2020		Year 2024		Year 2028		Year 2031		PSNL	Consented Noise Limit
	Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind		
115 Audretsch	7	16	8	16	7	16	7	15	6	15	35	35
160A Smiles & Smiles-Schmidt	9	26	9	25	8	24	8	27	7	26		
160B Smiles & Smiles-Schmidt	8	28	9	28	8	26	7	29	8	28		
167 Jaques	12	20	12	18	11	18	12	18	11	17		
176_R1 Rayner	11	18	11	17	11	16	11	16	10	16		
176_R2 Rayner	11	21	11	19	10	19	11	19	10	19		
200 Hughes, Beinssen & Aslett	9	22	9	21	9	20	10	21	8	20		
201 Cuthbert	8	14	9	14	8	13	8	14	7	13		
Privately Owned Receivers (East and South-east)												
153 Marskell	11	31	12	31	10	30	14	33	14	31	35	35
903 Hardiman & Hogan	17	35	19	34	17	34	22	36	21	35		
908 Lynch	16	34	17	34	16	37	21	35	19	34		
914 Nicod	16	36	17	35	16	37	21	36	18	35		
921 Toombs	16	36	17	36	16	37	21	37	18	36		
933 Faulkner	16	37	17	36	16	36	21	37	18	36		
942 Schneider	16	37	18	37	17	37	21	37	18	36		
952 O'Hara	17	35	18	36	18	35	22	36	18	35		

Note 1: Highest predicted noise levels from the INP meteorological conditions in **Table 11** for each receiver.
Note 2: Properties subject to noise mitigation upon request in accordance with Project Approval 05-0021 Table 3.
Note 3: Predicted $L_{Aeq(15minute)}$ noise level complies with the intrusive PSNL.
Note 4: Predicted negligible noise exceedance 1 to 2 dBA above intrusive PSNL.

No exceedance of the PSNL of 35 dBA (or the consented noise limits) are predicted at any privately owned receivers during the evening in 2018, 2020, 2024, 2028 or 2031 (**Table 25**) except for negligible exceedances (1 to 2 dBA) at receiver 102 Filipczyk (2028) and at all seven privately owned receivers in Wollar in various years (903 Hardiman & Hogan, 908 Lynch, 914 Nicod, 921 Toombs, 933 Faulkner, 942 Schneider and 952 O'Hara).

The predicted evening intrusive noise levels at resource-company owned receivers are presented in **Appendix K2** and summarised in **Appendix K4**.

7.3 Night-time Operating Intrusive Noise

The predicted night-time intrusive $L_{Aeq(15minute)}$ levels for the 2018, 2020, 2024, 2028 and 2031 operating scenarios are presented in **Table 26** for privately owned receivers in the vicinity of the Wilpinjong Coal Mine, together with the relevant PSNLs and consented noise limits (**Appendix A3)**.

Table 26 Night-time Intrusive $L_{Aeq(15minute)}$ Noise Levels (dBA re 20 µPa)[1]

ID No and Landholder	Year 2018		Year 2020		Year 2024		Year 2028		Year 2031		PSNL	Consented Noise Limit
	Calm	Wind or Inversion	Calm	Wind or Inversion	Calm	Wind or Inversion	Calm	Wind or Inversion	Calm	Wind or Inversion		
Privately Owned Receivers (South, West and South-west)												
69[2] Stokes	14	33	14	34	16	34	14	33	14	33	35	36
170 Cox	11	29	12	30	12	29	11	29	11	29	35	35
175 Andrews	13	26	13	27	13	27	13	28	13	27		
215 Larkin & Monaghan	12	27	12	27	11	27	12	28	12	27		
216 Waugh	11	26	12	27	11	25	12	27	12	26		
217 Mcdonald	11	26	11	26	11	24	11	27	11	26		
220 Stankovic	9	25	9	25	8	21	9	25	8	24		
221 Von Bischoffshausen	8	22	8	23	8	17	9	24	8	23		
225 Campbell	8	15	8	19	7	12	8	18	8	19		
226 Ball	8	24	8	24	8	22	7	23	7	24		
227 Baker	8	22	8	23	8	20	8	23	7	24		
229 Smith	6	18	6	20	6	13	6	19	6	20		
248 Lang	5	10	6	11	6	10	6	11	6	11		

ID No and Landholder	Year 2018		Year 2020		Year 2024		Year 2028		Year 2031		PSNL	Consented Noise Limit
	Calm	Wind or Inversion	Calm	Wind or Inversion	Calm	Wind or Inversion	Calm	Wind or Inversion	Calm	Wind or Inversion		
250 Ward	6	11	6	13	7	11	6	11	6	12	35	35
251 French & Le Sattler	7	13	7	13	8	12	7	12	7	12		
255 Jones	13	25	13	26	14	26	14	26	14	26		
227_C1 Baker	7	22	7	22	7	17	7	22	6	22		
227_C2 Baker	6	14	7	16	6	10	6	16	6	17		
Privately Owned Receivers (North-east)												
101 Pierce	19	31	19	31	19	30	18	31	17	29	35	35
102 Filipczyk	21	35	21	35	21	34	19	38	18	33		
103 Molloy	18	31	18	32	17	30	17	32	16	30		
104 Hartig	19	31	19	31	18	30	19	32	17	30		
105_R1 Toombs	15	26	15	24	14	24	15	23	14	23		
105_R2 Toombs	17	28	17	27	16	26	17	25	16	25		
107 Lee	15	28	16	27	15	26	16	26	15	25		
109 Vaisey	17	26	17	25	17	24	17	25	17	24		
113 Brett & Hilt	12	27	12	27	12	26	12	27	11	26		
115 Audretsch	8	18	8	18	8	17	8	18	7	17		
160A Smiles & Smiles-Schmidt	9	24	9	24	9	23	9	25	8	25		
160B Smiles & Smiles-Schmidt	9	28	9	27	8	26	8	28	8	28		
167 Jaques	13	20	13	19	12	18	13	19	12	18		
176_R1 Rayner	12	19	12	18	11	17	12	18	11	17		
176_R2 Rayner	12	22	11	21	11	20	11	21	11	20		
200 Hughes, Beinssen & Aslett	9	24	10	24	9	22	11	23	9	21		
201 Cuthbert	9	17	9	17	8	16	9	17	8	16		
Privately Owned Receivers (East and South-east)												
153 Marskell	12	30	13	31	10	30	14	33	15	31	35	35
903 Hardiman & Hogan	18	34	19	33	18	33	23	34	21	34		
908 Lynch	16	32	17	32	16	31	22	33	19	32		
914 Nicod	16	32	17	33	16	32	21	33	19	32		
921 Toombs	16	35	18	35	17	35	22	35	18	34		
933 Faulkner	17	35	18	35	17	35	21	35	18	34		
942 Schneider	17	35	18	36	17	35	22	35	18	35		
952 O'Hara	17	34	19	35	18	34	22	34	19	34		

Note 1: Highest predicted noise levels from the INP meteorological conditions **Table 11** for each receiver.
Note 2: Properties subject to noise mitigation upon request in accordance with Project Approval 05-0021 Table 3.
Note 3: Predicted $L_{Aeq(15minute)}$ noise level complies with the intrusive PSNL.
Note 4: Predicted negligible noise exceedance 1 to 2 dBA above intrusive PSNL.
Note 5: Predicted marginal to moderate noise exceedance of 3 to 5 dBA above intrusive PSNL.

No exceedance of the PSNL of 35 dBA (or the consented noise limits) are predicted at any privately owned receivers during the night-time in 2018, 2020, 2024, 2028 or 2031 (**Table 26**) except for a negligible exceedance (1 dBA) at receiver 942 Schneider (2020) and a marginal to moderate exceedance (3 dBA) at receiver 102 Filipczyk (2028).

The predicted night-time intrusive noise levels at resource-company owned receivers are presented in **Appendix K3** and summarised in **Appendix K4**.

7.4 Night-time Operating Sleep Disturbance

The predicted maximum $L_{A1(1minute)}$ levels for the 2018, 2020, 2024, 2028 and 2031 operating scenarios are presented in **Table 27** for privately owned receivers in the vicinity of the Wilpinjong Coal Mine, together with the relevant SDNLs and consented noise limits (**Appendix A3**).

Table 27 Night-time Sleep Disturbance $L_{A1(1minute)}$ Noise Levels (dBA re 20 µPa)[1]

ID No and Landholder	Year 2018	Year 2020	Year 2024	Year 2028	Year 2031	SDNL	Consented Noise Limit
Privately Owned Receivers (South, West and South-west)							
69[2] Stokes	39	40	41	39	40	45	45
170 Cox	36	36	36	36	36		
175 Andrews	33	34	34	35	34		
215 Larkin & Monaghan	34	34	33	34	34		
216 Waugh	33	33	31	34	33		
217 Mcdonald	33	33	30	34	33		
220 Stankovic	31	31	28	32	31		
221 Von Bischoffshausen	29	30	24	30	30		
225 Campbell	22	25	18	25	26		
226 Ball	30	31	29	30	31		
227 Baker	29	30	26	29	30		
229 Smith	24	27	20	26	27		
248 Lang	16	18	16	17	18		
250 Ward	18	19	17	18	19		
251 French & Le Sattler	19	20	19	18	18		
255 Jones	31	33	32	33	33		
227_C1 Baker	29	29	24	28	28		
227_C2 Baker	21	23	17	22	24		
Privately Owned Receivers (North-east)							
101 Pierce	38	37	37	38	36	45	45
102 Filipczyk	42	42	41	44	39		
103 Molloy	38	38	37	39	37		
104 Hartig	38	37	36	38	37		
105_R1 Toombs	33	31	30	29	30		
105_R2 Toombs	35	33	32	32	31		
107 Lee	35	33	33	33	32		
109 Vaisey	33	31	31	31	30		
113 Brett & Hilt	34	34	32	33	32		
115 Audretsch	25	24	24	24	23		
160A Smiles & Smiles-Schmidt	31	31	30	32	32		
160B Smiles & Smiles-Schmidt	34	34	32	34	34		
167 Jaques	27	26	25	25	25		
176_R1 Rayner	25	24	24	24	23		
176_R2 Rayner	29	28	27	27	27		
200 Hughes, Beinssen & Aslett	31	30	28	29	28		
201 Cuthbert	24	23	22	24	22		
Privately Owned Receivers (East and south-east)							
153 Marskell	37	38	36	40	37	45	45
903 Hardiman & Hogan	40	40	40	41	40		
908 Lynch	38	38	38	40	38		
914 Nicod	39	40	39	40	39		
921 Toombs	41	41	41	42	41		
933 Faulkner	42	42	41	42	41		
942 Schneider	42	42	42	42	41		
952 O'Hara	41	41	41	41	40		

Note 1: Highest predicted noise levels from the INP meteorological conditions **Table 11** for each receiver.

Note 2: Properties subject to noise mitigation upon request in accordance with Project Approval 05-0021 Table 3.

Note 3: Predicted $L_{A1(1minute)}$ noise level complies with the SDNL (**Table 18**).

No exceedances of the SDNLs (or the consented noise limits) are predicted at any privately owned receivers during the night-time in 2018, 2020, 2024, 2028 or 2031 (**Table 27**).

The predicted night-time sleep disturbance $L_{A1(1minute)}$ noise levels at resource-company owned receivers are presented in **Appendix K3** and summarised in **Appendix K4**.

7.5 Impact Assessment Summary

In summary, the predicted daytime, evening and night-time intrusive $L_{Aeq(15minute)}$ noise levels and night-time maximum $L_{A1(1minute)}$ noise levels for the 2018, 2020, 2024, 2028 and 2031 operating scenarios show:

- Compliance is generally determined by evening and night-time noise levels, due to the noise-enhancing meteorological conditions (refer **Table 11**) that occur during the evening and night-time;
- No exceedances of the PSNLs (or the consented noise limits) are predicted at any privately owned receivers during the daytime (**Table 24**);
- No exceedances of the PSNL of 35 dBA (or the consented noise limits) are predicted at any privately owned receivers during the evening (**Table 25**) except for negligible exceedances (1 to 2 dBA) at receiver 102 Filipczyk (2028) and at all seven privately owned receivers in Wollar in various years (903 Hardiman & Hogan, 908 Lynch, 914 Nicod, 921 Toombs, 933 Faulkner, 942 Schneider and 952 O'Hara);
- No exceedances of the PSNL of 35 dBA (or the consented noise limits) are predicted at any privately owned receivers during the night-time (**Table 26**) except for a negligible exceedance (1 dBA) at receiver 942 Schneider (2020) and a marginal to moderate exceedance (3 dBA) at receiver 102 Filipczyk (2028); and
- No exceedances of the SDNLs (or the consented noise limits) are predicted at any privately owned receivers during the night-time (**Table 27**).

Given the above, eight privately owned receivers (102 Filipczyk, 903 Hardiman & Hogan, 908 Lynch, 914 Nicod, 921 Toombs, 933 Faulkner, 942 Schneider, and 952 O'Hara) have been identified as being in a Noise Management Zone due to the Project. No receivers were identified as being in a Noise Affectation Zone.

Table 28 presents the privately owned receivers with predicted intrusive $L_{Aeq(15minute)}$ noise level exceedances of the PSNLs.

Table 28 Privately Owned Receivers[1] with Intrusive PSNL Exceedances

Period	Noise Management Zone		Affectation Zone
	Negligible 1 to 2 dBA above assessment criteria	Marginal to Moderate 3 to 5 dBA above assessment criteria	Significant > 5 dBA above assessment criteria
Daytime	-	-	-
Evening	903 Hardiman & Hogan, 908 Lynch, 914 Nicod, 921 Toombs, 933 Faulkner, 942 Schneider, 952 O'Hara,102 Filipczyk	-	-
Night-time	942 Schneider	102 Filipczyk	-

Note 1: Refer **Section 3.2** and **Appendix C3**.

Based on the noise impact assessment methodology as guided by the VLAMP and presented in **Sections 6** and **7**, it is concluded that seven privately owned residential receivers in Wollar village would be subject to negligible impacts (1 to 2 dBA above PSNL) as a result of the Project. These would not warrant any receiver based treatment or controls. Additionally, one privately owned residential receiver (102 Filipczyk) located north-east of the Wilpinjong Coal Mine would be subject to marginal impacts (3 to 5 dBA above PSNL) as a result of the Project and may warrant consideration of receiver based treatment or controls.

7.6 Privately Owned Vacant Land Impact Assessment

Year 2020 intrusive $L_{Aeq(15minute)}$ noise contours during noise enhancing evening 3 m/s north-westerly wind are presented in **Appendices L1 and L2**. Year 2024 and 2028 intrusive $L_{Aeq(15minute)}$ noise contours during a strong temperature inversion (5.2°C/100 m) are presented in **Appendices L3, L4, L5** and **L6** respectively. The calculation of the noise contours involves numerical interpolation of a noise level array with a graphical accuracy of up to approximately ±2 dBA. This means that in some cases the noise contours would differ slightly from the values in **Table 25** and **Table 26**, which are calculated at the individual receptor locations and are therefore more accurate predictions.

Based on the noise impact assessment methodology as guided by the VLAMP and presented in **Sections 6** and **7**, noise impacts on vacant land have been assessed on the basis that any vacant land is permitted to have a dwelling. In the years 2020, 2024 and 2028 the evening and night-time 45 dBA intrusive $L_{Aeq(15minute)}$ noise contour is predicted to fall well short of the nearest privately owned vacant land (i.e. in Wollar village) and therefore remain well below the maximum recommended rural residential night-time ($L_{Aeq(9\ hour)}$) noise amenity level of 45 dBA in accordance with the INP.

7.7 Review of Existing Wilpinjong Noise Management Plan

In accordance with Project Approval 05-0021, Schedule 2 Condition 5, WCPL has prepared a revised NMP dated May 2014 that documents the current noise management strategy (refer **Section 2.3**). It is recommended that the NMP be reviewed and if necessary, revised to incorporate the Project, including:

- Updated noise monitoring network to reflect land ownership;
- Updated noise trigger investigation protocols to reflect site procedures;
- Updated operator-attended and continuous real-time monitoring locations representative of privately owned receivers; and
- Where continuous monitors are located at compliance locations (e.g. privately owned receivers), conduct a review of the identification/characterization of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system).

8 CUMULATIVE NOISE AMENITY ASSESSMENT

8.1 $L_{Aeq(Period)}$ Noise Amenity Criteria

The INP provides non-mandatory cumulative noise assessment guidelines that address existing and successive industrial development by setting acceptable (and maximum) cumulative $L_{Aeq(period)}$ noise amenity levels for all industrial noise sources only (i.e. non-transport related) for a particular land use. It is noted that the INP does not set acceptable cumulative $L_{Aeq(15minute)}$ intrusive criteria for all industrial noise sources, but rather seeks to control cumulative noise via the $L_{Aeq(period)}$ noise amenity criterion (refer **Section 5.1**).

8.2 Project Operating Noise Amenity Levels

The predicted daytime, evening and night-time $L_{Aeq(period)}$ noise amenity levels for the 2018, 2020, 2024, 2028 and 2031 operating scenarios are presented in **Table 29** for privately owned receivers in the vicinity of the Wilpinjong Coal Mine and at community facilities in Wollar (i.e. school, churches and community hall).

Table 29 Noise Amenity $L_{Aeq(period)}$ for the 2018, 2020, 2024, 2028 and 2031 Operating Scenarios (dBA re 20 µPa)[1]

ID No	Ownership	2018			2020			2024			2028			2031		
		Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Privately Owned Receivers (South, West and South-west)																
69[2]	Stokes	30	24	29	30	24	29	30	25	30	29	25	29	29	25	29
170	Cox	28	23	26	27	23	26	26	22	25	27	23	26	26	22	26
175	Andrews	25	19	22	25	19	23	24	19	23	25	19	24	24	19	23
215	Larkin & Monaghan	20	22	24	18	22	25	14	22	24	18	23	25	15	22	24
216	Waugh	20	21	23	18	21	23	15	20	22	19	22	24	16	21	23
217	Mcdonald	21	21	23	20	21	23	15	19	21	21	22	24	18	20	23
220	Stankovic	20	17	21	20	18	21	14	14	17	20	19	22	18	18	21
221	Von Bischoffshausen	20	15	19	19	17	20	13	11	14	20	18	21	18	17	20
225	Campbell	13	9	12	15	11	15	9	8	9	16	11	14	15	11	15
226	Ball	19	13	19	19	15	20	14	10	17	20	15	19	19	16	20
227	Baker	18	12	18	19	15	19	12	10	15	19	15	19	19	15	20
229	Smith	16	10	14	17	13	16	11	7	10	17	12	16	17	14	17
248	Lang	9	6	8	9	7	9	7	6	8	9	6	8	9	7	9
250	Ward	10	7	9	10	7	10	9	7	9	10	7	9	10	7	9
251	French & Le Sattler	12	8	10	11	8	11	10	8	10	10	7	9	10	7	9
255	Jones	23	17	21	23	19	22	23	17	22	23	18	22	23	19	23
227_C1	Baker	20	12	18	20	14	18	14	8	13	19	13	18	18	14	18
227_C2	Baker	12	8	11	13	10	13	7	6	8	14	9	12	14	10	14
Privately Owned Receivers (North-east)																
101	Pierce	18	28	28	18	27	28	17	27	27	16	28	28	15	26	26
102	Filipczyk	21	31	32	20	31	31	19	30	30	18	32	33	16	29	29
103	Molloy	17	27	28	17	27	28	15	26	26	16	27	28	14	25	26
104	Hartig	19	27	28	18	26	27	16	25	26	17	27	28	15	26	26
105_R1	Toombs	14	21	22	14	20	20	12	20	20	13	18	19	11	19	19
105_R2	Toombs	16	23	24	16	22	23	14	21	22	15	21	22	14	21	21
107	Lee	15	23	24	15	22	23	13	21	22	14	21	22	12	20	21
109	Vaisey	16	21	22	16	20	21	15	20	20	15	20	21	14	19	20
113	Brett & Hilt	11	21	22	11	21	22	10	20	21	11	20	22	9	19	21
115	Audretsch	8	12	14	7	12	13	6	12	13	6	11	13	5	11	12
160A	Smiles & Smiles-Schmidt	9	22	21	8	21	21	7	21	20	7	23	22	5	22	22
160B	Smiles & Smiles-Schmidt	9	25	25	8	24	24	7	23	23	6	25	25	6	24	24
167	Jaques	12	16	17	12	15	16	10	15	15	11	15	15	9	14	15
176_R1	Rayner	11	14	15	10	13	14	9	13	13	10	13	14	8	12	13
176_R2	Rayner	11	17	18	10	15	16	9	15	16	10	15	16	8	15	16
200	Hughes, Beinssen & Aslett	9	17	19	9	16	18	8	16	17	9	16	18	7	15	16
201	Cuthbert	9	11	13	8	11	12	7	10	11	8	10	13	6	9	11

ID No	Ownership	2018			2020			2024			2028			2031		
		Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Privately Owned Receivers and Community Facilities (East and South-east))																
153	Marskell	12	27	28	12	28	29	9	27	27	14	30	31	13	28	28
903	Hardiman & Hogan	18	32	32	20	31	31	20	31	31	22	33	32	19	32	31
908	Lynch (7.17)	17	31	31	18	31	30	19	33	33	20	32	32	17	31	30
914	Nicod (7.13)	17	33	32	19	32	32	19	34	33	20	33	32	17	31	31
921	Toombs	18	33	33	19	33	33	19	33	33	20	34	33	16	32	32
933	Faulkner	18	34	33	19	33	33	19	33	33	20	34	34	16	32	32
942	Schneider (7.23)	18	34	33	20	34	34	20	34	34	20	34	34	16	33	32
952	O'Hara	19	32	32	21	33	33	21	32	32	21	33	32	16	31	31
901	School	19	33	33	20	33	33	21	33	33	21	34	33	17	33	32
944	School (7.22)	19	33	33	20	33	33	21	33	33	21	34	33	16	33	32
900	St Laurence O'Toole Catholic Church (7.12)	18	28	28	19	28	28	20	27	27	21	31	30	17	29	28
150A	St Luke's Anglican Church (7.14)	18	34	34	19	34	34	19	35	35	20	36	35	17	38	36
935	Community Hall	18	34	34	19	34	34	20	33	33	20	34	34	16	32	32

Note 1: Highest predicted noise levels from the INP meteorological conditions **Table 11** for each receiver.

Note 2: Properties subject to noise mitigation upon request in accordance with Project Approval 05-0021 Table 3.

Note 3: Predicted $L_{Aeq(period)}$ noise level complies with the amenity PSNL (**Table 17**).

A summary of potential noise impacts at privately owned receivers and other land uses is presented in **Sections 8.3** and **8.4** respectively. The predicted daytime, evening and night-time $L_{Aeq(period)}$ at resource-company owned receivers are presented in **Appendix M1** and summarised in **Appendix M2**.

8.3 Impact Assessment Summary

In summary, the predicted daytime, evening and night-time $L_{Aeq(period)}$ noise amenity levels for the 2018, 2020, 2024, 2028 and 2031 operating scenarios show that:

- Compliance is generally determined by evening and night-time noise levels, due to the noise enhancing meteorological conditions (refer **Table 11**) that occur during the evening and night-time;
- No exceedances of the amenity PSNL (**Table 17**) at any privately owned receivers during the daytime, evening and night-time (**Table 29**); and
- No exceedances of the amenity PSNL (**Table 17**) at any community facilities in Wollar during the daytime, evening and night-time (**Table 29**).

Given the above, no privately owned receivers or community facilities have been identified as being in a Noise Management Zone or Noise Affectation Zone due to the Project based on predicted noise amenity levels.

8.4 Consideration of Other Land Uses

Consistent with previous assessments, review of the noise contours presented in **Appendices L1** to **L6** indicate that the passive recreational PSNL of $L_{Aeq(period)}$ 50 dBA would be exceeded at both the Goulburn River National Park and the Munghorn Gap Nature Reserve in the vicinity of the Project. However, Project noise emission levels in these areas would be generally comparable to those assessed for the approved Wilpinjong Coal Mine. It is noted that public facilities in these reserved areas (i.e. camping grounds) are not located in the proximity of the Project and access is very limited to the reserved lands in the vicinity of the Project.

8.5 Existing, Approved and Proposed Industrial Developments

The major existing, approved and proposed industrial developments in the vicinity of the Project are presented in **Table 3** and a summary is presented in **Table 30**. The predicted noise levels from the Wilpinjong Coal Mine incorporating the Project, the Moolarben Coal Project Stage 1 (MOD 12) and Stage 2 (MOD 2) and Ulan Continued Operations Project (as modified) have been considered. The estimated mine operating evening and night-time $L_{Aeq(period)}$ noise amenity levels from each of these developments have been established by reviewing the EA (where available). These are then used for the purposes of the cumulative evening and night-time noise amenity assessment. The proposed Bylong Coal Project, which is located approximately 15 km to the south-southeast of the Wilpinjong Coal Mine, is considered too distant to contribute to cumulative noise levels at privately-owned dwellings in the vicinity of the Wilpinjong Coal Mine and has not been considered further.

Table 30 Existing, Approved or Proposed Developments in the Vicinity of the Project

Development Site	Approval Date	Consent	Status	Source of Noise Data
Wilpinjong Coal Mine incorporating the Project	-	-	Existing/Proposed	Refer Section 8.2
Moolarben Coal Project Stage 1 (MOD 12) and Stage 2 (MOD 2)[1]	-	-	Existing/Proposed	Moolarben Coal Complex UG1 Optimisation Modification EA Appendix C (SLR, 2015)
Ulan Continued Operations Project (as modified)	15 November 2010	MP 08_0184	Existing/Approved	Ulan Coal Continued Operations EA Appendix 12 (Umwelt, 2009)

Note 1: Moolarben Coal Complex UG1 Optimisation Modification was lodged with the NSW Minister for Planning on 3 July 2015.

The Ulan West Modification (MOD 3) EA (Umwelt, 2015) includes the repositioning of approved ventilation shafts and dewatering bores as well as the installation of additional ventilation shafts and associated surface infrastructure. The Ulan West Modification Noise Impact Assessment (EA Appendix 7) Section 5.4 concludes that the cumulative noise impact assessment criteria would not be exceeded due to MOD 3. A review of predicted noise impacts (as described in the EA Appendix 7) indicates that the Ulan Continued Operations Project (as modified) would not have the potential to increase noise in the vicinity of the Project above the noise levels previously identified in the Ulan Continued Operations Project EA (Umwelt, 2009) Appendix 12.

It should be noted that for each of the developments identified above, the likelihood of the existing, approved and proposed developments emitting maximum noise emissions simultaneously is remote, due to the range of development locations and directional and other differences in the noise enhancing (and diminishing) weather effects. This cumulative noise assessment is therefore considered to be conservative.

8.6 Cumulative Evening Noise Amenity Assessment

In accordance with the INP Chapter 2 Industrial Noise Criteria, the predicted evening cumulative $L_{Aeq(4hour)}$ noise amenity levels for the highest predicted noise levels at privately owned receivers in the vicinity of the Wilpinjong Coal Mine and at community facilities in Wollar (i.e. school, churches and community hall) are presented in **Table 31**.

Table 31 Evening Cumulative ($L_{Aeq(4hour)}$) Noise Amenity Levels (dBA re 20 µPa)[1]

ID No	Ownership	Wilpinjong Coal Mine with the Project	Moolarben Coal Project	Ulan Continued Operations Project	Cumulative Sum
Privately Owned Receivers (South, West and South-west)					
69[2]	Stokes	25	16	5	26
170	Cox	23	20	9	25
175	Andrews	19	16	6	21
215	Larkin & Monaghan	23	7	0	23
216	Waugh	22	7	0	22
217	Mcdonald	22	7	0	22
220	Stankovic	19	8	0	19
221	Von Bischoffshausen	18	8	0	18
225	Campbell	11	10	1	14
226	Ball	16	10	1	17
227	Baker	15	10	1	17
229	Smith	14	9	2	15
248	Lang	7	11	3	13
250	Ward	7	12	4	13
251	French & Le Sattler	8	12	4	14
255	Jones	19	13	5	20
227_C1	Baker	14	10	2	16
227_C2	Baker	10	10	2	14
Privately Owned Receivers (North-east)					
101	Pierce	28	6	0	28
102	Filipczyk	32	7	0	32
103	Molloy	27	6	0	27
104	Hartig	27	6	0	27
105_R1	Toombs	21	6	0	21
105_R2	Toombs	23	6	0	24
107	Lee	23	6	0	23
109	Vaisey	21	5	0	21
113	Brett & Hilt	21	5	0	21
115	Audretsch	12	5	0	13
160A	Smiles & Smiles-Schmidt	23	4	0	23
160B	Smiles & Smiles-Schmidt	25	4	0	25
167	Jaques	16	5	0	17
176_R1	Rayner	14	5	0	15
176_R2	Rayner	17	5	0	17
200	Hughes, Beinssen & Aslett	17	5	0	18
201	Cuthbert	11	5	0	12
Privately Owned Receivers and Community Facilities (East and South-east)					
153	Marskell	30	6	0	30
903	Hardiman & Hogan	33	9	0	33
908	Lynch (7.17)	33	9	0	33
914	Nicod (7.13)	34	9	0	34
921	Toombs	34	9	0	34
933	Faulkner	34	9	0	34
942	Schneider (7.23)	34	9	0	34
952	O'Hara	33	9	0	33
901	School	34	9	0	34
944	School (7.22)	34	9	0	34

ID No	Ownership	Wilpinjong Coal Mine with the Project	Moolarben Coal Project	Ulan Continued Operations Project	Cumulative Sum
900	St Laurence O'Toole Catholic Church (7.12)	31	9	0	31
150A	St Luke's Anglican Church (7.14)	38	9	0	38
935	Community Hall	34	9	0	34

Note 1: Highest predicted noise levels from the INP meteorological conditions **Table 11** for each receiver.
Note 2: Properties subject to noise mitigation upon request in accordance with Project Approval 05-0021 Table 3.
Note 3: Predicted $L_{Aeq(period)}$ noise level complies with the INP acceptable amenity level (**Table 16**).

A summary of potential cumulative noise impacts on privately owned receivers and community facilities are presented in **Section 8.8**. The predicted evening noise amenity levels at resource-company owned receivers are presented in **Appendix N1** and are summarised in **Appendix N3**.

8.7 Cumulative Night-time Noise Amenity Assessment

In accordance with the INP Chapter 2 Industrial Noise Criteria, the predicted night-time $L_{Aeq(9hour)}$ noise amenity levels for the highest predicted noise levels at privately owned receivers in the vicinity of the Wilpinjong Coal Mine and at community facilities in Wollar (i.e. school, churches and community hall) are presented in **Table 32**.

Table 32 Night-time Cumulative ($L_{Aeq(9hour)}$) Noise Amenity Levels (dBA re 20 µPa)[1]

ID No	Ownership	Wilpinjong Coal Mine with the Project	Moolarben Coal Project	Ulan Continued Operations Project	Cumulative Sum
Privately Owned Receivers (South, West and South-east)					
69[2]	Stokes	25	16	5	26
170	Cox	23	20	9	25
175	Andrews	19	16	6	21
215	Larkin & Monaghan	23	7	0	23
216	Waugh	22	7	0	22
217	Mcdonald	22	7	0	22
220	Stankovic	19	8	0	19
221	Von Bischoffshausen	18	8	0	18
225	Campbell	11	10	1	14
226	Ball	16	10	1	17
227	Baker	15	10	1	17
229	Smith	14	9	2	15
248	Lang	7	11	3	13
250	Ward	7	12	4	13
251	French & Le Sattler	8	12	4	14
255	Jones	19	13	5	20
227_C1	Baker	14	10	2	16
227_C2	Baker	10	10	2	14
Privately Owned Receivers (North-east)					
101	Pierce	28	6	0	28
102	Filipczyk	32	7	0	32
103	Molloy	27	6	0	27
104	Hartig	27	6	0	27
105_R1	Toombs	21	6	0	21
105_R2	Toombs	23	6	0	24
107	Lee	23	6	0	23
109	Vaisey	21	5	0	21

ID No	Ownership	Wilpinjong Coal Mine with the Project	Moolarben Coal Project	Ulan Continued Operations Project	Cumulative Sum
113	Brett & Hilt	21	5	0	21
115	Audretsch	12	5	0	13
160A	Smiles & Smiles-Schmidt	23	4	0	23
160B	Smiles & Smiles-Schmidt	25	4	0	25
167	Jaques	16	5	0	17
176_R1	Rayner	14	5	0	15
176_R2	Rayner	17	5	0	17
200	Hughes, Beinssen & Aslett	17	5	0	18
201	Cuthbert	11	5	0	12
Privately Owned Receivers and Community Facilities (East and South-east)					
153	Marskell	30	6	0	30
903	Hardiman & Hogan	33	9	0	33
908	Lynch (7.17)	33	9	0	33
914	Nicod (7.13)	34	9	0	34
921	Toombs	34	9	0	34
933	Faulkner	34	9	0	34
942	Schneider (7.23)	34	9	0	34
952	O'Hara	33	9	0	33
901	School	34	9	0	34
944	School (7.22)	34	9	0	34
900	St Laurence O'Toole Catholic Church (7.12)	31	9	0	31
150A	St Luke's Anglican Church (7.14)	38	9	0	38
935	Community Hall	34	9	0	34

Note 1: Highest predicted noise levels from the INP meteorological conditions **Table 11** for each receiver.

Note 2: Properties subject to noise mitigation upon request in accordance with Project Approval 05-0021 Table 3.

Note 3: Predicted $L_{Aeq(period)}$ noise level complies with the INP acceptable amenity level (**Table 16**).

A summary of potential cumulative noise impacts on privately owned receivers and community facilities are presented in **Section 8.8**. The predicted night-time noise amenity levels at resource-company owned receivers are presented in **Appendix N2** and are summarised in **Appendix N3**.

8.8 Impact Assessment Summary

In summary, the predicted evening and night-time $L_{Aeq(period)}$ noise amenity levels for the 2018, 2020, 2024, 2028 and 2031 operating scenarios show:

- Compliance is generally determined by evening and night-time noise levels, due to the noise enhancing meteorological conditions (refer **Table 11**) that occur during the evening and night-time;
- No exceedances of the INP acceptable amenity PSNL (**Table 16**) at any privately owned receivers during the evening and night-time (**Table 31** and **Table 32**); and
- No exceedances of the INP acceptable amenity PSNL (**Table 16**) at any community facilities in Wollar during the evening and night-time (**Table 31** and **Table 32**).

Given the above, no privately owned receivers or community facilities have been identified as being in a Noise Management Zone or a Noise Affectation Zone due to the Project based on predicted cumulative noise amenity levels.

9 BLASTING IMPACT ASSESSMENT

9.1 Blasting Assessment Criteria

9.1.1 Australian Standard Criteria

Australian Standard (AS) 2187: Part 2-2006 *Explosives - Storage and Use - Part 2: Use of Explosives* provides guidance in assessing blast-induced ground (and structural) vibration and airblast effects on buildings and their occupants and details are presented in Appendix J of AS 2187.

Recommended vibration limits are based on international standards (or studies) as presented in Appendix J Tables J4.5(A) and J4.5(B) of AS 2187, for human comfort and structural building damage respectively. Similarly, recommended human comfort and structural damage airblast limits are presented in Appendix J Tables J5.4(A) and J5.4(B) AS 2187, respectively.

The guideline *Assessing Vibration: A Technical Guideline* (DEC, 2006) specifically does not consider blasting-induced vibration and, therefore, this guideline is not discussed further.

9.1.2 Human Comfort Noise and Vibration Criteria

Ground vibration and airblast levels which cause human discomfort are lower than recommended structural damage limits. Therefore, compliance with the lowest applicable human comfort criteria generally ensures that the potential to cause structural damage is negligible. The OEH currently adopts the ANZEC *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* dated September 1990 for assessing potential annoyance from blasting during daytime hours, as follows:

- The recommended maximum level for airblast is 115 dB Linear.
- The level of 115 dB Linear may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 120 dB Linear at any time.
- The recommended maximum for ground vibration is 5 mm/s, Peak Vector Sum (PVS) vibration velocity. It is recommended however, that 2 mm/s PVS be considered the long-term regulatory goal for the control of ground vibration.
- The PVS level of 5 mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10 mm/s at any time.

The ANZEC criteria are generally consistent with AS 2187: Part 2-2006 Appendix J Tables J4.5(A) and J5.4(A) with respect to vibration and airblast human comfort respectively.

9.1.3 Livestock Comfort Noise and Vibration Criteria

In a study by Casaday and Lehmann (1967) (*Responses of Farm Animals to Sonic Booms*) animal installations were selected for observations on animal behaviour under sonic boom conditions. The number of animals observed in this study included approximately 10,000 commercial feedlot beef cattle, 100 horses, 150 sheep and 320 lactating dairy cattle. Booms during the test period were scheduled at varying intervals during the morning hours Monday to Friday of each week.

Results of the study showed that the reactions of the sheep and horses to sonic booms were slight. Dairy cattle were little affected by sonic booms (125 dB to 136 dB). Only 19 of 104 booms produced even a mild reaction, as evidenced by a temporary cessation of eating, rising of heads, or slight startle effects in a few of those being milked. Milk production was not affected during the test period, as evidenced by total and individual milk yield. The researchers developed a summary by species and farms indicating that the few abnormal behavioural changes observed were well within the range of activity variation within a group of animals. They defined these changes as horses jumping up and galloping around the paddock, bellowing of dairy cattle, and increased activity by beef cattle (Casaday and Lehmann, 1967). In order to provide for a conservative assessment, the lowest airblast exposure studied (125 dB) was adopted as a criterion for the purposes of assessment of livestock impacts.

Similarly, an investigation (Heggies Pty Ltd, 2006) was conducted to determine the vibration levels experienced by cattle during typical short-term road transportation together with any vibration-induced health affects as observed by a registered veterinary surgeon. The study concluded that cattle are commonly exposed to vibration levels in excess of 200 mm/s during road transportation with no adverse effects on the cattle's health including levels of stress and contentment. It was consequently presumed that there would only be an effect on the cattle's health at vibration levels well in excess of 200 mm/s.

9.1.4 Building Damage Airblast Criteria

In relation to building damage airblast criteria, AS 2187: Part 2-2006 Appendix J J5.4(B) recommends a maximum airblast of 133 dB Linear Peak.

9.1.5 Building Damage Vibration Criteria

The applicable building damage vibration criteria AS 2187: Part 2-2006 Appendix J J4.5(B) is derived from British Standard 7385: Part 2-1993 *Evaluation and Measurement for Vibration in Buildings Part 2. Guideline to damage levels from ground borne vibration*. The standard sets guideline values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels have been established to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

Sources of vibration which are considered in the standard include blasting (carried out during mineral extraction or construction excavation), demolition, piling, ground treatments (e.g. compaction), construction equipment, tunneling, road and rail traffic and industrial machinery.

The recommended limits (guide values) for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in **Table 33** and graphically in **Figure 5**.

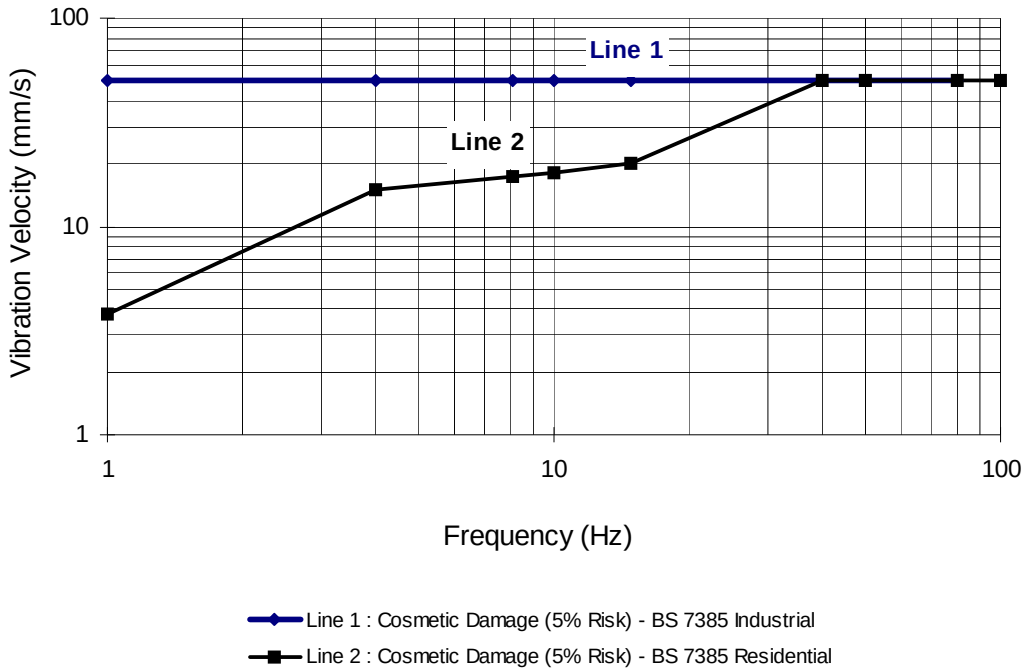
Table 33 Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage

Line	Type of Building	Vibration PCPV in Frequency Range of Predominant Pulse[1]	
		4 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

Note 1: Vibration Peak Component Particle Velocity - PCPV (mm/s).

The standard states that the guide values in **Figure 5** relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings.

Figure 5 Graph of Transient Vibration Guide Values for Cosmetic Damage



The standard goes on to state that minor damage is possible at vibration magnitudes which are greater than twice those given in **Table 33** and major damage to a building structure may occur at values greater than four times the tabulated values. It is noteworthy that extra to the guide values nominated in **Table 33**, the standard states that:

> *Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK.*

Also that:

> *A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.*

Based on the foregoing discussion a conservative vibration (PCPV) damage assessment criterion of 12.5 mm/s would be applicable to all privately owned residential dwellings.

9.1.6 Railway, Roadway and Other Public Infrastructure Vibration Damage Criteria

Infrastructure located outside of existing mining tenements includes the railway (line), roadway (culverts) and ETLs to the north of the Project lease areas. Accordingly, consideration has been given to potential vibration effects on such infrastructure.

The German Standard DIN 4150-3:1999 *Structural Vibration Part 3: Effects of vibration in structures* provides guideline values for evaluating the effect of vibration on buried pipework. The values are based on the assumption that pipes have been manufactured and laid using current technology. Additional considerations may be required at junctions. The recommended limits for short-term vibration to ensure minimal risk of damage are presented in **Table 34**.

Table 34 Guideline Values for Vibration - Effects of Short-Term Vibration on Buried Pipework

Pipe Material	Vibration PCPV Measured on the Pipe
Steel (including welded pipes)	100 mm/s
Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80 mm/s
Masonry, plastic	50 mm/s

Note: The WCPL BMP dated May 2014 nominates similar infrastructure vibration criteria.

The railway infrastructure comprises mainly steel with concrete and similar materials and based on the foregoing a vibration (PCPV) damage assessment criterion of 100 mm/s would be applicable. Similarly, roadway infrastructure comprises mainly concrete and similar materials and a vibration (PCPV) damage assessment criterion of 80 mm/s would be applicable.

WCPL have consulted with TransGrid regarding vibration damage criteria for the 330 kV ETL that is to be relocated for the Project. Based on this consultation a vibration (PCPV) damage criteria of 50 mm/s has been applied to the 330 kV ETL. This is comparable to the vibration (PCPV) damage criteria in the Wilpinjong Coal Mine BMP and Project Approval 05-0021 for public infrastructure.

9.1.7 Archaeological/Geological Vibration Damage Criteria

There are no regulatory criteria nominated in Australia for the assessment of damage to archaeological/geological structures from vibration. Research, however, has been undertaken by the United States (US) Army Corps of Engineers into the effects of large surface blasts on the dynamic stability of nearby unlined tunnels of various diameters in sandstone and granite (*Blast Vibration Monitoring and Control* [Dowding, 1985]). The results of the research indicated that intermittent rock fall or observable damage was not observed until vibration levels exceeded 460 mm/s. This assessment therefore adopts a conservative safe blast design vibration criterion of 250 mm/s (5% exceedance).

9.1.8 Aboriginal Heritage Site Vibration Damage Criteria

A number of Aboriginal rock shelter sites of have been identified during Aboriginal cultural heritage assessments conducted for the Wilpinjong Coal Mine. Five Aboriginal rock shelter sites located outside of the Project open cut limit (and inside the Mine Lease Boundary) have been identified for particular consideration due to their heritage significance (e.g. rock shelter sites with art).

Two groups of proximal rock shelters were identified for consideration:

- Rock shelter sites with art (WCP 72, 152, 153); and
- Rock shelter sites with artefacts of moderate significance (WCP 118/119).

Four of the rock shelter sites are closest to the Pit 5 extension area; WCP 118 (approximately 6 m from the Project open cut extensions), WCP 119 (approximately 23 m from the Project open cut extensions), WCP 152 (approximately 134 m from the approved mine and mining during the Project, and some 511 m from the Project open cut extensions) and WCP 153 (approximately 106 m from the approved mine and mining during the Project, and some 665 m from the Project open cut extensions).

Similarly, WCP 72 is approximately 198 m from the approved mine, approximately 232 m from mining within the existing approved open cut area during the Project, and some 342 m from the Project Pit 2 open cut extension area.

As above, there are no regulatory criteria nominated in Australia for the assessment of damage to Aboriginal rock shelter sites from vibration. This assessment therefore adopts the conservative blast design vibration criterion of 250 mm/s (5% exceedance) applicable to archaeological/geological structures.

9.2 Proposed Open Pit Blasting Practices

Assessment of the potential ground vibration and airblast emissions arising from overburden (i.e. waste rock) blasting has been based on the indicative Project blast design parameters presented in **Table 35** which are generally similar to the current blasting practices in the existing open cut areas. Potential blast impacts associated with the Project extension areas (**Appendix D2)** have been assessed.

Table 35 Current Wilpinjong Coal Mine and Project Indicative Blast Design Parameters

Parameter	Current Overburden Ranges	Project Overburden Ranges
Bench Height	Typically 5 to 49 m	Typically 10 to 30 m
Burden and Spacing	Typically 4 m x 8 m	Typically 8 m x 9 m
Stemming	Typically 3.5 m (aggregate)	Typically 3.5 to 4.5 m (aggregate)
Hole Diameter	Typically 125 to 229 mm	Typically 229 mm
Number of Holes	Typically 1050 holes	Typically 250 to 1200 holes
Charge Mass per Hole	Typically 150 to 800 kilograms (kg)	Typically 300 to 900 kilograms (kg)
Holes per Delay	Typically 1 to 6 holes	Typically 3 to 6 holes
Maximum Instantaneous Charge (MIC)	Typically 3,000 kg (5% exceedance)	Typically 100 to 3,900 kg with a mean of 1,350 kg (5% exceedance)
Explosive Type	Typically ANFO/Powergel	Typically ANFO/Powergel
Effective Powder Factor	Typically 0.3 to 0.6 kg^m^3	Typically 0.3 to 0.65 kg^m^3

Firstly, to determine the blasting emissions levels at the nearest potentially affected receivers in Wollar Village, the measured ground vibration and airblast levels from the Wilpinjong Coal Mine blast monitoring programme were collated (**Section 2.4**). The measured blast emissions results for 3 years (i.e. 2012 to 2014) were analysed to determine the 50% and 5% exceedance ground vibration and airblast site laws based on approximately 333 emission levels from the monitoring location at Wollar Public School (refer **Section 2**), as follows:

$$PVS\ (50\%) = 4*(R/Q^{1/2})^{-0.63}$$
$$PVS\ (5\%) = 11*(R/Q^{1/2})^{-0.63}$$
$$SPL\ (50\%) = 116 - 8*(\log(R) - \tfrac{1}{3}\log(Q))$$
$$SPL\ (5\%) = 128 - 8*(\log(R) - \tfrac{1}{3}\log(Q))$$

where,

PVS = Vibration velocity Peak Vector Sum (PVS) (mm/s)
SPL = Airblast Linear Peak Level (dBLpk re 20 µPa).
R = Distance between charge and receiver (m)
Q = Charge mass per delay (kg)

Similarly, to determine the blasting emissions levels at the nearest potentially affected receivers (excluding Wollar Village), the measured ground vibration and airblast levels from the Wilpinjong Coal Mine blast monitoring programme were collated (**Section 2.4**). The measured blast emissions results for 3 years (i.e. 2012 to 2014) was analysed to determine the 50% and 5% exceedance ground vibration and airblast site laws based on approximately 943 emission levels from the monitoring locations excluding Wollar Public School (refer **Section 2**), as follows:

$$PVS\ (50\%) = 75*(R/Q^{1/2})^{-1.02}$$
$$PVS\ (5\%) = 329*(R/Q^{1/2})^{-1.02}$$
$$SPL\ (50\%) = 154 - 19*(\log(R) - \tfrac{1}{3}\log(Q))$$
$$SPL\ (5\%) = 169 - 19*(\log(R) - \tfrac{1}{3}\log(Q))$$

where,

PVS = Vibration velocity Peak Vector Sum (PVS) (mm/s)
SPL = Airblast Level Linear Peak (dBLpk re 20 µPa).
R = Distance between charge and receiver (m)
Q = Charge mass per delay (kg)

9.3 Privately Owned Receivers, Community Facilities and Historical Heritage Sites

Using the ground vibration and airblast site laws described above, blast emissions were predicted at the nearest privately owned receivers, community facilities and historical heritage sites in Wollar from the Project extension areas (refer **Appendix D2**) for a typical upper overburden MIC 3,900 kg, a mean overburden MIC 1,350 kg and a lower overburden MIC 100 kg. The predicted ground vibration and airblast emissions are presented in **Table 36**.

Table 36 Predicted Ground Vibration and Airblast Levels for Privately Owned Receivers, Community Facilities and Historical Heritage Sites[4]

ID No	Ownership or Land Use	Vibration (mm/s)[1,4]		Airblast (dBLpk)[2,5]		Vibration (mm/s)[1,4]		Airblast (dBLpk)[2,5]		Vibration (mm/s)[1,4]		Airblast (dBLpk)[2,5]	
		3,900 kg		3,900 kg		1,350 kg		1,350 kg		100 kg		100 kg	
		50%	5%	50%	5%	50%	5%	50%	5%	50%	5%	50%	5%
Privately Owned Receivers (South, West and South-west)[4,5]													
69[3]	Stokes	0.3	0.8	96	108	0.2	0.6	95	107	0.1	0.2	92	104
170	Cox	0.2	0.6	94	107	0.1	0.4	93	106	0.1	0.2	90	102
175	Andrews	0.3	0.7	96	108	0.2	0.5	95	107	0.1	0.2	92	104
215	Larkin & Monaghan	0.1	0.4	92	105	0.1	0.3	91	104	0.0	0.1	88	100
216	Waugh	0.1	0.4	93	105	0.1	0.3	91	104	0.0	0.1	88	101
217	Mcdonald	0.1	0.4	93	105	0.1	0.3	91	104	0.0	0.1	88	101
220	Stankovic	0.2	0.4	93	105	0.1	0.3	92	104	0.0	0.1	88	101
221	Von Bischoffshausen	0.2	0.4	93	105	0.1	0.3	92	104	0.0	0.1	89	101
225	Campbell	0.2	0.5	94	106	0.1	0.4	93	105	0.1	0.2	90	102
226	Ball	0.2	0.6	94	107	0.1	0.4	93	106	0.1	0.2	90	102
227	Baker	0.2	0.6	94	107	0.1	0.4	93	105	0.1	0.2	90	102
229	Smith	0.3	0.7	96	108	0.2	0.5	94	107	0.1	0.2	91	104
248	Lang	0.3	0.9	97	110	0.2	0.7	96	108	0.1	0.3	93	105
250	Ward	0.4	1.0	98	110	0.3	0.7	96	109	0.1	0.3	93	106
251	French & Le Sattler	0.4	1.0	98	110	0.3	0.7	96	109	0.1	0.3	93	106
255	Jones	0.4	1.0	97	110	0.3	0.7	96	109	0.1	0.3	93	105
227_C1	Baker	0.2	0.6	95	107	0.2	0.5	94	106	0.1	0.2	91	103
227_C2	Baker	0.2	0.7	95	108	0.2	0.5	94	106	0.1	0.2	91	103
Privately Owned Receivers (North-east)[4,5]													
101	Pierce	0.2	0.6	94	107	0.1	0.4	93	105	0.1	0.2	90	102
102	Filipczyk	0.2	0.7	95	108	0.2	0.5	94	106	0.1	0.2	91	103
103	Molloy	0.2	0.5	93	106	0.1	0.3	92	104	0.1	0.1	89	101
104	Hartig	0.2	0.5	94	106	0.1	0.4	92	105	0.1	0.2	89	102
105_R1	Toombs	0.2	0.5	93	106	0.1	0.3	92	104	0.1	0.1	89	101
105_R2	Toombs	0.2	0.5	93	106	0.1	0.3	92	104	0.1	0.1	89	101
107	Lee	0.2	0.4	93	105	0.1	0.3	92	104	0.1	0.1	89	101
109	Vaisey	0.2	0.4	93	105	0.1	0.3	92	104	0.0	0.1	89	101
113	Brett & Hilt	0.1	0.4	93	105	0.1	0.3	91	104	0.0	0.1	88	101
115	Audretsch	0.1	0.4	93	105	0.1	0.3	91	104	0.0	0.1	88	101
160A	Smiles & Smiles-Schmidt	0.2	0.4	93	105	0.1	0.3	92	104	0.1	0.1	89	101
160B	Smiles & Smiles-Schmidt	0.2	0.4	93	105	0.1	0.3	92	104	0.1	0.1	89	101

ID No	Ownership or Land Use	Vibration (mm/s)[1,4]		Airblast (dBLpk)[2,5]		Vibration (mm/s)[1,4]		Airblast (dBLpk)[2,5]		Vibration (mm/s)[1,4]		Airblast (dBLpk)[2,5]	
		3,900 kg		3,900 kg		1,350 kg		1,350 kg		100 kg		100 kg	
		50%	5%	50%	5%	50%	5%	50%	5%	50%	5%	50%	5%
167	Jaques	0.1	0.4	93	105	0.1	0.3	91	104	0.0	0.1	88	101
176_R1	Rayner	0.2	0.4	93	105	0.1	0.3	92	104	0.0	0.1	89	101
176_R2	Rayner	0.2	0.4	93	105	0.1	0.3	92	104	0.0	0.1	88	101
200	Hughes, Beinssen & Aslett	0.1	0.4	92	105	0.1	0.3	91	103	0.0	0.1	88	100
201	Cuthbert	0.1	0.4	92	105	0.1	0.3	91	104	0.0	0.1	88	100
Privately Owned Receivers and Community Facilities (East and South-east)[4,5]													
153	Marskell	0.2	0.5	94	106	0.1	0.4	93	105	0.1	0.2	90	102
903	Hardiman & Hogan	0.5	1.3	99	111	0.3	0.9	98	110	0.1	0.4	95	107
908	Lynch	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
914	Nicod	0.4	1.2	98	111	0.3	0.8	97	110	0.1	0.4	94	106
921	Toombs	0.4	1.2	99	111	0.3	0.8	97	110	0.1	0.4	94	107
933	Faulkner	0.4	1.2	98	111	0.3	0.8	97	110	0.1	0.4	94	106
942	Schneider	0.4	1.2	98	111	0.3	0.8	97	109	0.1	0.4	94	106
952	O'Hara	0.5	1.3	99	111	0.3	0.9	98	110	0.1	0.4	95	107
901	School	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
944	School	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
900	St Laurence O'Toole Catholic Church	0.5	1.3	99	111	0.3	0.9	98	110	0.1	0.4	95	107
150A	St Luke's Anglican Church	0.4	1.1	98	110	0.3	0.8	97	109	0.1	0.3	94	106
935	Community Hall	0.4	1.2	98	111	0.3	0.8	97	109	0.1	0.4	94	106
Historical Heritage Sites (Wollar Village)[4,5]													
7.12	St Laurence O'Toole Catholic Church (900)	0.5	1.3	99	111	0.3	0.9	98	110	0.1	0.4	95	107
7.13	Former Masons Store (914) (old store)	0.4	1.2	98	111	0.3	0.8	97	110	0.1	0.4	94	106
7.14	St Luke's Anglican Church and Cemetery (150A)	0.4	1.1	98	110	0.3	0.8	97	109	0.1	0.3	94	106
7.15	Wollar Cemetery	0.5	1.5	100	112	0.4	1.1	99	111	0.2	0.5	95	108
7.16	Former Butcher and Garage (old house)	0.4	1.2	99	111	0.3	0.8	97	110	0.1	0.4	94	107
7.17	Lynch's House (908) (house)	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
7.18	King's (old house)	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
7.19	Kirkland's Hut (old house)	0.4	1.2	99	111	0.3	0.8	97	110	0.1	0.4	94	107
7.20	Old General Store (house)	0.4	1.2	98	111	0.3	0.8	97	109	0.1	0.4	94	106
7.21	Slab Hut (old house)	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
7.22	Wollar School (944) (school)	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
7.23	Former Police Station (942) (house)	0.4	1.2	98	111	0.3	0.8	97	109	0.1	0.4	94	106

Note 1: Vibration Velocity Peak Vector Sum (PVS) - (mm/s).
Note 2: Airblast Level Linear Peak - (dBLpk re 20 µPa).
Note 3: Properties subject to noise mitigation upon request in accordance with Project Approval 05-0021 Table 3.
Note 4 Predicted blast emission level complies with the human comfort criterion of 5 mm/s and building damage criterion of 12.5 mm/s.
Note 5 Predicted blast emission level complies with the human comfort criterion of 115 dBLpk and building damage criterion of 133 dBLpk.

The predicted ground vibration and air blast levels for resource-company owned receivers are presented in **Appendix O**.

9.3.1 Impact Assessment Summary

Based on a typical upper overburden blast MIC of 3,900 kg, the relevant human comfort and building damage ground vibration and airblast criteria are not predicted to be exceeded at any privately owned receivers, community facilities or Historical heritage sites in Wollar.

9.4 Proximal Livestock, Archaeological/Geological and Aboriginal Heritage Sites and Infrastructure

Using the ground vibration and airblast site laws described above, blast emissions were predicted at the nearest livestock, archaeological/geological and Aboriginal heritage sites and infrastructure from the Project extension areas (refer **Appendix D2**) for a typical upper overburden MIC 3,900 kg, a mean overburden MIC 1,350 kg and a lower overburden MIC 100 kg. The predicted ground vibration and airblast emissions are presented in **Table 37**.

Table 37 Predicted Ground Vibration and Airblast Levels Livestock, Archaeological/ Geological and Aboriginal Heritage Sites and Infrastructure

ID No or Land Use	Ownership/Land Owner	Vibration (mm/s)[1]		Vibration (mm/s)[1]		Vibration (mm/s)[1]	
		3,900 kg		1,350 kg		100 kg	
		50%	5%	50%	5%	50%	5%
Livestock[2]							
Stockyard Livestock Area	Peabody	29.7	129.7	17.3	75.6	4.6	20.1
Archaeological/Geological and Aboriginal Heritage Sites outside the Mining Lease Boundary[3]							
7.1 Historical Shale Oil Mine Complex (ruin)	Crown Land	30.5	132.9	17.8	77.5	4.7	20.6
36-3-0133 Wattle Creek No.1	Peabody	2.6	11.2	1.5	6.5	0.4	1.7
36-3-0098 Wattle Creek No.2	Goulburn River National Park	2.1	9.2	1.2	5.4	0.3	1.4
36-3-0106 Yawanna No.1	Goulburn River National Park	4.0	17.5	2.3	10.2	0.6	2.7
36-3-0101 Yawanna No.2	Goulburn River National Park	4.0	17.3	2.3	10.1	0.6	2.7
36-3-0115 Yawanna No.3	Peabody	5.9	25.9	3.5	15.1	0.9	4.0
36-3-1297 S2MC151	Moolarben	6.7	29.2	3.9	17.0	1.0	4.5
Archaeological/Geological and Aboriginal Heritage Sites inside the Mining Lease Boundary[3,4]							
36-3-0429 WCP 152	Peabody	34.7	151.4	20.2	88.3	5.4	23.5
36-3-0430 WCP 153	Peabody	43.9	191.4	25.6	111.6	6.8	29.7
36-3-0554 WCP 118	Peabody	718.2	3132.8	418.8	1826.7	111.5	486.3
36-3-0555 WCP 119	Peabody	210.5	918.1	122.7	535.3	32.7	142.5
36-3-0646 WCP 72	Peabody	19.9	86.8	11.6	50.6	3.1	13.5
Road and Rail Infrastructure[5,6]							
Ulan-Wollar Road Culvert	Mid-Western Regional Council	10.1	44.2	5.9	25.8	1.6	6.9
7.4 Wilpinjong Road Embankment	Mid-Western Regional Council	6.2	26.9	3.6	15.7	1.0	4.2
On-site Railway Loop	Peabody	5.4	23.6	3.2	13.8	0.8	3.7
Off-site Railway Line	ARTC	92.7	404.4	54.1	235.8	14.4	62.8

Note 1: Vibration Velocity Peak Vector Sum (PVS) - (mm/s).
Note 2: Predicted blast emission level complies with the livestock vibration criterion of 200 mm/s.
Note 3: Predicted blast emission level complies with the archaeological/geological and Aboriginal heritage vibration damage criterion of 250 mm/s.
Note 4: Predicted blast emission level exceeds the archaeological/geological and Aboriginal heritage vibration damage criterion of 250 mm/s.
Note 5: Predicted blast emission level complies with the road and rail vibration damage criterion of 80 mm/s to 100 mm/s.
Note 6: Predicted blast emission level exceeds the rail vibration damage criterion of 100 mm/s.

9.4.1 Impact Assessment Summary

Based on a typical upper overburden blast MIC of 3,900 kg, the relevant ground vibration criteria for livestock, archaeological/geological and Aboriginal heritage sites and infrastructure are predicted not to be exceeded, except at some of the nearest Aboriginal heritage sites and at the adjacent railway line. In order to mitigate potential blast impacts to these areas, the predicted vibration safe working distances to the proximal Aboriginal heritage sites are presented in **Section 9.5** and the generalised range of predicted vibration safe working distances from blasting for infrastructure are presented in **Section 9.6**.

9.5 Aboriginal Heritage Sites Predicted Safe Working Distances

The predicted vibration safe working distances from the range of potential pre-strip, overburden blasts and coal/partings blast designs to the Aboriginal rock shelter sites if they should warrant such management are presented in **Table 38**.

Table 38 Aboriginal Rock Shelter Predicted Safe Working Distances

Blast Design	Overburden MIC[1]	Overburden Distance 250 mm/s[2]	Pre-strip MIC[1]	Pre-strip Distance 250 mm/s[2]	Coal/Partings MIC[1]	Coal/Partings Distance 250 mm/s[2]
Upper	3,900 kg	82 m (5%)	2,500 kg	66 m (5%)	500 kg	30 m (5%)
Mean	1,350 kg	49 m (5%)	1,000 kg	42 m (5%)	170 kg	18 m (5%)
Lower	100 kg	14 m (5%)	75 kg	12 m (5%)	75 kg	12 m (5%)

Note 1: MIC - Maximum Instantaneous Charge (kg).

Note 2: The distance from the blast where the vibration velocity Peak Vector Sum (PVS) is predicted to be 250 mm/s.

The results presented in **Table 38** indicate upper size blasts (up to MIC 3,900 kg) can be implemented and achieve safe blast design vibration criterion of 250 mm/s (5% exceedance) at Aboriginal heritage sites WCP 72, WCP 152 and WCP 153 as they are located at greater than 100 m from the approved mine and greater than 300 m from the Project open cut extensions.

However, some controls on MIC would be required to achieve 250 mm/s (5% exceedance) at Aboriginal heritage sites WCP 118 and WCP 119 if they could be avoided by ancillary development and warranted ongoing blast management, given their very close proximity to the Project open cut extensions. However, it is understood these two sites would be subject to salvage and artefact collection in accordance with an Aboriginal Cultural Heritage Management Plan, and therefore would not be managed for blast vibration.

The above suggests that, outside of approximately 100 m of the Project open cut extensions, the safe blast design vibration criterion of 250 mm/s (5% exceedance) would be complied with, without limiting blast MIC. Any potential blasting impacts would continue to be managed and monitored in accordance with the requirements of the BMP as amended to address the Project, which may include more stringent performance measures for rock art sites than the assessment criteria of 250 mm/s (5% exceedance).

9.6 Generalised Predicted Safe Working Distances

The generalised predicted vibration safe working distances from the range of potential overburden, coal/partings and pre-strip blast designs for infrastructure are presented in **Table 39** together with predicted vibration safe working distance for airblast when the nearest stockyard may be in use with livestock.

Table 39 Generalised Predicted Safe Working Distances

Blast MIC[1]	Historical Sensitive/ Heritage Vibration[2] 12.5 mm/s	Public Infrastructure (ETLs) Vibration[2] 50 mm/s	Roadway Culvert Vibration[2] 80 mm/s	Railway Line/Loop Vibration[2] 100 mm/s	Archaeological/ Geological Structure Vibration[2] 250 mm/s	Stockyard Livestock Vibration[2] 200 mm/s	Stockyard Livestock Airblast[2] 125 dBLpk
Typical Overburden Blast Design							
3,900 kg	1552 m (5%)	399 m (5%)	250 m (5%)	201 m (5%)	82 m (5%)	102 m (5%)	3103 m (5%)
1,350 kg	913 m (5%)	235 m (5%)	147 m (5%)	118 m (5%)	49 m (5%)	60 m (5%)	2179 m (5%)
100 kg	249 m (5%)	64 m (5%)	40 m (5%)	33 m (5%)	14 m (5%)	17 m (5%)	915 m (5%)
Typical Pre-strip Blast Design							
2,500 kg	1242 m (5%)	319 m (5%)	200 m (5%)	161 m (5%)	66 m (5%)	82 m (5%)	2675 m (5%)
1,000 kg	786 m (5%)	202 m (5%)	125 m (5%)	102 m (5%)	42 m (5%)	52 m (5%)	1971 m (5%)
75 kg	216 m (5%)	56 m (5%)	35 m (5%)	28 m (5%)	12 m (5%)	15 m (5%)	832 m (5%)
Typical Coal/Partings Blast Design							
500 kg	556 m (5%)	143 m (5%)	90 m (5%)	72 m (5%)	30 m (5%)	37 m (5%)	1565 m (5%)
170 kg	324 m (5%)	84 m (5%)	53 m (5%)	42 m (5%)	18 m (5%)	22 m (5%)	1092 m (5%)
75 kg	216 m (5%)	56 m (5%)	35 m (5%)	28 m (5%)	12 m (5%)	15 m (5%)	832 m (5%)

Note 1: MIC - Maximum Instantaneous Charge (kg).

Note 2: The distance from the blast where the vibration velocity or airblast level is predicted to meet the relevant criteria.

Potential blasting impacts would continue to be managed and monitored in accordance with the requirements of the Development Consent and the Wilpinjong Coal Mine BMP.

The management of any flyrock (i.e. solid material ejected from the blast site) would continue to be managed in accordance with the Wilpinjong Coal Mine BMP with regard to nearby railway and roadway infrastructure.

9.7 Review of Existing Blast Management Plan

In accordance with Project Approval 05-0021, Schedule 2 Condition 5, WCPL has prepared a revised BMP dated May 2014 that documents the current blast management strategy (refer **Section 2.4**). It is recommended that the BMP be reviewed and if necessary, revised to incorporate the Project, including:

- Updated blast monitoring network to reflect land ownership.
- Updated livestock, Aboriginal heritage site and infrastructure vibration impact criteria. In particular, a review of the blast management protocol for any blasting within 100 m of any sensitive Aboriginal heritage rock shelter sites (e.g. sites with art) such that potential blast impacts are managed such that the structural integrity of sites is maintained.
- Development and ongoing review of “site laws” (i.e. site based prediction equations) for ground vibration and airblast.
- Any requirements associated with monitoring blast vibration at the relocated 330 kV TransGrid ETL and other relocated road and railway crossing infrastructure.

10 ROAD TRAFFIC NOISE ASSESSMENT

The detailed assessment of the road transport impacts are presented in the *Wilpinjong Extension Project Road Transport Assessment* (Appendix J of the EIS) (GTA Consultants, 2015) and includes consideration of the peak construction and operational traffic generation from the Wilpinjong Coal Mine incorporating the Project. This road traffic noise assessment focuses on Ulan Road (MR 214) as no private receivers remain on Ulan-Wollar Road between the Project and Ulan Road.

10.1 Road Traffic Generating Developments Noise Assessment Criteria

Ulan Road is classified as a main road (MR 208/214) (GTA Consultants, 2015), which is essentially a sub-arterial road. The RNP and associated Application Notes dated 12 June 2013 (refer **Appendix P**) is the relevant policy for the assessment of road noise in NSW. The RNP adopts a classification scheme for assessing noise impacts on an existing road network from additional traffic generated by the increased workforce being sought by the Project as presented in **Table 40**.

Table 40 Road Traffic Noise Assessment Criteria for Residential Land Uses (dBA re 20 µPa)

Road	Type of Project and Land Use	Total Traffic Noise Criteria[1]	Relative Increase Criteria[1]
Ulan Road	Land use developments generating additional traffic on existing sub-arterial roads	Daytime 60 $L_{Aeq(15hour)}$	Existing $L_{Aeq(15hour)}$ plus 12 dBA
		Night-time 55 $L_{Aeq(9hour)}$	Existing $L_{Aeq(9hour)}$ plus 12 dBA

Note 1: Daytime 0700 hours to 2200 hours, Night-time 2200 hours to 0700 hours.

It is noted that the NSW RNP Application Notes state that the relative increase criteria are primarily intended to protect existing quiet areas, being areas that are 12 dB or more below the relevant noise assessment criterion that applies day or night, from excessive changes in amenity due to noise from additional traffic.

In relation to situations where exceedances of the road traffic noise assessment criteria are predicted, the NSW RNP provides:

> *Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria.*
>
> *In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.*
>
> *… For existing residences and other sensitive land uses affected by **additional traffic on existing roads generated by land use developments**, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.*

In practice, noise level increases of less than 2 dBA are generally achieved when the percentage increase to the existing light and heavy traffic is no greater than 60%. The RNP describes a number of steps for applying the criteria. In general accordance with these steps, this assessment has:

- Identified a study area, defined as the portion of Ulan Road (south of Cope Road in the vicinity of Cooks Gap) with adjacent residential dwellings.
- Identified the receivers (i.e. residential dwellings and other land uses) adjacent to Ulan Road in the vicinity of the study area (**Table 41**).
- Tabulated road traffic flows within the study area, due to existing (2015) traffic, projected cumulative sources and the Project.
- Determined the relative increase in total traffic noise from the Project-generated traffic in 2017 and 2024 by comparison to the existing traffic.
- Determined the relative increase in total traffic noise from the Project-generated traffic in 2017 and 2024 by comparison to the projected cumulative 2017 and 2024 traffic.

It is noted that residential dwellings are also located adjacent to Ulan Road south of the study area, however, total traffic flows also increase with distance south on Ulan Road. Hence the section of Ulan Road south of Cope Road and north of Wollar Road (i.e. in the vicinity of Cooks Gap) was adopted as the study area, as the Project traffic as a proportion of total traffic is the highest in this section of Ulan Road.

Table 41 Ulan Road Adjacent Residential Dwellings

Project Dwelling No	Distance from Dwelling Façade (m)	Ownership	Address	Wilpinjong (MOD 5) Road Traffic Noise Assessment Dwelling No (2012)
1	108	Private	2569 Ulan Rd	1
2	78	Private	2672 Ulan Rd	2
3	106	Private	2691 Ulan Rd	3
4	73	Private	2723 Ulan Rd	4
5	67	Private	2745 Ulan Rd	5
6	28	Private	2778 Ulan Rd	6
7	115	Private	2847 Ulan Rd	-
8	109	Private	Lot 255 Moolarben Rd[1]	-
9	82	Private	3013 Ulan Rd	7
10	120	Private	South of 3013 Ulan Rd[1]	-
11	44	Private	3048 Ulan Rd	8
12	81	Private	3201 Ulan Rd	9
13	26	Private	3216 Ulan Rd	10
14	120	Mine	3227 Ulan Rd	-
15	84	Private	3277 Ulan Rd	11
16	100	Mine	3468 Ulan Rd	-
17	75	Commercial	3646-3672 Ulan Rd	-
18	90	Mine	9 Toole Rd	-
19	94	Commercial	North of 9 Toole Rd[1]	-

Source: *WCPL (2015)*
Note 1: No street address was determined for these properties.

As discussed in **Section 5.4**, in accordance with the VLAMP the consent authority is unable to grant voluntary mitigation and acquisition rights to reduce traffic noise impacts on the public road network. It is noted, however, that the Ulan Road Strategy that is in place with financial contributions from the Ulan Mine Complex, Moolarben Coal Complex and Wilpinjong Coal Mine includes the implementation of traffic noise mitigation measures along Ulan Road.

10.2 Ulan Road Existing Traffic Noise 2012

As presented in **Section 10.1**, a road traffic noise survey was conducted in December 2012 to quantify the near-field road traffic noise adjacent to Ulan Road for MOD 5. The data were then processed in accordance with the requirements of the RNP to derive the 2012 road traffic noise levels presented in **Table 42**.

Table 42 Unattended Road Traffic Noise Monitoring Results - December 2012 (dBA re 20 µPa)

Location	Position[1]	Leq(15hour)	Leq(9hour)
Corner of Ulan and Lagoons Roads	50 m from centre of Ulan Road	52	50

Note 1: Free field offset distance.

The existing traffic noise levels have been used to calculate the nominal offset distances from the centre of Ulan Road to meet the daytime and night-time total traffic noise criteria (refer **Table 2**) as presented in **Table 43**.

Table 43 Nominal Offset Distance to Meet the Total Traffic Noise Criteria - December 2012

Location	Offset Distance	Day Leq(15hour)[1]	Night Leq(9hour)[1]
Corner of Ulan and Lagoons Roads	20.5 m from centre of Ulan Road	60 dBA	-
	35.0 m from centre of Ulan Road	-	55 dBA

Note 1: Total traffic noise level inclusive of 2.5 dBA facade correction.

Based on the existing traffic noise levels, two residential dwellings in the study area (i.e. numbers 6 and 13) are within 35 m of Ulan Road and therefore receiving night-time $L_{eq(9hour)}$ traffic noise levels above the total traffic noise criteria of 55 dBA. All receivers in the study area were below daytime $L_{eq(15hour)}$ traffic noise criteria of 60 dBA.

10.3 Ulan Road 2017 and 2024 Traffic Noise Assessment

The existing traffic flows on Ulan Road (south of Cope Road and north of Wollar Road) are presented in **Table 44**, along with the Project-generated and the cumulative 2017 and 2024 traffic flows. For the purposes of noise impact assessment, the daytime and night-time cumulative 2017 traffic flows are shown, with the relative percentage increase associated with the Project traffic in parentheses.

Table 44 Ulan Road Existing, 2017 and 2024 Traffic (Between Cope Road and Wollar Road)

Time Period	Existing[1]	Cumulative 2017[2]	Project 2017[3]	Cumulative 2024[4]	Project 2024[5]
Ulan Road Light Vehicles					
Daytime 15 hour traffic	1,432	1,929	90 (4.9%)	1,519	243 (19.0%)
Night-time 9 hour traffic	611	915	48 (5.5%)	568	117 (25.9%)
Ulan Road Heavy Vehicles					
Daytime 15 hour traffic	271	413	74 (21.8%)	343	85 (32.9%)
Night-time 9 hour traffic	62	69	4 (6.2%)	68	12 (21.4%)
Ulan Road Total Vehicles					
Daytime 15 hour traffic	1,703	2,342	164 (7.5%)	1,862	328 (21.4%)
Night-time 9 hour traffic	673	984	52 (5.6%)	636	129 (25.4%)

Note 1: Existing 2015 traffic flow inclusive of Wilpinjong Coal Mine traffic.

Note 2: Cumulative 2017 traffic flow inclusive of Wilpinjong Coal Mine and the Project traffic.

Note 3: Project 2017 in comparison to cumulative 2017 traffic - values in parentheses represent the Project as a percentage of the cumulative subtotal in 2017(i.e. cumulative less the Project).

Note 4: Cumulative 2024 traffic flow inclusive of Wilpinjong Coal Mine and the Project traffic.

Note 5: Project 2024 in comparison to cumulative 2024 traffic - values in parentheses represent the Project as a percentage of the cumulative subtotal in 2024 (i.e. cumulative less the Project).

The relative increases in the daytime and night-time traffic noise have been used to update the nominal minimum off-set distances from the centre of Ulan Road required to meet the daytime and night-time total traffic noise criteria in 2017 and 2024 (refer **Table 40**) as presented in **Table 45**.

Table 45 Nominal Off-set Distance to Meet the Total Traffic Noise Criteria

Scenario	Off-set Distance[1]	Leq(15hour)[2]	Leq(9hour)[2]
Existing	20.5 m	60 dBA	-
	35.0 m	-	55 dBA
Cumulative subtotal in 2017 (i.e. excluding Project)	36.0 m	60 dBA	-
	62.0 m	-	55 dBA
Cumulative subtotal in 2017 plus Project (i.e. Cumulative)	37.0 m	60 dBA	-
	64.0 m	-	55 dBA
Cumulative subtotal in 2024 (i.e. excluding Project)	32.5 m	60 dBA	-
	52.5 m	-	55 dBA
Cumulative subtotal in 2024 plus Project (i.e. Cumulative)	34.0 m	60 dBA	-
	54.0 m	-	55 dBA

Note 1: Off-set distance from the centre of Ulan Road.

Note 2: Total traffic noise level inclusive of 2.5 dBA facade correction.

As mentioned above, two residential dwellings in the study area (i.e. numbers 6 and 13) are within 35 m of Ulan Road and therefore currently receiving night-time $L_{eq(9hour)}$ traffic noise levels above the total traffic noise criteria of 55 dBA. All receivers in the study area are currently below daytime $L_{eq(15hour)}$ traffic noise criteria of 60 dBA.

10.3.1 Traffic Noise - Cumulative 2017 plus Project

The daytime cumulative 2017 traffic is predicted to increase by approximately 8% due to the Project traffic in 2017 and result in a negligible 0.3 dBA increase in daytime $L_{Aeq(15\ hour)}$ traffic noise levels. The night-time cumulative 2017 traffic is predicted to increase by approximately 6% due to the Project traffic in 2017 traffic and result in a negligible 0.2 dBA increase in night-time $L_{Aeq(9\ hour)}$ traffic noise levels. Hence, the relative increase in traffic noise arising from the Project in 2017 in comparison to the 2017 forecasts without the Project is predicted to be less than 2 dBA which, in accordance with the RNP, represents a minor impact that is considered barely perceptible.

The cumulative 2017 traffic has been used to estimate the nominal minimum offset distances from the centre of Ulan Road required to meet the daytime and night-time total traffic noise criteria (refer **Table 40**) as presented in **Table 45**.

Based on the off-set distances presented in **Table 45**, three residential dwellings in the study area (i.e. numbers 6, 11 and 13) are within 62 m of Ulan Road and therefore likely to receive night-time $L_{Aeq(9hour)}$ traffic noise levels above the total traffic noise criterion of 55 dBA due to the predicted cumulative 2017 traffic excluding the Project traffic. Two residential dwellings in the study area (i.e. numbers 6 and 13) are within 36 m of the Ulan Road and therefore likely to receive daytime $L_{Aeq(15hour)}$ traffic noise levels above the total traffic noise criterion of 60 dBA due to the cumulative 2017 traffic excluding the Project traffic 2017.

Based on the off-set distances presented in **Table 45** for the cumulative 2017 traffic plus the Project, no additional dwellings are predicted to exceed the total road traffic noise criteria due to the Project traffic in 2017 within the study area.

10.3.2 Traffic Noise - Cumulative 2024 plus Project

The daytime cumulative 2024 traffic is predicted to increase by approximately 21% due to the Project traffic in 2024 and result in a negligible 0.8 dBA increase in daytime $L_{Aeq(15\ hour)}$ traffic noise levels. The night-time cumulative 2024 traffic is predicted to increase by approximately 25% due to the Project traffic in 2024 and result in a negligible 1 dBA increase in night-time $L_{Aeq(9\ hour)}$ traffic noise levels. Hence, the relative increase in traffic noise arising from the Project in 2024 in comparison to that forecast without the Project is predicted to be less than 2 dBA which, in accordance with the RNP, represents a minor impact that is considered barely perceptible.

The cumulative 2024 traffic has been used to estimate the nominal minimum offset distances from the centre of Ulan Road required to meet the daytime and night-time total traffic noise criteria (refer **Table 40**) as presented in **Table 45**.

Based on the off-set distances presented in **Table 45**, a total of three residential dwellings in the study area (i.e. numbers 6, 11 and 13) are within 50.5 m of Ulan Road and therefore likely to receive night-time $L_{Aeq(9hour)}$ traffic noise levels above the total traffic noise criterion of 55 dBA due to the predicted cumulative 2024 traffic excluding the Project traffic. Two residential dwellings in the study area (i.e. numbers 6 and 13) are within 31.5 m of Ulan Road and therefore likely to receive daytime $L_{Aeq(15hour)}$ traffic noise levels above the total traffic noise criterion of 60 dBA due to the cumulative 2024 traffic excluding the Project traffic.

Based on the off-set distances presented in **Table 45**, for the cumulative 2024 traffic plus the Project, no additional dwellings are predicted to exceed the total road traffic noise criteria due to the Project traffic in 2024 within the study area.

11 RAIL TRAFFIC NOISE ASSESSMENT

As discussed in **Section 3.3**, the Project involves an extension of the approved mine life by approximately seven years. In this context, while there would be no change to currently approved rail movements or rail loading hours at Wilpinjong Coal Mine, it is appropriate to consider the potential off-site rail transport cumulative noise impact for the extended period of mine life.

11.1 Rail Traffic Generating Developments Noise Assessment Criteria

The Australian Rail Track Corporation (ARTC) operates the Hunter Valley Rail Network in NSW and the extent of the network is shown in the Hunter Valley Network Corridor Diagram attached as **Appendix Q1**. Noise emissions from the ARTC's railways are regulated via their EPL No 3142, revision date 26 February 2014 (refer **Appendix Q2**).

In addition, Appendix 2 of the EPA RING (EPA, May 2013) specifies noise assessment requirements for land use developments other than rail infrastructure projects (i.e. mining and extractive industries) that are likely to generate additional rail traffic on an existing rail network (i.e. the Project) with potential noise impacts (refer **Appendix Q3**).

As a result, the rail noise assessment criteria from the ARTC's EPL and EPA's RING (Appendix 2) are now similar and the Project has been assessed against the requirements of the RING (Appendix 2). The rail noise assessment trigger levels are reproduced in **Table 46**.

Table 46 RING (Appendix 2) Rail Noise Assessment Trigger Levels

Railway	Descriptor	Rail Noise Assessment Trigger Levels
Main North, Merriwa and Gulgong to Sandy Hollow lines	Daytime/evening $L_{Aeq(15hour)}$	65 dBA
	Night-time $L_{Aeq(9hour)}$	60 dBA
	Maximum Pass-by L_{Amax} (95th percentile)	85 dBA

Note: 95th percentile equates to the 5% exceedance value.

The following rail noise assessment considers train movements along the Gulgong to Sandy Hollow railway line and in particular any rail noise impacts at the nearest privately owned receivers in the vicinity of the Project as shown in **Table 47**.

Table 47 Nearest Potentially Affect Receivers to Gulgong to Sandy Hollow Railway Line

Locality	Number of Receivers (ID)[1]	Offset Distance to Railway
East of Wilpinjong Coal Mine	7 (903 to 952)	900 m to 1,785 m
North-east of Wilpinjong Coal Mine	3 (102, 160A and 160B)	535 m to 4,415 m

Note 1: Refer **Section 3.2** and **Appendix C3**.

As discussed in **Section 5.4**, in accordance with the VLAMP, a consent authority is unable to grant voluntary mitigation and acquisition rights to reduce rail noise impacts on the public rail network.

11.2 Rail Traffic

It is noted that the Bylong Coal Project is a mining proposal that has not yet been approved, but may in the future be approved. It would contribute additional rail movements (i.e. some 6.5 Mtpa of thermal coal) on the Gulgong to Sandy Hollow Railway, east of Bylong.

Given the Project would only continue the existing approved Wilpinjong Coal Mine rail movements for a longer time period, the following assessment predicts rail noise levels at receivers located on the Gulgong to Sandy Hollow Railway between Wilpinjong and Bylong, and therefore does not include consideration of estimated rail movements for the proposed Bylong Coal Project.

11.2.1 Gulgong to Sandy Hollow Railway - Scenario 1

The existing, approved, operating and proposed daytime, night-time and 24 hour train movements are presented in **Table 48** together with the estimated operating conditions whilst travelling on the Gulgong to Sandy Hollow Railway. The Scenario 1 train movement analysis assumes that the existing, approved and proposed Cobbora, Ulan, Moolarben and Wilpinjong coal mines operate within approved capacities and the cumulative coal train movements are constrained by the existing railway capacity and shared proportionally between the operating mines.

Table 48 Gulgong to Sandy Hollow Railway Train Movements[1] - Scenario 1 Constrained

Status	Train Type	Train Movements						Train Length (m)	Train Speed (km/h)
		Daytime		Night-time		24 Hours			
		Mean	Peak	Mean	Peak	Mean	Peak		
Existing	Passenger	0	0	0	0	0	0	-	-
	Freight	2	2	0	0	2	2	850	60
Approved Mine	Cobbora Coal Project	10	11	2	3	12	14	1543	60
Operating Mines	Ulan Continued Operations[2]	9	14	5	6	14	20	1543	60
	Moolarben Stage 1 & Stage 2[3]	7	7	3	3	10	10	1543	60
	Wilpinjong Coal Project[4]	9	14	3	6	12	20	1543	60
Proposed Mine	Moolarben UG1 Reconfiguration	3	6	1	2	4	8	1543	60
Cumulative Existing + Approved/Operating/Proposed Mines		40	54	14	20	54	74		
Scheduled Maximum Coal Train Pathways[5]		-	-	-	-	42	42		
Capacity for Contracted/Prospective Volume[6]		-	-	-	-	36	36		
Cumulative Existing + Constrained Approved/ Operating/Proposed Mines[7]		28	28	10	10	38	38		

Note 1: Two movements equals one arrival and departure of a single train.
Note 2: Ulan Coal Continued Operations Noise and Vibration Assessment, Wilkinson Murray Pty Ltd, 2009.
Note 3: Moolarben Coal Project Environmental Assessment Report, Wells Environmental Services, 2009.
Note 4: Wilpinjong Coal Mine 75W Modification Noise Impact Assessment, Heggies Pty Ltd, 2010.
Note 5: ARTC Master Train Plan Gulgong to Muswellbrook and Muswellbrook to Gulgong dated 22 June 2014.
Note 6: ARTC Hunter Valley Corridor Capacity Strategy 2015-2025 dated July 2015 Table 10 and Table 12.
Note 7: Existing freight and passenger trains excluded from constraint.

11.2.2 Gulgong to Sandy Hollow Railway - Scenario 2

The Scenario 2 train movement analysis, presented in **Table 49**, assumes that the existing and approved Cobbora, Ulan, Moolarben and Wilpinjong mines operate at approved capacities and the cumulative coal train movements are unconstrained by the existing railway capacity.

Table 49 Gulgong to Sandy Hollow Railway Train Movements[1] - Scenario 2 Unconstrained

Status	Train Type	Train Movements						Train Length (m)	Train Speed (km/h)
		Daytime		Night-time		24 Hours			
		Mean	Peak	Mean	Peak	Mean	Peak		
Existing	Passenger	0	0	0	0	0	0	-	-
	Freight	2	2	0	0	2	2	850	60
Approved Mine	Cobbora Coal Project	10	11	2	3	12	14	1543	60
Operating Mines	Ulan Continued Operations[2]	9	14	5	6	14	20	1543	60
	Moolarben Stage 1 & Stage 2[3]	7	7	3	3	10	10	1543	60
	Wilpinjong Coal Project[4]	9	14	3	6	12	20	1543	60
Proposed Modification	Moolarben UG1 Reconfiguration	3	6	1	2	4	8	1543	60
Cumulative Existing + Unconstrained Approved/ Operating/Proposed Mines[5]		40	54	14	20	54	74		

Note 1: Two movements equals one arrival and departure of a single train.
Note 2: Ulan Coal Continued Operations Noise and Vibration Assessment, Wilkinson Murray Pty Ltd, 2009.
Note 3: Moolarben Coal Project Environmental Assessment Report, Wells Environmental Services, 2009.
Note 4: Wilpinjong Coal Mine 75W Modification Noise Impact Assessment, Heggies Pty Ltd, 2010.
Note 5: Existing freight and passenger trains excluded from constraint.

11.3 Noise Modelling Methodology

The calculation of the daytime and night-time equivalent continuous noise levels and the maximum pass-by levels have been conducted using the Nordic Rail Prediction Method (1984) with corrections for NSW trains (SLR, 2013). The noise predictions from the modified method have been previously accepted by proponents, the NSW EPA and NSW DP&E.

The prediction model uses characteristic noise levels for the various sources (locomotive engine and exhaust noise as a function of throttle notch, wheel/rail noise as a function of train speed, and wagon type, etc) at a fixed reference distance. The model then makes adjustments for the train length, distance from the track (assuming no barriers), angle of view (assuming 180 degrees) and facade reflection. Parameters including the daytime $L_{Aeq(15hour)}$, night-time $L_{Aeq(9hour)}$ and maximum (5% exceedance) pass-by level, can then be determined by summing the effects of the individual noise sources and by incorporating the number of train events.

Note, the model assumes no intervening structures (i.e. existing topography, buildings and the like), therefore, the predicted noise levels are indicative and in some cases likely to be higher than what would actually occur at some receiver distances.

11.4 Predicted Gulgong to Sandy Hollow Railway Noise

11.4.1 Cumulative Constrained Daytime and Night-time Operations - Scenario 1

The predicted daytime and night-time $L_{Aeq(15hour)}$ and maximum (5% exceedance) pass-by noise levels for the cumulative constrained rail traffic (refer **Table 48)** are presented in **Table 50** with the train movements considered on an average and peak basis.

Table 50 Cumulative Constrained Daytime and Night-time Rail Traffic Noise (dBA re 20 µPa)

Distance to Receiver	Daytime Existing + Constrained Cumulative Approved/Operating/Proposed Mines			Night-time Existing + Constrained Cumulative Approved/Operating/Proposed Mines		
	Average $L_{Aeq(15hour)}$	Peak $L_{Aeq(15hour)}$	Pass-by Maximum	Average $L_{Aeq(9hour)}$	Peak $L_{Aeq(9hour)}$	Pass-by Maximum
30 m	65	65	89	63	63	87
60 m	62	62	86	60	60	84
90 m	60	60	84	58	58	82
120 m	59	59	82	57	57	80
150 m	58	58	81	56	56	79

Note 1: Train movements are considered on an average and peak basis.

The following assessments are derived from the predicted daytime rail traffic noise levels:

- The cumulative constrained average $L_{Aeq(15hour)}$ rail noise level meets the 65 dBA criterion at a distance of 28 m (and greater).
- The cumulative constrained peak $L_{Aeq(15hour)}$ rail noise meets the 65 dBA criterion at a distance of 28 m (and greater).
- The cumulative constrained maximum pass-by noise level would remain unchanged and would continue to meet the criterion of 85 dBA at a distance of 61 m (and greater).

The following assessments are derived from the predicted night-time rail traffic noise levels:

- The cumulative constrained average $L_{Aeq(9hour)}$ rail noise level meets the 60 dBA criterion at a distance of 53 m (and greater).
- The cumulative constrained peak $L_{Aeq(9hour)}$ rail noise meets the 60 dBA criterion at a distance of 53 m (and greater).

- The cumulative constrained maximum pass-by noise level would remain unchanged and would continue to meet the criterion of 85 dBA at a distance of 40 m (and greater).

All privately owned receivers in the vicinity of the Project are located well beyond 61 m from the Gulgong to Sandy Hollow railway line (i.e. minimum of 500 m from the railway).

11.4.2 Cumulative Unconstrained Daytime and Night-time Operations - Scenario 2

The predicted daytime and night-time $L_{Aeq(15hour)}$ and maximum (5% exceedance) pass-by noise levels for the cumulative unconstrained rail traffic (refer **Table 48)** are presented in **Table 51** with the train movements considered on an average and peak basis.

Table 51 Cumulative Unconstrained Daytime and Night-time Rail Traffic Noise (dBA re 20 µPa)

Distance to Receiver	Daytime Existing + Unconstrained Cumulative Approved/Operating/Proposed Mines			Night-time Existing + Unconstrained Cumulative Approved/Operating/Proposed Mines		
	Average $L_{Aeq(15hour)}$	Peak $L_{Aeq(15hour)}$	Pass-by Maximum	Average $L_{Aeq(9hour)}$	Peak $L_{Aeq(9hour)}$	Pass-by Maximum
30 m	67	68	89	64	66	87
60 m	64	65	86	61	63	84
90 m	62	63	84	60	61	82
120 m	61	62	82	58	60	80
150 m	60	61	81	57	59	79

Note 1: Train movements are considered on an average and peak basis.

The following assessments are derived from the predicted daytime rail traffic noise levels:

- The cumulative unconstrained average $L_{Aeq(15hour)}$ rail noise level meets the 65 dBA criterion at a distance of 40 m (and greater).
- The cumulative unconstrained peak $L_{Aeq(15hour)}$ rail noise meets the 65 dBA criterion at a distance of 54 m (and greater).
- The cumulative unconstrained maximum pass-by noise level would remain unchanged and would continue to meet the criterion of 85 dBA at a distance of 61 m (and greater).

The following assessments are derived from the predicted night-time rail traffic noise levels:

- The cumulative unconstrained average $L_{Aeq(9hour)}$ rail noise level meets the 60 dBA criterion at a distance of 73 m (and greater).
- The cumulative unconstrained peak $L_{Aeq(9hour)}$ rail noise meets the 60 dBA criterion at a distance of 105 m (and greater).
- The cumulative unconstrained maximum pass-by noise level would remain unchanged and would continue to meet the criterion of 85 dBA at a distance of 40 m (and greater).

All privately owned receivers in the vicinity of the Project are located well beyond 105 m from the Gulgong to Sandy Hollow railway line (i.e. minimum of 500 m).

11.5 Summary Impact Assessment

In accordance with the requirements of the RING Appendix 2 (refer **Appendix Q3**), where the cumulative rail noise level exceeds the noise assessment trigger levels and project related noise increases greater than 0.5 dBA are predicted, all feasible and reasonable noise mitigation measures should be implemented. However, the Project does not involve any change to currently approved rail movements or rail loading hours at the Wilpinjong Coal Mine and therefore there are no rail related noise level increases (i.e. less than 0.5 dBA) at the nearest privately owned receivers in the vicinity of the Project. Furthermore, the nearest privately owned receivers are a minimum of 500 m from the railway and are located well beyond any cumulative rail noise affected areas for daytime and night-time rail movements on an average, peak and maximum pass-by basis.

Notwithstanding the foregoing, there remains some concern in the community about potential noise increases on the greater rail network as a result of increased coal haulage, but the EPA acknowledges that a strategic approach is needed to the assessment and management of noise generated on the rail network. The management of coal transportation by rail is the responsibility of the ARTC and is regulated by EPL 3142. Similarly, rail freight operators are responsible for maintaining their fleets to ensure consistency with operational standards. The ARTC is committed to developing and funding a noise abatement program, similar to that operated by the Roads and Maritime Services. Such a program has yet to be implemented but would help meet the objectives of the ARTC EPL to progressively reduce noise levels at potentially affected residential properties.

12 SUMMARY OF FINDINGS

12.1 Noise Assessment Criteria

12.1.1 Operating Assessment Criteria

The NSW EPA has regulatory responsibility for the control of noise from “scheduled premises” under the *Protection of the Environment Operations Act 1997*. In implementing the INP, the EPA has two broad objectives.

- Controlling intrusive noise levels in the short-term; and
- Maintaining noise amenity levels for particular land uses over the medium to long-term.

In accordance with the INP’s Chapter 2 Industrial Noise Criteria and associated Application Notes (12 June 2013), the PSNLs for the residential and other localities in the vicinity of the Wilpinjong Coal Mine are presented in **Table 52** for both intrusive noise and amenity. These criteria are nominated for the purposes of assessing potential noise impacts from the Project.

Table 52 Project Specific Noise Levels and Assessment Criteria (dBA re 20 µPa)

Locality	Land Use	Intrusive $L_{Aeq(15minute)}$[1]			Amenity $L_{Aeq(period)}$[1]		
		Day	Evening	Night	Day	Evening	Night
Wollar Village	Rural Residential[2]	36	35	35	50	45	40
Other Privately Owned Land	Rural Residential[2]	35	35	35	50	45	40
Any	School[3]	Intrusive noise criteria not applicable			External 45 when in use		
Any	Church, Hall[3]	Intrusive noise criteria not applicable			External 50 when in use		
Any	Passive Recreation	Intrusive noise criteria not applicable			External 50 when in use		

Note 1: Daytime 0700 hours to 1800 hours, Evening 1800 hours to 2200 hours, Night-time 2200 hours to 0700 hours.
Note 2: At the most-affected point within 30 m of the residential area.
Note 3: Internal criteria equivalent to external criteria minus 10 dBA.

The INP states that the PSNLs have been selected to preserve the amenity of at least 90% of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90% of the time. Provided the PSNLs are achieved, then most people would consider the resultant noise levels acceptable. In those cases where the PSNLs are not achieved, it does not automatically follow that all people exposed to the noise would find the noise unacceptable.

12.1.2 Sleep Disturbance Assessment Criteria

The INP Application Notes dated 12 June 2013 (**Appendix F**) suggest that the $L_{A1(1minute)}$ level of 15 dBA above the RBL is a suitable criterion for assessing sleep disturbance for the night-time period. The Project night-time $L_{A1(1minute)}$ SDNLs are presented in **Table 53** together with the comparable approved $L_{A1(1minute)}$ noise limit.

Table 53 Night-time LA1(1minute) Sleep Disturbance Noise Levels (dBA re 20 µPa)

Locality	Wilpinjong $L_{A1(1minute)}$ Night-time[1] Limit	Project $L_{A1(1minute)}$ Night-time[1] Criteria
Wollar Village	45	45
Other Privately Owned Land	45	45

Note 1: Monday to Saturday 2200 hours to 0700 hours; Sundays and Public Holidays 2200 hours to 0800 hours.

12.1.3 INP Assessable Meteorological Conditions

An assessment of the Site Meteorological Environment was prepared and is presented in **Appendix E** based on the analysis of the wind velocity and temperature gradients derived from the on-site AWS and PTT. The INP assessable meteorological noise modelling parameters are presented in **Table 11**.

12.1.4 Noise Impact Assessment Methodology

Table 54 presents the generalised methodology for assessing the Project operating noise levels against the intrusive and amenity PSNLs (**Table 17**) and the $L_{A1(1minute)}$ SDNLs (**Table 18**) together with cumulative amenity noise levels (**Table 16**) for assessing operating noise levels from existing, approved and proposed mining developments in the vicinity of the Project. The DP&E's SEARs for the Project (refer **Section 1.2**) reference the VLAMP and the amenity criteria are also used to determine any need for acquisition rights over vacant land as further discussed in **Section 5.4**.

Table 54 Project and Cumulative Noise Impact Assessment Methodology (dBA re 20 µPa)

Receiver Land Use	Assessment Parameter	Assessment Criteria	Noise Management Zone[1]		Affectation Zone[2]
			Negligible	Marginal to Moderate	Significant
Project affected residential dwellings	PSNL Intrusive	RBL plus 5 dBA	1 to 2 dBA above assessment criteria	3 to 5 dBA above assessment criteria	> 5 dBA above assessment criteria
	PSNL Amenity	INP acceptable			
	SDNL $L_{A1(1minute)}$	RBL plus 15 dBA			
Project affected vacant land	PSNL Amenity	INP acceptable	Not applicable	Not applicable	> 5 dBA above assessment criteria[3]
All industrial affected residential dwellings	Cumulative Amenity Level	INP acceptable	1 to 2 dBA above assessment criteria	3 dBA above assessment criteria	> 3 dBA above assessment criteria

Note 1: Noise Management Zone - depending on the range of exceedance of the PSNL and or SDNL assessment parameters, potential project noise impacts range from negligible to moderate in accordance with the VLAMP.

Note 2: Noise Affectation Zone - noise exceedances greater than 5 dBA above the PSNL and or SDNL assessment parameters may result in significant project noise impacts in accordance with the VLAMP.

Note 3: Noise Affectation Zone - equivalent to a noise exceedance of the INP's maximum noise amenity level on more than 25% of any privately owned vacant land, and a dwelling could be built on that vacant land under existing planning controls in accordance with the VLAMP.

12.1.5 Noise Mitigation and Management Measures

The noise mitigation and management measures for the existing Wilpinjong Coal Mine and the Project are detailed **Section 6.4**. WCPL is obligated to manage noise levels from the existing Wilpinjong Coal Mine in accordance with the noise limits specified in Project Approval 05-0021 using reasonable and feasible mitigation measures. This has been achieved through a combination of the following:

- Property acquisition which has had the effect of reducing the number of privately owned receivers that could potentially be affected by noise impacts from Wilpinjong operations.
- For the remaining privately owned receivers, the implementation of the noise management strategy as per the NMP, including the use of real-time noise monitoring and response protocols (i.e. standing down of equipment) as required to manage noise levels during the night.

WCPL would continue to meet its obligation to comply with the noise limits specified in an approval for the Project through the continued implementation of the noise management strategy and any resulting updates to the NMP. This would include WCPL adopting a range of reasonable noise control and management measures (including the potential use of low noise mobile equipment, mobile equipment stand-downs, mine operational management or the efficient combination of these controls) to appreciably reduce noise emissions from the Project in Wollar village and/or property acquisition. On this basis, the noise modelling for the Project incorporates the use of low noise mobile equipment and real-time noise controls (e.g. equipment stand-downs) under particular adverse meteorological conditions in accordance with this commitment.

12.2 Project and Cumulative Noise Exceedances and Impact Assessment Summary

12.2.1 Privately Owned Receivers, Community Facilities and Rural Vacant Land

The summary of noise exceedances of the relevant consented noise limits, PSNLs, SDNLs, and INP's maximum noise amenity levels are presented in **Table 55** for privately owned receivers, community facilities and rural vacant land.

Table 55 Summary of Exceedances at Privately Owned Receivers, Community Facilities and Vacant Land[1]

Exceedance Range	Intrusive $L_{Aeq(15minute)}$	Sleep Disturbance $L_{A1(1minute)}$	Amenity $L_{Aeq(period)}$ (i.e. school, hall, church)
Consented Noise Limits	903 Hardiman & Hogan, 908 Lynch, 914 Nicod, 921 Toombs, 933 Faulkner, 942 Schneider, 952 O'Hara, 102 Filipczyk	Nil	Nil
Exceedance Range	1 to 2 dBA above PSNL	3 to 5 dBA above PSNL	> 5 dBA above PSNL
Intrusive $L_{Aeq(15minute)}$	903 Hardiman & Hogan, 908 Lynch, 914 Nicod, 921 Toombs, 933 Faulkner, 942 Schneider, 952 O'Hara	102 Filipczyk	Nil
Exceedance Range	1 to 2 dBA above SDNL	3 to 5 dBA above SDNL	> 5 dBA above SDNL
Sleep Disturbance $L_{A1(1minute)}$	Nil	Nil	Nil
Exceedance Range	1 to 2 dBA above PSNL	3 to 5 dBA above PSNL	> 5 dBA above PSNL
Amenity $L_{Aeq(period)}$	Nil	Nil	Nil
Exceedance Range	1 to 2 dBA above INP Acceptable	3 dBA above INP Acceptable	> 3 dBA above INP Acceptable
Cumulative Amenity $L_{Aeq(period)}$	Nil	Nil	Nil
Exceedance Range	1 to 5 dBA above PSNL		> 5 dBA above PSNL
Vacant Land Amenity $L_{Aeq(period)}$	Nil	Nil	Nil

Note 1: Refer **Section 3.2** and **Appendix C3**.

12.2.2 Project Operating Intrusive Noise Levels and Impact Summary

The predicted daytime, evening and night-time intrusive $L_{Aeq(15minute)}$ noise levels and night-time maximum $L_{A1(1minute)}$ noise levels for the 2018, 2020, 2024, 2028 and 2031 operating scenarios show:

- No exceedances of the PSNLs (or the consented noise limits) are predicted at any privately owned receivers during the day (**Table 24**);
- No exceedances of the PSNL of 35 dBA (or the consented noise limits) are predicted at any privately owned receivers during the evening (**Table 25**) except for negligible exceedances (1 to 2 dBA) at receiver 102 Filipczyk (2028) and at all seven privately owned receivers in Wollar in various years (903 Hardiman & Hogan, 908 Lynch, 914 Nicod, 921 Toombs, 933 Faulkner, 942 Schneider and 952 O'Hara);
- No exceedances of the PSNL of 35 dBA (or the consented noise limits) are predicted at any privately owned receivers during the night-time (**Table 26**) except for a negligible exceedance (1 dBA) at receiver 942 Schneider (2020) and a marginal to moderate exceedance (3 dBA) at receiver 102 Filipczyk (2028); and
- No exceedances of the SDNLs (or the consented noise limits) are predicted at any privately owned receivers during the night-time (**Table 27**).

Given the above, eight privately owned receivers (102 Filipczyk, 903 Hardiman & Hogan, 908 Lynch, 914 Nicod, 921 Toombs, 933 Faulkner, 942 Schneider, and 952 O'Hara) have been identified as being in the Noise Management Zone due to the Project. No receivers were identified as being in the Noise Affectation Zone.

12.2.3 Project Operating Amenity Noise Levels and Impact Summary

The predicted daytime, evening and night-time $L_{Aeq(period)}$ noise amenity levels for the 2018, 2020, 2024, 2028 and 2031 operating scenarios show:

- No exceedances of the amenity PSNL (**Table 17**) at any privately owned receivers during the daytime, evening and night-time (**Table 29**); and
- No exceedances of the amenity PSNL (**Table 17**) at any community facilities in Wollar during the daytime, evening and night-time (**Table 29**).

Given the above, no privately owned receivers or community facilities have been identified as being in the Noise Management Zone or Noise Affectation Zone due to the Project based on predicted noise amenity levels.

12.2.4 Cumulative Mine Operating Amenity Noise Levels and Impact Summary

The predicted evening and night-time $L_{Aeq(period)}$ noise amenity levels for the 2018, 2020, 2024, 2028 and 2031 operating scenarios show:

- No exceedances of the INP acceptable amenity PSNL (**Table 16**) at any privately owned receivers during the evening and night-time (**Table 31** and **Table 32**); and
- No exceedances of the INP acceptable amenity PSNL (**Table 16**) at any community facilities in Wollar during the evening and night-time (**Table 31** and **Table 32**).

Given the above, no privately owned receivers or community facilities have been identified as being in the Noise Management Zone or Noise Affectation Zone due to the Project based on predicted cumulative noise amenity levels.

12.3 Blasting Impact Assessment

12.3.1 Privately Owned Receivers, Community Facilities and Historical Heritage Sites in Wollar

Blast emissions were predicted at the nearest privately owned receivers, community facilities and historical heritage sites in Wollar from the Project extension areas (refer **Appendix D2**) for a typical upper overburden MIC 3,900 kg, a mean overburden MIC 1,350 kg and a lower overburden MIC 100 kg. The predicted ground vibration and airblast emissions are presented in **Table 36** for privately owned receivers in the vicinity of the Wilpinjong Coal Mine, community facilities (i.e. school, churches and community hall) and historical heritage sites in Wollar.

Based on an upper overburden MIC 3,900 kg, the relevant human comfort and building damage ground vibration and airblast criteria are not predicted to be exceeded at any privately owned receivers, community facilities or historical heritage sites in Wollar.

12.3.2 Proximal Livestock, Archaeological/Geological and Aboriginal Heritage Sites and Infrastructure

Blast emissions were predicted at the nearest livestock, archaeological/geological and potentially sensitive Aboriginal heritage sites and infrastructure from the Project extension areas (refer **Appendix D2**) for a typical upper overburden MIC 3,900 kg, a mean overburden MIC 1,350 kg and a lower overburden MIC 100 kg. The predicted ground vibration and airblast emissions are presented in **Table 37** for livestock, archaeological/geological and Aboriginal heritage sites and road and rail infrastructure.

Based on an upper overburden MIC 3,900 kg, the relevant ground vibration criteria for livestock, archaeological/geological and Aboriginal heritage sites and infrastructure are predicted not to be exceeded, except at some of the nearest Aboriginal heritage rock shelter sites and at the adjacent railway line. In order to mitigate potential blast impacts to these areas, the predicted vibration safe working distances are presented in **Table 56**.

Table 56 Generalised Predicted Safe Working Distances

Blast MIC[1]	Historical Sensitive/ Heritage Vibration[2] 12.5 mm/s	Public Infrastructure (ETLs) Vibration[2] 50 mm/s	Roadway Culvert Vibration[2] 80 mm/s	Railway Line/Loop Vibration[2] 100 mm/s	Archaeological/ Geological Structure Vibration[2] 250 mm/s	Stockyard Livestock Vibration[2] 200 mm/s	Stockyard Livestock Airblast[2] 125 dBLpk
Typical Overburden Blast Design							
3,900 kg	1552 m (5%)	399 m (5%)	250 m (5%)	201 m (5%)	82 m (5%)	102 m (5%)	3103 m (5%)
1,350 kg	913 m (5%)	235 m (5%)	147 m (5%)	118 m (5%)	49 m (5%)	60 m (5%)	2179 m (5%)
100 kg	249 m (5%)	64 m (5%)	40 m (5%)	33 m (5%)	14 m (5%)	17 m (5%)	915 m (5%)

Note 1: MIC - Maximum Instantaneous Charge (kg).

Note 2: The distance from the blast where the vibration velocity or airblast level is predicted to meet the relevant criteria.

12.4 Road Traffic Noise Assessment

12.4.1 Traffic Noise Criteria

Ulan Road is classified as a main road (MR 208/214) (GTA Consultants, 2015), which is essentially a sub-arterial road. The RNP and associated Application Notes dated 12 June 2013 (refer **Appendix P**) is the relevant policy for the assessment of road noise in NSW. The RNP adopts a classification scheme for assessing noise impacts on an existing road network from additional traffic generated by the increased workforce being sought by the Project as presented in **Table 57**.

Table 57 Road Traffic Noise Assessment Criteria for Residential Land Uses (dBA re 20 µPa)

Road	Type of Project and Land Use	Total Traffic Noise Criteria[1]	Relative Increase Criteria[1]
Ulan Road	Land use developments generating additional traffic on existing sub-arterial roads	Daytime 60 $L_{Aeq(15hour)}$	Existing $L_{Aeq(15hour)}$ plus 12 dBA
		Night-time 55 $L_{Aeq(9hour)}$	Existing $L_{Aeq(9hour)}$ plus 12 dBA

Note 1: Daytime 0700 hours to 2200 hours, Night-time 2200 hours to 0700 hours.

12.4.2 Traffic Noise - Cumulative 2017 plus Project

The relative increase in traffic noise arising from the Project in 2017 in comparison to that forecast without the Project is predicted to be less than 2 dBA which, in accordance with the RNP, represents a minor impact that is considered barely perceptible.

12.4.3 Traffic Noise - Cumulative 2024 plus Project

The relative increase in traffic noise arising from the Project in 2024 in comparison to that forecast without the Project is predicted to be less than 2 dBA which, in accordance with the RNP, represents a minor impact that is considered barely perceptible.

12.5 Rail Traffic Noise Assessment

In accordance with the requirements of the RING Appendix 2 (refer **Appendix Q3**), where the cumulative rail noise level exceeds the noise assessment trigger levels and project related noise increases greater than 0.5 dBA are predicted, all feasible and reasonable noise mitigation measures should be implemented. However, the Project does not involve any change to currently approved rail movements or rail loading hours at the Wilpinjong Coal Mine and therefore there are no rail related noise level increases (i.e. less than 0.5 dBA) at the nearest privately owned receivers in the vicinity of the Project. Furthermore, the nearest privately owned receivers are a minimum 500 m from the railway, and are located well beyond any cumulative rail noise affected areas for daytime and night-time rail movements on an average, peak and maximum pass-by basis.

The management of coal transportation by rail is the responsibility of the ARTC and is regulated by EPL 3142. Similarly, rail freight operators are responsible for maintaining their fleets to ensure consistency with operational standards. The ARTC is committed to developing and funding a noise abatement program, similar to that operated by the Roads and Maritime Services. Such a program has yet to be implemented but would help meet the objectives of the ARTC EPL to progressively reduce noise levels at potentially affected residential properties.

13 REFERENCES

- Annual Review and Environmental Management Report 2014 (WCPL, 2015)
- Australian Rail Track Corporation Environment Protection Licence No 3142 (EPA, 2014)
- Assessing Vibration: A Technical Guideline (DEC, 2006)
- Australian Standard (AS) 2187: Part 2-2006 *Explosives - Storage and Use - Part 2: Use of Explosives*
- Blast Vibration Monitoring and Control (Dowding, 1985)
- British Standard 7385: Part 2-1993 *Evaluation and Measurement for Vibration in Buildings Part 2. Guideline to damage levels from ground borne vibration*
- Environmental Criteria for Road Traffic Noise (EPA, 1999)
- German Standard DIN 4150-3:1999 *Structural Vibration Part 3: Effects of vibration in structures*

- Hunter Valley Corridor Capacity Strategy 2015-2025 (ARTC, 2015)
- Interim Construction Noise Guideline (EPA, 2009)
- Master Train Plan Gulgong to Muswellbrook and Muswellbrook to Gulgong (ARTC, 2014)
- Moolarben Coal Project Environmental Assessment Report (Wells Environmental Services, 2009)
- Nordic Rail Prediction Method (1984) with corrections for NSW trains (SLR, 2013)
- NSW Industrial Noise Policy (EPA, 2000)
- NSW Road Noise Policy (DECCW, 2011)
- Protection of the Environment Operations Act 1997
- Rail Infrastructure Noise Guideline (EPA, 2013)
- Responses of Farm Animals to Sonic Booms (Casaday and Lehmann, 1967)
- Renzo Tonin Associates Environmental Noise Model (RTA, Version 3.06)
- *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZEC, 1990)
- Technical Paper - A simple outdoor criterion for assessment of low frequency noise emission (Broner, 2011)
- Ulan West Modification (MOD 3) Environmental Assessment (Umwelt, 2015)
- Ulan Coal Continued Operations Project Environmental Assessment Appendix 12 (Umwelt, 2009)
- Ulan Coal Continued Operations Noise and Vibration Assessment (Wilkinson Murray, 2009)
- Vibration Effects in Transported Cattle (Report 10-4250-R3 Heggies, 2006)
- Voluntary Land Acquisition and Mitigation Policy: For State Significant Mining, Petroleum and Extractive Industry Developments (NSW Government, 2014)
- Warkworth Continuation Project (SSD-6464) Environmental Assessment Report (DP&E, 2015)
- Warkworth Continuation 2014 Acoustics Review (Broner, 2015)
- WCPL Environment Protection Licence No 12425 (EPA, 2014)
- WCPL Environment Protection Licence No 12425 Monitoring Data Monthly Summary Reports (WCPL, 2014)
- WCPL Approval 05-0021 (as modified) (DP&I, 2006)
- WCPL Secretary's Environmental Assessment Requirements (DP&E, 2014)
- Wilpinjong Coal Project, Construction, Operation and Transportation Noise and Blasting Impact Assessment (Heggies, 2005)
- Wilpinjong Coal Mine 75W Modification Noise Impact Assessment (Heggies, 2010)
- Wilpinjong Coal Mine Modification, Noise and Blasting Impact Assessment (SLR, 2013)
- Wilpinjong Extension Project, Road Transport Assessment (GTA Consultants, 2015)
- Wilpinjong Modification 6 Noise and Blasting Impact Assessment (SLR, 2014)
- Wilpinjong Noise Management Plan (WCPL, 2014)
- Wilpinjong Blast Management Plan (WCPL, 2014)
- Wilpinjong Modification 6 Assessment Report (DP&E, 2014)

EXTRACT EPA REQUEST FOR SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Noise and Vibration

Potential impacts on the noise amenity of the surrounding area should be assessed in accordance with the NSW Government's Industrial Noise Policy (INP) and other relevant guidelines mentioned below, accounting for all noise sources associated with the project. In particular, seasonality assessments are to be undertaken to assess the impact of temperature inversions and wind conditions.

A noise and vibration impact assessment for both construction and operational scenarios should be undertaken as part of the EIS. The assessment should consider the issues outlined below, and identify noise mitigation measures to be implemented to meet project specific noise levels developed for the proposal.

The noise assessment must include (but not be limited to) an assessment of the C-weighted noise (low frequency) as well as A-weighted noise.

1. In relation to noise, the following matters should be addressed (where relevant) as part of the Environmental Assessment.

General

2. Construction noise associated with the proposed development should be assessed using the *Interim Construction Noise Guideline* (DECC, 2009).
   http://www.environment.nsw.gov.aulnoise/constructnoise.htm

3. Operational noise from all industrial activities (including private haul roads and private railway lines) to be undertaken on the premises must be assessed in accordance with the guidelines contained in the *NSW Industrial Noise Policy (EPA, 2000)* and *Industrial Noise Policy Application Notes*.
   http://www.environment.nsw.gov.aulnoise/industrial.htm

4. Vibration from all activities (including construction and operation) to be undertaken on the premises should be assessed using the guidelines contained in the *Assessing Vibration: a technical guideline* (DEC, 2006).
   http://www.environment.nsw.gov.au/noise/vibrationguide.htm

5. If blasting is required for any reasons during the construction or operational stage of the proposed development, blast impacts should be demonstrated to be capable of complying with the guidelines contained in *Australian and New Zealand Environment Council - Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC, 1990).
   http://www.environment.nsw.gov.au/noise/blasting.htm

Road

6. Noise on public roads from increased road traffic generated by land use developments should be assessed using the *NSW Road Noise Policy* (DECCW, 2011).
   http://www.environment.nsw.gov.au/noise/traffic.htm

7. Noise from new or upgraded public roads should be assessed using the *NSW Road Noise Policy* (DECCW, 2011).
   http://www.environment.nsw.gov.au/noise/traffic.htm

Rail

8. Noise from new or upgraded railways (other than railways on private premises) should be assessed using the *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (DECC, 2007).
   http://www.environment.nsw.gov.au/noise/railinfranoise.htm

EXTRACT EPA REQUEST FOR SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

9. Noise from increased rail traffic on the NSW Rail Network resulting from rail traffic generating development (e.g. an extractive industry) should be assessed using the *Environmental assessment requirements for rail traffic-generating developments* available at http://www.environment.nsw.gov.au/noise/railnoise.htm

10. The EIS needs to clearly document the ownership arrangements of the rail line from the development to the public system managed by ARTC or Rail Corp.

11. Noise from new or upgraded railways (other than railways on private premises) should be assessed using the *Rail Infrastructure Noise Guideline* (EPA, 2013). *http://www.environment.nsw.gov.au/noise/railnoise.htm*

12. Noise from increased rail traffic on the NSW Rail Network resulting from rail traffic generating development (e.g. an extractive industry) should be assessed using the guidance in Appendix 2 of the *Rail Infrastructure Noise Guideline* available at *http://www.environment.nsw.gov.au/noise/railnoise.htm*

13. Describe the noise monitoring system in detail, including the development and implementation of a monitoring program that:
    - uses a combination of predictive meteorological forecasting and real-time noise monitoring, supplemented with attended monitoring measures to evaluate the performance of the mine complex;
    - adequately supports the proactive and reactive noise management system on site;
    - includes a protocol for determining exceedances of the conditions imposed on the project;
    - evaluates and reports on the effectiveness of the noise management system on site;
    - provides for the annual validation of the noise model for the mine complex.

14. Describe the system that will be implemented to enable the community to access up-to-date information regarding the proposed blasting schedule.

Cumulative impacts

The EIS should provide an assessment of the cumulative impacts of the project during construction and operation of the proposal with regard to noise, air quality, water quality or waste Assessment of cumulative impacts must consider past, current and future activities in the area surrounding the project, impacts associated with internal components of this project (where relevant - e.g. a project involving construction throughout a precinct or similar), as well as the construction impacts of any projects recently completed.

EXTRACT MWRC REQUEST FOR SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

NOISE

The SEAR's should include a requirement that independent modelling be undertaken by NSW Environmental Protection Authority (EPA) and that suitable mitigation measures be identified to ensure that the mine has minimal impact on the village of Wollar and any sensitive noise receptors in the locality.

CUMULATIVE IMPACTS

The numerous modifications over the years have had a significant impact on the village of Wollar and a significant reduction in the number of residents. Wilpinjong has purchased a significant amount of land in the area to provide buffers zones around the mine and reduce the number of sensitive receivers. Council requests that the cumulative impact on all remaining sensitive receptors is adequately addressed to protect the amenity of residents in the locality.

EXTRACT PROJECT APPROVAL 05-0021 DATED 1 FEBRUARY 2006 (AS MODIFIED)

LIMITS ON APPROVAL

5. The Proponent may undertake mining operations on the site until 8 February 2027.

Note: Under this approval, the Proponent is required to rehabilitate the site and perform additional undertakings to the satisfaction of the Director-General and DRE. Consequently, this approval will continue to apply in all other respects other than the right to conduct mining operations until the site has been properly rehabilitated.

6. The Proponent shall not:
   (a) extract more than 16 million tonnes of ROM coal from the site in a calendar year; and
   (b) transport more than 12.5 million tonnes of product coal from the site in a calendar year.

7. The Proponent shall ensure that:
   (a) all product coal is transported from the site by rail;
   (b) no more than 10 laden trains leave the site on any one day; and
   (c) not more than 6 laden trains leave the site per day on average when calculated over any calendar year.

ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

NOISE

Noise Criteria

2. Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

Table 2: Noise Impact assessment criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1\ minute)}$
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	45
Wollar Village – Residential	36	35	35	45
All other privately owned land	35	35	35	45
901 – Wollar School	35(internal) 45 (external) When in use			-
150A – St Luke's Anglican Church 900 – St Laurence O'Toole Catholic Church	40 (internal) When in use			-
Goulburn River National Park/Munghorn Gap Nature Reserve	50 When in use			-

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 10 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- *To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and*
- *For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.*

Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

   If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID
69, 129, 135 and 137

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

Operating Conditions

4. The Proponent shall:
   (a) implement best management practice to minimise the operational, road, and rail noise of the project;
   (b) operate a comprehensive noise management system that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations, and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;
   (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
   (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
   (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
   (f) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,

   to the satisfaction of the Director-General.

Noise Management Plan

5. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
   (a) be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
   (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
   (c) describe the proposed noise management system in detail; and
   (d) include a monitoring program that:
      - evaluates and reports on:
        - the effectiveness of the noise management system;
        - compliance against the noise criteria in this approval; and
        - compliance against the noise operating conditions;
      - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this approval and trigger for further attended monitoring); and
      - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

EXTRACT PROJECT APPROVAL 05-0021 DATED 1 FEBRUARY 2006 (AS MODIFIED)

BLASTING

Blast Impact Assessment Criteria

6. The Proponent shall ensure that blasting on the site does not cause exceedances of the criteria in Table 4.

Table 4: Blasting impact assessment criteria

Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance
Residence on privately owned land	115	5	5% of the total number of blasts over a period of 12 months
	120	10	0%
All public infrastructure	-	50 *(or a limit determined by the structural design methodology in AS 2187.2-2006, or its latest version, or other alternative limit for public infrastructure, to the satisfaction of the Director-General)*	0%

However, these criteria do not apply if the Proponent has a written agreement with the relevant owner to exceed these criteria, and has advised the Department in writing of the terms of this agreement.

7. (deleted)

8. (deleted)

Blasting Hours

9. The Proponent shall only carry out blasting on the site between 9am and 5pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays, or at any other time without the written approval of the Director-General.

Blasting Frequency

10. The Proponent may carry out a maximum of:
(a) 2 blasts a day; and
(b) 5 blasts a week, averaged over a calendar year,
at the project site.

This condition does not apply to blasts that generate ground vibration of 0.5 mm/s or less at any residence on privately-owned land, blast misfires or blasts required to ensure the safety of the mine or its workers.

Note: For the purposes of this condition, a blast refers to a single blast event, which may involve a number of individual blasts fired in quick succession in a discrete area of the mine.

Property Inspections

11. If the Proponent receives a written request from the owner of any privately-owned land within 2 kilometres of any approved open cut mining pit on site for a property inspection to establish the baseline condition of any buildings and/or structures on his/her land, or to have a previous property inspection updated, then within 2 months of receiving this request the Proponent shall:
(a) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties to:
- establish the baseline condition of any buildings and other structures on the land, or update the previous property inspection report; and
- identify measures that should be implemented to minimise the potential blasting impacts of the project on these buildings and/or structures; and

(b) give the landowner a copy of the new or updated property inspection report.

If there is a dispute over the selection of the suitably qualified, experienced and independent person, or the Proponent or the landowner disagrees with the findings of the property inspection report, either party may refer the matter to the Director-General for resolution.

Property Investigations

12. If any landowner of privately-owned land claims that buildings and/or structures on his/her land have been damaged as a result of blasting associated with the project, then within 3 months of receiving this request, the Proponent shall:
    (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to investigate the claim; and
    (b) give the landowner a copy of the property investigation report.

    If this independent property investigation confirms the landowner's claim, and both parties agree with these findings, then the Proponent shall repair the damages to the satisfaction of the Director-General.

    If the Proponent or landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Director-General for resolution.

    If there is a dispute over the selection of the suitably qualified, experienced and independent person, or the Proponent or the landowner disagrees with the findings of the independent property investigation, either party may refer the matter to the Director-General for resolution.

Operating Conditions

13. During mining operations on the site, the Proponent shall:
    (a) implement best blasting practice to:
        - protect the safety of people and livestock in the area surrounding blasting operations;
        - protect public or private infrastructure/property and Aboriginal cultural heritage sites in the area surrounding blasting operations from blasting damage; and
        - minimise the dust and fume emissions from blasting at the project;
    (b) limit temporary blasting-related road closures to 1 per day;
    (c) co-ordinate the timing of blasting on site with the timing of blasting at the adjoining Moolarben and Ulan coal mines to minimise the potential cumulative blasting impacts of the three mines;
    (d) operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on site; and
    (e) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,

    to the satisfaction of the Director-General.

14. Prior to carrying out any blasting within 500 metres of a public road or railway on the site, the Proponent shall obtain approval from Council (in respect of public roads) and ARTC (in respect of the Gulgong-Sandy Hollow railway).

Blast Management Plan

15. The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Director-General. This plan must:
    (a) be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
    (b) describe the measures that would be implemented to ensure compliance with the blast criteria and operating conditions of this approval;
    (c) propose and justify any alternative ground vibration limits for public infrastructure in the vicinity of the site (if relevant); and
    (d) include a monitoring program for evaluating and reporting on compliance with the blasting criteria and operating conditions of this approval.

EXTRACT PROJECT APPROVAL 05-0021 DATED 1 FEBRUARY 2006 (AS MODIFIED)

METEOROLOGICAL MONITORING

22. During the life of the project, the Proponent shall ensure that there is a suitable meteorological station operating in the vicinity of the site that:
    (a) complies with the requirements in *Approved Methods for Sampling of Air Pollutants in New South Wales* guideline; and
    (b) is capable of continuous real-time measurement of temperature lapse rate in accordance with the *NSW Industrial Noise Policy*,
    to the satisfaction of the Director-General.

    Note: A system to measure temperature lapse rate at the site must be established in accordance with condition 22(b) by 31 December 2010, or as otherwise agreed by the Director-General.

APPENDIX 10
NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:
   (a) wind speeds greater than 3 m/s at 10 m above ground level; or
   (b) temperature inversion conditions between 1.5 ºC and 3ºC/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
   (c) temperature inversion conditions greater than 3ºC/100m

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.

4. This monitoring must be carried out at least 12 times a year, unless the Director-General directs otherwise.

5. Unless the Director-General agrees otherwise, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
   (a) monitoring locations for the collection of representative noise data;
   (b) meteorological conditions during which collection of noise data is not appropriate;
   (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

EXTRACT EPA ENVIRONMENT PROTECTION LICENCE NO 12425

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated by the property identification numbers on Figure 4A Relevant Land Ownership Plan Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010. The property identification numbers are indicated on Figure 4B Relevant Land Ownership List Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
b) Temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Temperature inversion conditions greater than 3°C/100m.

L5.4 For the purpose of condition L5.3:
a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
b) Temperature inversion conditions (vertical temperature gradient in degrees C) are to be determined by direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E to the NSW Industrial Noise Policy.

L5.5 To determine compliance:
a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:

i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve

b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.

c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
i) at the most affected point at a location where there is no dwelling at the location; or
ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).

L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:

a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
b) at a point other than the most affected point at a location.

L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

L6 Blasting

L6.1 The overpressure level from blasting operations at the premises must not exceed 115 dB (Lin Peak) at any noise sensitive location for more than five percent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

L6.2 The overpressure level from blasting operations at the premises must not exceed 120 dB (Lin Peak) at any noise sensitive at any time. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

L6.3 Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5 mm/sec at any noise sensitive locations for more than five percent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

L6.4 Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10 mm/sec at any noise senitive location at any time. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

Note: "Noise sensitive locations" includes buildings used as a residence, hospital, school, child care centre, place of public worship and nursing homes. A noise sensitive location includes the land within 30 metres of the building.

L6.5 Blasting operations at the premises may only take place between 9:00am – 5:00pm Monday to Saturday. Blasting outside the hours specified in this condition can only take place with the written approval of the EPA.

L6.6 Blasting at the premises is limited to the following:

a) a maximum of 2 blasts per day; and
b) a maximum of 5 blasts per week, averaged over a calender year.

EXTRACT EPA ENVIRONMENT PROTECTION LICENCE NO 12425

M4 Weather monitoring

M4.1 The meteorological weather station must be maintained so as to be capable of continuously monitoring the parameters specified in condition M4.2.

M4.2 For each monitoring point specified in the table below the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1. The licensee must use the sampling method, units of measure, averaging period and sample at the frequency specified opposite in the other columns.

Point 21

Parameter	Unit of Measure	Frequency	Averaging Period	Sampling Method
Air temperature	Degress celsius	Continuous	1 hour	AM-4
Wind direction	Degrees	Continuous	15 minute	AM-2 & AM-4
Wind speed	m/s	Continuous	15 minute	AM-2 & AM-4
Temperature lapse rate	Degrees	Continuous	15 minute	Part E2 & E4 of the Nsw Industrial Noise Policy
Rainfall	mm	Continuous	24 hour	AM-4
Relative humidity	%	Continuous	1 hour	AM-4

M8 Blasting

M8.1 To determine compliance with condition(s) L6.1 to L6.4:

a) Airblast overpressure and ground vibration levels experienced at the following noise sensitive locations must be measured and recorded for all blasts carried out on the premises;
- approximately 50m west of the Wollar Primary School grounds - E 777403 N6416219 (MGA94, Zone 55)

b) Instrumentation used to measure and record the airblast overpressure and ground vibration levels must meet the requirements of Australian Standard AS 2187.2-2006.

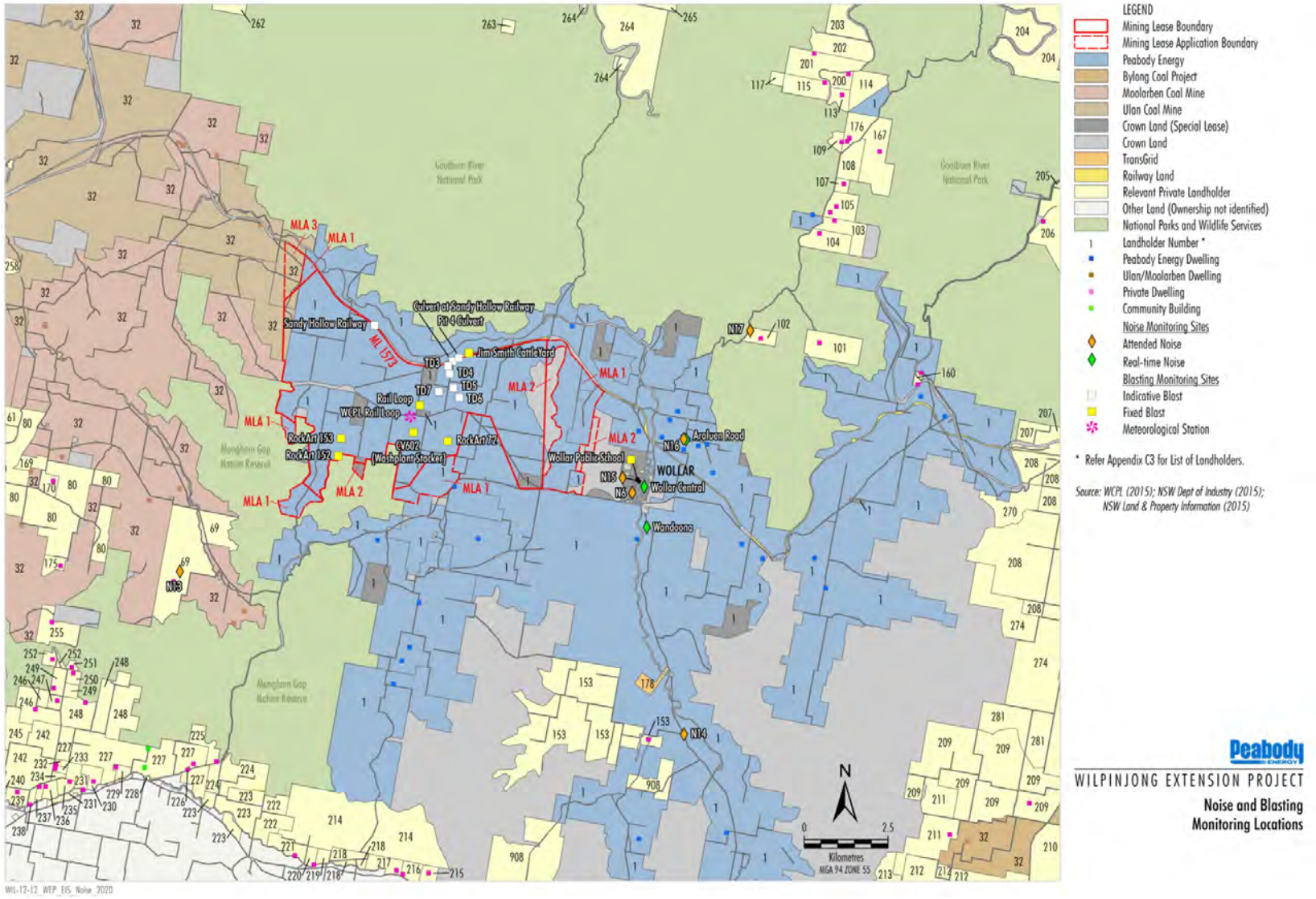
Note: A breach of the licence will still occur where airblast overpressure or ground vibration levels from the blasting operations at the premises exceeds the limit specified in conditions L6.1 to L6.4 at any "noise sensitive locations" other than the locations identified in the above condition.

R4 Other reporting conditions

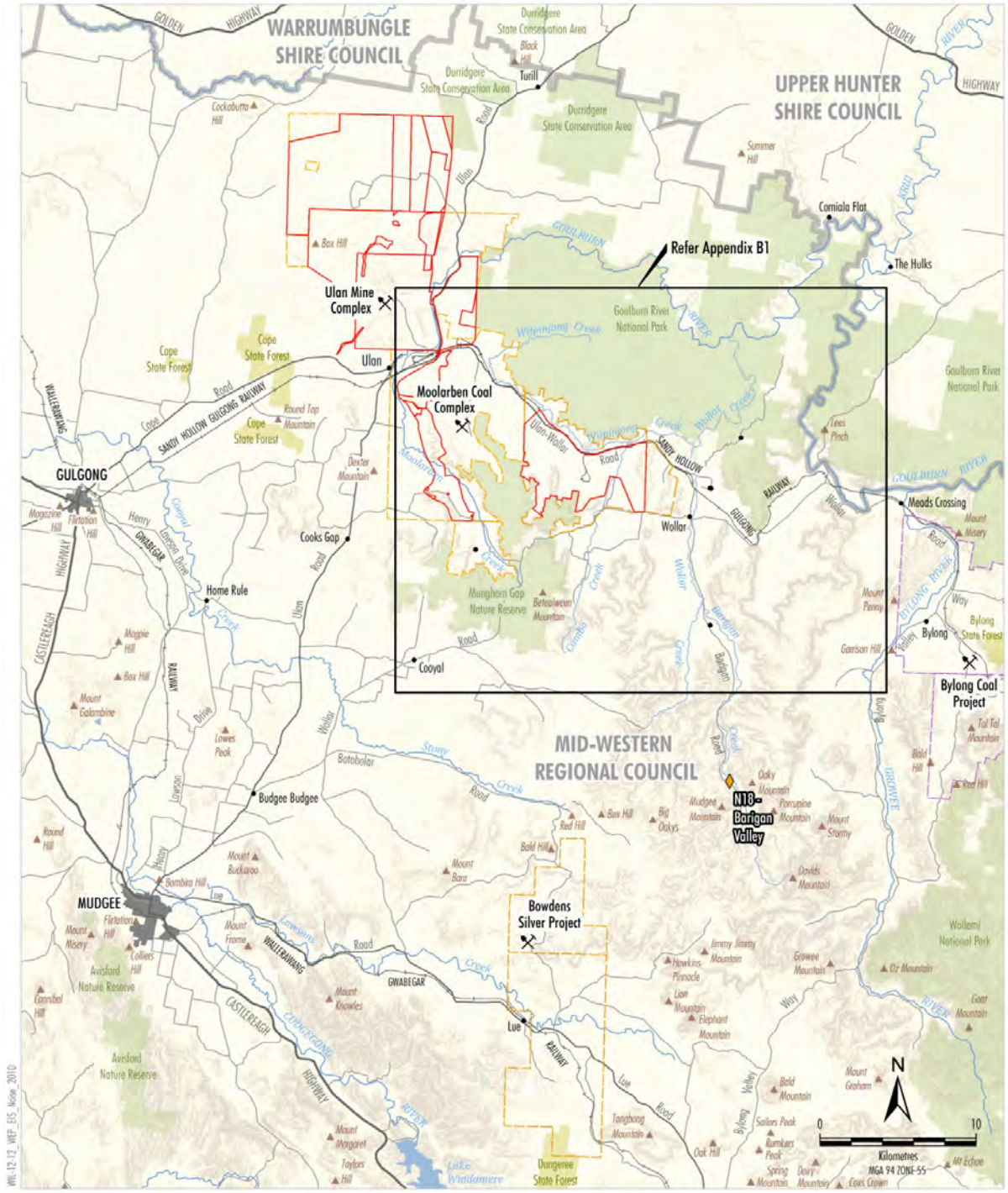
R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

a) an assessment of compliance with noise limits presented in Condition L5.1; and
b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

NOISE AND BLASTING MONITORING LOCATIONS



REGIONAL NOISE MONITORING SITES

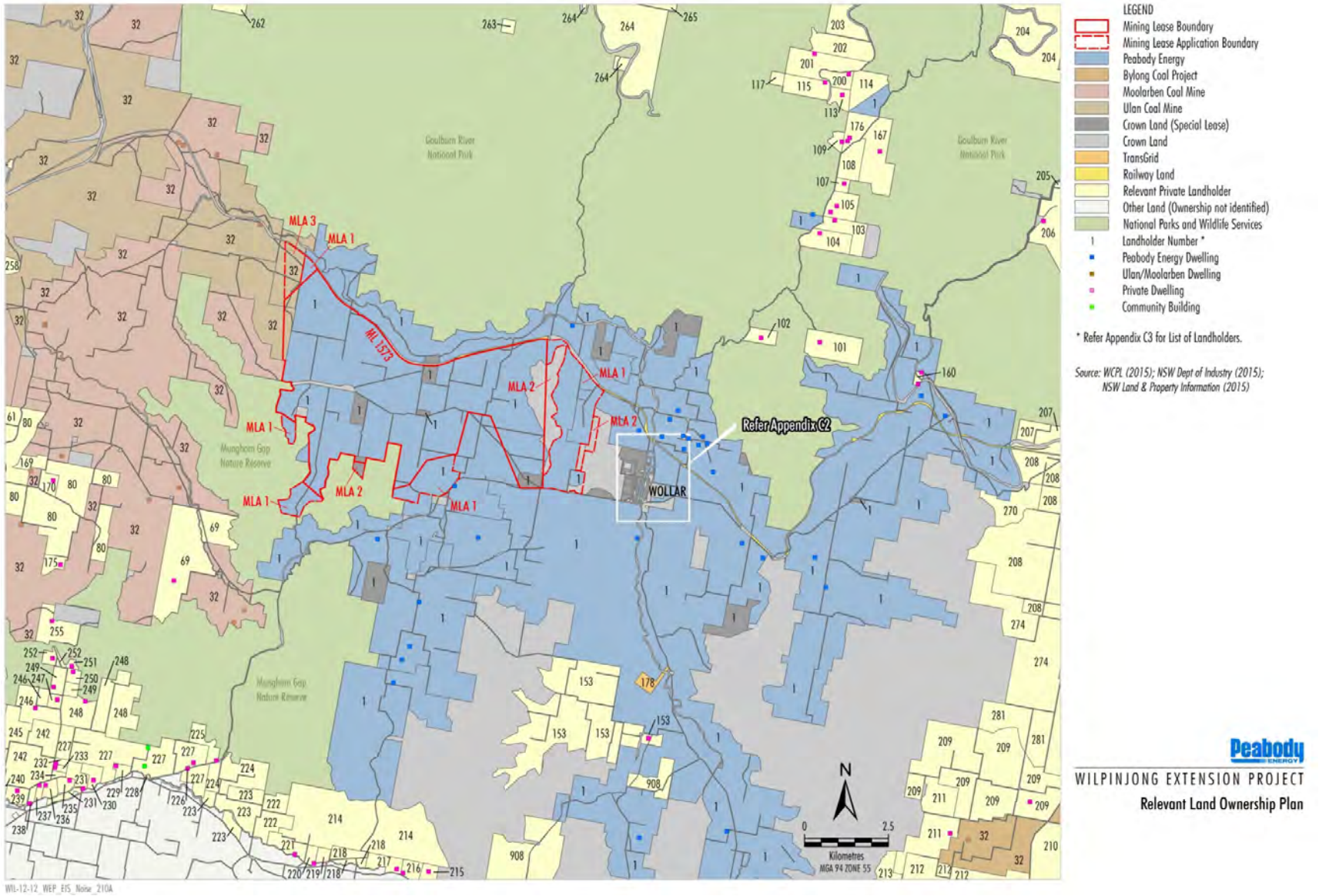


LEGEND
- Mining Lease Boundary
- Exploration Licence Boundary
- Authorisation Boundary
- Local Government Boundary
- NSW State Forest
- National Park, Nature Reserve or State Conservation Area
- Mining Operation
- Noise Monitoring Sites
- Attended Noise

Source: WCPL (2015); NSW Land & Property Information (2015); NSW Dept of Industry (2015); Geoscience Australia (2011)

Peabody ENERGY
WILPINJONG EXTENSION PROJECT
Regional Noise Monitoring Sites

RELEVANT LAND OWERSHIP PLAN



RELEVANT LAND OWNERSHIP PLAN (WOLLAR INSET)

LEGEND
- Peabody Energy
- Crown Land (Special Lease)
- Crown Land
- Railway Land
- Relevant Private Landholder
- 1 Landholder Number *
- Peabody Energy Dwelling
- Community Building
- Private Dwelling

* Refer to Appendix C3 for list of Landholders.

Source: WCPL (2015); NSW Dept of Industry (2015); NSW Land & Property Information (2015)

Peabody ENERGY
WILPINJONG EXTENSION PROJECT
Relevant Land Ownership Plan
Wollar Inset

RELEVANT LAND OWNERSHIP DETAILS

ID Number	Easting	Northing	Elevation	Ownership	Land Use
Privately Owned Receivers (Moolarben)					
69[1]	763579	6413175	545	DJ & JG Stokes	Residential
170	759985	6416165	500	MB Cox	Residential
175	760200	6413649	560	SF & MR Andrews	Residential
215	771176	6404501	659	TM Larkin & ET Monaghan	Residential
216	770408	6404459	645	RJ Waugh	Residential
217	770220	6404576	640	AE Mcdonald	Residential
220	767756	6404742	590	V & N Stankovic	Residential
221	767187	6405009	581	HC & E Von Bischoffshausen	Residential
225	764847	6407816	596	JW Campbell	Residential
226	763986	6407567	565	RD Ball	Residential
227	764163	6407745	571	Jb & J Baker	Residential
229	761855	6407651	562	DE & JI Smith	Residential
248	760942	6409573	587	GA, MA, CJ & CM Lang	Residential
250	760581	6410453	605	CJ Ward	Residential
251	760536	6410625	610	PD French & LE Sattler	Residential
255	759945	6411972	645	YR Jones	Residential
227_C1	762708	6407641	557	JB & J Baker	Rifle range clubhouse
227_C2	762815	6408199	589	JB & J Baker	Rifle range clubhouse
Privately Owned Receivers (Mogo)					
101	782836	6420282	435	NAB Pierce	Residential
102	781087	6420412	440	W Filipczyk	Residential
103	783283	6423923	425	MR Molloy	Residential
104	782838	6423538	425	J & IBD Hartig	Residential
105_R1	783340	6424343	395	DL & EH Toombs	Residential
105_R2	783156	6424166	412	DL & EH Toombs	Residential
107	783566	6425013	398	RJ Lee	Residential
109	783497	6426262	408	MO Vaisey	Residential
113	783505	6427658	323	AJ BRETT, S & D Hilt	Residential
115	782993	6428026	300	T Audretsch	Residential
167	784627	6425975	407	GJ Jaques	Residential
176_R1	783663	6426284	380	S Rayner	Residential
176_R2	783724	6426379	375	S Rayner	Residential
200	783701	6428281	300	BJ Hughes, CA Beinssen, K Aslett	Residential
201	782679	6428891	332	SJ Cuthbert	Residential
Privately Owned Receivers (Tichular and Barigan)					
153	777729	6408478	403	TW Marskell	Residential
160A	785872	6419380	238	B Smiles & A Smiles-Schmidt	Residential
160B	785768	6419042	235	B Smiles & A Smiles-Schmidt	Residential
Privately Owned Receivers and Community Facilities (Wollar Village)					
903	777235	6415547	370	MJ Hardiman & DM Hogan	Residential
908	777444	6415660	365	AE & AW Lynch (7.17)	Residential

RELEVANT LAND OWNERSHIP DETAILS

ID Number	Easting	Northing	Elevation	Ownership	Land Use
914	777544	6415640	362	S Nicod (7.13)	Residential
921	777533	6415777	365	EH Toombs	Residential
933	777611	6415840	362	CR Faulkner	Residential
942	777658	6416052	362	RWM & SM Schneider (7.23)	Residential
952	777578	6416399	365	BJ & DM O'hara	Residential
901	777547	6416227	365	Crown Land	School
944	777543	6416175	366	Crown Land (7.22)	School
900	777326	6415738	369	The Trustees Of The Roman Catholic Church For The Diocese Of Bathurst (7.12)	Church
150A	777654	6415365	364	E Tindale, A Mcdonald & WS Wilson (7.14)	Church
935	777633	6415922	363	Crown Land	Community Hall
Privately Owned Historical Heritage Sites					
7.12	777323	6415739	368	St Laurence's O'Toole Catholic Church, Wollar (900)	Church
7.13	777547	6415655	361	Former Masons Store (914)	Old house
7.14	777652	6415377	364	St Luke's Anglican Church and Cemetery, Wollar (150A)	Church and Cemetery
7.15	777212	6416587	380	Wollar Cemetery	Cemetery
7.16	777506	6415668	362	Former Butcher and Garage, Wollar	Old house
7.17	777446	6415673	363	Lynch's House, Wollar	House
7.18	777555	6415890	363	King's, Wollar	Old house
7.19	777573	6415914	362	Kirkland's Hut, Wollar	Old house
7.20	777630	6415772	400	Old General Store, Wollar	House
7.21	777583	6416116	363	Slab Hut, Wollar	Old house
7.22	777557	6416181	364	Wollar School, Wollar (944)	School
7.23	777679	6416052	361	Former Police Station, Wollar	House
Resource-company Historical Heritage Sites					
7.2	768791	6422807	400	Archer's Cottage Ruins	Ruin
7.5	772883	6416919	400	Pine Park Wool Shed	Old shed and woolshed
7.6	772009	6416085	400	Remains of Mara Cottage, Castleview	Ruin
7.7	769543	6414369	446	Barton's Cottage, Binngarra	Ruin
7.8	769588	6414747	436	Hillview	Ruin
7.10	777390	6414447	366	Wondoona, Wollar (1_WR)	Mmuseum/residence
7.11	766167	6423798	414	William Carr's Hut (32_32C)	Old house
Resource-company - Moolarben					
32_12	763719	6426239	442	Moolarben Coal Mines Pty Limited, Kores Australia Moolarben Coal Pty Limited, Sojitz Moolarben Resources Pty Limited	Occupied
32_13	763859	6426158	438		Occupied
32_14	764861	6425876	420		Occupied
32_29A	763746	6415947	500		Occupied
32_29B	762841	6415592	528		Occupied
32_32C	766154	6423779	412	Moolarben Coal Mines Pty Limited, Kores Australia	Occupied (7.11)
32_33A	759734	6420774	450		Occupied

RELEVANT LAND OWNERSHIP DETAILS

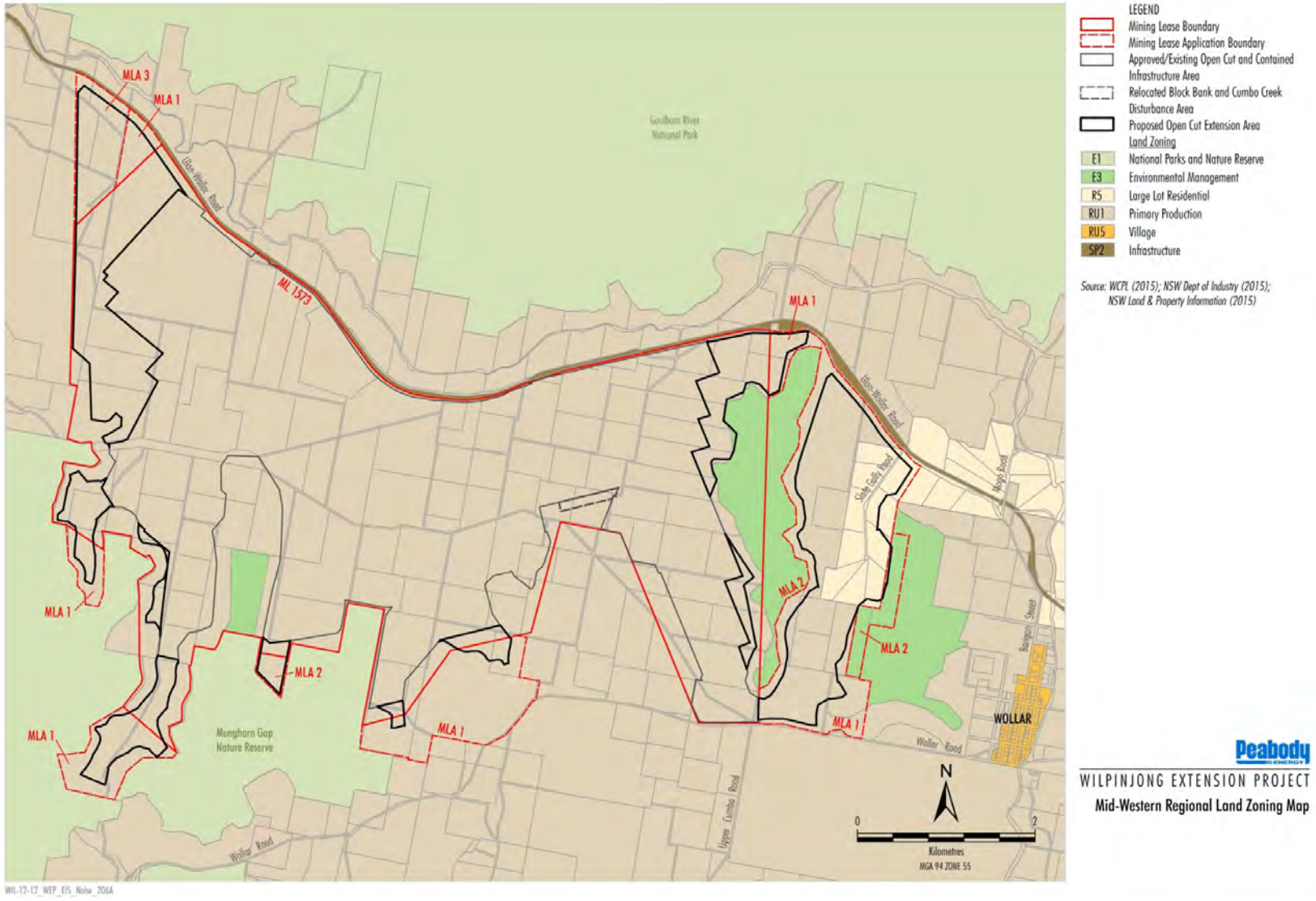
ID Number	Easting	Northing	Elevation	Ownership	Land Use
32_33B_5	759740	6420835	450	Moolarben Coal Pty Limited, Sojitz Moolarben Resources Pty Limited	Occupied
32_48A	765370	6411929	580		Occupied
32_48B	765680	6412292	555		Occupied
32_M02	759312	6416444	488		Occupied
32_M03	760245	6416890	510		Occupied
Resource-company - Peabody					
1_28C	777447	6417650	375	Peabody	Occupied
1_45	775463	6420780	356		Occupied
1_49	772652	6414452	455		Occupied
1_83	778608	6418243	360		Occupied
1_100B	781139	6413853	419		Occupied
1_106	782625	6424094	435		Occupied
1_129	778134	6417466	374		Occupied
1_130	778369	6417986	358		Occupied
1_133	778761	6417492	388		Occupied
1_135	778787	6417102	390		Occupied
1_136	779222	6417219	375		Occupied
1_140	779656	6416414	379		Renovate
1_143	778924	6417412	390		Occupied
1_145	779348	6417464	370		Occupied
1_151	770124	6410133	465		Occupied
1_152	779484	6417262	371		Occupied
1_154	777451	6405506	437		Occupied
1_156	780057	6405697	440		Occupied
1_158	782693	6413867	349		Occupied
1_159	783017	6412974	315		Occupied
1_162	785864	6418687	248		Occupied
1_163	786574	6418088	237		Occupied
1_164	771950	6415993	398		Occupied (7.6)
1_910	777418	6415491	365		Occupied
1_912	777486	6415527	363		Occupied
1_913	777483	6415485	362		Occupied
1_915	777410	6415720	368		Occupied
1_917	777584	6415700	362		Commercial
1_920	777608	6415735	362		Occupied
1_926	777626	6415817	361		Occupied
1_927	777674	6415806	361		Occupied
1_929	777490	6415863	367		Occupied
1_931	777422	6415880	368		Occupied
1_934	777509	6415939	366		Occupied
1_937	777510	6415979	366		Occupied
1_938	777439	6416006	368	Peabody	Occupied
1_939	777435	6416041	369		Occupied

RELEVANT LAND OWNERSHIP DETAILS

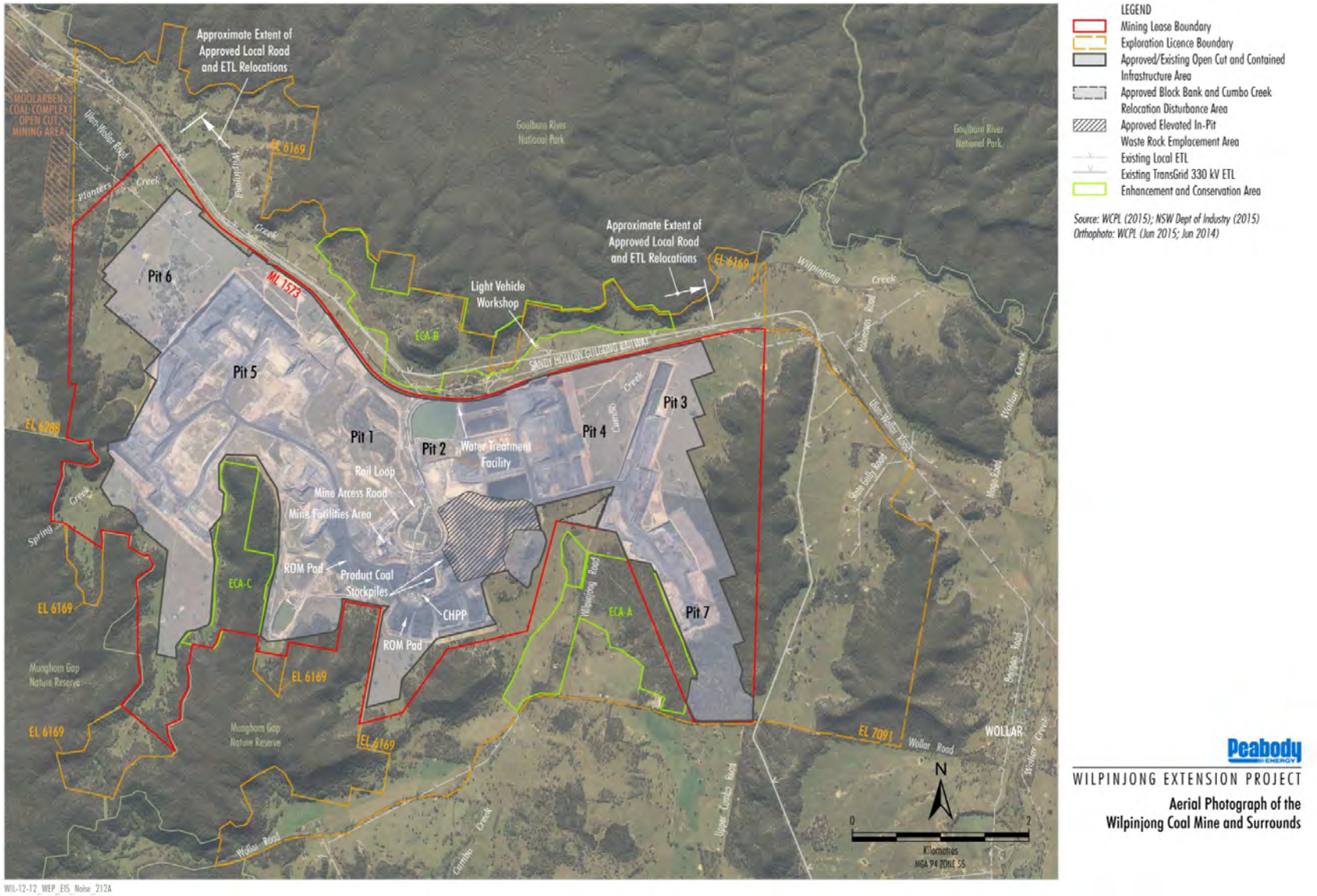
ID Number	Easting	Northing	Elevation	Ownership	Land Use
1_941	777517	6416064	367		Occupied
1_947B	777628	6416245	362		Occupied
1_953	777660	6416492	363		Occupied
1_956	777684	6416665	361		Occupied
1_W88A	770376	6410814	453		Occupied
1_W88B	770611	6411217	449		Occupied
1_WF	769652	6414414	445		Occupied (7.7)
1_WK	770890	6412538	431		Occupied
1_WR	777395	6414444	370		Occupied (7.10)
1_WT	780517	6414297	402		Occupied
Livestock					
Stockyard	772379	6410975	375	Peabody	Livestock
Archaeological/Geological and Aboriginal Heritage Sites outside the Mine Lease Boundary					
7.1 Shale Oil Mine Complex, Slate Gully	774898	6418956	422	Crown Land	Ruin
36-3-0133	769605	6422820	410	Peabody	Wattle Creek No.1
36-3-0098	769985	6422950	415	Goulburn River National Park	Wattle Creek No.2
36-3-0106	774885	6421450	370		Yawanna No.1
36-3-0101	774845	6421460	370		Yawanna No.2
36-3-0115	774905	6421090	354	Peabody	Yawanna No.3
36-3-1297	766386	6419437	494	Moolarben	S2MC151
Archaeological/Geological and Aboriginal Heritage Sites outside the Mine Lease Boundary					
36-3-0429	768480	6416913	476	Peabody	WCP 152
36-3-0430	768561	6417443	482		WCP 153
36-3-0554	767117	6418148	451		WCP 118
36-3-0555	767130	6418127	455		WCP 119
36-3-0646	771731	6417373	446		WCP 72
Road and Rail Infrastructure					
Ulan-Wollar Road	772077	6419833	375	Mid-Western Regional Council	Culvert
7.4 Wilpinjong Road	772555	6416975	384		Embankment
On-site Railway	770911	6418415	390	Peabody	Rail Loop
Off-site Railway	770911	6418415	390	ARTC	Rail Line

Note 1: Properties subject to noise mitigation upon request in accordance with Project Approval (05_0021) Table 3.

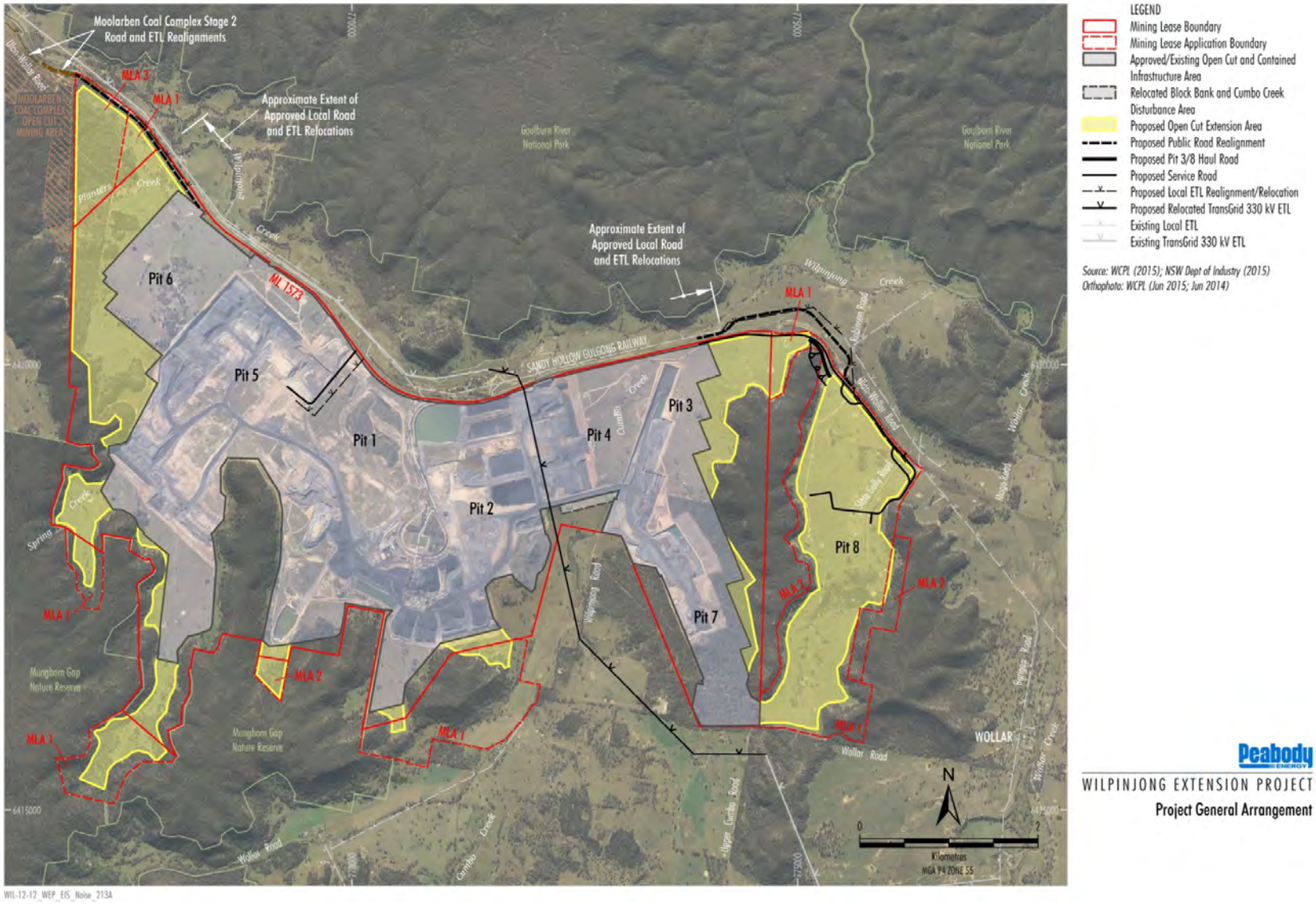
MID-WESTERN REGIONAL LAND ZONING MAP



AERIAL PHOTOGRAPH OF THE WILPINJONG COAL MINE AND SURROUNDS



PROJECT GENERAL ARRANGEMENT



1 Prevailing Winds

Section 5.3 of the INP, Wind Effects, states:

> *"Wind effects need to be assessed where wind is a feature of the area. Wind is considered to be a feature where source to receiver wind speeds (at 10 m height) of 3 m/s or below occur for 30 percent of the time or more in any assessment period (day, evening, night) in any season."*

An assessment of prevailing wind conditions was derived from the on-site Automatic Weather Station (AWS) located in the mine facilities area. The dominant seasonal wind speeds and directions for the period August 2011 to July 2014 are presented in **Attachment A** for daytime (0700 hours to 1800 hours), evening (1800 hours to 2200 hours) and night-time (2200 hours to 0700 hours) in accordance with a methodology consistent with the requirements of the INP.

Based on this analysis, the prevailing winds less than (or equal to) 3 m/s with a frequency of occurrence greater than (or equal to) 30% are presented in **Table 1** and are considered to be relevant to the Wilpinjong Extension Project in accordance with the INP.

Table 1 Prevailing Seasonal 10 m Wind Velocities In Accordance with the INP

Season	Winds ±45 degrees ≤ 3 m/s with Frequency of Occurrence ≥ 30%		
	Daytime	**Evening**	**Night-Time**
Annual	Nil	Nil	Nil
Summer	Nil	Nil	E (41%), ESE (44%), SE (37%)
Autumn	E (30%)	ESE (33%)	ESE (31%)
Winter	Nil	WNW (31%), NW (30%)	Nil
Spring	Nil	Nil	Nil

2 Temperature Inversions

Section 5.2 of the INP, Temperature Inversions, states:

> *"Assessment of impacts is confined to the night noise assessment period (10.00 pm to 7.00 am), as this is the time likely to have the greatest impact - that is, when temperature inversions usually occur and disturbance to sleep is possible."*

> *"Where inversion conditions are predicted for at least 30% (or approximately two nights per week) of total night-time in winter, then inversion effects are considered to be significant and should be taken into account in the noise assessment".*

An assessment of winter temperature gradients and atmospheric stability and was derived from the on-site Permanent Temperature Tower (PTT) located in the mine facilities area. Presented in **Attachment B** is the winter Temperature Gradient Exceedance Levels summary and **Attachment C** winter Temperature Gradient Exceedance Levels 24 hour profile and winter Temperature Gradient Cumulative Frequency Distribution for the 35 month period (August 2011 to July 2014) in accordance with a methodology consistent with the requirements of the INP.

Based on this analysis, the seasonal combine evening/night-time temperature gradients and atmospheric stability are presented in **Table 2** and considered to be relevant to the Project in accordance with the INP. Similarly, the winter daytime, evening, night-time and combine evening/night-time temperature gradients and atmospheric stability are presented in **Table 3**.

Table 2 Prevailing Seasonal Temperature Gradients in Accordance with the INP

Stability Class	Frequency of Occurrence - Evening/Night-time					Temperature Gradient $^{o}C/100\ m^{1}$	Qualitative Description
	Annual	Summer	Autumn	Winter	Spring		
A	0.0%	0.0%	0.0%	0.0%	0.0%	<-1.9	Lapse
A	0.0%	0.0%	0.0%	0.0%	0.0%	-1.9 to -1.7	Lapse
B	0.0%	0.0%	0.0%	0.0%	0.0%	-1.7 to -1.5	Lapse
C	0.0%	0.0%	0.0%	0.0%	0.0%	-1.5 to -0.5	Neutral
D	35.7%	61.2%	27.1%	17.4%	34.2%	-0.5 to 1.5	Weak inversion
F	25.3%	10.1%	31.0%	39.1%	23.2%	1.5 to 4	Moderate inversion
G	13.7%	3.4%	13.1%	20.9%	18.7%	>4.0	Strong inversion
F+G	39.0%	13.5%	44.2%	59.9%	42.0%	>1.5	Moderate to Strong

Note 1: $^{o}C/100$ m = Degrees Celsius per 100 metres.

Table 3 Prevailing Winter Temperature Gradients in Accordance with the INP

Stability Class	Frequency of Occurrence - Winter Season				Temperature Gradient $^{o}C/100\ m^{1}$	Qualitative Description
	Daytime	Evening	Night	Evening/Night		
A	16.2%	0.0%	0.0%	0.0%	<-1.9	Lapse
B	11.1%	0.0%	0.0%	0.0%	-1.9 to-1.7	Lapse
C	12.1%	0.0%	0.0%	0.0%	-1.7 to-1.5	Lapse
D	40.0%	24.0%	14.5%	17.4%	-1.5 to-0.5	Neutral
E	13.1%	25.5%	21.4%	22.6%	-0.5 to 1.5	Weak Inversion
F	5.9%	29.5%	43.4%	39.1%	1.5 to 4.0	Moderate Inversion
G	1.6%	21.0%	20.8%	20.9%	>4.0	Strong Inversion
F+G	7.5%	50.5%	64.2%	59.9%	>1.5	Moderate to Strong

Note 1: $^{o}C/100$ m = Degrees Celsius per 100 metres.

In accordance with Section 5.2 of the INP, the combined frequency of occurrence of moderate to strong (ie >1.5 $^{o}C/100$ m) winter temperature inversions is greater than 30% (actually 60%) during the combined evening/night-time period and therefore requires assessment.

In addition, the INP Section 5.2 *Temperature Inversions* also states:

> *"The drainage-flow wind default value should generally be applied where a development is at a higher altitude than a residential receiver, with no intervening higher ground (for example, hills). In these cases, both the specified wind and temperature inversion default values should be used in the noise assessment for receivers at the lower altitude."*

All privately owned receivers are positioned at higher elevation relative to the Project and/or there is intervening topography between the site and the receiver. As a result, a specific drainage flow wind has not been further considered in this assessment.

Noise Model Meteorological Parameters

Further analysis of the winter Temperature Gradient Exceedance Levels 24 hour profile (**Appendix C)** has been carried-out and summarised in **Table 4**.

Table 4 Winter Gradient Exceedance Levels 24 hour Profile

Morning Shoulder 0700 to 0900 hours	Daytime Mid 0900 to 1700 hours	Afternoon Shoulder 1700 to 1800 hours	Evening 1800 to 2200 hours	Night-time 2200 to 0700 hours	Evening and Night-time 1800 to 0700 hours
Moderate inversion 10% exceedance 3.6°C/100 m	Temperature Lapse 10% exceedance -0.8°C/100 m	Weak inversion 10% exceedance 2.0°C/100 m	Strong inversion 10% exceedance 5.2°C/100 m	Strong inversion 10% exceedance 5.0°C/100 m	Strong inversion 10% exceedance 5.2°C/100 m

Note 1: °C/100 m = Degrees Celsius per 100 metres

Based on the foregoing analysis of the wind velocity and temperature gradients derived from the on-site AWS and PTT, the INP meteorological parameters are presented in **Table 5**.

Table 5 INP Assessable Meteorological Noise Modelling Parameters

Period	Meteorological Parameter	Air Temperature	Relative Humidity	Wind Velocity	Temperature Gradient
Daytime INP	Calm	20°C	50%	0 m/s	0°C/100 m
	Autumn Wind 30% (occurrence)	19°C	55%	E 3 m/s	0°C/100 m
Evening INP	Calm	19°C	56%	0 m/s	0°C/100 m
	Autumn Wind 30% (occurrence)	18°C	63%	ESE 3 m/s	0°C/100 m
	Winter Wind 30% (occurrence)	10°C	71%	WNW, NW 3 m/s	0°C/100 m
Night-time INP	Calm	14°C	76%	0 m/s	0°C/100 m
	Summer Wind > 30 % (occurrence)	19°C	68%	ESE, SE, E 3 m/s	0°C/100 m
	Strong Inversion (10% exceedance)[1]	6°C	86%	0 m/s	5.2°C/100 m

Note 1: Winter evening/night-time 10% exceedance temperature gradient.
Note 2: m/s = metres per second.

ATTACHMENT A - On-site Automatic Weather Station - August 2011 to July 2014

Seasonal Frequency of occurrence 10 m Wind Velocity - Daytime

Period	Calm (<0.5 m/s)	Wind Direction ±45°	Wind Speed		
			0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Annual	6%	E	13.9%	9.8%	23.7%
Summer	3%	E	14.5%	14.5%	29.0%
Autumn	7%	E	17.9%	11.7%	29.6%
Winter	9%	WNW	9.0%	9.1%	18.1%
Spring	6%	E	10.4%	6.5%	16.9%

Seasonal Frequency of occurrence 10 m Wind Velocity - Evening

Period	Calm (<0.5 m/s)	Wind Direction ±45°	Wind Speed		
			0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Annual	12%	ESE	12.5%	9.5%	22.0%
Summer	3%	E	11.6%	13.4%	25.0%
Autumn	14%	ESE	18.7%	14.2%	33.0%
Winter	23%	WNW, NW	17.8%, 19.1%	12.7%, 10.4%	30.6%, 29.6%
Spring	13%	W	10.8%	9.7%	20.5%

Seasonal Frequency of occurrence 10 m Wind Velocity - Night-Time

Period	Calm (<0.5 m/s)	Wind Direction ±45°	Wind Speed		
			0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Annual	25%	ESE	18.8%	10.2%	28.9%
Summer	10%	ESE, E, SE	26.6%, 24.5%, 21.9%	17.6%, 16.3%, 14.6%	44.1%, 40.7%, 36.5%
Autumn	26%	ESE	21.3%	9.8%	31.0%
Winter	39%	NW	19.7%	9.3%	29.0%
Spring	31%	ESE	16.1%	8.0%	24.1%

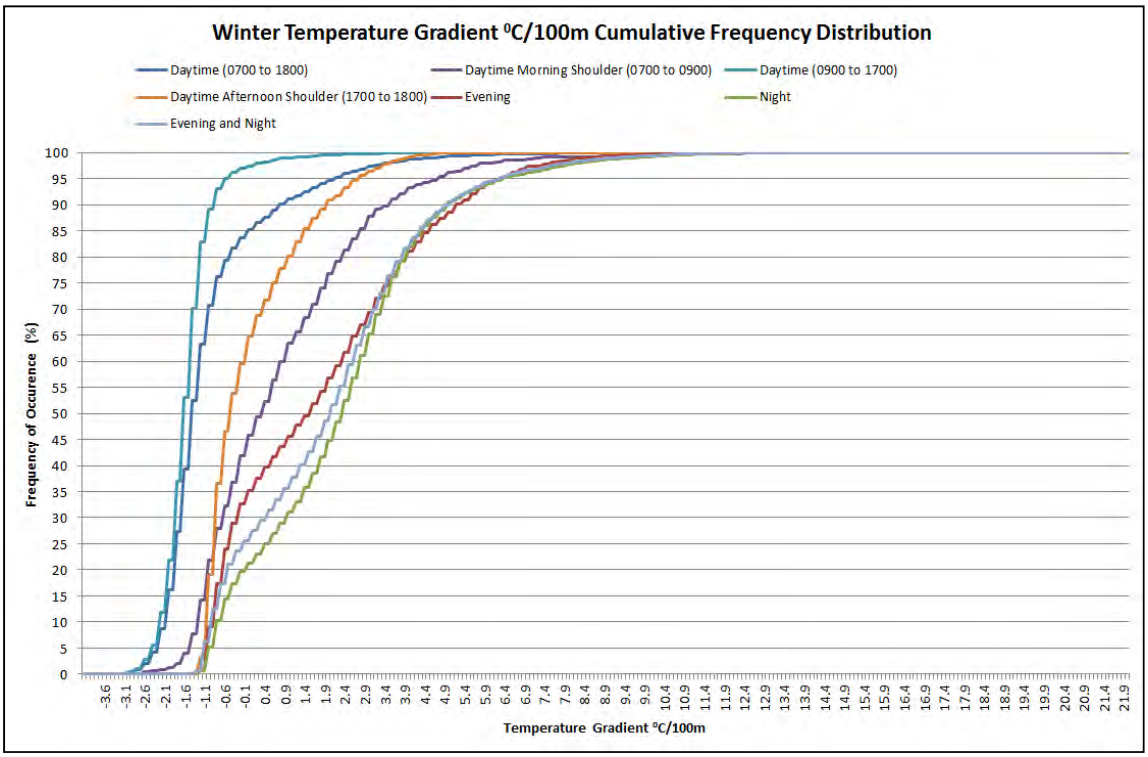
ATTACHMENT B - On-site Automatic Weather Station - August 2011 to July 2014

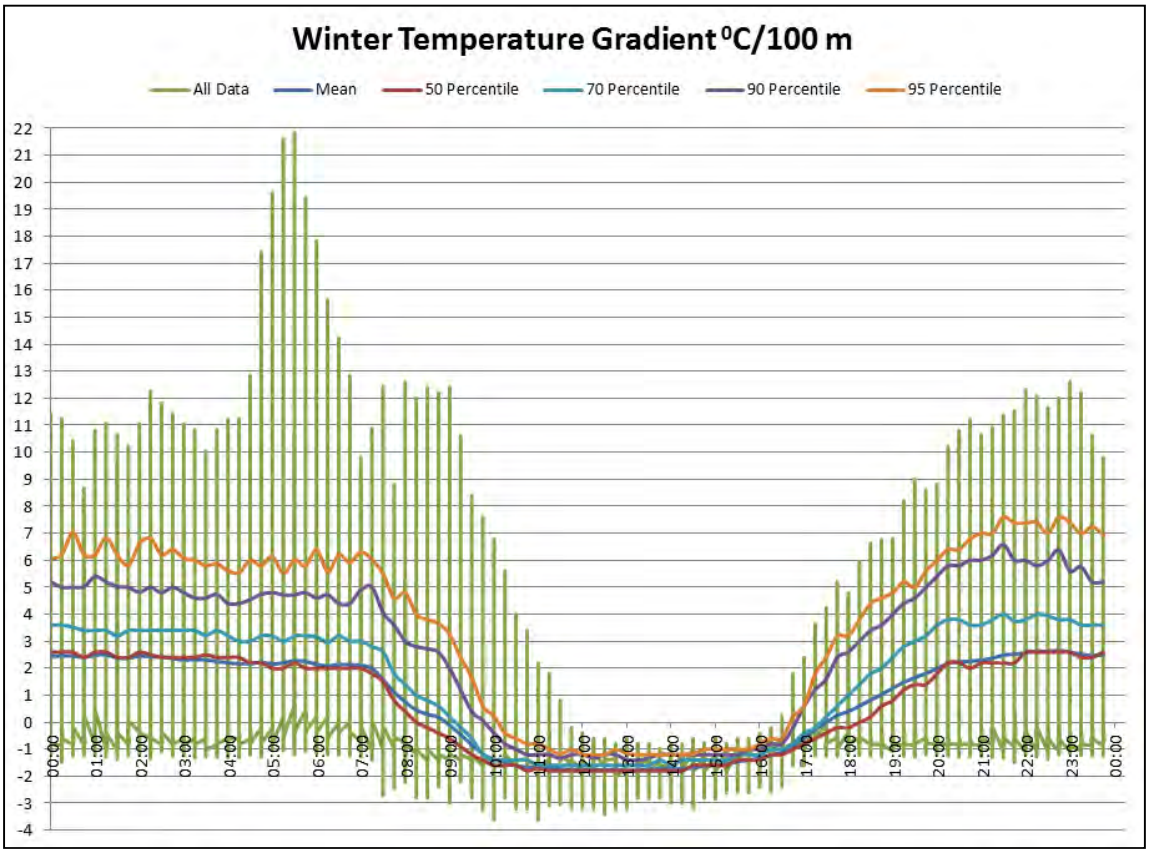
Winter Temperature Gradient Exceedance Level (Degrees C per 100 m) Summary

Daytime Exceedance					Evening Exceedance				
0700 to 1800 hours					1800 to 2200 hours				
50%	30%	10%	1.5%	0.625%	50%	30%	20%	10%	1.5%
-1.4	-1.0	0.8	4.0	8.0	1.6	3.2	4.0	5.2	8.0
Night-time Exceedance					Evening/Night-time Exceedance				
2200 to 0700 hours					1800 to 0700 hours				
50%	30%	20%	10%	2.5%	50%	30%	20%	10%	2.0%
2.4	3.4	4.0	5.0	8.0	2.2	3.4	4.0	5.2	8.0

Morning Shoulder Exceedance				Daytime Exceedance				Afternoon Shoulder Exceedance			
0700 to 0900 hours				0900 to 1700 hours				1700 to 1800 hours			
50%	30%	10%	5%	50%	30%	10%	5%	50%	30%	10%	5%
0.4	1.6	3.6	4.8	-1.6	-1.4	-0.8	-0.4	-0.4	0.4	2.0	2.8

ATTACHMENT C





EPA'S INP APPLICATION NOTE - SLEEP DISTURBANCE

Peak noise level events, such as reversing beepers, noise from heavy items being dropped or other high noise level events, have the potential to cause sleep disturbance. The potential for high noise level events at night and effects on sleep should be addressed in noise assessments for both the construction and operational phases of a development. The NSW Industrial Noise Policy (INP) (New South Wales [NSW] Environmental Protection Agency [EPA], 2000) does not specifically address sleep disturbance from high noise level events.

A review of research on sleep disturbance was conducted for the *NSW Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA, 1999). This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.

From the research, the DECCW recognised that current sleep disturbance criterion of an $L_{A1(1minute)}$ not exceeding the $L_{A90(15minute)}$ by more than 15 A-weighted decibels (dBA) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, the DECCW will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.

The detailed analysis should cover the maximum noise level or $L_{A1(1minute)}$, that is, the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the appendices to the ECRTN. Other factors that may be important in assessing the extent of impacts on sleep include:

- How often high noise events will occur.
- Time of day (normally between 2200 hrs and 0700 hrs).
- Whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).

The $L_{A1(1minute)}$ descriptor is meant to represent a maximum noise level measured under "fast" time response. DECC will accept analysis based on either $L_{A1(1minute)}$ or L_{Amax}.

NOISE EXTRACT DP&E VOLUNTARY LAND ACQUISITION AND MITIGATION POLICY

NOISE

This section details how the policy applies to noise impacts.

Assessment criteria

Applicants are required to assess the impacts of the development in accordance with the:

- NSW Industrial Noise Policy (EPA 2000) (INP);
- Rail Infrastructure Noise Guideline (EPA 2013) (RING);
- Road Noise Policy (DECCW 2011) (RNP); and the
- Interim Construction Noise Guideline (DECC 2009) (ICNG).

These policies and guidelines seek to strike an appropriate balance between supporting the economic development of NSW and protecting the amenity and wellbeing of the community. They recommend standards for regulating the construction, operational, road and rail noise impacts of a development, and require applicants to implement all reasonable and feasible avoidance and mitigation measures.

These standards are generally conservative, and it does not automatically follow that exceedances of the relevant criteria will result in unacceptable impacts.

Mitigation and acquisition criteria

A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce:

- Operational noise impacts of a development on privately-owned land; and
- Rail noise impacts of a development on privately-owned land near non-network rail lines (private rail lines) on or exclusively servicing industrial sites (see Appendix 3 of the RING);

But not:

- Construction noise impacts, as these impacts are shorter term and can be controlled;
- Noise impacts on the public road or rail network; or
- Modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts. In such cases, these legacy noise issues should be addressed through site-specific pollution reduction programs under the *Protection of the Environment Operations Act 1997*.

Process for decision-making on noise impacts

The decision-making process which should be applied by a consent authority under this policy is summarised in Figure 4 below.

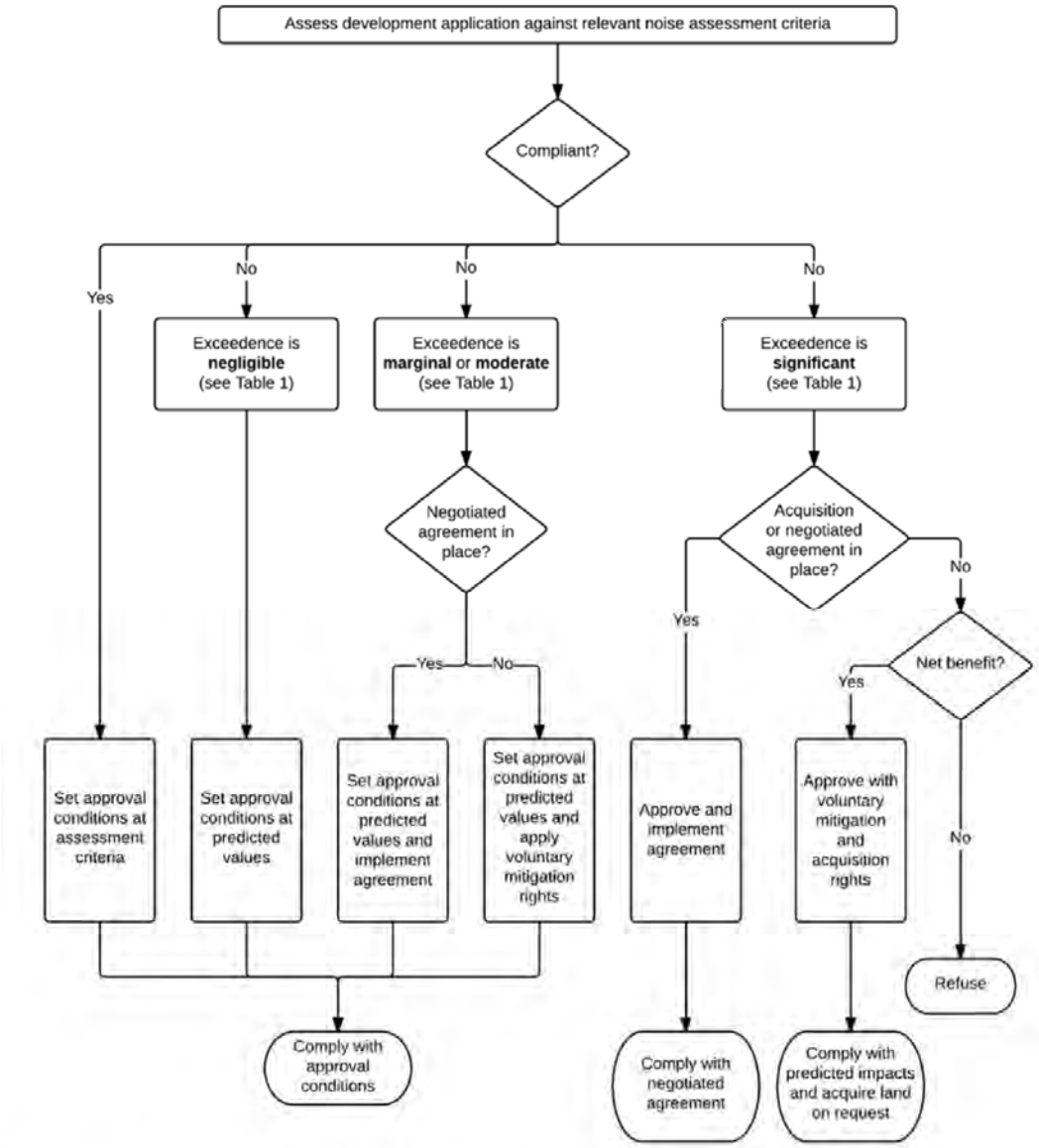


Figure 4 – Decision-making process for noise impacts.

Table 1 below summarises the NSW Government's interpretation of the significance of any potential exceedances of the relevant noise assessment criteria, and identifies potential treatments for these exceedances.

NOISE EXTRACT DP&E VOLUNTARY LAND ACQUISITION AND MITIGATION POLICY

Table 1 - Characterisation of noise impacts & potential treatments

Residual noise exceeds INP criteria by	Characterisation of impacts	Potential treatment
0-2dB(A) above the project specific noise level (PSNL)	Impacts are considered to be **negligible**	The exceedances would not be discernable by the average listener and therefore would not warrant receiver based treatments or controls
3-5dB(A) above the PSNL in the INP but the development would contribute less than 1dB to the total industrial noise level	Impacts are considered to be **marginal**	Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.
3-5dB(A) above the PSNL in the INP and the development would contribute more than 1dB to the total industrial noise level	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements like windows, doors, roof insulation etc. to further increase the ability of the building façade to reduce noise levels.
>5dB(A) above the PSNL in the INP	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions below.

Voluntary mitigation rights

A consent authority should only apply voluntary mitigation rights where, even with the implementation of best practice management:

- The noise generated by the development would be equal to or greater than 3dB(A) above the INP project specific noise level at any residence on privately owned land; or
- The development would increase the total industrial noise level at any residence on privately owned land by more than 1dB(A) and noise levels at the residence are already above the recommended amenity criteria in Table 2.1 of the INP; or
- The development includes a private rail line and the use of that private rail line would cause exceedances of the recommended acceptable levels in Table 6 of Appendix 3 of the RING (see Appendix B) by greater than or equal to 3dB(A) at any residence on privately owned land.

All noise levels must be calculated in accordance with the INP or RING (as applicable).

The selection of mitigation measures should be guided by the potential treatments identified in Table 1 above.

Voluntary land acquisition rights

A consent authority should only apply voluntary land acquisition rights where, even with the implementation of best practice management:

- The noise generated by the development would be more than 5dB(A) above the project specific noise level at any residence on privately owned land; or
- The noise generated by the development would contribute to exceedances of the recommended maximum noise levels in Table 2.1 of the INP on more than 25% of any privately owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls[7]; or
- The development includes a private rail line and the use of that private rail line would cause exceedances of the recommended maximum criteria in Table 6 of Appendix 3 of the RING at any residence on privately owned land.

All noise levels must be calculated in accordance with the INP or RING (as applicable).

[7] *Voluntary land acquisition rights should not be applied to address noise levels on vacant land other than to vacant land specifically meeting these criteria.*

Project Daytime Plant and Equipment Sound Power Levels (SWL) (dBA re 1ρW)

		SWL per Item (dBA)	2018		2020		2024		2028		2031	
			Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)
24 Hours Operational Mobile Plant	Atlas Copco Pit Viper 235 Drill	120	3	124	3	124	3	124	3	124	2	123
	Atlas Copco D65 Hammer Drill	120	3	124	3	124	3	124	3	124	2	123
	Liebherr 9400	121	2	124	2	124	2	124	2	124	2	124
	Liebherr 9350	121	4	127	4	127	4	127	2	124	1	121
	Cat 854G Wheel Dozer	117	3	122	3	122	3	122	2	120	2	120
	Cat D10T Dozer (Pit)	122	4	128	4	128	4	128	2	125	2	125
	Cat D10T Dozer (Dump)	122	3	126	3	126	3	126	2	125	1	122
	Cat D10T Dozer (Stockpile)	122	1	122	1	122	1	122	1	122	1	122
	Cat D11R Dozer (Stockpile)	125	2	128	2	128	2	128	2	128	2	128
	Cat D11R Dozer other (ripping)	125	2	128	3	130	3	130	3	130	2	128
	Cat D11R Production Dozer	125	7	134	6	133	6	133	5	132	5	132
	Cat 789 Truck	125	32	140	25	139	32	140	20	138	14	136
	Cat 16M Graders	115	4	121	4	121	4	121	3	120	2	118
	Cat 994H Wheel Loader	120	2	125	2	123	2	123	2	123	2	123
	Haulmax Water Truck	116	3	121	3	121	3	121	3	121	2	119
DAYTIME ONLY (Topsoil Removal/Rehab/Clean-up)	Cat D10R Dozer	122	1	122	1	122	1	122	1	122	1	122
	Cat 637 Scraper	111	1	111	1	111	1	111	1	111	1	111
	Cat 773 Watercart	116	1	116	1	116	1	116	1	116	1	116
	25 Tonne Excavator	112	1	112	1	112	1	112	1	112	1	112
DAYTIME ONLY (Road Maintenance and Watering)	Cat 16H Grader	115	1	115	1	115	1	115	1	115	1	115
	10 Tonne Drum Roller	109	1	109	1	109	1	109	1	109	1	109
	18,000 Litre Watercart	113	2	116	2	116	2	116	2	116	2	116
	Cat D6R Dozer	116	1	116	1	116	1	116	1	116	1	116
Total Mobile Plant (excluding Construction Fleet)			84	142.3	77	141.7	84	142.3	64	140.8	51	139.7

PROJECT DAYTIME PLANT AND EQUIPMENT SOUND POWER LEVELS (SWL)

		SWL per Item (dBA)	2018		2020		2024		2028		2031	
			Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)
DAYTIME ONLY (Indicative Maximum Construction Earthworks Fleet)	4WD	90	3	95	-	-	3	95	-	-	-	-
	10t tip truck	100	4	106	-	-	4	106	-	-	-	-
	CAT 725C Articulated Truck	117	4	123	-	-	4	123	-	-	-	-
	CAT 621H Open Bowl Scrapper	110	6	118	-	-	6	118	-	-	-	-
	CAT 950K Wheel Loader	112	1	112	-	-	1	112	-	-	-	-
	CAT 324D Excavator	112	1	112	-	-	1	112	-	-	-	-
	10 t water cart	113	2	116	-	-	2	116	-	-	-	-
	CAT 140M Grader	113	1	113	-	-	1	113	-	-	-	-
	CAT D10 Dozer	122	1	122	-	-	1	122	-	-	-	-
	CAT 825 Compactor	108	2	111	-	-	2	111	-	-	-	-
Total Construction Mobile Plant			25	127.1	-	-	25	127.1	-	-	-	-
Total Mobile Plant (including Construction Fleet)			109	142.4	77	141.7	109	142.4	64	140.8	51	139.7
24 Hours Operational Fixed Plant	Coal Preparation Plant	120	1	120	1	120	1	120	1	120	1	120
	Belt Press Filter	111	1	111	1	111	1	111	1	111	1	111
	ROM Bin & Feeder	106	2	109	2	109	2	109	2	109	2	109
	Reject Bin	109	1	109	1	109	1	109	1	109	1	109
	Sizer and Crashers	116	2	119	2	119	2	119	2	119	2	119
	Stockpile Discharge	100	4	106	4	106	4	106	4	106	4	106
	Transfer Station	100	4	106	4	106	4	106	4	106	4	106
	Train Loadout Bin	113	1	113	1	113	1	113	1	113	1	113
	Locos	100	3	105	3	105	3	105	3	105	3	105
	Raw Coal Conveyor	99 -102	5	109	5	109	5	109	5	109	5	109
	Reject Conveyor	99	1	99	1	99	1	99	1	99	1	99
	Product Conveyor	100	4	108	4	108	4	108	4	108	4	108
	Reclaim Conveyor	106	1	106	1	106	1	106	1	106	1	106
	Train Loadout Conveyor	106	1	108	1	108	1	108	1	108	1	108

PROJECT DAYTIME PLANT AND EQUIPMENT SOUND POWER LEVELS (SWL)

	SWL per Item (dBA)	2018		2020		2024		2028		2031	
		Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)
Total Fixed Plant		31	124.2	31	124.2	31	124.2	31	124.2	31	124.2
Total Mobile and Fixed Plant (excluding Construction Fleet)		115	142.3	107	141.7	114	142.3	94	140.9	81	139.9
Total Mobile and Fixed Plant (including Construction Fleet)		140	142.5	107	141.7	139	142.4	94	140.9	81	139.9

Project Evening/Night-time Plant and Equipment Sound Power Levels (SWL) (dBA re 1ρW)

		SWL per Item (dBA)	2018		2020		2024		2028		2031	
			Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)
24 Hours Operational Mobile Plant	Atlas Copco Pit Viper 235 Drill	120	3	124	3	124	3	124	3	124	2	123
	Atlas Copco D65 Hammer Drill	120	3	124	3	124	3	124	3	124	2	123
	Liebherr 9400	121	2	124	2	124	2	124	2	124	2	124
	Liebherr 9350	121	4	127	4	127	4	127	2	124	1	121
	Cat 854G Wheel Dozer	117	3	122	3	122	3	122	2	120	2	120
	Cat D10T Dozer (Pit)	122	4	128	4	128	4	128	2	125	2	125
	Cat D10T Dozer (Dump)	122	3	126	3	126	3	126	2	125	1	122
	Cat D10T Dozer (Stockpile)	122	1	122	1	122	1	122	1	122	1	122
	Cat D11R Dozer (Stockpile)	125	2	128	2	128	2	128	2	128	2	128
	Cat D11R Dozer other (ripping)	125	2	128	3	130	3	130	3	130	2	128
	Cat D11R Production Dozer	125	7	134	6	133	6	133	5	132	5	132
	Cat 789 Truck	125	32	140	25	139	32	140	20	138	14	136
	Cat 16M Graders	115	4	121	4	121	4	121	3	120	2	118
	Cat 994H Wheel Loader	120	2	125	2	123	2	123	2	123	2	123
	Haulmax Water Truck	116	3	121	3	121	3	121	3	121	2	119
DAYTIME ONLY (Topsoil Removal/Rehab/Clean-up)	Cat D10R Dozer	-	-	-	-	-	-	-	-	-	-	-
	Cat 637 Scraper	-	-	-	-	-	-	-	-	-	-	-
	Cat 773 Watercart	-	-	-	-	-	-	-	-	-	-	-
	25 Tonne Excavator	-	-	-	-	-	-	-	-	-	-	-
DAYTIME ONLY (Road Maintenance and Watering)	Cat 16H Grader	-	-	-	-	-	-	-	-	-	-	-
	10 Tonne Drum Roller	-	-	-	-	-	-	-	-	-	-	-
	18,000 Litre Watercart	-	-	-	-	-	-	-	-	-	-	-
	Cat D6R Dozer	-	-	-	-	-	-	-	-	-	-	-
Total Mobile Plant (excluding Construction Fleet)			75	142.2	68	141.6	75	142.2	55	140.7	42	139.6

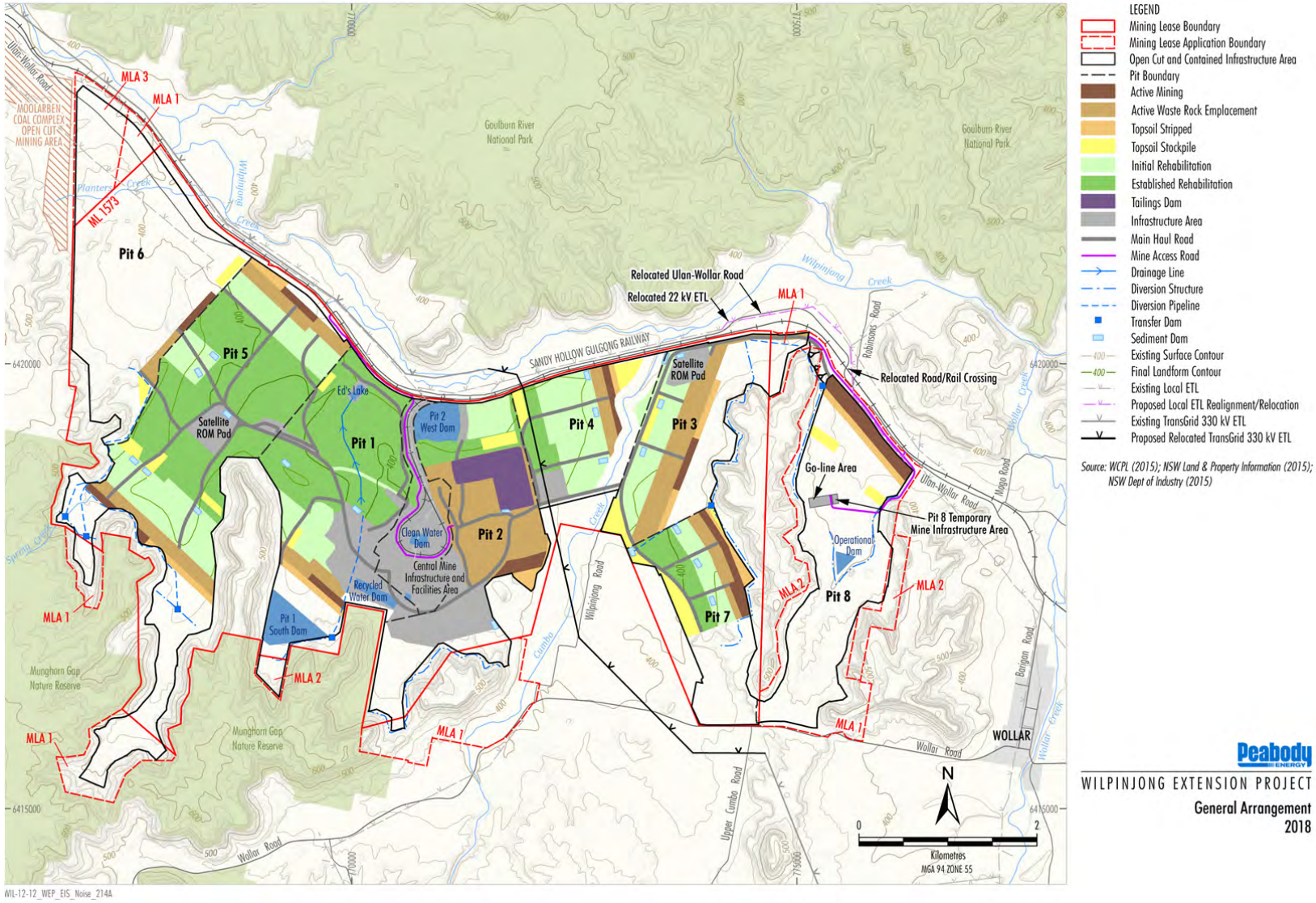
PROJECT EVENING/NIGHT-TIME PLANT AND EQUIPMENT SOUND POWER LEVELS (SWL)

		SWL per Item (dBA)	2018		2020		2024		2028		2031	
			Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)
DAYTIME ONLY (Indicative Maximum Construction Earthworks Fleet)	4WD	-	-	-	-	-	-	-	-	-	-	-
	10t tip truck	-	-	-	-	-	-	-	-	-	-	-
	CAT 725C Articulated Truck	-	-	-	-	-	-	-	-	-	-	-
	CAT 621H Open Bowl Scrapper	-	-	-	-	-	-	-	-	-	-	-
	CAT 950K Wheel Loader	-	-	-	-	-	-	-	-	-	-	-
	CAT 324D Excavator	-	-	-	-	-	-	-	-	-	-	-
	10 t water cart	-	-	-	-	-	-	-	-	-	-	-
	CAT 140M Grader	-	-	-	-	-	-	-	-	-	-	-
	CAT D10 Dozer	-	-	-	-	-	-	-	-	-	-	-
	CAT 825 Compactor	-	-	-	-	-	-	-	-	-	-	-
Total Construction Mobile Plant		-	-	-	-	-	-	-	-	-	-	-
Total Mobile Plant (including Construction Fleet)			75	142.2	68	141.6	75	142.2	55	140.7	42	139.6
24 Hours Operational Fixed Plant	Coal Preparation Plant	120	1	120	1	120	1	120	1	120	1	120
	Belt Press Filter	111	1	111	1	111	1	111	1	111	1	111
	ROM Bin & Feeder	106	2	109	2	109	2	109	2	109	2	109
	Reject Bin	109	1	109	1	109	1	109	1	109	1	109
	Sizer and Crashers	116	2	119	2	119	2	119	2	119	2	119
	Stockpile Discharge	100	4	106	4	106	4	106	4	106	4	106
	Transfer Station	100	4	106	4	106	4	106	4	106	4	106
	Train Loadout Bin	113	1	113	1	113	1	113	1	113	1	113
	Locos	100	3	105	3	105	3	105	3	105	3	105
	Raw Coal Conveyor	99 -102	5	109	5	109	5	109	5	109	5	109
	Reject Conveyor	99	1	99	1	99	1	99	1	99	1	99
	Product Conveyor	100	4	108	4	108	4	108	4	108	4	108
	Recalim Conveyor	106	1	106	1	106	1	106	1	106	1	106
	Train Loadout Conveyor	106	1	108	1	108	1	108	1	108	1	108

PROJECT EVENING/NIGHT-TIME PLANT AND EQUIPMENT SOUND POWER LEVELS (SWL)

	SWL per Item (dBA)	2018		2020		2024		2028		2031	
		Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)	Total Fleet (incl. Standby)	Overall SWLs (dBA)
Total Fixed Plant		31	124.2	31	124.2	31	124.2	31	124.2	31	124.2
Total Mobile and Fixed Plant (excluding Construction Fleet)		106	142.3	98	141.6	105	142.2	85	140.8	72	139.7
Total Mobile and Fixed Plant (including Construction Fleet)		106	142.3	98	141.6	105	142.2	85	140.8	72	139.7

GENERAL ARRANGEMENT 2018



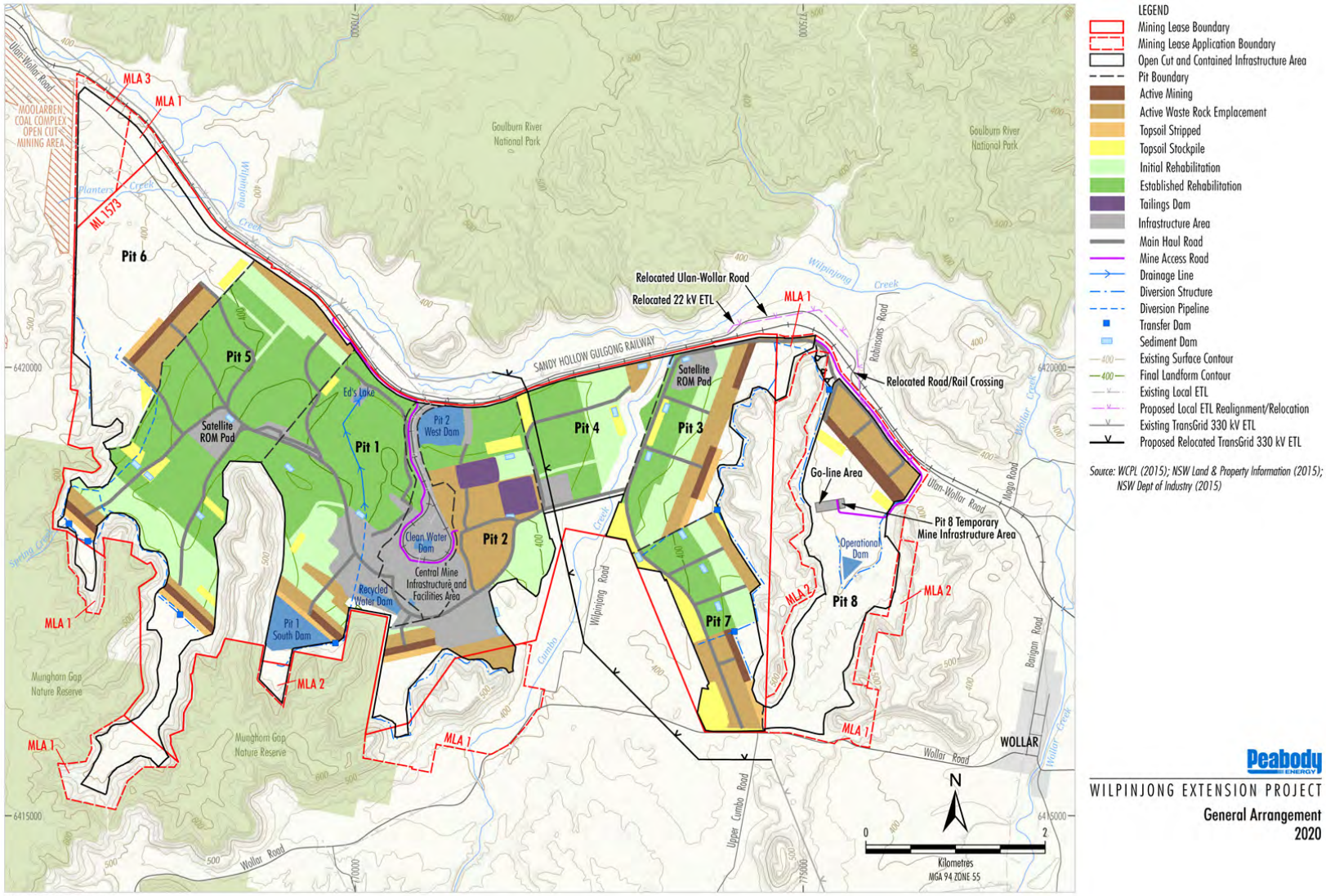
MOBILE EQUIPMENT FLEET DISTRIBUTION 2018

Year 2018 Scenario Typical Mobile Equipment Fleet Distribution

CHPP/ROM Area	Pit 1	Pit 3	Pit 4	Pit 5	Pit 6	Pit 7	Pit 8	Pit 8	Maintenance
Daytime/Evening/Night-time							Daytime	Evening/Night-time	Out Of Service
2 X CAT D11 Dozer (S/Pile) (Product) 1 X CAT 994H Wheel Loader (ROM) 1 X CAT 789D Haul Trucks (ROM) 1 X CAT 789D Haul Trucks (Reject)	Waste Fleet: 2 X Atlas Copco D65 Hammer Drill 1 X Liebherr Excavators R9350 2 X CAT D10 Dozer 3 X CAT 789D Haul Trucks	Waste Fleet 1: 2 X Atlas Copco Pit Viper 235 Drill 1 X Liebherr Excavators R9400 2 X CAT D10 Dozer 6 X CAT D11 Dozer (Pushing) 3 X CAT 789D Haul Trucks	Waste Fleet 1: 1 X Atlas Copco D65 Hammer Drill 1 X Liebherr Excavators R9350 2 X CAT D10 Dozer 4 X CAT 789D Haul Trucks	Satellite ROM: 1 X CAT 854G Wheel Loader	Coal Fleet: 1 X Atlas Copco Pit Viper 235 Drill 1 X Liebherr Excavators R9350 2 X CAT D11 Dozer 6 X CAT 789D Haul Trucks	Coal Fleet: 1 X Liebherr Excavators R9350 1 X CAT 854G Wheel Loader 5 X CAT 789D Haul Trucks	Coal Fleet: 1 X Liebherr Excavators R9400 1 X CAT 854G Wheel Loader 6 X CAT 789D Haul Trucks	Coal Fleet: Shut down	2 X CAT D11 Dozer 3 X CAT 789D Haul Trucks 2 X CAT D10 Dozer 1 X CAT 994H Wheel Loader 1 X CAT 16M Grader
			Road Maintenance And Watering (Daytime Only): 1 X 10 Tonne Drum Roller 1 X 18,000 Litre Water Cart 1 X CAT D6 0.5 X CAT 16H Grader		Construction Fleet (Road Construction - Daytime Only): 3 X 4WD 4 X 10 Tonne Tip Truck 4 X CAT 725C Articulated Truck 6 X CAT 621H Open Bowl Scrapper 1 X CAT 950K Wheel Loader 1 X CAT 324D Excavator 2 X 10 Tonne Water Cart 1 X CAT 140M Grader 1 X CAT D10 Dozer Dozer 2x CAT 825 Compactor		Topsoil Removal/Rehab/Clean-Up Fleet (Daytime Only): 1 X CAT D10 Dozer 1 X CAT 637 Scraper 1 X CAT 773 Water Cart 1 X 18,000 Litre Water Cart 0.5 X CAT 16H Grader		Construction Fleet: 1 X 25 Tonne Excavator
	Support Fleet: 0.5 X Haulmax 3900 Water Cart 0.5 X CAT 16M Grader	Support Fleet: 0.5 X Haulmax 3900 Water Cart 0.5 X CAT 16M Grader	Support Fleet: 0.5 X Haulmax 3900 Water Cart 0.5 X CAT 16M Grader		Support Fleet: 0.5 X Haulmax 3900 Water Cart 0.5 X CAT 16M Grader	Support Fleet: 0.5 X Haulmax 3900 Water Cart 0.5 X CAT 16M Grader	Support Fleet: 0.5 X Haulmax 3900 Water Cart 0.5 X CAT 16M Grader	Support Fleet: Shut down	

Source: WCPL

GENERAL ARRANGEMENT 2020



LEGEND
- Mining Lease Boundary
- Mining Lease Application Boundary
- Open Cut and Contained Infrastructure Area
- Pit Boundary
- Active Mining
- Active Waste Rock Emplacement
- Topsoil Stripped
- Topsoil Stockpile
- Initial Rehabilitation
- Established Rehabilitation
- Tailings Dam
- Infrastructure Area
- Main Haul Road
- Mine Access Road
- Drainage Line
- Diversion Structure
- Diversion Pipeline
- Transfer Dam
- Sediment Dam
- Existing Surface Contour
- Final Landform Contour
- Existing Local ETL
- Proposed Local ETL Realignment/Relocation
- Existing TransGrid 330 kV ETL
- Proposed Relocated TransGrid 330 kV ETL

Source: WCPL (2015); NSW Land & Property Information (2015); NSW Dept of Industry (2015)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

General Arrangement 2020

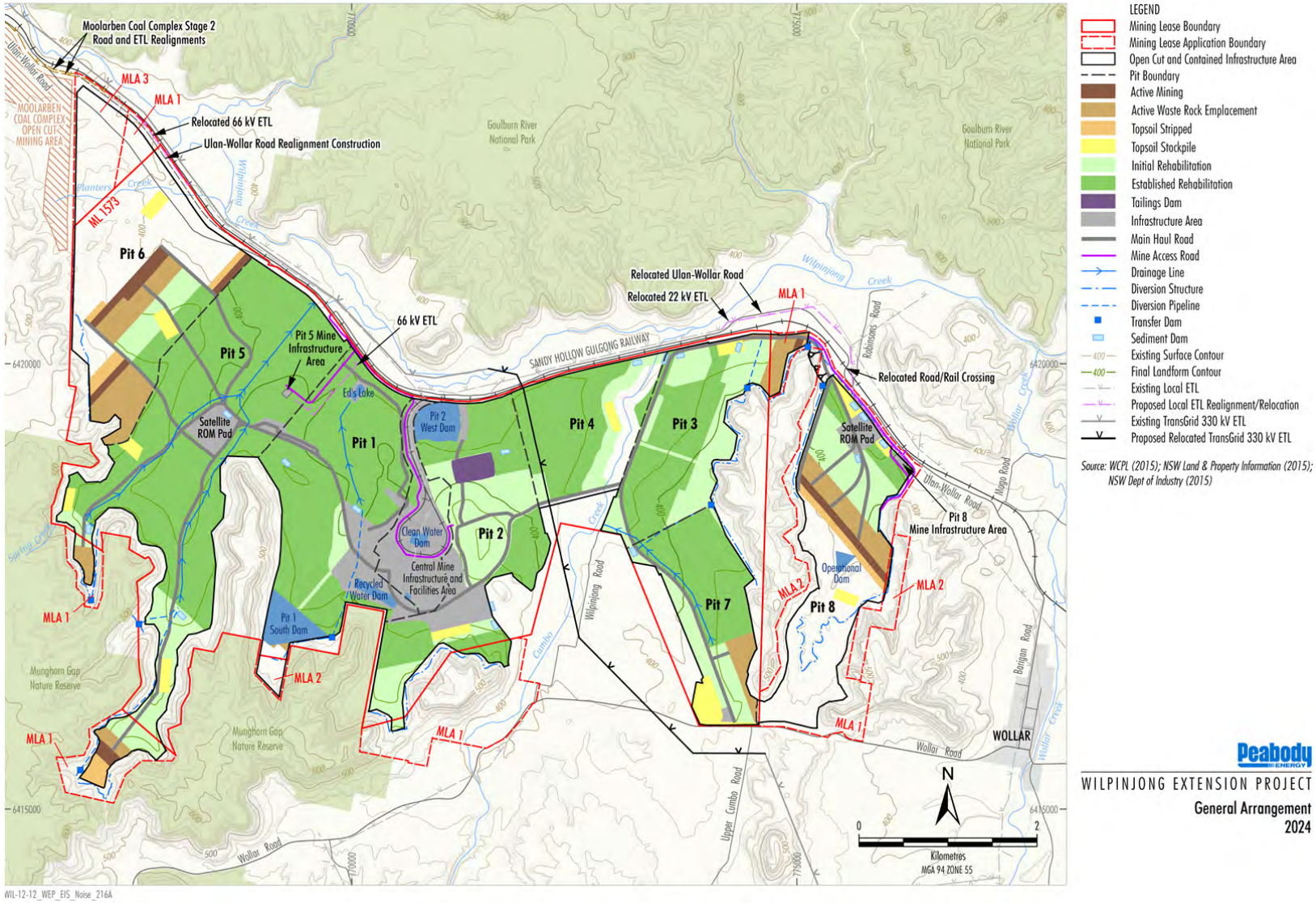
WIL-12-12_WEP_EIS_Noise_215A

Year 2020 Scenario Typical Mobile Equipment Fleet Distribution

CHPP/ROM Area	Pit 2	Pit 3	Pit 5	Pit 6	Pit 7	Pit 8	Pit 8	Maintenance
Daytime/Evening/Night-time						Daytime	Evening/Night-time	Out of Service
2 x CAT D11 Dozer (S/Pile) (Product) 1 x CAT 994H Wheel Loader (ROM) 1 x CAT 789D haul trucks (ROM) 1 x CAT 789D haul trucks (Reject)	Coal Fleet: 1 x Liebherr Excavators R9350 2 x CAT D10 Dozer 1 x CAT 854G Wheel Loader 2 x CAT 789D Haul Trucks	Waste Fleet 1: 1 x Atlas Copco Pit Viper 235 Drill 1 x Liebherr Excavators R9400 2 x CAT D10 Dozer 3 x CAT 789D Haul Trucks	Coal Fleet: 2 x Atlas Copco D65 Hammer 1 x Liebherr Excavators R9350 1 x CAT D10 Dozer 5 x CAT 789D Haul Trucks	Waste Fleet: 1 x Liebherr Excavators R9350 1 x CAT D10 Dozer 3 x CAT D11 Dozer 2 x CAT 789D Haul Trucks	Waste Fleet: 1 x Liebherr Excavators R9350 2 x CAT D10 Dozer 3 x CAT 789D Haul Trucks 4 x CAT D11 Dozer (Pushing)	Coal Fleet: 2 x Atlas Copco Pit Viper 235 Drill 1 x Liebherr Excavators R9400 1 x CAT 854G Wheel Loader 6 x CAT 789D Haul Trucks	Coal Fleet: 1 x Liebherr Excavators R9400 1 x CAT 854G Wheel Loader 4 x CAT 789D Haul Trucks	1 x Atlas Copco D65 Hammer Drill 2 x CAT D10 Dozer 2 x CAT D11 Dozer 2 x CAT 789D Haul Trucks 1 x CAT 16M Grader 1 x CAT 994H Wheel Loader
			Satellite ROM: 1 x CAT 854G Wheel Loader			Topsoil Removal/Rehab/Clean-up Fleet (Daytime only): 1 x CAT D10 Dozerr 1 x CAT 637 Scraper 1 x CAT 773 Water Cart 1 x 18,000 Litre Water Cart 0.5 x CAT 16H Grader		Construction Fleet: 0.5 x 25 tonne Excavator
						Road Maintenance and Watering (Daytime only): 1 x 10 tonne Drum Roller 1 x 18,000 Litre Water Cart 1 x CAT D6 0.5 x CAT 16H Grader 0.5 x 25 tonne Excavator		
	Support Fleet: 0.5 x Haulmax 3900 Water Cart 0.5 x CAT 16M Grader	Support Fleet: 0.5 x Haulmax 3900 Water Cart 0.5 x CAT 16M Grader	Support Fleet: 0.5 x Haulmax 3900 Water Cart 0.5 x CAT 16M Grader	Support Fleet: 0.5 x Haulmax 3900 Water Cart 0.5 x CAT 16M Grader	Support Fleet: 0.5 x Haulmax 3900 Water Cart 0.5 x CAT 16M Grader	Support Fleet: 0.5 x Haulmax 3900 Water Cart 0.5 x CAT 16M Grader	Support Fleet: 0.5 x Haulmax 3900 Water Cart 0.5 x CAT 16M Grader	

Source: WCPL

GENERAL ARRANGEMENT 2024



LEGEND
- Mining Lease Boundary
- Mining Lease Application Boundary
- Open Cut and Contained Infrastructure Area
- Pit Boundary
- Active Mining
- Active Waste Rock Emplacement
- Topsoil Stripped
- Topsoil Stockpile
- Initial Rehabilitation
- Established Rehabilitation
- Tailings Dam
- Infrastructure Area
- Main Haul Road
- Mine Access Road
- Drainage Line
- Diversion Structure
- Diversion Pipeline
- Transfer Dam
- Sediment Dam
- Existing Surface Contour
- Final Landform Contour
- Existing Local ETL
- Proposed Local ETL Realignment/Relocation
- Existing TransGrid 330 kV ETL
- Proposed Relocated TransGrid 330 kV ETL

Source: WCPL (2015); NSW Land & Property Information (2015); NSW Dept of Industry (2015)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

General Arrangement 2024

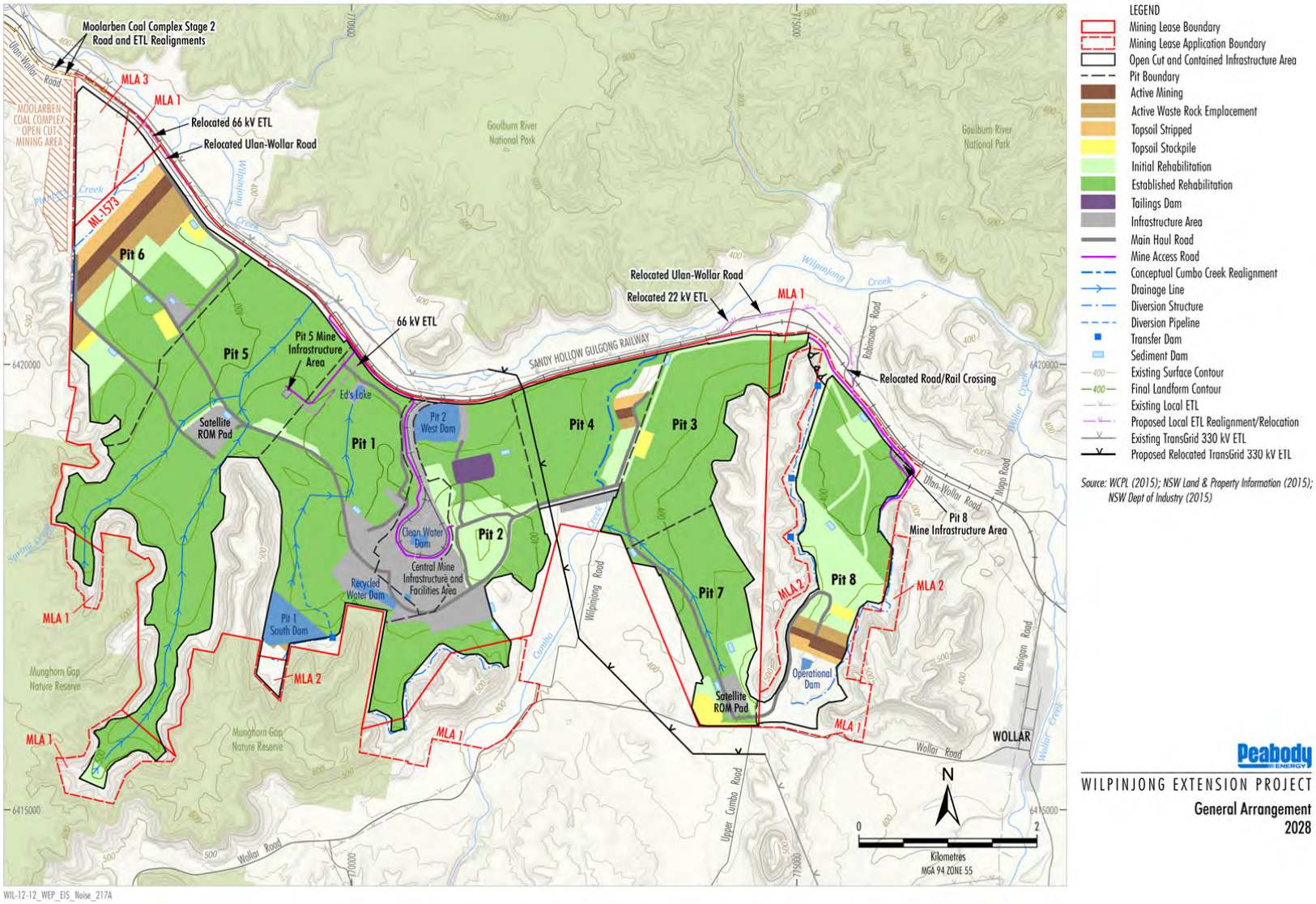
WIL-12-12_WEP_EIS_Noise_216A

Year 2024 Scenario Typical Mobile Equipment Fleet Distribution

CHPP/ROM Area	Pit 3	Pit 5	Pit 6	Pit 8	Pit 8	Maintenance
Daytime/Evening/Night-time				Daytime	Evening/Night-time	Out of Service
2 x D11 Dozer (S/Pile) (Product) 1 x CAT 994H Wheel Loader (ROM) 1 x CAT 789D haul trucks (ROM) 1 x CAT 789D haul trucks (Reject)	Waste Fleet 1: 1 x Atlas Copco D65 Hammer 1 x Liebherr Excavators R9400 2 x CAT D10 Dozer 3 x CAT 789D Haul Trucks	Coal Fleet: 2 x Atlas Copco D65 Hammer 1 x Liebherr Excavators R9350 1 x CAT 854G Wheel Loader 6 x CAT D11 Dozer (Pushing) 6 x CAT 789D Haul Trucks	Coal Fleet: 2 x Atlas Copco Pit Viper 235 Drill 1 x Liebherr Excavators R9350 1 x CAT 854G Wheel Loader 1 x CAT D10 Dozer 5 x CAT 789D Haul Trucks	Coal Fleet (Noise Attenuated): 1 x Liebherr Excavators R9400 1 x CAT 854G Wheel Loader 7 x CAT 789D Haul Trucks	Coal Fleet (Noise Attenuated): 1 x Liebherr Excavators R9400 1 x CAT 854G Wheel Loader 7 x CAT 789D Haul Trucks	2 x CAT D10 Dozer 2 x CAT D11 Dozer 3 x CAT 789D Haul Trucks 0.5 x CAT 994H Wheel Loader
			Waste Fleet: 1 x Atlas Copco Pit Viper 235 Drill 1 x Liebherr Excavators R9350 1 x CAT D10 Dozer 1 x CAT D11 Dozer 3 x CAT 789D Haul Trucks	Waste Fleet (Noise Attenuated): 1 x Liebherr Excavators R9350 2 x CAT D10 Dozer 3 x CAT 789D Haul Trucks Satellite ROM : 0.5 x CAT 994H Wheel Loader	Waste Fleet (Noise Attenuated): 1 x Liebherr Excavators R9350 2 x CAT D10 Dozer 3 x CAT 789D Haul Trucks Satellite ROM: Shut Down	Construction Fleet: 0.5 x 25 tonne Excavator
			Construction Fleet (Road Construction - daytime only): 3 x 4WD 4 x 10 tonne Tip Truck 4 x CAT 725C Articulated Truck 6 x CAT 621H Open Bowl Scrapper 1 x CAT 950K Wheel Loader 1 x CAT 324D Excavator 2 x 10 tonne Water Cart 1 x CAT 140M Grader 1 x CAT D10 DOZER Dozer 2x CAT 825 Compactor	Topsoil Removal/Rehab/Clean-up Fleet (Daytime only): 1 x CAT D10 Dozer 1 x CAT 637 Scraper 1 x CAT 773 Water Cart 1 x 18,000 Litre Water Cart 0.5 x CAT 16H Grader Road Maintenance and Watering (Daytime only): 1 x 10 tonne Drum Roller 1 x 18,000 Litre Water Cart 1 x CAT D6 0.5 x CAT 16H Grader 0.5 x 25 tonne Excavator		
	Support Fleet: 0.5 x Haulmax 3900 Water Cart 0.5 x CAT 16M Grader	Support Fleet: 0.5 x Haulmax 3900 Water Cart 1 x CAT 16M Grader	Support Fleet: 1 x Haulmax 3900 Water Cart 1.5 x CAT 16M Grader	Support Fleet: 1 x Haulmax 3900 Water Cart 1 x CAT 16M Grader	Support Fleet: 1 x Haulmax 3900 Water Cart 1 x CAT 16M Grader	

Source: WCPL

GENERAL ARRANGEMENT 2028



Source: WCPL (2015); NSW Land & Property Information (2015); NSW Dept of Industry (2015)

WIL-12-12_WEP_EIS_Noise_217A

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

General Arrangement 2028

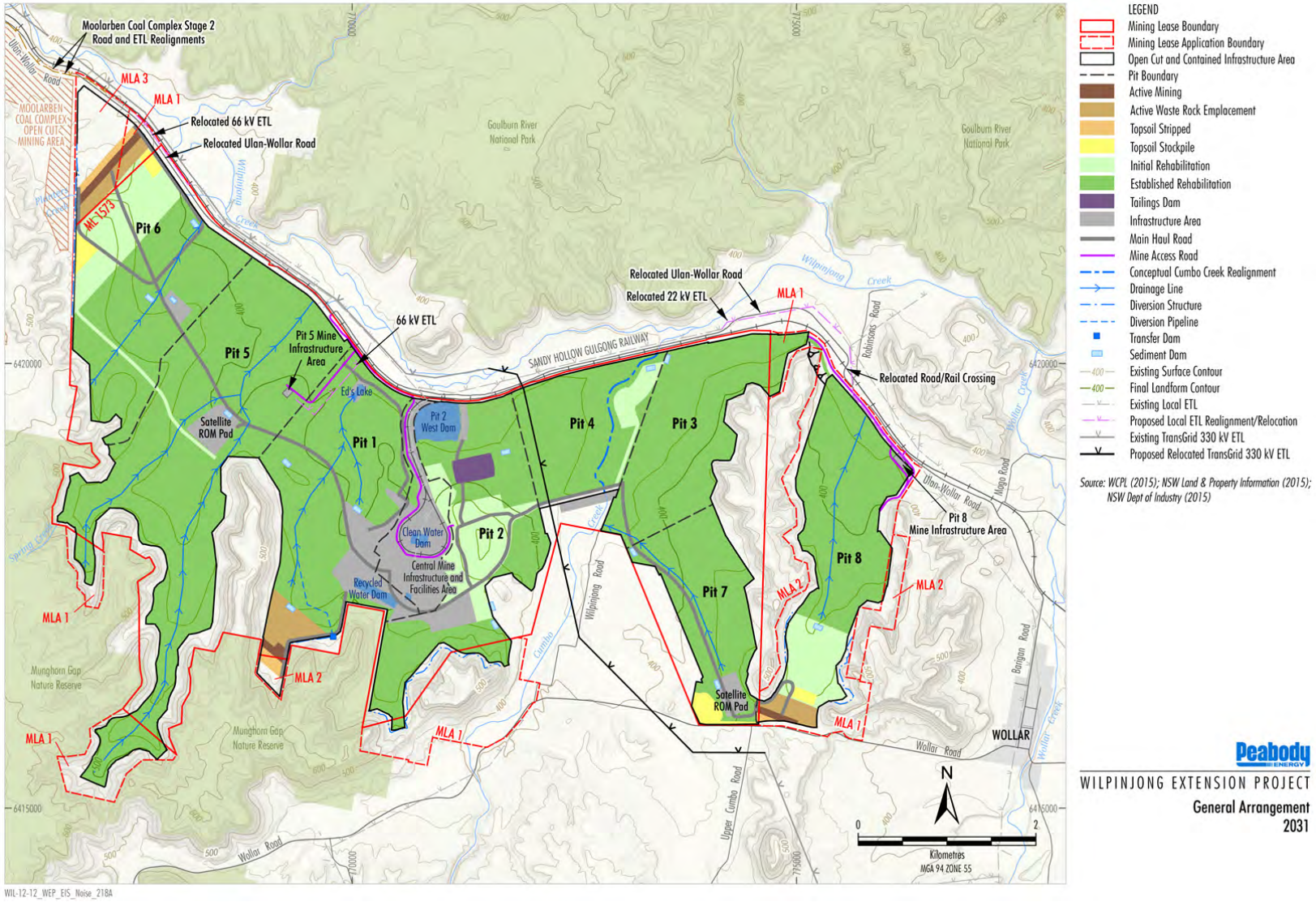
MOBILE EQUIPMENT FLEET DISTRIBUTION 2028

Year 2028 Scenario Typical Mobile Equipment Fleet Distribution

CHPP/ROM Area	Pit 4	Pit 6	Pit 7	Pit 8	Pit 8	Maintenance
Daytime/Evening/Night-time				Daytime	Evening/Night-time	Out of Service
2 x CAT D11 Dozer (S/Pile) (Product) 1 x CAT 994H Wheel Loader (ROM) 1 x CAT 789D haul trucks (ROM) 1 x CAT 789D haul trucks (Reject)	Coal Fleet: 2 x Atlas Copco D65 Hammer Drill 1 x Liebherr Excavators R9400 1 x CAT 854G Wheel Loader 3 x CAT D11 Dozer 4 x CAT 789D Haul Trucks	Waste Fleet 1: 1 x Liebherr Excavators R9350 2 x CAT D10 Dozer 3 x CAT 789D Haul Trucks	Satellite ROM: 1 x CAT 994H Wheel Loader	Coal Fleet: 2 x Atlas Copco Pit Viper 235 Drill 1 x Liebherr Excavators R9400 1 x CAT 854G Wheel Loader 4 x CAT D11 Dozer (Pushing) 6 x CAT 789D Haul Trucks	Coal Fleet: 2 x Atlas Copco Pit Viper 235 Drill 1 x Liebherr Excavators R9400 1 x CAT 854G Wheel Loader 4 x CAT D11 Dozer (Pushing) 4 x CAT 789D Haul Trucks	1 x Atlas Copco D65 Hammer Drill 1 x Atlas Copco Pit Viper 235 Drill 1 x CAT D10 Dozer 1 x CAT D11 Dozer 2 x CAT 789D Haul Trucks 1 x CAT 16M Grader
	Road Maintenance and Watering (Daytime only): 1 x 10 tonne Drum Roller 1 x 18,000 Litre Water Cart 1 x CAT D6 0.5 x CAT 16H Grader	Waste Fleet 2: 1 x Liebherr Excavators R9350 2 x CAT D10 Dozer 3 x CAT 789D Haul Trucks		Topsoil Removal/Rehab/Clean-up Fleet (Daytime only): 1 x CAT D10 Dozer 1 x CAT637 1 x CAT 773 Water Cart 1 x 18,000 Litre Water Cart 0.5 x CAT 16H Grader		Construction Fleet: 1 x 25 tonne Excavator
	Support Fleet: 1 x Haulmax 3900 Water Cart 0.5 x CAT 16M Grader	Support Fleet: 1 x Haulmax 3900 Water Cart 1 x CAT 16M Grader		Support Fleet: 1 x Haulmax 3900 Water Cart 0.5 x CAT 16M Grader	Support Fleet: 1 x Haulmax 3900 Water Cart 0.5 x CAT 16M Grader	

Source: WCPL

GENERAL ARRANGEMENT 2031



LEGEND
- Mining Lease Boundary
- Mining Lease Application Boundary
- Open Cut and Contained Infrastructure Area
- Pit Boundary
- Active Mining
- Active Waste Rock Emplacement
- Topsoil Stripped
- Topsoil Stockpile
- Initial Rehabilitation
- Established Rehabilitation
- Tailings Dam
- Infrastructure Area
- Main Haul Road
- Mine Access Road
- Conceptual Cumbo Creek Realignment
- Drainage Line
- Diversion Structure
- Diversion Pipeline
- Transfer Dam
- Sediment Dam
- Existing Surface Contour
- Final Landform Contour
- Existing Local ETL
- Proposed Local ETL Realignment/Relocation
- Existing TransGrid 330 kV ETL
- Proposed Relocated TransGrid 330 kV ETL

Source: WCPL (2015); NSW Land & Property Information (2015); NSW Dept of Industry (2015)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

General Arrangement 2031

Year 2031 Scenario Typical Mobile Equipment Fleet Distribution

CHPP/ROM Area	Pit 6	Pit 7	Pit 8	Maintenance
Daytime/Evening/Night-time				Out of Service
2 x CAT D11 Dozer (S/Pile) (Product) 1 x CAT 994H Wheel Loader (ROM) 1 x CAT 789D haul trucks (ROM) 1 x CAT 789D haul trucks (Reject)	Coal Fleet: 1 x Liebherr Excavators R9400 1 x CAT854G Wheel Loader 2 x CAT D11 Dozer 6 x CAT 789D Haul Trucks	Satellite ROM: 1 x CAT 994H Wheel Loader	Coal Fleet: 1 x Atlas Copco D65 Hammer Drill 1 x Liebherr Excavators R9400 1 x CAT 854G Wheel Loader 4 x CAT D11 Dozer (Pushing) 4 x CAT 789D Haul Trucks	2 x CAT D10 Dozer 1 x CAT D11 Dozer
	Waste Fleet: 2 x Atlas Copco Pit Viper 235 Drill 1 x Atlas Copco D65 Hammer Drill 1 x Liebherr Excavators R9350 2 x CAT D10 Dozer 2 x CAT 789D Haul Trucks		Road Maintenance and Watering (Daytime only): 1 x 10 tonne Drum Roller 1 x 18,000 Litre Water Cart 1 x CAT D6 0.5 x CAT 16H Grader	Construction Fleet: 1 x 25 tonne Excavator
	Topsoil Removal/Rehab/Clean-up Fleet (Daytime only): 1 x CAT D10 Dozerr 1 x CAT637 1 x CAT 773 Water Cart 1 x 18,000 Litre Water Cart 0.5 x CAT 16H Grader			
	Support Fleet: 1 x Haulmax 3900 Water Cart 1 x CAT 16M Grader		Support Fleet: 1 x Haulmax 3900 Water Cart 1 x CAT 16M Grader	

Source: WCPL

Feasible and Reasonable Mitigation

'Feasible' and 'reasonable' mitigation is defined as follows.

A **feasible** mitigation measure is a noise mitigation measure that can be engineered and is practical to build, given project constraints such as safety, maintenance and reliability requirements. It may also include options such as amending operational practices (eg changing timetable schedules) to achieve noise reduction.

Selecting **reasonable** measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure. To make such a judgement, consider the following.

- Noise impacts:
  - existing and future levels, and projected changes in noise levels
  - level of amenity before the project, eg the number of people affected or annoyed
  - any noise performance criteria for the development, eg internal noise levels for certain rooms
  - the amount by which the triggers are exceeded.
- Noise mitigation benefits:
  - the amount of noise reduction expected, including the cumulative effectiveness of proposed mitigation measures - ideally, a noise wall/mound should be able to reduce noise levels by at least 5 decibels
  - the number of people protected.
- Cost effectiveness of noise mitigation:
  - the total cost of mitigation measures, taking into account the physical attributes of the site, eg topography, geology, and the cost variation to the project given the expected benefit
  - noise mitigation costs compared with total project costs, taking into account capital and maintenance costs
  - ongoing operational and maintenance cost borne by the community, e.g. running air conditioners or mechanical ventilation.
- Community views:
  - engage with affected land users when deciding about aesthetic and other impacts of noise mitigation measures
  - determine the views of all affected land users, not just those making representations, through early community consultation
  - consider noise mitigation measures that have majority support from the affected community.

Take into account the above considerations when determining which locations should be mitigated first. In practice, the detail of the mitigation measures applied will largely depend on project-specific factors. The outcome this process aims to achieve is to balance the project's benefits for the wider community against the costs and benefits of mitigation measures. These are the measures that minimise, as far as practicable, the local impacts of the project. Project approval conditions that flow from this process should be achievable. They need to provide clarity and confidence for the proponent, local community, regulators and the ultimate operator that the proposed mitigation measures can achieve the predicted level of environmental protection.

RESOURCE-COMPANY OWNED RECEIVERS DAYTIME INTRUSIVE NOISE

ID No	Ownership	Year 2018		Year 2020		Year 2024		Year 2028		Year 2031	
		Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind
Resource-company (Moolarben)											
32_12	Moolarben	22	33	21	30	22	33	24	32	24	33
32_13	Moolarben	22	33	21	30	23	33	23	32	24	33
32_14	Moolarben	19	33	18	30	20	34	20	32	21	34
32_29A	Moolarben	15	30	15	29	16	26	15	29	14	28
32_29B	Moolarben	17	35	17	34	18	35	16	34	16	34
32_32C (7.11)	Moolarben	30	40	27	35	40	47	34	42	38	47
32_33A	Moolarben	12	31	11	30	12	30	11	31	11	30
32_33B_5	Moolarben	12	31	11	30	11	30	11	31	11	29
32_48A	Moolarben	18	32	16	31	17	30	16	31	15	30
32_48B	Moolarben	17	32	15	31	16	28	15	31	14	30
32_M02	Moolarben	12	31	11	29	12	29	12	31	12	30
32_M03	Moolarben	12	21	11	19	12	22	12	19	12	19
Resource-company (Peabody)											
1_28C	Peabody	25	22	29	26	27	24	23	20	19	15
1_45	Peabody	49	48	49	47	45	44	33	30	27	24
1_49	Peabody	35	39	37	43	27	36	37	44	36	45
1_83	Peabody	32	27	29	25	28	24	21	17	18	13
1_100B	Peabody	15	11	15	11	13	9	13	9	12	7
1_106	Peabody	19	15	19	14	17	13	18	14	16	12
1_129	Peabody	26	22	29	26	25	21	22	18	18	14
1_130	Peabody	30	27	29	25	27	23	21	17	18	13
1_133	Peabody	26	22	29	25	28	24	21	16	18	14
1_135	Peabody	26	22	28	26	24	20	21	16	18	14
1_136	Peabody	22	19	25	21	22	18	20	16	17	13
1_140	Peabody	21	18	24	22	20	16	18	14	16	11
1_143	Peabody	25	21	28	24	27	22	20	16	18	13
1_145	Peabody	24	20	26	22	23	19	20	16	17	13
1_151	Peabody	20	29	20	30	16	28	21	30	19	27
1_152	Peabody	23	19	25	21	23	19	19	15	17	12
1_154	Peabody	11	10	10	9	8	7	12	11	11	9
1_156	Peabody	12	10	12	9	9	7	13	10	12	9
1_158	Peabody	14	10	14	10	12	8	13	9	12	8
1_159	Peabody	12	8	13	9	11	7	9	5	8	4
1_162	Peabody	10	5	9	4	8	3	8	3	6	2
1_163	Peabody	9	4	8	4	7	2	7	3	6	2
1_164 (7.6)	Peabody	38	44	38	47	31	37	38	46	36	45
1_910	Peabody	19	16	20	18	20	18	22	19	20	17
1_912	Peabody	19	16	20	17	20	18	22	19	19	15
1_913	Peabody	19	16	20	18	20	18	22	19	20	16
1_915	Peabody	18	16	20	18	21	18	22	19	18	14
1_917	Peabody	18	16	20	17	20	18	21	18	18	14
1_920	Peabody	19	16	20	17	20	18	21	18	17	14
1_926	Peabody	19	16	20	18	20	18	21	18	17	13

RESOURCE-COMPANY OWNED RECEIVERS DAYTIME INTRUSIVE NOISE

ID No	Ownership	Year 2018		Year 2020		Year 2024		Year 2028		Year 2031	
		Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind	Calm	Wind
1_927	Peabody	19	16	20	17	20	18	21	18	17	14
1_929	Peabody	19	16	20	18	21	19	22	19	18	14
1_931	Peabody	19	17	20	18	21	19	22	19	18	15
1_934	Peabody	19	16	21	18	21	18	22	19	18	14
1_937	Peabody	19	16	21	18	21	18	22	19	18	14
1_938	Peabody	19	17	21	18	21	19	22	19	18	15
1_939	Peabody	19	17	21	19	22	19	22	19	18	15
1_941	Peabody	19	17	21	18	21	19	22	19	18	14
1_947B	Peabody	20	17	21	19	22	19	22	18	18	14
1_953	Peabody	21	18	22	20	23	20	22	18	18	14
1_956	Peabody	21	18	23	20	23	20	22	19	17	14
1_W88A	Peabody	21	30	21	30	17	28	21	32	20	29
1_W88B	Peabody	22	30	22	31	18	28	22	32	21	30
1_WF (7.7)	Peabody	26	39	29	38	21	35	28	40	28	37
1_WK	Peabody	23	32	23	33	20	25	23	33	22	32
1_WR (7.10)	Peabody	19	16	20	17	18	16	23	19	24	20
1_WT	Peabody	13	9	13	10	12	8	13	9	11	6

Note 1: Highest predicted noise levels from the INP meteorological conditions in Table 11 for each receiver.
Note 2: Predicted LAeq(15minute) noise level complies with the intrusive PSNL.
Note 3: Predicted negligible noise exceedance 1 to 2 dBA above intrusive PSNL.
Note 4: Predicted marginal to moderate noise exceedance of 3 to 5 dBA above intrusive PSNL.
Note 5: Predicted significant noise exceedance > 5 dBA above intrusive PSNL.

RESOURCE-COMPANY OWNED RECEIVERS EVENING INTRUSIVE NOISE

ID No	Ownership	Year 2018		Year 2020		Year 2024		Year 2028		Year 2031	
		Calm	Wind	Calm	Wind	Calm	Calm	Wind	Calm	Wind	Calm
Resource-company (Moolarben)											
32_12	Moolarben	20	31	21	31	22	32	24	33	24	34
32_13	Moolarben	20	31	21	31	22	32	24	33	24	34
32_14	Moolarben	17	30	17	30	19	32	20	34	21	34
32_29A	Moolarben	14	27	15	26	16	24	14	26	14	25
32_29B	Moolarben	16	32	16	33	17	33	16	32	16	32
32_32C (7.11)	Moolarben	26	37	27	36	30	39	34	43	35	45
32_33A	Moolarben	10	29	11	30	11	30	11	30	11	30
32_33B_5	Moolarben	10	29	11	29	11	30	11	30	11	29
32_48A	Moolarben	16	28	16	27	17	24	16	27	15	27
32_48B	Moolarben	15	28	15	27	16	23	14	27	14	27
32_M02	Moolarben	10	28	11	28	11	28	12	30	12	29
32_M03	Moolarben	10	18	11	18	12	18	12	17	12	17
Resource-company (Peabody)											
1_28C	Peabody	19	36	22	36	21	35	23	35	19	34
1_45	Peabody	38	48	47	50	45	46	32	41	27	38
1_49	Peabody	34	48	36	47	27	46	36	47	36	47
1_83	Peabody	19	41	25	45	26	40	20	41	18	39
1_100B	Peabody	12	31	13	30	12	30	13	32	12	30
1_106	Peabody	18	31	18	32	17	30	17	31	17	29
1_129	Peabody	20	39	25	39	21	40	21	41	18	36
1_130	Peabody	19	41	25	42	23	39	20	41	18	36
1_133	Peabody	19	40	26	42	24	39	20	41	18	41
1_135	Peabody	19	40	25	40	22	39	20	40	18	41
1_136	Peabody	19	33	21	34	19	33	19	33	18	31
1_140	Peabody	17	37	20	37	18	38	17	39	16	38
1_143	Peabody	19	40	25	42	23	39	20	41	18	40
1_145	Peabody	18	37	23	36	20	34	19	34	17	38
1_151	Peabody	19	35	20	35	16	34	20	34	19	34
1_152	Peabody	18	37	22	37	19	38	18	38	17	39
1_154	Peabody	10	28	9	28	8	26	11	29	11	28
1_156	Peabody	10	25	11	26	9	24	12	28	12	26
1_158	Peabody	12	29	12	28	11	27	12	28	12	27
1_159	Peabody	9	26	10	26	9	26	9	27	8	26
1_162	Peabody	8	29	8	28	7	27	7	28	6	28
1_163	Peabody	7	28	7	28	6	26	7	28	6	27
1_164 (7.6)	Peabody	36	47	36	45	30	42	37	48	36	45
1_910	Peabody	17	35	19	35	17	38	21	37	20	38
1_912	Peabody	17	36	18	35	17	38	21	36	20	35
1_913	Peabody	17	36	19	35	17	38	22	37	20	37
1_915	Peabody	16	33	17	32	16	36	21	34	18	33
1_917	Peabody	16	35	17	35	16	37	20	36	18	34
1_920	Peabody	16	37	17	36	16	37	21	37	18	35
1_926	Peabody	16	37	17	36	16	37	21	37	17	36

RESOURCE-COMPANY OWNED RECEIVERS EVENING INTRUSIVE NOISE

ID No	Ownership	Year 2018		Year 2020		Year 2024		Year 2028		Year 2031	
		Calm	Wind	Calm	Wind	Calm	Calm	Wind	Calm	Wind	Calm
1_927	Peabody	16	37	17	37	16	37	20	37	18	36
1_929	Peabody	16	36	17	36	16	36	21	37	18	36
1_931	Peabody	17	36	17	36	16	36	22	36	18	35
1_934	Peabody	16	36	18	36	17	36	21	37	18	36
1_937	Peabody	16	37	17	36	17	36	21	37	18	36
1_938	Peabody	16	36	18	36	17	35	22	37	18	36
1_939	Peabody	16	36	18	36	17	36	22	37	18	36
1_941	Peabody	16	36	18	37	17	36	21	37	18	36
1_947B	Peabody	17	36	18	37	17	36	22	37	18	36
1_953	Peabody	17	35	19	37	18	35	21	36	18	35
1_956	Peabody	17	35	19	37	18	35	22	36	18	35
1_W88A	Peabody	19	36	21	35	17	35	20	35	20	35
1_W88B	Peabody	21	37	21	37	18	36	21	36	21	36
1_WF (7.7)	Peabody	26	32	29	34	21	33	27	36	28	35
1_WK	Peabody	22	41	22	40	20	40	23	40	22	39
1_WR (7.10)	Peabody	18	39	19	41	17	37	22	47	24	46
1_WT	Peabody	11	28	11	28	10	28	12	28	11	27

Note 1: Highest predicted noise levels from the INP meteorological conditions in Table 11 for each receiver.
Note 2: Predicted LAeq(15minute) noise level complies with the intrusive PSNL.
Note 3: Predicted negligible noise exceedance 1 to 2 dBA above intrusive PSNL.
Note 4: Predicted marginal to moderate noise exceedance of 3 to 5 dBA above intrusive PSNL.
Note 5: Predicted significant noise exceedance > 5 dBA above intrusive PSNL.

RESOURCE-COMPANY OWNED RECEIVERS NIGHT-TIME INTRUSIVE NOISE

ID No	Ownership	2018			2020			2024			2028			2031		
		Calm	Wind or Inversion	LA1 (1min)	Calm	Wind or Inversion	LA1 (1min)	Calm	Wind or Inversion	LA1 (1min)	Calm	Wind or Inversion	LA1 (1min)	Calm	Wind or Inversion	LA1 (1min)
Resource-company (Moolarben)																
32_12	Moolarben	21	32	39	21	32	39	23	34	40	25	35	41	24	35	42
32_13	Moolarben	21	32	39	22	32	39	23	34	41	24	35	41	24	35	42
32_14	Moolarben	18	31	38	18	32	38	20	33	40	21	35	41	21	35	41
32_29A	Moolarben	15	29	35	15	28	34	16	26	33	15	28	35	15	28	34
32_29B	Moolarben	16	34	40	17	35	41	18	35	42	16	35	41	16	34	41
32_32C (7.11)	Moolarben	27	39	45	28	38	45	31	41	48	35	45	51	35	46	53
32_33A	Moolarben	11	29	36	11	30	36	12	30	37	12	31	37	12	31	37
32_33B_5	Moolarben	11	29	36	11	30	36	12	30	37	11	31	37	12	30	36
32_48A	Moolarben	17	33	39	16	32	39	17	33	39	16	32	38	15	32	39
32_48B	Moolarben	16	33	39	15	32	38	16	32	39	15	32	39	14	33	39
32_M02	Moolarben	10	29	36	11	29	36	12	30	36	12	31	37	12	31	37
32_M03	Moolarben	10	19	26	11	19	26	12	19	26	12	19	25	12	18	25
Resource-company (Peabody)																
1_28C	Peabody	20	35	41	23	34	41	22	34	41	23	34	41	19	33	40
1_45	Peabody	39	49	56	48	54	60	45	51	57	33	45	51	28	42	48
1_49	Peabody	34	48	54	37	48	55	27	45	52	37	49	55	37	49	56
1_83	Peabody	20	40	46	25	42	49	26	38	44	21	41	48	18	40	47
1_100B	Peabody	13	30	36	14	29	36	12	29	35	13	30	36	12	29	36
1_106	Peabody	18	32	39	18	33	39	17	31	37	18	32	39	17	31	37
1_129	Peabody	20	37	44	25	38	44	22	36	43	22	38	44	19	35	41
1_130	Peabody	20	40	47	25	40	46	24	38	45	21	39	46	18	36	42
1_133	Peabody	20	40	46	27	40	47	24	38	45	20	40	46	18	41	47
1_135	Peabody	19	39	46	26	39	46	23	38	45	21	39	46	18	41	47
1_136	Peabody	19	32	39	22	33	40	19	32	39	20	31	38	18	31	37
1_140	Peabody	18	36	43	21	35	42	18	36	43	18	38	44	16	38	45
1_143	Peabody	19	39	46	26	40	47	24	38	45	20	40	46	18	40	47
1_145	Peabody	19	35	42	23	35	42	21	33	40	20	33	40	18	38	44
1_151	Peabody	19	37	43	21	36	43	16	35	42	21	36	43	20	35	42
1_152	Peabody	18	36	42	23	36	43	20	36	42	19	37	43	17	39	45
1_154	Peabody	10	27	34	10	27	34	8	25	32	12	29	36	11	27	34
1_156	Peabody	11	25	31	11	26	32	9	23	29	13	28	34	13	26	33
1_158	Peabody	13	27	34	13	27	34	12	27	33	13	27	33	12	26	33
1_159	Peabody	10	25	32	11	26	32	9	25	32	9	26	32	8	25	32
1_162	Peabody	8	28	35	8	27	34	7	26	33	8	28	34	7	27	34
1_163	Peabody	7	28	34	7	27	34	7	26	33	7	27	34	7	27	33
1_164 (7.6)	Peabody	37	49	55	37	48	55	30	42	49	38	50	57	36	48	54
1_910	Peabody	18	34	41	19	34	40	17	35	41	22	35	42	21	35	41
1_912	Peabody	17	34	41	19	34	40	17	34	41	22	34	41	20	34	40
1_913	Peabody	17	34	41	19	34	40	17	34	41	22	35	41	21	34	41
1_915	Peabody	16	31	37	17	31	37	16	31	37	22	32	39	19	31	38
1_917	Peabody	16	32	39	17	33	40	16	32	39	21	33	40	18	32	39
1_920	Peabody	16	34	41	17	35	41	16	34	41	21	34	41	18	33	40
1_926	Peabody	16	35	41	18	35	42	17	35	41	21	35	42	18	34	41
1_927	Peabody	16	35	42	18	36	42	17	35	42	21	35	42	18	34	41
1_929	Peabody	17	35	42	18	35	42	17	35	41	22	35	42	19	35	41
1_931	Peabody	17	35	42	18	35	41	17	35	41	22	35	42	19	35	41
1_934	Peabody	17	35	42	18	35	42	17	35	41	22	36	42	19	35	41
1_937	Peabody	17	35	42	18	35	42	17	35	41	22	36	42	19	35	41
1_938	Peabody	17	35	42	18	35	42	17	35	41	22	36	42	19	35	42
1_939	Peabody	17	36	42	18	35	42	17	35	42	22	36	42	19	35	42
1_941	Peabody	17	35	42	18	35	42	17	35	42	22	36	42	19	35	42
1_947B	Peabody	17	35	42	18	35	42	18	35	41	22	35	42	19	35	41

RESOURCE-COMPANY OWNED RECEIVERS NIGHT-TIME INTRUSIVE NOISE

ID No	Ownership	2018			2020			2024			2028			2031		
		Calm	Wind or Inversion	LA1 (1min)	Calm	Wind or Inversion	LA1 (1min)	Calm	Wind or Inversion	LA1 (1min)	Calm	Wind or Inversion	LA1 (1min)	Calm	Wind or Inversion	LA1 (1min)
1_953	Peabody	17	34	41	19	36	43	18	34	41	22	34	41	18	34	40
1_956	Peabody	18	34	40	19	36	43	19	35	41	22	34	41	18	33	40
1_W88A	Peabody	20	38	44	21	37	43	17	36	42	21	37	44	21	36	43
1_W88B	Peabody	21	39	45	22	38	45	18	37	44	22	38	45	22	38	44
1_WF (7.7)	Peabody	26	40	47	30	40	46	21	37	44	28	43	49	29	41	47
1_WK	Peabody	23	42	49	22	42	49	20	40	47	23	42	48	23	41	48
1_WR (7.10)	Peabody	18	38	44	20	39	45	17	36	43	22	42	48	25	45	51
1_WT	Peabody	11	26	32	12	27	34	11	26	33	13	26	33	11	26	32

Note 1: Highest predicted noise levels from the INP meteorological conditions in Table 11 for each receiver.
Note 2: Predicted $L_{Aeq(15minute)}$ noise level complies with the intrusive PSNL.
Note 3: Predicted negligible noise exceedance 1 to 2 dBA above intrusive PSNL.
Note 4: Predicted marginal to moderate noise exceedance of 3 to 5 dBA above intrusive PSNL.
Note 5: Predicted significant noise exceedance > 5 dBA above intrusive PSNL.
Note 6: Predicted $L_{Aeq(1minute)}$ noise level complies with the SDNL.
Note 7: Predicted negligible noise exceedance 1 to 2 dBA above SDNL.
Note 8: Predicted marginal to moderate noise exceedance of 3 to 5 dBA above SDNL.
Note 9: Predicted significant noise exceedance > 5 dBA above SDNL.

RESOURCE-COMPANY OWNED RECEIVERS INTRUSIVE NOISE IMPACT SUMMARY

The current WCPL property acquisition strategy has resulted in a 'buffer' of mine owned lands surrounding the majority of the Project. Consequently, predicted noise levels are elevated at some resource-company owned properties. In addition, a number of properties in the vicinity of the Project are owned by MCMPL.

In summary, the predicted daytime, evening and night-time $L_{Aeq(period)}$ noise amenity levels in Years 2018, 2020, 2024, 2028 and 2031 show that:

- During the daytime, a moderate noise exceedance of 3 to 5 dBA above PSNL 35 dBA is predicted at resource-company owned receiver 1_WF and significant noise exceedances of greater than 5 dBA above PSNL 35 dBA are predicted at resource-company owned receivers 32_32C, 1_45, 1_49 and 1_164.
- During the evening, negligible noise exceedances of 1 to 2 dBA above PSNL 35 dBA are predicted at resource-company owned receivers 1_28C, 1_915, 1_917, 1_920, 1_926, 1_927, 1_929, 1_931, 1_934, 1_937, 1_938, 1_939, 1_941, 1_947B, 1_953, 1_956, 1_W88A, 1_W88B and 1_WF. Marginal to moderate noise exceedances of 3 to 5 dBA above PSNL 35 dBA are predicted at resource-company owned receivers 1_140, 1_145, 1_152, 1_910, 1_912 and 1_913. Significant noise exceedances of greater than 5 dBA above PSNL 35 dBA are predicted at resource-company owned receiver 32_32C, 1_45, 1_49, 1_83, 1_129, 1_130, 1_133, 1_135, 1_143, 1_164, 1_WK and 1_WR.
- During the night-time, negligible noise exceedances of 1 to 2 dBA above PSNL 35 dBA are predicted at resource-company owned receivers 1_151, 1_927, 1_934, 1_937, 1_938, 1_939, 1_941, 1_953 and 1_956. Marginal to moderate noise exceedances of 3 to 5 dBA above PSNL 35 dBA are predicted at resource-company owned receivers 1_129, 1_130, 1_140, 1_143, 1_145, 1_152, 1_W88A and 1_W88B. Significant noise exceedances of greater than 5 dBA above PSNL 35 dBA are predicted at resource-company owned receivers 32_32C, 1_45, 1_49, 1_83, 1_133, 1_135, 1_164, 1_WF, 1_WK and 1_WR.

Table K1 and Table K2 present the resource-company owned receivers with predicted intrusive $L_{Aeq(15minute)}$ noise level exceedances of the PSNLs and predicted $L_{A1(1minute)}$ exceedances of the SDNLs respectively.

Table K1 Resource-company owned Receivers[1] with Intrusive PSNL Exceedances

Period	Noise Management Zone		Noise Affection Zone
	1 dBA to 2 dBA above PSNL	**3 dBA to 5 dBA above PSNL**	**> 5 dBA above PSNL**
Daytime	-	1_WF	32_32C, 1_45, 1_49, 1_164
Evening	1_28C, 1_915, 1_917, 1_920, 1_926, 1_927, 1_929, 1_931, 1_934, 1_937, 1_938, 1_939, 1_941, 1_947B, 1_953, 1_956, 1_W88A, 1_W88B, 1_WF	1_140, 1_145, 1_152, 1_910, 1_912, 1_913	32_32C, 1_45, 1_49, 1_83, 1_129, 1_130, 1_133, 1_135, 1_143, 1_164, 1_WK, 1_WR
Night-time	1_151, 1_927, 1_934, 1_937, 1_938, 1_939, 1_941, 1_953, 1_956	1_129, 1_130, 1_140, 1_143, 1_145, 1_152, 1_W88A, 1_W88B	32_32C, 1_45, 1_49, 1_83, 1_133, 1_135, 1_164, 1_WF, 1_WK, 1_WR

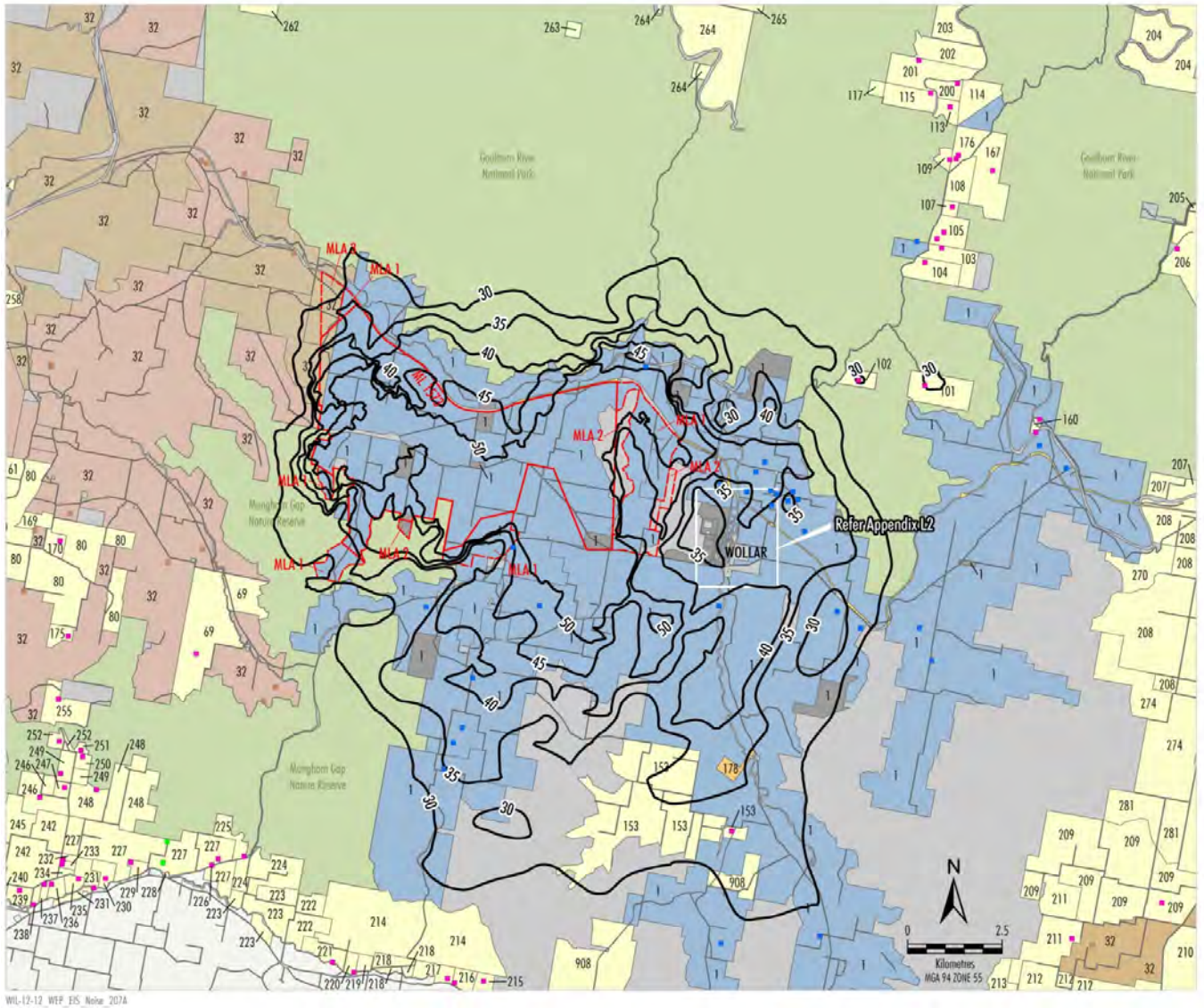
Note 1: Refer **Section 3.2** and **Appendix C3**.

Table K2 Resource-company owned Receivers[1] Night-time $L_{A1(1minute)}$ SDNL Exceedances

Period	Noise Management Zone		Noise Affection Zone
	1 dBA to 2 dBA above SDNL	**3 dBA to 5 dBA above SDNL**	**> 5 dBA above SDNL**
Night-time	1_130, 1_133, 1_135, 1_143	1_83, 1_WF, 1_WK	32_32C, 1_45, 1_49, 1_164, 1_WR

Note 1: Refer **Section 3.2** and **Appendix C3**.

EVENING NORTH WEST WIND INTRUSIVE LAEQ(15MINUTE) NOISE CONTOURS - 2020



LEGEND
- Mining Lease Boundary
- Mining Lease Application Boundary
- Peabody Energy
- Bylong Coal Project
- Moolarben Coal Mine
- Ulan Coal Mine
- Crown Land (Special Lease)
- Crown Land
- TransGrid
- Railway Land
- Relevant Private Landholder
- Other Land (Ownership not identified)
- National Parks and Wildlife Services
- Landholder Number *
- Peabody Energy Dwelling
- Ulan/Moolarben Dwelling
- Private Dwelling
- Community Building
- Evening North West Wind Intrusive $L_{Aeq\ (15\ minute)}$ Noise Contour

* Refer Appendix C3 for List of Landholders.

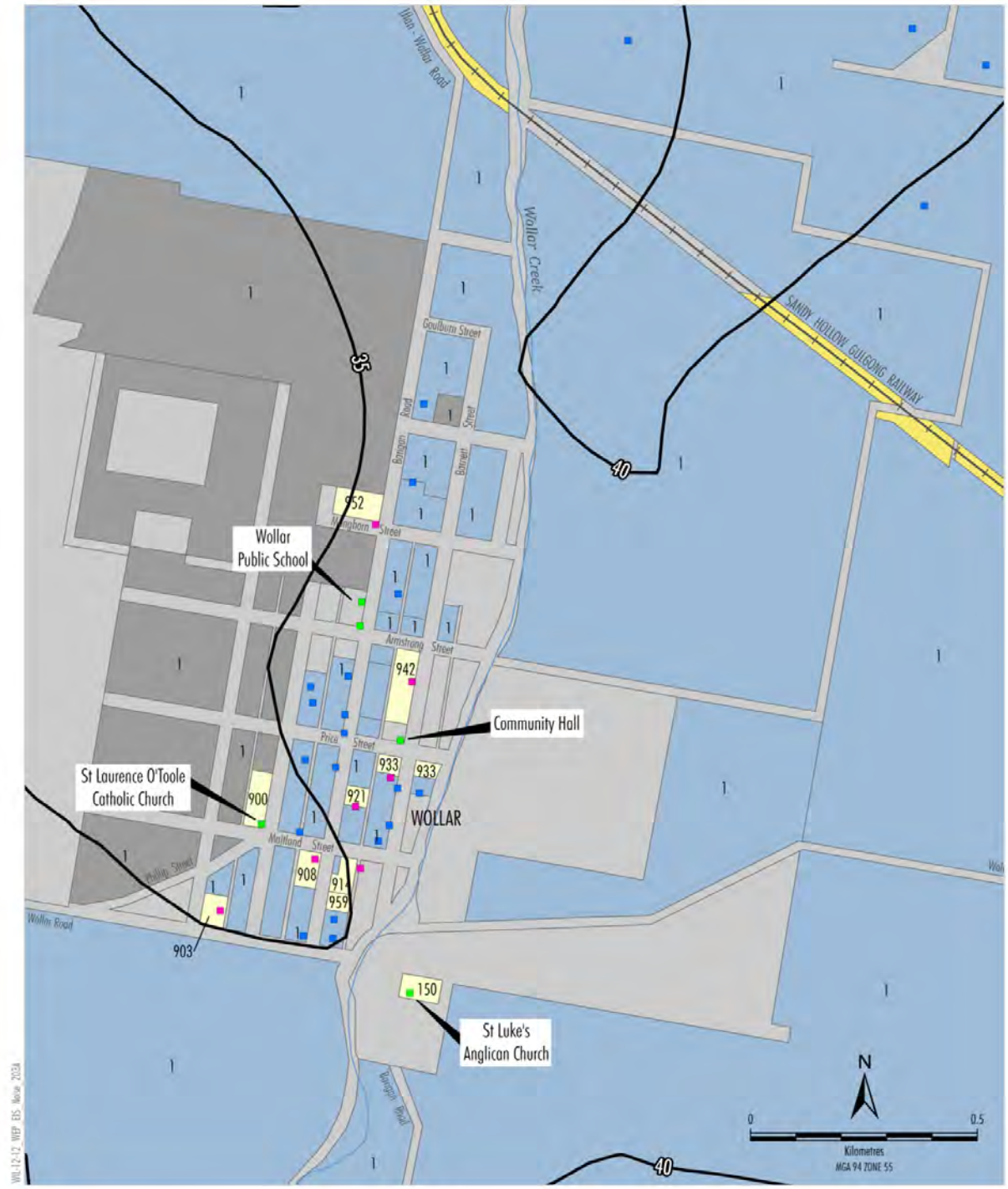
Source: WCPL (2015); NSW Dept of Industry (2015); NSW Land & Property Information (2015)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Evening North West Wind Intrusive $L_{Aeq\ (15\ minute)}$ Noise Contours - 2020

EVENING NORTH WEST WIND INTRUSIVE LAEQ(15MINUTE) NOISE CONTOURS WOLLAR INSET - 2020



LEGEND
- Peabody Energy
- Crown Land (Special Lease)
- Crown Land
- Railway Land
- Relevant Private Landholder
- 1 Landholder Number *
- Peabody Energy Dwelling
- Community Building
- Private Dwelling
- Evening North West Wind Intrusive $L_{Aeq\ (15\ minute)}$ Noise Contour

* Refer to Appendix C3 for list of Landholders.

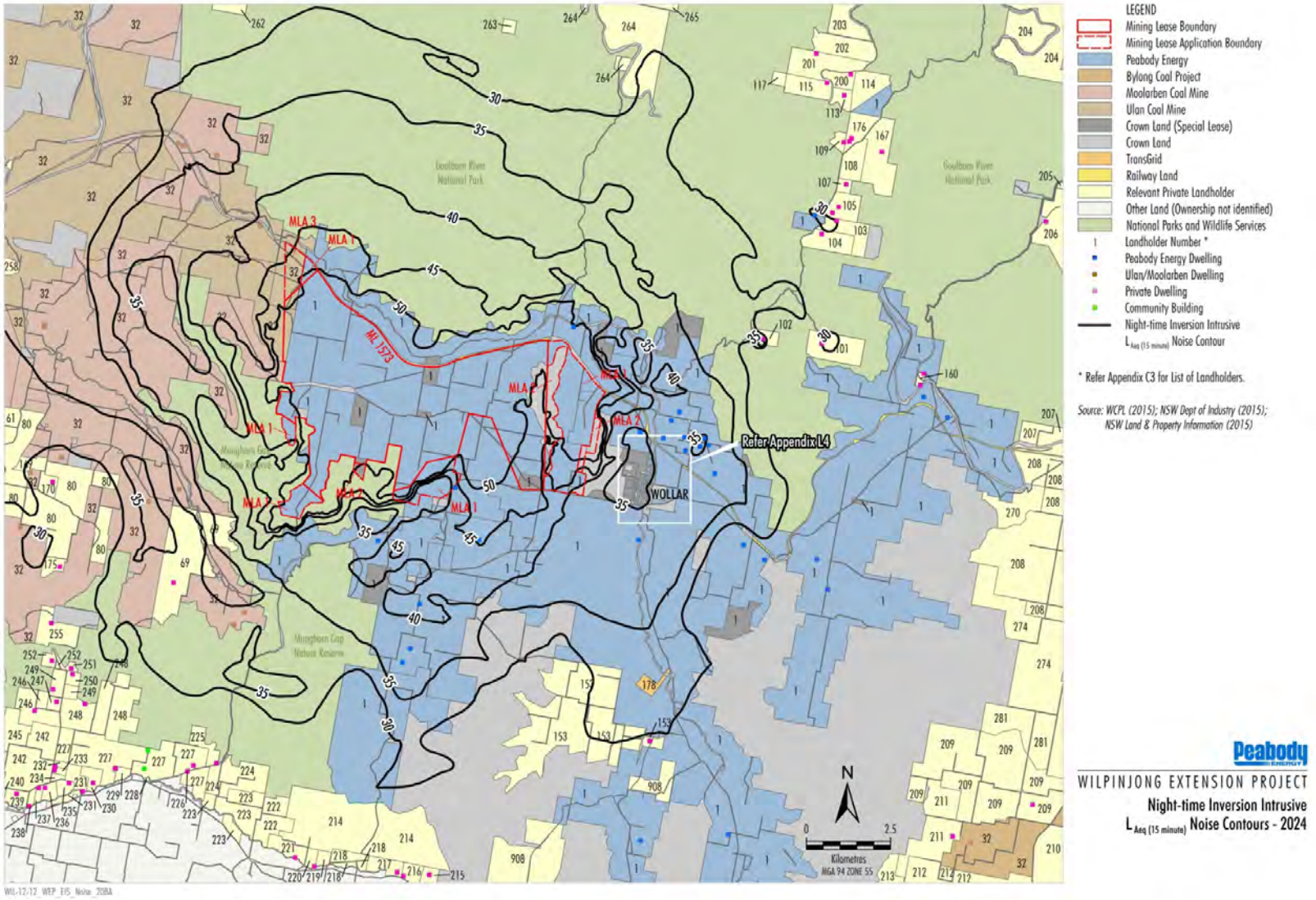
Source: WCPL (2015); NSW Dept of Industry (2015); NSW Land & Property Information (2015)

Peabody ENERGY

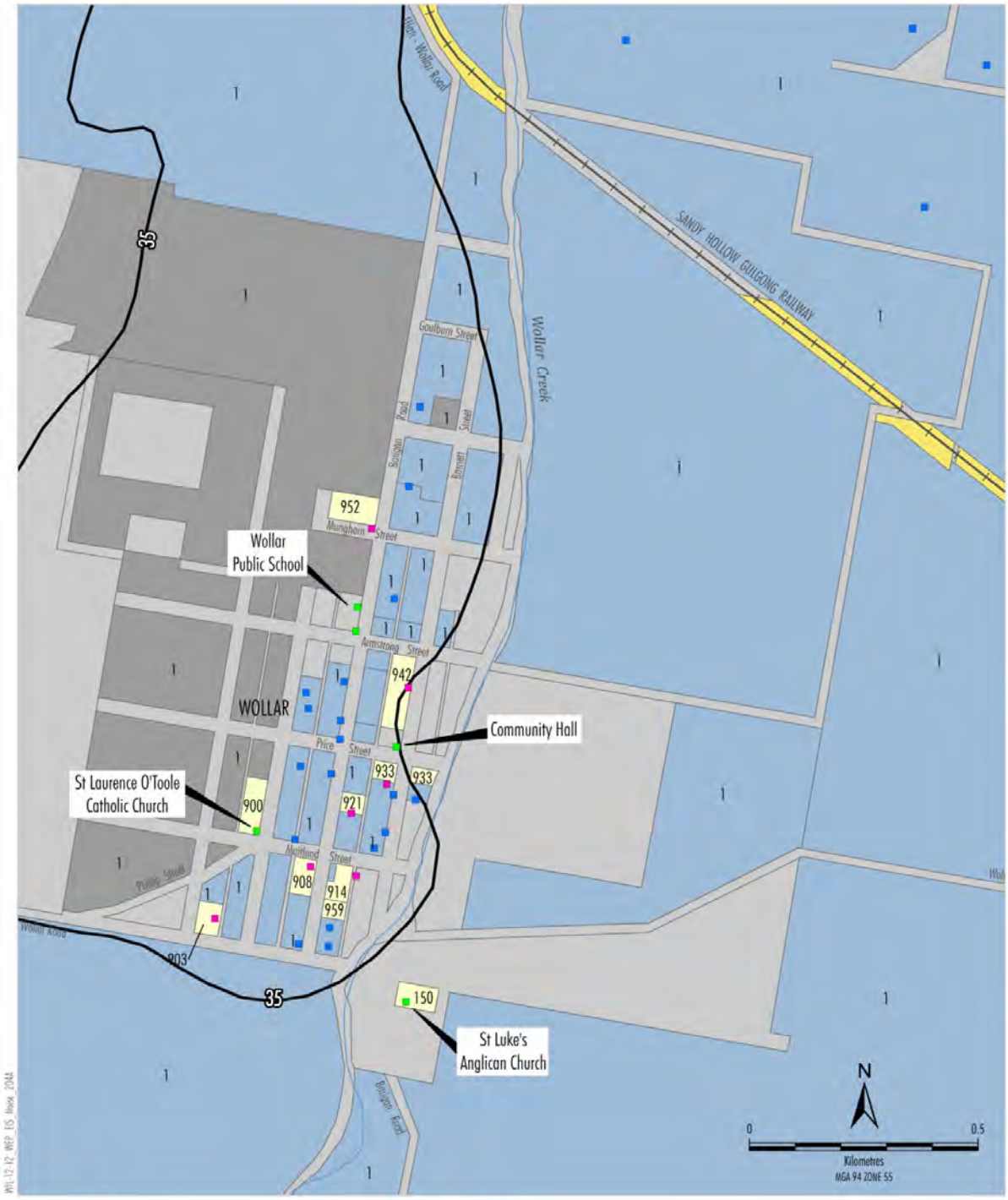
WILPINJONG EXTENSION PROJECT

Evening North West Wind Intrusive $L_{Aeq\ (15\ minute)}$ Noise Contours Wollar Inset - 2020

NIGHT TIME INVERSION INTRUSIVE LAEQ(15MINUTE) NOISE CONTOURS - 2024



NIGHT TIME INVERSION INTRUSIVE LAEQ(15MINUTE) NOISE CONTOURS WOLLAR INSET- 2024



LEGEND
- Peabody Energy
- Crown Land (Special Lease)
- Crown Land
- Railway Land
- Relevant Private Landholder
- Landholder Number *
- Peabody Energy Dwelling
- Community Building
- Private Dwelling
- Night-time Inversion Intrusive $L_{Aeq\ (15\ minute)}$ Noise Contour

* Refer to Appendix C3 for list of Landholders.

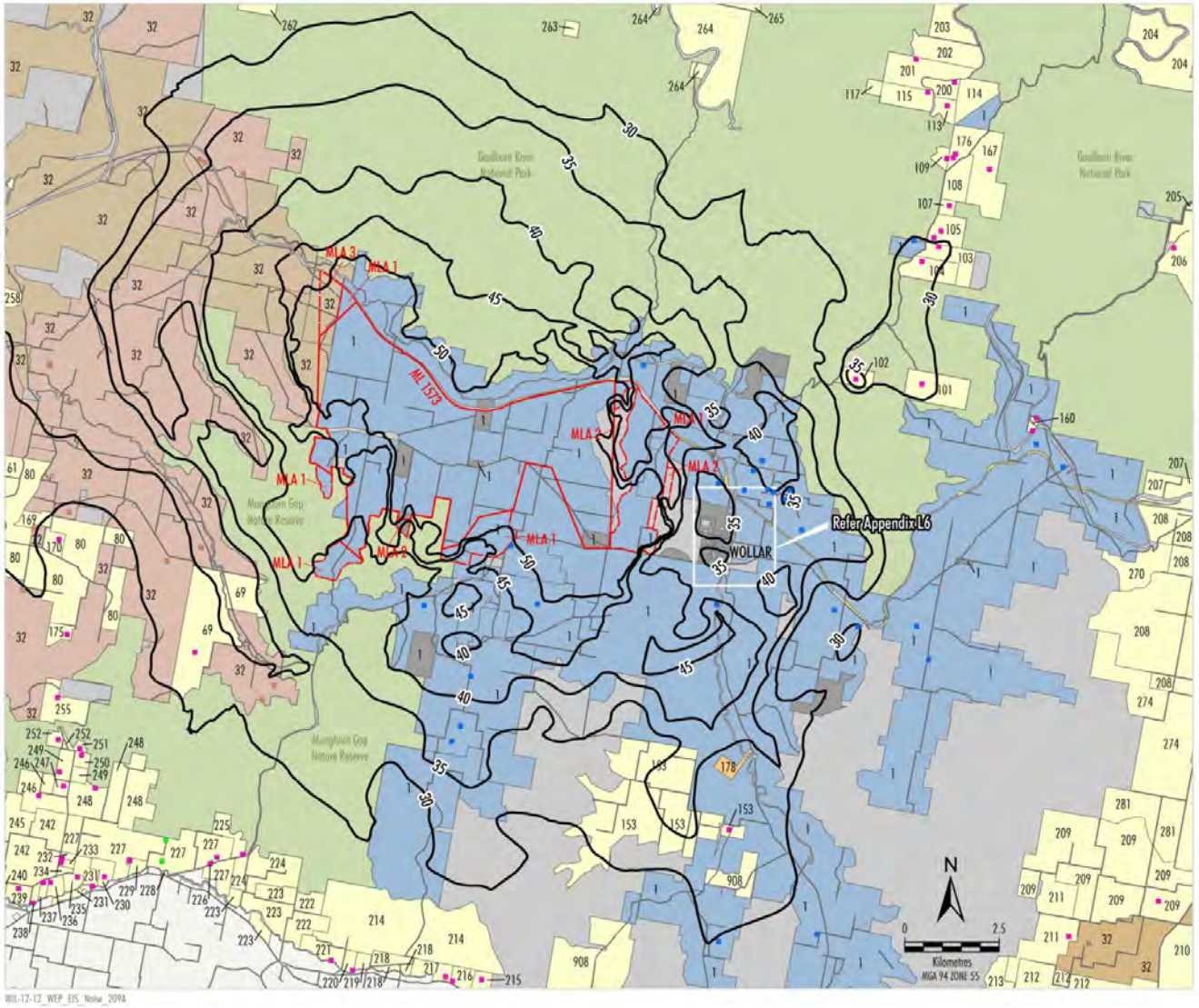
Source: WCPL (2015); NSW Dept of Industry (2015); NSW Land & Property Information (2015)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Night-time Inversion Intrusive $L_{Aeq\ (15\ minute)}$ Noise Contours - Wollar Inset - 2024

NIGHT TIME INVERSION INTRUSIVE $L_{AEQ(15MINUTE)}$ NOISE CONTOURS - 2028



LEGEND
- Mining Lease Boundary
- Mining Lease Application Boundary
- Peabody Energy
- Bylong Coal Project
- Moolarben Coal Mine
- Ulan Coal Mine
- Crown Land (Special Lease)
- Crown Land
- TransGrid
- Railway Land
- Relevant Private Landholder
- Other Land (Ownership not identified)
- National Parks and Wildlife Services
- 1 Landholder Number *
- Peabody Energy Dwelling
- Ulan/Moolarben Dwelling
- Private Dwelling
- Community Building
- Night-time Inversion Intrusive $L_{Aeq\ (15\ minute)}$ Noise Contour

* Refer Appendix C3 for List of Landholders.

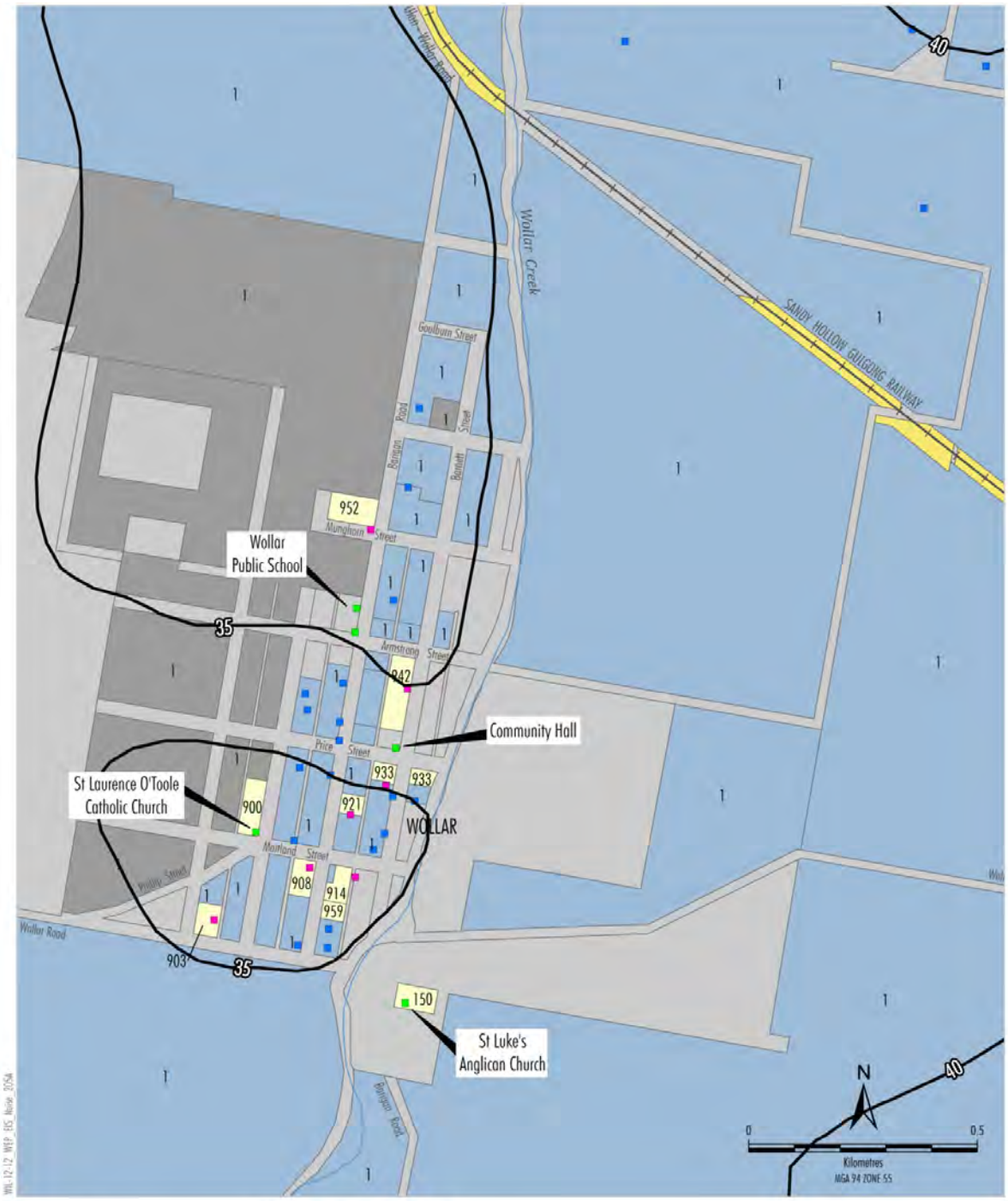
Source: WCPL (2015); NSW Dept of Industry (2015); NSW Land & Property Information (2015)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Night-time Inversion Intrusive $L_{Aeq\ (15\ minute)}$ Noise Contours - 2028

NIGHT TIME INVERSION INTRUSIVE $L_{AEQ(15MINUTE)}$ NOISE CONTOURS WOLLAR INSET - 2028



LEGEND
- Peabody Energy
- Crown Land (Special Lease)
- Crown Land
- Railway Land
- Relevant Private Landholder
- 1 Landholder Number *
- Peabody Energy Dwelling
- Community Building
- Private Dwelling
- Night-time Inversion Intrusive $L_{Aeq\ (15\ minute)}$ Noise Contour

* Refer to Appendix C3 for list of Landholders.

Source: WCPL (2015); NSW Dept of Industry (2015); NSW Land & Property Information (2015)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Night-time Inversion Intrusive $L_{Aeq\ (15\ minute)}$ Noise Contours Wollar Inset - 2028

RESOURCE-COMPANY OWNED RECEIVERS NOISE AMENITY LEVELS

ID No	Ownership	2018			2020			2024			2028			2031		
		Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
Resource-company (Moolarben)																
32_12	Moolarben	30	25	29	28	25	29	30	27	30	30	28	31	31	29	32
32_13	Moolarben	30	26	29	28	26	29	30	27	31	30	28	32	31	29	32
32_14	Moolarben	30	24	28	27	25	28	31	26	30	29	28	32	31	28	31
32_29A	Moolarben	28	21	24	26	21	24	24	19	22	26	21	24	25	20	24
32_29B	Moolarben	32	27	30	31	27	31	32	27	31	31	26	31	31	27	31
32_32C (7.11)	Moolarben	38	32	35	33	31	35	45	34	37	39	38	42	44	40	43
32_33A	Moolarben	28	23	26	27	24	27	27	24	26	28	24	26	27	24	26
32_33B_5	Moolarben	28	23	26	27	23	26	27	24	26	28	24	26	26	23	26
32_48A	Moolarben	30	23	28	28	22	28	27	21	28	28	23	28	28	24	28
32_48B	Moolarben	29	23	28	28	22	27	26	20	27	28	23	28	27	23	28
32_M02	Moolarben	28	22	25	26	22	25	27	22	25	28	24	27	27	23	27
32_M03	Moolarben	19	13	15	17	14	16	19	14	16	17	13	16	17	13	15
Resource-company (Peabody)																
1_28C	Peabody	24	32	32	28	32	32	26	32	32	22	32	31	17	31	30
1_45	Peabody	48	44	45	48	48	50	44	45	47	31	37	40	26	34	37
1_49	Peabody	38	44	45	41	44	46	33	42	43	42	44	46	43	44	46
1_83	Peabody	30	37	37	27	42	41	26	36	35	19	37	37	16	34	35
1_100B	Peabody	14	28	28	14	27	27	11	27	27	12	28	28	10	27	27
1_106	Peabody	18	28	28	17	28	29	15	26	27	16	27	28	15	26	27
1_129	Peabody	25	35	35	28	36	35	23	36	35	20	37	36	16	32	32
1_130	Peabody	29	38	38	28	38	38	25	36	36	19	36	35	16	32	32
1_133	Peabody	24	37	37	27	39	38	27	36	36	19	37	37	16	36	36
1_135	Peabody	24	37	37	27	37	37	23	36	36	19	36	36	16	36	36
1_136	Peabody	21	30	30	23	31	31	20	30	30	18	29	29	16	28	28
1_140	Peabody	20	34	34	23	33	33	18	34	34	16	36	35	14	35	35
1_143	Peabody	24	37	37	27	39	38	25	36	36	19	37	37	16	35	36
1_145	Peabody	22	33	33	24	33	33	22	31	31	18	30	30	16	33	33
1_151	Peabody	27	31	34	27	31	33	25	30	32	27	30	33	25	30	32
1_152	Peabody	21	33	33	24	33	33	21	34	33	17	34	34	15	35	35
1_154	Peabody	11	24	25	10	24	25	8	23	23	12	26	27	10	24	25
1_156	Peabody	11	22	23	11	23	23	8	21	21	12	24	25	11	23	24
1_158	Peabody	13	26	25	13	25	25	11	24	24	11	25	25	10	24	24
1_159	Peabody	11	23	23	12	23	23	9	23	23	8	24	23	6	23	23
1_162	Peabody	8	25	25	7	25	24	6	23	23	6	25	25	5	24	24
1_163	Peabody	7	25	25	7	24	24	5	23	23	6	24	24	4	23	23
1_164 (7.6)	Peabody	42	43	46	44	43	45	35	39	40	43	45	47	42	43	45
1_910	Peabody	18	32	32	19	32	32	19	35	34	21	34	33	19	34	33
1_912	Peabody	18	33	33	19	32	32	19	34	34	21	33	32	18	32	32
1_913	Peabody	18	33	32	19	32	32	19	34	34	21	34	33	19	33	33
1_915	Peabody	17	29	29	19	29	29	20	32	32	21	31	31	17	29	29
1_917	Peabody	17	32	31	19	32	32	19	33	33	20	33	32	16	31	30
1_920	Peabody	17	33	33	19	33	33	19	34	34	20	34	33	16	32	32
1_926	Peabody	18	34	33	19	33	33	19	33	33	20	34	34	16	32	32
1_927	Peabody	18	34	33	19	34	34	19	33	33	20	34	34	16	32	32
1_929	Peabody	18	33	33	19	33	33	20	33	33	21	34	33	16	32	32
1_931	Peabody	18	33	33	19	33	33	20	33	33	21	33	33	17	32	32
1_934	Peabody	18	33	33	20	33	33	20	33	33	21	34	33	16	32	32
1_937	Peabody	18	34	33	20	33	33	20	33	33	21	34	33	16	32	32
1_938	Peabody	18	33	33	20	33	33	20	32	33	21	34	33	17	32	32
1_939	Peabody	18	33	33	20	33	33	21	33	33	21	34	33	17	32	33
1_941	Peabody	18	33	33	20	33	33	20	33	33	21	34	33	17	32	32

RESOURCE-COMPANY OWNED RECEIVERS NOISE AMENITY LEVELS

ID No	Ownership	2018			2020			2024			2028			2031		
		Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
1_947B	Peabody	19	33	33	20	34	34	21	33	33	21	34	33	16	33	32
1_953	Peabody	19	32	32	21	34	34	22	32	32	20	32	32	16	31	31
1_956	Peabody	20	32	31	22	34	34	22	32	32	21	32	32	16	31	31
1_W88A	Peabody	27	32	34	28	31	34	26	31	33	29	31	34	27	31	33
1_W88B	Peabody	28	33	36	29	33	35	26	32	34	29	32	35	27	32	35
1_WF (7.7)	Peabody	36	29	35	35	32	36	32	30	33	37	33	38	35	32	36
1_WK	Peabody	29	37	39	31	36	39	23	36	38	31	36	38	30	35	38
1_WR (7.10)	Peabody	18	36	36	19	38	38	17	34	34	21	44	43	22	43	43
1_WT	Peabody	12	24	24	12	25	25	10	24	24	11	25	24	9	24	24

Note 1: Highest predicted noise levels from the INP meteorological conditions in Table 11 for each receiver.
Note 2: Predicted $L_{Aeq(period)}$ noise level complies with the amenity PSNL.
Note 3: Predicted negligible noise exceedance 1 to 2 dBA above amenity PSNL.
Note 4: Predicted marginal to moderate noise exceedance of 3 to 5 dBA above amenity PSNL.
Note 5: Predicted significant noise exceedance > 5 dBA above amenity PSNL.

In summary, the predicted daytime, evening and night-time $L_{Aeq(period)}$ noise amenity levels in Years 2018, 2020, 2024, 2028 and 2031 show that:

- During the daytime, no resource-company owned receivers are predicted to exceed the amenity PSNLs or the consented noise limits.
- During the evening, a marginal to moderate noise exceedance of 3 to 5 dBA above amenity PSNL is predicted at resource-company owned receiver 1_45.
- During the night-time, negligible noise exceedances of 1 to 2 dBA above amenity PSNL are predicted at resource-company owned receivers 32_32C and 1_83. A marginal to moderate noise exceedance of 3 to 5 dBA above amenity PSNL is predicted at resource-company owned receiver 1_WR. Significant noise exceedances of greater than 5 dBA above PSNL are predicted at resource-company owned receivers 1_45, 1_49 and 1_164.

Table M3 presents the resource-company owned receivers with predicted $L_{Aeq(period)}$ amenity noise level exceedance of the PSNLs.

Table M3 Resource-company Owned receivers[1] with $L_{Aeq(period)}$ PSNL Exceedances

Period	Noise Management Zone		Noise Affection Zone
	1 dBA to 2 dBA above PSNL	**3 dBA to 5 dBA above PSNL**	**> 5 dBA above PSNL**
Daytime	-	-	-
Evening	-	1_45	-
Night-time	32_32C, 1_83,	1_WR	1_45, 1_49, 1_164

Note 1: Refer **Section 3.2** and **Appendix C3**

RESOURCE-COMPANY OWNED RECEIVERS EVENING CUMULATIVE AMENITY NOISE

Evening Cumulative ($L_{Aeq(4hour)}$) Noise Amenity Levels (dBA re 20 µPa)

ID No	Ownership	Wilpinjong Coal Mine with the Project[1]	Moolarben Coal Project	Ulan Continued Operations Project	Cumulative Sum
Resource-company (Moolarben)					
32_12	Moolarben	29	44	19	44
32_13	Moolarben	29	45	18	45
32_14	Moolarben	28	51	15	51
32_29A	Moolarben	21	23	7	25
32_29B	Moolarben	27	21	7	28
32_32C (7.11)	Moolarben	40	58	11	58
32_33A	Moolarben	24	23	20	27
32_33B_5	Moolarben	24	23	20	27
32_48A	Moolarben	24	15	3	24
32_48B	Moolarben	23	15	4	24
32_M02	Moolarben	24	20	9	25
32_M03	Moolarben	14	23	10	23
Resource-company (Peabody)					
1_28C	Peabody	32	9	0	32
1_45	Peabody	48	11	2	48
1_49	Peabody	44	12	1	44
1_83	Peabody	42	8	0	42
1_100B	Peabody	28	6	0	28
1_106	Peabody	28	6	0	28
1_129	Peabody	37	9	0	37
1_130	Peabody	38	9	0	38
1_133	Peabody	39	8	0	39
1_135	Peabody	37	8	0	37
1_136	Peabody	31	8	0	31
1_140	Peabody	36	8	0	36
1_143	Peabody	39	8	0	39
1_145	Peabody	33	8	0	33
1_151	Peabody	31	11	1	31
1_152	Peabody	35	8	0	35
1_154	Peabody	26	5	0	26
1_156	Peabody	24	4	0	25
1_158	Peabody	26	5	0	26
1_159	Peabody	24	5	0	24
1_162	Peabody	25	4	0	25
1_163	Peabody	25	4	0	25
1_164 (7.6)	Peabody	45	14	2	45
1_910	Peabody	35	9	0	35
1_912	Peabody	34	9	0	34
1_913	Peabody	34	9	0	34
1_915	Peabody	32	9	0	32
1_917	Peabody	33	9	0	33
1_920	Peabody	34	9	0	34
1_926	Peabody	34	9	0	34

RESOURCE-COMPANY OWNED RECEIVERS EVENING CUMULATIVE AMENITY NOISE

ID No	Ownership	Wilpinjong Coal Mine with the Project[1]	Moolarben Coal Project	Ulan Continued Operations Project	Cumulative Sum
1_927	Peabody	34	9	0	34
1_929	Peabody	34	9	0	34
1_931	Peabody	33	9	0	33
1_934	Peabody	34	9	0	34
1_937	Peabody	34	9	0	34
1_938	Peabody	34	9	0	34
1_939	Peabody	34	9	0	34
1_941	Peabody	34	9	0	34
1_947B	Peabody	34	9	0	34
1_953	Peabody	34	9	0	34
1_956	Peabody	34	9	0	34
1_W88A	Peabody	32	11	1	32
1_W88B	Peabody	33	12	1	33
1_WF (7.7)	Peabody	33	15	3	33
1_WK	Peabody	37	12	2	37
1_WR (7.10)	Peabody	44	9	0	44
1_WT	Peabody	25	7	0	25

Note 1: Highest predicted noise levels from the INP meteorological conditions in Table 11 for each receiver.
Note 2: Predicted $L_{Aeq(period)}$ noise level complies with the INP acceptable amenity level.
Note 3: Predicted negligible noise exceedance 1 to 2 dBA above INP acceptable amenity level.
Note 4: Predicted marginal to moderate noise exceedance of 3 to 5 dBA above INP acceptable amenity level.
Note 5: Predicted significant noise exceedance > 5 dBA above INP acceptable amenity level.

RESOURCE-COMPANY OWNED RECEIVERS NIGHT-TIME CUMULATIVE AMENITY NOISE

Night-time Cumulative ($L_{Aeq(4hour)}$) Noise Amenity Levels (dBA re 20 µPa)

ID No	Ownership	Wilpinjong Coal Mine with the Project[1]	Moolarben Coal Project	Ulan Continued Operations Project	Cumulative Sum
Resource-company - Moolarben					
32_12	Moolarben	29	44	19	44
32_13	Moolarben	29	45	18	45
32_14	Moolarben	28	51	15	51
32_29A	Moolarben	21	23	7	25
32_29B	Moolarben	27	21	7	28
32_32C (7.11)	Moolarben	40	58	11	58
32_33A	Moolarben	24	23	20	27
32_33B_5	Moolarben	24	23	20	27
32_48A	Moolarben	24	15	3	24
32_48B	Moolarben	23	15	4	24
32_M02	Moolarben	24	20	9	25
32_M03	Moolarben	14	23	10	23
Resource-company - Peabody					
1_28C	Peabody	32	9	0	32
1_45	Peabody	48	11	2	48
1_49	Peabody	44	12	1	44
1_83	Peabody	42	8	0	42
1_100B	Peabody	28	6	0	28
1_106	Peabody	28	6	0	28
1_129	Peabody	37	9	0	37
1_130	Peabody	38	9	0	38
1_133	Peabody	39	8	0	39
1_135	Peabody	37	8	0	37
1_136	Peabody	31	8	0	31
1_140	Peabody	36	8	0	36
1_143	Peabody	39	8	0	39
1_145	Peabody	33	8	0	33
1_151	Peabody	31	11	1	31
1_152	Peabody	35	8	0	35
1_154	Peabody	26	5	0	26
1_156	Peabody	24	4	0	25
1_158	Peabody	26	5	0	26
1_159	Peabody	24	5	0	24
1_162	Peabody	25	4	0	25
1_163	Peabody	25	4	0	25
1_164 (7.6)	Peabody	45	14	2	45
1_910	Peabody	35	9	0	35
1_912	Peabody	34	9	0	34
1_913	Peabody	34	9	0	34
1_915	Peabody	32	9	0	32
1_917	Peabody	33	9	0	33
1_920	Peabody	34	9	0	34

RESOURCE-COMPANY OWNED RECEIVERS NIGHT-TIME CUMULATIVE AMENITY NOISE

ID No	Ownership	Wilpinjong Coal Mine with the Project[1]	Moolarben Coal Project	Ulan Continued Operations Project	Cumulative Sum
1_926	Peabody	34	9	0	34
1_927	Peabody	34	9	0	34
1_929	Peabody	34	9	0	34
1_931	Peabody	33	9	0	33
1_934	Peabody	34	9	0	34
1_937	Peabody	34	9	0	34
1_938	Peabody	34	9	0	34
1_939	Peabody	34	9	0	34
1_941	Peabody	34	9	0	34
1_947B	Peabody	34	9	0	34
1_953	Peabody	34	9	0	34
1_956	Peabody	34	9	0	34
1_W88A	Peabody	32	11	1	32
1_W88B	Peabody	33	12	1	33
1_WF (7.7)	Peabody	33	15	3	33
1_WK	Peabody	37	12	2	37
1_WR (7.10)	Peabody	44	9	0	44
1_WT	Peabody	25	7	0	25

Note 1: Highest predicted noise levels from the INP meteorological conditions in Table 11 for each receiver.
Note 2: Predicted $L_{Aeq(period)}$ noise level complies with the INP acceptable amenity level.
Note 3: Predicted negligible noise exceedance 1 to 2 dBA above INP acceptable amenity level.
Note 4: Predicted marginal to moderate noise exceedance of 3 to 5 dBA above INP acceptable amenity level.
Note 5: Predicted significant noise exceedance > 5 dBA above INP acceptable amenity level.

In summary, the predicted evening and night-time $L_{Aeq(period)}$ noise amenity levels in Years 2018, 2020, 2024, 2028 and 2031 show that:

- During the evening, a marginal to moderate noise exceedance of 3 to 5 dBA above amenity PSNL is predicted at resource-company owned receiver 1_45 and significant noise exceedances of greater than 5 dBA above PSNL are predicted at resource-company owned receivers 32_14 and 32_32C.
- During the night-time, a negligible noise exceedance of 1 to 2 dBA above amenity PSNL is predicted at resource-company owned receiver 1_83, marginal to moderate noise exceedances of 3 to 5 dBA above amenity PSNL are predicted at resource-company owned receivers 32_12, 32_13, 1_49, 1_164 and 1_WR, and significant noise exceedances of greater than 5 dBA above PSNL are predicted at resource-company owned receivers 32_14, 32_32C and 1_45.

Table N1 presents the resource-company owned receivers with predicted noise level exceedance of the INP's acceptable amenity levels.

Table N1 Resource-company Owned Receivers[1] with INP Acceptable Amenity Level Exceedances

Period	Noise Management Zone		Noise Affection Zone
	1 dBA to 2 dBA above INP Acceptable	**3 dBA above INP Acceptable**	**> 3 dBA above INP Acceptable**
Evening	-	1_45	32_14, 32_32C
Night-time	1_83	32_12, 32_13, 1_49, 1_164, 1_WR	32_14, 32_32C, 1_45

Note 1: Refer **Section 3.2** and **Appendix C3**.

RESOURCE-COMPANY OWNED RECEIVERS
PREDICTED GROUND VIBRATION AND AIRBLAST LEVELS

ID No	Ownership	Vibration (mm/s)[1]		Airblast (dBLpk)[2]		Vibration (mm/s)[1]		Airblast (dBLpk)[2]		Vibration (mm/s)[1]		Airblast (dBLpk)[2]	
		3,900 kg		3,900 kg		1,350 kg		1,350 kg		100 kg		100 kg	
		50%	5%	50%	5%	50%	5%	50%	5%	50%	5%	50%	5%
Resource-company (Moolarben)[3,4,5,6,7,8]													
32_12	Moolarben	0.3	0.7	96	108	0.2	0.5	95	107	0.1	0.2	91	104
32_13	Moolarben	0.3	0.7	96	108	0.2	0.5	95	107	0.1	0.2	92	104
32_14	Moolarben	0.3	0.8	97	109	0.2	0.6	95	108	0.1	0.3	92	105
32_29A	Moolarben	0.3	0.9	97	109	0.2	0.6	96	108	0.1	0.3	93	105
32_29B	Moolarben	0.3	0.8	96	108	0.2	0.5	95	107	0.1	0.2	92	104
32_32C	Moolarben	4.3	18.6	119	134	2.5	10.8	116	131	0.7	2.9	109	124
32_33A	Moolarben	0.2	0.5	94	106	0.1	0.4	93	105	0.1	0.2	90	102
32_33B_5	Moolarben	0.2	0.5	94	106	0.1	0.4	93	105	0.1	0.2	90	102
32_48A	Moolarben	0.3	0.8	96	109	0.2	0.6	95	107	0.1	0.3	92	104
32_48B	Moolarben	0.3	0.9	97	109	0.2	0.6	96	108	0.1	0.3	93	105
32_M02	Moolarben	0.2	0.6	94	107	0.1	0.4	93	105	0.1	0.2	90	102
32_M03	Moolarben	0.2	0.6	94	107	0.1	0.4	93	105	0.1	0.2	90	102
Resource-company (Peabody)[3,4,5,6,7,8]													
1_28C	Peabody	0.5	1.5	100	112	0.4	1.1	99	111	0.2	0.5	96	108
1_45	Peabody	8.5	37.0	125	140	4.9	21.6	122	137	1.3	5.7	115	130
1_49	Peabody	2.1	9.1	114	129	1.2	5.3	111	126	0.3	1.4	104	119
1_83	Peabody	0.4	1.1	98	110	0.3	0.8	97	109	0.1	0.3	94	106
1_100B	Peabody	0.2	0.6	95	107	0.2	0.4	93	106	0.1	0.2	90	103
1_106	Peabody	0.2	0.5	94	106	0.1	0.3	92	105	0.1	0.2	89	102
1_129	Peabody	0.4	1.2	98	111	0.3	0.8	97	109	0.1	0.4	94	106
1_130	Peabody	0.4	1.1	98	111	0.3	0.8	97	109	0.1	0.4	94	106
1_133	Peabody	0.4	1.0	98	110	0.3	0.7	96	109	0.1	0.3	93	106
1_135	Peabody	0.4	1.0	97	110	0.3	0.7	96	108	0.1	0.3	93	105
1_136	Peabody	0.3	0.9	97	109	0.2	0.6	96	108	0.1	0.3	93	105
1_140	Peabody	0.3	0.8	96	109	0.2	0.6	95	107	0.1	0.3	92	104
1_143	Peabody	0.3	1.0	97	110	0.2	0.7	96	108	0.1	0.3	93	105
1_145	Peabody	0.3	0.9	97	109	0.2	0.6	96	108	0.1	0.3	93	105
1_151	Peabody	0.2	0.6	95	107	0.2	0.4	94	106	0.1	0.2	91	103
1_152	Peabody	0.3	0.8	97	109	0.2	0.6	95	108	0.1	0.3	92	105
1_154	Peabody	0.2	0.4	93	105	0.1	0.3	91	104	0.0	0.1	88	101
1_156	Peabody	0.1	0.4	93	105	0.1	0.3	91	104	0.0	0.1	88	101
1_158	Peabody	0.2	0.5	94	106	0.1	0.4	93	105	0.1	0.2	90	102
1_159	Peabody	0.2	0.5	94	106	0.1	0.4	92	105	0.1	0.2	89	102
1_162	Peabody	0.2	0.4	93	105	0.1	0.3	92	104	0.1	0.1	89	101
1_163	Peabody	0.2	0.4	93	105	0.1	0.3	92	104	0.0	0.1	89	101
1_910	Peabody	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
1_912	Peabody	0.4	1.2	99	111	0.3	0.8	97	110	0.1	0.4	94	106
1_913	Peabody	0.4	1.2	98	111	0.3	0.8	97	110	0.1	0.4	94	106
1_915	Peabody	0.4	1.2	99	111	0.3	0.9	98	110	0.1	0.4	94	107
1_917	Peabody	0.4	1.2	98	111	0.3	0.8	97	109	0.1	0.4	94	106
1_920	Peabody	0.4	1.2	98	111	0.3	0.8	97	109	0.1	0.4	94	106

RESOURCE-COMPANY OWNED RECEIVERS
PREDICTED GROUND VIBRATION AND AIRBLAST LEVELS

ID No	Ownership	Vibration (mm/s)[1]		Airblast (dBLpk)[2]		Vibration (mm/s)[1]		Airblast (dBLpk)[2]		Vibration (mm/s)[1]		Airblast (dBLpk)[2]	
		3,900 kg		3,900 kg		1,350 kg		1,350 kg		100 kg		100 kg	
		50%	5%	50%	5%	50%	5%	50%	5%	50%	5%	50%	5%
1_926	Peabody	0.4	1.2	98	111	0.3	0.8	97	109	0.1	0.4	94	106
1_927	Peabody	0.4	1.1	98	111	0.3	0.8	97	109	0.1	0.4	94	106
1_929	Peabody	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
1_931	Peabody	0.4	1.2	99	111	0.3	0.9	98	110	0.1	0.4	94	107
1_934	Peabody	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
1_937	Peabody	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
1_938	Peabody	0.4	1.2	99	111	0.3	0.9	98	110	0.1	0.4	95	107
1_939	Peabody	0.5	1.2	99	111	0.3	0.9	98	110	0.1	0.4	95	107
1_941	Peabody	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
1_947B	Peabody	0.4	1.2	99	111	0.3	0.9	97	110	0.1	0.4	94	107
1_953	Peabody	0.5	1.2	99	111	0.3	0.9	98	110	0.1	0.4	95	107
1_956	Peabody	0.5	1.3	99	111	0.3	0.9	98	110	0.1	0.4	95	107
1_W88A	Peabody	0.2	0.7	95	108	0.2	0.5	94	106	0.1	0.2	91	103
1_W88B	Peabody	0.3	0.7	96	108	0.2	0.5	94	107	0.1	0.2	91	104
1_WK	Peabody	0.3	0.9	97	109	0.2	0.6	96	108	0.1	0.3	92	105
1_WT	Peabody	0.2	0.6	95	107	0.2	0.5	94	106	0.1	0.2	91	103
Resource-company Owned European Heritage Sites[9]													
7.2 Archer's Cottage Ruins (ruin)	Peabody	4.2	18.4	-	-	2.5	10.7	-	-	0.7	2.9	-	-
7.5 Pine Park Wool Shed (old shed and woolshed)	Peabody	5.1	22.4	-	-	3.0	13.1	-	-	0.8	3.5	-	-
7.6 Remains of Mara Cottage (ruin) (1_164)	Peabody	7.8	34.1	-	-	4.6	19.9	-	-	1.2	5.3	-	-
7.7 Barton's Cottage (ruin) (1_WF)	Peabody	0.5	1.3	-	-	0.3	0.9	-	-	0.1	0.4	-	-
7.8 Hillview (ruin)	Peabody	0.5	1.5	-	-	0.4	1.1	-	-	0.2	0.5	-	-
7.10 Wondoona (1_WR) (museum/residence)	Peabody	0.4	1.0	-	-	0.3	0.7	-	-	0.1	0.3	-	-
7.11 William Carr's Hut (32_32C) (old house)	Peabody	4.2	18.5	-	-	2.5	10.8	-	-	0.7	2.9	-	-

Note 1: Vibration Velocity Peak Vector Sum (PVS) - (mm/s).
Note 2: Airblast Level Linear Peak - (dBLpk re 20 µPa).
Note 3 Predicted blast emission level complies with the human comfort criterion of 5 mm/s.
Note 4 Predicted blast emission level complies with the human comfort criterion of 115 dBLpk.
Note 6: Predicted blast emission level exceedance of 1 to 2 mm/s or 1 to 2 dB above the human comfort criteria of 5 mm/s and 115 dBLpk.
Note 7: Predicted blast emission level exceedance of 3 to 5 mm/s or 3 to 5 dB above the human comfort criteria of 5 mm/s and 115 dBLpk.
Note 8: Predicted blast emission level exceedance of > 5 mm/s or > 5 dB above the human comfort criteria of 5 mm/s and 115 dBLpk.
Note 9 Predicted blast emission level complies with the archaeological/geological and Aboriginal heritage vibration damage criterion of 250 mm/s.

NSW Road Noise Policy - application notes

Relative increase criteria (see Section 2.4 of RNP)

The last paragraph in Section 2.4 (page 15) states: 'The relative increase criteria are primarily intended to protect existing quiet areas from excessive changes in amenity due to noise from a road project'.

'Quiet area' is intended to mean areas 'that are 12 dB or more below the relevant noise assessment criterion that applies day or night'. The relative increase criteria are intended to apply to 'noise from a road project' or 'noise from a land use development with the potential to generate additional traffic'.

The first sentence in the last paragraph should therefore be read to mean: 'The relative increase criteria are primarily intended to protect existing quiet areas, being areas that are 12 dB or more below the relevant noise assessment criterion that applies day or night, from excessive changes in amenity due to noise from additional traffic.'

Applying the assessment criteria to additional traffic on existing roads generated by land use developments (see Section 3.4.1 of RNP)

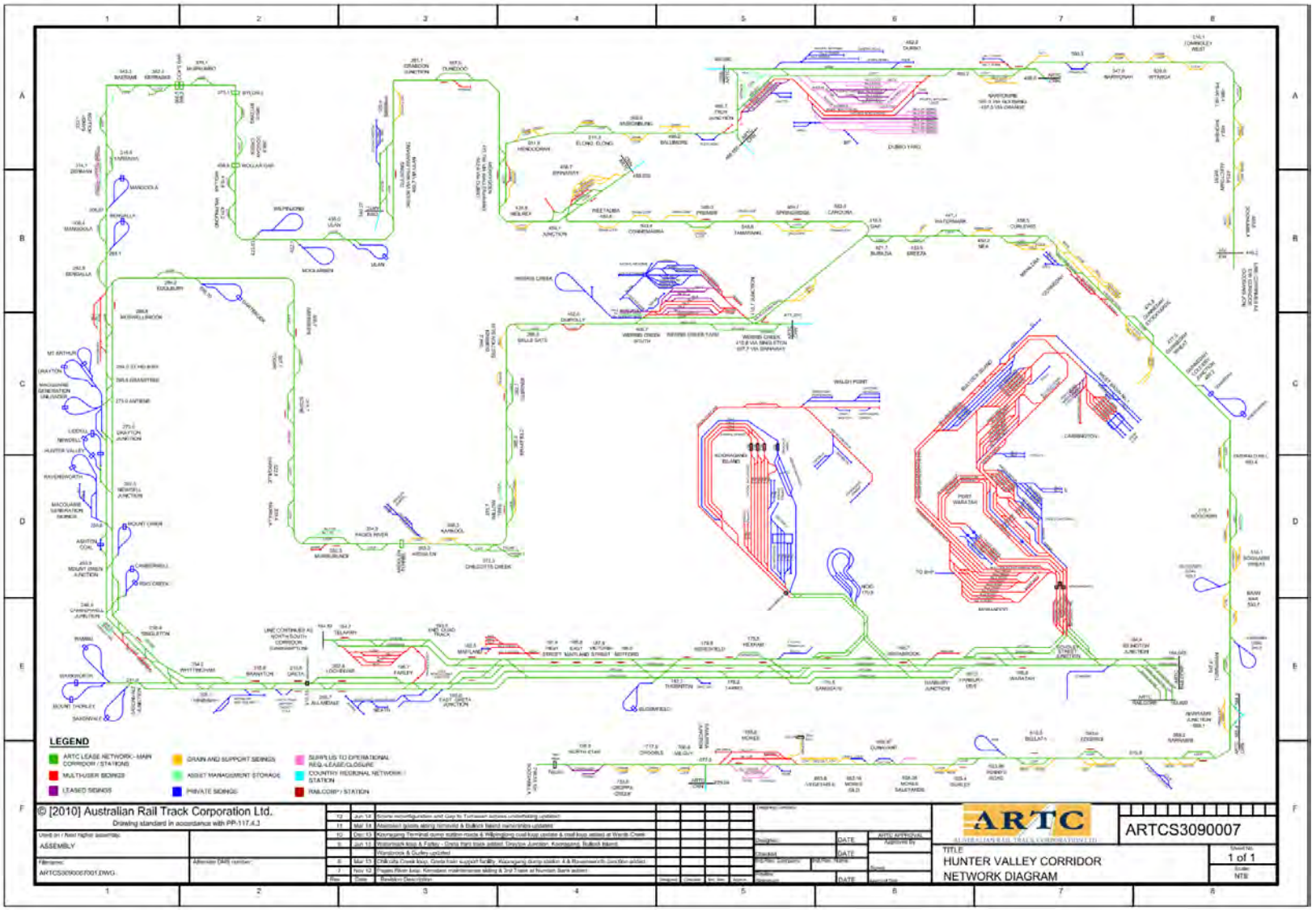
The second paragraph in Step 4 states: 'For existing residences and other sensitive land uses affected by **additional traffic on existing roads generated by land use developments**, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding "no build option".'

The policy provides for this 2 dB increase if the relevant assessment criteria identified in Step 2 is not achievable after the feasible and reasonable mitigation measures noted in Step 3 have been considered. The 2 dB increase applies to both the relevant day and night assessment criteria.

The second paragraph in Step 4 should therefore be read to mean: 'After taking Steps 1 to 3, for existing residences and other sensitive land uses affected by **additional traffic on existing roads generated by land use developments**, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.'

Where cumulative impacts from road traffic-generating developments are likely, Section 3.5 notes that planning authorities should use strategic planning policies to minimise exposure to unacceptable noise levels.

HUNTER VALLEY NETWORK CORRIDOR DIAGRAM



L2 Noise limits

L2.1 Approvals for Locomotives

The licensee must obtain approval from the EPA prior to permitting operation on the "premises" of:
1. a class or type of locomotive, whether new or existing, that has not been operated on the NSW rail network; or
2. a locomotive that has been substantially modified since it was last used on the NSW rail network

EPA approval will be on the basis of compliance with the locomotive noise limits in Condition L2.3.

This condition L2 does not apply to the operation of a locomotive solely for the purposes of conducting noise or other tests that are required for the locomotive's acceptance by the EPA, the licensee or any person concerned with the design, manufacture, supply or acquisition of the locomotive, provided that multiple pass bys do not occur adjacent to residential premises in the course of the testing.

Note: EPA approval for a class or type or model of locomotive will require noise test results from a representative number of locomotives from that class or type.

L2.2 General Noise Limits

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

L2.3 EPA Locomotive Noise Limits

Operating Condition	Speed and Location of Measurement	Noise Limit - Microphone height: 1.5 metres above
Idle with compressor radiator fans and air conditioning operating at maximum load occurring at idle	Stationary 15 metre contour	70 dB(A) Max
All other throttle settings under self load with compressor radiator fans and air conditioning operating	Stationary 15 metre contour	87 dB(A) Max 95 dB Linear Max
All service conditions	As per Australian Standard AS2377-2002 (Acoustics - Methods for the measurement of railbound vehicle noise) except as otherwise approved by the EPA	87 dB(A) Max 95 dB Linear Max

L2.4 Limits for Tonality

All external noise must be non-tonal. For the purpose of this condition, external noise is non-tonal if the sound pressure level in each unweighted (linear) one-third octave band does not exceed the level of the adjacent bands on both sides by:

a) 5 dB if the centre frequency of the band containing the tone is above 400 Hz; and

b) 8 dB if the centre frequency of the band containing the tone is between 160 and 400 Hz, inclusively; and

c) 15 dB if the centre frequency of the band containing the tone is below 160 Hz.

L2.5 Limits for Low-Frequency Noise

All external noise must not exhibit an undue low-frequency component. To comply with this requirement, linear noise levels must not exceed the A-weighted noise levels by more than 15dB.

L2.6 **Locomotive Noise Emission Test Methods**

Application for approval as required by L2.1 must be supported by type testing of the locomotive using procedures that are consistent with the requirements of Australian Standard AS2377-2002 (Acoustics – Methods for the measurement of railbound vehicle noise) except as otherwise approved by the EPA. The type testing must provide all necessary measurement parameters for demonstrating compliance with the locomotive noise limits in L2.3.

Information supplied to the EPA as part of the application for approval must fulfil the requirements of Section 11 of AS2377-2002 for reporting.

Note: The measurement parameters required in L2.3 differ in some cases from those identified in AS2377-2002. The test procedures, measurement equipment and environmental conditions applied in supporting the application to the EPA for approval are to yield all parameters identified in L2.3 but are otherwise to be applied in a manner that is consistent with the requirements of AS2377-2002. The 15 metre contour specified in L2.3 is to be represented by the 12 measurement points shown in AS2377-2002, Figure 1.

L2.7 **Approval of Locomotives Not Meeting All EPA Limits**

The EPA may approve locomotives that do not comply with all limits prescribed by L2.3, provided that the application for approval demonstrates that:

a) the noise emission performance of the locomotive is consistent with current best practice; and

b) all measures for minimising the extent of any non-compliance have been investigated and those that are identified as reasonable and feasible have been implemented; and

c) none of the non-compliances will result in unacceptable environmental impacts.

U1 PRP 3.1 Audit of the Noise Performance of Locomotives on the ARTC Network

U1.1 Almost a third of all rail noise complaints received by the Environment Protection Authority (EPA) between 2007 and 2011 were generated by pass by noise from locomotives. For this reason the EPA considers the ongoing monitoring and management of locomotive noise to be a critical component of environmental regulation of the NSW rail network.

The purpose of PRP 3.1 is for the licensee to:

1. obtain accurate measurements of the noise performance of locomotives operating on the NSW rail network by conducting wayside noise monitoring and to provide that data to relevant locomotive operators and the EPA; and

2. obtain accurate information on the actions of locomotive operators to rectify locomotives identified by the wayside monitoring as poorly performing in order to determine whether locomotive operators are implementing all reasonable and feasible noise mitigation measures.

The licensee is required to comply with PRP3.1 outlined in U1.2 below by completing each described action in the program within the set timeframe.

U1.2 **Action 3.1A**

The licensee will implement and maintain a monitoring program which will:
- Monitor noise emissions from locomotives and rolling stock accessing ARTC's network and passing the Metford wayside measurement location; and
- Record and store data from wayside noise monitoring.

The noise monitoring program must be consistent with the *Australian Rail track Corporation Wayside Noise Monitoring Program Work Plan* submitted to the EPA by ARTC on 17 April 2009 and with the previous noise ARTC Wayside Noise Pilot Monitoring Program conducted between January – July 2010.

Timeframe – Commencement of the program will be within 16 weeks of inclusion of the PRP on the licence. The program will be conducted for a period of 12 months.

Action 3.1B

The licensee will submit to the EPA for approval a comprehensive reporting procedure that, as a minimum, includes:
1. providing quarterly reports to relevant locomotive operators on noise data collected which identify those locomotives with noise levels in the top 5% of locomotives measured in that quarter;
2. obtaining quarterly reports from locomotive operators on actions taken to reduce noise levels from identified locomotives; and
3. providing the EPA with quarterly reports which include:
   - noise monitoring data showing all noise monitoring results, and
   - the information received (from the preceding quarter) from locomotive operators on measures taken to reduce noise levels from identified locomotives.

Timeframe – Within 12 weeks of inclusion of the PRP on the licence.

Action 3.1C

The licensee will implement the EPA approved reporting procedure from Action 3.1B.

Timeframe – Within three weeks of the EPA approving the procedure.

Appendix 2 Environmental assessment requirements for rail traffic-generating developments

Land-use developments other than rail projects that are likely to generate additional rail traffic on an existing rail network should be assessed against the following requirements:

- Identify the typical offset distance/s of sensitive receivers from the rail line/s that are likely to be affected by increased rail movements.
- Quantify the existing level of rail noise at the offset distance/s identified above using the noise descriptors $L_{Aeq,15/9hr}$ and L_{Amax} (95th percentile) dB(A).
- Predict the cumulative rail noise level (i.e. from the existing and proposed rail movements) using a calibrated noise model (based on predicted increased rail movements) at the offset distances identified above.
- Compare the cumulative noise level with the rail noise assessment trigger levels: $L_{Aeq,15hr}$ 65 dB(A), $L_{Aeq,9hr}$ 60 dB(A), and L_{Amax} (95th percentile) 85 dB(A).
- Implement all feasible and reasonable noise mitigation measures where the cumulative noise level exceeds the noise assessment trigger levels and project-related noise increases are predicted.
- Where the L_{Aeq} noise level increases are more than 2 dB(A), which is equivalent to approximately 60 per cent of the total line or corridor rail traffic, and exceeds the relevant noise assessment trigger level, strong justification should be provided as to why it is not feasible or reasonable to reduce the increase.

Notes

1. A project-related noise increase is an increase of more than 0.5 dB over the day or night periods.
2. The geographical extent of the rail noise assessment ideally should be where project-related rail noise increases are less than 0.5 dB. This roughly equates to where project-related rail traffic represents less than 10 per cent of the total line or corridor rail traffic.
3. Guidance on the concept of 'feasible and reasonable' is outlined in Appendix 6.

Mitigating noise from rail traffic-generating developments

For a traffic-generating development like a coal mine, the proponent would not have control over the public rail infrastructure. Consequently they would have limited opportunities to implement mitigation, such as noise barriers. In such cases, control of noise and vibration at the source is the most effective means of mitigation. However, the land-use developer responsible for the additional rail traffic (such as a mine, quarry or industrial site) could contract to a rail service provider who would use best practice rolling stock, including locomotives approved to operate on the NSW rail network in accordance with environment protection licences issued by the EPA. At property (architectural) treatments should be considered for affected receivers, if reasonable.