Invincible Colliery

Environmental Noise Monitoring

Quarter 4 2021

Prepared for

Castlereagh Coal

Global Acoustics

Noise and Vibration Analysis and Solutions

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Invincible Colliery

Environmental Noise Monitoring Quarter 4 2021

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Prepared for

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Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Castlereagh Coal to conduct a quarterly noise survey of operations at Invincible Colliery (the site), an open cut coal mine north-west of Lithgow. The purpose of the survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended environmental noise monitoring described in this report was conducted during the day period of 13 December 2021 at three monitoring locations around the site.

The site is currently under care and maintenance, therefore monitoring was not undertaken during the evening or night periods, as there are no activities occurring on site during these times.

There is unlikely to be noise impact from site, as operations have been significantly reduced. The monitoring program has been modified slightly to take this into account. The duration of each day measurement was 10 minutes if no site noise was audible. If site activities were audible, the measurement duration was increased to 15 minutes.

1.2 Attended Noise Monitoring Locations

Monitoring locations are detailed in Table 1.1 and shown on Figure 1. It should be noted that Figure 1 shows the actual monitoring position, not the location of residences.

Table 1.1: ATTENDED NOISE MONITORING LOCATIONS

Descriptor	Owner	Monitoring Location
Cullen Bullen Centre	M. Crane	Mudgee Road
Cullen Bullen West	-	Off Carson Siding Road and Farley Street
Cullen Bullen South	R. Crane	Off Cullen Valley Haul Road

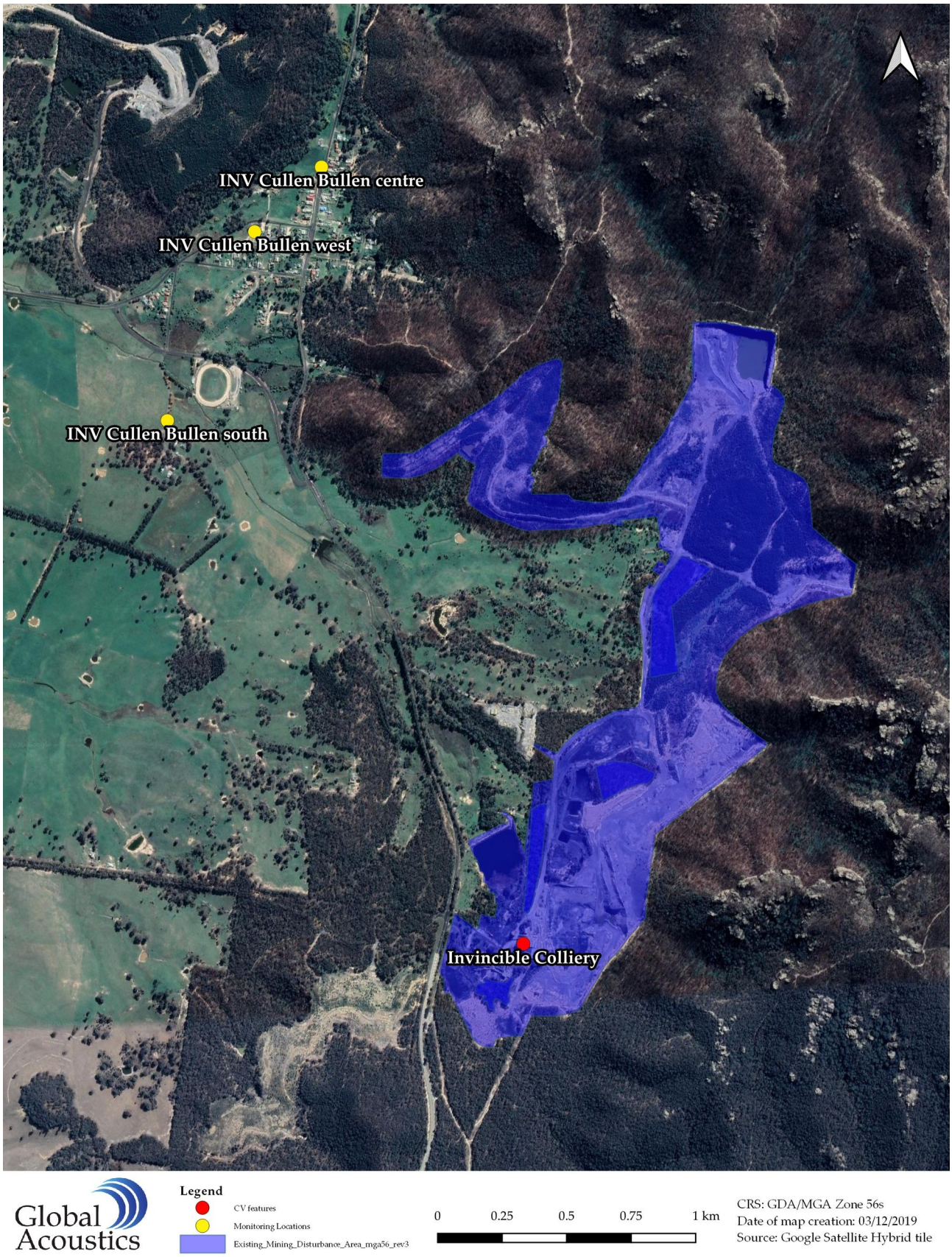

Figure 1: Invincible Colliery Attended Noise Monitoring Locations

1.3 Terminology & Abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise.
L_{Amax}	The maximum A-weighted noise level over a time period.
L_{A1}	The noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The average noise A-weighted energy during a measurement period.
L_{A50}	The noise level which is exceeded for 50 per cent of the time and the median noise level during a measurement period.
L_{A90}	The level exceeded for 90 percent of the time. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
SC	Stability class (or category) is determined from measured wind speed and either sigma-theta or VTG.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	This is the period 7:00am to 6:00pm.
Evening	This is the period 6:00pm to 10:00pm.
Night	This is the period 10:00pm to 7:00am.

2 REGULATOR REQUIREMENTS AND NOISE CRITERIA

2.1 Project Approval

The most current approval associated with activities at Invincible Colliery is 07_0127 (MOD 5, February 2018) Schedule 3 and Appendix 4 of the project approval detail specific conditions relating to noise generated by the site. Relevant sections of the project approval are reproduced in Appendix A.

Noise impact assessment criteria as described in the project approval are detailed in Table 2.1.

Table 2.1: INVINCIBLE COLLIERY PROJECT APPROVAL NOISE IMPACT ASSESSMENT CRITERIA, dB

Location	Day	Evening	Night	
	$L_{Aeq,15minute}$	$L_{Aeq,15minute}$	$L_{Aeq,15minute}$	$L_{A1,1minute}$
All Privately owned land	35	35	35	45

Notes:

1. *An agreement with respect to noise emissions has been negotiated between Invincible Colliery and the owner of "Billabong" and "Hillview" properties. Therefore noise criteria at these two locations do not apply in accordance with Schedule 3, Condition 2 of the project approval.*

The noise criteria in Table 2.1 do not apply under meteorological conditions of:

(a) *wind speeds greater than 3 m/s at 10 metres above ground level; or*

(b) *temperature inversion conditions between 1.5°C and 3°C/100m* (F stability class) *and wind speeds greater than 2 m/s at 10 metres above ground level; or*

(c) *temperature inversion conditions greater than 3°C/100m* (G stability class).

2.2 Environment Protection Licence

Invincible Colliery holds Environment Protection Licence (EPL) No. 1095 issued by the Environment Protection Authority (EPA) most recently on 14 May 2015. Noise requirements are detailed in condition L4 of the EPL. Noise impact assessment criteria as described in the EPL are summarised in Table 2.2.

Table 2.2: INVINCIBLE COLLIERY EPL NOISE CRITERIA, dB

Location	Day	Evening	Night
	$L_{Aeq,15minute}$	$L_{Aeq,15minute}$	$L_{Aeq,15minute}$
All Privately owned land	40	35	35

The noise criteria in Table 2.2 apply under all meteorological conditions except:

- *during rain and wind speeds (at 10m height) greater than 3m/s; and*
- *under "non-significant" weather conditions.*

The EPA has confirmed with Global Acoustics that non-significant weather conditions are those that occur less than 30% of the time. The most recent noise impact assessment for Invincible Colliery was undertaken by Umwelt as part of the Southern Extension Project in 2016. The wind rose data in Appendix C of that assessment indicates that only NE and ENE winds occur more than 30% of the time at this particular site during the day or evening. Therefore, the EPL noise criteria in Table 2.2 only apply under NE and ENE wind directions (33.75° - 78.75°).

2.3 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) was approved for use in NSW in October 2017. For assessment of modifying factors, the NPfI immediately superseded the 'Industrial Noise Policy' (INP, 2000), as outlined in the EPA document 'Implementation and transitional arrangements for the Noise Policy for Industry' (2017). Assessment and reporting of modifying factors has been undertaken in accordance with Fact Sheet C of the NPfI.

3 METHODOLOGY

3.1 Overview

Attended environmental noise monitoring was conducted in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. Meteorological data was obtained from the Invincible Colliery automatic weather station (AWS) which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended Noise Monitoring

During this survey, monthly attended monitoring was undertaken during the day period at each location. The duration of each day measurement was 10 minutes if no site noise was audible. If site activities were audible, the measurement duration was increased to 15 minutes. Atmospheric condition measurement was also undertaken at each monitoring location.

This survey presents noise levels gathered during attended monitoring that are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of the sites's contribution, if any, to measured levels. At each receptor location, site-only $L_{Aeq,15minute}$ and $L_{A1,1minute}$ (in the absence of any other noise) was measured directly, where possible, or, determined by frequency analysis.

If the exact contribution of the source of interest (in this case Invincible Colliery) cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise descriptors in accordance with Section 7.1 of the NPfI. This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- Site noise levels were extremely low and unlikely, in many cases, to be even noticed;
- Site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or

- It was not feasible, nor reasonable to employ methods such as move closer and back calculate. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

A measurement of $L_{A1,1minute}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or L_{Amax}, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15 minute measurement).

Often extraneous noise events (for example, road traffic pass-bys and dogs) interfere with the measurement of site noise levels in the frequency range of interest. Where required, the sound level meter is paused during these occurrences to aid in quantification of the site only noise.

3.3 Meteorological Conditions

The sigma-theta method outlined in the NPfI allows stability class to be determined from sigma-theta and wind speed data. However, temperature inversion gradient (VTG) cannot be determined by this method. Consequently, stability class prevailing during each measurement has been assessed against the stability class that corresponds with the consent VTG to determine whether noise criteria were applicable.

3.4 Modifying Factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

Assessment of modifying factors is undertaken at the time of measurement if the site was audible and directly quantifiable, such that the site-only L_{Aeq} was not "NM" or less than a maximum cut off value (e.g. "<20 dB" or "<30dB").

If applicable, modifying factors have been reported and added to measured site-only L_{Aeq} noise levels when meteorological conditions satisfied requirements for site noise criteria to be applicable. Low-frequency modifying factors have only been applied to site-only L_{Aeq} levels if WCP was the only contributing low-frequency noise source.

3.5 Attended Monitoring Equipment

The equipment detailed in Table 3.1 were used to measure environmental noise levels. Calibration certificates are provided in Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level meter	1070590	11/06/2022
Pulsar 106 acoustic calibrator	74813	10/06/2022

4 RESULTS

4.1 Total Measured Noise Levels

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. Discussion as to the noise sources responsible for these measured levels is provided in Section 4.3 of this report.

Table 4.1: MEASURED NOISE LEVELS[1] - QUARTER 4 2021

Location	Start Date and Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
Cullen Bullen Centre	13/12/2021 14:42	64	54	50	47	46	42	38
Cullen Bullen West	13/12/2021 15:16	61	49	45	42	40	37	33
Cullen Bullen South	13/12/2021 15:41	55	45	40	37	35	32	29

Notes:

1. *Levels in this table are not necessarily the result of activity at Invincible Colliery.*

4.2 Modifying Factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.4.

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.3 Attended Noise Monitoring

4.3.1 Project Approval Monitoring

Table 4.2 details $L_{Aeq,15minute}$ noise levels for Invincible Colliery in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the project approval.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY INVINCIBLE COLLIERY AGAINST PROJECT APPROVAL CRITERIA – QUARTER 4 2021

Location	Start Date and Time	Wind Speed m/s[1]	Stability Class[1]	L_{Aeq} Criterion dB	Criterion Applies?[1]	Site L_{Aeq} dB [2,3]	Exceedance[3,4]	Notes
Cullen Bullen Centre	13/12/2021 14:42	1.6	A	35	Yes	IA	Nil	Invincible Colliery was inaudible. Road traffic noise, breeze and a lawnmower generated the measured noise levels. A plane and residential noise were also noted.
Cullen Bullen West	13/12/2021 15:16	2.2	B	35	Yes	IA	Nil	Invincible Colliery was inaudible. Road traffic noise and breeze generated the measured noise levels.
Cullen Bullen South	13/12/2021 15:41	2.4	A	35	Yes	IA	Nil	Invincible Colliery was inaudible. Road traffic noise and insects generated the measured noise levels. Birds and a truck reverse alarm was also noted.

Notes:

1. *Noise emission limits apply under all meteorological conditions, except wind speeds greater than 3 m/s at 10 meters above ground level, s tability class F conditions and wind speeds greater than 2 m/s at 10 metres above ground level, and stability class G conditions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to Invincible Colliery, including modifying factors if applicable;*
3. *Bold results in red are those greater than the relevant criterion (if applicable); and*
4. *NA in exceedance column means atmospheric conditions outside specified in the project approval, therefore criterion was not applicable.*

4.3.2 EPL Monitoring

Table 4.3 details $L_{Aeq,15minute}$ noise levels for Invincible Colliery in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the EPL.

Table 4.3: $L_{Aeq,15minute}$ GENERATED BY INVINCIBLE COLLIERY AGAINST EPL CRITERIA – QUARTER 4 2021

Location	Start Date and Time	Wind Speed m/s[1]	Wind Direction ° MN[1]	L_{Aeq} Criterion dB	Criterion Applies?[1]	Site L_{Aeq} dB [2,3]	Exceedance[3,4]	Notes
Cullen Bullen Centre	13/12/2021 14:42	1.6	177	40	No	IA	NA	Invincible Colliery was inaudible. Road traffic noise, breeze and a lawnmower generated the measured noise levels. A plane and residential noise were also noted.
Cullen Bullen West	13/12/2021 15:16	2.2	222	40	No	IA	NA	Invincible Colliery was inaudible. Road traffic noise and breeze generated the measured noise levels.
Cullen Bullen South	13/12/2021 15:41	2.4	226	40	No	IA	NA	Invincible Colliery was inaudible. Road traffic noise and insects generated the measured noise levels. Birds and a truck reverse alarm was also noted.

Notes:

1. *Noise emission limits apply under all meteorological conditions, except during rainfall, wind speeds (at 10m height) greater than 3m/s, and under "non-significant" weather conditions ; (e.g. wind directions outside of the angles 33.75° - 78.75°);*
2. *Site-only $L_{Aeq,15minute}$ attributed to Invincible Colliery, including modifying factors if applicable;*
3. *Bold results in red are those greater than the relevant criterion (if applicable); and*
4. *NA in exceedance column means atmospheric conditions outside specified in the project approval, therefore criterion was not applicable.*

4.4 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.4. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.4: MEASURED ATMOSPHERIC CONDITIONS – QUARTER 4 2021

Location	Start Date and Time	Temperature ° C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
Cullen Bullen Centre	13/12/2021 14:42	35	1.0	110	5
Cullen Bullen West	13/12/2021 15:16	27	1.0	30	3
Cullen Bullen South	13/12/2021 15:41	29	0.0	0	5

Notes:

1. *"-" denotes calm conditions at 1.8 metres.*

Meteorological data used for compliance assessment is sourced from the Invincible Colliery AWS.

5 SUMMARY

Global Acoustics was engaged by Castlereagh Coal to conduct a quarterly noise survey of operations at Invincible Colliery, an open cut coal mine north-west of Lithgow. The purpose of the survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended environmental noise monitoring described in this report was conducted during the day period of 13 December 2021 at three monitoring locations around the site. The site is currently under care and maintenance, therefore monitoring was not undertaken during the evening or night periods, as there are no activities occurring on site during those times.

Invincible Colliery complied with noise limits at all locations during Quarter 4 2021 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A REGULATOR DOCUMENTS

A.1 INVINCIBLE COLLIERY PROJECT APPROVAL

NOISE

Acquisition Upon Request

1. If a written request for acquisition was made by the owner of the land listed in Table 1, before the approval of Modification 5, the Proponent must acquire the land in accordance with the procedures in conditions 5 and 6 of schedule 4.

Table 1: Land subject to acquisition upon request

Residence
Billabong, Hillview

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 3.

Noise Criteria

2. The Proponent must ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land.

Table 2: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{Aeq(15\ minute)}$	$L_{A1(1\ minute)}$
393 (Billabong)	*40*	*40*	*35*	*45*
394 (Hillview)	*43*	*43*	*35*	*45*
All other privately owned land	*35*	*35*	*35*	*45*

Note: To interpret the locations referred to in Table 2, see the applicable figures in Appendix 3.

Noise generated by the project is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be revised from time to time). Appendix 4 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 a written agreement with the relevant landowner to exceed the noise criteria, and the Proponent has advised the Department in writing of the terms of this agreement.

Operating Conditions

3. The Proponent must:
   (a) implement all reasonable and feasible measures to minimise the operational, low frequency and road noise of the project;
   (b) minimise the noise impacts of the project during meteorological conditions when the noise criteria in this consent do not apply (see Appendix 4);
   (c) co-ordinate noise management at the site with the Cullen Valley and Baal Bone mines, to minimise any cumulative noise impacts; and
   (d) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this approval.

Noise Management Plan

4. Prior to recommencing mining operations, unless the Secretary agrees otherwise, the Proponent must prepare a Noise Management Plan for the project to the satisfaction of the Secretary. This plan must:
   (a) be prepared in consultation with the EPA;
   (b) describe the measures that would be implemented to ensure compliance with the relevant noise criteria and operating conditions in this approval;
   (c) describe the proposed noise management system in detail; and

(d) include a noise 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; and
- defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

5. The Noise Management Plan approved by the Secretary must be implemented.

APPENDIX 4
NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

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

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must 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 4 times a year, unless the Secretary directs otherwise.

5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out generally 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 conformance 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 and low frequency noise.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows:
   Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
   - where any of the 1/3 octave noise levels in Table 4-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
   - where any of the 1/3 octave noise levels in Table 4-1 are exceeded by more than 5dB and cannot be mitigated, a 5 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period and a 2dB positive adjustment applies for the daytime period.

Table 4-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	***One-third octave $L_{Zeq,15minute}$ threshold level***												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

A.2 INVINCIBLE COLLIERY EPL

L4 Noise limits

L4.1 Noise from the premises must not exceed:

a) 40 dB(A) LAeq(15 minute) during the day (7 am to 6 pm); and
b) 35 dB(A) LAeq(15 minute) at all other times except as expressly provided by this licence;

at any residence on privately owned land.

Where LAeq means the equivalent continuous noise level – the level of noise equivalent to the energy-average of noise levels occurring over a measurement period.

Note: The licensee may exceed the limits set in L5.1 only if the licensee has a written negotiated noise agreement with the landowner of the premises in question and has provided a copy of this agreement to the EPA.

L4.2 To determine compliance with condition(s) L5.1 noise must be measured at, or computed for, the most affected point or within the residential boundary, or at the most affected point within 30 m of a dwelling (rural situations) where the dwelling is more than 30 m from the boundary. A modifying factor correction must be applied for tonal, impulsive or intermittent noise in accordance with the "Environmental Noise Management - NSW Industrial Noise Policy (January 2000)".

L4.3 The noise emission limits identified in this licence apply under all meteorological conditions except:
a) during rain and wind speeds (at 10m height) greater than 3m/s; and
b) under "non-significant weather conditions".

Note: Field meteorological indicators for non-significant weather conditions are described in the NSW Industrial Noise Policy, Chapter 5 and Appendix E in relation to wind and temperature inversions.

APPENDIX

B CALIBRATION CERTIFICATES

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C20331

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	Rion NA-28
Instrument Serial Number :	01070590
Microphone Serial Number :	08184
Pre-amplifier Serial Number :	52329

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	21.1°C	**Ambient Temperature :**	21.8°C
Relative Humidity :	57.8%	**Relative Humidity :**	56.5%
Barometric Pressure :	101.27kPa	**Barometric Pressure :**	101.17kPa

Calibration Technician : Jeff Yu
Calibration Date : 11 Jun 2020
Secondary Check: Max Moore
Report Issue Date : 15 Jun 2020
Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13dB*	*Temperature*	*±0.2°C*
1kHz	*±0.13dB*	*Relative Humidity*	*±2.4%*
8kHz	*±0.14dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests	*±0.10dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
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Sound Calibrator
IEC 60942-2017

Calibration Certificate

Calibration Number C20332

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar Model 106
Instrument Serial Number : 74813

Atmospheric Conditions
Ambient Temperature : 21.5°C
Relative Humidity : 56.9%
Barometric Pressure : 101.46kPa

Calibration Technician : Jeff Yu
Calibration Date : 10 Jun 2020
Secondary Check: Max Moore
Report Issue Date : 15 Jun 2020

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	93.96	1000.30

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.14dB*	*Temperature*	*±0.2°C*
Frequency	*±0.09%*	*Relative Humidity*	*±2.4%*
Distortion	*±0.09%*	*Barometric Pressure*	*±0.015kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

* The tests <1000 kHz are not covered by Acoustic Research Labs Pty Ltd NATA accreditation

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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