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Moolarben Coal Complex

OC4 South-West Modification

Noise Assessment

Report Number 610.13549-R1

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Yancoal Australia Limited
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Moolarben Coal Complex

OC4 South-West Modification

Noise Assessment

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1 INTRODUCTION

1.1 Background

Moolarben Coal Operations Pty Ltd (MCO), a wholly owned subsidiary of Yancoal Australia Limited (Yancoal), operates the Moolarben Coal Complex, which is located approximately 40 kilometres north of Mudgee in the Western Coalfields of New South Wales (NSW).

The Moolarben Coal Complex comprises four approved open cut coal mining areas (OC1 to OC4), three approved underground coal mining areas (UG1, UG2 and UG4) and other mining related infrastructure including coal processing and transport facilities. Mining operations at the Moolarben Coal Complex are currently approved until 31 December 2038 and will continue to be carried out in accordance with Project Approval (05_0117) (Moolarben Coal Project Stage 1) dated 6 September 2007 (as modified) (**Appendix A1**) and Project Approval (08_0135) (Moolarben Coal Project Stage 2) dated 30 January 2015 (**Appendix A2**).

MCO has reviewed the mining sequence and associated infrastructure layout requirements at the Moolarben Coal Complex to enable more efficient access to the OC4 coal resource. As a consequence, the approved Stage 2 Haul Road (to the north of OC4) would no longer be required, and would be replaced by a shorter, more direct, haul road route from OC4 to OC1 (to the south-west of the approved Stage 2 haul road), which forms the major component of the proposed OC4 South-West Modification (the Modification).

SLR Consulting Australia Pty Ltd (SLR) has been engaged by MCO to evaluate and assess the potential noise impacts associated with the Modification. In preparing this assessment SLR has considered several documents including the following:

- *Moolarben Coal Project Appendix 4 Noise and Vibration Impact Assessment* (MCP Stage 1 NIA) (Spectrum Acoustics, August 2006);
- *Moolarben Coal Project Stage 1 Optimisation Modification Appendix C Noise and Vibration Impact Assessment* (MCP Stage 1 Mod 9 NIA) (EMM, May 2013);
- *Moolarben Coal Project Stage 2 Preferred Project Report Appendix D Environmental Noise Assessment* (MCP Stage 2 PPR NIA) (Global Acoustics, January 2012);
- *Noise Management Plan* (NMP) (MCO, 2013);
- *Annual Environmental Management Report 2012-2013* (AEMR 2013) (MCO, 2013);
- *Monthly Environmental Noise Monitoring Reports September 2013 to September 2014* (MENMRs) (MCO, 2013/2014); and
- *Quarterly Environmental Noise Assessment Reports March 2013 to August 2014* (QENARs) (Advitech Environmental, 2013/2014).

1.2 Assessment Requirements

The noise impacts for the Modification have been guided by the assessment guidelines as presented in **Table 1**.

Table 1 Noise Impact Assessment Procedure Guidelines

Assessment Guideline	Criteria	Impact
Modification Maximum, Intrusive and Amenity Noise Guided by the requirements of the NSW *Industrial Noise Policy* (INP) (EPA[1], 2000) and associated Application Notes dated 12 June 2013 in relation to setting acceptable project specific noise levels (PSNLs) and assessing any impacts.	**Section 5**	**Section 7, Section 8**
Cumulative Amenity Noise Guided by the requirements of the INP in relation to existing and successive industrial development by setting acceptable (and maximum) cumulative equivalent continuous noise level ($L_{Aeq\ [period]}$) amenity levels for all industrial (ie non-transport related) noise in a receiver area.	**Section 5**	**Section 9**

Note 1: EPA - Environment Protection Authority

Other approved or proposed projects in the vicinity of Moolarben Coal Complex are presented in **Table 2**. The Wilpinjong Coal Project and Ulan Continued Operations Project are considered cumulatively for operational noise (**Section 9**) in this assessment.

Table 2 Other Approved or Proposed Projects

Proponent	Project	Status
Wilpinjong Coal Pty Ltd (WCPL)	Wilpinjong Coal Project (Modification 6)	Project Approval (MP 05_0021) dated 1 February 2006 (as modified), which was last modified on the 21 November 2014 (Modification 6). The Wilpinjong Coal Project is approved to operate up to a maximum coal export capacity (from the site) of 12.5 million tonnes per annum (Mtpa).
Ulan Coal Mines Ltd (UCML)	Ulan (Mine Complex) Continued Operations Project (Modification 2)	Project Approval (MP 08_0184) dated 15 November 2010 (as modified), which was last modified in May 2012 (Modification 2). The Ulan Mine Complex is approved to operate up to a maximum coal export capacity (from the site) of 20 Mtpa.

2 EXISTING MOOLARBEN COAL COMPLEX

2.1 Overview

Since commencement of coal mining operations in 2010, mining activities have only occurred within OC1 and OC2 (**Appendix B2**). Subject to all necessary approvals being in place, mining activities within OC4 are currently planned to commence during 2015. The Moolarben Coal Project Preferred Project Report (MCP Stage 2 PPR) (MCO, 2012) described a maximum (total site) product coal rate of up to 13 Mtpa.

Run-of-mine (ROM) coal from the open cuts is transferred to the Stage 1 ROM coal facility or ROM stockpile by internal haul roads (**Appendix B2**). ROM coal from the undergrounds will be transferred to the Stage 1 ROM coal facility or ROM stockpile by conveyor and internal haul roads.

Approved conveyors connecting the Stage 1 ROM coal facility to the OC4 pit are yet to be constructed (**Appendix B2**). Once constructed, these conveyors would allow transfer of OC4 ROM coal to the Stage 1 ROM coal facility and Coal Handling and Preparation Plant (CHPP) rejects from the CHPP to OC4.

Coal at the Stage 1 ROM coal facility is conveyed to the coal handling and preparation plant (CHPP) in the Stage 1 Infrastructure Area. Crushing and sizing facilities are included at the Stage 1 ROM coal facility and the CHPP (**Appendix B2**). The Moolarben Coal Complex is approved to process up to 13 Mtpa of ROM coal.

Product coal is loaded onto trains for export to the Port of Newcastle up to 24 hours per day, seven days per week.

2.2 Land Ownership

The Land Ownership Plan (**Appendix C1**) identifies the nearest receivers together with the Land Ownership Details (**Appendices C2 and C3**) including a list of property ID numbers, landowners and dwelling co-ordinates.

2.3 Approvals

The Moolarben Coal Project Stage 1 was assessed in the *Moolarben Coal Project Environmental Assessment Report* (MCO, 2006) (MCP Stage 1 EA) and was approved on 6 September 2007. The MCP Stage 1 Project Approval (05_0117) was last modified in January 2015 (Modification 3).

A Major Project Application for the Moolarben Coal Project Stage 2 was lodged with the then Department of Planning and Infrastructure on 1 May 2008. Subsequently, MCO prepared the MCP Stage 2 PPR that was approved in early 2015 (MCP Stage 2 Project Approval [08_0135]). The General Arrangement Plan for the approved Stages 1 and 2 of the Moolarben Coal Project is presented as **Appendix B2**.

With respect to noise emissions, MCO operate in accordance with the following project approval and licence conditions:

- MCP Stage 1 Project Approval (05_0117) dated 6 September 2007 (as modified) with the relevant sections attached as **Appendix A1**.
- MCP Stage 2 Project Approval (08_0135) dated 30 January 2015 with the relevant sections attached as **Appendix A2**.
- EPA Environment Protection Licence (EPL) No 12932 anniversary date 18 August.

It is noted that MCP Stage 1 Project Approval (05_0117) and MCP Stage 2 Project Approval (08_0135) have identical noise conditions and include conditions relating to acquisition upon request, mitigation upon request and noise assessment criteria (ie the Project Approval noise limits). Note, the Project Approval noise limits are presented as external noise levels, except for the school and church which are nominated as 35 A weighted decibels (dBA) (internal when in use). The internal noise levels can be conservatively transposed to an external noise level by adding 10 dBA. It follows that, the Project Approval noise limits in relation to the school and church would have equivalent external noise levels of 45 dBA equivalent continuous noise level ($L_{Aeq(1\ hour)}$) and 45 dBA $L_{Aeq(period)}$ respectively (generally consistent with the INP).

2.4 Noise Management Strategy

MCO has adopted an Environmental Management Strategy (EMS) which establishes the overarching framework for environmental management and monitoring of activities undertaken at the Moolarben Coal Complex. The EMS has been prepared in accordance with the MCP Stage 1 Project Approval (05_0117) and provides the strategic framework for environmental management at the Moolarben Coal Complex. Accordingly, MCO has prepared and implemented the Noise Management Plan (NMP) and Environmental Monitoring Program (EMP) in accordance with the EMS.

The existing EMS is currently being updated to incorporate the Stage 2 Project Approval (08_0135).

2.4.1 Noise Management Plan

The approved NMP dated 29 October 2013 has been prepared to manage project specific, cumulative and traffic noise impacts associated with Stage 1 of the Moolarben Coal Complex. The NMP describes the current noise management regime, which consists of five off-site operator-attended monitoring sites, three off-site continuous real-time monitors and with two on-site Automatic Weather Stations (AWS) (**Appendix B1)**. 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 MCO to take pre-emptive noise management actions to avoid potential non-compliances.

The existing NMP is currently being updated to incorporate the Stage 2 Project Approval (08_0135).

2.4.2 Noise Control and Management Measures

MCO implements a range of noise control and management measures at the Moolarben Coal Complex that includes planning controls, operational controls, engineering controls, a real-time response protocol, meteorological forecasting and continuous improvement, as described in the NMP, to identify and manage noise impacts aimed to achieve compliance with the approved noise criteria (refer **Section 2.3**).

Planning Controls - during mine planning, consideration is given to:

- Weather forecasting;
- Seasonal influences on noise impacts, including prevailing winds and temperature inversions;
- Sound power levels of mobile equipment during equipment procurement and scheduling;
- The location of fixed infrastructure;
- The location and design of mine site haul roads; and
- Noise monitoring results.

Operational Controls - including the following:

- Separate day and night dumping areas when deemed necessary;
- Use of shielded areas during adverse (ie noise enhancing) weather conditions;
- Use of real-time noise monitoring data that incorporate automatic noise alarms to assist operational personnel in proactive management of noise impacts;
- Use of operational personnel to monitor real time noise data to assist production supervisors in proactive management of noise impacts;
- Regular maintenance of equipment, including sound attenuation components;
- Conducting noise management training with relevant personnel to re-enforce the importance of noise mitigation; and
- Sound power testing of mobile and stationary equipment.

Engineering Controls - engineering controls are fitted to higher risk mobile and stationary equipment where noise levels are predicted, or demonstrated to exceed the relevant noise criteria and include:

- Enclosure of higher risk stationary equipment at the CHPP;
- Attenuation of mobile equipment such as haul trucks, shovels and excavators, dozers and drills;
- Development of an equipment noise specification which details equipment Sound Power Levels (SWLs) to be met, which have been determined via noise modelling in previous noise impact assessments, subsequent commitments and associated approvals; and
- Where applicable, the use of rubber lined truck bodies (Dura-Tray) on haul trucks.

Continuous Improvement - implementation of feasible and reasonable mitigation measures:

MCO is committed to maintaining an awareness of best practice noise mitigation technologies and alternative operating methodologies. MCO implements noise control and management measures that are found to be feasible, reasonable and effective in the context of a safe and economic mining operation; and where there is a clear community benefit with their application. Available best practice mitigation technologies and alternative operating methodologies are reviewed on an ongoing basis, reported in the Annual Environmental Monitoring Report (AEMR)/Annual Review and considered from the results of Independent Environmental Audits.

Real-time Response Protocols - are implemented where reasonable and feasible, involving:

Noise control and management measures are implemented under the real-time noise conditions presented in **Table 3** with the responses shown in **Table 4**.

Table 3 Real-Time Response Trigger Levels

Time Period	Location	Green Low pass LAeq[1]	Amber Low pass LAeq[1]	Red Low pass LAeq[1]
Day (7am-6pm)	Lagoons Road	>34dBA for 24 consecutive 5 minute periods	>36dBA for 24 consecutive 5 minute periods	>38dBA for 12 consecutive 5 minute periods
	Winchester Crescent	>31dBA for 24 consecutive 5 minute periods	>33dBA for 24 consecutive 5 minute periods	>35dBA for 12 consecutive 5 minute periods
Evening (6pm-10pm)	Lagoons Road	>34dBA for 12 consecutive 5 minute periods	>36dBA for 6 consecutive 5 minute periods	>38dBA for 6 consecutive 5 minute periods
	Winchester Crescent	>31dBA for 12 consecutive 5 minute periods	>33dBA for 6 consecutive 5 minute periods	>35dBA for 6 consecutive 5 minute periods
Night (10pm-7am)	Lagoons Road	>33dBA for 12 consecutive 5 minute periods	>35dBA for 6 consecutive 5 minute periods	>37dBA for 6 consecutive 5 minute periods
	Winchester Crescent	>31dBA for 12 consecutive 5 minute periods	>33dBA for 6 consecutive 5 minute periods	>35dBA for 6 consecutive 5 minute periods

Source: Table 8 Noise Management Plan (NMP) (MCO, 2013)

Note 1: 630 hertz (Hz) Low pass filter frequency applied.

The real-time response measures evolve over time as a result of greater understanding of the weather patterns and mine operating conditions. The real-time response measures are based on algorithms which are written within the real-time noise software to post-process noise and meteorological data. The algorithms have been based upon noise modelling conducted for the MCP Stage 1 EA and actual noise and meteorological results recorded since commencement of operations in 2010.

The Moolarben Coal Complex Production and the Environment and Community departments are automatically notified when these triggers have been met through SMS alarming. The response trigger levels adequacies are reviewed on an annual basis with any changes reported in the AEMR/Annual Review.

Table 4 Real-Time Response Management Actions

Colour	Management/Control Action
Green	• Confirm prevailing weather conditions are acceptable as per approval requirements. • Review the audio to determine noise source and record observations. • If MCO noise is audible: - review predicted weather conditions to identify if noise enhancing conditions are forecast for the rest of the shift - rerun the model if forecast has changed - review predicted noise impacts for the shift against actual observations - rerun the model if predictions have changed. • Monitor changes in noise levels. • Record management strategies, including details of investigation, type of response (if any required), real-time monitoring results and actions taken.
Amber	• Confirm prevailing weather conditions are acceptable as per approval requirements. • Drive to alarm location to determine noise source and record observations. • If MCO noise is audible: - alert the Open Cut Examiner (OCE) of the noise observations - review noise generating activities and make preparations for moving into a protected area or shutting down equipment if noise levels remain elevated - review predicted weather conditions to identify if noise enhancing conditions are forecast for the rest of the shift - rerun the model if forecast has changed - review predicted noise impacts for the shift against actual observations - rerun the model if predictions have changed. • Monitor changes in noise levels • Record management strategies, including details of investigation, type of response (if any required), real-time monitoring results and actions taken.
Red	• Confirm prevailing weather conditions are acceptable as per approval requirements. • Drive to alarm location to determine noise source and record observations. If MCO noise is audible: - alert the OCE of the noise observations - commence moving equipment into protected areas or shutting down equipment. • Monitor changes in noise levels against operational changes: - review predicted weather conditions to identify if noise enhancing conditions are forecast for the rest of the shift - rerun the model if forecast has changed - review predicted noise impacts for the shift against actual observations - rerun the model if predictions have changed. • Record management strategies, including details of investigation, type of response (if any required), real time monitoring results and actions taken.

Source: Table 9 Noise Management Plan (NMP) (MCO, 2013)

2.5 Noise Compliance

2.5.1 Noise Monitoring Program

A summary of recent noise monitoring locations and associated monitoring frequency are presented in **Table 5** together with a cross reference to the Noise Monitoring Location Plan (**Appendix B1)**.

Table 5 Recent Noise Monitoring Programme Summary

Locality	Location ID[1]	Parameter	Frequency
Ulan	NA1 Ulan Public School	Operator-attended monitoring	Every month
Cooks Gap (North)	NA6 Lower Ridge Road[3]		
Cooks Gap (South)	NA8 Southern Ridge Road		
Cooks Gap (Central)	NA9 Winchester Crescent		
Cooks Gap (South)	NA10 Moolarben Road[2]		
Cooks Gap (North)	NR5 Upper Northern Ridge Road[3]	Real-time monitoring	Continuous
Cooks Gap (North)	NR3 Lagoons Road[4]		
Cooks Gap (Central)	NR4 Winchester Crescent		

Note 1: ID = Identification, refer **Appendix B1**. NA = Attended noise monitoring site. NR = Real-time noise monitoring site.
Note 2: Attended monitoring site to be established prior to commencement of mining in OC3.
Note 3: Real-time monitoring site moved from NR1 Ulan Public School to NR5 Upper Northern Ridge Road in Q4 2014.
Note 4: NR3 and NA6 MCO owned land.

2.5.2 Operator-attended Noise Compliance Results

A review of the AEMR 2013 and MENMRs between September 2013 and September 2014 presents monthly operator-attended noise monitoring at four locations during the period of November 2012 to September 2014, including NA1 Ulan Public School, NA6 Lower Ridge Road (MCO owned Receiver 64, Cooks Gap north), NA8 Southern Ridge Road (Receiver 268, Cooks Gap south) and NA9 Winchester Crescent (Receiver 83, Cooks Gap central).

Largely due to the implementation of the proactive noise control and management measures described in **Section 2.4.2**, MCO has maintained a strong record of recent compliance with the approved noise criteria, with no exceedances at privately owned receivers recorded during the November 2012 to September 2014 reporting period.

2.5.3 Continuous Noise Monitoring Results

The real-time noise monitoring system and response protocols form an integral part of the noise management of Moolarben Coal Complex operations. All data recorded by the real-time noise monitoring system is compiled into QENARs. The QENARs present an analysis of the long term continuous noise monitoring data to assist MCO with evaluation of the performance of mine noise management practices.

A review of the QENARs from March 2013 to August 2014 presents the real-time noise monitoring results recorded at 3 locations, including NR1 Ulan Public School, NR3 Lagoons Road (MCO owned Receiver 6, Cooks Gap north,) and NR4 Winchester Crescent (Receiver 234C, Cooks Gap central).

The L_{Aeq} descriptor is influenced by extraneous noise sources including livestock, traffic, early morning bird activity and insects, and often represents an over-estimate of the contribution from mining operations. Accordingly, the QENARs include the results of the 630 hertz (Hz) low pass filter frequency (ie $L_{AeqLF(15min)}$), which aim to represent the intrusive mine noise level as accurately as possible.

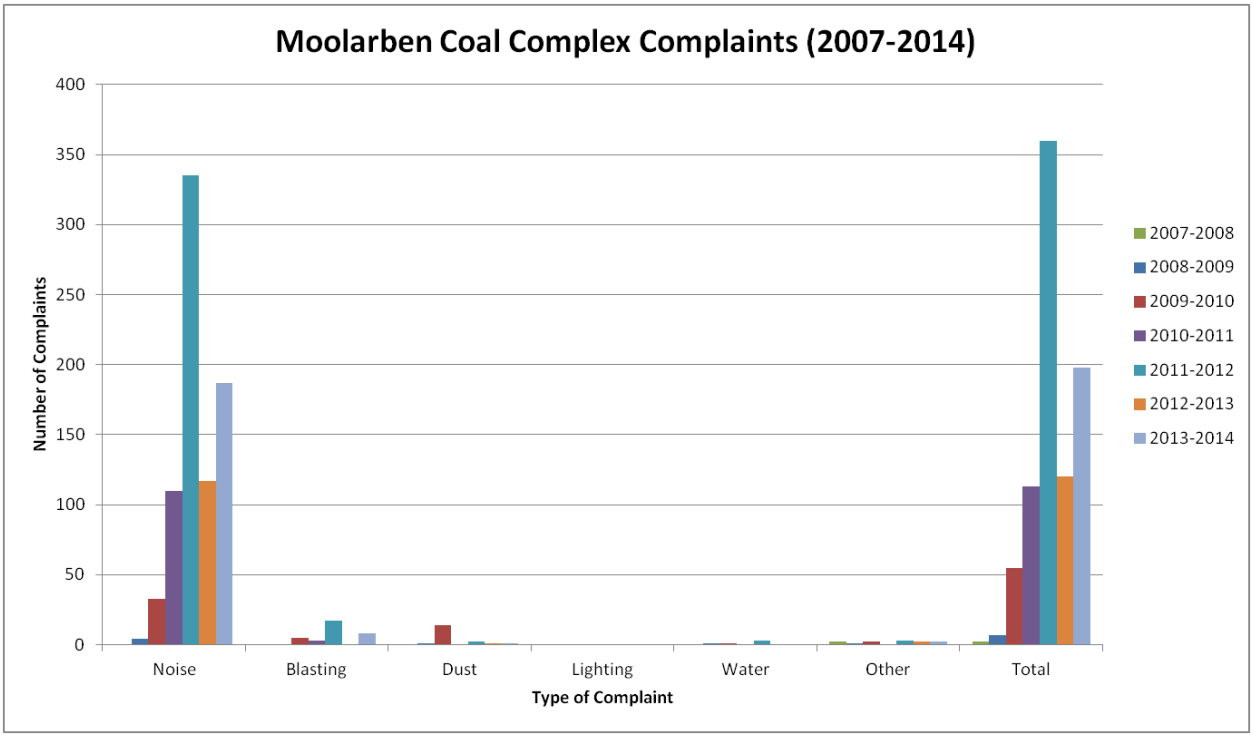
It is noted that in each instance that the Real-Time Response Trigger Levels were exceeded, the Real-time Response Protocols identified in **Section 2.4.2** were implemented, indicating the effectiveness of the Real-time Response Protocol.

2.6 Noise Complaints Summary

MCO maintains a complaints register in accordance with approval requirements. A summary of the complaint records from 2007 to 31 August 2014 are presented in **Figure 1**, including operating noise complaints. **Figure 1** shows the number of noise related complaints has diminished from the peak recorded in 2011/2012. The reduction in noise-related complaints coincides with the continued implementation of MCO's proactive noise control and management measures described in **Section 2.4.2** including the introduction of the Dura-Tray haul trucks, ongoing noise attenuation to mining fleet, the use of dedicated Mining and Production Environmental Assistants to provide real-time feedback to the mining operations, mine planning to allow for protected work areas to be developed, ongoing community consultation and land acquisitions.

All complaints received by MCO relating to noise were responded to in accordance with the Community Complaints Procedure detailed in the NMP. 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 MCO during adverse weather conditions. However, there were no reportable environmental incidents (ie reportable non-compliances) relating to noise in the 2013-2014 reporting period.

Figure 1 Complaints Register Summary 2007 to 2014



Source: MCO (2014)

3 PROPOSED MODIFICATION

3.1 Hours of Operation

There would be no change in the approved operating hours of the Moolarben Coal Complex due to the Modification as presented in **Table 6**.

Table 6 Approved Moolarben Coal Complex and Modification Hours of Operation

Operation	Description	Currently Approved[1]	Modification
On-Site	Mine maintenance, operation, coal handling	24 hours, 7 days per week	Unchanged
	Blasting	0900 hours to 1700 hours A maximum of 2 blasts per day and 9 blasts per week on average over any 12 month period	Unchanged
Off-Site	Train Traffic	24 hours, 7 days per week	Unchanged
	Road Traffic	24 hours, 7 days per week	Unchanged

Note 1: As per MCP Stage 1 Project Approval (05_0117) and MCP Stage 2 Project Approval (08_0135).

3.2 On-site Mining Operation

MCO has reviewed the mining sequence and associated infrastructure layout requirements at the Moolarben Coal Complex to enable more efficient access to the OC4 resource. As a consequence, the approved Stage 2 Haul Road (to the north of OC4) would no longer be required, and would be replaced by a shorter, more direct, haul road route to OC1 (to the south-west of the approved Stage 2 haul road).

The OC4 South-West Modification includes the following key components:

- Construction of the OC4 south-west haul road between OC4 and OC1 (and therefore the approved Stage 2 Haul Road would not need to be constructed);
- Adjustments to the site water management system to contain surface water runoff from the south-west haul road and diversion of clean water;
- Refinements to the early stages of mining and associated infrastructure layout at OC4 (wholly located within the approved surface disturbance footprint); and
- Backfilling of the northern OC1 final void to approximately pre-mining elevations.

The General Arrangement Plan Incorporating the Modification is attached as **Appendix B3**.

More detailed mine planning that has been undertaken since the lodgement of the Stage 2 PPR EA indicates that additional fleet would be required to meet expected production while maintaining compliance with noise limits. An indicative Moolarben Coal Complex mobile equipment fleet is presented in **Table 17**.

3.3 On-site Blasting

There would be no change in the approved Moolarben Coal Complex blasting regime due to the Modification and, therefore, blasting is not further considered in this report.

3.4 Off-site Rail Transport

There would be no change to the approved rail movements or rail loading hours and, therefore, off-site rail transport noise is not further considered in this report.

3.5 Off-site Road Transport

There would be no material change in the approved daily road traffic generation due to the Modification and, therefore, off-site road transport noise is not further considered in this report.

4 EXISTING METEOROLOGICAL AND NOISE ENVIRONMENT

4.1 Meteorological Environment

As discussed in **Section 2.4.1**, MCO maintains two on-site AWSs as shown in **Appendix B1**. An assessment of prevailing wind conditions was derived from the EPA approved AWS located at WS3. The dominant seasonal wind speeds and directions recorded for the 42 month period from January 2011 to June 2014 are presented in **Appendix D** 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.

An assessment of winter temperature gradients and atmospheric stability has been derived from the on-site Temperature Tower located at Wilpinjong Coal Mine. Presented in **Appendix D** is the winter Temperature Gradient Exceedance Levels summary, winter Temperature Gradient Exceedance Levels 24 hour profile and winter Temperature Gradient Cumulative Frequency Distribution for the 34 month period (August 2011 to July 2014) in accordance with a methodology consistent with the requirements of the INP Appendix E (E2).

4.1.1 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 in any season."*

The prevailing winds less than (or equal to) 3 metres per second (m/s) with a frequency of occurrence greater than (or equal to) 30% are presented in **Table 7** and considered to be relevant to the Moolarben Coal Complex in accordance with the INP.

Table 7 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	SW (33%), WSW (30.8%)	Nil
Summer	Nil	ENE (30.6%)	ENE (37.1%), E (36.3%)
Autumn	Nil	SSW (31.6%), SW (34.7%), WSW (30.3%)	Nil
Winter	WSW (30.8%), W (30%)	SSW (32.3%), SW (40.5%), WSW (40.4%), W (30.5%)	SW (32.7%), WSW (33.1%)
Spring	Nil	SSW (37.3%), SW (44.4%), WSW (42.1%)	SSW (36.1%), SW (37.5%), WSW (30.6%)

4.1.2 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".*

The seasonal combined evening/night-time temperature gradients and atmospheric stability are presented in **Table 8** and considered to be relevant to Moolarben Coal Complex in accordance with the INP.

Table 8 Prevailing Seasonal Temperature Gradients in Accordance with the INP

Stability Class	Frequency of Occurrence - Evening/Night-time					Temperature Gradient °C/100 m[1]	Qualitative Description
	Annual	Summer	Autumn	Winter	Spring		
A	0.3%	0.7%	0.0%	0.0%	0.3%	<-1.9	Lapse
B	0.5%	1.3%	0.1%	0.0%	0.5%	-1.9 to -1.7	Lapse
C	0.9%	2.3%	0.2%	0.0%	0.9%	-1.7 to -1.5	Lapse
D	34.6%	58.1%	26.9%	17.4%	33.2%	-1.5 to -0.5	Neutral
E	25.0%	24.7%	28.6%	22.6%	23.5%	-0.5 to 1.5	Weak inversion
F	25.1%	9.5%	31.0%	39.1%	22.8%	1.5 to 4	Moderate inversion
G	13.7%	3.4%	13.1%	20.9%	18.7%	>4.0	Strong inversion
F+G	38.8%	12.9%	44.1%	59.9%	41.6%	>1.5	Moderate to Strong

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

In accordance with **Table 8**, the combined frequency of occurrence of moderate to strong (ie >1.5°C/100 m) winter temperature inversions is greater than 30% (actually 59.9%) during the combined evening/night-time period and therefore requires assessment, in accordance with the INP. The assessment of winter temperature gradients and atmospheric stability derived from the Wilpinjong Coal Mine Temperature Tower data has provided additional data regarding the characterisation of temperature gradients that occur in the area.

Based on analysis of available data (**Appendix D**), it was determined that noise impacts coinciding with temperature gradients up to 5.2°C/100 were assessable, in accordance with the INP, as these temperature inversions occur for up to 90% of the time during the evening/night periods during winter.

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."*

Some of the Cooks Gap privately owned receivers are positioned at lower elevation relative to the Moolarben Coal Complex with minimal intervening topography between the site and the nearest receivers. A site specific 1.0 m/s east-northeast drainage flow has been adopted in this assessment (which is generally consistent with the MCP Stage 1 Mod 9 NIA).

4.1.3 Noise Model Meteorological Parameters

The Environmental Noise Model (ENM) noise modelling meteorological parameters are presented in **Table 9** based on foregoing analysis of the Moolarben Coal Complex AWS meteorological data set together with the Wilpinjong Coal Mine winter temperature gradients.

Table 9 Calm (Neutral) and Noise Enhancing Meteorological Modelling Parameters

Period	Meteorological Parameter	Air Temperature	Relative Humidity	Wind Velocity	Temperature Gradient
Daytime	Calm	18°C	55%	0 m/s	0°C/100 m
	Wind only	19°C	55%	WSW and W 3 m/s	0°C/100 m
Evening	Calm	16°C	66%	0 m/s	0°C/100 m
	Wind only	16°C	65%	ENE, SSW, SW, WSW and W 3 m/s	0°C/100 m
Night-time	Calm	12°C	75%	0 m/s	0°C/100 m
	Wind only	12°C	75%	ENE, E, SSW, SW and WSW 3 m/s	0°C/100 m
	Strong Inversion	6°C	70%	0 m/s	5.2°C/100 m
	Strong Inversion plus Drainage	6°C	70%	ENE 1.0 m/s	5.2°C/100 m

4.2 Noise Environment

Although the Moolarben Coal Complex has approved noise limits for privately owned receivers in its Stages 1 and 2 Project Approvals, the INP procedures and Application Notes (12 June 2013) require noise impact assessments to review the pre-mining background noise data to determine the relevant Rating Background Levels (RBLs) and noise amenity levels ($L_{Aeq(period)}$). Background noise monitoring results to characterise and quantify the pre-mine noise environment in the area surrounding Moolarben Coal Complex were conducted in July 2005 for the *Noise and Vibration Impact Assessment Proposed Moolarben Coal Mine Ulan, NSW* (Spectrum Acoustics, 2006).

The measurement methodology and analysis procedures are described in the MCP Stage 1 NIA. The relevant estimated RBLs and noise amenity levels ($L_{Aeq(period)}$) are presented in **Table 10**, which form the basis of establishing the Project-specific noise assessment criteria (**Section 5**).

Table 10 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
Privately Owned Land	30	30	30	<44	<39	<34

Source: Spectrum Acoustics (2006)

Note 1: Estimated RBLs and noise amenity levels in the absence of Moolarben Coal Complex operation.

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

5 NOISE ASSESSMENT CRITERIA

The Moolarben Coal Complex operates in accordance with the Project Approval noise limits (**Section 2.3 and Appendices A1 and A2**). The Project Approval noise limit for privately owned receivers is 35 dBA $L_{Aeq(15minute)}$ during the daytime, evening and night-time with the exception of five receivers (30, 31, 63[1], 70, 75) as shown in Appendices A1 and A2. Notwithstanding, in accordance with the INP Application Notes (12 June 2013), PSNLs and Sleep Disturbance Noise Levels (SDNLs) for the Moolarben Coal Complex incorporating the Modification determined in accordance with the INP are described below.

5.1 Intrusive and Amenity Noise 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 (ie $L_{Aeq[15minute]}$ 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 Moolarben Coal Complex are shown in **Table 11**.

Table 11 INP Acceptable and Maximum Noise Amenity Levels (dBA re 20 µPa)

Locality	INP Noise Amenity Zone	Amenity LAeq(period)[1] Acceptable			Amenity LAeq(period)[1] Maximum		
		Day	Evening	Night	Day	Evening	Night
Privately Owned Land	Rural Residential	50	45	40	55	50	45
Any	School[2]	External 45 when in use			External 50 when in use		
Any	Church[2]	External 50 when in use			External 55 when in use		
Any	Passive Recreation	External 50 when in use			External 55 when in use		
Any	Commercial	External 65 when in use			External 70 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: External criteria equivalent to internal criteria plus 10 dBA.

In addition, the DP&E has released the Voluntary Land Acquisition and Mitigation Policy (VLA&MP) (DP&E, 2014) which formalises existing NSW Government practice in relation to land acquisition and mitigation associated with State Significant (mining, petroleum and extractive) Developments.

With regard to vacant land the VLA&MP indicates that the consent authority should only grant voluntary land acquisition rights where the noise generated by the development would contribute exceedances of the recommended maximum noise levels in Table 2.1 of the INP on more than 25% of any privately owned land, and a dwelling could be built on that land under existing planning controls. Based on the VLA&MP guidance, the residential rural night-time maximum recommended ($L_{Aeq(9hour)}$) noise amenity level would be 45 dBA.

1 Receiver 63 is subject to a private agreement with MCO and therefore the Project Approval noise criteria do not apply to this property.

In accordance with the INP's Chapter 2 Industrial Noise Criteria and relevant Application Notes, the PSNLs for the residential and other localities in the vicinity of the Moolarben Coal Complex are presented **Table 12** for both intrusive noise and amenity. These criteria are nominated for the purposes of assessing potential noise impacts from the Moolarben Coal Complex incorporating the Modification.

Table 12 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
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 (daytime/evening only)		
Any	Church[3]	Intrusive noise criteria not applicable			External 50 when in use (daytime/evening only)		
Any	Passive Recreation	Intrusive noise criteria not applicable			External 50 when in use		
Any	Commercial	Intrusive noise criteria not applicable			External 65 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: External criteria equivalent to internal criteria plus 10 dBA.

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 described in **Section 4.2**. Thus, the most stringent PSNLs for Moolarben Coal Complex incorporating the Modification at rural residential receivers (and vacant land) would be the intrusiveness criterion (ie 35 dBA $L_{Aeq(15minute)}$) for daytime, evening and night-time periods.

The Privately Owned Land amenity criteria nominated in **Table 12** are reflective of the general rural area generally consistent with Local Environmental Plan zoning. Cumulative noise impacts from the Moolarben Coal Complex incorporating the Modification are assessed against the amenity $L_{Aeq(period)}$ acceptable noise levels specified in **Table 11** being the total noise level from all industrial sources.

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 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. In subjective terms, exceedances of the PSNLs can be described as follows:

- Negligible noise level increase <1 dBA - not noticeable by all people.
- Marginal noise level increase 1 dBA to 2 dBA - not noticeable by most people.
- Moderate noise level increase 3 dBA to 5 dBA - not noticeable by some people but may be noticeable by others.
- Appreciable noise level increase >5 dBA - noticeable by most people.

5.2 Low Frequency Noise Modifying Adjustment Factors

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 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.

Noise measurements of the existing Moolarben Coal Complex noise emissions (coinciding with temperature inversions) were conducted by SLR for a duration of one week in August 2014 using a full spectrum noise monitor (ie capacity to measure low frequency noise) located at the receiver 175 (MCO) being generally representative of the nearest Cooks Gap receivers to the Moolarben Coal Complex.

The noise data were then analysed in accordance with the INP requirements to estimate the $L_{eq(15minute)}$ A and C weighted noise levels of the Moolarben Coal Complex operations and this coincided with strong temperature inversions (average approximately 5.6^{o}C/100 m) between 0000 hours to 0500 hours. The measurement results at the receiver 175 (MCO) show a mean difference of 13.3 dB between the estimated (mine-contributed) intrusive $L_{Aeq(15minute)}$ and the $L_{Ceq(15minute)}$ noise levels (ie below the INP's low frequency modifying threshold of 15 dB).

On review of this data and operator-attended noise monitoring results presented in the MENMRs, it is concluded that Moolarben Coal Complex noise emissions do not contain "dominant low frequency content" in accordance with the INP's assessment procedures.

In addition, recent research presented 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. Furthermore, the INP's low frequency assessment approach does not involve an absolute noise level criterion and may not provide an appropriate assessment of annoyance. Based on a comprehensive review of many case histories and literature, the technical paper recommends criteria for the assessment of low frequency noise as presented in **Table 13**.

Table 13 Criteria for Assessment of Low Frequency Noise (dBC re 20 µPa)

Sensitive Receiver	Period	Range	Criteria L_{eq}
Residential	Night-time or Plant Operation 24/7	Desirable	60
		Maximum	65
	Daytime or Intermittent (1-2 hours)	Desirable	65
		Maximum	70
Commercial/Office/ Industrial	Night-time or Plant Operation 24/7	Desirable	70
		Maximum	75
	Daytime or Intermittent (1-2 hours)	Desirable	75
		Maximum	80

Source: Broner, 2011

5.3 Sleep Disturbance Assessment Criteria

The INP Application Notes dated 12 June 2013 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 to sleep disturbance and traffic noise. The review has been more recently updated in The NSW Road Noise Policy (Department of Environment, Climate Change and Water [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 the MCP Stage 1 Project Approval (05_0117) and MCP Stage 2 Project Approval (08_0135).

The Modification night-time $L_{A1(1minute)}$ SDNLs are presented in **Table 14** together with the comparable approved $L_{A1(1minute)}$ noise limit.

Table 14 Night-time $L_{A1(1minute)}$ Sleep Disturbance Assessment Criteria (dBA re 20 µPa)

Locality	Project Approval $L_{A1(1minute)}$ Limit[1]	Proposed Modification $L_{A1(1minute)}$ Criteria[1]
Privately Owned Land	45	45

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

Night-time operations would involve a larger proportion of the mobile equipment being operated in repeatable routines and a relatively smaller proportion of continuous fixed plant. Noise emissions from the mobile equipment are typically variable, whereas fixed plant noise emissions are relatively continuous (or steady) levels. When mobile equipment and fixed plant operate simultaneously, some noise sources (including the operation of coal trains) have the potential to emerge audibly above the overall mine noise.

The monthly operator-attended noise monitoring results as presented in the MENMRs from monitoring locations NA6, NA8 and NA9 have been reviewed to determine the mean difference between the intrusive $L_{Aeq(15minute)}$ and the corresponding $L_{A1(1minute)}$ noise levels. The results are summarised in **Table 15** including the mean (mine-contributed) intrusive $L_{Aeq(15minute)}$ and the $L_{A1(1minute)}$ noise levels.

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

Locality	Location ID[1]	Mean LAeq(15minute)	Mean LA1(1minute)	Mean Difference
Cooks Gap (North)	NA6 Lower Ridge Road[2]	27 dBA	31 dBA	3.9 dBA
Cooks Gap (South)	NA8 Southern Ridge Road	23 dBA	25 dBA	2.0 dBA
Cooks Gap (Central)	NA9 Winchester Crescent	27 dBA	30 dBA	3.0 dBA
	Overall	**26 dBA**	**29 dBA**	**3.0 dBA**

Note 1: ID = Identification, refer **Appendix B1**.
Note 2: NA6 MCO owned land.

The measured results at locations NA6, NA8 and NA9 show a mean difference of approximately 3 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 (**Section 5.1**) (ie RBL plus 5 dBA) are achieved, then the SDNLs (ie 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 7.3** together with an assessment of potential sleep disturbance impacts from Moolarben Coal Complex incorporating the Modification.

5.4 Modification and Cumulative Noise Impact Assessment Methodology

5.4.1 Noise Impact Assessment Methodology

In view of the foregoing, **Table 16** presents the methodology for assessing the Modification operating noise levels against the intrusive and amenity PSNLs (**Table 12**) and the $L_{A1(1minute)}$ SDNLs (**Table 14**) together with cumulative amenity noise levels (**Table 11**) for assessing operating noise levels from existing, approved and proposed mining developments in the vicinity of Moolarben Coal Complex.

Table 16 Modification and Cumulative Noise Impact Assessment (dBA re 20 µPa)

Assessment Source	Assessment Parameter	Assessment Criteria	Noise Management Zone[1]		Noise Affectation Zone
			Marginal	Moderate	
Modification	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[2]
	PSNL Amenity	INP acceptable			
	SDNL LA1(1minute)	RBL plus 15 dBA			
Mine Developments	Cumulative Amenity	INP acceptable	1 to 2 dBA above assessment criteria	3 dBA above assessment criteria	> 3 dBA above assessment criteria[3]

Note 1: Depending on the degree of predicted exceedance of the relevant assessment parameter potential noise impacts in the noise management zone could range from marginal to moderate (in terms of the perceived noise increase).

Note 2: Exposure to Project noise levels greater than 5 dBA above the relevant PSNL and or SDNL may be considered unacceptable by some landowners.

Note 3: Exposure to cumulative mine noise levels greater than 3 dBA above the relevant INP acceptable noise level may be considered unacceptable by some landowners.

For the purposes of assessing any potential Modification noise impacts, the noise management and affectation zones are further defined as follows.

5.4.2 Noise Management Zone

Depending on the degree of predicted exceedance of the PSNL and or SDNL (1 to 5 dBA), potential noise impacts in the noise management zone could range from marginal to moderate (in terms of the perceived noise increase). In addition to the noise mitigation measures included in the predictive modelling (**Section 6.1**), noise management procedures would include:

- Noise monitoring on-site and within the community.
- Prompt response to any community issues of concern.
- Refinement of on-site noise mitigation measures and operating procedures where practicable.
- Implementation of reasonable and feasible acoustical mitigation at receivers (which may include measures such as enhanced glazing, insulation and/or air-conditioning) at receivers where noise monitoring shows mine noise levels are 3 to 5 dBA above the relevant criteria.

5.4.3 Noise Affectation Zone

Exposure to Moolarben Coal Complex incorporating the Modification noise levels greater than 5 dBA above the relevant PSNL and or SDNL may be considered unacceptable by some landowners. These landowners are typically afforded rights for acquisition upon request in the relevant approval documentation. Management procedures for the Noise Affectation Zone would include:

- Discussions with relevant land owners to assess concerns and define responses.

- Implementation of reasonable and feasible acoustical mitigation at receivers (which may include measures such as enhanced glazing, insulation and/or air-conditioning) at receivers where noise monitoring shows mine noise levels are >5 dBA above the relevant criteria.
- Negotiated agreements with land owners where required.

6 NOISE MODELLING METHODOLOGY

6.1 Noise Control and Management Measures

6.1.1 Moolarben Coal Complex Existing Operations

MCO is obligated to manage noise levels from the Moolarben Coal Complex in accordance with the noise limits specified in MCP Stage 1 Project Approval (05_0117) and MCP Stage 2 Project Approval (08_0135) using reasonable and feasible mitigation measures. The obligation to meet the Project Approval noise limits has been achieved through a combination of the following:

- For the majority of private landowners, the implementation of the noise management strategy as per the NMP including the use of real-time noise monitoring to manage noise levels during the night.
- For a minority of private landowners, property acquisitions and private compensation agreements and which has had the effect of reducing the number of privately owned receivers that could potentially be affected by noise impacts from the Moolarben Coal Complex.

An appreciable level of effort has been applied by MCO to identify and implement reasonable and feasible on-site noise controls since the commencement of mining, particularly to minimise the impact of night-time noise emissions from the Moolarben Coal Complex (**Appendix E**) including:

- Fitting of large haul trucks with Dura-Trays to reduce the noise emissions associated with loading and unloading.
- Locating mobile fleet (eg excavators) behind pit walls and at low elevations to shield noise emissions during adverse weather conditions.
- Construction of steps in waste emplacements to allow dumping to occur at lower elevations during adverse weather conditions.
- Construction of berms/bunds along haul roads which are exposed to receivers.

Further detail regarding the Moolarben Coal Complex noise management strategy and MCO's recent compliance with the noise limits specified in MCP Stage 1 Project Approval (05_0117) and MCP Stage 2 Project Approval (08_0135) is provided in **Section 2.3**. MCO would continue to meet its obligation to comply with the noise limits specified in MCP Stage 1 Project Approval (05_0117) and MCP Stage 2 Project Approval (08_0135) through the continued implementation of the noise management strategy. This would include the continuation of real-time monitoring, and the stand-down of equipment, as required, as part of the response to an exceedance of the Real-Time Response Trigger Levels.

6.1.2 Moolarben Coal Complex Incorporating the Modification

Given the successful implementation of the noise management strategy for the existing operations, MCO has made allowances for noise attenuated mobile equipment and fixed plant associated with the Modification in order to comply with the Project Approval noise limits.

However, further investigation of reasonable and feasible noise mitigation measures for the proposed Modification was necessary and was conducted in consultation with MCO particularly in relation to evening and night-time operations. A number of iterative steps were undertaken to develop noise mitigation measures for the Modification, including:

- Extensive preliminary noise modelling scenarios representative of the predicted maximum Modification noise emissions to identify any potential noise exceedances.
- Ranking the highest noise contributors and progressively introducing noise mitigation measures to appreciably reduce noise associated with the Modification.
- Revision of detailed mine planning to reschedule intrusive activities to less sensitive times of the day where possible and to optimise acoustic benefit of mine landforms (eg shielding of noise sources by out-of-pit waste rock emplacements). This was an ongoing, iterative process requiring both acoustic (provided by SLR) and mine planning input (provided by MCO).
- Evaluating various combinations of noise control and management measures to assess their relative effectiveness.
- Agreement by MCO to adopt a range of noise control and management measures (including low noise equipment and operational controls) to appreciably reduce noise emissions associated with the proposed Modification.

The noise control and management measures have had the effect of appreciably reducing noise levels at nearby privately owned receivers. In particular, noise reduction at receivers to levels at or below the Project Approval noise limits in Cooks Gap has been targeted through the implementation of the above measures. This has been achieved in particular by:

- Operation of some support fleet during the daytime only.
- Procuring of extra-quiet (XQ) mobile equipment fleet and “low noise’ fixed plant (ie conveyor drives and conveyor idlers).
- Establishing extensive acoustic bunding around the site, targeting haul roads.
- From 2018, OC4 emplacement of waste rock operations during evening and night-time at relatively lower elevations, utilizing main dump shielding toward the Cooks Gap receivers.
- Maximising in-pit hauling of OC1 waste rock (ie restricting fleet to lower elevations).
- Minimising out-of-pit rock emplacement of OC1 waste rock.

Given the optimised mine plan for the Modification and other operational restrictions, it is considered that the measures presented above are reasonable and feasible.

6.2 Mobile Equipment and Fixed Plant Sound Power Levels

The potential for machinery to emit noise is quantified as the SWL expressed in dBA re 1 pico watt (pW). At the receptor, the received noise is quantified as the sound pressure level (SPL) expressed in dBA re 20 micro pascals (µPa). In general terms, any variation in the on-site plant and equipment SWLs will produce a similar variation in the off-site SPL at the receiver (ie an increase of 5 dBA in the SWL of equipment operating at a site would result in a corresponding 5 dBA increase in SPL of intrusive noise at the receiver, when averaged over the same 15 minute period).

Equipment SWLs at the Moolarben Coal Complex are the subject of ongoing measurements in accordance with the NMP, and MCO have refined the SWLs for individual fleet items. Comparative mobile equipment, fixed plant and total SWLs are presented in **Table 17** as determined from the MCP Stage 1 Mod 9 NIA and the proposed Modification. Based on the MCP Stage 1 Mod 9 NIA the site SWL was approximately 134 dBA and for the proposed Modification, the (total) site SWL is approximately 135 dBA. As shown in **Table 17**, due to the additional mobile equipment and fixed plant the proposed Modification site SWL is approximately 1.2 dBA higher by comparison to the approved Moolarben Coal Complex.

Table 17 Comparative Fixed Plant and Mobile Equipment Fleets SWLs (dBA re 1 pW)

Equipment	Type/ Capacity	MCP Stage 1 Mod 9 NIA[1,2]			Proposed Modification[3]		
		No. Items	SWL per Item	Total SWL	No. Items	SWL per Item	Total SWL
Drill	Atlas Copco DML60	3	120	125	2	117	120
	Pit Viper 275				2	115	118
Excavator	Liebherr 996	6	118	126	2	117	120
	Liebherr 996B				1	111	111
	Liebherr 9800				1	114	114
	CAT 6050				2	118	121
Front-end Loader	Komatsu WA1200	1	120	120	2	121	124
	Komatsu WD900				1	120	120
	CAT 854				1	114	114
Truck	Komatsu 830E	25	115	129	29	115	130
	Komatsu 730E/CAT 789				9	114	124
Dozer	Komatsu D475	15	114	126	7	113	121
	Komatsu D375				3	113	118
	CAT D11T				8	116	125
	CAT D10T				4	114	120
Water Truck	Komatsu HD785	4	114	120	4	115	121
Grader	Komatsu GD825	4	112	118	2	110	113
	CAT 24M				2	110	113
	CAT 16M				2	108	111
Support Loader	Komatsu WA580-6	-	-	-	1	115	115
Support Excavator	Komatsu PC450	-	-	-	2	105	108
Support Scraper	CAT 657G	-	-	-	1	117	117
Service Truck	Komatsu HD785	-	-	-	1	115	115
Service Truck	CAT 773F	-	-	-	1	114	114
Mobile Equipment				**133.2**			**134.6**
CHPP		1	117	117	1	118	118
Reject Bin		1	104	104	1	104	104
Feeder		1	114	114	1	114	114
Crusher		1	113	113	1	114	114
Transfer Station		2	115	118	2	115	118
Sizing Station		1	114	114	1	116	116
Stacker		1	105	105	1	105	105
Conveyor			101 (per 100m)	120		101 (per 100m)	120
Conveyor Drive		6	102-107	113	11	98	108
Ventilation Fans		2	112	112	2	112	115
Loadout Bin		1	113	113	1	113	113
Locomotive		3	108	113	3	109	114
Fixed Plant				**125.8**			**125.9**
Estimated Mine Site				**134.0**			**135.2**

Note 1: Estimated mobile equipment SWLs based on demonstrated noise controls. Estimated fixed plant SWLs based on achievable low noise emission standards and NIA acoustic design requirements.

Note 2: As modelled in the MCP Stage 1 Mod 9 NIA (including the Stage 2 operations) based on an approximate 85% mobile equipment utilisation.

Note 3: Estimated mobile equipment SWLs based on existing performance and demonstrated noise controls. Estimated fixed plant SWLs based on achievable low noise emission standards and NIA acoustic design requirements. The number of items stated is the total excluding any utilisation rate.

The L_{Aeq} SWLs given for each item of mobile equipment or fixed plant do not include noise emissions which emanate from alarms or communication "horns". It is noted that MCO have installed broad-band "quacker" reversing alarms on all of the Moolarben Coal Complex mobile equipment fleet. Further, implementation of "silent horns" which uses radio to communicate between mobile plant is used on-site. External horns are used in emergency situations only.

6.3 Noise Model Validation

The noise model for the Moolarben Coal Complex 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 and all State Environmental Authorities throughout Australia as representing one of the most appropriate predictive methodologies currently available. The ENM algorithm has been used for all major noise assessments at the Moolarben Coal Complex including the MCP Stage 1 Mod 9 NIA and MCP Stage 2 PPR NIA.

SLR conducted a noise investigation survey in July and August 2014 to update and validate the Moolarben Coal Complex noise model and reflect as-built noise emissions, as follows:

- On-site noise measurements to determine fixed plant SWLs including CHPP, conveyors and drives, ROM bin, sizing station as well as locomotives operating on the rail loop.
- On-site noise measurements to determine and/or verify mobile equipment SWLs including dozers, excavators, haul trucks and drills.
- The digital terrain was updated to include latest high resolution landforms, particularly extensive noise wall bunding on the western extent of OC2 as well as incorporating the proposed Modification mine plans and significant mobile equipment.
- Additional noise sources were added into the model to more accurately reflect the noise emissions from mobile equipment, particularly haul trucks on the OC4 South-West haul route.
- Far-field operator-attended and unattended noise surveys (3 validation locations) were conducted to determine Moolarben Coal Complex's noise level contribution at each location. For each survey the prevailing weather conditions as well as the number and location of operating plant and equipment were recorded.
- The outcome of the validation exercise resulted in a noise model calibration factor (of negative 2.1 dBA) which has been included in the Modification noise assessment (while noting that the validation outcomes are generally consistent with field measurement and modelling results from similar large scale resource developments).

The two operational noise modelling scenarios (described below) include all existing and proposed plant and equipment items operating concurrently to simulate the overall maximum energy equivalent (ie 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 continuous fixed plant items. Mobile fleet undergo regular maintenance on-site, resulting in a portion of the total mobile fleet (refer **Table 17**) being out of service at any given time. This has been reflected in the two operational noise modelling scenarios which assume a mobile fleet utilisation of approximately 83% and 82% for 2016 and 2018 respectively. Generally, 80% to 85% mobile equipment utilisation (and driver availability) is consistent with large scale open-cut mining operations.

6.4 Noise Modelling Scenarios

In accordance with INP requirements, the Modification description was reviewed to determine representative scenarios to assess potential noise impacts. Scenarios representing typical operations of Moolarben Coal Complex incorporating the Modification in 2016 and 2018 were selected. Justification for these scenarios is provided below.

6.4.1 Year 2016 Scenario

The 2016 scenario represents potential worst case noise impacts at the Cooks Gap privately owned receivers, as in this year operations for Moolarben Coal Complex incorporating the Modification would include:

- OC4 operations (where the majority of the fleet is located) focussed in the west (ie closer to the nearest private receivers in Cooks Gap);
- Operation of the proposed OC4 south-west haul road between OC4 and OC1 (**Appendix B3**). By comparison with the approved Stage 2 (overland) conveyor, the operation of the proposed OC4 south-west haul road has the greater potential noise impact at the nearest private receivers;
- The development of the OC4 out-of-pit waste emplacement to its maximum elevation;
- OC1 operations near to the Ulan Village;
- Open Cut operations at the maximum open cut ROM coal production rate (13 Mtpa) and waste rock production rate (55 Million bank cubic metres [Mbcm] per annum); and
- The operation of the maximum number of mobile equipment items (**Table 18**) in addition to CHPP, coal stockpiling, rail loading and maintenance operations.

Table 18 Year 2016 Scenario Typical Mobile Equipment Fleet Distribution[1]

Open Cut 1 Area	Open Cut 4 Area	CHPP/ROM Area	Drill / Preparation Area
Overburden Fleet: 1 x Atlas Copco DML 60 Drill 1 x Komatsu D375 Dozer 1 x Liebherr 996B Excavator 5 x Komatsu 830E Trucks	**Coal Fleet**: 1 x Atlas Copco DML 60 Drill 2 x CAT D11 Dozers 1 x CAT 6050 Shovel 2 x Komatsu WD900 Dozers 8 x Komatsu 730E/CAT 789D Haul Trucks	3 x Komatsu D475 Dozers (S/Pile) (ROM) 1 x Komatsu WA1200 Loader (ROM) 1 x Komatsu 730E /CAT 789D Haul Trucks (Reject)	2 x PitViper 275 Drills 1 x Komatsu PC450 Excavator 2 x CAT D10 Dozers 1 x CAT 16M Grader 1 x CAT 657 Scraper
	Overburden Fleet 1: 1 x Liebherr 9800 Excavator 2 x CAT D11 Dozers 6 x Komatsu 830E Trucks 1 x Komatsu WA580 Loader 1 x Komatsu D475 Dozer		
	Overburden Fleet 2: 1 x Liebherr 996 Excavator 2 x CAT D11 Dozers 5 x Komatsu 830E Trucks		
	Overburden Fleet 3: 1 x CAT 6050 Shovel 1 x CAT D10 Dozer 1 x CAT 854 Dozer 4 x Komatsu 830E Trucks		
	Overburden Fleet 4: 1 x Liebherr 996 Excavator 1 x Komatsu D375 Dozer 1 x Komatsu D475 Dozer 4 x Komatsu 830E Trucks		
Support Fleet: 1 x Komatsu GD825 Grader	**Support Fleet**: 3 x Komatsu HD785 Water Trucks 1 x CAT 16M Grader 2 x CAT 24M Grader 1 x CAT 773F Service Trucks		

Note 1: Based on approximate 83% mobile equipment utilisation by comparison with the total Modification fleet presented in **Table 17**.

6.4.2 Year 2018 Scenario

The 2018 scenario represents potential worst case noise impacts at the Cooks Gap privately owned receivers, as in this year operations for Moolarben Coal Complex incorporating the Modification would include:

- OC1 and OC4 operations would be focussed in the west (ie closer to the nearest private receivers in Cooks Gap);
- Operation of the proposed OC4 south-west haul road between OC4 and OC1 (**Appendix B3**). By comparison with the approved Stage 2 (overland) conveyor, the operation of the proposed OC4 south-west haul road has the greater potential noise impact at the nearest private receivers.;
- Open cut operations at the maximum ROM coal production rate (13 Mtpa) and waste rock production rate would be near maximum (up to approximately 53 Mbcm per annum); and
- The operation of the maximum number of mobile equipment items (**Table 19**) in addition to CHPP, coal stockpiling, rail loading and maintenance operations.

Table 19 Year 2018 Scenario Typical Mobile Equipment Fleet Distribution[1]

Open Cut 1 Area	Open Cut 4 Area	CHPP/ROM Area	Drill / Preparation Area
Overburden Fleet: 1 x Atlas Copco DML 60 Drill 1 x Komatsu D375 Dozer 1 x Liebherr 996B Excavator 4 x Komatsu 830E Trucks	**Coal Fleet**: 1 x Atlas Copco DML 60 Drill 2 x CAT D11 Dozers 1 x CAT 6050 Shovel 2 x Komatsu WD900 Dozers 8 x Komatsu 730E/CAT 789D Haul Trucks	3 x Komatsu D475 Dozers (S/Pile) (ROM) 1 x Komatsu WA1200 Loader (ROM) 1 x Komatsu 730E /CAT 789D Haul Trucks (Reject)	2 x PitViper 275 Drills 1 x Komatsu PC450 Excavator 2 x CAT D10 Dozers 1 x CAT 16M Grader 1 x CAT 657 Scraper
	Overburden Fleet 1: 1 x Liebherr 9800 Excavator 2 x CAT D11 Dozers 8 x Komatsu 830E Trucks 1 x Komatsu WA580 Loader 1 x Komatsu D475 Dozer		
	Overburden Fleet 2: 1 x Liebherr 996 Excavator 2 x CAT D11 Dozers 5 x Komatsu 830E Trucks		
	Overburden Fleet 3: 1 x Liebherr 996 Excavator 1 x CAT D10 Dozer 1 x CAT 854 Dozer 8 x Komatsu 830E Trucks		
Support Fleet: 1 x Komatsu GD825 Grader	**Support Fleet**: 3 x Komatsu HD785 Water Trucks 1 x CAT 16M Grader 2 x CAT 24M Grader 1 x CAT 773F Service Trucks		

Note 1: Based on approximate 82% mobile equipment utilisation by comparison with the total Modification fleet presented in **Table 17**.

7 INTRUSIVE NOISE IMPACT ASSESSMENT

7.1 Daytime Operating Intrusive Noise Levels

The predicted daytime operating $L_{Aeq(15minute)}$ intrusive noise levels for the 2016 and 2018 operating scenarios are presented in **Table 20** for privately owned receivers together with the relevant PSNLs and Project Approval noise limits (**Appendices A1** and **A2**).

Table 20 Daytime Years 2016 and 2018 $L_{Aeq(15minute)}$ Intrusive Noise Levels (dBA re 20 µPa)

ID No and Landholder		Year 2016[4]		Year 2018[4]		Project Approval Noise Limit	Intrusive PSNL
		Calm	Wind	Calm	Wind		
Cooks Gap							
37	Szymkarczuk	10	6	9	6	35	35
39	Sprigg	12	8	12	9	35	35
40	Devenish	11	7	11	8	35	35
41(a)	Libertis	12	8	12	8	35	35
41(b)	Libertis	15	11	20	16	35	35
59	Szymkarczuk	17	13	23	19	35	35
60	Rayner & Mundey	13	9	16	12	35	35
61	Miller	16	12	19	15	35	35
63[1, 2]	Whiticker	20	15	27	22	39	35
70[2]	Coventry	20	16	26	22	37	35
75[2]	Ban	18	13	25	21	36	35
76	Carbone	17	13	21	17	35	35
79	Nagle	16	12	23	19	35	35
80	Sebelic	16	12	22	18	35	35
82	Hungerford & Clemens	16	11	20	16	35	35
83	Wall	16	11	20	16	35	35
84	Sebelic	14	10	18	14	35	35
86	Harris	15	10	19	15	35	35
87	Howe	14	10	18	14	35	35
88	Meyers	11	8	13	10	35	35
89	Glover & Tomlinson	14	10	19	14	35	35
90	Powell	14	10	18	14	35	35
91	Graham	10	7	11	7	35	35
94	Mittemayer	13	9	18	13	35	35
95	Withington	13	9	17	13	35	35
96	Lazicic	12	8	17	13	35	35
97	Smith	12	8	16	12	35	35
98	Piper	12	8	14	10	35	35
99	Jenner & Jensen	11	7	12	8	35	35
100	Kapista	10	7	10	6	35	35
101	Hull	11	7	11	7	35	35
102	Roberts	11	7	10	7	35	35
103	Burnett & Grant	12	8	15	11	35	35
104	Deeben	12	8	13	9	35	35
105	Katsikaris	12	8	13	9	35	35
106	Reid	12	8	11	8	35	35
107	Raso	11	8	11	7	35	35
109	Evans	12	8	12	8	35	35

ID No and Landholder		Year 2016[4]		Year 2018[4]		Project Approval Noise Limit	Intrusive PSNL
		Calm	Wind	Calm	Wind		
110	Thompson & Evans	11	8	12	8	35	35
111	McEwan	11	8	12	8	35	35
112	Croft	11	7	11	7	35	35
113	Ratcliff	11	8	11	8	35	35
119	Kearns	11	7	10	7	35	35
171	McGregor	12	8	14	10	35	35
180	Barrett	20	15	24	20	35	35
181	Forster	20	15	22	17	35	35
182	Dutoitcook	19	15	24	19	35	35
183	Steines	20	15	23	18	35	35
184 (a)	Stevenson	19	14	23	19	35	35
184 (b)	Stevenson	19	14	23	19	35	35
186	Adamson	18	13	19	15	35	35
187	Feeney	18	14	22	18	35	35
188	Fielding	14	9	14	10	35	35
189	Goggin & Hyde	17	13	22	17	35	35
190	Sahyoun	14	10	15	10	35	35
191	Lasham	18	14	19	15	35	35
192	Williams	16	12	21	16	35	35
194	Potts	14	10	15	10	35	35
195	Cottam	16	12	19	15	35	35
196	Saxberg & Weir	15	10	16	12	35	35
200	Grimshaw	14	10	15	11	35	35
201(a)	Towerton	13	9	14	9	35	35
201(b)	Towerton	13	9	15	10	35	35
202	Butler	13	9	16	11	35	35
203	Miller	14	10	16	12	35	35
204	Donnan	14	10	18	14	35	35
206	Marshall & Vella	14	10	17	13	35	35
207	Smith	12	8	15	11	35	35
208	Hasaart	12	8	15	11	35	35
209	Mawson	12	8	15	11	35	35
210	Tebutt	12	8	15	11	35	35
217	Patterson	12	8	14	10	35	35
218	Soady	12	8	14	10	35	35
219	Riger	12	8	15	11	35	35
220	Rusten & Smith	12	9	15	11	35	35
222	Purtell	12	8	14	11	35	35
223	Palmer & Stewart	12	8	14	10	35	35
224	Dupond	14	10	19	15	35	35
226	Muscat	14	10	19	15	35	35
227	Hughes	15	10	20	16	35	35
229	Lowe	15	11	20	16	35	35
230	Hoole & Rawlinson	15	11	21	16	35	35
231	Morrison & Benny	15	11	21	17	35	35
232	Haaring	16	11	21	17	35	35
233	Boal	16	11	21	17	35	35
234	Gaw	16	12	22	17	35	35

ID No and Landholder		Year 2016[4]		Year 2018[4]		Project Approval Noise Limit	Intrusive PSNL
		Calm	Wind	Calm	Wind		
235	Wilson	16	12	22	17	35	35
236	Donovan	17	12	22	18	35	35
237	Puskaric	16	12	23	18	35	35
238	Powell	16	12	23	19	35	35
240	Hartley	17	13	23	18	35	35
300	Collins & Marshall	12	7	12	7	35	35
303	Ungaro	17	12	21	16	35	35
305	Barisic & Aul	18	13	20	15	35	35
306	Armstrong	19	14	21	16	35	35
307	Chant & Young	18	13	20	15	35	35
308	Dower	15	10	17	12	35	35
309	Maher	12	7	14	8	35	35
310	Death	12	7	12	7	35	35
312	Ioannou	10	5	10	4	35	35
313	Pracy	9	4	9	4	35	35
314	Ford	9	4	8	3	35	35
315	Richards & Uzelac	9	4	8	3	35	35
316	Vassel & Williams	9	4	8	3	35	35
317	Hore & Bingham	9	4	9	4	35	35
Moolarben Road							
30[2, 3]	Cox	12	10	15	13	39	35
31[2]	Cox	13	11	18	16	36	35
32	Stokes	5	6	4	6	35	35
35	Johnson & Thompson & Debreczeny	11	9	17	16	35	35
47	Andrews	10	8	15	15	35	35
Ulan							
11(b)	Mullins & Imrie	10	22	10	23	35	35
255	Schmitz	15	11	18	14	35	35
258	Elias	18	14	21	17	35	35

Note 1: Receiver subject to a private agreement with MCO.
Note 2: Project Approval Noise Limit for this receiver is above the intrusive PSNL (refer **Appendices A1** and **A2**).
Note 3: Landowner that can request additional noise mitigation measures.
Note 4: Highest predicted noise level from the INP meteorological conditions (**Table 9**) for each receiver.
Note 5: Predicted intrusive noise level complies with the intrusive PSNL.

7.2 Evening Operating Intrusive Noise Levels

The predicted evening operating $L_{Aeq(15minute)}$ intrusive noise levels for the 2016 and 2018 operating scenarios are presented in **Table 21** for privately owned receivers together with the relevant PSNLs and Project Approval noise limits (**Appendix A1**).

Table 21 Evening Years 2016 and 2018 Intrusive $L_{Aeq(15minute)}$ Noise Levels (dBA re 20 µPa)

ID No and Landholder		Year 2016[4]		Year 2018[4]		Project Approval Noise Limit	Intrusive PSNL
		Calm	Wind	Calm	Wind		
Cooks Gap							
37	Szymkarczuk	10	27	10	27	35	35
39	Sprigg	12	27	12	27	35	35
40	Devenish	11	27	11	26	35	35
41(a)	Libertis	12	28	12	27	35	35
41(b)	Libertis	15	29	21	29	35	35
59	Szymkarczuk	17	31	24	32	35	35
60	Rayner & Mundey	14	25	16	28	35	35
61	Miller	16	30	20	30	35	35
63[1,2]	Whiticker	20	36	27	36	39	35
70[2]	Coventry	20	35	27	35	37	35
75[2]	Ban	18	34	25	33	36	35
76	Carbone	17	33	22	33	35	35
79	Nagle	16	33	24	33	35	35
80	Sebelic	17	32	23	31	35	35
82	Hungerford & Clemens	16	30	20	30	35	35
83	Wall	16	30	20	30	35	35
84	Sebelic	14	30	19	29	35	35
86	Harris	15	29	20	29	35	35
87	Howe	14	29	19	29	35	35
88	Meyers	12	28	14	28	35	35
89	Glover & Tomlinson	14	29	19	28	35	35
90	Powell	14	28	19	28	35	35
91	Graham	11	28	11	28	35	35
94	Mittemayer	14	28	18	27	35	35
95	Withington	13	28	17	27	35	35
96	Lazicic	13	28	17	27	35	35
97	Smith	12	28	16	27	35	35
98	Piper	12	28	14	27	35	35
99	Jenner & Jensen	11	27	12	27	35	35
100	Kapista	11	27	10	27	35	35
101	Hull	11	27	11	26	35	35
102	Roberts	11	27	11	26	35	35
103	Burnett & Grant	12	27	15	27	35	35
104	Deeben	12	27	13	26	35	35
105	Katsikaris	12	27	13	26	35	35
106	Reid	12	26	12	26	35	35
107	Raso	12	26	11	26	35	35
109	Evans	12	26	12	26	35	35
110	Thompson & Evans	12	26	12	26	35	35
111	McEwan	12	26	12	26	35	35
112	Croft	12	26	11	26	35	35
113	Ratcliff	12	26	11	26	35	35
119	Kearns	11	27	10	26	35	35
171	McGregor	12	20	14	21	35	35
180	Barrett	21	33	25	32	35	35
181	Forster	20	28	22	30	35	35

ID No and Landholder		Year 2016[4]		Year 2018[4]		Project Approval Noise Limit	Intrusive PSNL
		Calm	Wind	Calm	Wind		
182	Dutoitcook	20	32	24	32	35	35
183	Steines	20	32	23	31	35	35
184(a)	Stevenson	19	32	24	31	35	35
184(b)	Stevenson	19	31	24	31	35	35
186	Adamson	18	26	20	28	35	35
187	Feeney	19	31	23	30	35	35
188	Fielding	14	24	15	27	35	35
189	Goggin & Hyde	18	31	22	30	35	35
190	Sahyoun	15	24	15	26	35	35
191	Lasham	18	25	20	27	35	35
192	Williams	17	30	21	29	35	35
194	Potts	14	25	15	26	35	35
195	Cottam	17	30	19	29	35	35
196	Saxberg & Weir	15	26	17	26	35	35
200	Grimshaw	14	22	16	24	35	35
201(a)	Towerton	13	22	14	24	35	35
201(b)	Towerton	13	24	15	26	35	35
202	Butler	14	23	16	24	35	35
203	Miller	14	27	17	26	35	35
204	Donnan	14	27	19	27	35	35
206	Marshall & Vella	15	22	17	24	35	35
207	Smith	13	26	15	25	35	35
208	Hasaart	13	26	16	25	35	35
209	Mawson	12	26	15	25	35	35
210	Tebutt	12	26	15	25	35	35
217	Patterson	13	27	15	26	35	35
218	Soady	12	26	14	25	35	35
219	Riger	13	26	15	26	35	35
220	Rusten & Smith	13	23	15	22	35	35
222	Purtell	13	27	15	26	35	35
223	Palmer & Stewart	12	27	15	26	35	35
224	Dupond	14	28	20	27	35	35
226	Muscat	15	28	20	28	35	35
227	Hughes	15	29	20	28	35	35
229	Lowe	15	30	21	29	35	35
230	Hoole & Rawlinson	15	30	21	29	35	35
231	Morrison & Benny	15	30	21	29	35	35
232	Haaring	16	30	22	30	35	35
233	Boal	16	31	22	30	35	35
234	Gaw	16	31	22	30	35	35
235	Wilson	17	31	22	30	35	35
236	Donovan	17	31	22	30	35	35
237	Puskaric	17	32	23	31	35	35
238	Powell	17	32	23	31	35	35
240	Hartley	17	33	23	32	35	35
300	Collins & Marshall	12	27	12	30	35	35
303	Ungaro	18	28	21	30	35	35
305	Barisic & Aul	18	29	21	29	35	35

ID No and Landholder		Year 2016[4]		Year 2018[4]		Project Approval Noise Limit	Intrusive PSNL
		Calm	Wind	Calm	Wind		
306	Armstrong	19	29	21	30	35	35
307	Chant & Young	18	28	21	29	35	35
308	Dower	15	26	18	28	35	35
309	Maher	12	26	14	28	35	35
310	Death	12	28	13	29	35	35
312	Ioannou	10	27	10	28	35	35
313	Pracy	10	27	9	28	35	35
314	Ford	9	27	9	28	35	35
315	Richards & Uzelac	9	27	8	29	35	35
316	Vassel & Williams	9	27	8	29	35	35
317	Hore & Bingham	10	26	9	29	35	35
Moolarben Road							
30[2, 3]	Cox	13	31	15	31	39	35
31[2]	Cox	13	30	18	29	35	35
32	Stokes	5	7	4	7	35	35
35	Johnson & Thompson & Debreczeny	12	29	17	28	35	35
47	Andrews	10	25	15	25	35	35
Ulan							
11(b)	Mullins & Imrie	10	6	10	7	35	35
255	Schmitz	16	29	18	30	35	35
258	Elias	19	32	21	32	35	35

Note 1: Receiver subject to a private agreement with MCO.
Note 2: Project Approval Noise Limit for this receiver is above the intrusive PSNL (refer Appendices A1 and A2).
Note 3: Landowner that can request additional noise mitigation measures.
Note 4: Highest predicted noise level from the INP meteorological conditions (**Table 9**) for each receiver.
Note 5: Predicted intrusive noise level complies with the intrusive PSNL.
Note 6: Predicted intrusive noise level marginal 1 to 2 dBA above intrusive PSNL.

7.3 Night-time Operating Intrusive Noise and Sleep Disturbance

The predicted night-time $L_{Aeq(15minute)}$ intrusive and sleep disturbance $L_{A1(1minute)}$ noise levels for the 2016 and 2018 operating scenarios for privately owned receivers are presented in **Table 22** together with the relevant PSNLs, SDNLs and Project Approval noise limits (**Appendix A1**).

Table 22 Night-time 2016 & 2018 Intrusive $L_{Aeq(15minute)}$ & $L_{A1(1minute)}$ Noise (dBA re 20 µPa)

ID No and Landholder		Year 2016[4]			Year 2018[4]			Project Approval Noise Limit	Intrusive PSNL/ SDNL
		Calm	Wind or Inversion	$L_{A1(1min)}$	Calm	Wind or Inversion	$L_{A1(1min)}$		
Cooks Gap									
37	Szymkarczuk	10	30	33	10	30	33	35/45	35/45
39	Sprigg	12	29	32	12	29	32	35/45	35/45
40	Devenish	11	29	32	12	29	32	35/45	35/45
41(a)	Libertis	12	30	33	12	29	32	35/45	35/45
41(b)	Libertis	15	31	34	21	31	34	35/45	35/45
59	Szymkarczuk	18	34	37	24	35	38	35/45	35/45
60	Rayner & Mundey	14	28	31	16	31	34	35/45	35/45
61	Miller	16	33	36	20	32	35	35/45	35/45
63[1, 2]	Whiticker	21	**38**	41	28	**38**	41	39/45	35/45
70[2]	Coventry	21	37	40	27	37	40	37/45	35/45

ID No and Landholder		Year 2016[4]			Year 2018[4]			Project Approval Noise Limit	Intrusive PSNL/ SDNL
		Calm	Wind or Inversion	$L_{A1(1min)}$	Calm	Wind or Inversion	$L_{A1(1min)}$		
75[2]	Ban	18	36	39	26	36	39	36/45	35/45
76	Carbone	17	35	38	22	35	38	35/45	35/45
79	Nagle	17	35	38	24	35	38	35/45	35/45
80	Sebelic	17	34	37	23	34	37	35/45	35/45
82	Hungerford & Clemens	16	33	36	20	32	35	35/45	35/45
83	Wall	16	32	35	21	32	35	35/45	35/45
84	Sebelic	14	32	35	19	32	35	35/45	35/45
86	Harris	15	31	34	20	31	34	35/45	35/45
87	Howe	15	32	35	19	31	34	35/45	35/45
88	Meyers	12	31	34	14	31	34	35/45	35/45
89	Glover & Tomlinson	15	31	34	19	31	34	35/45	35/45
90	Powell	14	31	34	19	30	33	35/45	35/45
91	Graham	11	30	33	11	30	33	35/45	35/45
94	Mittemayer	14	30	33	18	29	32	35/45	35/45
95	Withington	13	30	33	18	29	32	35/45	35/45
96	Lazicic	13	30	33	17	29	32	35/45	35/45
97	Smith	12	30	33	16	29	32	35/45	35/45
98	Piper	12	30	33	15	29	32	35/45	35/45
99	Jenner & Jensen	12	29	32	12	29	32	35/45	35/45
100	Kapista	11	29	32	10	29	32	35/45	35/45
101	Hull	11	29	32	11	28	31	35/45	35/45
102	Roberts	11	29	32	11	28	31	35/45	35/45
103	Burnett & Grant	12	29	32	16	29	32	35/45	35/45
104	Deeben	12	29	32	13	28	31	35/45	35/45
105	Katsikaris	12	29	31	14	28	31	35/45	35/45
106	Reid	12	28	31	12	28	31	35/45	35/45
107	Raso	12	28	31	12	28	31	35/45	35/45
109	Evans	12	28	31	13	28	31	35/45	35/45
110	Thompson & Evans	12	28	31	12	28	31	35/45	35/45
111	McEwan	12	28	31	12	28	31	35/45	35/45
112	Croft	12	28	31	12	28	31	35/45	35/45
113	Ratcliff	12	28	31	12	28	31	35/45	35/45
119	Kearns	11	29	32	11	29	31	35/45	35/45
171	McGregor	13	21	24	14	22	25	35/45	35/45
180	Barrett	21	35	38	25	35	38	35/45	35/45
181	Forster	21	30	33	23	32	35	35/45	35/45
182	Dutoitcook	20	34	37	24	34	37	35/45	35/45
183	Steines	20	34	37	24	34	37	35/45	35/45
184(a)	Stevenson	19	34	37	24	34	37	35/45	35/45
184(b)	Stevenson	20	34	37	24	33	36	35/45	35/45
186	Adamson	18	28	31	20	30	33	35/45	35/45
187	Feeney	19	33	36	23	33	36	35/45	35/45
188	Fielding	14	26	29	15	29	32	35/45	35/45
189	Goggin & Hyde	18	33	36	23	32	35	35/45	35/45

ID No and Landholder		Year 2016[4]			Year 2018[4]			Project Approval Noise Limit	Intrusive PSNL/ SDNL
		Calm	Wind or Inversion	$L_{A1(1min)}$	Calm	Wind or Inversion	$L_{A1(1min)}$		
190	Sahyoun	15	26	29	16	28	31	35/45	35/45
191	Lasham	18	27	30	20	29	32	35/45	35/45
192	Williams	17	32	35	22	32	35	35/45	35/45
194	Potts	14	28	31	16	28	31	35/45	35/45
195	Cottam	17	31	34	20	31	34	35/45	35/45
196	Saxberg & Weir	15	28	31	17	28	31	35/45	35/45
200	Grimshaw	15	24	27	16	26	29	35/45	35/45
201(a)	Towerton	13	24	26	14	26	29	35/45	35/45
201(b)	Towerton	13	27	30	15	28	31	35/45	35/45
202	Butler	14	25	28	16	26	29	35/45	35/45
203	Miller	15	29	32	17	28	31	35/45	35/45
204	Donnan	14	29	32	19	28	31	35/45	35/45
206	Marshall & Vella	15	24	27	17	26	29	35/45	35/45
207	Smith	13	27	30	16	27	30	35/45	35/45
208	Hasaart	13	27	30	16	27	30	35/45	35/45
209	Mawson	12	27	30	16	27	30	35/45	35/45
210	Tebutt	13	27	30	16	26	29	35/45	35/45
217	Patterson	13	28	31	15	27	30	35/45	35/45
218	Soady	13	28	31	14	27	30	35/45	35/45
219	Riger	13	28	31	15	27	30	35/45	35/45
220	Rusten & Smith	13	25	28	15	24	27	35/45	35/45
222	Purtell	13	28	31	15	28	31	35/45	35/45
223	Palmer & Stewart	12	29	32	15	28	31	35/45	35/45
224	Dupond	14	30	33	20	29	32	35/45	35/45
226	Muscat	15	30	33	20	30	33	35/45	35/45
227	Hughes	15	31	34	21	30	33	35/45	35/45
229	Lowe	16	32	35	21	31	34	35/45	35/45
230	Hoole & Rawlinson	16	32	35	22	31	34	35/45	35/45
231	Morrison & Benny	16	32	35	22	32	35	35/45	35/45
232	Haaring	16	33	35	22	32	35	35/45	35/45
233	Boal	16	33	36	22	32	35	35/45	35/45
234	Gaw	17	33	36	22	32	35	35/45	35/45
235	Wilson	17	33	36	23	33	36	35/45	35/45
236	Donovan	17	33	36	23	33	36	35/45	35/45
237	Puskaric	17	34	37	23	34	36	35/45	35/45
238	Powell	17	34	37	24	34	37	35/45	35/45
240	Hartley	18	35	38	24	35	38	35/45	35/45
300	Collins & Marshall	12	29	32	12	33	36	35/45	35/45
303	Ungaro	18	31	34	22	33	36	35/45	35/45
305	Barisic & Aul	18	31	34	21	32	35	35/45	35/45
306	Armstrong	19	31	34	21	32	35	35/45	35/45
307	Chant & Young	19	30	33	21	32	35	35/45	35/45
308	Dower	16	29	32	18	31	34	35/45	35/45
309	Maher	12	29	32	14	30	33	35/45	35/45

ID No and Landholder		Year 2016[4]			Year 2018[4]			Project Approval Noise Limit	Intrusive PSNL/ SDNL
		Calm	Wind or Inversion	$L_{A1(1min)}$	Calm	Wind or Inversion	$L_{A1(1min)}$		
310	Death	12	30	33	13	31	34	35/45	35/45
312	Ioannou	10	30	33	10	31	34	35/45	35/45
313	Pracy	10	29	32	10	30	33	35/45	35/45
314	Ford	9	30	33	9	31	34	35/45	35/45
315	Richards & Uzelac	9	30	33	9	31	34	35/45	35/45
316	Vassel & Williams	9	30	33	9	31	34	35/45	35/45
317	Hore & Bingham	10	29	32	9	32	35	35/45	35/45
Moolarben Road									
30[2, 3]	Cox	13	34	37	16	34	37	39/45	35/45
31[2]	Cox	13	34	37	19	33	36	35/45	35/45
32	Stokes	5	14	17	5	16	19	35/45	35/45
35	Johnson & Thompson & Debreczeny	12	31	34	18	31	34	35/45	35/45
47	Andrews	10	28	31	15	28	31	35/45	35/45
Ulan									
11(b)	Mullins & Imrie	10	23	26	10	24	27	35/45	35/45
255	Schmitz	16	32	35	19	33	36	35/45	35/45
258	Elias	19	35	38	22	35	38	35/45	35/45

Note 1: Receiver subject to a private agreement with MCO.
Note 2: Project Approval Noise Limit for this receiver is above the intrusive PSNL (refer **Appendices A1** and **A2**).
Note 3: Landowner that can request additional noise mitigation measures.
Note 4: Highest predicted noise level from the INP meteorological conditions (**Table 9**) for each receiver.
Note 5: Predicted intrusive noise level complies with the intrusive PSNL and maximum SDNL.
Note 6: Predicted intrusive noise level marginal 1 to 2 dBA above intrusive PSNL or maximum SDNL.
Note 7: Predicted intrusive noise level moderate 3 to 5 dBA above intrusive PSNL or maximum SDNL.

7.4 Impact Assessment Summary and Comparison with Approved Moolarben Coal Complex

In summary, the predicted daytime, evening and night-time intrusive and maximum noise levels show that:

- No exceedance of the Project Approval noise limits are predicted during the daytime, evening and night-time in 2016 or 2018 (**Table 20** to **Table 22**) at any privately owned receivers.
- A marginal exceedance of 1 dBA above the intrusive PSNL (35 dBA) at 63 Whiticker is predicted during adverse weather conditions in the evening (**Table 21**).
- A marginal exceedances of 1 dBA to 2 dBA above the intrusive PSNL (35 dBA) at 75 Ban and 70 Coventry are predicted during adverse weather conditions in the night-time (**Table 22**).
- A moderate exceedance of 3 dBA above the intrusive PSNL (35 dBA) at 63 Whiticker is predicted during adverse weather conditions in the night-time (**Table 22**).
- No exceedance of the intrusive PSNL 35 dBA at all other privately owned receivers.
- No exceedance of the maximum SDNL 45 dBA at all privately owned receivers.

The Modification would not result in new predicted exceedances of the Project Approval Noise Limits.

By comparison with the outcomes of the MCP Stage 1 Mod 9 NIA, all of the privately owned receivers with predicted exceedances of the intrusive PSNLs listed above were previously identified in the MCP Stage 1 Mod 9 NIA as being the noise management zone (and therefore are already eligible to request additional noise mitigation measures). As a result of the Modification, there are no additional privately owned receivers predicted to be within the noise management or affectation zones.

7.5 Privately Owned Vacant Land Impact Assessment

The outer envelope night-time $L_{Aeq(15minute)}$ intrusive noise contours for Years 2016 and 2018 are presented in **Appendices F1** and **F2** 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 will differ slightly from the values in **Table 22**.

The noise impacts on vacant land have been assessed in accordance with **Section 5.1** on the basis that the subject vacant land is permitted to have a dwelling. The Year 2018 night-time $L_{Aeq(15minute)}$ intrusive noise contour of 35 dBA is predicted to dissect two vacant properties (ie 34 and 178) and therefore remain below the VLA&MP residential rural night-time maximum recommended ($L_{Aeq(9hour)}$ noise amenity level of 45 dBA. Similarly, both vacant properties also remain below the Project Approval noise limit with regard to the land acquisition of 45 dBA where more than 25% of the vacant land area is affected.

8 NOISE AMENITY IMPACT ASSESSMENT

8.1 Modification Operating Noise Amenity Levels

The predicted daytime, evening and night-time $L_{Aeq(period)}$ noise amenity levels for the operating scenarios in Years 2016 and 2018 are presented in **Table 23** for privately owned receivers as well as schools, churches and commercial receivers in Ulan Village.

Table 23 Daytime, Evening and Night-time Noise Amenity Years 2016 & 2018 (dBA re 20 µPa)

ID No and Landholder		Year 2016[4]			Year 2018[4]		
		Day	Evening	Night	Day	Evening	Night
Cooks Gap							
37	Szymkarczuk	8	25	27	7	24	27
39	Sprigg	10	25	27	10	24	27
40	Devenish	9	24	27	9	23	26
41(a)	Libertis	10	25	27	10	24	27
41(b)	Libertis	12	26	29	18	26	29
59	Szymkarczuk	15	28	31	21	30	33
60	Rayner & Mundey	11	22	25	13	25	28
61	Miller	13	27	30	17	27	30
63[1, 2]	Whiticker	17	33	36	24	33	36
70[2]	Coventry	17	32	35	24	32	35
75[2]	Ban	15	31	34	22	31	34
76	Carbone	14	30	33	19	30	33
79	Nagle	13	30	33	21	30	33
80	Sebelic	14	29	32	20	29	32
82	Hungerford & Clemens	13	27	30	17	27	30
83	Wall	13	27	30	18	27	30
84	Sebelic	11	27	29	16	26	29
86	Harris	12	26	29	17	26	29
87	Howe	12	26	29	16	26	29
88	Meyers	9	25	28	11	26	28
89	Glover & Tomlinson	11	26	29	16	26	28
90	Powell	11	26	28	16	26	28
91	Graham	8	25	28	9	25	28
94	Mittemayer	11	25	27	15	25	27
95	Withington	10	25	28	15	25	27
96	Lazicic	10	25	28	14	25	27
97	Smith	9	25	28	13	25	27
98	Piper	9	25	27	12	24	27
99	Jenner & Jensen	9	24	27	9	24	27
100	Kapista	8	24	27	7	24	27
101	Hull	8	24	26	8	23	26
102	Roberts	8	24	26	8	23	26
103	Burnett & Grant	9	24	27	12	24	26
104	Deeben	9	24	26	10	23	26
105	Katsikaris	9	24	26	11	23	26
106	Reid	9	24	26	9	23	26
107	Raso	9	24	26	9	23	26
109	Evans	10	23	26	10	23	26
110	Thompson & Evans	9	23	26	9	23	26
111	McEwan	9	24	26	10	23	25
112	Croft	9	23	26	9	23	25
113	Ratcliff	9	23	26	9	23	25
119	Kearns	8	24	26	8	23	26
171	McGregor	10	18	20	11	18	20

ID No and Landholder		Year 2016[4]			Year 2018[4]		
		Day	Evening	Night	Day	Evening	Night
180	Barrett	17	30	33	22	30	33
181	Forster	17	25	28	19	28	30
182	Dutoitcook	17	29	32	21	29	32
183	Steines	17	29	32	20	29	32
184(a)	Stevenson	16	29	32	21	29	32
184(b)	Stevenson	16	29	32	21	29	31
186	Adamson	15	24	26	17	26	28
187	Feeney	16	28	31	20	28	31
188	Fielding	11	22	24	12	24	27
189	Goggin & Hyde	15	28	31	19	28	30
190	Sahyoun	12	22	24	12	23	26
191	Lasham	15	23	25	17	25	27
192	Williams	14	27	30	18	27	30
194	Potts	11	23	25	12	23	26
195	Cottam	14	27	30	16	26	29
196	Saxberg & Weir	12	23	25	13	23	26
200	Grimshaw	12	20	22	13	22	24
201(a)	Towerton	10	19	21	11	21	23
201(b)	Towerton	10	22	24	12	23	26
202	Butler	11	21	23	13	22	24
203	Miller	12	24	27	14	24	26
204	Donnan	11	25	27	16	24	26
206	Marshall & Vella	12	20	22	14	22	24
207	Smith	10	23	25	12	23	25
208	Hasaart	10	23	26	13	23	25
209	Mawson	9	23	25	12	23	25
210	Tebutt	10	23	25	12	22	25
217	Patterson	10	24	26	12	23	25
218	Soady	10	23	26	11	23	25
219	Riger	10	23	26	12	23	26
220	Rusten & Smith	10	21	23	12	20	22
222	Purtell	10	24	26	12	23	26
223	Palmer & Stewart	10	24	26	12	23	26
224	Dupond	11	25	28	17	25	27
226	Muscat	12	25	28	17	25	28
227	Hughes	12	26	28	18	26	28
229	Lowe	12	27	30	18	27	29
230	Hoole & Rawlinson	13	27	30	18	27	29
231	Morrison & Benny	12	27	30	19	27	29
232	Haaring	13	27	30	19	27	30
233	Boal	13	28	31	19	28	30
234	Gaw	13	28	31	19	28	30
235	Wilson	14	28	31	19	28	31
236	Donovan	14	28	31	19	28	31
237	Puskaric	14	29	32	20	29	31
238	Powell	14	29	32	20	29	32

ID No and Landholder		Year 2016[4]			Year 2018[4]		
		Day	Evening	Night	Day	Evening	Night
240	Hartley	15	30	33	20	30	33
300	Collins & Marshall	9	24	27	9	27	31
303	Ungaro	15	26	29	18	28	31
305	Barisic & Aul	15	26	29	17	27	30
306	Armstrong	16	26	29	18	27	30
307	Chant & Young	15	25	28	17	27	30
308	Dower	13	24	26	15	26	28
309	Maher	9	23	26	11	25	28
310	Death	9	25	28	9	26	29
312	Ioannou	7	24	27	7	26	29
313	Pracy	7	24	27	6	25	28
314	Ford	6	24	27	6	25	29
315	Richards & Uzelac	6	24	27	5	26	29
316	Vassel & Williams	6	24	27	5	26	29
317	Hore & Bingham	7	23	27	6	26	29
Moolarben Road							
30[2, 3]	Cox	11	28	32	13	28	31
31[2]	Cox	11	28	31	16	27	30
32	Stokes	5	6	10	4	6	12
35	Johnson & Thompson & Debreczeny	10	26	29	16	26	28
47	Andrews	8	22	25	14	23	25
Ulan							
11(a)	Mullins & Imrie	23	9	22	23	9	23
11(b)	Mullins & Imrie	18	9	18	19	9	19
11(c)	Mullins & Imrie	21	10	21	21	10	21
255	Schmitz	13	27	30	16	28	31
258	Elias	16	29	33	19	30	33
Ulan Village Non-residential							
9	Orica Australia Pty Limited	21	36	39	27	37	40
26	Forty North P/L	22	32	36	16	16	34
46B	North Eastern Wiradjuri Wilpinjong Community Fund Limited	30	40	44	25	35	40
66	Rostherne P/L	27	38	42	16	16	38
149	Mid Western Regional Council	27	39	42	30	39	43
160[5]	Minister for Education and Training (Ulan Public School)	27	38	-	28	38	-
162	Rowmint P/L	28	39	42	16	16	38
168[5]	PJL Constructions Pty Limited (Church)	27	39	-	29	39	-

Note 1: Receiver subject to a private agreement with MCO.
Note 2: Project Approval Noise Limit for this receiver is above the intrusive PSNL (refer **Appendices A1** and **A2**).
Note 3: Landowner that can request additional noise mitigation measures.
Note 4: Highest predicted noise level from the INP meteorological conditions (**Table 9**) for each receiver.
Note 5: In use daytime and evening only.
Note 6: Predicted amenity level complies with the relevant amenity PSNL (**Table 12**).

8.2 Impact Assessment Summary

In summary, the predicted daytime, evening and night-time noise amenity levels show that:

- No exceedance of the Project Approval noise limits are predicted during the daytime, evening and night-time in 2016 or 2018 (**Table 23**) at any school or church.
- No exceedance of the relevant amenity PSNL (**Table 12**) at all privately owned receivers.
- No exceedance of the relevant amenity PSNL (**Table 12**) at all commercial receivers.

Based on the outer envelope night-time $L_{Aeq(15minute)}$ intrusive noise contours for Years 2016 and 2018 are presented in **Appendices F1** and **F2** respectively, the noise levels at Goulburn River National Park and Munghorn Gap Nature Reserve are unlikely to exceed the relevant PNSL (and Project Approval noise limit) of $L_{Aeq(period)}$ 50 dBA.

9 CUMULATIVE NOISE AMENITY ASSESSMENT

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 (ie 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 (**Section 5.1**).

A summary of the major existing, approved and proposed industrial developments in the vicinity of Moolarben Coal Complex are presented in **Table 2**. The predicted noise amenity levels from the Moolarben Coal Complex incorporating the Modification, Ulan Continued Operations Project and Wilpinjong Coal Project (Modification 6) were also conservatively considered. The estimated mine operating evening and night-time $L_{Aeq(period)}$ noise amenity levels from each these developments have been established by reviewing the relevant EAs (where available). These are then used for the purposes of the cumulative evening and night-time noise amenity assessment.

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

In accordance with the INP Chapter 2 Industrial Noise Criteria, the evening cumulative sum of the existing, approved and proposed developments $L_{Aeq(4hour)}$ noise amenity levels have been determined (**Appendix G1**). Similarly, the night-time cumulative sum of the existing, approved and proposed developments $L_{Aeq(9hour)}$ noise amenity levels have been determined (**Appendix G2**). In summary, the predicted daytime, evening and night-time (cumulative) noise amenity levels show that:

- No exceedance of the INP acceptable evening and night-time noise amenity levels (**Table 11**) are predicted at any privately owned receivers due to potential cumulative impacts.
- No exceedance of the INP acceptable evening and night-time noise amenity levels (**Table 11**) are predicted at any school, church or commercial receivers due to potential cumulative impacts.

10 SUMMARY OF FINDINGS

10.1 Noise Assessment Criteria

10.1.1 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 dated 12 June 2013, the PSNLs for the residential, industrial and other localities are presented in **Table 24** for intrusive noise and amenity levels. These criteria are nominated for the purposes of assessing potential noise impacts from the Modification.

Table 24 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
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		
Any	Commercial	Intrusive noise criteria not applicable			External 65 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: External criteria equivalent to internal criteria plus 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.

10.1.2 Sleep Disturbance Assessment Criteria

The INP Application Notes dated 12 June 2013 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 Modification night-time $L_{A1(1minute)}$ SDNLs are presented in **Table 25** together with the comparable approved $L_{A1(1minute)}$ noise limit.

Table 25 Night-time $L_{A1(1minute)}$ Sleep Disturbance Noise Levels (dBA re 20 µPa)

Locality	Project Approval $L_{A1(1minute)}$ Limit[1]	Proposed Modification $L_{A1(1minute)}$ Criteria[1]
Privately Owned Land	45	45

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

10.1.3 INP Assessable Meteorological Conditions

An assessment of the Site Meteorological Measurement Methodology was prepared for the Modification (**Appendix D)** based on the analysis of the wind velocity from the EPA approved AWS located at WS3. An assessment of winter temperature gradients and atmospheric stability has been derived from the on-site Temperature Tower located at Wilpinjong Coal Mine. The INP assessable meteorological noise modelling parameters are presented **Table 9**.

10.1.4 Noise Impact Assessment Methodology

Table 26 presents the methodology for assessing the Modification operating noise levels against the intrusive and amenity PSNLs and the $L_{A1(1minute)}$ SDNLs together with cumulative amenity noise levels (**Table 11**) for assessing operating noise levels from existing, approved and proposed mining developments in the vicinity of the Modification.

Table 26 Modification and Cumulative Mine Noise Impact Assessment (dBA re 20 µPa)

Assessment Source	Assessment Parameter	Assessment Criteria	Noise Management Zone[1]		Noise Affectation Zone
			Marginal	Moderate	
Modification	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[2]
	PSNL Amenity	INP acceptable			
	SDNL $LA1_{(1minute)}$	RBL plus 15 dBA			
Mine Developments	Cumulative Amenity	INP acceptable	1 to 2 dBA above assessment criteria	3 dBA above assessment criteria	> 3 dBA above assessment criteria[3]

Note 1: Depending on the degree of predicted exceedance of the relevant assessment parameter potential noise impacts in the noise management zone could range from marginal to moderate (in terms of the perceived noise increase).

Note 2: Exposure to Project noise levels greater than 5 dBA above the relevant PSNL and or SDNL may be considered unacceptable by some landowners.

Note 3: Exposure to cumulative mine noise levels greater than 3 dBA above the relevant INP acceptable noise level may be considered unacceptable by some landowners.

10.1.5 Noise Control and Management Measures

MCO is obligated to manage noise levels from the Moolarben Coal Complex in accordance with the Project Approval noise limits using reasonable and feasible mitigation measures. The obligation to meet the Project Approval noise limits has been achieved through a combination of the following:

- For the majority of private landowners, the implementation of the noise management strategy as per the NMP including the use of real-time noise monitoring to manage noise levels during the night.
- For a minority of private landowners, property acquisitions and private compensation agreements and which has had the effect of reducing the number of privately owned receivers that could potentially be affected by noise impacts from the Moolarben Coal Complex.

Further detail regarding the Moolarben Coal Complex noise management strategy and MCO's recent compliance with the noise limits specified in MCP Stage 1 Project Approval (05_0117) and MCP Stage 2 Project Approval (08_0135) is provided in **Section 2**. MCO would continue to meet its obligation to comply with the noise limits specified in MCP Stage 1 Project Approval (05_0117) and MCP Stage 2 Project Approval (08_0135) through the continued implementation of the noise management strategy. This would include the continuation of real-time monitoring, and the stand-down of equipment, as required, as part of the response to an exceedance of the Real-Time Response Trigger Levels.

10.2 Modification and Cumulative Mine Operating Noise Impact Assessment

10.2.1 Privately Owned Receivers and Vacant Land

The exceedances at privately owned receivers of the PSNLs, SDNLs, and INP's acceptable noise amenity levels are presented in **Table 27** together with the Project Approval noise limits.

Table 27 Summary of Criteria Exceedances at Privately Owned Receivers[1] and Vacant Land

Exceedance Range	**1 to 2 dBA above PSNL**	**3 to 5 dBA above PSNL**	**> 5 dBA above PSNL**
Intrusive $L_{Aeq(15minute)}$	70 Coventry 75 Ban	63 Whiticker[2]	-
Exceedance Range	**1 to 2 dBA above SDNL**	**3 to 5 dBA above SDNL**	**> 5 dBA above SDNL**
Sleep Disturbance $L_{A1(1minute)}$	-	-	-
Exceedance Range	**1 to 2 dBA above PSNL**	**3 to 5 dBA above PSNL**	**> 5 dBA above PSNL**
Amenity $L_{Aeq(period)}$	-	-	-
Exceedance Range	**1 to 2 dBA above INP Acceptable**	**3 dBA above INP Acceptable**	**> 3 dBA above INP Acceptable**
Cumulative Amenity $L_{Aeq(period)}$	-	-	-

Exceedance Range	**Intrusive $L_{Aeq(15minute)}$**	**Sleep Disturbance $L_{A1(1minute)}$**	**Amenity $L_{Aeq(period)}$ (ie school, hall, church)**	**Land Acquisition $L_{Aeq(15minute)}$**
Project Approval Noise Limits	-	-	-	-

Note 1: Refer **Appendix C3**.
Note 2: Receiver subject to a private agreement with MCO.

In summary, during the daytime, evening and night-time, no privately owned receivers are predicted to exceed the relevant amenity PSNL, intrusive PSNL or maximum SDNL, except for three privately owned receivers (**Table 27**).

Marginal noise exceedances of 1 to 2 dBA above intrusive PSNL 35 dBA are predicted at privately owned receivers 70 Coventry and 75 Ban and a moderate noise exceedance of 3 dBA above intrusive PSNL 35 dBA is predicted at privately owned receiver 63 Whiticker. Receiver 63 is subject to a private agreement with MCO.

No exceedance of the current Project Approval noise limits are predicted at any privately owned receivers or vacant land in 2016 or 2018 based on the continued implementation of the noise management strategy.

10.2.2 Review of the Noise Management Measures

MCO is committed to maintaining an awareness of best practice noise mitigation technologies and alternative operating methodologies. MCO implement noise control and management measures that are found to be feasible, reasonable and effective in the context of a safe and economic mining operation; and where there is a clear community benefit with their application. Available best practice mitigation technologies and alternative operating methodologies are reviewed on an ongoing basis.

The existing EMS and NMP are currently being updated to incorporate the Stage 2 Project Approval (08_0135). The NMP would be updated as necessary to incorporate the Modification.

EXTRACT STAGE 1 PROJECT APPROVAL (05_0117) DATED 6 SEPTEMBER 2007 (AS MODIFIED)

NOISE

Noise Criteria

Acquisition Upon Request

1A. Upon receiving a written request for acquisition from an owner of the land listed in Table 1A, the Applicant shall acquire the land in accordance with the procedures in conditions 10 and 11 of Schedule 4.

Table 1A: Land subject to acquisition upon request

Receiver ID
32

Note: To interpret the land referred to in Table 1, see the applicable figures in Appendix 5.

Transitional Acquisition and Mitigation Arrangements

1B. Any receiver that had made a written request for acquisition or mitigation prior to the determination of Modification 3, on 30 January 2015 shall be granted the acquisition or mitigation options in accordance with the condition that applied at the date of that request.

Note: Receivers 30, 63, 70, 75 and 31 were granted acquisition and mitigation rights with the approval of Modification 9 in June 2014. A new Voluntary Land Acquisition and Mitigation Policy was gazetted on 19 December 2014, consequently the conditions have been updated to reflect the new policy, however transitional arrangements are provided for the owners of any privately owned land, if a written request for acquisition or mitigation had already been made, prior to the determination of Modification 3.

1. The Proponent shall ensure that the noise generated by the Moolarben mine complex does not exceed the noise criteria in Table 1 at any residence on privately-owned land or the other specified locations.

Table 1: Noise criteria dB(A)

Land Number	Day $L_{Aeq(15min)}$	Evening $L_{Aeq(15min)}$	Night $L_{Aeq(15min)}$	Night $L_{A1(1min)}$
30, 63	39	39	39	45
70	37	37	37	45
75	36	36	36	45
31	36	35	35	45
All other privately owned residences	35	35	35	45
Ulan Primary School		35 (internal) when in use		-
Ulan Anglican Church Ulan Catholic Church		35 (internal) when in use		-
Goulburn River National Park Munghorn Gap Nature Reserve		50		-

Note: To interpret the land referred to in Table 1 see the applicable figures in Appendix 5.

Noise generated by the complex is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 6 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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

Land Acquisition Criteria

2. If the noise generated by the Moolarben mine complex exceeds the criteria in Table 2A at any residence on privately-owned land, then upon receiving a written request for acquisition from an owner of the land listed in Table 2A, the Proponent shall acquire the land in accordance with the procedures in conditions 10 and 11 of Schedule 4.

Table 2A: Acquisition criteria dB(A) $L_{Aeq\ (15min)}$

Receiver ID	Day ($L_{Aeq\ (15min)}$)	Evening ($L_{Aeq\ (15min)}$)	Night ($L_{Aeq\ (15min)}$)
63	43	43	42

Receiver ID	Day ($L_{Aeq\ (15min)}$)	Evening ($L_{Aeq\ (15min)}$)	Night ($L_{Aeq\ (15min)}$)
All other privately-owned residences	40	40	40

Note: To interpret the land referred to Table 2A, see the applicable figures in Appendix 5.

3. If the noise generated by the Moolarben mine complex contributes to exceedances of the relevant criteria in Table 2 on more than 25% of any privately-owned land (and a dwelling could be built on that land under existing planning controls), the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 10-11 of Schedule 4.

Table 2: Land acquisition criteria

Day/Evening/Night $L_{Aeq(period)}$	Receiver
55/50/45	All privately-owned land

Note: Noise generated by the complex is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 6 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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

Noise Mitigation Criteria

4. If the noise generated by the Moolarben mine complex exceeds the criteria in Table 3A at any privately owned residence, then upon receiving a written request 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 Secretary for resolution.

Table 3A: Mitigation criteria dB(A) LAeq (15min)

Receiver ID	Day ($L_{Aeq\ (period)}$)	Evening ($L_{Aeq\ (15min)}$)	Night ($L_{Aeq\ (15min)}$)
63	40	40	39
All other privately owned residences	37	37	37

Note: To interpret the land referred to Table 3A, see the applicable figures in Appendix 5.

Mitigation Upon Request

5. Upon receiving a written request from the owner of the residence on the land listed in 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 complex 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 Secretary for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID
30

Note: To interpret the land referred to in Table 3 see the applicable figures in Appendix 5.

EXTRACT STAGE 1 PROJECT APPROVAL (05_0117) DATED 6 SEPTEMBER 2007 (AS MODIFIED)

Operating Conditions

6. 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 on site 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 6);
   (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 with the noise management at Ulan and Wilpinjong 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,
   to the satisfaction of the Secretary.

Noise Management Plan

7. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Secretary. This plan must:
   (a) be prepared in consultation with the EPA and be submitted to the Secretary for approval by 31 March 2015;
   (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;
   (d) include a monitoring program that:
   - uses attended noise monitoring to evaluate compliance of the project against the noise criteria in this approval;
   - 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);
   - evaluates and reports on:
     - the effectiveness of the noise management system; and
     - compliance against the noise operating conditions; and
   - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

BLASTING

Blasting Criteria

8. The Proponent shall ensure that the blasting on the Moolarben mine complex does not cause exceedances of the criteria in Table 4.

Table 4: Blasting criteria

Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance
Residence on privately owned land, churches and schools	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
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 Secretary)	0%

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

EXTRACT STAGE 1 PROJECT APPROVAL (05_0117) DATED 6 SEPTEMBER 2007 (AS MODIFIED)

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 Secretary.

Blasting Frequency

10. The Proponent may carry out a maximum of:
    (a) 2 blasts a day; and
    (b) 9 blasts a week, averaged over a calendar year,
    at the Moolarben mine complex.

    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, blasts 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 Secretary for resolution.

Property Investigations

12. If the owner of any privately-owned land claims that buildings and/or structures on his/her land have been damaged as a result of blasting on the site, then within 2 months of receiving this claim the Proponent shall:
    (a) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties 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 damage to the satisfaction of the Secretary.

    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, then either party may refer the matter to the Secretary for resolution.

Operating Conditions

13. The Proponent shall:
    (a) implement best practice blasting management to:
        - protect the safety of people and livestock in the surrounding area;
        - protect public or private infrastructure/property in the surrounding area from any damage; and
        - minimise the dust and fume emissions of any blasting;
    (b) operate a suitable system to enable the public to get up-to-date information on the proposed blasting Schedule on site; and
    (c) co-ordinate the timing of blasting on site with the timing of blasting at the Ulan and Wilpinjong mines to minimise cumulative blasting impacts,
    to the satisfaction of the Secretary.

EXTRACT STAGE 1 PROJECT APPROVAL (05_0117) DATED 6 SEPTEMBER 2007 (AS MODIFIED)

14. The Proponent shall not undertake blasting on site within 500 metres of:
    (a) any public road;
    (b) the Gulgong to Sandy Hollow Railway Line;
    (c) the Wollar-Wellington 330kV Transmission Line; or
    (d) any land outside the site not owned by the Proponent,

    unless the Proponent has:
    - demonstrated to the satisfaction of the Secretary that the blasting can be carried out closer to the infrastructure or land without compromising the safety of people or livestock or damaging the infrastructure and/or other buildings and structures; and
    - updated the Blast Management Plan to include the specific measures that would be implemented while blasting is being carried out within 500 metres of the infrastructure or land; or
    - a written agreement with the relevant infrastructure owner or landowner to allow blasting to be carried out closer to the infrastructure or land, and the Proponent has advised the Department in writing of the terms of this agreement.

Blast Management Plan

15. The Proponent shall prepare and implement a Blast Management Plan for the project prior to undertaking any blasting on site to the satisfaction of the Secretary. This plan must:
    (a) be prepared in consultation with the EPA and be submitted to the Secretary for approval by 31 March 2015;
    (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 compliance with the blasting criteria and operating conditions of this approval.

METEOROLOGICAL MONITORING

20B. For the life of the project, the Proponent shall ensure that there is a meteorological station in the vicinity of the site that:
    (a) complies with the requirements in the 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, unless a suitable alternative is approved by the Secretary following consultation with the EPA.

EXTRACT STAGE 1 PROJECT APPROVAL (05_0117) DATED 6 SEPTEMBER 2007 (AS MODIFIED)

APPENDIX 6:
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) during periods of rain or hail;
   (b) average wind speed at microphone height exceeds 5 m/s;
   (c) wind speeds greater than 3 m/s measured at 10 m above ground level; or
   (d) temperature inversion conditions greater than 3°C/100 m.

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 approval.

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

5. Unless the Secretary 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.

NOISE

Acquisition Upon Request

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Applicant shall acquire the land in accordance with the procedures in conditions 5 and 6 of Schedule 5.

Table 1: Land subject to acquisition upon request

Receiver ID
32

Note: To interpret the land referred to in Table 1, see the applicable figures in Appendix 5.

Mitigation Upon Request

2. Upon receiving a written request from the owner of any residence on the land listed in Table 2, 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 Secretary for resolution.

Table 2: Residence subject to additional noise mitigation upon request

Receiver ID
30

Note: To interpret the land referred to in Table 2, see the applicable figures in Appendix 5.

Noise Criteria

3. The Proponent shall ensure that the noise generated by the Moolarben mine complex does not exceed the criteria in Table 3 at any residence on privately-owned land or the other specified locations.

Table 3: Noise criteria dB(A)

Receiver ID	Day	Evening	Night	
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{A1(1min)}$
30, 63	39	39	39	45
70	37	37	37	45
75	36	36	36	45
31	36	35	35	45
All other privately-owned residences	35	35	35	45
Ulan Primary School	35 (internal) when in use			-
Ulan Anglican Church Ulan Catholic Church	35 (internal) when in use			-
Goulburn River National Park Munghorn Gap Nature Reserve	50			-

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the Moolarben mine complex is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy*. Appendix 6 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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

Land Acquisition Criteria

4. If the noise generated by the Moolarben mine complex exceeds the criteria in Table 4 at any residence on privately-owned land, then upon receiving a written request for acquisition from an owner of the land listed in Table 4, the Proponent shall acquire the land in accordance with the procedures in conditions 5 and 6 of Schedule 5.

Table 4: Acquisition criteria dB(A) $L_{Aeq\ (15min)}$

Receiver ID	Day ($L_{Aeq\ (15min)}$)	Evening ($L_{Aeq\ (15min)}$)	Night ($L_{Aeq\ (15min)}$)
63	43	43	42
All other privately-owned residences	40	40	40

Note: To interpret the land referred to Table 4, see the applicable figures in Appendix 5.

5. If the noise generated by the Moolarben mine complex contributes to exceedances of the relevant criteria in Table 5 on more than 25% of any privately-owned land (and a dwelling could be built on that land under existing planning controls), the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 5 and 6 of Schedule 5.

Table 5: Land acquisition criteria

Day/Evening/Night $L_{Aeq(period)}$	Receiver
55/50/45	All privately-owned land

Note: Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 6 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

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

Noise Mitigation Criteria

6. If the noise generated by the Moolarben mine complex exceeds the criteria in Table 6 at any privately owned residence, then upon receiving a written request 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 Secretary for resolution.

Table 6: Mitigation criteria dB(A) $L_{Aeq\ (15min)}$

Receiver ID	Day ($L_{Aeq\ (15min)}$)	Evening ($L_{Aeq\ (15min)}$)	Night ($L_{Aeq\ (15min)}$)
63	40	40	39
All other privately owned residences	37	37	37

Note: To interpret the land referred to Table 6, see the applicable figures in Appendix 5.

Operating Conditions

7. The Proponent shall:
   (a) implement best management practice to minimise the operational and road 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 6);
   (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 Moolarben mine complex with the noise management at Ulan and Wilpinjong mines to minimise cumulative noise impacts; and
   (f) carry out regular monitoring to determine whether the Moolarben mine complex is complying with the relevant conditions of this approval,

   to the satisfaction of the Secretary.

Noise Management Plan

8. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Secretary. This plan must:
   (a) be prepared in consultation with the EPA, and submitted to and approved by the Secretary prior to the commencement of any development on site under this approval;
   (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.

BLASTING

Blasting Criteria

9. The Proponent shall ensure that blasting on the Moolarben mine complex does not cause exceedances of the criteria in Table 7.

Table 7: Blasting criteria

Location	***Airblast overpressure (dB(Lin Peak))***	***Ground vibration (mm/s)***	***Allowable exceedance***
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
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 Secretary)*	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.

Blasting Hours

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

Blasting Frequency

11. The Proponent may carry out a maximum of:
    (a) 2 blasts a day; and
    (b) 9 blasts a week, averaged over a calendar year,
    at the Moolarben mine complex.

    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

12. 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 Secretary for resolution.

Property Investigations

13. If the owner of any privately-owned land claims that buildings and/or structures on his/her land have been damaged as a result of blasting on the site, then within 2 months of receiving this claim the Proponent shall:
    (a) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties 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 damage to the satisfaction of the Secretary.

    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, then either party may refer the matter to the Secretary for resolution.

Operating Conditions

14. The Proponent shall:
    (a) implement best management practice to:
        - protect the safety of people and livestock in the surrounding area;
        - protect public or private infrastructure/property in the surrounding area from any damage; and
        - minimise the dust and fume emissions of any blasting;
    (b) ensure that blasting on the site does not damage Aboriginal rock shelter sites S2MC229 (AHIMS No. 36-3-1376), S2MC232 (AHIMS No. 36-3-1379) or S2MC233 (AHIMS No. 36-3-1380);

(c) operate a suitable system to enable the public to get up-to-date information on the proposed blasting Schedule on site; and
(d) co-ordinate the timing of blasting on site with the timing of blasting at the Ulan and Wilpinjong mines to minimise cumulative blasting impacts,

to the satisfaction of the Secretary.

Note: To identify the Aboriginal rock shelter sites, see the applicable figure in Appendix 8.

15. The Proponent shall not undertake blasting on site within 500 metres of:
(a) any public road;
(b) the Gulgong to Sandy Hollow Railway Line;
(c) the Wollar-Wellington 330kV Transmission Line; or
(d) any land outside the site not owned by the Proponent,

unless the Proponent has:

- demonstrated to the satisfaction of the Secretary that the blasting can be carried out closer to the infrastructure or land without compromising the safety of people or livestock or damaging the infrastructure and/or other buildings and structures; and
- updated the Blast Management Plan to include the specific measures that would be implemented while blasting is being carried out within 500 metres of the infrastructure or land; or
- a written agreement with the relevant infrastructure owner or landowner to allow blasting to be carried out closer to the infrastructure or land, and the Proponent has advised the Department in writing of the terms of this agreement.

Blast Management Plan

16. The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Secretary. This plan must:
(a) be prepared in consultation with the EPA, and submitted to and approved by the Secretary prior to conducting any blasting on site;
(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.

METEOROLOGICAL MONITORING

24. For the life of the project, the Proponent shall ensure that there is a meteorological station in the vicinity of the site that:
(a) complies with the requirements in the *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*, unless a suitable alternative is approved by the Secretary following consultation with the EPA.

APPENDIX 6
NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

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

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.

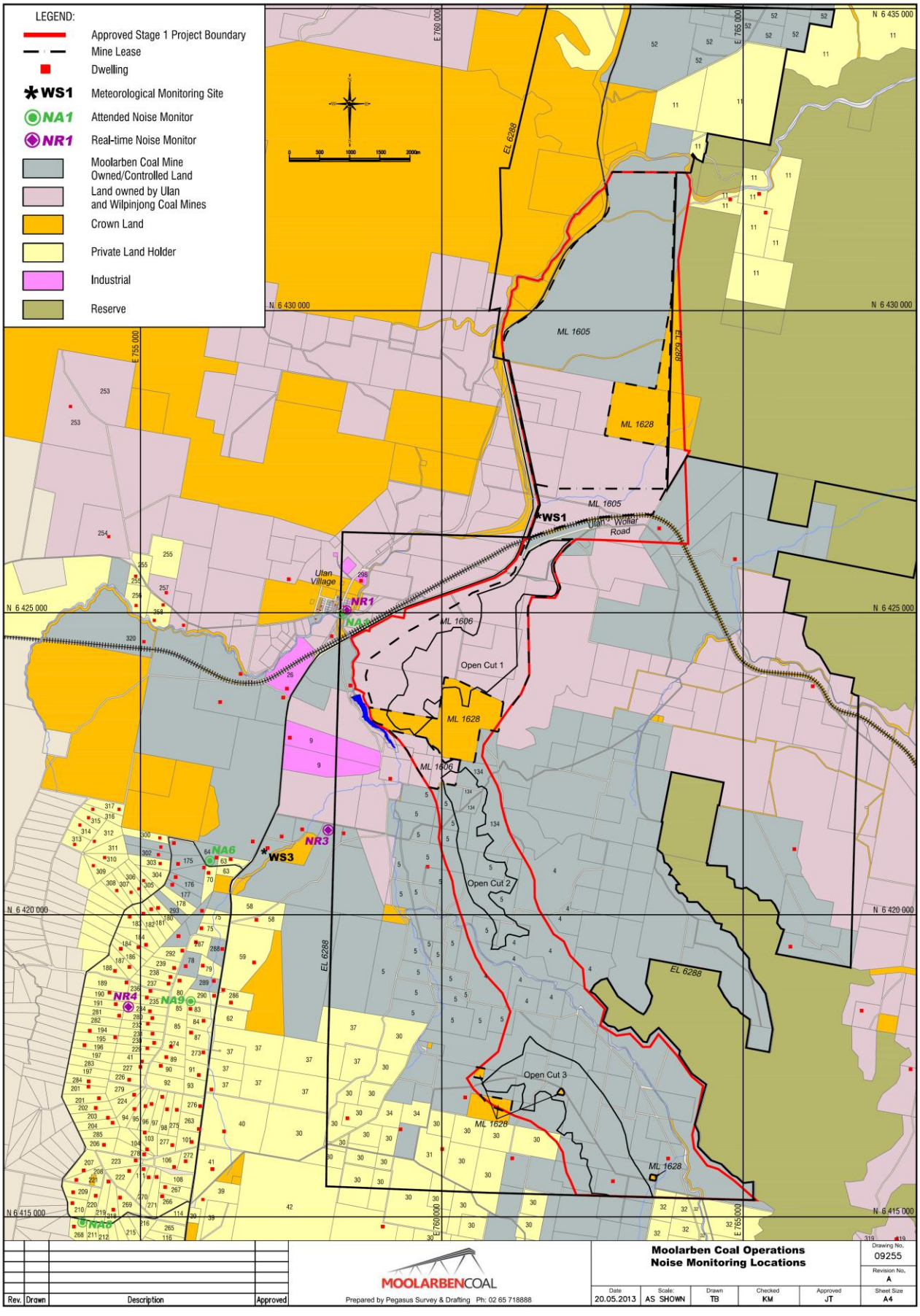
Compliance Monitoring

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

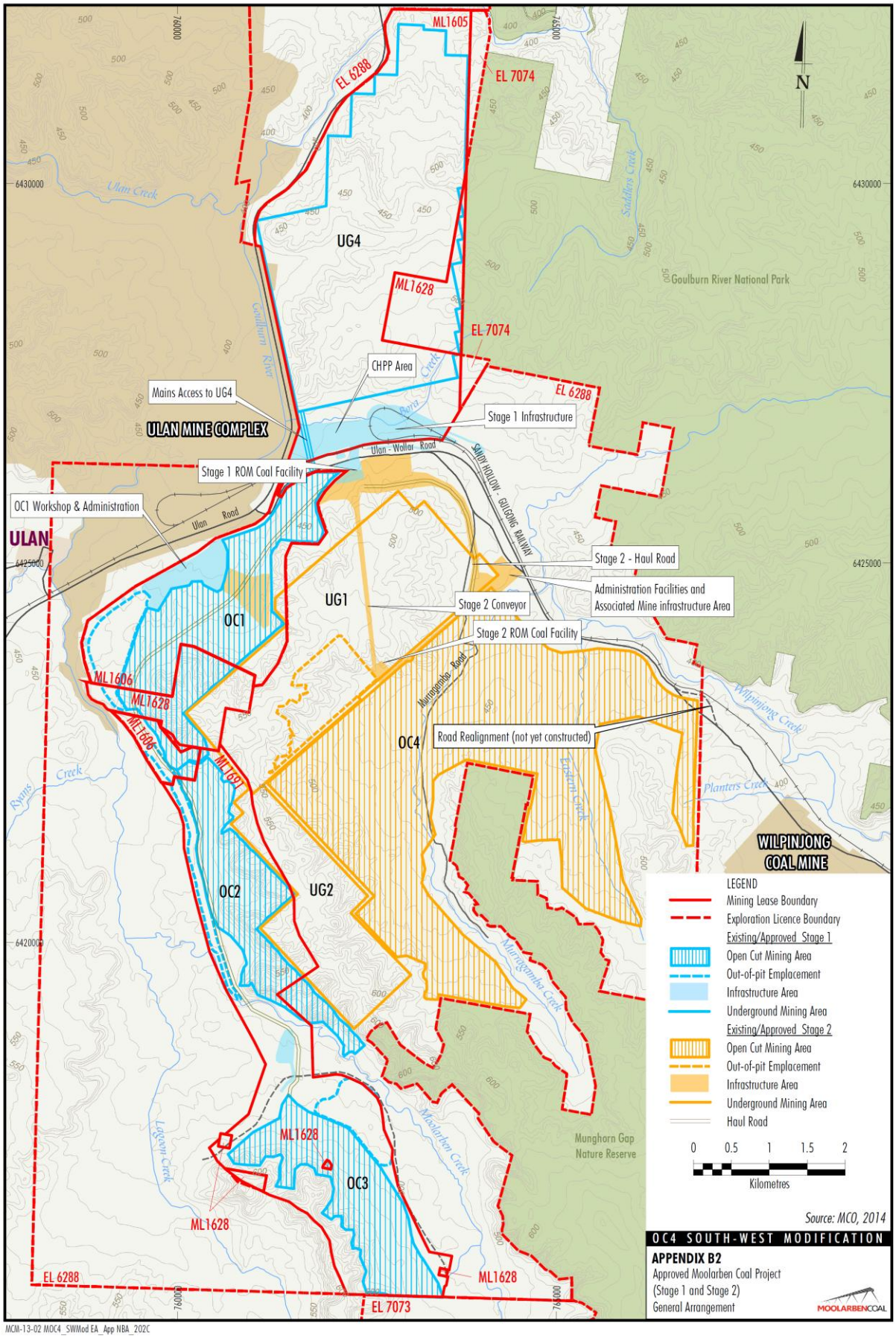
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.

5. Unless the Secretary 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:
   (d) monitoring locations for the collection of representative noise data;
   (e) meteorological conditions during which collection of noise data is not appropriate;
   (f) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
   (g) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

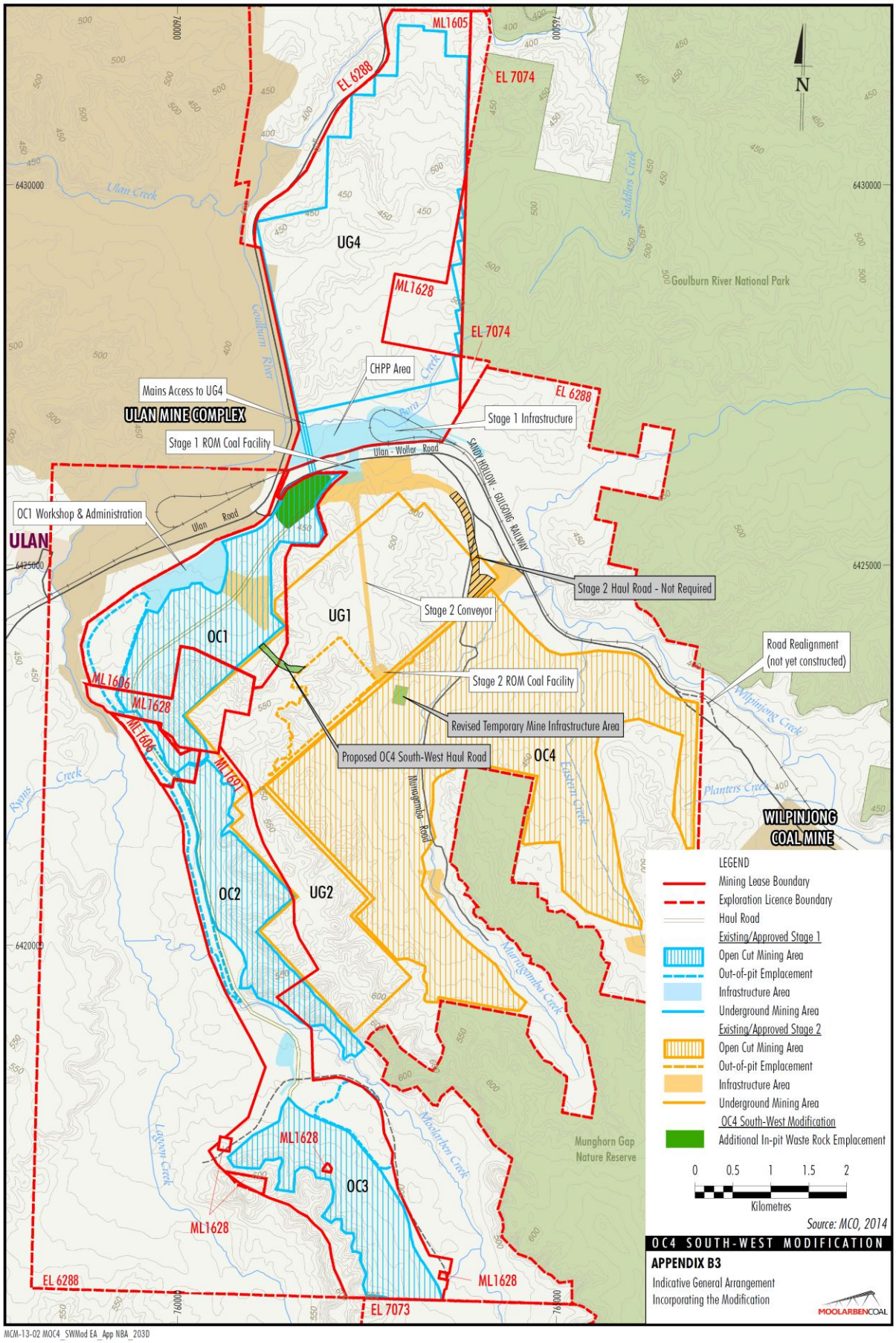
NOISE MONITORING LOCATION PLAN



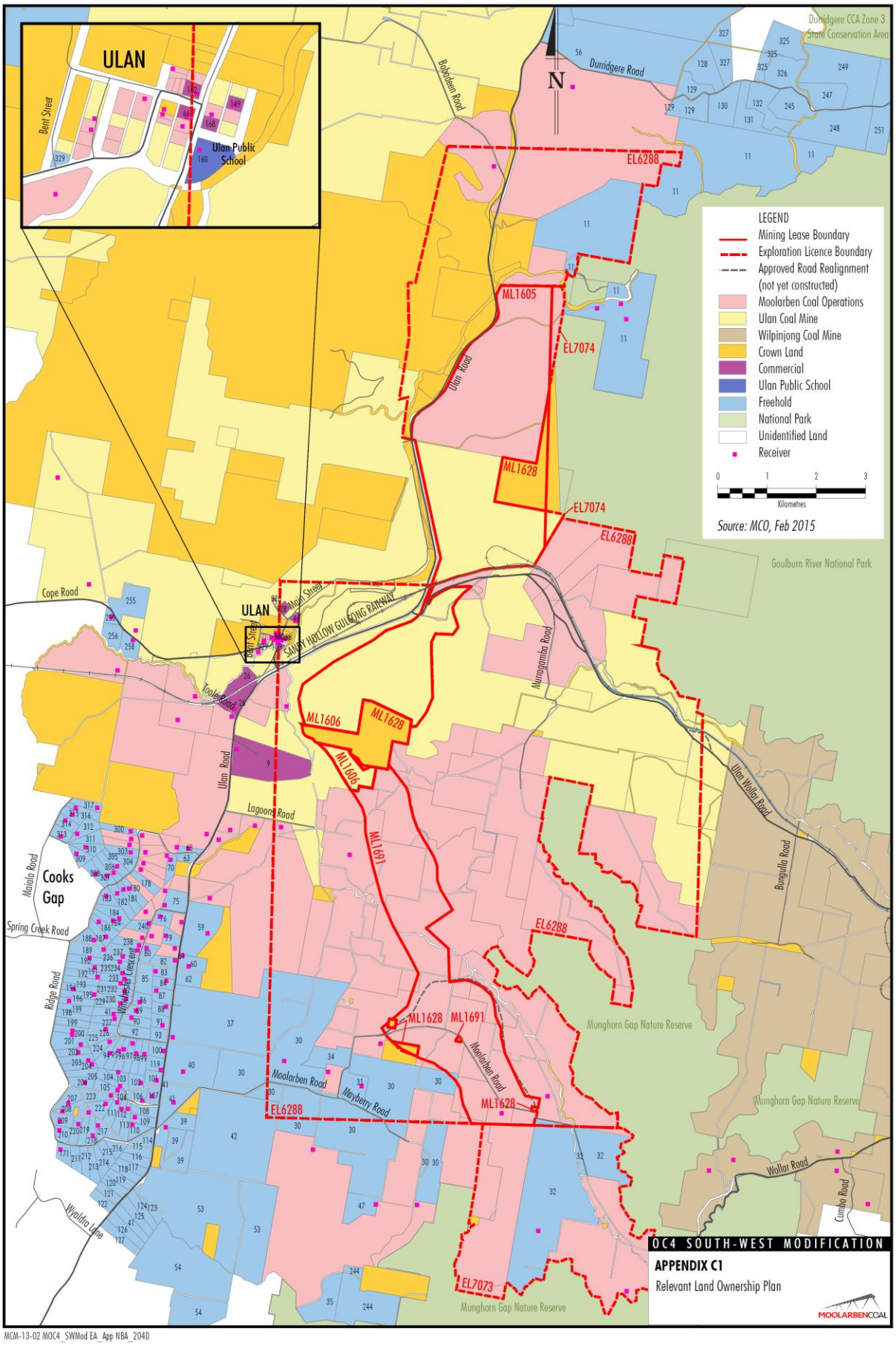
GENERAL ARRANGEMENT PLAN STAGE 1 AND STAGE 2



PROPOSED GENERAL ARRANGEMENT PLAN INCORPORATING THE MODIFICATION



LAND OWERNSHIP PLAN



RELEVANT LAND OWNERSHIP LIST

Ref No	Landholder
9	Orica Australia Pty Limited
11	JE Mullins & CD Imrie
26	Forty North Pty Limited
30	RB Cox
31	MB Cox
32	DJ & JG Stokes
34	J Asztalos
35	PR Johnson & MS & GJ Thompson & PH & FH Debreczeny
37	J Szymkarczuk
39	RM & DJ Sprigg
40	JM Devenish
41	PP Libertis
42	C & L Schmidt
46	North Eastern Wiradjuri Wilpinjong Community Fund Limited
47	SF & MR Andrews
53	WD & MS Bryant
54	MA & C Harris
56	MJ & V Cundy
59	G & GM Szymkarczuk
60	CL Rayner & DM Mundey
61	MA Miller
62	R Menchin
63	BF & B Whiticker
66	Rostherne Pty Limited
70	DJ & A Coventry
75	P Ban
76	SR & PC Carbone
79	PTJ & SE Nagle
80	W & D Sebelic
82	SC Hungerford & MC Clemens
83	CF & CR Wall
84	DS Sebelic
85	J & Z Nikolovski
86	NW Harris
87	BJ & K Howe
88	BC Meyers
89	MV & HM Glover & E & BJ Tomlinson
90	SA Powell
91	HM Graham
92	VA Pullicino & J & S & G Bonnici
93	F & M Fenech
94	LK Mittemayer
95	BJ Withington
96	D Lazicic
97	DJ & MD Smith
98	ME & JJ Piper
99	DE Jenner & WB Jensen
100	A Kapista
101	RD & DMZ Hull
102	KA Roberts
103	SB Burnett & SL Grant
104	RA & LA Deeben
105	DJ & N Katsikaris
106	TB & JH Reid
107	ZJ & M & AA Raso
108	R Varga
109	DA Evans
110	JT Thompson & HT Evans
111	GJ & NJ McEwan
112	MJ & LM Croft
113	CPG Ratcliff
114	TF & K Holland
115	AK & BH Quinn
116	DJ & SM Reid
117	JM Dick
118	A Scott
119	PJ Kearns
120	PS & DR Ord
121	EJ Cullen
122	WF Wirth
123	ND Sullivan
124	WJ & HE Bailey
125	DB McBride
126	MP Julian
127	BKT & SA Bracken
128	AW Sims
129	M Yelds
130	GP McEwen
131	GR & RA King
132	N Atkins
149	Mid-Western Regional Council
151	Al Cunningham (Land entrusted to Catholic Church)
160	Minister For Education And Training
162	DM Harrison
168	PJL Constructions Pty Limited
171	AD & SA McGregor
178	PR Stone
180	CD & LL Barrett
181	SM Forster
182	J Dutoitcook
183	R & EA Steines
184	LA Stevenson
186	RW & IJ Adamson
187	BT & KM Feeney
188	KR & T Fielding
189	M, M, D & A Goggin & J, A, P & R Hyde
190	T & LK Sahyoun
191	BW & TS Lasham
192	D Williams
193	DJ Moloney
194	PM & K Potts
195	R Cottam
196	F Saxberg & M Weir
198	GR & ME Metcalfe
199	PGG & I Nielsen
200	VK Grimshaw
201	KR & GM Towerton
202	H & VF Butler
203	DJ Miller
204	RB & JE Donnan
205	DW Sparrow & M Tallan
206	CA Marshall & R Vella
207	AA & DM Smith
208	SA & CR Hasaart
209	F Mawson
210	JM & AM Tebutt
211	SA McGregor & WJ Gray
212	E & M Lepik
213	D & J Parsonage
214	RK & EG O'Neil
215	SG & PM Green
216	G Holland & FA Handicott
217	RP & JL Patterson
218	GF & GEL Soady
219	T & S Riger
220	SJ Rusten & NJ Smith
222	BJ Purtell
223	EW Palmer & JM Stewart
224	RS & PCC Dupond
225	G & RF Doualetas
226	LAA & FC Muscat
227	WP & JA Hughes
229	JJ & BA Lowe
230	DA Hoole & DT Rawlinson
231	T Morrison & SM Benny
232	L & JA Haaring
233	K & D Boal
234	D & L Gaw
235	LM & RS Wilson
236	RG & CA Donovan
237	A Puskaric
238	B Powell
240	GJ & DM Hartley
244	JT & YR Jones
245	MP & KLE Cresham
247	J & K Batshon
248	G Boustani
249	CJ & JI Eldridge
251	NF Potter & CE Selley
255	HJ & H Schmitz
256	RC Campbell
258	PM & CD Elias
300	CM Collins & CY Marshall
303	HJ Ungaro
304	G Balajan
305	L Barisic & M Aul
306	E Armstrong
307	M Chant & NK Young
308	NA Dower
309	GS Maher
310	KI Death
311	BJ & LC Williamson
312	MS & JJ Ioannou
313	NJ & BDE Pracy
314	SL Ford
315	WJ Richards & BJ Uzelac
316	CR Vassel & CM Williams
317	RJ Hore & V Bingham
325	S & T Fevale
326	AW & LM Murray
327	CA Tanner
328	Essential Energy
329	Tuck-Lee

Source: MCO, Feb 2015

OC4 SOUTH-WEST MODIFICATION

APPENDIX C2
Relevant Landholder List

MOOLARBENCOAL

MCM-13-02 MOC4_SWMod EA_App NBA_001C

LAND OWNERSHIP DETAILS

ID	Owner	Type	Easting (MGA)	Northing (MGA)	Elevation
Cooks Gap					
37	J Szymkarczuk	Private	756179	6417107	547
39	RM & DJ Sprigg	Private	756038	6415288	585
40	JM Devenish	Private	756389	6416414	554
41(a)	PP Libertis (Perpetual Lease)	Private	756194	6415791	574
41(b)	PP Libertis (Perpetual Lease)	Private	754978	6417572	586
59	G & GM Szymkarczuk	Private	756886	6419210	538
60	CL Rayner and DM Mundey	Private	756500	6418546	527
61	MA Miller	Private	756375	6418755	524
63[1, 2]	BF & B Whiticker	Private	756497	6420923	494
70[2]	DJ & A Coventry	Private	756132	6420692	510
75[2]	P Ban	Private	756012	6419777	513
76	SR & PC Carbone	Private	755920	6419546	517
79	PTJ & SE Nagle	Private	756034	6419159	519
80	W & D Sebelic	Private	755649	6418908	531
82	SC Hungerford & MC Clemens	Private	756223	6418659	524
83	CF & CR Wall	Private	755832	6418444	533
84	DS Sebelic	Private	756047	6418248	531
86	NW Harris	Private	755506	6417818	558
87	BJ & K Howe	Private	755841	6418051	539
88	BC Meyers	Private	756043	6417724	539
89	MV & HM Glover & E & BJ Tomlinson	Private	755431	6417645	559
90	SA Powell	Private	755337	6417501	565
91	HM Graham	Private	755969	6417348	544
94	LK Mittemayer	Private	754900	6416785	609
95	BJ Withington	Private	755085	6416834	600
96	D Lazicic	Private	755183	6416867	590
97	DJ & MD Smith	Private	755364	6416985	573
98	ME & JJ Piper	Private	755440	6416783	575
99	DE Jenner & WB Jensen	Private	755603	6416770	568
100	A Kapista	Private	755992	6416832	556
101	RD & DMZ Hull	Private	755850	6416237	571
102	KA Roberts	Private	755530	6416189	579
103	SB Burnett & SL Grant	Private	755072	6416399	595
104	RA & LA Deeben	Private	755112	6416116	592
105	DJ & N Katsikaris	Private	755061	6416033	597
106	TB & JH Reid	Private	755558	6415823	601
107	ZJ & M & AA Raso	Private	755752	6415919	587
109	DA Evans	Private	755410	6415494	620
110	JT Thompson & HT Evans	Private	755361	6415339	619
111	GJ & NJ McEwan	Private	755052	6415789	604
112	MJ & LM Croft	Private	755138	6415655	605
113	CPG Ratcliff	Private	755269	6415661	606
119	PJ Kearns	Private	755937	6416447	564

LAND OWNERSHIP DETAILS

ID	Owner	Type	Easting (MGA)	Northing (MGA)	Elevation
171	AD & SA McGregor	Private	753898	6414840	665
180	CD & LL Barrett	Private	755292	6420111	565
181	SM Forster	Private	755178	6420092	568
182	J Dutoitcook	Private	755049	6420016	580
183	R & EA Steines	Private	754822	6419969	589
184(a)	LA Stevenson	Private	755093	6419504	564
184(b)	LA Stevenson	Private	754967	6419464	581
186	RW & IJ Adamson	Private	754674	6419437	589
187	BT & KM Feeney	Private	754816	6419137	594
188	KR & T Fielding	Private	754577	6419073	584
189	M Goggin & JA Hyde	Private	754772	6418881	593
190	T & LK Sahyoun	Private	754488	6418711	579
191	BW & TS Lasham	Private	754592	6418520	588
192	D Williams	Private	754649	6418328	589
194	PM & K Potts	Private	754160	6418080	578
195	R Cottam	Private	754583	6417973	591
196	F Saxberg & M Weir	Private	754072	6417840	583
200	VK Grimshaw	Private	754141	6417241	604
201 (a)	KR & GM Towerton	Private	754138	6417158	605
201 (b)	KR & GM Towerton	Private	754311	6416962	609
202	H & VF Butler	Private	754258	6416804	609
203	DJ Miller	Private	754462	6416639	627
204	RB & JE Donnan	Private	754537	6416557	635
206	CA Marshall & R Vella	Private	754394	6416192	628
207	AA & DM Smith	Private	754057	6415768	635
208	SA & CR Hasaart	Private	753938	6415612	648
209	F Mawson	Private	753883	6415407	650
210	JM & AM Tebutt	Private	753873	6415226	660
217	RP & JL Patterson	Private	754659	6415319	661
218	GF & GEL Soady	Private	754550	6415117	666
219	T & S Riger	Private	754468	6415587	647
220	SJ Rusten & NJ Smith	Private	754258	6415351	645
222	BJ Purtell	Private	754813	6415761	628
223	EW Palmer & JM Stewart	Private	754921	6415935	612
224	RS & PCC Dupond	Private	754895	6417021	602
226	LAA & FC Muscat	Private	754812	6417270	592
227	WP & JA Hughes	Private	755000	6417482	585
229	JJ & BA Lowe	Private	755115	6417791	579
230	DA Hoole & DT Rawlinson	Private	755229	6417879	573
231	T Morrison & SM Benny	Private	755200	6418034	563
232	L & JA Haaring	Private	755121	6418197	564
233	D & K Boal	Private	755196	6418290	554
234	D & L Gaw	Private	755157	6418405	557
235	LM & RS Wilson	Private	755107	6418631	559

LAND OWNERSHIP DETAILS

ID	Owner	Type	Easting (MGA)	Northing (MGA)	Elevation
236	RG & CA Donovan	Private	755165	6418738	557
237	A Puskaric	Private	755468	6418862	540
238	B Powell	Private	755497	6418969	537
240	GJ & DM Hartley	Private	755694	6419408	527
300	CM Collins & CY Marshall	Private	755327	6421268	542
303	HJ Ungaro	Private	755327	6420850	553
305	L Barisic & M Aul	Private	755052	6420566	559
306	E Armstrong	Private	754978	6420431	564
307	M Chant & NK Young	Private	754843	6420373	563
308	NA Dower	Private	754605	6420402	554
309	GS Maher	Private	754219	6420817	534
310	KI Death	Private	754407	6420948	534
312	MS & JJ Ioannou	Private	754239	6421215	523
313	NJ & BDE Pracy	Private	753906	6421166	518
314	SL Ford	Private	753997	6421486	512
315	WJ Richards & BJ Uzelac	Private	754141	6421605	511
316	CR Vassel & CM Williams	Private	754210	6421744	510
317	RJ Hore & V Bingham	Private	754646	6421744	519
Moolarben Road					
30[2, 3]	RB Cox	Private	758435	6416631	496
31[2]	MB Cox	Private	760008	6416123	501
32	DJ & JG Stokes	Private	763590	6413194	544
35	PR Johnson & MS & GJ Thompson & PH & FH Debreczeny	Private	759021	6414840	541
47	SF & MR Andrews	Private	760293	6413734	561
Ulan					
11 (a)	JE Mullins & CD Imrie	Commercial	765376	6431622	388
11 (b)	JE Mullins & CD Imrie	Private	765265	6431931	380
11 (c)	JE Mullins & CD Imrie	Commercial	764784	6431839	393
255	HJ & H Schmitz	Private	754922	6425602	458
258	PM & CD Elias	Private	755375	6425132	453
Ulan Village Non-residential					
160	Minister for Education and Training (Ulan Public School)	School	758350	6425029	418
168	PJL Constructions Pty Limited (Church)	Church	758386	6425136	419
9	Orica Australia Pty Limited	Commercial	757478	6422930	451
26	Forty North Pty Limited	Commercial	757430	6423741	435
46B	North Eastern Wiradjuri Wilpinjong Community Fund Limited	Commercial	758663	6425526	416
66	Rostherne Pty Limited	Commercial	758310	6425130	420
149	Mid Western Regional Council	Commercial	758457	6425165	417
162	Rowmint Pty Ltd	Commercial	758342	6425199	419

Note 1: Receiver subject to a private agreement with MCO.
Note 2: Project Approval Noise Limit for this receiver is above the intrusive PSNL (refer Appendices A1 and A2).
Note 3: Landowner that can request additional noise mitigation measures.

On-site Automatic Weather Station (AWS) - August 2011 to July 2014

Table D1 Seasonal Frequency of Occurrence Wind Speed Intervals - 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	10.0%	ENE	13.1%	10.4%	23.4%
Summer	4.1%	ENE	12.7%	15.0%	27.7%
Autumn	12.9%	ENE	17.0%	11.8%	28.8%
Winter	16.4%	WSW	17.5%	13.3%	30.8%
		W	16.3%	13.8%	30.0%
Spring	6.1%	WSW	9.9%	12.4%	22.4%

Table D2 Seasonal Frequency of Occurrence Wind Speed Intervals - 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	19.1%	SW	28.7%	4.4%	33.0%
		WSW	26.1%	4.7%	30.8%
Summer	9.5%	ENE	14.8%	15.8%	30.6%
Autumn	24.7%	SSW	29.8%	1.8%	31.6%
		SW	32.1%	2.6%	34.7%
		WSW	27.6%	2.8%	30.3%
Winter	28.0%	SSW	29.6%	2.8%	32.3%
		SW	35.5%	5.0%	40.5%
		WSW	34.3%	6.1%	40.4%
		W	24.4%	6.1%	30.5%
Spring	13.1%	SSW	32.0%	5.3%	37.3%
		SW	37.1%	7.3%	44.4%
		WSW	34.5%	7.5%	42.1%

Table D3 Seasonal Frequency of Occurrence Wind Speed Intervals - 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	36.1%	SW	25.5%	1.9%	27.4%
Summer	25.7%	ENE	21.2%	15.9%	37.1%
		E	20.3%	16.0%	36.3%
Autumn	43.8%	SW	25.2%	1.3%	26.5%
Winter	44.7%	SW	29.4%	3.3%	32.7%
		WSW	28.4%	4.7%	33.1%
Spring	28.6%	SSW	34.6%	1.6%	36.1%
		SW	35.4%	2.1%	37.5%
		WSW	28.4%	2.3%	30.6%

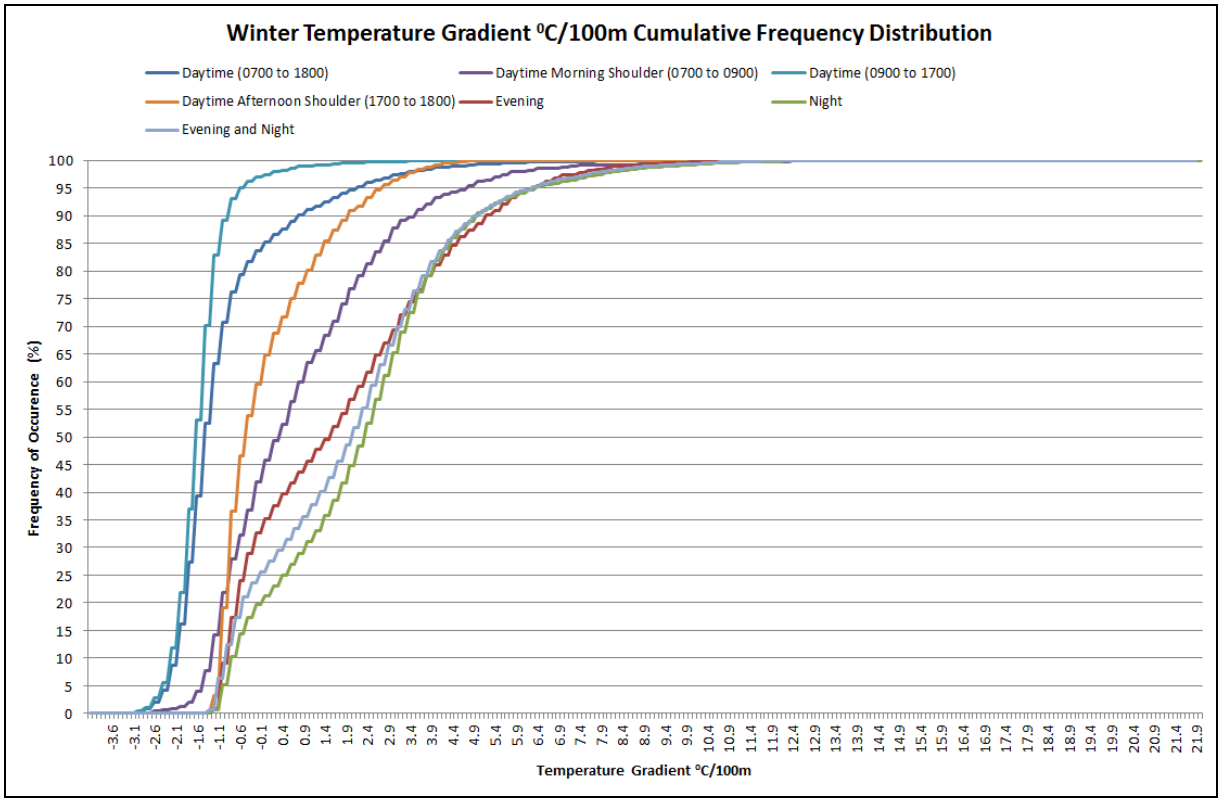
Table D4 Winter Temperature Gradient Exceedance Level (Degrees C per 100 m) Summary

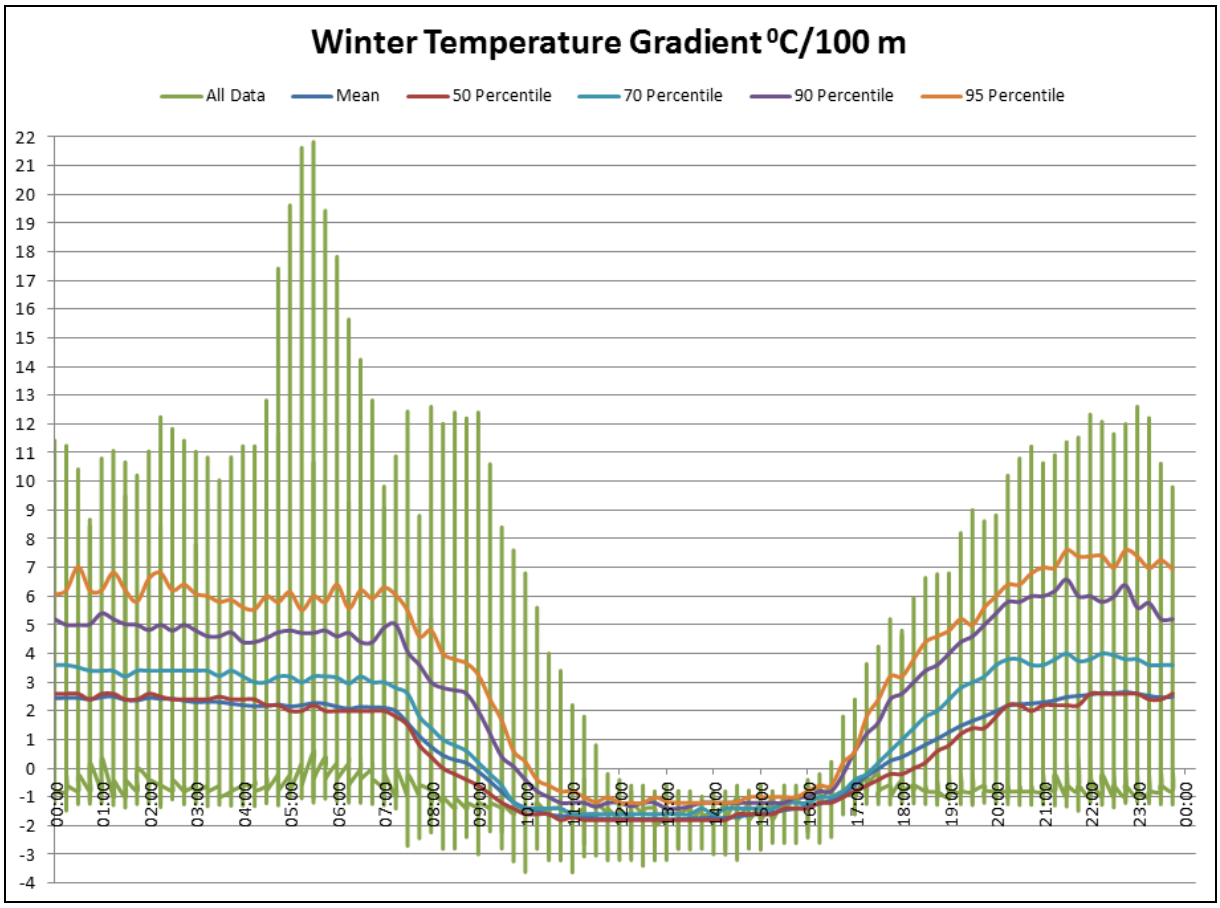
Daytime Exceedance			Evening Exceedance			Night-time Exceedance			Evening/Night-time Exceedance		
0700 to 1800 hours			1800 to 2200 hours			2200 to 0700 hours			1800 to 0700 hours		
50%	30%	10%	50%	30%	10%	50%	30%	10%	50%	30%	10%
-1.4	-1.0	0.8	1.6	3.2	5.2	2.4	3.4	5.0	2.2	3.4	5.2

Table D5 Morning Shoulder, Daytime and 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

On-site Automatic Temperature Tower (ATT) - August 2011 to July 2014





PHOTOS OF EXISTING REASONABLE AND FEASIBLE NOISE CONTROLS

Plate 1 Haul truck fitted with Duratray

Plate 2 Excavator shielded by pit wall

Plate 3 Overburden dump area shielded by side of waste emplacement

Plate 4 Typical berms/bunding along haul roads

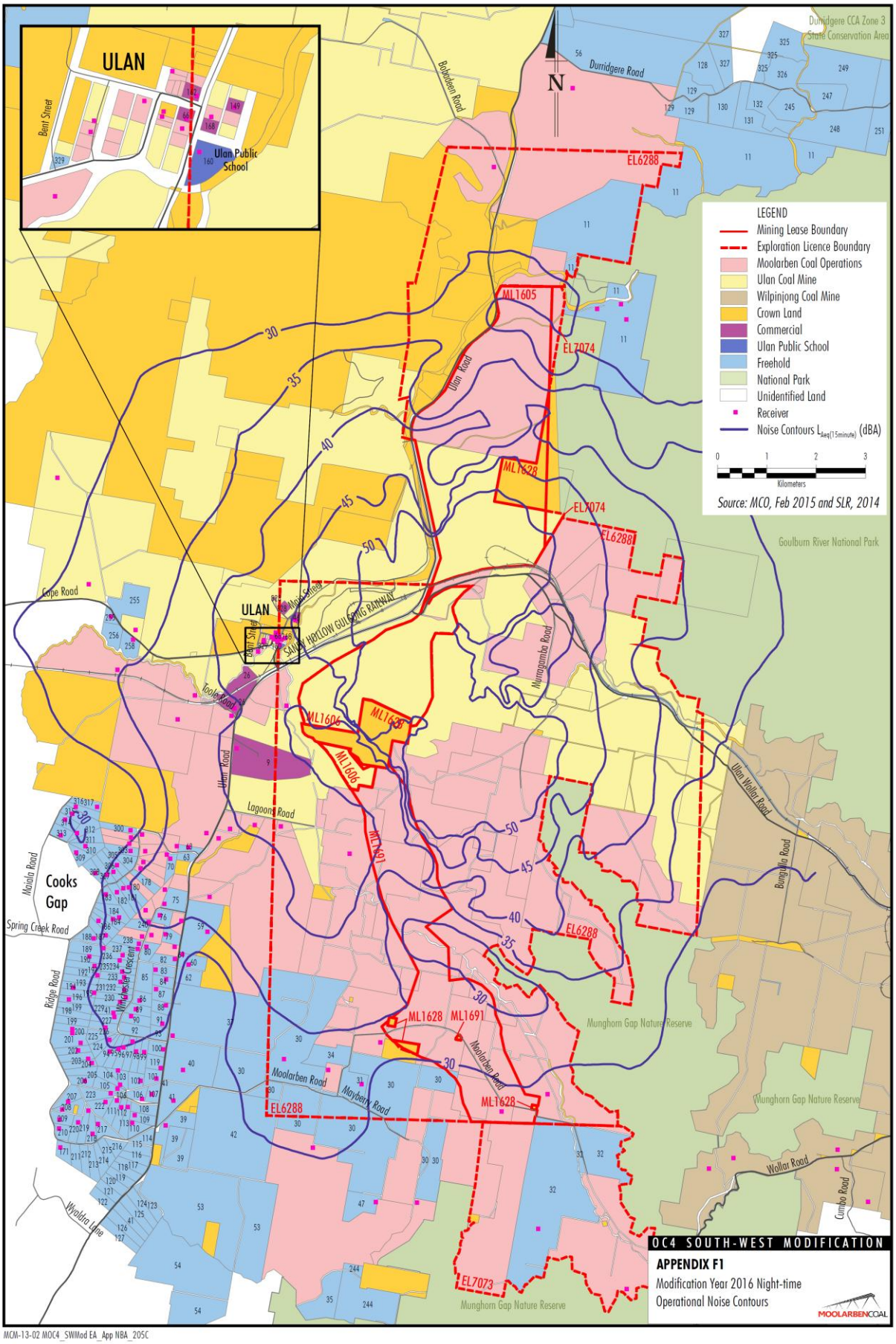
Source: MCO, 2014

OC4 SOUTH-WEST MODIFICATION
APPENDIX E
Existing Noise Management Measures

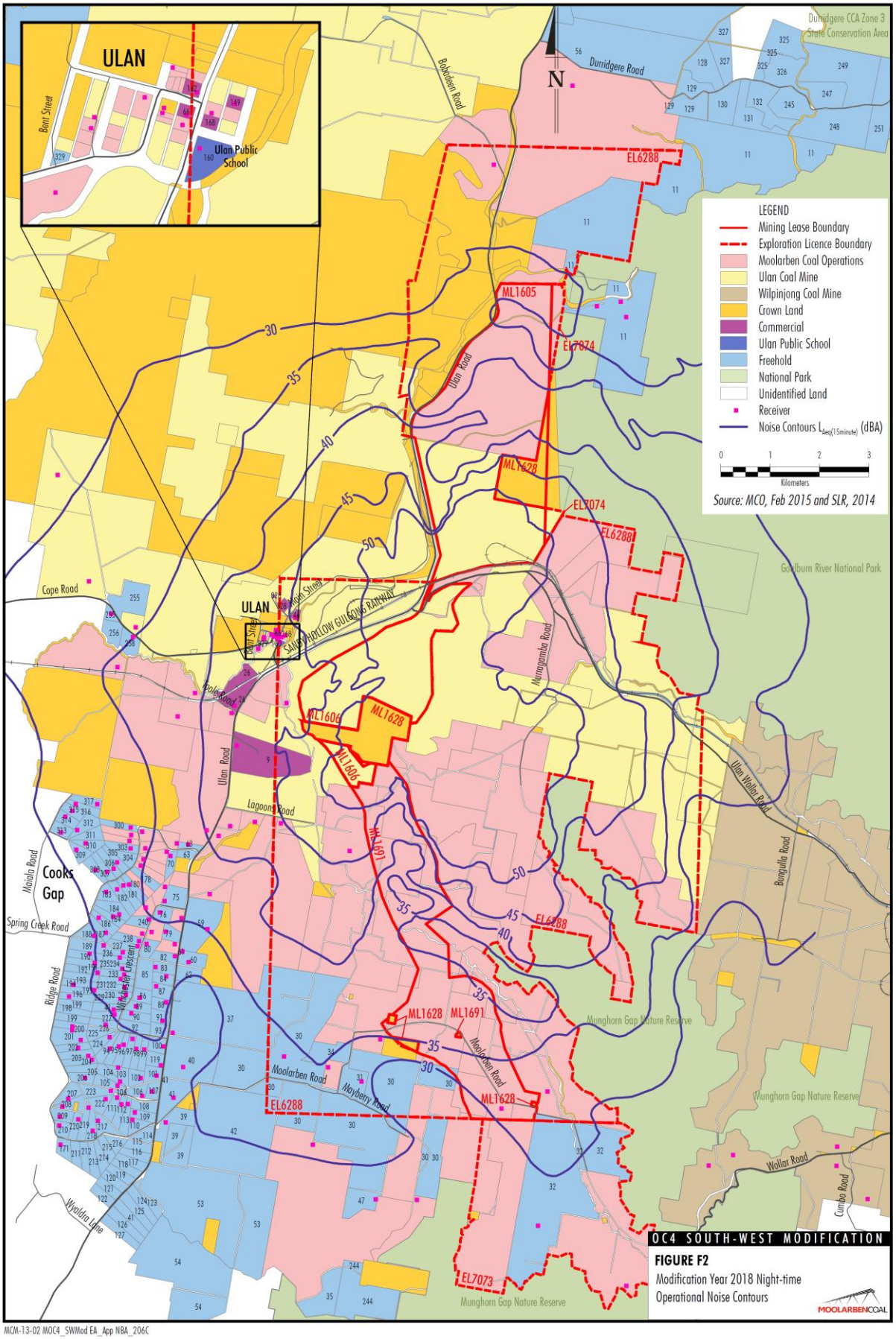
MOOLARBENCOAL

MCM-13-02 MOC4_SWMod EA_App NBA_002

YEAR 2016 NIGHT-TIME OPERATING INTRUSIVE LAEQ(15MINUTE) NOISE CONTOUR



YEAR 2018 NIGHT-TIME OPERATING INTRUSIVE LAEQ(15MINUTE) NOISE CONTOUR



MCM-13-02 MOC4_SWMod EA_App NBA_206C

In accordance with the INP Chapter 2 Industrial Noise Criteria (Section 2.2.4), the evening cumulative sum of the existing, approved and proposed developments $L_{Aeq(4hour)}$ noise amenity levels have been determined as presented below.

Table G1 - Evening Cumulative (LAeq(4hour)) Noise Amenity Levels (dBA re 20 µPa)

ID No and Landholder		Moolarben Coal Complex Modification[4]	Ulan Coal Continued Operations	Wilpinjong Coal Project Modification[4]	Cumulative Amenity Level	NSW INP Acceptable Amenity
Cooks Gap						
37	Szymkarczuk	24	25	24	29	45
39	Sprigg	24	24	23	28	45
40	Devenish	23	25	24	29	45
41(a)	Libertis	24	24	23	29	45
41(b)	Libertis	26	25	23	30	45
59	Szymkarczuk	30	28	24	33	45
60	Rayner & Mundey	25	27	24	30	45
61	Miller	27	27	24	31	45
63[1, 2]	Whiticker	33	30	24	35	45
70[2]	Coventry	32	29	23	34	45
75[2]	Ban	31	28	23	33	45
76	Carbone	30	28	23	33	45
79	Nagle	30	27	23	32	45
80	Sebelic	29	27	23	32	45
82	Hungerford & Clemens	27	27	24	31	45
83	Wall	27	26	23	31	45
84	Sebelic	26	26	24	30	45
86	Harris	26	26	23	30	45
87	Howe	26	26	23	30	45
88	Meyers	26	26	24	30	45
89	Glover & Tomlinson	26	26	23	30	45
90	Powell	26	25	23	30	45
91	Graham	25	25	23	29	45
94	Mittemayer	25	25	23	29	45
95	Withington	25	25	23	29	45
96	Lazicic	25	25	23	29	45
97	Smith	25	25	23	29	45
98	Piper	24	25	23	29	45
99	Jenner & Jensen	24	25	23	29	45
100	Kapista	24	25	23	29	45
101	Hull	23	24	23	28	45
102	Roberts	23	24	23	28	45
103	Burnett & Grant	24	24	23	28	45
104	Deeben	23	24	23	28	45
105	Katsikaris	23	24	23	28	45
106	Reid	23	24	23	28	45
107	Raso	23	24	23	28	45

ID No and Landholder		Moolarben Coal Complex Modification[4]	Ulan Coal Continued Operations	Wilpinjong Coal Project Modification[4]	Cumulative Amenity Level	NSW INP Acceptable Amenity
109	Evans	23	24	23	28	45
110	Thompson & Evans	23	24	23	28	45
111	McEwan	23	24	23	28	45
112	Croft	23	24	23	28	45
113	Ratcliff	23	24	23	28	45
119	Kearns	23	25	23	29	45
171	McGregor	18	23	22	26	45
180	Barrett	30	28	23	33	45
181	Forster	28	28	23	31	45
182	Dutoitcook	29	28	23	32	45
183	Steines	29	27	22	32	45
184(a)	Stevenson	29	27	23	32	45
184(b)	Stevenson	29	27	23	32	45
186	Adamson	26	27	22	30	45
187	Feeney	28	27	23	31	45
188	Fielding	24	26	22	29	45
189	Goggin & Hyde	28	26	23	31	45
190	Sahyoun	23	26	22	29	45
191	Lasham	25	26	22	29	45
192	Williams	27	26	22	30	45
194	Potts	23	25	22	29	45
195	Cottam	26	25	22	30	45
196	Saxberg & Weir	23	25	22	28	45
200	Grimshaw	22	25	22	28	45
201(a)	Towerton	21	25	22	28	45
201(b)	Towerton	23	25	22	28	45
202	Butler	22	24	22	28	45
203	Miller	24	24	22	28	45
204	Donnan	24	24	22	28	45
206	Marshall & Vella	22	24	22	27	45
207	Smith	23	24	22	28	45
208	Hasaart	23	23	22	28	45
209	Mawson	23	23	22	27	45
210	Tebutt	22	23	22	27	45
217	Patterson	23	23	22	28	45
218	Soady	23	23	22	28	45
219	Riger	23	24	22	28	45
220	Rusten & Smith	20	23	22	27	45
222	Purtell	23	24	22	28	45
223	Palmer & Stewart	23	24	22	28	45
224	Dupond	25	25	23	29	45
226	Muscat	25	25	23	29	45

ID No and Landholder		Moolarben Coal Complex Modification[4]	Ulan Coal Continued Operations	Wilpinjong Coal Project Modification[4]	Cumulative Amenity Level	NSW INP Acceptable Amenity
227	Hughes	26	25	23	30	45
229	Lowe	27	26	23	30	45
230	Hoole & Rawlinson	27	26	23	30	45
231	Morrison & Benny	27	26	23	30	45
232	Haaring	27	26	23	30	45
233	Boal	28	26	23	31	45
234	Gaw	28	26	23	31	45
235	Wilson	28	26	23	31	45
236	Donovan	28	26	23	31	45
237	Puskaric	29	27	23	32	45
238	Powell	29	27	23	32	45
240	Hartley	30	27	23	32	45
300	Collins & Marshall	27	29	23	32	45
303	Ungaro	28	29	23	32	45
305	Barisic & Aul	27	28	23	31	45
306	Armstrong	27	28	23	31	45
307	Chant & Young	27	28	22	31	45
308	Dower	26	28	22	30	45
309	Maher	25	28	22	30	45
310	Death	26	28	22	31	45
312	Ioannou	26	28	22	31	45
313	Pracy	25	28	22	30	45
314	Ford	25	28	22	31	45
315	Richards & Uzelac	26	28	22	31	45
316	Vassel & Williams	26	28	22	31	45
317	Hore & Bingham	26	29	22	31	45
Moolarben Road						
30[2, 3]	Cox	28	25	26	31	45
31[2]	Cox	27	25	27	31	45
32	Stokes	6	22	32	32	45
35	Johnson & Thompson & Debreczeny	26	24	26	30	45
47	Andrews	23	23	27	30	45
Ulan						
11(a)	Mullins & Imrie	9	25	23	27	65
11(b)	Mullins & Imrie	9	25	23	27	45
11(c)	Mullins & Imrie	10	25	23	27	65
255	Schmitz	28	30	20	32	45
258	Elias	30	28	21	32	45
Ulan Village Non-residential						
9	Orica Australia Pty Limited	37	34	25	39	65
26	Forty North P/L	16	36	25	36	65
46B	North Eastern Wiradjuri Wilpinjong Community Fund Limited	35	48	23	48	65

ID No and Landholder		Moolarben Coal Complex Modification[4]	Ulan Coal Continued Operations	Wilpinjong Coal Project Modification[4]	Cumulative Amenity Level	NSW INP Acceptable Amenity
66	Rostherne P/L	16	43	23	43	65
149	Mid Western Regional Council	39	44	23	45	65
160[5]	Minister for Education and Training (Ulan Public School)	38	42	23	44	45/45[6]
162	Rowmint P/L	16	43	23	43	65
168[5]	PJL Constructions Pty Limited (church)	39	43	23	44	50/45[6]

Note 1: Receiver subject to a private agreement with MCO.
Note 2: Project Approval Noise Limit for this receiver is above the intrusive PSNL (refer Appendices A1 and A2).
Note 3: Landowner that can request additional noise mitigation measures.
Note 4: Highest predicted noise level from the INP meteorological conditions (**Table 9**) for each receiver.
Note 5: In use daytime and evening only.
Note 6: INP Acceptable amenity noise level criteria/Project Approval noise limit.
Note 7 Predicted evening noise level complies with the INP Acceptable noise amenity level.

In accordance with the INP Chapter 2 Industrial Noise Criteria (Section 2.2.4), the night-time cumulative sum of the existing, approved and proposed developments $L_{Aeq(9hour)}$ noise amenity levels have been determined as presented below.

Table G2 - Night-time Cumulative (LAeq(9hour)) Noise Amenity Levels (dBA re 20 µPa)

ID No and Landholder		Moolarben Coal Complex Modification[4]	Ulan Coal Continued Operations	Wilpinjong Coal Project Modification[4]	Cumulative Amenity Level	NSW INP Acceptable Amenity
Cooks Gap						
37	Szymkarczuk	27	26	26	31	40
39	Sprigg	27	25	25	30	40
40	Devenish	26	26	26	31	40
41(a)	Libertis	27	25	25	31	40
41(b)	Libertis	29	26	25	32	40
59	Szymkarczuk	33	29	26	35	40
60	Rayner & Mundey	28	28	26	32	40
61	Miller	30	28	26	33	40
63[1, 2]	Whiticker	36	31	26	38	40
70[2]	Coventry	35	30	25	37	40
75[2]	Ban	34	29	25	35	40
76	Carbone	33	29	25	35	40
79	Nagle	33	28	25	35	40
80	Sebelic	32	28	25	34	40
82	Hungerford & Clemens	30	28	26	33	40
83	Wall	30	27	25	33	40
84	Sebelic	29	27	26	32	40
86	Harris	29	27	25	32	40
87	Howe	29	27	25	32	40
88	Meyers	28	27	26	32	40
89	Glover & Tomlinson	28	27	25	32	40
90	Powell	28	26	25	31	40
91	Graham	28	26	25	31	40
94	Mittemayer	27	26	25	31	40
95	Withington	27	26	25	31	40
96	Lazicic	27	26	25	31	40
97	Smith	27	26	25	31	40
98	Piper	27	26	25	31	40
99	Jenner & Jensen	27	26	25	31	40
100	Kapista	27	26	25	31	40
101	Hull	26	25	25	30	40
102	Roberts	26	25	25	30	40
103	Burnett & Grant	26	25	25	30	40
104	Deeben	26	25	25	30	40
105	Katsikaris	26	25	25	30	40
106	Reid	26	25	25	30	40
107	Raso	26	25	25	30	40

ID No and Landholder		Moolarben Coal Complex Modification[4]	Ulan Coal Continued Operations	Wilpinjong Coal Project Modification[4]	Cumulative Amenity Level	NSW INP Acceptable Amenity
109	Evans	26	25	25	30	40
110	Thompson & Evans	26	25	25	30	40
111	McEwan	25	25	25	30	40
112	Croft	25	25	25	30	40
113	Ratcliff	25	25	25	30	40
119	Kearns	26	26	25	30	40
171	McGregor	20	24	24	28	40
180	Barrett	33	29	25	35	40
181	Forster	30	29	25	33	40
182	Dutoitcook	32	29	25	34	40
183	Steines	32	28	24	34	40
184(a)	Stevenson	32	28	25	34	40
184(b)	Stevenson	31	28	25	34	40
186	Adamson	28	28	24	32	40
187	Feeney	31	28	25	33	40
188	Fielding	27	27	24	31	40
189	Goggin & Hyde	30	27	25	33	40
190	Sahyoun	26	27	24	31	40
191	Lasham	27	27	24	31	40
192	Williams	30	27	24	32	40
194	Potts	26	26	24	30	40
195	Cottam	29	26	24	32	40
196	Saxberg & Weir	26	26	24	30	40
200	Grimshaw	24	26	24	29	40
201(a)	Towerton	23	26	24	29	40
201(b)	Towerton	26	26	24	30	40
202	Butler	24	25	24	29	40
203	Miller	26	25	24	30	40
204	Donnan	26	25	24	30	40
206	Marshall & Vella	24	25	24	29	40
207	Smith	25	25	24	29	40
208	Hasaart	25	24	24	29	40
209	Mawson	25	24	24	29	40
210	Tebutt	25	24	24	29	40
217	Patterson	25	24	24	30	40
218	Soady	25	24	24	29	40
219	Riger	26	25	24	30	40
220	Rusten & Smith	22	24	24	28	40
222	Purtell	26	25	24	30	40
223	Palmer & Stewart	26	25	24	30	40
224	Dupond	27	26	25	31	40
226	Muscat	28	26	25	31	40

ID No and Landholder		Moolarben Coal Complex Modification[4]	Ulan Coal Continued Operations	Wilpinjong Coal Project Modification[4]	Cumulative Amenity Level	NSW INP Acceptable Amenity
227	Hughes	28	26	25	31	40
229	Lowe	29	27	25	32	40
230	Hoole & Rawlinson	29	27	25	32	40
231	Morrison & Benny	29	27	25	32	40
232	Haaring	30	27	25	32	40
233	Boal	30	27	25	33	40
234	Gaw	30	27	25	33	40
235	Wilson	31	27	25	33	40
236	Donovan	31	27	25	33	40
237	Puskaric	31	28	25	34	40
238	Powell	32	28	25	34	40
240	Hartley	33	28	25	35	40
300	Collins & Marshall	31	30	25	34	40
303	Ungaro	31	30	25	34	40
305	Barisic & Aul	30	29	25	33	40
306	Armstrong	30	29	25	33	40
307	Chant & Young	30	29	24	33	40
308	Dower	28	29	24	32	40
309	Maher	28	29	24	32	40
310	Death	29	29	24	33	40
312	Ioannou	29	29	24	33	40
313	Pracy	28	29	24	32	40
314	Ford	29	29	24	32	40
315	Richards & Uzelac	29	29	24	33	40
316	Vassel & Williams	29	29	24	33	40
317	Hore & Bingham	29	30	24	33	40
Moolarben Road						
30[2, 3]	Cox	31	26	28	34	40
31[2]	Cox	30	26	29	33	40
32	Stokes	12	23	34	34	40
35	Johnson & Thompson & Debreczeny	28	25	28	32	40
47	Andrews	25	24	29	32	40
Ulan						
11(a)	Mullins & Imrie	23	27	26	30	65
11(b)	Mullins & Imrie	19	27	26	30	40
11(c)	Mullins & Imrie	21	27	26	30	65
255	Schmitz	31	32	23	35	40
258	Elias	33	31	24	36	40
Ulan Village Non-residential						
9	Orica Australia Pty Limited	40	35	27	42	65
26	Forty North P/L	34	37	27	39	65
46B	North Eastern Wiradjuri	40	50	26	50	65

ID No and Landholder		Moolarben Coal Complex Modification[4]	Ulan Coal Continued Operations	Wilpinjong Coal Project Modification[4]	Cumulative Amenity Level	NSW INP Acceptable Amenity
	Wilpinjong Community Fund Limited					
66	Rostherne P/L	38	45	26	45	65
149	Mid Western Regional Council	43	46	26	48	65
160[5]	Minister for Education and Training (Ulan Public School)	-	-	-	-	45/45[6]
162	Rowmint P/L	38	45	26	46	65
168[5]	PJL Constructions Pty Limited (Church)	-	-	-	-	50/45[6]

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Note 4: Highest predicted noise level from the INP meteorological conditions (**Table 9**) for each receiver.
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Note 7 Predicted evening noise level complies with the INP Acceptable noise amenity level.