

Appendix E

Noise and Vibration Impact Assessment

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Bloomfield Colliery Modification Noise and Vibration Impact Assessment

Report Number 630.01573-R01

19 November 2017

Bloomfield Collieries Pty Ltd
PO Box 4
EAST MAITLAND NSW 2323

Version: v1.1

Bloomfield Colliery Modification

Noise and Vibration Impact Assessment

PREPARED BY:

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
10 Kings Road
New Lambton NSW 2305 Australia
(PO Box 447 New Lambton NSW 2305 Australia)
+61 2 4037 3200 +61 2 4037 3201
newcastleau@slrconsulting.com www.slrconsulting.com

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
630.01573-R01-v1.1	19 November 2017	Martin Davenport	Dick Godson	Dick Godson
630.01573-R01-v1.0	29 September 2017	Martin Davenport	Mark Blake	Mark Blake

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Bloomfield Collieries Pty Ltd to undertake a Noise and Vibration Impact Assessment (NVIA) for the proposed Bloomfield Colliery Modification Project (the Project). This report presents the results and findings of the NVIA.

The NVIA has been prepared with reference to Australian Standards (AS) 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3.

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

Table 1 Noise Impact Assessment Procedure Guidelines

Assessment Guideline	Criteria	Assessment
Modification Maximum, Intrusive and Amenity Noise A quantitative assessment guided by the requirements of the NSW <i>Industrial Noise Policy</i> (INP) (EPA ¹ , 2000) and associated INP Application Notes (EPA, 2013) in relation to assessing noise impacts from the modification, expansion or upgrade of existing industrial premises.	Section 5	Section 6
Cumulative Amenity Noise A quantitative assessment guided by the requirements of the INP in relation to existing and successive industrial development by setting acceptable (and maximum) equivalent continuous noise amenity levels (LAeq [period]) for all industrial (ie non-transport related) noise in a receiver area.	Section 6.6	Section 6.6
Blasting A quantitative assessment guided by the requirements of <i>Technical basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration</i> (ANZEC, 1990).	Section 7.1.2	Section 7.4

It is noted that the NSW Draft Industrial Noise Guideline (DING) was released by the EPA for consultation in September 2015. When finalised, the DING is intended to update and replace the INP which has applied in NSW since 2000. At the time of this assessment, the DING has not yet been finalised and as such the INP remains the relevant guideline in setting out the EPA's requirements for the assessment and management of operational noise from industrial premises in NSW.

The Project will utilise the existing rail loop/loading and washery facilities already assessed as part of the approved Abel Coal Mine Project. Therefore, the noise impact from these facilities will only be considered as part of a cumulative assessment. No changes road and rail traffic will occur as a result of this project nor are any construction activities proposed. Accordingly, road noise, rail noise and construction noise are not considered further in this assessment.

In preparing this assessment SLR has considered several documents including the following:

- 30-1573-R1R1 Noise and Blasting Assessment - Bloomfield Project (EA NIA) (Heggies, 2008).
- 30-1573-R2R1 Bloomfield Colliery Modification - Noise Impact Assessment (MOD NIA) (Heggies 2010)
- 630.01573-R3R3 Bloomfield Coal Project - Noise Monitoring Program (NMP) (SLR 2013).
- 630.10334-R1 Abel Upgrade Modification - Noise Impact Assessment (Abel MOD NIA) (SLR 2012).

2 PROJECT OVERVIEW

2.1 Introduction

Bloomfield Colliery currently operates in accordance with Project Approval 07_0087 (PA 07_0087) granted on 3 September 2009. PA 07_0087 has subsequently been modified on three separate occasions:

- Modification 1 - Amending overburden emplacement, rehabilitation works, construction of a new alternative haul route ("Wattle Tree Drive"/western haul route) and amending a powerline easement.
- Modification 2 - Seeking an extension for the submission of certain management plans.
- Modification 3 - Approval to modify approved vegetation clearing and Biodiversity Offset Area.

Mining may take place 24 hours per day, seven days per week under PA 07_0087 until 31 December 2021.

2.2 Project Description

Mine scheduling to support PA 07_0087 indicated that the remaining recoverable resource would be exhausted by the end of 2021, hence the current consent lapse date of 31 December 2021.

For the following reasons mining is now predicted to extend beyond the current consent lapse date:

- Run of Mine (ROM) coal production levels have been lower than the 1.3 million tonnes per annum (Mtpa) over the life of the project.
- Changes to the mine fleet have allowed extraction of coal seams that were previously considered not be a recoverable resource.
- Further exploration has been undertaken which has identified other previously unrecoverable resources that the mine fleet can now access.

As a result, Bloomfield has identified up to 13 million tonnes of recoverable ROM coal resource remaining in the approval area.

Therefore the Project consists of modifying the previously approved final landform by moving the final void approximately 200 m to the west.

Additionally the Project seeks to modify the current mining lapse date to coincide with the Abel consent limit of 31 December 2030.

The Project will:

- In general, include all currently approved operations,
- Continue to extract up to 1.3 million tonnes per annum (Mtpa) of run of mine (ROM) coal.
- Operate 24 hours per day and seven days per week.

2.3 Existing Project Approval and Consent Conditions

The relevant conditions relating to noise from PA 07_0087 as modified are reproduced below.

Schedule 3 NOISE

Noise Impact Assessment Criteria

1. *The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in **Table 2**:*

Table 2 Operational noise impact assessment criteria

Morning Shoulder	Day	Evening	Night	Location and Locality	
<i>L_{Aeq}(15min)</i>	<i>L_{Aeq}(15min)</i>	<i>L_{Aeq}(15min)</i>	<i>L_{Aeq}(15min)</i>	<i>L_{A1}(1min)</i>	
40	35	35	35	45	E Browns Road, Black Hill
42	35	35	35	45	F Black Hill Road, Black Hill
43	39	42	37	45	G Buchanan Road, Buchanan
35	35	35	35	45	H Mt Vincent Road, Louth Park
35	35	35	35	45	L Kilshanny Avenue, Ashtonfield
48	39	39	37	46	M John Renshaw Drive, Buttai
43	42	42	35	46	N Lings Road, Buttai

Notes

- To interpret the locations in Table 1, see Appendix 2.
- The limits in Table 1 are to apply under meteorological conditions of up to 3 m/s at 10 m above ground level, excluding F and G class inversions as described in the NSW Industrial Noise Policy.

However, if the Proponent has a written negotiated noise agreement with the landowner of any land, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 on that land in accordance with the negotiated noise agreement.

Cumulative Noise Criteria

2. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on, or on more than 25 percent of, any privately owned land:

- *L_{Aeq}(11 hour) 50 dB(A) – Day;*
- *L_{Aeq}(4 hour) 45 dB(A) – Evening; and*
- *L_{Aeq}(9 hour) 40 dB(A) – Night.*

It should be noted that the project approval noise conditions given in **Table 2** are applicable to the assessed receiver locations given in Appendix 2 of PA 07_0087, and have been set based on achievable noise levels under prevailing weather conditions at the time of the EA NIA and MOD NIA.

Given the significant time since PA 07_0087 was granted additional receiver locations have been assessed in this NVIA where appropriate.

2.4 Sensitive Receptors

There are numerous residential properties in the vicinity of the Project. The closest most potentially affected residential receptors to the Project are provided in **Table 3** and shown in **Figure 1**.



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Receiver Locations

FIGURE 1

Table 3 Nearest Sensitive Receptors

Receptor ID ¹	Locality	Receptor Type / Description	Receiver Location	
			Easting	Northing
E	Black Hill	Residential	366938	6366795
F ²		Residential	367471	6367197
F1		Residential	367045	6367368
F2		Residential	366766	6367384
M	Buttai	Residential	366320	6367540
M1		Residential	366368	6367349
N		Residential	365080	6367704
N1		Residential	365214	6367719
N2		Residential	365305	6367349
N3		Residential	366005	6366790
N4		Residential	365851	6366379
N5		Residential	365301	6366422
N6		Residential	364953	6366755
N7		Residential	364699	6367165
N8		Residential	364879	6367523
N9		Residential	364333	6366682
G	Buchanan	Residential	362820	6368716
G1		Residential	362696	6367353
G2		Residential	362548	6367566
G3		Residential	362766	6368336
G4		Residential	362601	6368536
G5 ³		Residential	363081	6368997
G6		Residential	362818	6369897
G7		Residential	362963	6370052
G8		Residential	363046	6370282
G9		Residential	362925	6370475
H	Louth Park	Residential	364843	6371713
L	Ashtonfield	Residential	367414	6372389
I		Residential	369556	6372623

1 -The receptors listed here represent the nearest noise-sensitive receptors to the Project site. Other residential properties in the area are further from the Project.

2 Yancoal owned property.

3 Bloomfield owned property.

3 IMPACT ASSESSMENT PROCEDURES

3.1 Operational Noise - NSW Industrial Noise Policy

Responsibility for the control of noise emission in NSW is vested in Local Government and the EPA. The INP was released in January 2000 and provides a framework and process for deriving noise criteria for consents and licences that will enable the relevant authority to regulate premises that are scheduled under the Protection of the Environment Operations Act, 1997.

Appendix A presents the INP Application Note which provides guidance with regard to the assessment of noise from the modification of existing industrial premises.

The specific policy objectives are:

- To establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses.
- To use the criteria as the basis for deriving project specific noise levels.
- To promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects.
- To outline a range of mitigation measures that could be used to minimise noise impacts.
- To provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development.
- To carry out functions relating to the prevention, minimisation and control of noise from premises scheduled under the Act.

The policy sets two separate noise criteria to meet environmental noise objectives; one to account for intrusive noise and the other to protect the amenity of particular land uses.

Assessing Intrusiveness

For assessing intrusiveness, the background noise level must be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) of the source should not be more than five decibels above the measured background level (L_{A90}).

Assessing Amenity

The amenity assessment is based on noise criteria specific to land use (rural) and associated activities (**Table 4**). The criteria relate only to industrial-type noise and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industries need to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion (**Table 5**).

Table 4 Amenity Criteria Recommended LAeq Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended LAeq(Period) Noise Level (dBA)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/Industrial Interface (for existing situations only)	Day	65	70
		Evening	55	60
		Night	50	55
School classrooms - internal	All	Noisiest 1 hour period when in use	35	40
Hospital wards - internal - external	All	Noisiest 1 hour period	35	40
			50	55
Place of worship - internal	All	When in use	40	45
Area specifically reserved for passive recreation (eg National Park)	All	When in use	50	55
Active recreation area (eg school playground, golf course)	All	When in use	55	60
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

Note: Monday - Saturday: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am.
 Sundays, Public Holidays: Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
 The LAeq index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

Table 5 Modification to Acceptable Noise Level (ANL)* to Account for Existing Levels of Industrial Noise

Total Existing LAeq Noise Level from Industrial Noise Sources	Maximum LAeq Noise Level for Noise from New Sources Alone, dBA
≥ Acceptable noise level plus 2 dBA	If existing noise level is <i>likely to decrease</i> in future acceptable noise level minus 10 dBA If existing noise level is <i>unlikely to decrease</i> in future existing noise level minus 10 dBA
Acceptable noise level plus 1 dBA	Acceptable noise level minus 8 dBA
Acceptable noise level	Acceptable noise level minus 8 dBA
Acceptable noise level minus 1 dBA	Acceptable noise level minus 6 dBA
Acceptable noise level minus 2 dBA	Acceptable noise level minus 4 dBA
Acceptable noise level minus 3 dBA	Acceptable noise level minus 3 dBA
Acceptable noise level minus 4 dBA	Acceptable noise level minus 2 dBA
Acceptable noise level minus 5 dBA	Acceptable noise level minus 2 dBA
Acceptable noise level minus 6 dBA	Acceptable noise level minus 1 dBA
< Acceptable noise level minus 6 dBA	Acceptable noise level

* ANL = recommended acceptable LAeq noise level for the specific receiver, area and time of day from **Table 4**

3.2 INP Project Specific Criteria

The INP Project Specific Noise Criteria are the more stringent of either the amenity or intrusive criteria. The *NSW Industrial Noise Policy – Application Notes*, approved by the EPA in December 2010 (INP Application Notes), clarify that this is not necessarily just a matter of comparing the magnitude of the amenity criteria to the intrusive criteria as they apply over different time periods. Three situations of comparative magnitude arise:

- *Predicted intrusiveness < amenity criteria* – The intrusive criteria applies
- *Predicted intrusiveness = amenity criteria* – The intrusive criteria applies
- *Predicted intrusiveness > amenity criteria* – Specified licence condition noise limits shall ensure that both the intrusive and amenity noise levels apply

The INP states that these criteria have been selected to protect 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 criteria in the INP are achieved, it is unlikely that most people would consider the resultant noise levels excessive.

Table 6 provides the methodology for the noise impact assessment for the Project's intrusive and amenity assessment criteria.

Table 6 Noise Impact Assessment Methodology

Assessment Criteria	Project Specific Criteria	Noise Management Zone	Noise Affection Zone
Intrusive	Rating background level plus 5 dB	≤ 5 dB above Project specific criteria	> 5 dB above Project specific criteria
Amenity	INP based on existing industrial level	≤ 5 dB above Project specific criteria	> 5 dB above Project specific criteria

For the purposes of assessing the potential noise impacts the Project specific, management and affection criteria are further defined as follows.

3.2.1 Project Specific Criteria

Most people in the broader community would generally consider exposure to noise levels corresponding to this zone acceptable.

3.2.2 Noise Management Zone

Depending on the degree of exceedance of the Project specific criteria (1 dB to 5 dB) noise impacts could range from negligible to moderate. It is recommended that management procedures be implemented including:

- Prompt response to any community issues of concern.
- Noise monitoring on site and within the community.
- Refinement of on-site noise mitigation measures and plant operating procedures where practical.
- Consideration of acoustical mitigation at receivers.
- Consideration of negotiated agreements with property holders.

3.2.3 Noise Affection Zone

Exposure to noise levels exceeding the Project specific criteria by more than 5 dB may be considered unacceptable by some property holders and the INP recommends that the proponent explore the following:

- Discussions with relevant property holders to assess concerns and provide solutions.
- Implementation of acoustical mitigation at receivers.
- Negotiated agreements with property holders, where required.

3.3 Sleep Disturbance

The potential for sleep disturbance has been assessed using the guidance provided in the INP Application Notes.

The INP Application Notes recognises that the current LA1(1minute) sleep disturbance criteria of 15 dBA above the prevailing LA90(15minute) level is not ideal. The assessment of potential sleep disturbance is complex and poorly understood and the EPA believes that there is insufficient information to determine a suitable alternative criteria.

In the interim, the INP guideline suggests that the LA1(1minute) level of 15 dBA above the RBL is a suitable screening criteria for sleep disturbance for the night-time period.

Guidance regarding potential for sleep disturbance is also provided in the RNP. The RNP calls upon a number of studies that have been conducted into the effect of maximum noise levels on sleep. The RNP acknowledges that, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance. However, the RNP provides the following conclusions from the research on sleep disturbance:

- Maximum internal noise levels below 50 - 55 dBA are unlikely to awaken people
- One or two noise events per night, with maximum internal noise levels of 65 - 70 dBA, are not likely to affect health and well-being significantly.

It is generally accepted that internal noise levels in a dwelling, with the windows open, are 10 dB lower than external noise levels. Based on a worst case minimum attenuation, with windows open, of 10 dB, the first conclusion above suggests that short term external noises of 60 dBA to 65 dBA are unlikely to cause awakening reactions. The second conclusion suggests that one (1) or two (2) noise events per night with maximum external noise levels of 75 dBA to 80 dBA are not likely to affect health and wellbeing significantly.

4 EXISTING NOISE AND METEOROLOGICAL ENVIRONMENT

4.1 Existing Noise Environment

Although Bloomfield Colliery has approved noise limits in PA 07_0087, the INP procedures and associated Application Notes for the modification, expansion or upgrade of existing industrial premises require that noise impact assessments determine the relevant Rating Background Levels (RBLs) and noise amenity levels ($L_{Aeq(period)}$) in the absence of the existing industrial premises.

It should be noted that the criteria provided in PA 07_0087 for the approved operation differed from the Project Specific Noise Levels (PSNLs) established with reference to the INP as part of the EA NIA.

As part of the NMP, SLR has conducted noise monitoring on a quarterly basis at locations surrounding the Project. The noise monitoring consists of continuous, unattended noise logging and operator attended noise surveys. The operator attended noise surveys are used to define existing noise sources, including Bloomfield when detected, and the character of noise in the area and also used to qualify unattended noise logging results. Background noise monitoring was conducted at the locations F, G, L, M, and N as presented in **Appendix B**.

Operator attended noise surveys accompanying the unattended noise monitoring generally note that the noise environment at these locations is dominated by road traffic noise and natural noises such as insect, frog, cicada and bird noise.

Significant sources of road traffic noise in the Project region include the following major roads and highways:

- John Renshaw Drive.
- The New England Highway.
- Buchanan Road
- Hunter Expressway (opened 22 March 2014).

Given the foregoing, it is appropriate that the RBLs be reassessed to determine the change in the background noise levels in the Project area since the opening of the Hunter Expressway in March 2014

4.1.1 Unattended Continuous Noise Monitoring

A summary of the measured Rating Background Levels (RBLs) during the quarterly noise monitoring surveys conducted by SLR since the Q2 2015 (April - June 2015) quarterly monitoring period up until the Q1 2017 (January-March 2017) quarterly monitoring period are provided in **Table 7**. Also presented in **Table 7** is the overall RBL calculated from the Assessment Background Levels (ABLs) over the entire monitoring period and thus providing a robust dataset with which to calculate the representative long-term RBL at each monitoring location.

Table 7 Measured Background Noise Levels

Monitoring Location	Period	Measured RBL								Overall Q2 2015 to Q1 2017
		Q2 2015	Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016	Q4 2016	Q1 2017	
F	Day	44	42	47	44	49	46	48	45	45
	Evening	41	48	43	39	46	53	43	37	42
	Night	39	41	42	31	44	43	42	35	40
G	Day	32	35	44	38	42	40	43	41	40
	Evening	34	38	44	37	34	39	38	39	38
	Night	29	30	48	31	30	30	33	38	31
L	Day	31	31	34	32	37	33	35	34	34
	Evening	34	33	37	37	32	34	35	37	36
	Night	30	27	35	40	28	30	31	42	33
M	Day	44	43	46	41	48	46	47	40	44
	Evening	41	44	45	44	45	46	44	40	44
	Night	37	34	42	36	41	34	39	36	37
N ¹	Day	46	44	45	36	49	42	44	43	43
	Evening	37	41	41	36	45	41	38	38	39
	Night	33	39	38	29	38	36	31	37	35

1. Alternative Logger Location at 699 John Renshaw Drive, adjacent Bloomfield Colliery.

4.1.2 Operator Attended Noise Monitoring Summary

In order to supplement the unattended logger measurements and to assist in identifying the character and duration of the noise sources, operator-attended daytime, evening, and night-time surveys were also conducted at each noise logging location, with the exception of Location N where monitoring was conducted at Lings Road. The operator-attended measurement results are summarised in **Table 8**.

Table 8 Quarterly Operator Attended Noise Monitoring Results – Q2 2015 to Q1 2017

Monitoring Location	Measured LA90(15minute) All Noise Sources			Bloomfield LAeq(15minute) Contribution		
	Day	Evening	Night	Day	Evening	Night
F	45, 52, 51, 47, 50, 45, 52, 44	48, 54, 48, 54, 49, 49, 46, 45	44, 49, 40, 39, 43, 47, 45, 35	<35 ¹ , <42 ¹ , <41 ¹ , <37 ¹ , <40 ¹ , <35 ¹ , <42 ¹ , <34 ¹	<38 ¹ , <44 ¹ , <38 ¹ , <54 ¹ , <39 ¹ , <39 ¹ , <36 ¹ , <35 ¹	<34 ¹ , <39 ¹ , <30 ¹ , <30 ¹ , <33 ¹ , <37 ¹ , <35 ¹ , <30 ¹
G	30, 38, 43, 45, 39, 40, 55, 36	44, 41, 43, 42, 38, 38, 64, 38	31, 32, 45, 36, 34, 31, 44, 32	<30 ¹ , <30 ¹ , <33 ¹ , <35 ¹ , <30 ¹ , <30 ¹ , <45 ¹ , <30 ¹	42, <31 ¹ , 36, 40, 40, <30 ¹ , <54 ¹ , <30 ¹	<30 ¹ , <30 ¹ , <35 ¹ , 36 ¹ , 37, <30 ¹ , <34 ¹ , <30 ¹
L	30, 38, 40, 38, 38, 33, 38, 32	34, 34, 42, 44, 35, 33, 36, 40	36, 31, 38, 34, 30, 25, 34, 40	<30 ¹ , <30 ¹ , <30 ¹ , <30 ¹ , <30 ¹ , <30 ¹ , <30 ¹ , <30 ¹	<30 ¹ , <30 ¹ , <32 ¹ , <34 ¹ , <30 ¹ , 31, <30 ¹ , <30 ¹	<30 ¹ , <30 ¹ , <30 ¹ , <30 ¹ , <30 ¹ , <30 ¹ , <30 ¹ , <30 ¹
M	46, 51, 51, 46, 49, 45, 49, 43	48, 48, 47, 52, 51, 45, 44, 45	43, 41, 46, 38, 48, 40, 45, 39	<36 ¹ , <41 ¹ , <41 ¹ , <36 ¹ , <39 ¹ , 32, <39 ¹ , <33 ¹	<38 ¹ , 38, <37 ¹ , <42 ¹ , 33, <35 ¹ , <34 ¹ , <35 ¹	37, 37, <36 ¹ , <30 ¹ , 48 ² , 35, <35 ¹ , <30 ¹
N	58, 55, 53, 53, 53, 48, 53, 50	48, 48, 43, 52, 53, 50, 44, 48	38, 40, 51, 35, 41, 41, 49, 37	<48 ¹ , <45 ¹ , <43 ¹ , <43 ¹ , <43 ¹ , <38 ¹ , <43 ¹ , <40 ¹	40, <38 ¹ , <33 ¹ , <42 ¹ , 40, <40 ¹ , <34 ¹ , <38 ¹	<30 ¹ , <32 ¹ , <41 ¹ , <30 ¹ , <31 ¹ , <31 ¹ , <39 ¹ , <30 ¹

1 Bloomfield operations inaudible/not measurable. Any contribution would be at least 10 dB below the LA90 level. Where contribution would be less than 30 dB, estimated contribution is set to <30 dB.

2 Measured exceedance of PA 07_0087.

Where Bloomfield Colliery noise emissions are audible, operator attended noise monitoring indicates that measured noise emissions do not exhibit any discernible low frequency, intermittent or tonal characteristics at the nearest residential receiver areas and as such are not considered further in this NVIA.

4.1.3 Noise Monitoring Summary

Location F

Noise levels at this location are typically dominated by constant road traffic noise from John Renshaw Drive. Bloomfield Colliery operations are not audible at this location and would not impact on the long-term RBL.

Location G

Noise levels at his location are typically dominated by road traffic noise from Buchanan Road as well as insects. Bloomfield colliery operations, when audible, are typically below the measured LA90 background noise level during operator attended noise surveys. As such, Bloomfield Colliery operations would have a negligible influence on the long-term RBL at this location.

Location L

Noise levels at this location are typically dominated by road traffic, general suburban noise as well as natural noise such as frogs and insects. Bloomfield colliery operations are generally inaudible at this location and would have a negligible influence on the long-term RBL.

Location M

Noise levels at this location are typically dominated by constant road traffic noise from John Renshaw Drive. Bloomfield Colliery operations are intermittently audible at this location and generally below the measured LA90 background noise level during operator attended noise surveys. As such, Bloomfield Colliery operations would have a negligible influence on the long-term RBL at this location.

Location N

Noise levels during operator attended noise surveys at this location are dominated by constant road traffic noise from John Renshaw Drive. Bloomfield colliery operations, when audible, are typically below the measured LA90 background noise level during operator attended noise surveys.

In accordance with the NMP, unattended noise monitoring is conducted adjacent to Bloomfield Colliery operations at 699 John Renshaw Drive. Given that the monitoring location has a clear line of sight to open cut operations the long term RBL at this location would be, to an extent, influenced by Bloomfield Colliery operations. However it should be noted that the long term RBL measured at this location, despite the proximity to Bloomfield Colliery operations, is less than that of Location M, further indicating that Bloomfield colliery operations have a negligible impact on background noise levels at the surrounding receiver locations.

4.1.4 Background and Industrial Noise Levels in the Absence of Bloomfield Colliery Operations

In accordance with the INP Application Notes for the modification of existing industrial premises (refer **Appendix A**), the Rating Background Levels (RBLs) and LAeq(period) amenity levels have to be determined in the absence of existing Bloomfield Colliery operations.

As described in **Section 4.1.3**, existing Bloomfield Colliery operations at Locations F, G, L and M would have a negligible influence on the measured long term RBLs. Accordingly, the RBLs in the absence of existing Bloomfield Colliery operations are presented in **Table 9**.

Table 9 Background and Industrial Noise in the Absence of Bloomfield Colliery Operations

Monitoring Location	Locality Area (Noise Amenity Area)	Adopted RBLs			Estimated LAeq(period) Industrial Noise Contribution		
		Day	Evening	Night	Day	Evening	Night
F	Black Hill (Suburban)	45	42	40	<49	<39	<34
G	Buchanan & Louth Park (Suburban)	40	38	31	<49	<39	<34
L	Ashtonfield (Suburban)	34	36	33	<49	<39	<34
M	Buttai (Suburban)	44	44	37	<49	<39	<34

4.2 INP Assessment of Prevailing Weather Conditions

An assessment of prevailing meteorological conditions was carried out as part of the EA NIA. 12 months of weather data from an EPA weather station located at Francis Greenway High School near to Beresfield, approximately 7 km north east of Bloomfield Colliery was analysed. The prevailing meteorological parameters used in the EA NIA is provided in **Table 10**.

Table 10 EA NIA Meteorological Modelling Parameters

Modelling Situation	Air Temp	Relative Humidity	Wind Speed	Wind Direction	Temperature Gradient
Calm (All periods)	20°C	65%	N/A	N/A	N/A
South Easterly Wind (Evening and night)	10°C	65%	3 m/s	135°	N/A
North West Wind (Night)	10°C	65%	3 m/s	315°	N/A

Given the significant time since the previous meteorological assessment an updated analysis of prevailing weather has been conducted.

4.2.1 Wind

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases the noise produced by the wind will obscure noise from most industrial and transport sources.

Wind effects need to be considered when wind is a feature of the area under consideration (in accordance with the INP). Where wind blows from the source to the receiver at speeds up to 3 m/s for more than 30% of the time in any season, then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

The INP provides two methods to assess wind effects; analysis of relevant weather data to determine whether wind is a feature based on the frequency of occurrence and wind speed (*detailed approach*) or simply assume that wind is a feature of the area (*simple approach*).

As stated in the INP Application Notes: *“The EPA has previously accepted (and will accept) noise predictions based on modelling noise emissions using long term weather data, as it can present a higher level of analysis than that required under the INP”*. Furthermore, the, then, Australian Government Department of Industry, Innovation and Science best practice document *Airborne Contaminants, Noise and Vibration – Leading Practice Sustainable Development Program for the Mining Industry* dated October 2009 states that a noise model should require data on meteorological conditions over several years.

Wind data was obtained from the on-site meteorological station for a six year period from March 2011 to March 2017.

A summary of the most frequently occurring winds is contained within **Table 11**, **Table 12** and **Table 13**. The percentage occurrence figures provided in bold are those that exceed the 30% threshold.

Table 11 Seasonal Frequency of Occurrence of Wind Speed Intervals – Daytime

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	1.1%	ESE±45	23.8%	20.0%	43.8%
Autumn	8.6%	SE±45	19.1%	7.5%	26.6%
Winter	4.3%	W±45	22.6%	9.3%	31.9%
Spring	0.5%	ESE±45	18.9%	11.3%	30.2%

Table 12 Seasonal Frequency of Occurrence of Wind Speed Intervals – Evening

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	3.6%	ESE±45	56.7%	7.6%	64.3%
Autumn	19.3%	SE±45	33.2%	3.3%	36.4%
Winter	12.4%	WNW±45	18.7%	7.9%	26.5%
Spring	5.2%	ESE±45	46.4%	3.2%	49.6%

Table 13 Seasonal Frequency of Occurrence of Wind Speed Intervals – Night

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	10.1%	SE±45	48.0%	5.0%	53.0%
Autumn	21.2%	SW±45	27.2%	1.8%	29.0%
Winter	8.7%	WSW±45	37.7%	6.1%	43.7%
Spring	2.2%	WSW±45	6.4%	9.0%	15.5%

Long terms seasonal wind records indicate that prevailing conditions, in accordance with the INP assessment methodology, are a feature of the area. Therefore wind conditions have been considered as part of this assessment.

4.2.2 Temperature Inversion

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months. The NSW INP states that temperature inversions need only be considered for the night-time period. Note that the night-time period for determining inversion frequency is from one hour before sunset to one hour after sunrise (taken to be 6.00pm to 7.00am).

Temperature inversions were determined not to be a feature of the area in the EA NIA based on 12 months of data from the Beresfield weather station.

Data provided from the on-site weather station did not contain sigma theta data to enable the analysis of atmospheric stability classes. However 12 months of data from the Beresfield weather station for the year 2011 was analysed as part of the Abel MOD NIA.

The occurrence of atmospheric stability classes during the winter night-time period at the Beresfield weather station for the year 2011 are presented in **Table 14**.

Table 14 Night-time (6.00pm – 7.00am) Stability Frequency of Occurrence – Beresfield

Pasquil Stability Class	Frequency of Occurrence Percentage During Winter
A	0.0%
B	0.0%
C	0.0%
D	42.7%
E	13.0%
F	44.0%
G	0.3%

The frequency of occurrence of F Class temperature inversions, as determined in accordance with methodology provided in the INP, is greater than 30% and therefore this weather condition has been considered as part of this NVIA.

4.2.3 NVIA Meteorological Modelling Parameters

The resulting noise model meteorological parameters used in this NVIA following updated analysis of local meteorological conditions are provided in **Table 15**.

Table 15 NVIA Meteorological Modelling Parameters

Period	Meteorological Scenario	Air Temp	Relative Humidity	Wind Direction and Speed	Pasquil Stability Class
All Periods	Calm	10°C	70%	N/A	D
Day	Wind only	10°C	70%	3 m/s E, ESE, SE, SSE, W, WNW	D
Evening	Wind only	10°C	70%	3 m/s ENE, E, ESE, SE, SSE	D
Night-time	Wind only	10°C	70%	3 m/s E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW	D
Night-time	Inversion	10°C	70%	N/A	F
Night-time	Inversion with drainage flow	10°C	70%	3 m/s source to receiver	F

5 PROJECT SPECIFIC NOISE CRITERIA

5.1 Operational Noise Criteria

The Project Specific Noise Levels (PSNLs) noise emission design criteria for the Project have been established with reference to the INP outlined in **Section 3.1**.

The amenity criteria have been established using the results of ambient noise measurements provided in **Table 9** with adjustments to account for existing industrial noise contributions as necessary. The acoustical environment typifies that of suburban environments.

The project specific intrusive and amenity noise levels for all assessed receptors are contained within **Table 16**.

Table 16 Project Specific Noise Levels

Location	Locality Area (Noise Amenity Area)	Period	Adopted RBL	Intrusive Criteria LAeq(15minute) dBA	Amenity Criteria LAeq(period) dBA
E, F - F2	Black Hill (Suburban)	Day	45	50	55
		Evening	42	47	45
		Night	40	45	40
G - G9, H	Buchanan & Louth Park (Suburban)	Day	40	45	55
		Evening	38	43	45
		Night	31	36	40
L, I	Ashtonfield (Suburban)	Day	34	39	55
		Evening	34	39 ¹	45
		Night	33	38	40
M - M1, N - N9	Buttai (Suburban)	Day	44	49	55
		Evening	44	49	45
		Night	37	42	40

1. Evening RBL and criteria adjusted to be no greater than the daytime in accordance with the INP application notes.

5.2 Sleep Disturbance Criteria

The night-time LA1(1minute) Sleep Disturbance Noise Levels (SDNLs) determined in accordance with the INP Application Notes are presented in **Table 17**.

Table 17 Sleep Disturbance Noise Goals

Location	Period	Adopted Night-time RBL	Sleep Disturbance Noise Goal LA1(1minute)
E, F - F2	Night-time (10:00 pm – 7:00 am)	40 dBA	55 dBA
G - G9, H		31 dBA	46 dBA
L, I		33 dBA	48 dBA
M - M1, N - N9		37 dBA	52 dBA

6 OPERATIONAL NOISE IMPACT ASSESSEMENT

6.1 Operational Noise Modelling Parameters

The Conservation of Clean Air and Water Europe (CONCAWE) prediction methodology was utilised within SoundPLAN 3D modelling software (Version 7.4) to predict noise emissions from the Project. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used this map, together with noise source data, ground cover, shielding by barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest sensitive receivers.

Topographic contours and operational mine plans were supplied by Bloomfield for the purpose of modelling noise from the Project.

Noise predictions were carried out for three (3) operational years, namely;

- Year 2018 - Representative of Bloomfield operations at the commencement of the Project.

- Year 2021 - Representative of Bloomfield operations midway through Project related mining operations.
- Year 2025 - Representative of the furthest extent of Project related operations to the west.

Prediction of noise emission levels was carried out under the meteorological parameters given in **Table 15**.

The meteorological category used within the CONCAWE algorithm is assessed in accordance with Pasquill and Turner Stability Categories. The six meteorological categories used within the CONCAWE algorithm based on Pasquill Stability Category and vector wind speeds are shown in **Table 18**.

Table 18 CONCAWE Meteorological Category

Meteorological Category	Pasquill Stability Category		
	A, B	C, D, E	F, G
1	$V < -3.0$	-	-
2	$-3.0 < V < -0.5$	$V < -3.0$	-
3	$-0.5 < V < +0.5$	$-3.0 < V < -0.5$	$V < -3.0$
4	$+0.5 < V < +3$	$-0.5 < V < 0.5$	$-3.0 < V < -0.5$
5	$V > 3$	$0.5 < V < +3$	$-0.5 < V < +0.5$
6	-	$V > +3$	$+0.5 < V < +3$

Other assumptions made relating to the Project operation in the modelling process include:

- All acoustically significant plant and equipment operates simultaneously.
- Mobile noise sources, such as haul trucks, were modelled at typical locations and assumed to operate in repetitive cycles.

6.2 Operational Scenario - Noise Model Summary

The operational scenario modelled during each period is summarised in **Table 19**. Equipment considered in operation is marked with a 'tick' (✓) and those not considered to be in operation are marked with a 'cross' (×). Where there is a number in parenthesis following a tick, this represents the number of pieces of the equipment that has been considered in the noise model during the relevant period. Sound power levels of relevant equipment are contained within **Appendix C**.

Table 19 Operational Scenario Considered in Noise Model

Scenario	Plant and Equipment	Period	
		Day/Evening/Night	Night - Reduced Operations
Scenario 1 Coaling via main (eastern) haul route.	Hitachi Excavator 5500	✓	✓
	Caterpillar Rear Dump Trucks 789 (or similar)	✓(5)	✓(5)
Scenario 2 Coaling via alternate (western) haul route.	Caterpillar Rear Dump Trucks 793 (or similar)	✓(3)	✓(3)
	SK75 Drill (or similar)	✓	x
	SK50 Drill (or similar)	✓	x
	D10 or D11 Dozer (or similar)	✓(2)	✓(1)
	Cat 24G Grader (or similar)	✓	✓
	Cat 777 Watercart (or similar)	✓	✓
Scenario 3 Overburden	Hitachi Excavator 5500	✓	✓
	Caterpillar Rear Dump Trucks 789 (or similar)	✓(3)	✓(3)
	Caterpillar Rear Dump Trucks 793 (or similar)	✓(3)	✓(3)
	SK75 Drill (or similar)	✓	x
	SK50 Drill (or similar)	✓	x
	D10 and/or D11 Dozer (or similar)	✓(3)	✓(1)
	992 Front End Loader (or similar) replacing dozer at overburden dump	x	✓
	Cat 24G Grader (or similar)	✓	✓
	Cat 777 Watercart (or similar)	✓	✓

6.3 Predicted Operational Noise Levels

The predicted daytime, evening and night-time operating intrusive LAeq(15minute) noise levels to the nearest residential receiver areas for year 2018, 2021 and 2025 operations are presented in **Table 20**, **Table 21** and **Table 22**, respectively.

The intrusive LAeq(15minute) noise level contours for the Year 2018 during reduced night-time operations are presented in **Appendix D**. The calculation of the noise contours involves numerical interpolation of a noise level array with a graphical accuracy of up to ± 2 dBA. This means that in some cases the contour isopleths presented in **Appendix D** may differ from values presented in **Table 20**.

Table 20 Predicted Operating Intrusive LAeq(15minute) Noise Levels - 2018

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA)			Noise Assessment Criteria (dBA)	
			Scenario 1/Scenario 2/Scenario 3			PA 07_0087	PSNL
			Calm	Prevailing Wind	Temperature Inversion		
Black Hill	E	Day	30 / 27 / 27	36 / 33 / 34	N/A	35	50
		Evening	30 / 27 / 27	31 / 26 / 25	N/A	35	47
		Night	30 / 27 / 27	36 / 33 / 34	36 / 33 / 34	35	45

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)		
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL	
Bloomfield Colliery	F	Night Reduced Operations	28 / 24 / 25	34 / 30 / 31	34 / 30 / 31	35	45	
		Day	30 / 27 / 27	36 / 33 / 33	N/A	35	50	
		Evening	30 / 27 / 27	29 / 25 / 22	N/A	35	47	
		Night	30 / 27 / 27	36 / 33 / 33	36 / 33 / 33	35	45	
		Night Reduced Operations	29 / 23 / 24	35 / 29 / 30	35 / 30 / 30	35	45	
	F1	Day	33 / 29 / 29	38 / 35 / 35	N/A	-	50	
		Evening	33 / 29 / 29	32 / 29 / 25	N/A	-	47	
		Night	33 / 29 / 29	38 / 35 / 35	38 / 35 / 35	-	45	
		Night Reduced Operations	32 / 26 / 26	37 / 32 / 32	37 / 32 / 32	-	45	
	F2	Day	34 / 30 / 30	39 / 36 / 36	N/A	-	50	
		Evening	34 / 30 / 30	34 / 30 / 27	N/A	-	47	
		Night	34 / 30 / 30	39 / 36 / 36	39 / 36 / 36	-	45	
		Night Reduced Operations	33 / 27 / 27	38 / 32 / 32	38 / 32 / 32	-	45	
	Buchanan & Louth Park	G	Day	31 / 31 / 33	37 / 37 / 39	N/A	39	45
			Evening	31 / 31 / 33	37 / 37 / 39	N/A	42	43
			Night	31 / 31 / 33	37 / 37 / 39	37 / 37 / 39	37	36
			Night Reduced Operations	28 / 29 / 31	34 / 34 / 36	34 / 34 / 36	37	36
		G1	Day	27 / 27 / 29	33 / 33 / 35	N/A	-	45
			Evening	27 / 27 / 29	33 / 33 / 35	N/A	-	43
			Night	27 / 27 / 29	33 / 33 / 35	34 / 33 / 35	-	36
			Night Reduced Operations	25 / 25 / 27	31 / 31 / 33	31 / 31 / 33	-	36
		G2	Day	27 / 27 / 29	33 / 33 / 35	N/A	-	45
			Evening	27 / 27 / 29	33 / 33 / 35	N/A	-	43
			Night	27 / 27 / 29	33 / 33 / 35	34 / 34 / 35	-	36
Night Reduced Operations			25 / 25 / 27	31 / 31 / 33	31 / 31 / 33	-	36	
G3		Day	16 / 16 / 18	22 / 22 / 23	N/A	-	45	
		Evening	16 / 16 / 18	22 / 22 / 23	N/A	-	43	
		Night	16 / 16 / 18	22 / 22 / 23	22 / 22 / 23	-	36	
		Night Reduced Operations	13 / 13 / 15	19 / 19 / 21	19 / 19 / 21	-	36	
G4		Day	14 / 14 / 15	20 / 20 / 21	N/A	-	45	
		Evening	14 / 14 / 15	20 / 20 / 21	N/A	-	43	
		Night	14 / 14 / 15	20 / 20 / 21	20 / 20 / 21	-	36	
		Night Reduced Operations	11 / 11 / 13	17 / 17 / 18	17 / 17 / 19	-	36	
G5		Day	33 / 33 / 35	39 / 39 / 40	N/A	-	45	

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
Ashtonfield	G6	Evening	33 / 33 / 35	39 / 39 / 40	N/A	-	43
		Night	33 / 33 / 35	39 / 39 / 40	39 / 38 / 40	-	36
		Night Reduced Operations	30 / 30 / 32	36 / 36 / 38	36 / 36 / 38	-	36
		Day	31 / 31 / 32	37 / 37 / 38	N/A	-	45
		Evening	31 / 31 / 32	37 / 37 / 38	N/A	-	43
		Night	31 / 31 / 32	37 / 37 / 38	37 / 37 / 38	-	36
		Night Reduced Operations	28 / 28 / 30	34 / 34 / 36	34 / 34 / 36	-	36
		Day	31 / 31 / 32	37 / 37 / 38	N/A	-	45
	G7	Evening	31 / 31 / 32	37 / 37 / 38	N/A	-	43
		Night	31 / 31 / 32	37 / 37 / 38	37 / 37 / 38	-	36
		Night Reduced Operations	28 / 28 / 29	34 / 34 / 35	34 / 34 / 35	-	36
		Day	31 / 32 / 32	37 / 37 / 38	N/A	-	45
	G8	Evening	31 / 32 / 32	37 / 37 / 38	N/A	-	43
		Night	31 / 32 / 32	37 / 37 / 38	37 / 37 / 38	-	36
		Night Reduced Operations	28 / 28 / 29	34 / 34 / 35	34 / 34 / 35	-	36
		Day	30 / 30 / 31	36 / 36 / 37	N/A	-	45
Buttai	G9	Evening	30 / 30 / 31	36 / 36 / 37	N/A	-	43
		Night	30 / 30 / 31	36 / 36 / 37	36 / 36 / 37	-	36
		Night Reduced Operations	27 / 27 / 28	33 / 33 / 34	33 / 33 / 34	-	36
		Day	17 / 18 / 17	23 / 23 / 23	N/A	35	45
	H	Evening	17 / 18 / 17	23 / 23 / 23	N/A	35	43
		Night	17 / 18 / 17	23 / 23 / 23	23 / 23 / 23	35	36
		Night Reduced Operations	14 / 15 / 14	19 / 21 / 23	19 / 21 / 19	35	36
		Day	26 / 28 / 22	32 / 34 / 28	N/A	35	39
	L	Evening	26 / 28 / 22	32 / 34 / 28	N/A	35	39
		Night	26 / 28 / 22	32 / 34 / 28	32 / 34 / 28	35	38
		Night Reduced Operations	25 / 27 / 15	30 / 33 / 28	30 / 32 / 21	35	38
		Day	17 / 18 / <10	24 / 25 / <10	N/A	-	39
		Evening	17 / 18 / <10	24 / 23 / <10	N/A	-	39
		Night	17 / 18 / <10	24 / 25 / <10	24 / 25 / <10	-	38
		Night Reduced Operations	17 / 18 / <10	24 / 25 / <10	24 / 25 / <10	-	38
		Day	36 / 33 / 34	41 / 38 / 39	N/A	39	49
	M	Evening	36 / 33 / 34	38 / 34 / 31	N/A	39	49
		Night	36 / 33 / 34	41 / 38 / 39	41 / 38 / 39	37	42

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
		Night Reduced Operations	35 / 30 / 31	39 / 35 / 36	40 / 35 / 36	37	42
	M1	Day	34 / 31 / 32	39 / 37 / 38	N/A		49
		Evening	34 / 31 / 32	36 / 33 / 30	N/A		49
		Night	34 / 31 / 32	39 / 37 / 38	40 / 37 / 38		42
		Night Reduced Operations	33 / 28 / 30	38 / 34 / 35	38 / 34 / 35		42
	N	Day	23 / 22 / 29	26 / 26 / 32	N/A	42	49
		Evening	23 / 22 / 29	28 / 27 / 33	N/A	42	49
		Night	23 / 22 / 29	26 / 26 / 32	28 / 27 / 33	35	42
		Night Reduced Operations	21 / 19 / 26	25 / 23 / 29	26 / 24 / 30	35	42
	N1	Day	25 / 22 / 36	28 / 28 / 39	N/A	-	49
		Evening	25 / 22 / 36	30 / 28 / 40	N/A	-	49
		Night	25 / 22 / 36	28 / 28 / 39	30 / 27 / 39	-	42
		Night Reduced Operations	24 / 20 / 34	27 / 24 / 38	29 / 25 / 38	-	42
	N2	Day	34 / 34 / 39	39 / 39 / 42	N/A	-	49
		Evening	34 / 34 / 39	39 / 39 / 43	N/A	-	49
		Night	34 / 34 / 39	39 / 39 / 42	39 / 39 / 43	-	42
		Night Reduced Operations	32 / 31 / 36	36 / 36 / 39	37 / 37 / 40	-	42
	N3	Day	32 / 30 / 34	37 / 36 / 40	N/A	-	49
		Evening	32 / 30 / 34	35 / 31 / 35	N/A	-	49
		Night	32 / 30 / 34	37 / 36 / 40	37 / 36 / 39	-	42
		Night Reduced Operations	30 / 27 / 32	35 / 33 / 37	36 / 33 / 37	-	42
	N4	Day	27 / 27 / 28	34 / 33 / 34	N/A	-	49
		Evening	27 / 27 / 28	31 / 30 / 31	N/A	-	49
		Night	27 / 27 / 28	34 / 33 / 34	34 / 33 / 35	-	42
		Night Reduced Operations	25 / 24 / 26	31 / 30 / 32	31 / 30 / 32	-	42
	N5	Day	29 / 29 / 32	35 / 34 / 37	N/A	-	49
		Evening	29 / 29 / 32	35 / 34 / 38	N/A	-	49
		Night	29 / 29 / 32	35 / 34 / 37	35 / 35 / 38	-	42
		Night Reduced Operations	28 / 26 / 29	32 / 32 / 35	33 / 32 / 35	-	42
	N6	Day	31 / 31 / 34	35 / 35 / 37	N/A	-	49
		Evening	31 / 31 / 34	37 / 36 / 40	N/A	-	49
		Night	31 / 31 / 34	35 / 35 / 37	37 / 36 / 40	-	42
		Night Reduced Operations	29 / 28 / 32	32 / 32 / 35	35 / 34 / 37	-	42
	N7	Day	33 / 33 / 36	36 / 36 / 40	N/A	-	49

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
	N8	Evening	33 / 33 / 36	38 / 38 / 41	N/A	-	49
		Night	33 / 33 / 36	36 / 36 / 40	38 / 38 / 41	-	42
		Night Reduced Operations	30 / 30 / 33	34 / 34 / 37	35 / 35 / 38	-	42
		Day	25 / 24 / 27	28 / 28 / 30	N/A	-	49
		Evening	25 / 24 / 27	30 / 29 / 32	N/A	-	49
		Night	25 / 24 / 27	28 / 28 / 30	30 / 29 / 32	-	42
		Night Reduced Operations	22 / 21 / 24	26 / 24 / 27	27 / 26 / 29	-	42
		Day	30 / 29 / 32	35 / 35 / 37	N/A	-	49
	N9	Evening	30 / 29 / 32	36 / 35 / 38	N/A	-	49
		Night	30 / 29 / 32	35 / 35 / 37	36 / 35 / 38	-	42
		Night Reduced Operations	28 / 27 / 30	33 / 32 / 35	33 / 33 / 35	-	42

1. Highest predicted level to each receiver from the day, evening and night INP meteorological conditions (**Table 15**).
2. Levels shown in **bold** indicate an exceedance of the PA 06_0087 and/or PSNL criteria.

2018 Results Summary

In summary, the predicted daytime, evening and night-time intrusive LAeq(15minute) noise levels, show that:

- Exceedances of the PA 07_0087 noise limits are predicted at Locations E, F, G, and M. However, at locations E, F and M, PA 07_0087 noise limits have been set below the PSNLs. No exceedances of the PSNLs are predicted at locations E, F and M. Exceedances of the PSNL's are predicted at Locations G5, G6, G7, G8, G9, and N2. At Location G exceedance of the PA 07_0087 noise limits and PSNLs are predicted.
- During reduced night-operations compliance with the relevant PSNLs and PA 07_0087 noise limits are predicted at all receiver locations with the exception of G5, which is in the same ownership as Bloomfield and Location M. Given that compliance with the PSNLs and PA 07_0087 is predicted at Location M under Scenario 2, coal haulage is possible at any-time under prevailing weather conditions.

Table 21 Predicted Operating Intrusive LAeq(15minute) Noise Levels - 2021

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
Black Hill	E	Day	27 / 22 / 25	33 / 28 / 31	N/A	35	50
		Evening	27 / 22 / 25	29 / 22 / 25	N/A	35	47
		Night	27 / 22 / 25	33 / 28 / 31	33 / 28 / 31	35	45
		Night Reduced Operations	26 / 15 / 19	32 / 21 / 25	32 / 22 / 25	35	45
	F	Day	29 / 22 / 25	34 / 28 / 31	N/A	35	50
		Evening	29 / 22 / 25	28 / 22 / 23	N/A	35	47
		Night	29 / 22 / 25	34 / 28 / 31	34 / 28 / 31	35	45

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
Buchanan & Louth Park	F1	Night Reduced Operations	28 / 17 / 19	33 / 23 / 24	33 / 23 / 24	35	45
		Day	31 / 24 / 27	36 / 30 / 33	N/A	-	50
		Evening	31 / 24 / 27	31 / 25 / 26	N/A	-	47
		Night	31 / 24 / 27	36 / 30 / 33	36 / 30 / 33	-	45
		Night Reduced Operations	30 / 18 / 21	35 / 24 / 27	35 / 24 / 27	-	45
	F2	Day	32 / 25 / 28	37 / 31 / 34	N/A	-	50
		Evening	32 / 25 / 28	34 / 25 / 28	N/A	-	47
		Night	32 / 25 / 28	37 / 31 / 34	37 / 31 / 34	-	45
		Night Reduced Operations	31 / 19 / 22	36 / 24 / 27	36 / 25 / 27	-	45
	G	Day	29 / 29 / 30	35 / 35 / 36	N/A	39	45
		Evening	29 / 29 / 30	35 / 35 / 36	N/A	42	43
		Night	29 / 29 / 30	35 / 35 / 36	35 / 35 / 36	37	36
		Night Reduced Operations	25 / 24 / 24	30 / 30 / 30	30 / 30 / 30	37	36
	G1	Day	27 / 27 / 26	33 / 33 / 33	N/A	-	45
		Evening	27 / 27 / 26	33 / 33 / 33	N/A	-	43
		Night	27 / 27 / 26	33 / 33 / 33	33 / 33 / 33	-	36
		Night Reduced Operations	24 / 24 / 22	30 / 30 / 28	30 / 30 / 28	-	36
	G2	Day	26 / 26 / 26	32 / 32 / 32	N/A	-	45
		Evening	26 / 26 / 26	32 / 32 / 32	N/A	-	43
		Night	26 / 26 / 26	32 / 32 / 32	32 / 32 / 32	-	36
		Night Reduced Operations	23 / 22 / 20	29 / 28 / 27	29 / 28 / 27	-	36
	G3	Day	14 / 14 / 15	19 / 19 / 20	N/A	-	45
		Evening	14 / 14 / 15	19 / 19 / 20	N/A	-	43
		Night	14 / 14 / 15	19 / 19 / 20	19 / 19 / 20	-	36
		Night Reduced Operations	10 / 9 / 9	15 / 15 / 15	15 / 15 / 15	-	36
	G4	Day	11 / 11 / 13	17 / 17 / 19	N/A	-	45
		Evening	11 / 11 / 13	17 / 17 / 19	N/A	-	43
		Night	11 / 11 / 13	17 / 17 / 19	17 / 17 / 19	-	36
		Night Reduced Operations	7 / 7 / 8	13 / 13 / 14	13 / 13 / 14	-	36
	G5	Day	29 / 29 / 31	35 / 35 / 37	N/A	-	45
		Evening	29 / 29 / 31	35 / 35 / 37	N/A	-	43
		Night	29 / 29 / 31	35 / 35 / 37	35 / 34 / 37	-	36
		Night Reduced Operations	25 / 24 / 24	31 / 30 / 30	31 / 30 / 30	-	36
	G6	Day	27 / 27 / 28	32 / 32 / 34	N/A	-	45

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
Ashtonfield	G7	Evening	27 / 27 / 28	32 / 32 / 34	N/A	-	43
		Night	27 / 27 / 28	32 / 32 / 34	32 / 32 / 34	-	36
		Night Reduced Operations	22 / 21 / 24	28 / 27 / 30	28 / 27 / 30	-	36
		Day	27 / 27 / 28	33 / 32 / 34	N/A	-	45
		Evening	27 / 27 / 28	33 / 32 / 34	N/A	-	43
		Night	27 / 27 / 28	33 / 32 / 34	33 / 32 / 34	-	36
		Night Reduced Operations	22 / 21 / 22	28 / 26 / 28	28 / 27 / 28	-	36
		Day	27 / 27 / 29	33 / 33 / 34	N/A	-	45
	G8	Evening	27 / 27 / 29	33 / 33 / 34	N/A	-	43
		Night	27 / 27 / 29	33 / 33 / 34	33 / 32 / 34	-	36
		Night Reduced Operations	22 / 21 / 24	28 / 27 / 30	28 / 27 / 30	-	36
		Day	26 / 26 / 27	32 / 32 / 33	N/A	-	45
	G9	Evening	26 / 26 / 27	32 / 32 / 33	N/A	-	43
		Night	26 / 26 / 27	32 / 32 / 33	32 / 32 / 33	-	36
		Night Reduced Operations	21 / 21 / 23	27 / 27 / 28	27 / 27 / 29	-	36
		Day	12 / 15 / 17	18 / 20 / 22	N/A	35	45
Buttai	H	Evening	12 / 15 / 17	18 / 20 / 22	N/A	35	43
		Night	12 / 15 / 17	18 / 20 / 22	18 / 20 / 22	35	36
		Night Reduced Operations	9 / 13 / 13	15 / 19 / 18	15 / 18 / 18	35	36
		Day	25 / 27 / 25	31 / 32 / 31	N/A	35	39
	L	Evening	25 / 27 / 25	31 / 32 / 31	N/A	35	39
		Night	25 / 27 / 25	31 / 32 / 31	31 / 32 / 31	35	38
		Night Reduced Operations	24 / 26 / 20	30 / 32 / 26	30 / 32 / 26	35	38
		Day	17 / 19 / 16	23 / 25 / 23	N/A	-	39
	I	Evening	17 / 19 / 16	23 / 24 / 22	N/A	-	39
		Night	17 / 19 / 16	23 / 25 / 23	23 / 26 / 24	-	38
		Night Reduced Operations	17 / 19 / 12	23 / 25 / 19	23 / 26 / 19	-	38
	M	Day	33 / 28 / 31	38 / 33 / 37	N/A	39	49
		Evening	33 / 28 / 31	37 / 27 / 33	N/A	39	49
		Night	33 / 28 / 31	38 / 33 / 37	38 / 33 / 36	37	42
		Night Reduced Operations	32 / 21 / 26	36 / 25 / 31	37 / 26 / 31	37	42
	M1	Day	33 / 30 / 31	38 / 35 / 37	N/A		49
		Evening	33 / 30 / 31	36 / 28 / 32	N/A		49
		Night	33 / 30 / 31	38 / 35 / 37	38 / 35 / 37		42

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
		Night Reduced Operations	32 / 27 / 28	37 / 33 / 34	38 / 33 / 34		42
	N	Day	23 / 20 / 23	26 / 24 / 28	N/A	42	49
		Evening	23 / 20 / 23	27 / 25 / 29	N/A	42	49
		Night	23 / 20 / 23	26 / 24 / 28	27 / 25 / 29	35	42
		Night Reduced Operations	21 / 18 / 19	24 / 21 / 22	25 / 22 / 24	35	42
	N1	Day	24 / 21 / 29	27 / 25 / 34	N/A	-	49
		Evening	24 / 21 / 29	28 / 26 / 35	N/A	-	49
		Night	24 / 21 / 29	27 / 25 / 34	28 / 26 / 35	-	42
		Night Reduced Operations	23 / 19 / 27	26 / 22 / 31	27 / 24 / 32	-	42
	N2	Day	28 / 28 / 31	33 / 33 / 35	N/A	-	49
		Evening	28 / 28 / 31	33 / 33 / 37	N/A	-	49
		Night	28 / 28 / 31	33 / 33 / 35	33 / 34 / 37	-	42
		Night Reduced Operations	20 / 22 / 28	24 / 26 / 31	25 / 28 / 33	-	42
	N3	Day	30 / 29 / 31	35 / 34 / 37	N/A	-	49
		Evening	30 / 29 / 31	33 / 30 / 34	N/A	-	49
		Night	30 / 29 / 31	35 / 34 / 37	36 / 34 / 37	-	42
		Night Reduced Operations	29 / 27 / 28	33 / 33 / 34	34 / 33 / 34	-	42
	N4	Day	22 / 22 / 24	28 / 28 / 30	N/A	-	49
		Evening	22 / 22 / 24	25 / 24 / 28	N/A	-	49
		Night	22 / 22 / 24	28 / 28 / 30	28 / 28 / 30	-	42
		Night Reduced Operations	13 / 10 / 17	18 / 16 / 23	18 / 16 / 23	-	42
	N5	Day	25 / 24 / 28	29 / 29 / 34	N/A	-	49
		Evening	25 / 24 / 28	31 / 29 / 34	N/A	-	49
		Night	25 / 24 / 28	29 / 29 / 34	31 / 30 / 35	-	42
		Night Reduced Operations	22 / 18 / 24	27 / 22 / 29	28 / 24 / 30	-	42
	N6	Day	26 / 26 / 29	30 / 30 / 32	N/A	-	49
		Evening	26 / 26 / 29	32 / 32 / 34	N/A	-	49
		Night	26 / 26 / 29	30 / 30 / 32	32 / 32 / 34	-	42
		Night Reduced Operations	22 / 21 / 25	27 / 25 / 29	28 / 27 / 31	-	42
	N7	Day	29 / 28 / 32	33 / 32 / 36	N/A	-	49
		Evening	29 / 28 / 32	35 / 34 / 38	N/A	-	49
		Night	29 / 28 / 32	33 / 32 / 36	34 / 34 / 38	-	42
		Night Reduced Operations	26 / 24 / 30	30 / 28 / 33	31 / 29 / 35	-	42
	N8	Day	22 / 20 / 27	26 / 23 / 32	N/A	-	49

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
N9		Evening	22 / 20 / 27	27 / 25 / 32	N/A	-	49
		Night	22 / 20 / 27	26 / 23 / 32	27 / 25 / 32	-	42
		Night Reduced Operations	20 / 17 / 23	24 / 20 / 28	25 / 22 / 28	-	42
		Day	26 / 26 / 30	32 / 31 / 36	N/A	-	49
		Evening	26 / 26 / 30	32 / 31 / 36	N/A	-	49
		Night	26 / 26 / 30	32 / 31 / 36	32 / 32 / 36	-	42
		Night Reduced Operations	24 / 22 / 27	29 / 28 / 33	29 / 28 / 33	-	42

1. Highest predicted level to each receiver from the day, evening and night INP meteorological conditions (**Table 15**).
2. Levels shown in **bold** indicate an exceedance of the PA 06_0087 and/or PSNL criteria.

2021 Results Summary

In summary, the predicted daytime, evening and night-time intrusive LAeq(15minute) noise levels, show that:

- Exceedance of the PA 07_0087 noise limits are predicted at Location M. However, at this location PA 07_0087 noise limits have been set below the PSNLs. No exceedances of the PSNLs are predicted at location M.
- During reduced night-operations compliance with the relevant PSNLs and PA 07_0087 noise limits are predicted at all receiver locations.

Table 22 Predicted Operating Intrusive LAeq(15minute) Noise Levels - 2025

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
Black Hill	E	Day	26 / 20 / 26	31 / 26 / 32	N/A	35	50
		Evening	26 / 20 / 26	28 / 22 / 25	N/A	35	47
		Night	26 / 20 / 26	31 / 26 / 32	31 / 27 / 32	35	45
		Night Reduced Operations	25 / 14 / 19	30 / 20 / 24	30 / 21 / 24	35	45
	F	Day	26 / 18 / 16	32 / 24 / 22	N/A	35	50
		Evening	26 / 18 / 16	26 / 20 / 12	N/A	35	47
		Night	26 / 18 / 16	32 / 24 / 22	32 / 24 / 22	35	45
		Night Reduced Operations	26 / 16 / 9	32 / 22 / 15	32 / 22 / 15	35	45
	F1	Day	29 / 20 / 19	34 / 26 / 25	N/A	-	50
		Evening	29 / 20 / 19	30 / 23 / 16	N/A	-	47
		Night	29 / 20 / 19	34 / 26 / 25	34 / 26 / 25	-	45
		Night Reduced Operations	28 / 17 / 12	34 / 23 / 17	34 / 23 / 17	-	45
	F2	Day	30 / 23 / 30	36 / 29 / 36	N/A	-	50
		Evening	30 / 23 / 30	33 / 24 / 28	N/A	-	47
		Night	30 / 23 / 30	36 / 29 / 36	36 / 29 / 35	-	45

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
Buchanan & Louth Park	G	Night Reduced Operations	30 / 17 / 23	35 / 22 / 28	35 / 23 / 28	-	45
		Day	24 / 24 / 27	30 / 30 / 33	N/A	39	45
		Evening	24 / 24 / 27	30 / 30 / 33	N/A	42	43
		Night	24 / 24 / 27	30 / 30 / 33	30 / 30 / 33	37	36
	G1	Night Reduced Operations	22 / 23 / 24	28 / 29 / 30	28 / 29 / 30	37	36
		Day	21 / 21 / 24	27 / 27 / 30	N/A	-	45
		Evening	21 / 21 / 24	27 / 27 / 30	N/A	-	43
		Night	21 / 21 / 24	27 / 27 / 30	27 / 27 / 30	-	36
	G2	Night Reduced Operations	20 / 20 / 22	26 / 26 / 28	26 / 26 / 28	-	36
		Day	20 / 21 / 24	26 / 27 / 30	N/A	-	45
		Evening	20 / 21 / 24	26 / 27 / 30	N/A	-	43
		Night	20 / 21 / 24	26 / 27 / 30	26 / 27 / 30	-	36
	G3	Night Reduced Operations	19 / 20 / 22	25 / 26 / 28	25 / 26 / 28	-	36
		Day	9 / 9 / 13	15 / 15 / 18	N/A	-	45
		Evening	9 / 9 / 13	15 / 15 / 18	N/A	-	43
		Night	9 / 9 / 13	15 / 15 / 18	15 / 15 / 18	-	36
	G4	Night Reduced Operations	8 / 8 / 9	14 / 13 / 15	14 / 14 / 15	-	36
		Day	7 / 8 / 11	13 / 14 / 16	N/A	-	45
		Evening	7 / 8 / 11	13 / 14 / 16	N/A	-	43
		Night	7 / 8 / 11	13 / 14 / 16	14 / 14 / 17	-	36
	G5	Night Reduced Operations	6 / 6 / 7	12 / 12 / 13	12 / 12 / 13	-	36
		Day	25 / 26 / 28	31 / 31 / 34	N/A	-	45
		Evening	25 / 26 / 28	31 / 31 / 34	N/A	-	43
		Night	25 / 26 / 28	31 / 31 / 34	31 / 31 / 34	-	36
	G6	Night Reduced Operations	23 / 24 / 25	29 / 30 / 31	29 / 30 / 31	-	36
		Day	24 / 24 / 26	29 / 30 / 32	N/A	-	45
		Evening	24 / 24 / 26	29 / 30 / 32	N/A	-	43
		Night	24 / 24 / 26	29 / 30 / 32	29 / 30 / 32	-	36
	G7	Night Reduced Operations	21 / 22 / 22	27 / 28 / 28	27 / 28 / 28	-	36
		Day	24 / 24 / 26	30 / 29 / 32	N/A	-	45
		Evening	24 / 24 / 26	30 / 29 / 32	N/A	-	43
		Night	24 / 24 / 26	30 / 29 / 32	30 / 29 / 32	-	36
	G8	Night Reduced Operations	20 / 20 / 22	26 / 26 / 28	27 / 26 / 28	-	36
		Day	24 / 25 / 27	30 / 30 / 33	N/A	-	45

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
Ashtonfield	G9	Evening	24 / 25 / 27	30 / 30 / 33	N/A	-	43
		Night	24 / 25 / 27	30 / 30 / 33	30 / 30 / 33	-	36
		Night Reduced Operations	21 / 21 / 23	27 / 27 / 29	27 / 27 / 29	-	36
		Day	23 / 23 / 25	29 / 29 / 31	N/A	-	45
		Evening	23 / 23 / 25	29 / 29 / 31	N/A	-	43
		Night	23 / 23 / 25	29 / 29 / 31	29 / 29 / 31	-	36
		Night Reduced Operations	20 / 20 / 21	26 / 26 / 27	26 / 26 / 27	-	36
		Day	12 / 15 / 14	18 / 20 / 19	N/A	35	45
	H	Evening	12 / 15 / 14	18 / 20 / 19	N/A	35	43
		Night	12 / 15 / 14	18 / 20 / 19	18 / 20 / 19	35	36
		Night Reduced Operations	10 / 13 / 10	15 / 18 / 15	15 / 18 / 15	35	36
		Day	24 / 27 / 20	30 / 32 / 27	N/A	35	39
	I	Evening	24 / 27 / 20	30 / 32 / 27	N/A	35	39
		Night	24 / 27 / 20	30 / 32 / 27	30 / 32 / 27	35	38
		Night Reduced Operations	24 / 26 / 14	29 / 32 / 20	29 / 31 / 21	35	38
		Day	17 / 18 / <10	23 / 24 / <10	N/A	-	39
Buttai	M	Evening	17 / 18 / <10	23 / 23 / <10	N/A	-	39
		Night	17 / 18 / <10	23 / 24 / <10	23 / 24 / <10	-	38
		Night Reduced Operations	17 / 18 / <10	23 / 24 / <10	23 / 24 / <10	-	38
		Day	31 / 22 / 32	36 / 27 / 38	N/A	39	49
	M1	Evening	31 / 22 / 32	36 / 24 / 32	N/A	39	49
		Night	31 / 22 / 32	36 / 27 / 38	36 / 28 / 37	37	42
		Night Reduced Operations	31 / 19 / 26	35 / 23 / 31	36 / 25 / 31	37	42
		Day	30 / 24 / 31	35 / 30 / 37	N/A		49
	N	Evening	30 / 24 / 31	34 / 25 / 31	N/A		49
		Night	30 / 24 / 31	35 / 30 / 37	35 / 30 / 37		42
		Night Reduced Operations	29 / 18 / 24	34 / 22 / 29	34 / 24 / 29		42
		Day	20 / 16 / 25	24 / 19 / 29	N/A	42	49
	N1	Evening	20 / 16 / 25	25 / 21 / 30	N/A	42	49
		Night	20 / 16 / 25	24 / 19 / 29	25 / 21 / 29	35	42
		Night Reduced Operations	19 / 15 / 20	24 / 18 / 24	24 / 20 / 24	35	42
		Day	20 / 18 / 24	23 / 22 / 28	N/A	-	49
		Evening	20 / 18 / 24	25 / 23 / 29	N/A	-	49
		Night	20 / 18 / 24	23 / 22 / 28	25 / 23 / 29	-	42

Locality Area	Location	Period	Predicted Intrusive Noise Level ^{1,2} (dBA) Scenario 1/Scenario 2/Scenario 3			Noise Assessment Criteria (dBA)	
			Calm	Prevailing Wind	Temperature Inversion	PA 07_0087	PSNL
		Night Reduced Operations	19 / 17 / 20	23 / 20 / 24	24 / 22 / 25	-	42
	N2	Day	28 / 28 / 29	32 / 33 / 33	N/A	-	49
		Evening	28 / 28 / 29	33 / 34 / 34	N/A	-	49
		Night	28 / 28 / 29	32 / 33 / 33	33 / 34 / 34	-	42
		Night Reduced Operations	25 / 26 / 25	29 / 30 / 28	30 / 31 / 30	-	42
	N3	Day	27 / 24 / 29	32 / 30 / 35	N/A	-	49
		Evening	27 / 24 / 29	32 / 27 / 33	N/A	-	49
		Night	27 / 24 / 29	32 / 30 / 35	33 / 30 / 35	-	42
		Night Reduced Operations	26 / 22 / 25	30 / 27 / 31	32 / 28 / 31	-	42
	N4	Day	17 / 16 / 25	23 / 22 / 31	N/A	-	49
		Evening	17 / 16 / 25	21 / 20 / 30	N/A	-	49
		Night	17 / 16 / 25	23 / 22 / 31	23 / 22 / 31	-	42
		Night Reduced Operations	13 / 10 / 18	18 / 16 / 24	19 / 17 / 24	-	42
	N5	Day	25 / 24 / 28	29 / 30 / 32	N/A	-	49
		Evening	25 / 24 / 28	30 / 30 / 34	N/A	-	49
		Night	25 / 24 / 28	29 / 30 / 32	31 / 30 / 34	-	42
		Night Reduced Operations	23 / 23 / 24	27 / 28 / 29	29 / 29 / 30	-	42
	N6	Day	25 / 25 / 28	29 / 28 / 33	N/A	-	49
		Evening	25 / 25 / 28	31 / 31 / 34	N/A	-	49
		Night	25 / 25 / 28	29 / 28 / 33	31 / 31 / 34	-	42
		Night Reduced Operations	23 / 23 / 25	28 / 26 / 29	28 / 29 / 30	-	42
	N7	Day	27 / 26 / 31	31 / 30 / 36	N/A	-	49
		Evening	27 / 26 / 31	33 / 32 / 36	N/A	-	49
		Night	27 / 26 / 31	31 / 30 / 36	33 / 32 / 36	-	42
		Night Reduced Operations	25 / 24 / 27	29 / 28 / 31	30 / 29 / 32	-	42
	N8	Day	21 / 17 / 32	26 / 20 / 37	N/A	-	49
		Evening	21 / 17 / 32	27 / 22 / 37	N/A	-	49
		Night	21 / 17 / 32	26 / 20 / 37	26 / 22 / 37	-	42
		Night Reduced Operations	20 / 14 / 27	25 / 18 / 31	25 / 19 / 31	-	42
	N9	Day	25 / 25 / 28	31 / 30 / 33	N/A	-	49
		Evening	25 / 25 / 28	31 / 31 / 34	N/A	-	49
		Night	25 / 25 / 28	31 / 30 / 33	31 / 31 / 34	-	42
		Night Reduced Operations	24 / 23 / 25	29 / 29 / 30	29 / 29 / 31	-	42

1. Highest predicted level to each receiver from the day, evening and night INP meteorological conditions (**Table 15**).
2. Levels shown in **bold** indicate an exceedance of the PA 06_0087 and/or PSNL criteria.

2025 Results Summary

In summary, the predicted daytime, evening and night-time intrusive LAeq(15minute) noise levels, show that:

- Exceedance of the PA 07_0087 noise limits are predicted at Location M. However, at this location PA 07_0087 noise limits have been set below the PSNLs. No exceedances of the PSNLs are predicted at location M.
- During reduced night-operations compliance with the relevant PSNLs and PA 07_0087 noise limits are predicted at all receiver locations.

6.4 Predicted Intrusive Noise Discussion and Noise Management

Predicted noise levels show that, generally, Project operations have the potential to exceed the relevant PSNLs and PA 07_0087 noise limits under prevailing noise enhancing weather conditions. During reduced night-time operations noise levels at all locations are predicted to meet the relevant PSNLs and PA 07_0087 noise limits under prevailing noise enhancing weather conditions with the exception of Locations G5 and M.

Current mining activities at Bloomfield Colliery are guided by predicted upcoming weather conditions and mining areas that may pose a noise risk (due to working heights, topographical shielding etc) under those weather conditions. This allows for the scheduling of mining operations to reduce noise impacts to the surrounding receivers as much as practicable. Given the flexibility in mining operations, fleet composition and haul routes, the Project would be able to meet the relevant PSNLs and PA 07_0087 noise limits at all locations, with the exception of Location G5, under prevailing weather conditions.

6.5 Sleep Disturbance

In assessing sleep disturbance, typical L_{max} noise levels of acoustically significant plant and equipment to be used at the subject site were used as input to the acoustic model and predictions of noise emissions were made at the nearest residential areas under adverse weather conditions at night. Noise events considered included loading haul trucks, haul truck movements, dozer and front end loader operations as well as haul trucks dumping.

The use of the L_{max} noise level provides a worst-case prediction since the LA1(1minute) noise level of a noise event is less than the L_{max}.

A summary of the highest predicted sleep disturbance noise levels at the most affected locations from the assessed mining years are contained within **Table 23**.

Table 23 Predicted Maximum Night-time L_{max} Noise Levels

Receptor ID ¹	Locality	Predicted Night-time L _{max} Noise Level ¹ Night / Night - Reduced Operations			Noise Assessment Criteria LA1(1minute) (dBA)	
		2018	2021	2025	SDNL	PA 07_0087
E	Black Hill	38 / 38	38 / 32	39 / 38	55	45
F ²		39 / 39	39 / 34	39 / 39	55	45
F1		42 / 42	42 / 36	42 / 42	55	-
F2		43 / 43	43 / 37	43 / 43	55	-
M	Buttai	45 / 45	45 / 40	45 / 45	52	46
M1		45 / 45	43 / 41	44 / 43	52	-
N		39 / 39	34 / 31	36 / 34	52	46
N1		52 / 52	42 / 38	35 / 33	52	-

Receptor ID ¹	Locality	Predicted Night-time L _{Amax} Noise Level ¹			Noise Assessment Criteria	
		Night / Night - Reduced Operations			LA1(1minute) (dBA)	
		2018	2021	2025	SDNL	PA 07_0087
N2		48 / 48	39 / 39	43 / 43	52	-
N3		43 / 42	39 / 39	41 / 39	52	-
N4		37 / 37	32 / 30	38 / 29	52	-
N5		41 / 40	37 / 34	39 / 37	52	-
N6		42 / 42	40 / 40	39 / 37	52	-
N7		44 / 44	43 / 43	42 / 39	52	-
N8		36 / 36	41 / 41	44 / 40	52	-
N9		40 / 39	39 / 39	38 / 37	52	-
G	Buchanan	39 / 39	40 / 40	38 / 38	46	45
G1		36 / 36	36 / 36	34 / 34	46	-
G2		36 / 36	36 / 36	34 / 34	46	-
G3		25 / 25	23 / 22	23 / 21	46	-
G4		22 / 22	21 / 20	20 / 18	46	-
G5 ³		41 / 41	41 / 41	40 / 40	46	-
G6		39 / 39	37 / 37	36 / 36	46	-
G7		39 / 39	37 / 37	36 / 36	46	-
G8		39 / 39	37 / 37	36 / 36	46	-
G9		38 / 38	35 / 34	35 / 35	46	-
H	Louth Park	26 / 25	27 / 24	23 / 23	46	45
L	Ashtonfield	39 / 39	39 / 39	39 / 39	48	45
I		32 / 32	32 / 32	32 / 32	48	-

1. Highest predicted level to each receiver from the night INP meteorological conditions (**Table 15**)

As presented in **Table 23** predicted maximum night-time noise levels meet the relevant SDNLs and PA 07_0087 noise limits at all the nearest residential receiver areas.

6.6 Cumulative Noise Impact Assessment

Existing, approved and proposed mining in the vicinity of the Project includes the existing Abel Underground Mine, Donaldson Open Cut Mine and the Tasman Extension Underground Mine.

Given the separation distance between the Tasman Extension Underground Mine and the Project, cumulative impacts are expected to be negligible and therefore have not been considered. Donaldson Open Cut Mine has ceased production and all major earthworks on the site have been finalised. Therefore cumulative impacts from the Donaldson Open Cut Mine have not been considered.

Furthermore, Abel Underground Mine was placed on Care & Maintenance on 28 April 2016, however given that future operation of the site is possible, and the current use of the Bloomfield Coal Handling and Preparation Plant (CHPP) under the Abel Underground Mine consent cumulative impacts have been assessed.

6.6.1 LAeq(period) Cumulative Noise Impact Assessment Criteria

The INP provides non-mandatory cumulative noise assessment guidelines that address existing and successive industrial development by setting acceptable (and maximum) cumulative LAeq(period) noise amenity levels for all non-transport related industrial noise sources in a receiver area. It is noted that the INP does not set acceptable cumulative LAeq(15minute) intrusive criteria for all industrial noise sources, but rather seeks to control cumulative noise via LAeq(period) noise amenity criterion.

As presented in **Section 2.3**, PA 07_0087 contains cumulative noise criteria for the Project combined with other mines in the area based upon a combination of the suburban and rural acceptable LAeq(period) noise amenity levels outlined in **Table 4**.

6.6.2 Cumulative Noise Levels

To assess the cumulative impacts from the Project and Able Underground Mine, predicted intrusive noise levels (i.e LAeq(15minute)) from the Project and Able Underground Mine have been logarithmically added, with the resulting noise level adjusted (by -3 dB) to the equivalent amenity level (i.e LAeq(period)) for comparison with the relevant amenity criteria for each location.

The predicted cumulative amenity levels during adverse weather conditions are presented in **Table 24**.

Table 24 Cumulative Noise Levels

Location	Period	Intrusive Predicted Noise Level LAeq(15minute) (dBA)		Cumulative Amenity Level LAeq(period)	Amenity Criteria (LAeq)
		Abel Underground Mine	Project - Highest Predicted Managed Noise Level		
E	Day	30	34	32	50
	Evening	32	31	32	45
	Night	30	34	32	40
F	Day	32	33	33	50
	Evening	34	30	32	45
	Night	33	35	34	40
G	Day	30	39	37	50
	Evening	30	39	37	45
	Night	30	36	34	40
H	Day	30	30	30	50
	Evening	30	30	30	45
	Night	30	30	30	40
I	Day	36	30	34	50
	Evening	36	30	34	45
	Night	36	30	34	40
L	Day	40	34	38	50
	Evening	40	34	38	45
	Night	40	33	38	40

The cumulative noise levels from the Project plus the Abel Underground Mine are not predicted to exceed the amenity criteria at relevant receiver locations or on more than 25 percent of, any privately owned land, with the exception of Lot 30/DP1113350 (vacant land within the mining lease).

Noise from Bloomfield coal haulage operations (i.e. Scenario 1 and Scenario 2) are predicted to exceed the relevant $L_{Aeq(period)}$ amenity criteria on more than 25 percent of Lot 30/DP1113350, however no exceedance is predicted during overburden operations (Scenario 3). Given the land is within 40 m of the existing haul route, mitigation of noise across Lot 30/DP1113350 would not be considered reasonable and feasible. Furthermore, it is noted that the Project does not seek to modify operations of the existing haul routes in the vicinity of Lot 30/DP1113350, and as such noise levels from Bloomfield Colliery on Lot 30/DP1113350 would not increase due to the Project.

7 BLASTING IMPACT ASSESSMENT

7.1 Blasting Assessment Criteria

7.1.1 Australian Standard Criteria

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

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

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

7.1.2 Human Comfort Airblast and Vibration Criteria

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

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

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

7.2 Assessment of Blasting Impacts

In order to predict the levels of blast emissions (ground vibration and airblast) at the surrounding receivers from the Project, the measured ground vibration and airblast levels from blasting operations conducted in 2014 to 2016 were used to develop blast emissions site laws.

7.3 Blast Emission Site Laws

For each site law, using statistical analysis of the measured data and assuming a log-normal distribution of data, a 95% confidence line and 50% confidence levels were determined. The ground vibration and airblast criteria advocated by the EPA and ANZECC (refer to **Section 7.1.2**), cater for the inherent variation in emission levels from a given blast design by allowing a five percent exceedance of a general criterion up to a (never to be exceeded) maximum. Correspondingly, the "5% exceedance" (95% confidence) levels have been used in the blast emission site laws.

The 5% site laws for ground vibration and airblast are:

Ground Vibration

$$\text{PVS (5\%)} = 2275 (\text{SD}_1)^{-1.6}$$

Airblast

$$\text{SPL(5\%)} = 174 - 25 \log (\text{SD}_2)$$

where PVS (5%) and SPL (5%) are the levels of ground vibration (Peak Vector Sum - mm/s) and airblast (dB Linear) respectively, above which 5% of the total population (of data points) will lie, assuming that the population has the same statistical distribution as the underlying measured sample.

SD_1 and SD_2 are the ground vibration and airblast scaled distances, where:

$$\text{SD}_1 = \frac{\text{Distance}}{\sqrt{\text{MIC}}} \quad (\text{m.kg}^{-0.5})$$

and,

$$\text{SD}_2 = \frac{\text{Distance}}{3\sqrt{\text{MIC}}} \quad (\text{m.kg}^{-0.33})$$

where MIC is maximum instantaneous explosive charge in kg.

7.4 95% MIC and Blast Emissions Predictions

The approach of this assessment was to determine the limiting factors to the blast design for the Modification with the aim of achieving the relevant criteria at all locations. Calculations were conducted using the respective 5% site law equations in order to determine the Maximum Instantaneous Charge (MIC).

Table 25 5% MIC and Blast Emissions Predictions

Year	Approximate Distance to Nearest Receiver (m)	MIC Based on Ground Vibration or Airblast (kg)	Blast Emission Prediction Based on MIC	
			Predicted PVS Ground Vibration (mm/s)	Predicted Airblast Level (dB Linear)
2018	1500	280	1.7	115
2021	1200	145	1.4	115
2025	1500	280	1.7	115

The levels of airblast and ground vibration have been predicted using the developed site laws for Bloomfield Colliery. The maximum instantaneous charge (MIC) may exceed (or be less than) the values in **Table 25**, depending on the location of the area being mined and its relation to the nearest affected receiver. Bloomfield will continue to utilise independent technical advice with regards to initiation techniques and timing as well as blast hole loading profiles to control the airblast and ground vibration impacts from mine blasting.

Bloomfield Colliery currently has a network of blast monitors within the surrounding residential areas which are used to provide feedback on ground vibration and airblast levels for each blast. Data collected from the monitors is correlated with blast parameters such as charge weight and location and used to ensure future blasts are adequately designed to avoid exceedances of appropriate noise and vibration criteria. This feedback and design process will continue to be appropriate for future blasts within the Project disturbance boundary.

8 CONCLUSION

SLR Consulting has conducted a NVIA for the proposed Project.

Operational Noise Modelling

A computer model was used to predict noise emissions from the operation of the Project.

Operational noise levels are predicted to meet the relevant project specific and PA 07_0087 noise levels at all receiver locations under calm and prevailing weather conditions provided existing noise management practices as described in **Section 6.4** are implemented as appropriate.

Sleep Disturbance Assessment

The predicted L_{Amax} noise levels meet the sleep disturbance criteria at all locations and therefore, are not likely to cause sleep disturbance at any assessed residential location.

Cumulative Impact Assessment

The cumulative impact of mining in the area surrounding the Project, including the Abel Underground Mine, is predicted to comply with the relevant amenity criteria set in accordance with the INP and PA 07_0087, at relevant receiver locations or on more than 25 percent of, any privately owned land, with the exception of Lot 30/DP1113350 (vacant land within the mining lease).

Blasting

Calculations were conducted in order to estimate the 5% exceedance MICs for compliance with the relevant vibration and airblast criteria at the nearest sensitive receivers. The maximum instantaneous charge (MIC) may exceed (or be less than) the predicted values depending on the location of the area being mined and its relation to the nearest affected receiver.

Data collected from blasts within the Project disturbance boundary will be monitored and managed to ensure future blasts are adequately designed to avoid exceedances of appropriate noise and vibration criteria. This feedback and design process will continue to be appropriate for future blasts within the Project disturbance boundary.

Noise impact assessment for the modification of existing industrial premises

Background

(see INP Section 10)

Section 10 of the NSW Industrial Noise Policy (INP) outlines the application of the policy to existing industrial premises.

As well as being used to assess noise emissions from new industrial premises, the INP is also applied to situations where existing industrial premises are modified, expanded or upgraded.

Where a modification is proposed, the noise level targets for the premises (termed Project Specific Noise Levels) are to be determined firstly excluding any noise from the subject premises. The noise from the existing premises is then assessed against these targets to determine if there is a need to consider noise mitigation for existing operations. The predicted noise level from the proposed modification is then assessed, both in isolation and in combination with noise from the existing premises.

The total noise emissions from the modified premises should ideally not exceed the Project Specific Noise Levels. If the existing premises cannot achieve these targets, the allowable noise emissions from the proposed modification will be set so that the modification does not significantly increase the existing noise emissions.

Recommended approach

This application note outlines these processes together with the degree of information required to support a proper assessment of modifications to an existing industrial premises.

A noise impact assessment for the modification of existing industrial premises should include, as a minimum:

- existing noise criteria contained in consents, approvals or licences, that are applicable to the premises;
- Project Specific Noise Levels (PSNLs) for the premises determined in accordance with the INP and relevant application notes (see, for example, Appendix A4 of the INP). Note: care should be taken to exclude noise from the existing premises when quantifying background and existing industrial noise levels (further guidance is in the INP in Section 11.1.2);
- where application of the INP results in a PSNL more stringent than existing noise criteria, the PSNL should be adopted for noise assessment purposes. Note: the INP acknowledges that the PSNL is a goal sought to be achieved through the application of feasible and reasonable noise mitigation measures and is not necessarily applied as a statutory limit by default.
- measured or predicted noise levels from the existing premises at noise sensitive receiver locations;
- predicted noise contribution from the proposed modification, in isolation, at noise sensitive receiver locations; and
- cumulative noise levels from the entire premises (i.e. combined level from existing and proposed modification) compared to the PSNL.

Where noise from the existing premises exceeds the PSNL

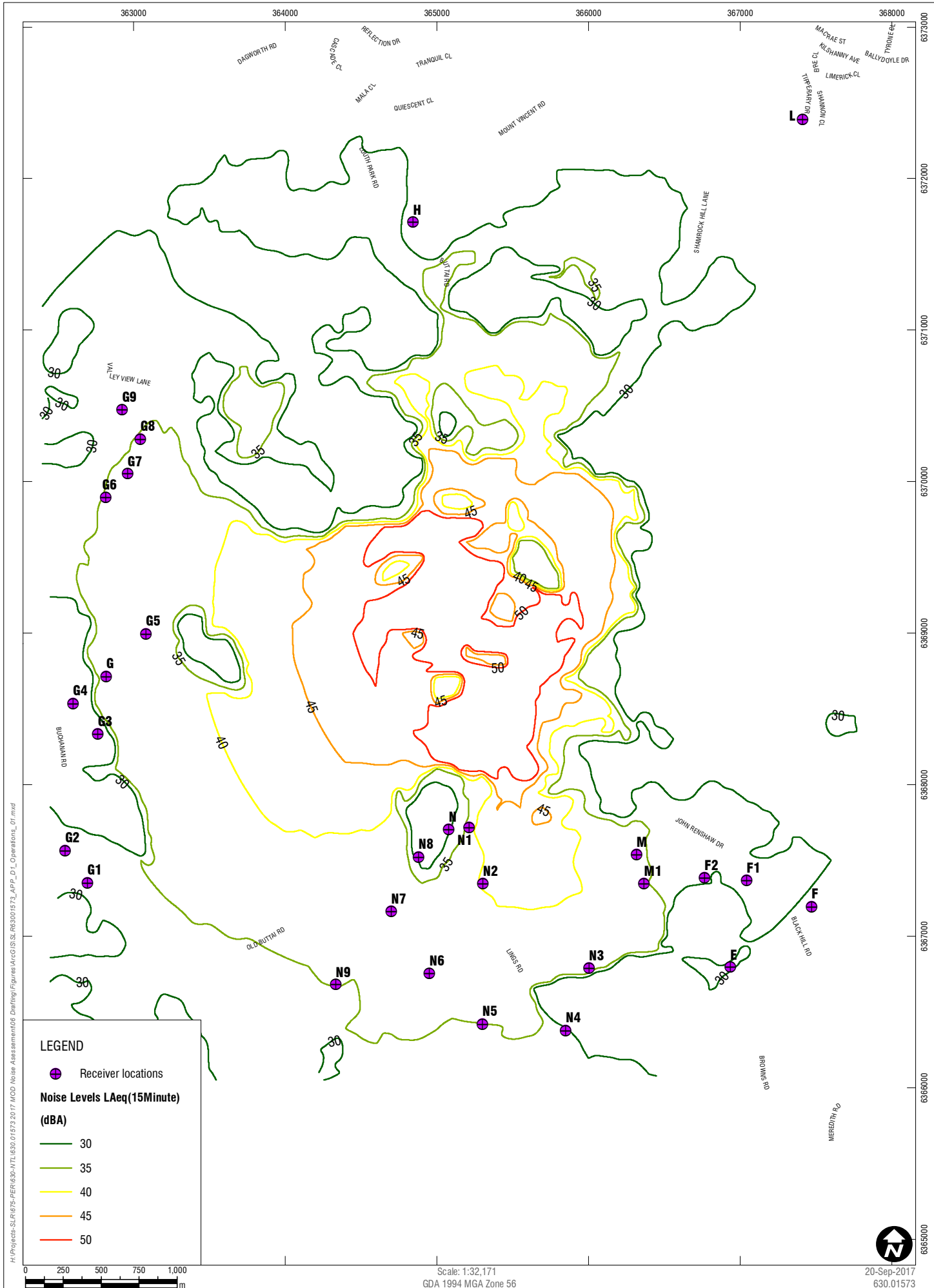
Where it can be determined that noise from the existing premises alone is currently exceeding the PSNL, a preliminary analysis of potential noise mitigation measures, and conceptual noise reductions, needs to be undertaken for the existing premises. Note: this does not mean that in all circumstances noise mitigation to existing premises will be required as part of a modification. Decisions of this nature will be determined on a case by case basis, taking into account various factors, for example, feasible and reasonable mitigation options, the absolute level of noise and existing measures of community impact, including complaints.

Once the conceptual mitigated level of noise performance of the existing premises (i.e. what can be achieved) has been determined, the contribution noise level goal for the modification can be determined. The noise level goal for the modification should be set at least 10dB below the PSNL, or where it has been determined that the existing premises cannot achieve the PSNL, it should be set at least 10dB below the conceptual mitigated noise performance of the existing premises.

This approach is designed to ensure that noise from the modification does not become the limiting factor in noise from the entire premises potentially meeting the PSNL

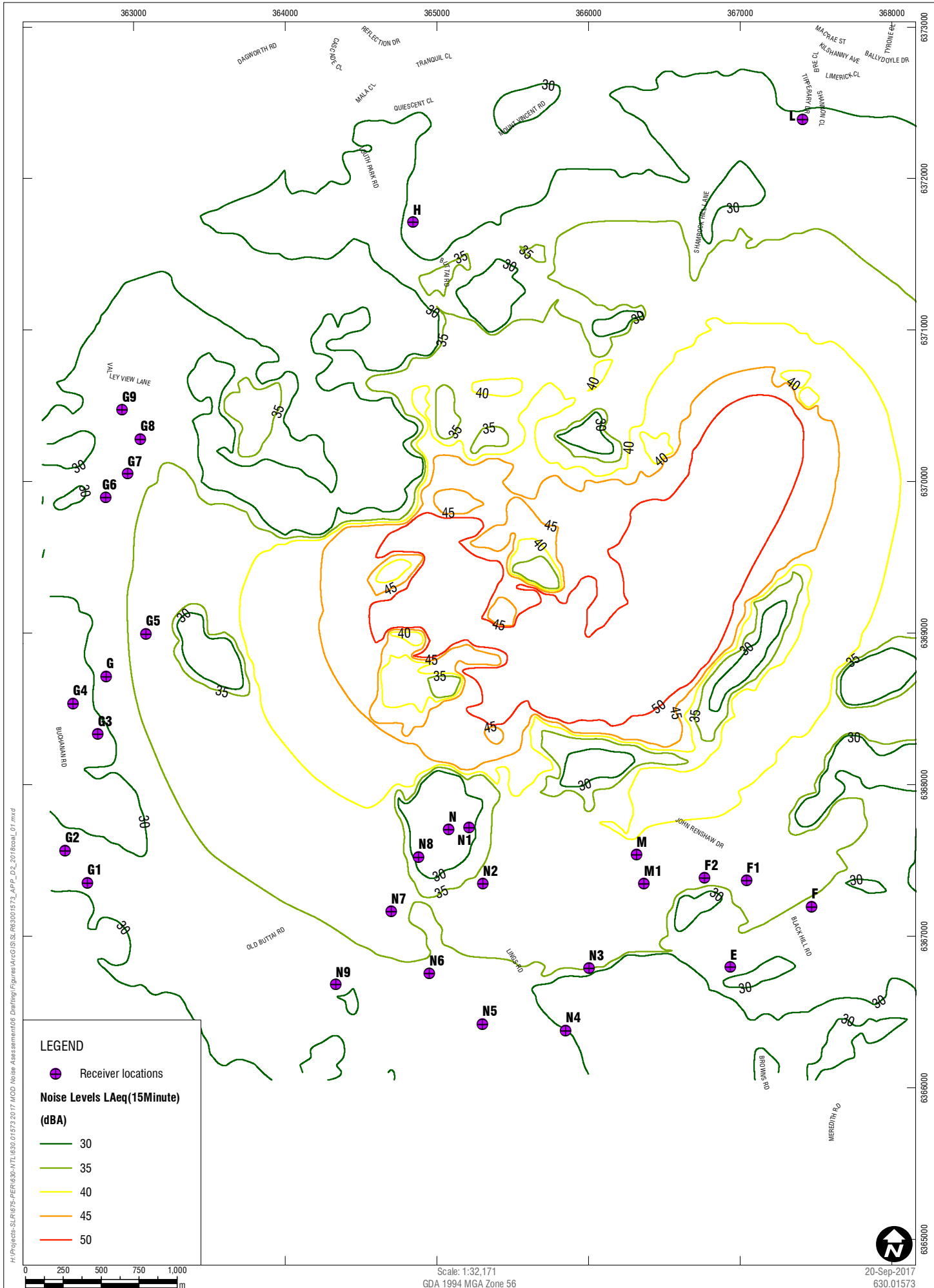


Equipment Description	Sound Power Level (SWL) Octave Band Centre Frequency (Hz) - dBA re 1pW										dBA Overall SWL
	31.5	63	125	250	500	1k	2k	4k	8k	16k	
Hitachi Excavator 5500	54	78	96	103	103	109	110	108	102	90	115
Caterpillar Rear Dump Trucks 789	67	82	93	103	106	106	105	104	96	81	112
Caterpillar 777 Watercart	67	82	93	103	106	106	105	104	96	81	112
Caterpillar Rear Dump Trucks 793	66	82	101	100	108	108	106	100	92	78	113
Caterpillar Front End Loader 992	77	90	99	103	103	106	107	110	104	91	114
Caterpillar Dozer D11	84	97	104	113	113	109	110	103	98	83	118
Caterpillar Dozer D10	84	97	104	113	113	109	110	103	98	83	118
Caterpillar Grader 24G	71	84	98	99	104	106	105	106	101	92	112
SK75 Drill	66	83	95	103	111	111	110	106	99	85	116
SK50 Drill	58	75	89	100	107	107	107	103	98	86	113



Sheet Size : A4

2018 Overburden Night Reduced Operations F Class Inversion



Sheet Size : A4

2018 Coaling Night Reduced Operations F Class Inversion

