



Appendix E

Noise impact assessment





Balranald Mineral Sands Project - Modification of Consent (SSD-5285)

Noise impact assessment

Prepared for Iluka Resources Limited
April 2022





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Balranald Mineral Sands Project - Modification of Consent (SSD-5285)

Noise impact assessment

Report Number

S200529 RP14

Client

Iluka Resources Limited

Date

28 April 2022

Version

v3 Final

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1 Introduction

EMM Consulting Pty Limited (EMM) was commissioned by Iluka Resources Limited (Iluka) to undertake a noise impact assessment (NIA) for the proposed modification (MOD1) to the approved Balranald Mineral Sands Project in south-western New South Wales (NSW).

This report will support a modification report which will be submitted to the NSW Department of Planning and Environment (DPE) under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 Project background

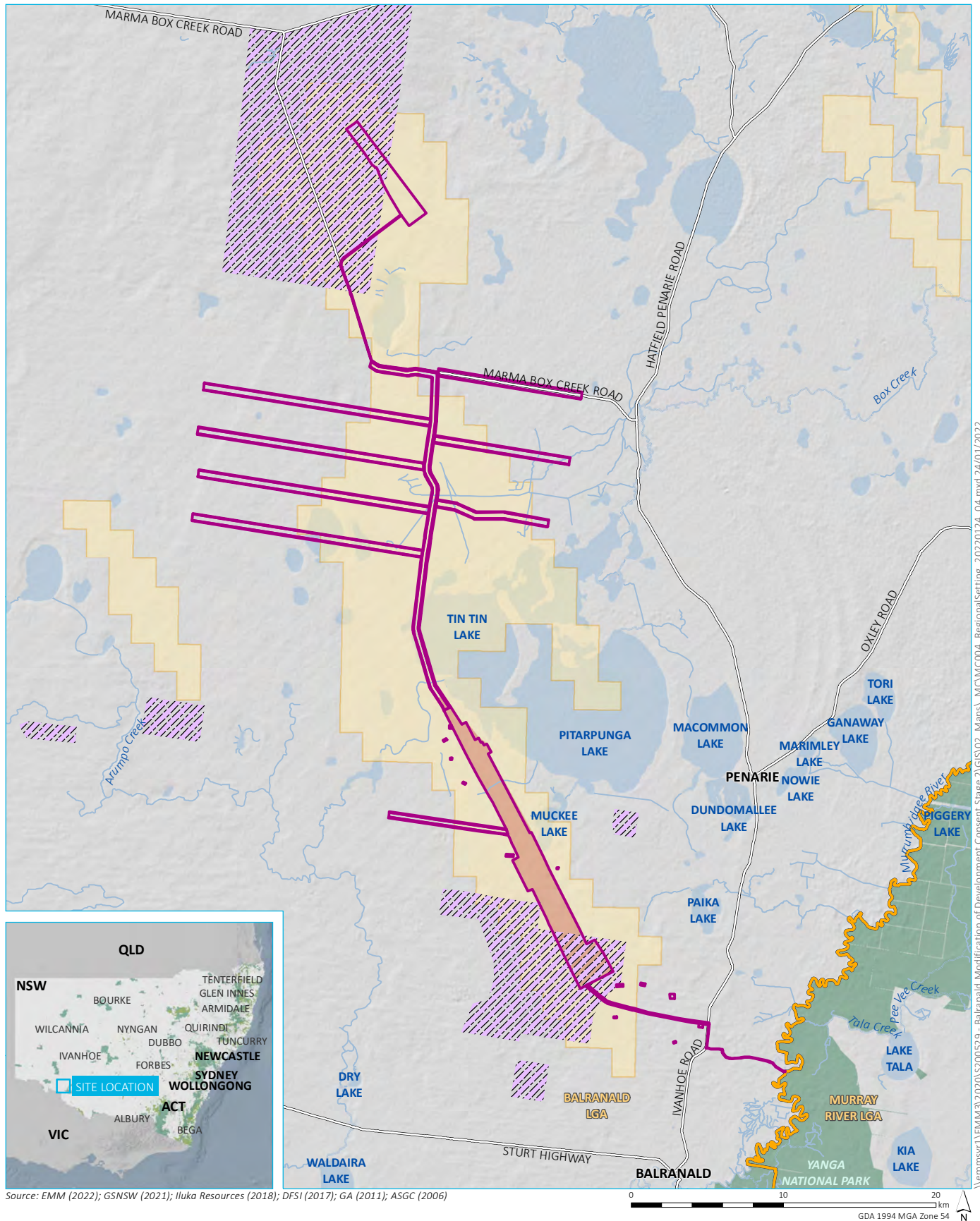
Iluka have approval to develop a mineral sand mine in south-western (NSW), known as the Balranald Mineral Sands Project (hereafter referred to as 'the Balranald Project' or 'the site'). It includes construction, mining, primary processing and rehabilitation of two linear mineral sand deposits, known as the West Balranald and Nepean deposits, located approximately 12 kilometres (km) and 66 km north-west of the town of Balranald, respectively.

An environmental impact statement (EIS) was prepared and submitted in 2015 to accompany a State Significant Development (SSD-5285) application under Part 4 of the EP&A Act for an open cut, truck and shovel mining method. Development consent was granted by DPE under Part 4 of the EP&A Act on 5 April 2016. The Balranald Project also included undertaking a bulk sampling activity at the West Balranald mine to test the removal ore using underground mining methods.

The regional setting and approved EIS project area are shown in Figure 1.1.

Since development consent was granted in April 2016, Iluka has undertaken the approved bulk sampling activity involving the extraction of mineralised material or ore, from depth within the approved disturbance area of the West Balranald mine.

The outcome of the bulk sampling activities confirmed the effectiveness of the underground mining method, validated key elements of the mining unit design and have been used to help guide the proposed MOD1 to inform the potential suitability (ie commerciality and reduced environmental impacts) of underground mining as an alternative method for resource extraction for the Balranald Project.



KEY

- EIS Approved Balranald Project Area (SSD-5285)
- Exploration Licence (EL7450)
- Mining Lease (ML1736)
- Southern Mallee Conservation Area (2015)
- Major road
- Watercourse/drainage line
- Waterbody
- NPWS reserve

Local government area

- NPWS reserve
- State forest

Regional Setting and EIS Approved Balranald Project Area (SSD-5285)

Balranald Mineral Sands Project
Noise impact assessment
Figure 1.1

1.2 Modification of consent

The proposed modification would involve:

- continuing underground mining within a portion of the approved disturbance footprint of the West Balranald deposit pursuant to the consent (ie mining area); and
- development of approved mineral processing infrastructure within a proposed new area of disturbance (ie surface infrastructure).

The proposed modification will ensure minimal or no changes are proposed to a number of key aspects of the existing Balranald Project; in particular, ore production and processing at a rate no greater than approved under the development consent. Potential environmental impacts from the proposed modification, including noise, will be reduced compared to the approved Balranald Project.

The construction of infrastructure approved under the development consent would be undertaken to support the construction and operation for the proposed underground mining trial, including mineral processing infrastructure, haul road, transmission line, access roads, upgrade of external roads and intersections, gravel extraction, monitoring infrastructure and accommodation facility.

The majority of this infrastructure would be required regardless of the mining method (ie open cut as approved under the development consent, or underground). For all other land located outside of the proposed modification area, ie other areas of the West Balranald mine and the Nepean mine, Iluka proposes no change to the currently approved open cut mining method at this stage.

The underground mining process would involve:

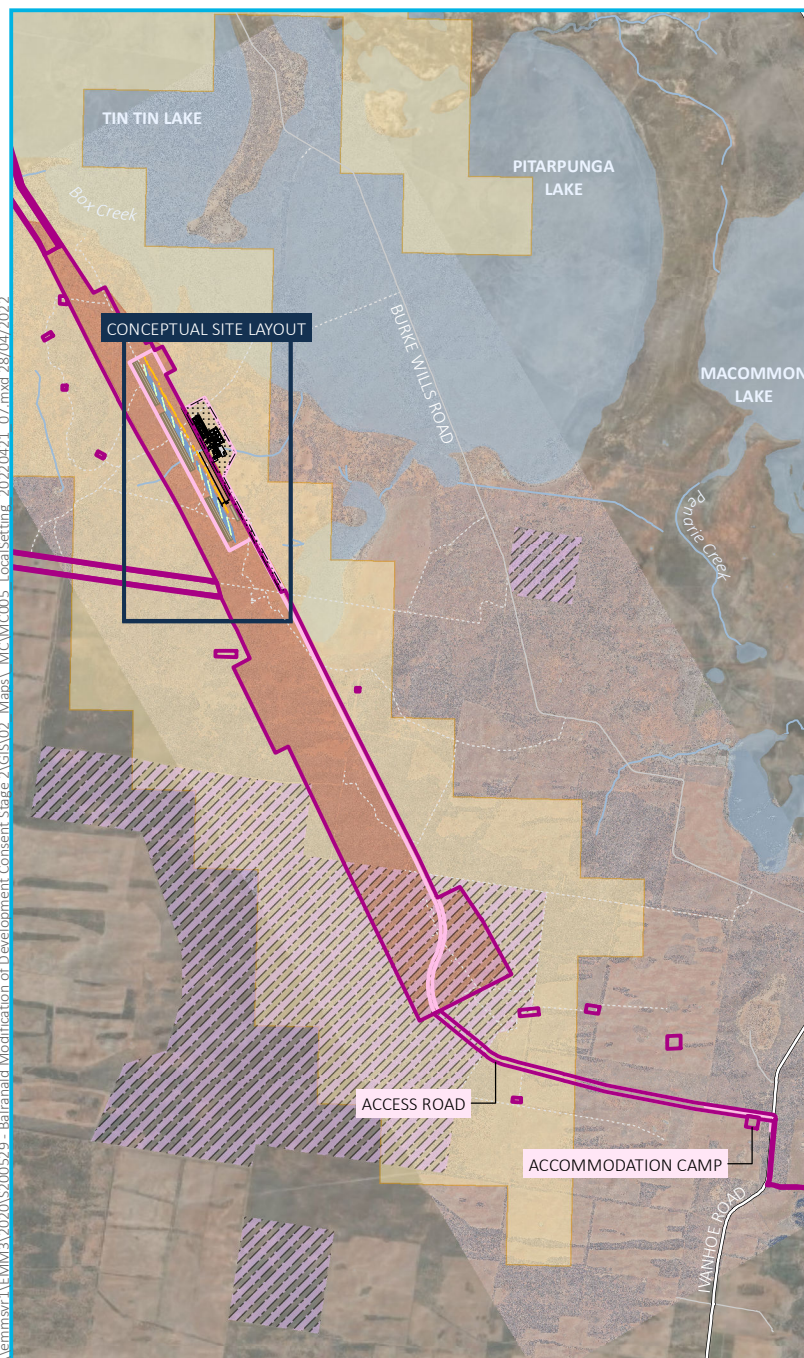
- clearing the footprint directly above the mining area – the area will be stripped of topsoil, subsoil and non-saline overburden to a nominal depth of 2 metres (m);
- surface placement of treated sand tails and overburden/subsoil ahead of mining into the space created by the above stripping;
- underground mining of the ore;
- processing of the mined ore to separate the heavy mineral concentrate (HMC) from sand tails, sand fines and oversize;
- stockpiling of Heavy Mineral Concentrate (HMC);
- backfilling of sand fines underground;
- replacement of subsoil and topsoil for rehabilitation and final landform; and
- environmental monitoring activities (including groundwater, geochemistry, subsidence, air quality and noise).

Ore is expected to be produced and processed at a rate no greater than approved under the development consent. The on-site processing plant will produce HMC to generate two primary product streams; magnetic HMC and non-magnetic HMC.

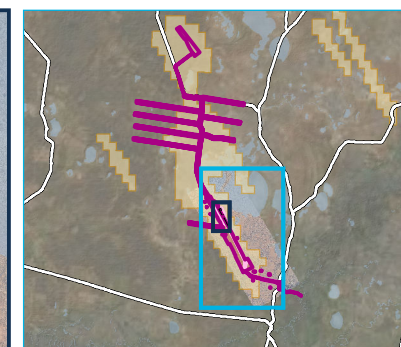
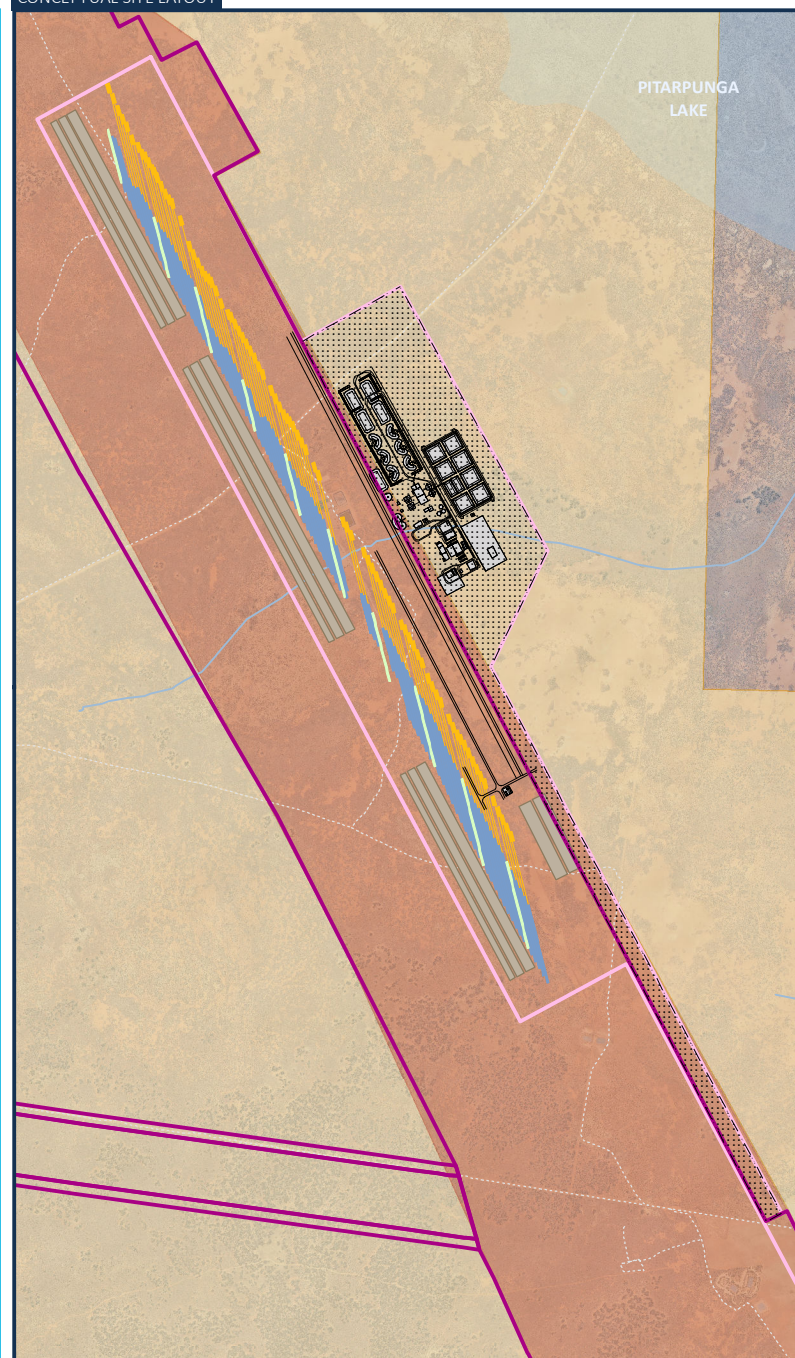
The product would be stockpiled and transported off-site for downstream processing with underground mining operations to be undertaken for a period of six years.

The proposed modification and conceptual layout are shown in Figure 1.2.

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CONCEPTUAL SITE LAYOUT



KEY

- EIS Approved Balranald Project Area (SSD-5285)
- Proposed modification study area
- Proposed modification extension to Balranald Project Area boundary
- Processing area infrastructure
- Subsoil stockpile
- Drill pad and string to underground stope
- Underground stope
- Underground pillar
- Major road
- Minor road
- Existing track
- Watercourse/drainage line
- Waterbody
- Southern Mallee Conservation Area (2015)
- Exploration Licence (EL7450)
- Mining Lease (ML1736)

Proposed modification and
conceptual site layout

Balranald Mineral Sands Project
Noise impact assessment
Figure 1.2

1.3 Purpose of the NIA and scope

The purpose of this NIA is to provide a comparison of noise impacts related to the proposed modification against the predicted impacts of the approved Balranald Project.

The NIA consists of:

- a summary of the findings from 2015 noise assessment;
- an update to the noise assessment methodology (eg assessment criteria) consistent with the NSW Environment Protection Authority (EPA) Noise Policy for Industry (NPfI) (2017). The NPfI supersedes the Industrial Noise Policy (INP) (2000), which was used for the 2015 noise assessment;
- an operational noise assessment (including sleep disturbance) as per the NPfI with worst-case noise predictions for MOD1;
- an assessment of noise from construction activities associated with MOD1 in accordance with the NSW Department of Environment and Climate Change (DECC) Interim Construction Noise Guideline (ICNG) (2009); and
- comparison of noise impacts between the approved Balranald Project and the proposed MOD1.

A number of technical terms are required for the discussion of noise. These are explained in the glossary of acoustic terms in Appendix A.

2 Summary of the 2015 noise assessment

2.1 Operational noise

The 2015 noise assessment provided noise predictions for the approved Balranald Project for three representative years of mining operations (year 1, year 4, and year 8), selected to assess the potential noise impacts of worst-case operations. The main activities assessed included soil stripping and handling, overburden handling, open-cut ore mining and handling, product processing and hauling materials.

The noise assessment showed that during adverse weather conditions (ie noise-enhancing) for all assessment periods and all stages of the mine life, operational noise levels from the Balranald Project were predicted to satisfy the relevant noise criteria at most assessment locations. The exception was at one assessment location (ie R5 – Karra Homestead) where noise levels were predicted to result in significant impacts with Iluka seeking to acquire this privately-owned property.

Modifying factor corrections for annoying noise characteristics (eg low frequency noise) for operations were assessed and identified to be within the relevant thresholds, and hence low frequency noise impacts from the Balranald Project were considered unlikely.

2.2 Construction noise

The construction noise assessment undertaken for the Balranald Project as presented in the 2015 noise assessment demonstrated that predicted noise levels from construction activities satisfied the relevant ICNG noise management levels at most assessment locations. The exception was at assessment location R13 where predicted noise levels during the night period (ie outside the recommended standard construction hours) were marginally above the relevant noise management levels and sleep disturbance screening criteria. This was associated with the Nepean mine access road construction. Appropriate noise management and mitigation measures were recommended to ensure that noise levels complied with the relevant noise managements levels, in particular for construction outside the recommended standard construction hours.

2.3 Sleep disturbance

Potential sleep disturbance impacts from maximum noise level events during operations and construction were assessed as part of the 2015 noise assessment. Maximum night-time noise levels (L_{Amax}) from the Balranald Project were predicted to satisfy the relevant sleep disturbance screening criteria at all residential assessment locations during operations and construction.

2.4 Road traffic noise

The road traffic noise assessment undertaken for the Balranald Project as presented in the 2015 noise assessment demonstrated that road traffic noise levels during operations and construction were predicted to satisfy the relevant noise criteria at all nearest assessment locations for all assessed roads.

2.5 Noise management and mitigation

2.5.1 Operations

Feasible and reasonable noise management measures were recommended for the Balranald Project for operations. Furthermore, Iluka committed to managing noise levels to reduce the potential noise impacts at all assessment locations, including R5 – Karra Homestead with Iluka seeking to acquire this privately-owned property.

2.5.2 Construction

Feasible and reasonable noise management measures were recommended for the Balranald Project for construction. The main objective was to ensure that, as far as practicable, noise levels from construction activities would meet the relevant ICNG noise management levels across the 24-hour construction period.

This included the following noise management measures:

- Construction noise monitoring in the early stages of construction (where relevant).
- A review of noise management measures to ensure noise levels during construction remain below the noise management levels (where required).
- Consultation with the affected landowners prior to and during construction where exceedance of noise management levels were predicted, and where relevant, notification of proposed management measures to ensure noise levels during construction remained below the noise management levels.

3 Updated NIA for the proposed modification

The NIA examined predicted construction and operation noise emissions from MOD1 given the minor change to the project footprint to accommodate the relocation of processing plant and associated surface infrastructure.

Noise modelling for MOD1 was based on three-dimensional digitised ground contours of the project area and surrounding land for one worst-case stage of the proposed modification. The noise model represents snapshots, with plant and equipment placed at various locations and heights, representing realistic operations and construction scenarios.

The following sections provide an assessment of noise for MOD1, including from proposed operations, construction and road traffic noise.

3.1 Noise policy update

Assessment requirements, modelling methodologies and assumptions related to MOD1 that are adopted in this NIA are generally consistent with the 2015 noise assessment. However, since the 2015 noise assessment (dated May 2015), the INP (EPA 2000) has been superseded by the NPfl (EPA 2017).

In accordance with the EPA's *Implementation and transitional arrangements for the Noise Policy for Industry* (2017), this assessment has adopted the NPfl approach and hence assessment requirements for operational noise (eg criteria) and modelling methodologies (eg modelled meteorological conditions) have been updated where applicable.

3.2 Statutory approval and licence

3.2.1 Development consent

In accordance with Schedule 3, Condition 3 of the development consent (SSD-5285) for the approved Balranald Project, Iluka must ensure that noise levels from site operations do not exceed the relevant noise limits. The noise limits from Table 2 of Condition 3 of the development consent are reproduced in Table 3.1.

Table 3.1 Noise limits

Location	Day	Evening	Night	
	L _{Aeq,15min}	L _{Aeq,15min}	L _{Aeq,15min}	L _{A1,1min}
Any residence on privately-owned land	35	35	35	45
Mungo National Park and Mungo State Conservation Area (when in use)	50	50	50	-

The development consent states that noise generated by the development is to be measured in accordance with the relevant requirements of the relevant NSW noise policy (ie NPfl). Additional noise monitoring requirements for evaluating compliance with the noise limits (eg meteorological conditions under which the limits apply) are provided in Appendix 5 of the development consent.

Other relevant conditions in the development consent include those related to the implementation of all feasible and reasonable measures to minimise noise from site (Condition 4) and the preparation of a noise management plan (Condition 5).

Further, in accordance with Schedule 4, Condition 1 of the development consent, Iluka shall notify in writing the owner(s) of the land listed in Table 1 of Schedule 3 (ie R5 – Karra Homestead) of their right to request the implementation of additional noise mitigation measures and/or acquisition of their land in accordance with the procedures outlined in Condition 3 and Condition 4 of Schedule 4.

3.2.2 Environment Protection Licence

Noise requirements for the approved Balranald Project are also contained within the Environment Protection Licence (EPL) issued by the EPA, EPL 20795. Condition L3.1 of the EPL provides noise limits the site must not exceed. The noise limits provided in the EPL are consistent with those outlined in Table 2 of Condition 3 of the development consent (refer to Table 3.1).

Condition L3.2 of the EPL outlines meteorological conditions under which the limits do not apply.

3.2.3 Noise management

Noise management measures for the Balranald Project (SSD-5285) include the following:

- Maintaining all plant and equipment in good working order to ensure sound outputs were within manufacturer specifications.
- Compliance noise monitoring (refer to Section 3.3.3).
- Notification to landowners potentially affected by site construction/operations (eg access routes in use on their properties).
- Complaints management in accordance with Iluka's *HSEC Group Standard 02 – Social Performance* protocol.

3.3 Existing noise environment

3.3.1 Assessment locations

Noise from mining operations has been predicted for privately-owned assessment locations (eg residences, habitable buildings) surrounding the approved Balranald Project. No other sensitive land uses were identified within the site noise catchment which has been conservatively defined as 10 km from any noise source.

Assessment locations identified within the noise catchment for the site are presented in Table 3.2. These are consistent with those adopted in the 2015 noise assessment.

Table 3.2 Assessment locations

Assessment location ID	Easting (MGA 54)	Northing (MGA 54)	Assessment location type ¹
R2	727253	6197483	Homestead
R5 ²	720457	6188284	Homestead
R7	737625	6180476	Homestead
R11	725618	6222584	Homestead

Table 3.2 Assessment locations

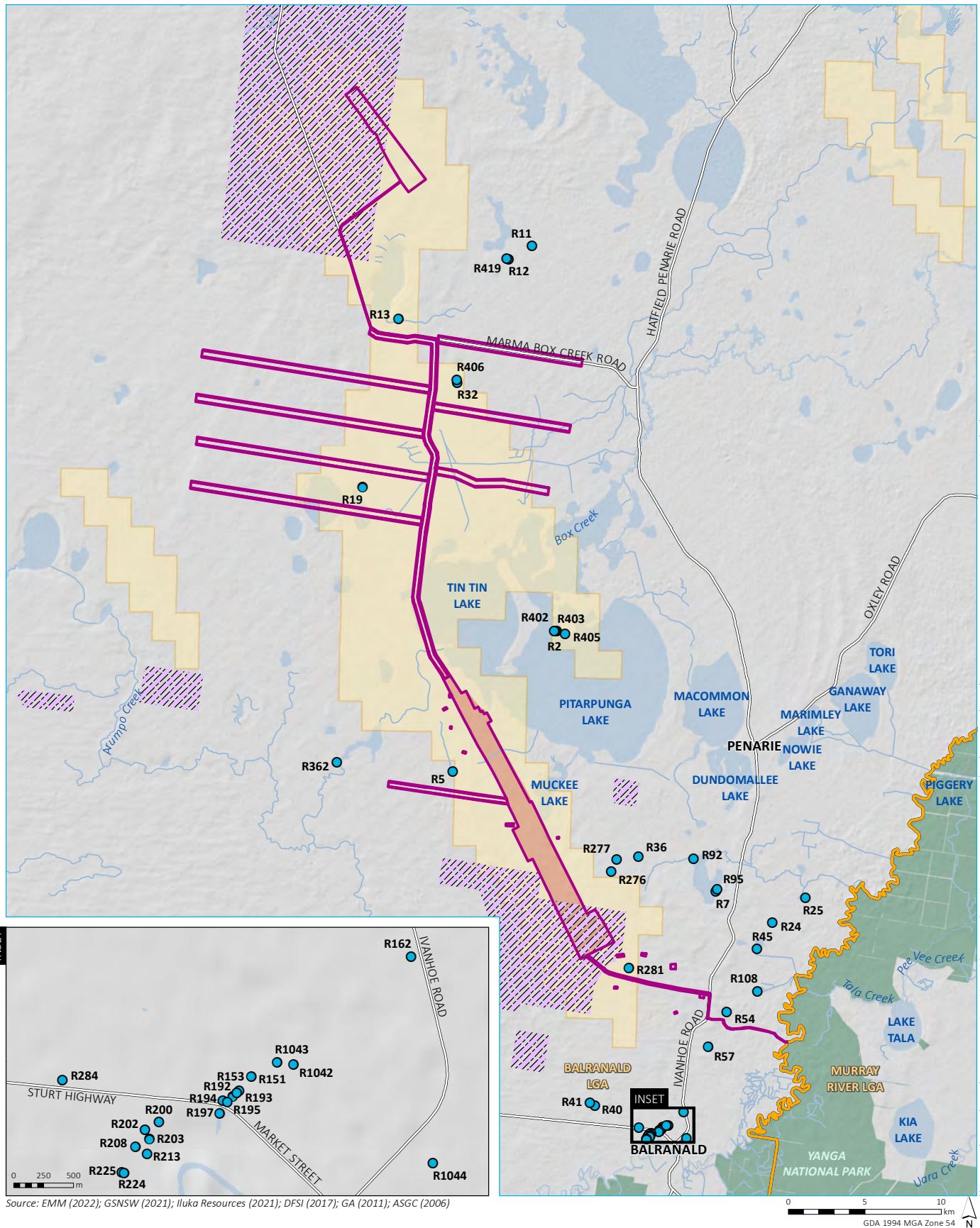
Assessment location ID	Easting (MGA 54)	Northing (MGA 54)	Assessment location type ¹
R12	724084	6221740	Shearer's Quarters
R13	716916	6217832	Homestead
R19	714568	6206861	Homestead
R24	741313	6178438	Shearer's Quarters
R25	743461	6180042	Homestead
R32	720745	6213679	Homestead
R36	732569	6182762	Shearing Shed
R40	729735	6166498	Homestead
R41	729416	6166705	Shearers Quarters
R45	740323	6176723	Unknown
R54	738333	6172592	Homestead
R57	737116	6170324	Unknown
R92	736181	6182610	Unknown
R95	737707	6180611	Unknown
R108	740345	6173973	Unknown
R151	734182	6165100	House
R153	734080	6164978	Unknown
R162	735524	6166108	Unknown
R192	734024	6164931	Unknown
R193	734061	6164960	Unknown
R194	733941	6164898	Unknown
R195	733981	6164885	Unknown
R197	733916	6164790	Unknown
R200	733406	6164720	Unknown
R202	733290	6164651	Unknown
R203	733327	6164573	Unknown
R208	733207	6164508	Unknown
R213	733307	6164450	Unknown
R224	733093	6164295	Unknown
R225	733114	6164290	Unknown
R276	730802	6181794	Shed
R277	731164	6182572	Shed
R281	731964	6175482	Shed
R284	732598	6165070	Unknown

Table 3.2 **Assessment locations**

Assessment location ID	Easting (MGA 54)	Northing (MGA 54)	Assessment location type ¹
R362	712896	6188906	Unknown
R402	727155	6197495	Shed
R403	727064	6197495	Shed
R405	727771	6197280	Shed
R406	720716	6213873	Shed
R419	723971	6221765	Unknown
R1042	734536	6165202	House
R1043	734397	6165219	House
R1044	735704	6164370	House

Notes: 1. Properties identified as “Unknown” have been included as they may potentially be private residences.
 2. Residence currently uninhabited and subject to ‘Acquisition upon request’ as per the development consent.

Assessment locations are shown in Figure 3.1.



- KEY**
- EIS Approved Balranald Project Area (SSD-5285)
 - Exploration Licence (EL7450)
 - Mining Lease (ML1736)
 - Southern Mallee Conservation Area (2015)
 - Noise assessment location
 - Major road
 - Watercourse/drainage line
 - Waterbody
 - NPWS reserve
 - Local government area

Assessment locations

Balranald Mineral Sands Project
Noise impact assessment
Figure 3.1

3.3.2 Background noise surveys

A key element in assessing environmental noise impacts from industrial sources is to quantify the existing ambient acoustic environment. It was identified during the ambient noise monitoring completed by EMM for the 2015 noise assessment that background noise levels in the surrounding community are below the NPfI minimum Rating Background Level (RBL) of 35 dB for the day period, and 30 dB for the evening and night periods. These minimum RBLs have been adopted for all assessment locations in this assessment.

3.3.3 Compliance noise monitoring

The approved bulk sampling activity has been undertaken since 2016 with noise management and mitigation measures implemented on-site (refer to Section 3.2.3).

Monthly operator-attended noise monitoring rounds were completed in the early stages of the Balranald Project at the nearest residence (R5). Monitoring occurred during pre-mining bulk sampling work (June to September 2016) and was conducted during the day and night periods to assess compliance with the relevant noise limits (refer to Table 3.1).

Further, monthly operator-attended noise monitoring was completed for the Balranald Project at the nearest residence (R5) during mining and backfilling between June and November 2020. Monitoring was conducted during the day, evening and night periods to assess compliance with the relevant noise limits (refer to Table 3.1).

A review of attended noise monitoring data identified that site noise contributions satisfied the relevant noise limits at R5. Being the closest residence to site operations at the time, site noise was considered to have satisfied the relevant noise limits at all other residential assessment locations.

The attended noise monitoring data also demonstrated that modifying factor corrections for low frequency noise and other annoying noise characteristics were found to be not relevant at R5 and all other residential assessment locations in accordance with Fact Sheet C of the NPfI.

3.4 Noise assessment criteria

3.4.1 Operational noise trigger levels

Noise from industrial sites or processes in NSW is regulated by the local council, DPE and/or the EPA, and generally have a licence and/or development consent conditions stipulating noise limits (refer to Section 3.2.1). These limits are generally derived from project specific noise trigger levels or operational noise levels predicted at assessment locations. They are based on EPA guidelines (ie NPfI or previous INP) or noise levels that can be achieved by a specific site following the application of all reasonable and feasible noise mitigation.

The objectives of noise trigger levels for industry are to protect the community from excessive intrusive noise and preserve amenity for specific land uses.

To ensure these objectives are met, the EPA provides project specific noise trigger levels, namely intrusiveness and amenity noise levels as described in the NPfI.

The 2015 noise assessment was completed in accordance with the INP. Since the INP has been superseded by the NPfI, the assessment of operational noise for this assessment was revised in accordance with the NPfI assessment requirements. Updated noise criteria for MOD1 (referred herein as 'project noise trigger levels' as per the NPfI) are provided in the following sections.

i Intrusiveness noise levels

The intrusiveness noise levels require that $L_{Aeq,15min}$ noise levels from the proposed modification during the relevant operational periods do not exceed the RBL by more than 5 dB at residential assessment locations. The day RBL for all assessment locations has been updated to align with the NPfI minimum RBL of 35 dB for the day period. The evening and night RBLs are based on the NPfI minimum RBLs of 30 dB and are consistent with those adopted in the 2015 noise assessment.

Table 3.3 presents the intrusiveness noise levels determined for MOD1 based on the adopted RBLs.

Table 3.3 Project intrusiveness noise levels

Assessment location	Assessment period	Adopted RBL ¹ , dB(A)	Project intrusiveness noise level (RBL + 5 dB), $L_{Aeq,15min}$, dB
All residential assessment locations	Day	35 ²	40
	Evening	30 ³	35
	Night	30 ³	35

Notes: 1. Referenced from the 2015 noise assessment.
2. Updated to align with the NPfI minimum RBL for the day period (ie 35 dB).
3. Based on the NPfI minimum RBL of 30 dB for this period and is consistent with the RBL adopted in the 2015 noise assessment.
4. Day: 7.00 am to 6.00 pm Monday to Saturday; 8.00 am to 6.00 pm Sundays and public holidays; evening: 6.00 pm to 10.00 pm; night: remaining periods.

ii Amenity noise levels

The assessment of amenity is based on noise levels specific to the land use. The noise levels assessed relate only to industrial noise and exclude road or rail traffic noise. Where the measured existing industrial noise approaches recommended amenity noise levels, it needs to be demonstrated that noise levels from new industry will not contribute to existing industrial noise such that amenity noise levels are exceeded.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level for a new industrial development is the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB. It is noted that this approach is based on a receiver being impacted by three or four individual industrial sites (or noise sources).

The noise amenity area for residential assessment locations surrounding the site have been categorised as 'rural' amenity category based on existing background noise levels (referenced from the 2015 noise assessment) and contributing noise sources in accordance with the definitions provided in Table 2.3 of the NPfI. As per Table 2.3 of the NPfI, a 'rural' residential area is defined as "an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse".

The project amenity noise levels are provided in Table 3.4. A conservative approach of adopting the minus 5 dB method was used for all assessment locations, although in reality only noise from site is likely to be experienced at all assessment locations and hence site could 'take up' the whole of the amenity target at some locations.

Table 3.4 Project amenity noise levels

Assessment locations	Amenity area	Time period ¹	Project amenity noise level dB, $L_{Aeq,period}$ (Recommended amenity noise level minus 5 dB)
All assessment locations	Rural	Day	45
		Evening	40
		Night	35

Notes: 1. Day: 7.00 am to 6.00 pm Monday to Saturday; 8.00 am to 6.00 pm Sundays and public holidays; evening: 6.00 pm to 10.00 pm; night: 10.00 pm to 7.00 am Monday to Saturday; 10.00 pm to 8.00 am Sundays and public holidays.

iii Project noise trigger levels

The project noise trigger levels (PNTLs) are the lower of the calculated intrusiveness or amenity noise levels.

It is commonly acknowledged and accepted amongst agencies and industry that average noise levels from industrial sites measured over a number of hours are typically 3 dB higher over a 15-minute worst-case assessment period. To standardise the time periods for the intrusiveness and amenity noise levels, the NPfI states that the $L_{Aeq,15min}$ is equivalent to the $L_{Aeq,period} + 3$ dB, unless robust evidence is provided for an alternative approach for the particular development being considered. This approach has been adopted for this assessment.

The PNTLs adopted for all residential assessment locations are provided in Table 3.5.

Table 3.5 Adopted PNTLs

Assessment location	Assessment period	Intrusiveness $L_{Aeq,15min}$, dB	Amenity ¹ $L_{Aeq,15min}$, dB	Adopted PNTL ² $L_{Aeq,15min}$, dB
All residential assessment locations	Day	40	48	40
	Evening	35	43	35
	Night	35	38	35

Notes: 1. Project amenity $L_{Aeq,15min}$ noise level is the project amenity noise level $L_{Aeq,period}$ (refer to Table 3.4) plus 3 dB as per the NPfI.
2. PNTL is the lower of the calculated intrusiveness or amenity $L_{Aeq,15min}$ noise levels.
3. Day: 7.00 am to 6.00 pm Monday to Saturday; 8.00 am to 6.00 pm Sundays and public holidays; evening: 6.00 pm to 10.00 pm; night is the remaining periods.

It is noted that the adopted PNTLs shown in Table 3.5 are based on the intrusiveness noise levels and largely unchanged from those approved in the EIS development consent (SSD-5285) and EPL noise limits. The only changes are for the less sensitive day period due to NSW EPA policy changes.

EMM recommends that noise limits (in the PA and EPL) be adjusted in accordance with the findings of this assessment and the NPfI.

3.4.2 Sleep disturbance screening criteria

The site will continue to operate during the night period as part of the proposed modification and therefore, in accordance with the NPfI, the potential for sleep disturbance has been assessed. It is noted that noise from proposed night-time construction works have also been considered in the assessment of sleep disturbance.

The NPfI suggests that a detailed maximum noise level event assessment should be undertaken where the development/premises night-time noise levels at a residential location exceed the following screening criteria:

- $L_{Aeq,15min}$ 40 dB or the prevailing RBL plus 5 dB (whichever is the greater); and/or
- L_{Amax} 52 dB or the prevailing RBL plus 15 dB (whichever is the greater).

The sleep disturbance screening criteria for all residential assessment locations are provided in Table 3.6. It is noted that the L_{Amax} trigger level can be conservatively compared to the $L_{A1,1min}$ noise limit listed in the development consent for all residential assessment locations. Although, the L_{Amax} trigger level in Table 3.6 is 7 dB higher than the 45 dB $L_{A1,1min}$ limit stated in the development consent, it is the 'standard' minimum L_{Amax} trigger level in accordance with the NPfI. The NPfI L_{Amax} trigger level has been adopted for this assessment of sleep disturbance from maximum noise levels.

Table 3.6 Maximum noise level event screening criteria for sleep disturbance

Assessment locations	Adopted (night) RBL ¹ , dB(A)	Maximum noise level event screening criteria, dB	
		RBL +5 dB or standard ² $L_{Aeq,15min}$	RBL +15 dB or standard ² L_{Amax}
All residential assessment locations	30	40	52

Notes: 1. Referenced from the 2015 noise assessment.
2. Whichever is greater.

3.4.3 Construction noise management levels

The assessment of noise from proposed construction works for MOD1 has been completed using the ICNG. The ICNG provides two methods for the assessment of construction noise emissions:

- quantitative: suited to major construction projects with typical durations of more than three weeks; and
- qualitative: suited to short term infrastructure maintenance (3 weeks or less).

The method for a quantitative assessment requires a more complex approach, involving noise emission predictions from construction activities to the nearest sensitive receivers, whilst the qualitative assessment methodology is a more simplified approach that relies more on noise management strategies. Due to the type of construction works for the proposed modification and anticipated duration, this assessment has adopted a quantitative assessment approach.

The ICNG recommends standard hours for construction work which are:

- Monday to Friday from 7.00 am to 6.00 pm;
- Saturdays from 8.00 am to 1.00 pm; and
- no work on Sundays or public holidays.

These time restrictions are the primary noise management tool of the ICNG. Most construction activities associated with the proposed modification are proposed to be completed during the ICNG standard hours. Some construction activities will occur outside the recommended standard construction hours including during the night period. As a conservative approach to this assessment and for consistency with the 2015 noise assessment, all construction activities proposed for the proposed modification have been conservatively assumed to occur 24 hours and seven days per week.

The noise management levels (NMLs) for residential receivers for construction activities proposed during and outside of the recommended standard construction hours as per Table 2 of the ICNG are reproduced in Table 3.7.

Table 3.7 ICNG NMLs for residential receivers

Time of day	NML $L_{Aeq,15min}$	How to apply
Recommended standard hours: - Monday to Friday 7.00 am to 6.00 pm - Saturday 8.00 am to 1.00 pm - No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. - The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB	The highly noise affected level represents the point above which there may be strong community reaction to noise. - Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: i) times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; and ii) if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements, see Section 7.2.2 of the ICNG.

Source: ICNG.

In summary, the noise management levels for assessment locations as per the ICNG are:

- 10 dB above the existing background levels (RBL + 10 dB) for standard construction hours; and
- 5 dB above the existing background levels (RBL + 5 dB) outside of the standard construction hours.

Where noise levels from construction works are predicted above the NMLs during or outside the recommended standard hours, all feasible and reasonable noise management and mitigation measures should be implemented. The ICNG also states that where all feasible and reasonable noise management and mitigation measures have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community. Some guidance on negotiating agreements is provided in Section 7.2.2 of the ICNG.

The EPA's sleep disturbance screening criteria (refer to Table 3.6) have also been used to assess construction noise during the night period (10.00 pm to 7.00 am Monday to Saturday, and 10.00 pm to 8.00 am on Sundays).

It is noted that the ICNG requires a strong justification for works outside of recommended standard hours. The site is located in a relatively remote area, and is approximately 12 km at its closest point to Balranald town. Properties outside Balranald town are typically large rural land holdings, and dwellings are sparsely located on these properties. The nearest residence to the site (ie active mining operations) is assessment location R5 located approximately 2.8 km to the south-west. Other buildings such as sheds, shearers quarters and outbuildings are also sparsely located.

Given the remote nature of the project area, a 24-hour, seven day per week construction schedule has been assessed (ie worst case scenario noise emissions).

The construction NMLs adopted for the project during the ICNG recommended standard hours and outside of the standard construction hours (out-of-hours) are presented in Table 3.8.

Table 3.8 **Adopted NMLs**

Assessment location	Assessment period	Adopted RBL ³ , dB(A)	NML L _{Aeq,15min} , dB
All residential assessment locations	Standard hours ¹	35	45 (RBL + 10)
	Out-of-hours ²	30	35 (RBL + 5)

Notes: 1. Recommended standard hours between Monday to Friday 7 am to 6 pm and Saturday 8 am to 1 pm (excluding public holidays).
 2. Outside the recommended standard hours including the night period.
 3. Based on the NPfl minimum RBLs.

3.4.4 Road traffic noise criteria

The principal guidance to assess the impact of road traffic noise on assessment locations is in the NSW Department of Environment, Climate Change and Water (DECCW) Road Noise Policy (RNP) (2011). The road noise assessment criteria for residential land uses (ie residential assessment locations), reproduced from Table 3 of the RNP for road categories relevant to MOD1 are presented in Table 3.9.

Table 3.9 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria	
		Day (7.00 am – 10.00 pm)	Night (10.00 pm – 7.00 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	60 dB $L_{Aeq,15hr}$ (external)	55 dB $L_{Aeq,9hr}$ (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments.	55 dB $L_{Aeq,1hr}$ (external)	50 dB $L_{Aeq,1hr}$ (external)

Source: RNP.

Additionally, the RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB.

Further to meeting the assessment criteria shown in Table 3.9, any significant increase in total traffic noise at assessment locations must be considered. Assessment locations experiencing increases in total traffic noise levels above those presented in Table 3.10 should be considered for mitigation as per the RNP.

Table 3.10 Relative increase criteria for residential land uses

Road category	Type of project/development	Total traffic noise level increase	
		Day (7.00 am – 10.00 pm)	Night (10.00 pm – 7.00 am)
Freeway/arterial/sub-arterial roads and transitways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic +12 dB $L_{Aeq,15hr}$ (external)	Existing traffic +12 dB $L_{Aeq,9hr}$ (external)

3.5 Meteorological conditions

Noise propagation over distance can be significantly affected by meteorological conditions. Of most interest are source-to-receiver wind, the presence of a temperature inversion or the combination of both, as these conditions can enhance received noise levels. To account for these phenomena, the NPfI specifies the following two options:

1. Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur (conservative approach).
2. Determine the significance of noise-enhancing conditions, which is based on a 30% threshold of occurrence.

3.5.1 Wind

Source-to-receiver wind (as being the directional component of wind) can enhance noise levels from a development at receivers.

The NPfI states that where wind is identified to be a significant feature of the area then assessment of noise impacts should consider the highest wind speed up to 3 m/s, which is considered to prevail for at least 30% of the time. The NPfI defines significant wind as the presence of source-to-receiver wind speed (measured at 10 m above ground level) of 3 m/s or less, occurring for 30% of the time or more in any assessment period and season.

3.5.2 Temperature inversion

The NPfI states that the assessment of the impact of temperature inversion be confined to the night-time noise assessment period where temperature inversions generally occur. Sigma-theta data is required to determine the significance of temperature inversions, that is if they occur for 30% of the time or more during the night period.

3.5.3 Meteorological conditions adopted for modelling

This NIA has adopted the NPfI's first option in adopting the noise-enhancing meteorological conditions for all assessment periods for the modelling. An analysis to determine the significance of noise-enhancing conditions (NPfI second option based on a 30% threshold) was not completed. Furthermore, 'very noise-enhancing' meteorological conditions for the night period (ie G class temperature inversion) were adopted for modelling.

The meteorological conditions adopted for modelling are presented in Table 3.11.

Table 3.11 Meteorological conditions adopted for modelling

Assessment period	Meteorological conditions	Air temperature	Relative humidity	Wind speed ¹	Wind direction	Stability category
Day	Winds	20°C	90%	3 m/s	All	D class
Evening/night	Winds	10°C	90%	3 m/s	All	D class
Night	Strong temperature inversion	10°C	90%	0 m/s	All	G class ²

Notes: 1. Worst-case 3 m/s wind speed was assumed for all wind directions in accordance with the NPfI.
2. Temperature inversion value of 4°C/100 m.
3. Day period: 7.00 am to 6.00 pm Monday to Saturday and 8.00 am to 6.00 pm Sundays and public holidays. Evening period: 6.00 pm to 10.00 pm every day. Night period: 10.00 pm to 7.00 am Monday to Saturday and 10.00 pm to 8.00 am Sundays and public holidays.

The area surrounding the site is generally flat with noise sources typically at a similar elevation to surrounding assessment locations. The potential for source-to-receiver drainage flow winds to occur is therefore not relevant and has not been considered in the assessment.

3.6 Noise modelling methodology and results

This section presents the methods and base parameters used to model noise emissions from MOD1, including the effect of meteorological conditions.

Noise modelling was based on three-dimensional digitised ground contours of the project area and surrounding land for one worst-case stage of the proposed modification. The noise model represents snapshots, with plant and equipment placed at various locations and heights, representing realistic operations and construction scenarios.

Noise predictions were carried out using the Brüel and Kjær Predictor Version 11 software. 'Predictor' calculates total noise levels at assessment locations from concurrent operation of multiple noise sources. The model considers factors such as the lateral and vertical location of plant, source-to-receiver distances, ground effects, atmospheric absorption, topography of the project area and applicable meteorological conditions.

3.6.1 Operational noise

Acoustically significant fixed and mobile plant and equipment items considered in this assessment and included in the noise model are provided in Table 3.12. Modelling has assumed all plant and equipment to operate continuously and at full duty throughout the respective operating periods (day, evening and night) as applicable, therefore providing a conservative prediction of noise levels (ie worst-case scenario).

Sound power level data for some of the operations plant and equipment items are based on measurement undertaken by EMM at the site during the bulk sampling activity in 2020. Otherwise, plant and equipment sound power levels have been taken from an EMM database and this data have been benchmarked against noise levels at similar mining operations in NSW.

Table 3.12 Modelled operations plant and equipment quantities and sound power levels

Plant and equipment	Sound power level (Lw)	Quantity – years 1 to 6		
	L _{Aeq,15min} , dB	Day	Evening	Night
Haul truck D400	117	3	3	3
Excavator CAT 375	117	1	1	1
Dozer CAT D10	116	1	1	1
Front-end loader (FEL)	110	3	3	3
Carry grader	115	2	2	2
Water cart CAT 785C	115	1	1	1
Road truck	106	1	1	1
WHIMS	111	1	1	1
Screen unit	105	1	1	1
Tails stacker	95	1	1	1
Wet concentrator plant	111	1	1	1
Pre-concentrator plant	111	1	1	1
MU10	105	1	1	1
Roller	101	1	1	1
Feller buncher	118	1	-	-
Booster	95	11	11	11
Pump	95	6	6	6
HDD Drill rig	114 ¹	1	1	1
Mud pump	104 ¹	3	3	3
Injection rig	96 ¹	1	1	1
Generator for injection rig	98 ¹	1	1	1
Pit pump	91 ¹	1	1	1
Generator (genset)	90 ¹	4	4	4

Notes: 1. Based on measurements undertaken by EMM at the site.

Modelling results showed that site noise levels for MOD1 are predicted to satisfy the adopted PNTLs at all assessment locations for the day, evening and night periods during worst-case meteorological conditions. Predicted noise levels from proposed operations are shown in Table 3.13..

Table 3.13 Predicted noise levels from proposed worst-case operations

Assessment location ID	Predicted worst-case $L_{Aeq,15min}$ noise levels, dB			Adopted PNTLs, $L_{Aeq,15min}$, dB		
	Day	Evening	Night	Day	Evening	Night
R2	<35	<30	<30	40	35	35
R5 ¹	36	33	33	N/A	N/A	N/A
R7	<35	<30	<30	40	35	35
R11	<35	<30	<30	40	35	35
R12	<35	<30	<30	40	35	35
R13	<35	<30	<30	40	35	35
R19	<35	<30	<30	40	35	35
R24	<35	<30	<30	40	35	35
R25	<35	<30	<30	40	35	35
R32	<35	<30	<30	40	35	35
R36	<35	<30	<30	40	35	35
R40	<35	<30	<30	40	35	35
R41	<35	<30	<30	40	35	35
R45	<35	<30	<30	40	35	35
R54	<35	<30	<30	40	35	35
R57	<35	<30	<30	40	35	35
R92	<35	<30	<30	40	35	35
R95	<35	<30	<30	40	35	35
R108	<35	<30	<30	40	35	35
R151	<35	<30	<30	40	35	35
R153	<35	<30	<30	40	35	35
R162	<35	<30	<30	40	35	35
R192	<35	<30	<30	40	35	35
R193	<35	<30	<30	40	35	35
R194	<35	<30	<30	40	35	35
R195	<35	<30	<30	40	35	35
R197	<35	<30	<30	40	35	35
R200	<35	<30	<30	40	35	35
R202	<35	<30	<30	40	35	35
R203	<35	<30	<30	40	35	35
R208	<35	<30	<30	40	35	35
R213	<35	<30	<30	40	35	35
R224	<35	<30	<30	40	35	35

Table 3.13 Predicted noise levels from proposed worst-case operations

Assessment location ID	Predicted worst-case $L_{Aeq,15min}$ noise levels, dB			Adopted PNTLs, $L_{Aeq,15min}$, dB		
	Day	Evening	Night	Day	Evening	Night
R225	<35	<30	<30	40	35	35
R276	<35	<30	<30	40	35	35
R277	<35	<30	<30	40	35	35
R281	<35	<30	<30	40	35	35
R284	<35	<30	<30	40	35	35
R362	<35	<30	<30	40	35	35
R402	<35	<30	<30	40	35	35
R403	<35	<30	<30	40	35	35
R405	<35	<30	<30	40	35	35
R406	<35	<30	<30	40	35	35
R419	<35	<30	<30	40	35	35
R1042	<35	<30	<30	40	35	35
R1043	<35	<30	<30	40	35	35
R1044	<35	<30	<30	40	35	35

Notes: 1. Residence currently uninhabited and subject to 'acquisition upon request' as per the development consent.

A comparison of predicted operational noise levels from the proposed modification and EIS approved site noise levels (2015 noise assessment) was also completed. The comparison identified the modelled overall noise levels at all assessment locations from MOD1 is less than the approved Balranald Project.

Furthermore, based on the noise levels shown in Table 3.13, noise levels from the proposed modification are predicted to satisfy the requirements of the DPE Voluntary Land Acquisition and Mitigation Policy For State Significant Mining, Petroleum and Extractive Industry Developments (VLAMP) (2018) on all privately-owned land. This finding is consistent with that of the 2015 noise assessment.

3.6.2 Construction noise

Noise from proposed construction activities differ from operational activities and hence has been assessed separately against the ICNG NMLs (refer to Table 3.8). These will occur prior to and in isolation of any operations.

Activities such as removal and stockpiling of topsoil and overburden have not been considered in the construction noise assessment as such activities are already assessed as operation under the more stringent NPfI PNTLs.

The construction scenarios, plant and equipment, associated sound power levels and quantities considered in the construction noise assessment are generally consistent with those adopted in the 2015 noise assessment. All scenarios have been considered to occur simultaneously 24 hours a day and therefore represent worst-case noise levels throughout the construction phase.

The only difference with the 2015 noise assessment is the location of the MOD1 processing area infrastructure which is now proposed to be constructed and operated approximately 6 km to the north-west (closer to R5).

Potential impacts for sleep disturbance from proposed construction activities during the night period (10.00 pm to 7.00 am Monday to Saturday, and 10.00 pm to 8.00 am on Sundays) have also been assessed as described in Section 3.6.2.

Predicted noise levels from proposed construction during the recommended standard hours and out-of-hours (including the night period) are shown in Table 3.14.

Table 3.14 Predicted construction noise levels

Assessment location	Predicted construction $L_{Aeq,15min}$ noise levels, dB		Construction NMLs, dB	
	Standard hours	Out-of-hours	Standard hours	Out-of-hours
R281 ¹	<40	35	45	35
R5	<40	<35	45	35
All other assessment locations	<40	<35	45	35

Notes: 1. This assessment location has been identified as a shed.

Modelling results showed that site noise levels from proposed construction are predicted to satisfy the relevant NMLs at all assessment locations during the recommended standard hours and out-of-hours (including the night period) during worst-case meteorological conditions. This finding is consistent with that of the 2015 noise assessment.

3.6.3 Sleep disturbance

Maximum noise levels from proposed night operations with the potential to cause sleep disturbance at nearby assessment locations have been assessed in accordance with the NPfl. This included maximum night-time noise levels from proposed construction activities.

Maximum predicted $L_{Aeq,15min}$ noise levels for the night period were taken from Table 3.13 and Table 3.14 and compared against the relevant sleep disturbance trigger levels. Modelling results showed that $L_{Aeq,15min}$ noise levels from proposed construction during the night period are predicted to satisfy the relevant sleep disturbance screening criteria at all assessment locations during worst-case meteorological conditions.

Maximum L_{Amax} noise level events from proposed construction activities, such as truck pass-by, material handling and loading activities are assessed against the L_{Amax} sleep disturbance screening criteria. Typical L_{Amax} noise levels from such events as measured on similar projects are summarised in Table 3.15.

Table 3.15 Maximum noise levels from typical L_{Amax} sources

Noise source or activity	Measured L_{Amax} noise level, dB
Haul truck or road truck	125
FEL loading haul trucks	125
Dozer or FEL with reversing alarm	115
Reverse alarm	105-115 ¹

Notes: 1. Including a maximum modifying factor adjustment of 10 dB for tonal and intermittent noise as per Fact Sheet C of the NPfl.

The highest maximum noise levels from construction activities would likely result from handling, loading or transporting of material. The maximum sound power level (at source) for such events has previously been measured to be typically 125 dB L_{Amax} . Maximum noise levels at each assessment location were modelled under worst-case meteorological conditions for the night period (refer to Table 3.11).

Predicted L_{Amax} noise levels at assessment locations were based on typical mobile plant and equipment positions during construction. Predictions were based on a single event, rather than the simultaneous operation of a number of plant items, because of the low probability of more than one maximum L_{Amax} noise event occurring concurrently.

Predicted L_{Amax} noise levels for the night period during worst-case meteorological conditions are provided in Table 3.16.

Table 3.16 Predicted maximum L_{Amax} noise levels

Assessment location	Predicted L_{Amax} noise levels, dB	L_{Amax} criterion, dB
R54	38	52
R57	37	52
All other assessment locations	<30	52

Notes: 1. These properties have been identified as sheds and therefore sleep disturbance impacts do not apply.

Predictions in Table 3.16 show that L_{Amax} noise levels for MOD1 during operations and construction during the night period are expected to be well below the 52 dB L_{Amax} screening criteria at all residential assessment locations during worst-case meteorological conditions. Therefore, it is unlikely that the proposed modification will cause sleep disturbance at any residential receivers and no further detailed assessment of sleep disturbance is required as per the NPfI. This finding is consistent with that of the 2015 noise assessment.

3.6.4 Road traffic noise

A review of the road traffic data from the Traffic Impact Assessment report (TIA) prepared by EMM for MOD1 (2022) and the road traffic noise assessment prepared for the 2015 noise assessment was completed. The review indicated that volumes associated with the proposed modification during both construction and operations will generally be reduced. Furthermore, transport routes associated with the proposed modification will remain generally unchanged from the EIS approved operations (SSD-5285).

The approved and MOD1 road traffic volumes for construction are compared in Table 3.17. The increase in predicted noise levels for MOD1 is also provided in Table 3.17 for all relevant roads.

Table 3.17 Comparison of road traffic volumes (construction)

Road	Approved daily traffic volumes		MOD1 daily traffic volumes		Increase in road traffic noise level
	All traffic	Heavy vehicles	All traffic	Heavy vehicles	L _{Aeq,period} , dB
Balranald-Ivanhoe Road (north of Oxley Road)	179	24	130	26	Nil
Balranald-Ivanhoe Road (5 km north of Sturt Highway)	755	264	481	102	Nil
Balranald-Ivanhoe Road (north of Moa Street)	878	289	616	130	Nil
Mayall Street (north of Market Street)	913	100	919	96	Nil
McCabe Street (southern end)	309	193	216	110	Nil
Sturt Highway (1 km south of Balranald)	1,782	677	1,786	601	Nil
Sturt Highway (east of MR 67 Balranald-Tooleybuc Rd)	1,282	449	1,386	485	0.3
Sturt Highway (Euston, east of Murray Bridge Road)	1,710	580	1,740	610	0.2
Balranald-Tooleybuc Road (northern section)	751	272	711	198	Nil
Balranald-Tooleybuc Road (southern section)	560	224	466	111	Nil
Balranald-Tooleybuc Road (at existing Tooleybuc Bridge)	1,226	321	1,199	218	Nil
Arumpo Road (western section)	33	3	36	3	0.1
Arumpo Road (eastern section)	22	2	24	2	0.3
Burke and Wills Road (northern end)	33	13	12	1	Nil
Burke and Wills Road (southern end)	44	14	24	2	Nil
Piper Street (at Sturt Highway)	102	33	91	15	Nil
Moa Street (at Sturt Highway)	501	22	448	22	Nil
Moa Street (north of O'Connor Street)	241	38	139	18	Nil
O'Connor Street (west of Moa Street)	157	38	151	20	Nil
Market Street Sturt Highway (west of Mayall Street)	3,274	606	3,575	660	0.3

The approved and MOD1 road traffic volumes for operations are compared in Table 3.18. The increase in predicted noise levels for MOD1 is also provided in Table 3.18 for all relevant roads.

Table 3.18 Comparison of road traffic volumes (operations)

Road	Approved daily traffic volumes		MOD1 daily traffic volumes		Increase in road traffic noise level
	All traffic	Heavy vehicles	All traffic	Heavy vehicles	L _{Aeq,period} , dB
Balranald-Ivanhoe Road (north of Oxley Road)	186	37	139	26	Nil
Balranald-Ivanhoe Road (5 km north of Sturt Highway)	798	298	600	197	Nil
Balranald-Ivanhoe Road (north of Moa Street)	929	324	741	225	Nil
Mayall Street (north of Market Street)	956	104	1,042	122	0.5
McCabe Street (southern end)	354	226	266	149	Nil
Sturt Highway (1 km south of Balranald)	1,893	732	1,946	706	Nil
Sturt Highway (east of MR 67 Balranald-Tooleybuc Rd)	1,334	465	1,459	517	0.4
Sturt Highway (Euston, east of Murray Bridge Road)	1,753	600	1,831	650	0.3
Balranald-Tooleybuc Road (northern section)	813	310	775	239	Nil
Balranald-Tooleybuc Road (southern section)	613	261	556	184	Nil
Balranald-Tooleybuc Road (at existing Tooleybuc Bridge)	1,310	362	1,322	296	Nil
Arumpo Road (western section)	59	16	38	3	Nil
Arumpo Road (eastern section)	47	14	25	2	Nil
Burke and Wills Road (northern end)	12	1	13	1	0.7
Burke and Wills Road (southern end)	23	2	25	2	0.2
Piper Street (at Sturt Highway)	105	32	89	9	Nil
Moa Street (at Sturt Highway)	503	23	455	23	Nil
Moa Street (north of O'Connor Street)	228	38	127	13	Nil
O'Connor Street (west of Moa Street)	162	38	152	15	Nil
Market Street Sturt Highway (west of Mayall Street)	3,401	630	3,744	696	0.4

On the roads where traffic volumes associated with the proposed modification are predicted to increase when compared to the approved Balranald Project, during either construction or operations, the increase in noise levels are predicted to be negligible (up to 0.7 dB).

The increase in road traffic noise levels shown in Table 3.17 and Table 3.18 are unlikely to cause total road traffic noise levels (from baseline and proposed modification traffic combined) to exceed the relevant RNP noise criteria (refer to Table 3.9) at all nearest assessment locations. This is consistent with the findings of the road traffic noise assessment presented in the 2015 noise assessment.

Therefore, no additional road traffic noise impacts are anticipated from traffic associated with the proposed modification when compared to the 2015 noise assessment.

4 Noise management and mitigation

4.1 Operational noise

Feasible and reasonable noise management and mitigation measures were recommended in the 2015 noise assessment for the approved Balranald Project for operations. Iluka committed to managing noise levels to reduce the potential noise impacts at all assessment locations.

The implementation of noise management and mitigation measures for the approved Balranald Project (SSD-5285) will be implemented for the proposed MOD1. Measures will include (although not limited to) the following:

- Maintaining all plant and equipment in good working order to ensure sound outputs were within manufacturer specifications.
- Compliance noise monitoring.
- Notification to landowners potentially affected by site operations.
- Complaints management, including recording, reporting and acting on noise complaints.

4.2 Construction noise

Feasible and reasonable noise management measures were recommended in the 2015 noise assessment for the approved Balranald Project for construction. The main objective was to ensure that, as far as practicable, noise levels from construction activities would meet the relevant ICNG noise management levels across the 24-hour construction period.

The implementation of noise management measures for the approved Balranald Project (SSD-5285) will be implemented for the proposed MOD1. Measures will include (although not limited to) the following:

- Consultation with the relevant landowners prior to and during construction.
- Construction noise monitoring in the early stages of construction (where relevant).
- A review of noise management measures to ensure noise levels during construction remain below the noise management levels (where required).
- Complaints management, including recording, reporting and acting on noise complaints.

5 Conclusion

EMM has completed a noise impact assessment of the proposed MOD1 associated with operational noise, construction noise, sleep disturbance and road traffic noise. A comparison of noise impacts related to the proposed modification against the predicted impacts of the approved Balranald Project (2015 noise assessment) was also completed.

Worst-case operational noise levels were predicted to satisfy the PNTLs at all assessment locations during noise-enhancing meteorological conditions for the day, evening and night periods. When compared to approved site noise levels (2015 noise assessment), the modelled overall noise levels predicted at all assessment locations from MOD1 is less than the approved Balranald Project.

Noise levels from proposed worst-case construction works during and outside the ICNG recommended standard construction hours (including the night period) were predicted to satisfy the relevant NMLs at all assessment locations during noise-enhancing meteorological conditions.

Maximum night-time noise levels ($L_{Aeq,15min}$ and L_{Amax}) from the proposed MOD1 are predicted to satisfy the relevant sleep disturbance screening levels at all assessment locations.

Road traffic noise levels during operations and construction for MOD1 were predicted to satisfy the relevant noise criteria at all nearest assessment locations for all assessed roads.

With the proposed modification to approved operations, this assessment has demonstrated that noise levels from MOD1 (operational noise, construction noise and road traffic noise) are predicted to be lower or similar to predictions in the 2015 noise assessment at all assessment locations.

Noise management and mitigation measures for the approved Balranald Project (SSD-5285) will be implemented during construction and operations for MOD1.

References

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Appendix A

Glossary of acoustic terms



A.1 Glossary

Several technical terms are required for the discussion of noise. Noise terms and abbreviations used in this report are explained in Table A.1.

Table A.1 Glossary of acoustic terms and abbreviations

Abbreviation or term	Description
Amenity noise level	The amenity noise levels relate to the overall level of industrial noise subject to land zoning or use
Day period	Monday – Saturday: 7.00 am to 6.00 pm, on Sundays and public holidays: 8.00 am to 6.00 pm
dB	Noise is measured in the unit called the decibel (dB)
DPE	NSW Department of Planning and Environment
DECCW	NSW Department of Environment, Climate Change and Water
EIS	Environmental impact statement
EMM	EMM Consulting Pty Limited
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
EP&A Act	<i>Environmental and Planning Assessment Act 1979</i> (NSW)
Evening period	Monday – Saturday: 6.00 pm to 10.00 pm, on Sundays and public holidays: 6.00 pm to 10.00 pm
ICNG	<i>NSW Interim Construction Noise Guideline</i> (DECC 2009)
INP	<i>NSW Industrial Noise Policy</i> (EPA 2000) (superseded)
Intrusiveness noise level	The intrusiveness noise level refers to noise that intrudes above the background level by more than 5 dB. The intrusiveness noise level is described in detail in this report.
$L_{A1,1min}$	The 'A-weighted' noise level exceeded for 1% of the specified time period of 1 minute
L_{Aeq}	The energy average noise from a source. This is the equivalent continuous 'A-weighted' sound pressure level over a given period. The $L_{Aeq,15min}$ descriptor refers to an L_{Aeq} noise level measured over a 15-minute period.
L_{Amax}	The maximum root mean squared 'A-weighted' sound pressure level (or maximum noise level) received during a measuring interval
Night period	Monday – Saturday: 10.00 pm to 7.00 am, on Sundays and public holidays: 10.00 pm to 8.00 am
NML	Noise management level (in accordance with the ICNG)
NMP	Noise Management Plan
NPfi	<i>NSW Noise Policy for Industry</i> (EPA 2017)
Out-of-hours (OOH)	Outside the ICNG recommended standard hours for construction
PNTL	Project noise trigger levels (PNTLs) are targets for a particular industrial noise source or industry. The adopted PNTLs are the lower of either the project intrusive or project amenity noise levels.
RBL	The Rating Background Level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period.
RNP	<i>NSW Road Noise Policy</i> (DECCW 2011)
Sound power level (L _w)	This is a measure of the total power radiated by a source. The sound power level of a source is a fundamental property of the source and is independent of the surrounding environment.

Table A.1 **Glossary of acoustic terms and abbreviations**

Abbreviation or term	Description
Standard hours	ICNG recommended standard hours for construction include Monday to Friday 7.00 am to 6.00 pm, Saturday 8.00 am to 1.00 pm, no work on Sundays or public holidays.
Temperature inversion	A positive atmospheric temperature gradient where atmospheric temperature increases with altitude.

It is useful to have an appreciation of the decibel (dB), the unit of noise measurement. Table A.2 gives an indication as to what an average person perceives about changes in noise levels in the environment.

Table A.2 **Perceived change in noise level**

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

Examples of common noise levels are provided in Figure A.1.

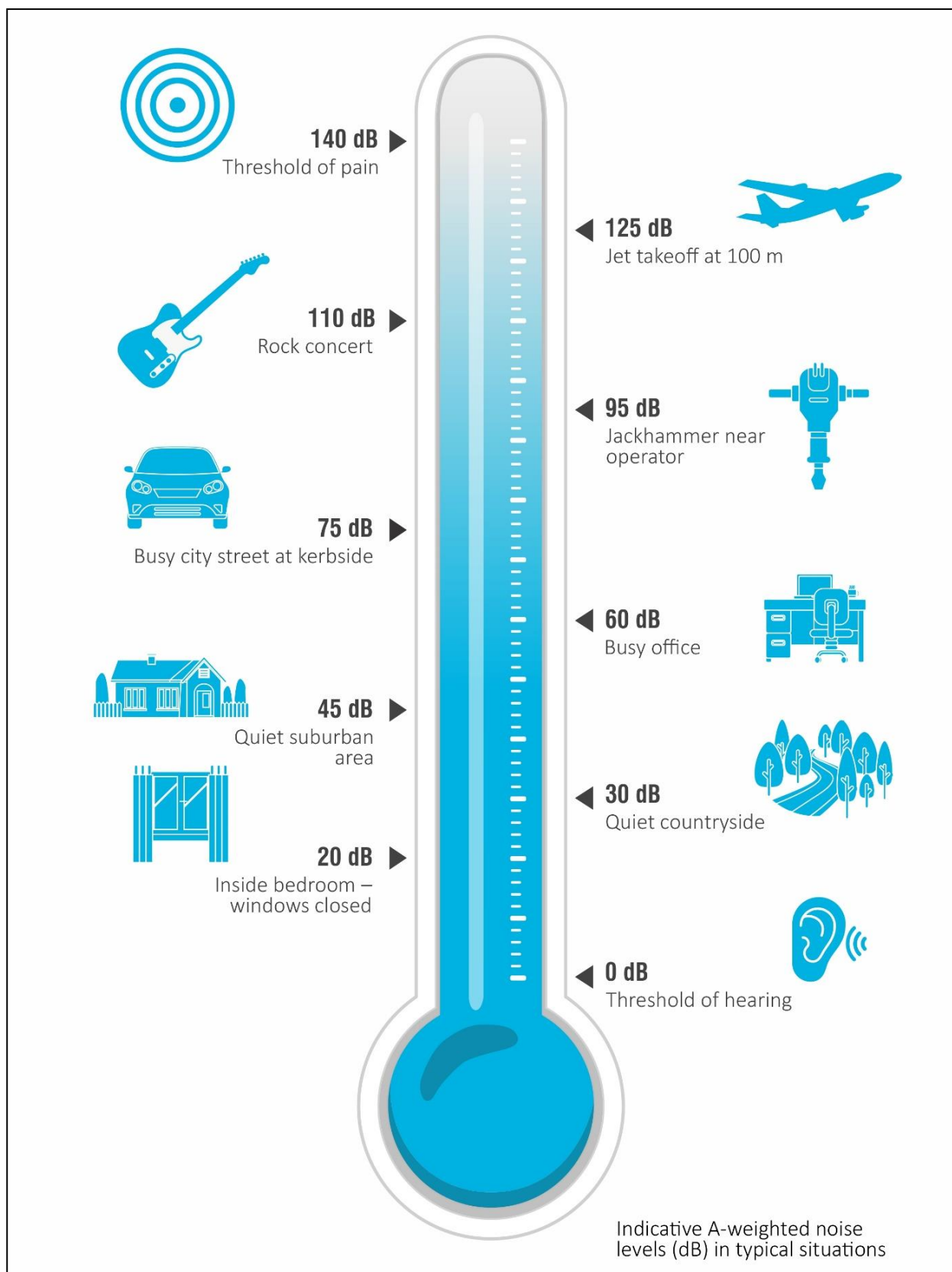


Figure A.1 Common noise levels



