Noise and Vibration Impact Assessment

Federation Project
Nymagee, NSW

Prepared for: SLR Consulting Australia Pty Ltd
September 2021
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Muller Acoustic Consulting

Document Information

Noise and Vibration Impact Assessment

Federation Project

Nymagee, NSW

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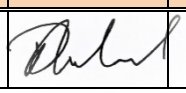
MAC201133-03RP1V1	Final	28 September 2021	Dale Redwood		Oliver Muller	

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1 Introduction

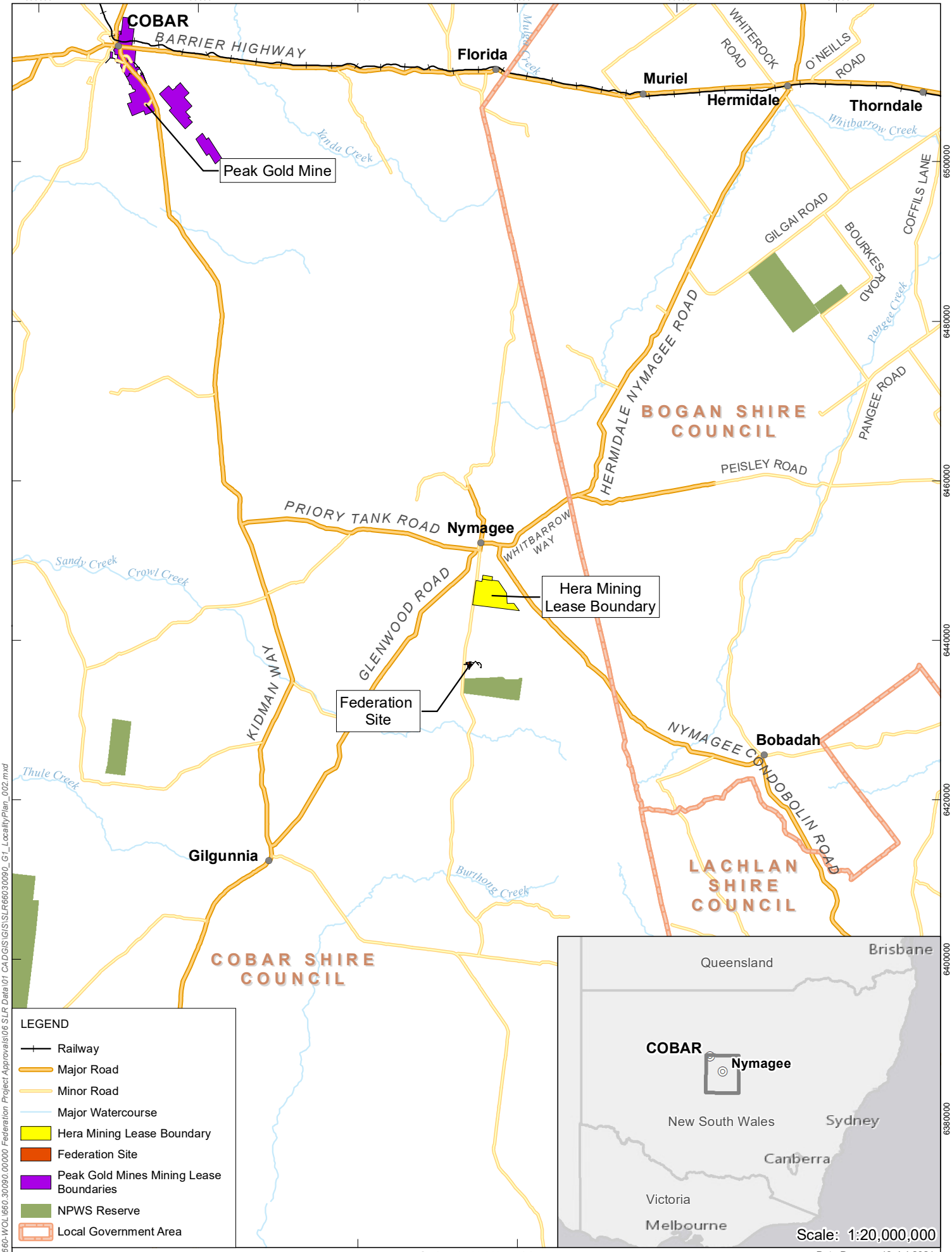
Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by SLR Consulting Australia Pty Ltd (SLR) on behalf of Hera Resources Pty Ltd (Hera Resources) to complete a Noise and Vibration Impact Assessment (NVIA) for the construction and operation of the 'Federation Project' or the 'Project', an underground mine development, including amendments at Hera Mine to facilitate processing of ore from the Federation Site, and a Services Corridor between the two mine sites.

The Federation Site is located on the 'Balowra' property approximately 15km south of the Nymagee township and 10km south of Hera Resources' 'Hera Mine' in the central west of NSW. The Project Location Plan including Federation Site and Hera Mine Site Boundary are shown in **Figure 1**.

The NVIA was completed to quantify potential construction, operational and road traffic and ancillary facilities noise impacts at nearby receivers associated with the Federation Project, and will accompany the Environmental Impact Statement (EIS) being prepared by SLR to assess the Project. The NVIA has been conducted in accordance with the following policies and guidelines:

- NSW Environment Protection Authority's (EPA's), Noise Policy for Industry (NPI), 2017;
- NSW Department of Environment and Climate Change (DECC), Interim Construction Noise Guideline (ICNG), 2009;
- NSW Department of Environment, Climate Change and Water (DECCW), Road Noise Policy (RNP), 2011;
- Department of Environment, Climate Change and Water (DECCW), Voluntary Land Acquisition and Mitigation Policy (VLAMP), 2018;
- Australian Standard AS2187.2-2006 (AS2187.2) – Explosives-Storage and Use Part 2: Use of Explosives; and
- Australian and New Zealand Environment Council (ANZEC), 1990, Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.



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Data Source: Basedata NSW SS, 2019, Geoscience Australia
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FEDERATION PROJECT LOCATION PLAN

FIGURE 1

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2 Project Background

2.1 Overview

Hera Resources Pty Limited (Hera Resources) is a wholly owned subsidiary of Aurelia Metals Limited (Aurelia). Hera Resources currently own and operate the Hera Mine located approximately 80km south-east of Cobar and approximately 5km south of the township of Nymagee in western NSW. Aurelia owns and operates the Peak Gold Mine (PGM) near Cobar in western NSW.

Hera Resources is evaluating the development of the Federation Project (the Project), a proposed underground metalliferous mine development. The Project comprises underground mining activities and surface infrastructure at the Federation Site, amendments at Hera Mine to facilitate processing of ore from the Federation Site, and a Services Corridor connecting the Federation Site with Hera Mine. The Federation Site is located approximately 15km south of the Nymagee township and 10km south of the Hera Mine.

The Federation Project will be a State Significant Development (SSD) (the Project) as defined by the *State Environmental Planning Policy (State and Regional Development) 2011 (the SRD SEPP*).

2.2 Background

Hera Mine has been operational since 2012 and produces gold and silver doré (unrefined bars) and a zinc/lead concentrate. Waste rock and metalliferous ore are extracted using underground open stope mining methods and underground load and haul operations. Hera Mine is approved to process up to 505,000 tonnes of ore on site annually, with lead/zinc concentrate transported to the Hermidale rail siding located approximately 75km to the north-east. The Hera Mine Project Approval was modified in June 2021 to allow for operations up to 31 December 2025.

In April 2019 high grade lead, zinc and gold mineralisation was discovered at the Federation deposit. Subsequent surface drilling programs have delineated a substantial gold-lead-zinc-copper-silver mineral deposit. Hera Resources is evaluating the development of a satellite underground mine at the Federation Site that leverages established infrastructure at the Hera Mine to minimise environmental impacts and allow for the continuation of mining operations in the Nymagee area. Mining of the Federation deposit will allow for a transition of mining operations from Hera Mine to Federation, as ore from the Federation deposit replaces ore from the Hera Mine.

2.3 Project Overview

The Project, as shown in **Figure 2** comprises:

- The establishment and operation of underground gold and metalliferous mining activities, with supporting surface infrastructure, mining approximately 6.95 million tonnes (Mt) of ore over a period of 12 to 14 years, referred to as the Federation Site.
- Amendments at the Hera Mine to facilitate mining and processing of Federation ore, including new process plant and disposal of tailings in the Hera Mine tailings storage facility (TSF).
- Services Corridor between the Federation Site and Hera Mine, including powerline, water pipeline and access track.

Total ore production from the Federation Site is approximately 6.95 Mt over the life of the mine. The majority of ore produced will be sent to Hera Mine for processing. However up to 200 ktpa will be transported to PGM during operational years two to five (total of 750 kt over this period), whilst the new processing plant at Hera Mine is being commissioned.

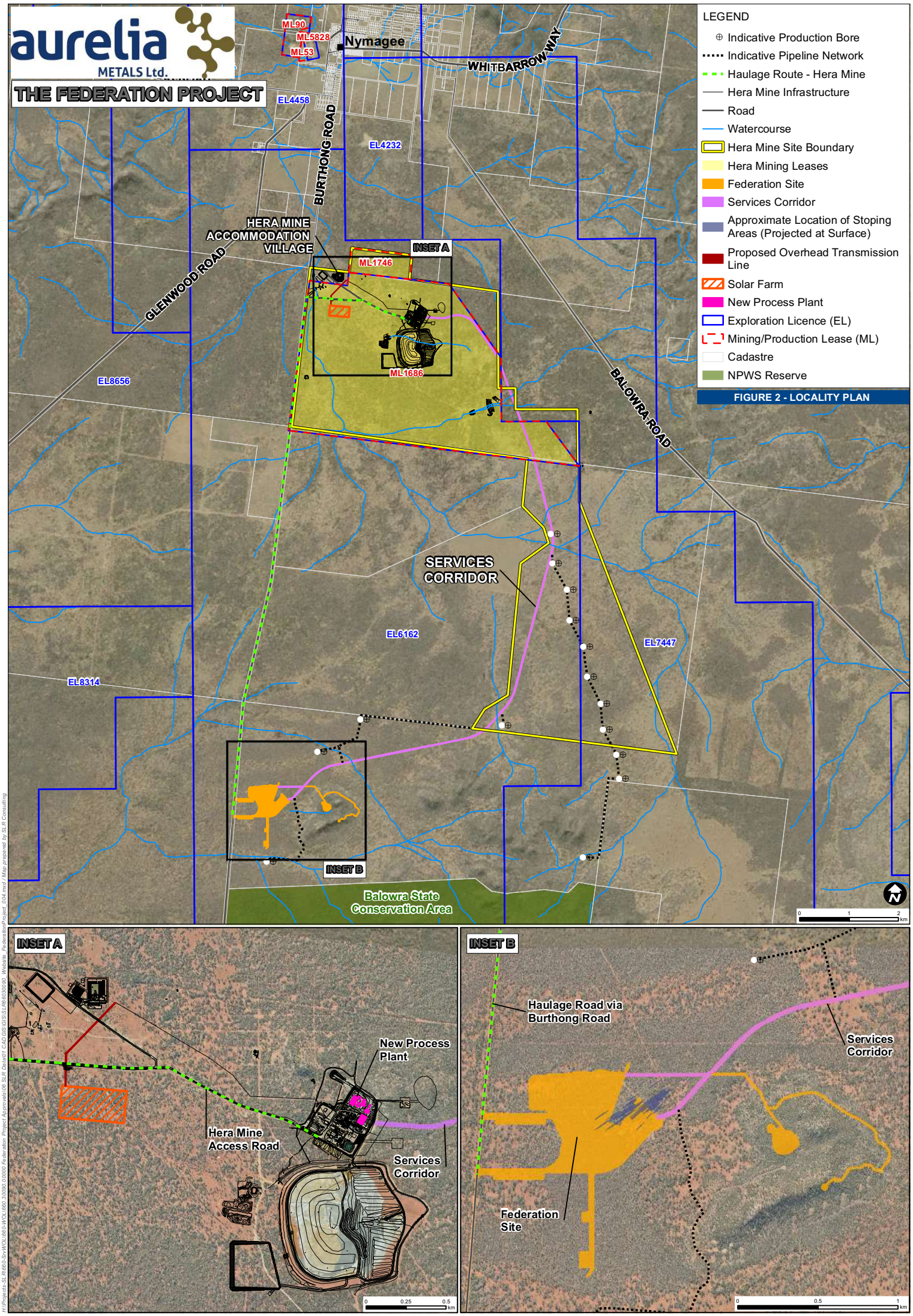
Access to the underground mine will be via a portal developed through the base of a box cut. The main decline will be developed to gain access to all production levels, where stopes will be excavated. The loosened ore from the stopes will be brought to the surface via underground truck and placed on the Federation Site Run of Mine (ROM) ore stockpile near the boxcut. Ore will then be transported by surface trucks via Burthong Road to the Hera Mine ROM stockpile at the Hera Mine process plant.

Hera Mine infrastructure is proposed to be modified to facilitate the Project including a new 750 ktpa processing plant and solar farm. The existing processing plant will continue to operate at Hera Mine until the commissioning of the new plant. The new plant will be within the existing approved footprint of Hera Mine. The new processing plant will produce silver and gold doré and separate lead, zinc and copper concentrates.

A total of 5.8 Mt of tailings will be generated from the processing of the ore from Federation. Of this approximately 5.2 Mt will be produced at Hera Mine, with the remaining 0.6 Mt at PGM. Approximately 60% of total tailings produced will be returned to Federation Site to backfill underground stopes.

Hera Mine and Federation Site will be connected by a Services Corridor. The nominated width of the corridor is up to 20m with an approximate length of 14.3km. Clearing of existing vegetation will be required to install the proposed services infrastructure, including a power transmission line, water pipeline, access track and potentially a tailings slurry pipeline. The access track will be used for maintenance and inspection requirements and will not be used for haulage or ore.

Concentrate from Hera Mine will be trucked to the Hermidale rail siding for transport, as per the current concentrate transport methods and truck sizing. Concentrate from PGM will be transported to Hermidale or Dubbo rail sidings, as per the current concentrate transport methods and truck sizing.



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Data Source: Basedata NSW SS, 2019, Aerial imagery supplied by © Department of Customer Service 2020. Aerometrex Pty Ltd, 2019 Coordinate System: GDA 1994 MGA Zone 55 Date Drawn: 30-Aug-2021

2.4 Transitional Period

It is anticipated that approval for the Federation Project will be obtained in early 2023. Prior to the construction and operation of the Federation Project, an Exploration Decline Program will be undertaken. This activity will be undertaken under a separate approval to that being sought for the Federation Project. The main objectives of the Exploration Decline Program are to further define the mineral resources associated with the Federation deposit, including permitting drilling of exploration drill holes from underground.

Key components of the Exploration Decline Program include:

- Establishment of a Surface Infrastructure Area required to support the exploration decline.
- Development of a box cut, portal, exploration decline, two ventilation rises and one escapeway.
- Transportation to and storage of waste rock within the Surface Infrastructure Area, with subsequent transport of waste rock to Hera Mine.
- Establishment and use of an approximately 14.8km surface pipeline to transfer water from the exploration decline to Hera Mine.
- Exploration drilling from the exploration decline.
- Extraction of one or more bulk samples together totaling no more than 20,000t and transportation of that material to Hera Mine processing plant via Burthong Road.

It is anticipated that the Exploration Decline Program will commence in November 2021 with the Surface Infrastructure Area established and waste rock being generated from the decline. It is anticipated that ore from the bulk sample will be mined and processed between the third quarter of 2022 and first quarter of 2023. Based on the current schedule for the Federation Project, there will be a transitional period between Exploration Decline Program activities, mining operations at Hera Mine, and Federation Project construction and operations. Following approval of the Federation Project:

- Construction of Federation Project infrastructure (including the new process plant) will commence in the first half of 2023
- Exploration Decline Program activities will transition into mining operations at the Federation Site
- Hera Mine operations may continue over a period of 6 to 12 months.

From early 2024, it is anticipated that all activities will be related to the Federation Project operations. The operational workforce numbers will be transitioned from Hera Mine operations to Federation Project operations.

2.5 Federation Project Detailed Overview

2.5.1 Mining Method

Underground mine stoping method. Access to the underground mine will be via a portal developed through the base of a box cut and decline. The proposed mining method requires excavation via drilling to a depth of approximately 530m to access areas of economically viable mineral resource deposits. Once the mineral deposit is accessed, stopes will be excavated via drilling and blasting.

Bench stopes will be progressively backfilled with waste rock and returned tailings from Hera Mine, which will be processed by a pastefill plant located on the Federation Site.

2.5.2 Mine Ventilation

The conceptual design has a first stage with installation of twin 110kW decline fans, and a Return Air Rise. Second stage with installation of a twin 500kW primary ventilation system consisting of two 250kW primary fans located on surface.

Secondary ventilation fans will also be required as the mine is developed.

2.5.3 Processing

A new 750 ktpa process plant design is proposed to be commissioned at Hera Mine. The existing processing plant will continue to operate at Hera until the completion of the new plant. The new plant will be within the existing approved footprint of Hera Mine.

The new processing plant involves:

- Three stages of crushing followed by ball milling with hydrocyclone classification.
- Gravity separation to recover gold from the milling circuit recirculating load, followed by cyanide leaching of the gravity concentrate.
- Sequential flotation to produce separate copper, lead and zinc concentrates.
- Concentrate thickening and filtration.
- Tailings thickening and disposal by underground backfill placement in the stopes at the Federation Site and surface storage in the Hera Mine TSF.

The primary difference between the proposed plant and the current plant, is that each concentrate (e.g. zinc concentrate) will be produced through dedicated processing circuits.

2.5.4 Waste Rock Management

Two waste rock stockpiles will be located at the Federation Site to store waste rock generated from the development of the boxcut, decline and the lateral and vertical development. One stockpile will be for the storage of non-acid forming (NAF) materials and the other for potential acid forming (PAF) materials. Should a greater proportion of waste rock be identified as PAF material, all or part of the NAF waste rock stockpile area will be managed as a PAF waste rock stockpile. PAF waste rock will be stored on surface with drainage to a lined leachate pond and used as backfill underground during or post mine life. NAF waste rock will be stored on surface for later use in rehabilitation, such as backfilling the box cut.

2.5.5 Ore Transport

Ore from the Federation deposit, that will be processed at Hera Mine, is proposed to be transported approximately 11km along Burthong Rd. Ore proposed for processing at PGM will be transported along Burthong Rd, Priory Tank Rd and Kidman Way (the same as the currently approved alternate concentrate haulage route). Ore will be transported in trucks with an approximate 50t payload.

2.5.6 Tailings Storage

The approved Hera Mine TSF will continue to be used to store tailings from the Hera processing plant which will process ore from the Federation Site. It is estimated over the life of the Project 5.2 Mt of tailings will be produced from Federation, of which 3.5 Mt will be returned to the Federation Site to be used as backfill. The remaining 1.7 Mt will be placed into the approved TSF.

2.5.7 Surface Infrastructure – Federation Site

Additional infrastructure at the Federation Site includes:

- Site roads, laydown and access control
- Explosives magazines x 2
- Mobile equipment maintenance workshop and warehouse
- Hydrocarbon storage
- Heavy and light vehicle washdown facilities
- Administration building
- Change house and laundry
- Sewerage treatment plant
- Potable Water Treatment Plant
- Substation
- Soil stockpiles

- Pastefill Plant
- Batch Plant
- Communications Tower
- Quarry

2.5.8 Power Supply

A new solar farm will be commissioned at Hera Mine, which will be located 200m south of the existing heavy vehicle access road. The solar farm will be connected to the gas fired power plant on site via a new transmission line. The new plant will increase power production to meet the additional requirements of the Federation Site, as well as the anticipated increase in demand at the Hera Mine from increased processing plant capacity.

2.5.9 Concentrate Transport

Concentrate from Hera Mine will be trucked to the Hermidale rail siding for transport, as per the current concentrate transport methods and truck sizing (50 tonne payload). Concentrate from PGM will be transported to Hermidale or Dubbo rail sidings, as per the current concentrate transport methods and truck sizing.

2.5.10 Decommissioning and Rehabilitation

Rehabilitation and decommissioning of the Project, including the Hera Mine site, would be undertaken on completion of extraction of the Federation deposit, with underground exploration continuing at Hera Mine during extraction from the Federation deposit. Backfilling of the stope voids will occur throughout operations

2.6 Proposed Activities & Operating Hours

There are several key activities associated with the Project that have the potential to generate acoustic impacts on nearby receivers. **Table 1** provides a summary of Project noise sources and the assessment period in which they propose to occur.

Table 1 Federation Project Operating Hours

Activity/Operation	Period
Underground Mining / Operations	24 hours / day, 7 days / week
Haulage Operations	Daylight hours (7am to 7pm), 7 days / week
Blasting	Above ground 9am to 5pm, Monday to Saturday Underground 24 hours / day, 7 days / week

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

2.7 Construction

Construction activities will be undertaken 7 days per week during daylight hours, unless a particular aspect of construction requires 24/7 activities. It is anticipated that construction activities will be undertaken over a period of six to twelve months.

Construction within the Services Corridor will involve the clearing of existing vegetation, associated earthworks, installation of the transmission line infrastructure, water pipeline establishment and construction of the services road.

Construction activities at the Hera Mine site will involve clearing and establishment of the solar farm and transmission line connecting to the existing line. No clearing will be required for the construction, installation and commissioning of the new processing plant which is located within the existing approved disturbance area at Hera Mine.

Prior to the construction and operation of the Federation Project, an Exploration Decline Program will be undertaken. This activity will be undertaken under a separate approval to that being sought for the Federation Project. The purpose of the Exploration Decline Program is to further define the mineral resources associated with the Federation deposit through extraction of one or more bulk samples together totalling no more than 20,000t, drilling of exploration drill holes from underground, and establishment of associated surface infrastructure, a box cut, portal, exploration decline, ventilation rises and escapeway. Ore from the bulk sample and waste rock from the exploration decline will be transported to Hera Mine under the Exploration Decline Program approval.

Construction activities at the Federation Site, other than those associated with the Exploration Decline Program, will involve clearing and construction of the site access haul road, services road to the quarry and communications tower, and installation of additional infrastructure.

2.8 Receiver Review

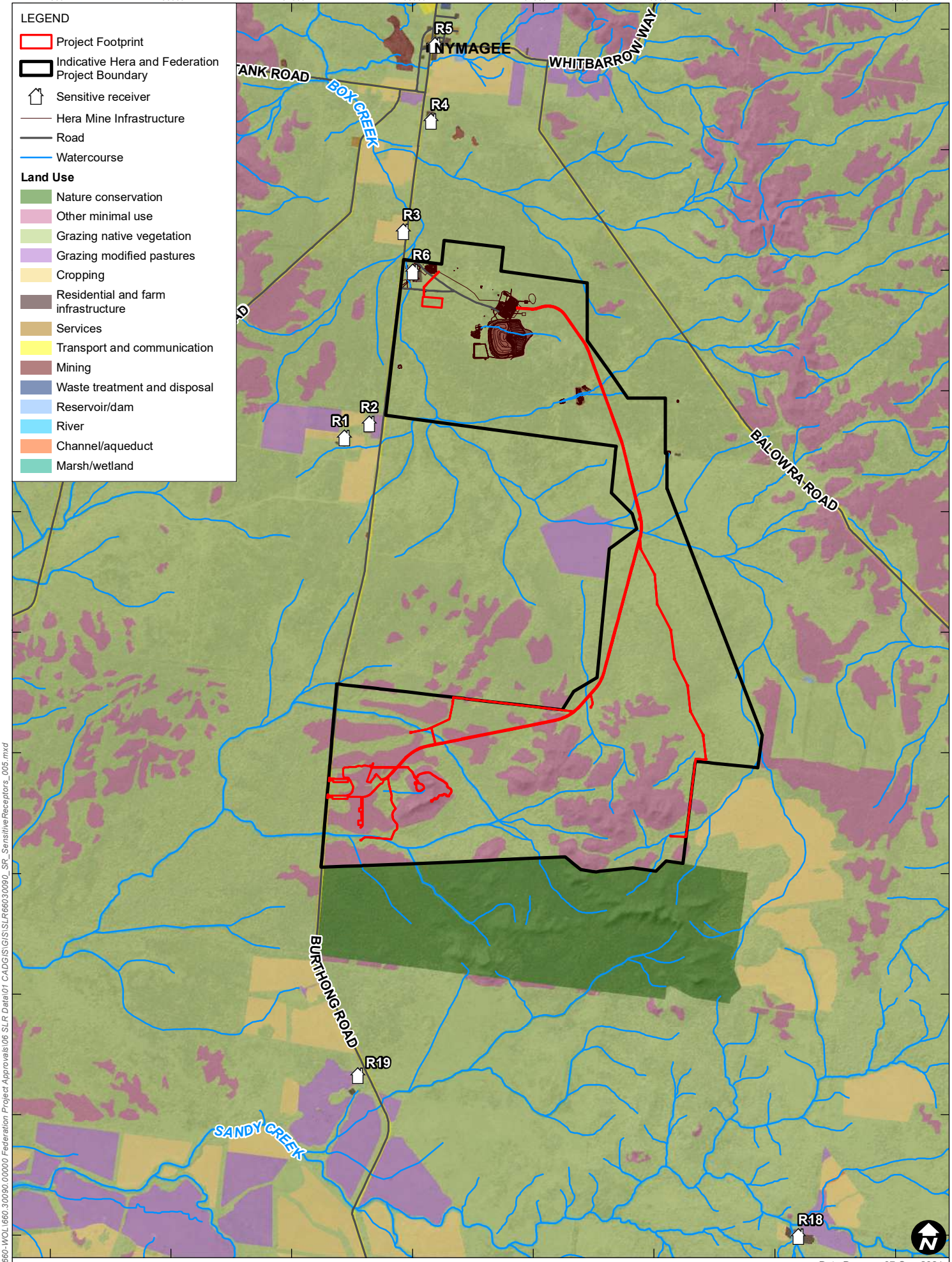
The region surrounding the Project Area is described as a sparsely populated rural environment. **Table 2** presents a summary of the potentially sensitive receivers within the locality of the Project Area. **Figure 3.** provides a locality plan showing the position of these receivers in relation to the Project.

Table 2 Receiver Locations

Receiver ID	Address	Receiver Type	Coordinates (GDA94/MGA55)	
			Easting	Northing
R1	1245 Burthong Road	Residential	433606	6444043
R2	688 Burthong Road	Residential	434127	6444330
R3	224 Burthong Road	Residential	434809	6448305
R4	39 Burthong Road	Residential	435319	6450718
R5	Nymagee Village	Residential	435485	6452163
R6[1]	Mining Accommodation	Accommodation	435210	6447568
R18	2781 Balowra Road	Residential	442772	6427557
R19	2120 Burthong Road	Residential	433736	6430509

Note 1: Project related receiver. Excluded from assessment.

It is noted that receiver R6 represents the Hera Mine mining accommodation village. Therefore, as the receiver is deemed to be Project related, it is excluded from further assessment.



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Sensitive Receiver Map

FIGURE 3

2.9 Assessment Requirements

The NVIA has been prepared in accordance with the NSW DPIE's Secretary's Environmental Assessment Requirements (SEARs) for the Project, issued on 17 August 2021. The SEARs identify matters which must be addressed in the assessment and essentially form the Project's terms of reference. **Table 3** lists individual requirements relevant to this NVIA and where they are addressed in this report.

Table 3 Noise Related SEARs and Agency Requirements

SEAR	Section
Identification of representative noise monitoring locations for determining compliance with applicable noise goals and where relevant noise goals would be set as representative limits.	Section 2.8
An assessment of the likely construction and operational noise impacts of the development in accordance with the *Noise Policy for Industry NSW*, and the *Voluntary Land Acquisition and Mitigation Policy*.	Section 6.1 Section 6.2 Section 6.3
If a claim is made for specific construction noise criteria for certain activities, then this claim must be justified and accompanied by an assessment of the likely construction noise impacts of these activities in accordance with the *Interim Construction Noise Guideline*.	Section 6.6
An assessment of the likely road noise impacts of the development in accordance with the *NSW Road Noise Policy.*	Section 6.4
An assessment of the likely blasting impacts of the development on people, animals, buildings and infrastructure, and significant natural features, having regard to the relevant ANZECC guidelines.	Section 6.5

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3 Noise Policy and Guidelines

3.1 Noise Policy for Industry

The EPA released the Noise Policy for Industry (NPI) in October 2017 which provides a process for establishing noise criteria for consents and licenses enabling the EPA to regulate noise emissions from scheduled premises under the Protection of the Environment Operations Act 1997.

The objectives of the NPI are to:

- provide noise criteria that is used to assess the change in both short term and long-term noise levels;
- provide a clear and consistent framework for assessing environmental noise impacts from industrial premises and industrial development proposals;
- promote the use of best-practice noise mitigation measures that are feasible and reasonable where potential impacts have been identified; and
- support a process to guide the determination of achievable noise limits for planning approvals and/or licences, considering the matters that must be considered under the relevant legislation (such as the economic and social benefits and impacts of industrial development).

The policy sets out a process for industrial noise management involving the following key steps:

1. Determine the Project Noise Trigger Levels (PNTLs) (ie criteria) for a development. These are the levels (criteria), above which noise management measures are required to be considered. They are derived by considering two factors: shorter-term intrusiveness due to changes in the noise environment; and maintaining the noise amenity of an area.

2. Predict or measure the noise levels produced by the development with regard to the presence of annoying noise characteristics and meteorological effects such as temperature inversions and wind.

3. Compare the predicted or measured noise level with the PNTL, assessing impacts and the need for noise mitigation and management measures.

4. Consider residual noise impacts - that is, where noise levels exceed the PNTLs after the application of feasible and reasonable noise mitigation measures. This may involve balancing economic, social and environmental costs and benefits from the proposed development against the noise impacts, including consultation with the affected community where impacts are expected to be significant.

5. Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development.

6. Monitor and report environmental noise levels from the development.

3.1.1 Project Noise Trigger Levels (PNTL)

The policy sets out the procedure to determine the PNTLs relevant to an industrial development. The PNTL is the lower (ie, the more stringent) of the **Project Intrusiveness Noise Level** (PINL) and **Project Amenity Noise Level** (PANL) determined in accordance with Section 2.3 and Section 2.4 of the NPI.

3.1.2 Rating Background Level (RBL)

The Rating Background Level (RBL) is a determined parameter from noise monitoring and is used for assessment purposes. As per the NPI, the RBL is an overall single figure background level representing each assessment period (day, evening and night) over the noise monitoring period.

3.1.3 Project Intrusiveness Noise Level (PINL)

The PINL ($LA_{eq(15min)}$) is the RBL + 5dB and seeks to limit the degree of change a new noise source introduces to an existing environment. Hence, when assessing intrusiveness, background noise levels need to be measured.

For low noise environments, such as rural environments, minimum assumed RBLs apply within the NPI and can be adopted in lieu of completing background noise measurements. This is considered the most conservative method for establishing noise criteria for a project. These result in minimum intrusiveness noise levels as follows:

- Minimum Day RBL = 35dBA;
- Minimum Evening RBL = 30dBA; and
- Minimum Night RBL = 30dBA.

Due to the rural nature of the locality, the PINLs for the proposal have been determined based on the minimum RBL+5dBA.

3.1.4 Project Amenity Noise Level (PANL)

The PANL is relevant to a specific land use or locality. To limit continuing increases in intrusiveness levels, the ambient noise level within an area from all combined industrial sources should remain below the recommended amenity noise levels specified in Table 2.2 (of the NPI). The NPI defines two categories of amenity noise levels:

- **Amenity Noise Levels (ANL)** – are determined considering all current and future industrial noise within a receiver area; and
- **Project Amenity Noise Level (PANL)** – is the recommended level for a receiver area, specifically focusing the project being assessed.

Additionally, Section 2.4 of the NPI states: "to ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows":

PANL for new industrial developments = recommended **ANL** minus 5dBA.

The following exceptions apply when deriving the PANL:

- areas with high traffic noise levels;
- proposed developments in major industrial clusters;
- existing industrial noise and cumulative industrial noise effects; and
- greenfield sites.

Where relevant this assessment has considered influences of traffic with respect to amenity noise levels (ie areas where existing traffic noise levels are 10dB greater than the recommended amenity noise level).

The recommended amenity noise levels as per Table 2.2 of the NPI are reproduced in **Table 4**.

Table 4 Amenity Noise Levels			
Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level dB LAeq(period)
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks.	See column 4	See column 4	5dB above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School Classroom	All	Noisiest 1-hour period when in use	35 (internal) 45 (external)
Hospital ward			
- internal	All	Noisiest 1-hour	35
- external	All	Noisiest 1-hour	50
Place of worship - internal	All	When in use	40
Passive Recreation	All	When in use	50
Active Recreation	All	When in use	55
Commercial premises	All	When in use	65
Industrial	All	When in use	70

Notes: The recommended amenity noise levels refer only to noise from industrial noise sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as rural residential; suburban residential; urban residential; industrial interface; commercial; industrial – see Table 2.3 and Section 2.7 of the NPI.

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

3.1.5 Maximum Noise Assessment Trigger Levels

The potential for sleep disturbance from maximum noise level events from a project during the night-time period needs to be considered. The NPI considers sleep disturbance to be both awakenings and disturbance to sleep stages.

Where night-time noise levels from a development/premises at a residential location exceed the following criteria, a detailed maximum noise level event assessment should be undertaken:

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

A detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the impacts on sleep disturbance include:

- how often the events would occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the development;
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods); and
- current understanding of effects of maximum noise level events at night.

3.2 Voluntary Land Acquisition and Mitigation Policy

The Voluntary Land Acquisition and Mitigation Policy (VLAMP, November 2018) describes the NSW Government's policy for voluntary mitigation and land acquisition actions undertaken to address noise impacts from State significant mining, petroleum and extractive industry developments. It aims to provide a balance between economic development and protecting the health, preserve amenity and control intrusive noise where potential impacts are identified.

The VLAMP outlines methods to determine the significance of potential exceedances of relevant noise assessment criteria and identifies potential treatments for those exceedances (VLAMP Table 1) and has been reproduced in **Table 5**.

Table 5 Characterisation of Noise Impacts and Potential Treatments (VLAMP Table 1)			
If the predicted noise level minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Characterisation of impacts:	Potential treatment:
All time periods 0-2dBA	Not applicable	Impacts are considered to be **negligible**	The exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatments or controls
All time periods 3-5dBA	< recommended amenity noise level in Table 2.2 of the NPI; or > recommended amenity noise level in Table 2.2 of the NPI, but the increase in total cumulative industrial noise level resulting from the development is >1dB	Impacts are considered to be **marginal**	Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.
All time periods 3-5dBA	> recommended amenity noise level in Table 2.2 of the NPI, and the increase in total cumulative industrial noise level resulting from the development is >1dB	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded facade elements like windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.
Day and evening >5dBA	< recommended amenity noise levels in Table 2.2 of the NPI	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded facade elements like windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.
Day and evening >5dBA	> recommended amenity noise levels in Table 2.2 of the NPI	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.
Night >5dBA	Not applicable	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.

3.2.1 Voluntary Mitigation Rights

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

- the noise generated by the development would meet the requirements of Table 1 (VLAMP) such that the impacts would be characterised marginal, moderate or significant at any residence on privately owned land; or
- the development would increase the total industrial noise level at any residence on privately owned land by more than 1dBA and noise levels at the residence are already above the recommended amenity noise levels in Table 2.2 of the NPI; or
- the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended acceptable levels in Table 6 of Appendix 3 of the RING by greater than or equal to 3dBA at any residences on privately owned land.

3.2.2 Voluntary Acquisition Rights

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

- the noise generated by the development would be characterised as significant, according to Table 1 (VLAMP), at any residence on privately owned land; or
- the noise generated by the development would contribute to exceedances of the acceptable noise levels plus 5dB in Table 2.2 of the NPI on more than 25% of any privately owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls; or
- the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended maximum criteria outlined in Table 6 of Appendix 3 of the RING by greater than or equal to 3dBA at any residences on privately owned land.

Impacts would be classified as significant where:

- During the daytime and evening periods, noise levels from the project are >5dBA above the PNTLs and the total cumulative industrial noise level is greater than the recommended amenity noise levels in Table 2.2 of the NPI; or
- During the night time period, noise levels from the project are >5dBA above the PNTLs.

3.3 Road Noise Policy

The road traffic noise criteria are provided in the Road Noise Policy (RNP), 2011. The policy sets out noise criteria applicable to different road classifications for the purpose of quantifying traffic noise impacts. Road noise criteria relevant to this assessment are presented in detail in Section 4.4.

For some industries such as mines and extractive industries, that are not served by arterial roads, a principal haulage route may be identified. The RNP indicates that where local authorities identify a 'principal haulage route', the noise criteria for the route should match those for arterial/sub-arterial roads, recognising that they carry a different level and mix of traffic to local roads.

3.4 ANZEC Blasting Guidelines

Noise and vibration levels from blasting are assessable against criteria established in the Australian and New Zealand Environment Council (ANZEC) – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration. The blasting limits are generally consistent with the guideline levels contained within AS2187:2006 Part 2 – Explosives - Storage and Usage – Part 2. Where compliance is achieved, the risk of human annoyance is minimised.

Furthermore, for damage induced vibration, German Standard DIN 4150 - Part 3: 1999 provides the strictest guideline levels of vibration velocity for evaluating the effects of vibration in structures. Blasting and vibration induced damage criteria relevant to this assessment are presented in detail in Section 4.5.

3.5 Interim Construction Noise Guideline

The assessment and management of noise from construction work is completed with reference to the Interim Construction Noise Guideline (ICNG). The ICNG is specifically aimed at managing noise from construction work regulated by the EPA and is used to assist in setting statutory conditions in licences or other regulatory instruments.

The ICNG sets out procedures to identify and address the impact of construction noise on residences and other sensitive land uses. This section provides a summary of noise objectives that are applicable to the assessment. The ICNG provides two methodologies for the assessment of construction noise emissions:

- Quantitative, which is suited to major construction proposals with typical durations of more than three weeks
- Qualitative, which is suited to short term infrastructure maintenance (for proposals with a typical duration of less than three weeks).

The methodology for a quantitative assessment requires a more complex approach, involving noise emission predictions from construction activities to the relevant assessment locations, whilst the qualitative assessment methodology is a more simplified approach that relies primarily on noise management strategies. This assessment has adopted the quantitative assessment approach.

3.5.1 Standard Hours for Construction

Table 6 presents the ICNG recommended standard hours for construction works.

Table 6 Recommended Standard Hours for Construction

Daytime	Construction Hours
Monday to Friday	7am to 6pm
Saturdays	8am to 1pm
Sundays or Public Holidays	No construction

These recommended hours do not apply in the event of direction from police, or other relevant authorities, for safety reasons or where required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm.

It is noted that construction activities for the Project are anticipated to be undertaken 12 hours per day during daylight hours from 7am to 7pm. It is noted that some limited construction activities may require 24 hour activities. Construction activities may therefore extend outside standard hours for construction.

3.5.2 Out of Hours Construction

Works conducted outside of recommended standard hours are considered out of hours work (OOH). The ICNG suggests that any request to vary the hours of construction activities as identified above shall be:

- considered on a case by case basis or activity-specific basis;
- accompanied by details of the nature and need for activities to be undertaken during the varied construction hours;
- accompanied by written evidence that activities undertaken during the varied construction hours are strongly justified;
- appropriate consultation with potentially affected receivers and notification of the relevant regulatory authorities has occurred; and
- all practicable and reasonable mitigation measures will be put in place.

3.5.3 Construction Noise Management Levels

Section 4 of the ICNG details the quantitative assessment method involving predicting noise levels and comparing them with the Noise Management Level (NML) and are important indicators of the potential level of construction noise impact. Table 7 reproduces the ICNG Noise Management Level (NML) for residential receivers. The NML is determined by adding 10dB (standard hours) or 5dB for Out of Hours (OOH) to the Rating Background Level (RBL) for each specific assessment period.

Table 7 Noise Management Levels		
Time of Day	Management Level LAeq(15min)[1]	How to Apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays.	Noise affected RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq(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 work to be carried out, the expected noise levels and duration, as well as contact details.
	Highly Noise Affected 75dBA (HNA)	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 times identified by the community when they are less sensitive to noise such as before and after school for work near schools, or mid-morning or mid-afternoon for work near residences; and 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 + 5dB	A strong justification would typically be required for work 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 5dBA 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.

Note 1: The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the construction noise management levels for noise assessment purposes and is the median of the ABL's.

3.5.4 Construction Sleep Disturbance

Section 4.3 of the ICNG (DECC, 2009) states that a sleep disturbance assessment is required where construction activities are planned to occur for more than two consecutive nights. Although it is anticipated that construction activities would typically occur during daylight hours, MAC understands that some activities such as long concrete pours for the new processing plant and paste plant would potentially require construction activities during out of hours work periods. Hence, an assessment of potential sleep disturbance during activities outside standard construction hours has been undertaken.

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4 Assessment Criteria

4.1 Operational Noise Criteria

4.1.1 Intrusiveness Noise Levels

The PINL for the Project are presented in **Table 8** and have been determined based on the minimum RBL +5dBA and only apply to residential receivers.

Table 8 Project Intrusiveness Noise Levels

Receiver Type	Period[1]	Adopted RBL dB LA_{90}	PINL dB $LA_{eq(15min)}$
Residential	Day	35	40
	Evening	30	35
	Night	30	35

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2 Amenity Noise Levels and Project Amenity Noise Levels

The PANL for residential receivers and other receiver types (ie non-residential) potentially affected by the Project are presented in **Table 9.**

Table 9 Amenity Noise Levels and Project Amenity Noise Levels

Receiver Type	Noise Amenity Area	Assessment Period[1]	NPI Recommended ANL dB $LA_{eq(period)}$	ANL dB $LA_{eq(period)}$[2]	PANL dB $LA_{eq(15min)}$[3]
Residential	Rural	Day	50	45	48
		Evening	45	40	43
		Night	40	35	38

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Note 2: Project Amenity Noise Level equals the Amenity Noise Level -5dB as there is other industry in the area.

Note 3: Includes a +3dB adjustment to the amenity period level to convert to a 15-minute assessment period as per Section 2.2 of the NPI.

4.2.1 Project Noise Trigger Levels

The PNTL are the lower of either the PINL or the PANL. **Table 10** presents the derivation of the PNTLs in accordance with the methodologies outlined in the NPI.

Table 10 Project Noise Trigger Levels

Receiver Type	Noise Amenity Area	Assessment Period[1]	PINL dB $L_{Aeq(15min)}$	PANL dB $L_{Aeq(15min)}$	PNTL dB $L_{Aeq(15min)}$
Residential	Rural	Day	40	48	40
		Evening	35	43	35
		Night	35	38	35

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2.2 Maximum Noise Assessment Trigger Levels

The maximum noise trigger levels shown in **Table 11** are based on night time RBLs and trigger levels as per Section 2.5 of the NPI. The trigger levels will be applied to transient noise events that have the potential to cause sleep disturbance.

Table 11 Maximum Noise Trigger Level

Residential Receivers			
$L_{Aeq(15min)}$		L_{Amax}	
40dB $L_{Aeq(15min)}$ or RBL + 5dB		52dB L_{Amax} or RBL + 15dB	
Trigger	40	Trigger	52
RBL +5dB	35	RBL +15dB	45
Highest	**40**	**Highest**	**52**

Note: Monday to Saturday; Night 10pm to 7am. On Sundays and Public Holidays Night 10pm to 8am.

Note: NPI identifies that maximum of the two values is to be adopted which is shown in bold font.

4.3 Voluntary Land Acquisition and Mitigation Policy Significant Criteria

The VLAMP significance criteria (where impacts would be classified as significant as above) applicable to the Project are presented in **Table 12**.

Table 12 VLAMP Project Specific Significance Criteria

Catchment	Period	PNTL dB $LA_{eq(15min)}$	VLAMP Significant Impact Thresholds		
			Voluntary Acquisition[1]		Vacant Lands Acquisition[2]
			Recommended ANL dB $LA_{eq(period)}$	PNTL+5dB dB $LA_{eq(15min)}$	Recommended ANL +5dB dB $LA_{eq(period)}$
All receivers	Day	40	48	45	53
	Evening	35	43	40	48
	Night	35	38	40	43

Note 1: Voluntary acquisition rights where the Project Noise Level (PNL) exceeds the PNTL by more than 5dB.

Note 2: Project Noise Levels (PNL) exceed the relevant criteria on more than 25% for any privately-owned land parcels.

4.4 Road Traffic Noise Criteria

In accordance with the RNP, this assessment has adopted the 'Freeway/arterial/sub-arterial road' category for the designated inbound and outbound transport routes, consistent with the classification of the haulage route as a 'principal haulage route'. **Table 13** reproduces the road traffic noise assessment criteria relevant for this road type.

Table 13 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road category	Type of Project/development	Assessment Criteria - dB(A)	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeway/arterial/sub-arterial road	Existing residences affected by additional traffic on existing freeways/sub-arterial/roads generated by land use developments	60dB(A) $LA_{eq(15hr)}$	55dB(A) $LA_{eq(9hr)}$

Note: For road noise assessments, the day period is from 7am to 10pm (ie there is no evening assessment period as there is with operational noise). Night is from 10pm to 7am.

In addition to the assessment criteria above, any increase in the total traffic noise level at a location due to a proposed traffic generating development must be considered. In accordance with Section 2.4 of the RNP, residences experiencing increases in total traffic noise above the relative increase criteria of Existing traffic $LA_{eq(15hr)}$ + 12dB should be considered for mitigation.

4.5 ANZEC Guideline Blasting Limits

The ANZEC blasting limits for air-blast overpressure and ground vibration are presented in **Table 14**.

Table 14 ANZEC Guideline Blasting Limits

	Overpressure dB (Linear Peak)	Ground Vibration PPV (mm/s)
Recommended Maximum (95% of all blasts)	115	5
Level not to be exceeded	120	10
Long term goal for ground vibration	N/A	2

4.6 Construction Noise Criteria

Noise Management Levels (NMLs) for construction activities for all residential receivers are 45dB $LA_{eq(15min)}$ (RBL +10dB). Construction activities are typically planned for standard hours, however, MAC understands that some activities may be required outside standard construction hours under exceptional circumstances. The relevant NMLs for standard construction hours and out of hours periods are summarised in **Table 15**.

Table 15 Construction Noise Management Levels

Location	Assessment Period	RBL dB LA_{90}	NML dB $LA_{eq(15min)}$
All Residential Receivers	Day (Standard Hours)	35	45 (RBL+10dBA)
	Evening (OOH Period 1)	30	35 (RBL+5dBA)
	Night (OOH Period 2)	30	35 (RBL+5dBA)

4.7 Construction Vibration

Department of Environment and Conservation (DEC) 2006, Assessing Vibration: A Technical Guideline (the 'Guideline') provides guidance on determining effects of vibration on buildings occupants. The guideline does not address vibration induced damage to structures, blast induced vibration effects or structure borne noise effects.

A qualitative assessment of potential vibration impacts has been completed. Due to the nature of the works proposed and distances to potential vibration sensitive receivers (i.e. more than 1.5km to the nearest receivers to construction activities), vibration impacts from the Project would be negligible, and have not been considered further in this assessment.

5 Modelling Methodology

A computer model was developed to quantify Project noise emissions to neighbouring receivers using DGMR (iNoise, Version 2021.1) noise modelling software. iNoise is an intuitive and quality assured software for industrial noise calculations in the environment. 3D noise modelling is considered industry best practice for assessing noise emissions from projects.

The model incorporated a three-dimensional digital terrain map giving all relevant topographic information used in the modelling process. Additionally, the model uses relevant noise source data, ground type, attenuation from barrier or buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Where relevant, modifying factors in accordance with Fact Sheet C of the NPI have been applied to calculations.

The model calculation method used to predict noise levels was in accordance with ISO 9613:1 and ISO 9613:2 including corrections for meteorological conditions using CONCAWE[1]. The ISO 9613 standards are the most used noise prediction method worldwide. Many countries refer to ISO 9613 in their noise legislation. However, the ISO 9613 standard does not contain guidelines for quality assured software implementation, which leads to differences between applications in calculated results. In 2015 this changed with the release of ISO/TR 17534-3. This quality standard gives clear recommendations for interpreting the ISO 9613 method. iNoise fully supports these recommendations. The models and results for the 19 test cases are included in the software.

[1] Report no. 4/18, "the propagation of noise from petroleum and petrochemical complexes to neighbouring communities", Prepared by C.J. Manning, M.Sc., M.I.O.A. Acoustic Technology Limited (Ref.AT 931), CONCAWE, Den Haag May 1981

5.1 Operational Noise Modelling Scenarios

The Federation Project is an underground metalliferous mine employing excavation through drilling and blasting mining methods. The loosened ore from the stopes is brought to the surface via underground truck and placed on the run of mine (ROM) ore stockpile near the box cut. Ore is then transported by surface trucks to the ROM stockpile at Hera Mine.

The Federation Project would involve the following noise generating activities:

- Movement of haul trucks from box cut and extraction area to the ROM Pad;
- Loading of A-double road trucks from ROM Pad by front-end loader, and haulage to Hera Mine;
- Operation of new process plant at Hera;
- Haulage of concentrate from the Hera Mine;
- Haulage of tailings from the Hera Mine to the Federation Site;
- Operation of the shotcrete batch plant and paste plant at the Federation Site;
- Backfilling of stopes from tailings paste plant located adjacent to stoping footprint
- Operation of the quarry at the Federation Site
- Use of power generator during the initial stages of the Federation Project; and
- Management of waste rock stockpiles from the lateral and vertical developments.

Additionally, a quarry will be located to the east of the mine infrastructure, with conventional drilling and blasting methods employed to excavate material.

Mining activities will be undertaken 24 hours per day, however, quarrying activities and transportation of ore to Hera Mine will occur during daylight hours (7am to 7pm) only.

MAC understands that following installation of the new processing plant at Hera Mine, the exiting plant will be decommissioned. It is noted that for a period of time, the existing and new processing plants are likely to operate simultaneously. Hence, the assessment has assumed both processing plants operating simultaneously as a worst-case scenario.

5.1.1 Sound Power Levels - Operation

The noise emission levels used in modelling are summarised in **Table 16**. Noise emission levels for Hera Mine were sourced from the assessment of noise levels for the Hera Mine Project Approval Modification 6, approved in June 2021.

Table 16 Single Octave Equipment Sound Power Levels, dB $LA_{eq(15min)}$ ($re10^{-12}W$)

Noise Source/Item	Octave Band Centre Frequency, Hz								Total, dBA
	63	125	250	500	1000	2000	4000	8000	
Federation									
Pneumatic Drill	85	103	96	102	106	107	103	99	112
Excavator	82	95	104	105	107	106	101	91	112
Haul Trucks (x4)	96	93	101	105	109	107	102	95	113
Front-end Loader	93	98	100	107	105	103	97	88	111
Grader	86	95	99	100	109	104	100	88	111
Road Trains	65	80	87	93	92	92	87	83	98
Diesel Generator	66	102	92	94	97	93	90	80	105
Water Cart	81	82	89	91	95	97	89	81	101
Vent Fans (x2)	85	93	103	106	100	98	91	75	109
Pastefill Plant	79	89	93	100	104	103	97	90	108
Shotcrete Batch Plant	78	92	96	105	107	106	100	93	112
Hera Mine									
Pneumatic Drill	85	103	96	102	106	107	103	99	112
Excavator	82	95	104	105	107	106	101	91	112
Haul Trucks (x4)	96	93	101	105	109	107	102	95	113
Front-end Loader	93	98	100	107	105	103	97	88	111
Grader	86	95	99	100	109	104	100	88	111
Road Trains	65	80	87	93	92	92	87	83	98
Diesel Generator	66	102	92	94	97	93	90	80	105
Water Cart	81	82	89	91	95	97	89	81	101
Crushing and Grinding Circuit (x2)[1]	89	99	103	108	109	108	103	101	114
Sleep Disturbance Assessment									
Dumping Material	91	101	107	112	112	112	104	96	117

Note 1: Assessment considers the simultaneous operation of the existing and the new processing plants.

5.1.2 Annoying Characteristics

Fact Sheet C of the NPI provides guidelines for applying 'modifying factors' adjustments to account for annoying noise characteristics such as low frequency, tonality, intermittent noise, irregular or noise of short duration. It is noted that due to the nature of the mining and processing operations, intermittent noise is unlikely to be a feature of the site and has not been considered further.

An analysis of low-frequency noise and tonality was completed for operations at the Federation Site and Hera Mine. The results of the analysis of low-frequency noise found that modelled noise levels from all sources exceeded the screening test of C-A weighted noise levels greater or equal to 15dB at the nearest receivers. Further analysis was undertaken to determine whether noise levels exceed the threshold for any octave band. The results of the assessment indicated that Z weighted noise levels remained below the relevant thresholds for all octave bands for each assessed receiver location. Hence, no correction for low-frequency noise is applied.

An assessment of tonality was undertaken to identify dominant tones associated with the Federation Project. The tonal noise correction applies when the level of an octave band exceeds the level of the adjacent band on either side by at least 5dB. The results of the tonality assessment demonstrates that the Federation Project operations do not result in dominant tones. Hence, no correction for tonality is applied.

5.2 Meteorological Analysis

Noise emissions from industry can be significantly affected by prevailing weather conditions. Wind has the potential to increase noise at a receiver when it is at low velocities and travels from the direction of the noise source. As the strength of the wind increases, the noise produced by the wind will mask the audibility of most industrial sources.

Meteorological conditions that enhance received noise levels include source to receiver winds and the presence of temperature inversions. To account for potential enhancements, the NPI specifies that the source to the receiver wind component speeds up to 3m/s for 30% or more of the time in any seasonal period (i.e. day, evening or night), is considered to be a feature wind and predictions must incorporate these conditions.

To determine the prevailing conditions for the Project, weather data during the period September 2017 to September 2019 was obtained from the Bureau of Meteorology Cobar Airport Automatic Weather Station (AWS). The data was analysed using the EPA's Noise Enhancement Wind Analysis (NEWA) program in order to determine the frequency of occurrence of winds speeds up to 3m/s in each seasonal period.

Table 17 summarises the results of the wind analysis and includes the dominant wind direction and percentage occurrence during each season for each assessment period. The results of the detailed analysis of meteorological data is presented in Appendix B.

Table 17 Seasonal Frequency of Occurrence Wind Speed Intervals

Season	Period[1]	Wind Direction ±(45°)	% Wind Speeds (m/s)
			0.5 to 3 m/s
Summer	Day	NNE, NE, ENE, E	6
	Evening	NE, ENE, E, ESE	17
	Night	ENE, E, ESE	17
Autumn	Day	ENE, S, SSW	9
	Evening	ENE	24
	Night	NE, E	21
Winter	Day	SSW	12
	Evening	S	20
	Night	NNE, ENE	19
Spring	Day	SSW	7
	Evening	ENE	21
	Night	ENE, E	19

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Based on the results of this analysis, prevailing winds are not applicable for the assessment and the relevant meteorological conditions adopted for the assessment are summarised in Table 18.

Table 18 Modelled Site-Specific Meteorological Parameters

Assessment Condition[1]	Temperature	Wind Speed / Direction	Relative Humidity	Stability Class
Daytime - Calm	25°C	0.5m/s / all directions	50%	D
Evening - Calm	15°C	0.5m/s / all directions	60%	D
Night - Inversion	5°C	1.0m/s / all directions	70%	G

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

5.3 Road Noise Assessment Methodology

The United States (US) Environment Protection Agency's road traffic calculation method is used to predict the LA_{eq} noise levels from Project related trucks travelling past existing receivers adjacent to the haul routes. This method is an internationally accepted theoretical traffic noise prediction model and is ideal for calculating road traffic noise where relatively small traffic flows are encountered.

MAC understands that material haulage will generally comprise the following:

- Transport of ore from the Federation deposit to the Hera Mine;
- Transport of ore from the Federation deposit to PGM;
- Transport of tailings from Hera Mine to the Federation Site to be used as backfill; and
- Transport of concentrate from Hera Mine to the Hermidale Rail Siding.

Ore from the Federation Deposit will be transported approximately 11km along Burthong Road to the Hera Mine for processing. Ore to be processed at Peak Mine will be transported along Burthong Road, Priory Tank Road and Kidman Way. Ore will be transported via A-double road trains with an approximate 50t payload.

Approximately 60% of the total tailings will be used for paste backfilling of the stope voids at the Federation Site. Tailings will be transported to the Federation Site from Hera Mine via Burthong Road, with the potential for backfilling trucks carrying ore from the Federation Site; however, this assessment considers separate truck fleets for haulage of ore and tailings, which provide a worst-case scenario.

Concentrate from Hera Mine will be trucked to the Hermidale rail siding for transport, as per the current concentrate transport methods and truck sizing. Concentrate from Peak Mine will be transported to Hermidale or Dubbo rail sidings, as per the current concentrate transport methods and truck sizing.

In addition to haulage vehicles, the Federation Project is expected to generate light vehicle and bus traffic from the movement of workers to and from the site, and heavy vehicle traffic through delivery of materials or removal of waste.

Table 19 presents the haulage and non-haulage traffic volumes for each travel route during transportation operations. The traffic volumes represent the daily traffic movements and maximum daily haulage movements during the peak year of haulage for each travel route.

Table 19 Proposed Haulage and Non-haulage Vehicle Movements					
Haulage Route	Travel Route	Daily Project Traffic Volumes			
		Light Vehicles	Buses	Heavy Vehicles	Haulage Trucks
Federation Site to Hera Mine	Burthong Road Federation Site to Hera Mine	41	12	8	184
Hera Mine to Hermidale Siding	Hartwood Street – Milford Street – Whitbarrow Way – Nymagee Hermidale Road	100	0	4	32
Federation Site to PGM	Burthong Road (Hera Mine) to Priory Tank Road	148	0	20	49
	Priory Tank Road to Kidman Way	48	0	16	30
	Kidman Way to Barrier Highway (PGM)	48	0	16	30

Note 1: Two (2) movements equal one (1) return trip.

Existing road traffic volumes for each of the haulage routes were provided by The Transport Planning Partnership (TTPP) (2021, Ref: 21194_r01c04_210816_Federation Project). MAC understands that the traffic volume measurements were sourced from Cobar Shire Council and Transport for NSW. Due to the age of the data, TTPP projected the data to the peak year of haulage using a 1 percent annual traffic growth rate. The projected daily background (i.e. without the Project) traffic volumes are provided in **Table 20**.

Table 20 Projected Daily Traffic Volumes for Peak Year of Haulage[1]			
Road	Monitoring Location	Light Vehicles	Heavy Vehicles
Burthong Road / Hartwood Street	50m South of Hotel	110	38
Priory Tank Road	5km East of Kidman Way	49	18
Kidman Way	South of Peak Complex	148	137
Nymagee – Hermidale Road	2km South of Currans Rd	895	283

Note 1: Sourced from TTPP (2021), Ref: 21194_r01c04_210816_Federation Project

A review of aerial imagery was undertaken to identify the nearest residential receiver to the carriageway along each of the haulage routes. The closest offset distances are provided in **Table 21**.

Table 21 Closest Offset Distances – Road Traffic Assessment			
Road	Receiver ID	Address	Offset Distance (m)
Federation Site to Hera Mine			
Burthong Road	R1	1245 Burthong Road, Nymagee	750m
Burthong Road	R2	688 Burthong Road, Nymagee	260m
Hera Mine to Peak Gold Mine			
Burthong Road	R3	224 Burthong Road, Nymagee	75m
Burthong Road	R4	39 Burthong Road, Nymagee	110m
Priory Tank Road	N/A	2082 Glenwood Road, Nymagee	25m
Kidman Way	N/A	5826 Wallace Vale Road, Nymagee	220m
Hera Mine to Hermidale Rail Siding			
Burthong Road	R3	224 Burthong Road, Nymagee	75m
Hartwood Street	R5	2 Grahams Street, Nymagee	25m
Nymagee – Hermidale Road	N/A	15 Nymagee Street, Hermidale	15m

5.4 Blasting and Vibration Assessment Methodology

5.4.1 Air-Blast Overpressure

Calculation of overpressure has been completed using the following AS2187.2 equation:

$$\mathrm{P} = K_a \left(\frac{R}{(Q^{1/3})}\right)^a$$

Where:

P = Pressure, in kilopascals;

Q = Effective explosives charge mass, in kilograms (MIC);

R = Distance from charge, in metres;

K_a = Site constant, a conservative value of 25 was adopted; and

a = Site exponent, a value of -1.45 was adopted.

The conversion of 'P' to unweighted decibels (dBZ) is completed using the following formula:

$$\mathrm{SPL} = 10\ x \log\left(\frac{P}{P_0}\right)^2$$

5.4.2 Ground-Borne Vibration

Preliminary estimations for vibration have been completed using the following AS2187.2 equation:

$$\mathrm{V} = K_g \left(\frac{R}{(Q^{1/2})}\right)^{-B}$$

Where:

V = ground vibration as vector peak particle velocity, in mm/s;

R = distance between charge and point of measurement, in m;

Q = maximum instantaneous charge (effective charge mass per delay), in kg;

K_g = a constant related to site and rock properties for estimation purposes, a value of 1140 was adopted as per AS2187.2 to predict the 50% chance of exceedance in "average conditions"; and

B = a constant related to site and rock properties for estimation purposes, a value of 1.6 was adopted.

5.5 Construction Noise Modelling Scenarios

To facilitate and support mining operations at the Federation site, the Project will involve site establishment and installation of surface infrastructure at the Federation Site, amendments to infrastructure at Hera Mine, and the construction of a Services Corridor between the Federation Site and Hera Mine.

Based on the Project activities, the following modelling scenarios have been adopted for the assessment:

- Scenario 1 (Federation Site) – Site establishment;
- Scenario 2 – Construction of Services Corridor between the Federation Site and Hera Mine;
- Scenario 3 (Hera Mine) – Construction of solar farm and Construction and installation of new processing plant.

The assessed scenarios are considered to be representative of realistic worst-case conditions based on the proposed number and location of the noise sources. A more detailed description of the construction scenarios is presented in the following sections, along with plant and equipment emissions data which are presented in Section 5.5.4.

It is anticipated that construction activities will typically be undertaken during daylight hours over a period of six to twelve months. It is noted that some activities, including long concrete pours for the new processing plant at Hera Mine and the paste plant at the Federation Site may occur during out of hours work periods.

5.5.1 Federation Site Establishment

Site establishment, other than infrastructure established under approval for the Exploration Decline Program, would include the following processes:

- Marking out by a qualified surveyor of all areas of approved disturbance.
- Establishment of heavy vehicle site access roads comprising unsealed gravel pavement, between Burthong Road and the Federation Site.
- Establishment of any additional surface water infrastructure prior to the commencement of land preparation activities in accordance with an Erosion and Sediment Control Plan prepared in accordance with Managing Urban Stormwater.
- Progressive establishment of surface infrastructure including tailings paste plant, second explosives magazine area and communications tower
- Quarrying activities.

Site establishment operations are expected to require approximately six to twelve weeks to complete.

5.5.2 Services Corridor

As part of the Federation Project, Hera Resources proposes to establish a Services Corridor between the Federation Site and Hera Mine, inclusive of:

- Powerline.
- Water pipeline.
- Access track.
- Potentially a tailings slurry pipeline and return water pipeline.

The nominated width of the corridor is up to 20m with an approximate length of 14.3km. Construction of the Services Corridor will initially involve clearing of existing vegetation and associated earthworks using mobile equipment such as bulldozers and/or graders. Compactors and haul trucks may also be used for the construction of the access track.

Installation of the proposed powerline, water pipelines and tailings slurry pipeline will be undertaken using an excavator or backhoe, franna crane or telehandler, and pneumatic tools.

5.5.3 Hera Mine Infrastructure

A new 750ktpa process plant is proposed to be constructed at Hera Mine to process ore mined from the Federation deposit. The new plant will be located within the existing approved disturbance area at Hera Mine. Therefore, there will be no clearing of existing vegetation to enable the installation and commissioning of the plant.

A new solar farm will also be constructed at Hera Mine approximately 200m to the south of the existing heavy vehicle access road. Construction of the solar farm will require vegetation clearing, minor earthworks including trenching for cabling and footings, and the installation of the solar panels and transmission line connecting to the existing line.

5.5.4 Sound Power Levels - Construction

Mobile and fixed plant emission data used in modelling for this assessment were obtained from the MAC noise database for relevant construction noise sources. The noise emission levels used in modelling are summarised in **Table 22**.

Table 22 Single Octave Equipment Sound Power Levels, dB LAeq(15min) (re10^{-12}W)									
Noise Source/Item	Octave Band Centre Frequency, Hz								Total, dBA
	63	125	250	500	1000	2000	4000	8000	
Scenario 1 – Site Establishment and Infrastructure(Federation Site)									
Bulldozer	86	95	99	107	103	102	100	90	110
Grader	86	95	99	100	108	104	100	88	111
Compactor	72	90	101	105	106	103	99	93	111
Haul Trucks	91	88	96	100	104	102	97	90	108
Excavator	82	95	104	105	107	106	101	91	112
Water Cart	81	82	89	91	95	97	89	81	101
Concrete Truck/Pump	85	93	97	103	104	102	100	93	109
Franna Crane	72	82	87	89	90	90	83	74	96
EWP	65	78	84	93	94	91	86	82	98
Pneumatic Tools	69	92	93	97	100	101	97	88	106
Delivery Trucks	85	89	96	99	96	98	87	81	104
Scenario 2 – Services Corridor									
Bulldozer	86	95	99	107	103	102	100	90	110
Grader	86	95	99	100	108	104	100	88	111
Excavator	82	95	104	105	107	106	101	91	112
Compactor	72	90	101	105	106	103	99	93	111
Haul Truck	91	88	96	100	104	102	97	90	108
Water Cart	81	82	89	91	95	97	89	81	101
Franna Crane	72	82	87	89	90	90	83	74	96
Pneumatic Tools	69	92	93	97	100	101	97	88	106
Delivery Trucks	85	89	96	99	96	98	87	81	104
Scenario 3 – Processing Plant and Solar Farm (Hera Mine)									
Backhoe	74	83	90	100	100	95	87	85	104
Piling Rig (Peg)	69	91	92	93	97	95	86	79	101
Franna Crane	72	82	87	89	90	90	83	74	96
Pneumatic Tools	69	92	93	97	100	101	97	88	106
Delivery Trucks	85	89	96	99	96	98	87	81	104
Grader	86	95	99	100	108	104	100	88	111

Table 22 Single Octave Equipment Sound Power Levels, dB $LA_{eq(15min)}$ ($re10^{-12}W$)									
Noise Source/Item	Octave Band Centre Frequency, Hz								Total, dBA
	63	125	250	500	1000	2000	4000	8000	
Crane (Mobile)	72	85	91	100	101	98	93	89	105
Crane (Tower)	85	94	96	102	105	106	97	85	110
Concrete Truck (x2)	88	96	100	106	107	105	103	96	112
Concrete Pump	84	94	91	96	97	97	91	81	103
EWP	65	78	84	93	94	91	86	82	98
Excavator	82	95	104	105	107	106	101	91	112
Telehandler	72	82	87	89	90	90	83	74	96

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6 Noise Assessment Results

This assessment has quantified operational noise levels at the nearest receivers

6.1 Operational Noise Results

The predicted noise levels for the operation of the Federation Project at each receiver location are provided in **Table 23**. The results are presented separately for the Federation Site and the Hera Mine, as well as the cumulative noise levels from the two sites. The noise contour maps are provided in **Appendix C** and modelled plant locations shown in **Appendix D**.

The results of the predictive modelling demonstrate that noise emissions from the operation of the Federation Project, including processing and haulage operations at the Hera Mine would satisfy the PNTL at all residential receivers during calm and adverse meteorological conditions.

Table 23 Predicted Operational Noise Levels

Receiver	Period[1]	Noise Level, dB LAeq(15min)			PNTL
		Federation Site	Hera Mine	Cumulative	
R1	Day (Calm)	<30	<30	<30	40
	Evening (Calm)	<30	<30	<30	35
	Night (Inversion)	<30	<30	<30	35
R2	Day (Calm)	<30	<30	<30	40
	Evening (Calm)	<30	<30	<30	35
	Night (Inversion)	<30	<30	<30	35
R3	Day (Calm)	<30	34	34	40
	Evening (Calm)	<30	<30	<30	35
	Night (Inversion)	<30	<30	<30	35
R4	Day (Calm)	<30	<30	<30	40
	Evening (Calm)	<30	<30	<30	35
	Night (Inversion)	<30	<30	<30	35
R5	Day (Calm)	<30	<30	<30	40
	Evening (Calm)	<30	<30	<30	35
	Night (Inversion)	<30	<30	<30	35
R18	Day (Calm)	<30	<30	<30	40
	Evening (Calm)	<30	<30	<30	35
	Night (Inversion)	<30	<30	<30	35
R19	Day (Calm)	<30	<30	<30	40
	Evening (Calm)	<30	<30	<30	35
	Night (Inversion)	<30	<30	<30	35

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

6.2 Maximum Noise Level Assessment

In assessing the potential for sleep disturbance, a typical L_{Amax} noise source of 117dB was used to represent transient events from the dumping of material from haul truck to NAF and PAF Waste Rock Storage Areas, and material handling at the Hera Mine processing plant, to the nearest residential receivers, under G Class stability conditions (ie worst case).

The results of the analysis identify that maximum noise trigger levels will not be exceeded for all residential receivers, hence no further assessment or detailed analysis is required. Predicted noise levels from L_{Amax} events are presented in **Table 24**.

Table 24 Predicted Maximum Noise Levels

Receiver	Period	Noise Predictions dB L_{Amax}	Trigger Level dB L_{Amax}
R1	Night	<30	52
R2		<30	52
R3		<30	52
R4		<30	52
R5		<30	52
R18		<30	52
R19		<30	52

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

6.3 VLAMP Assessment

The results of the of the operational noise assessment provided in **Section 6.1** demonstrate that noise emissions associated with the operation of the Federation Project would not exceed the PNTL at any of the assessed receiver locations. Therefore, as per the VLAMP definitions, there are no receivers that fall under voluntary land mitigation rights or voluntary land acquisition rights.

Furthermore, the noise contours plotted over the lot boundaries, provided in **Appendix E**, demonstrate that predicted noise levels from the operation of the Federation Project would not contribute to exceedances of the acceptable noise levels plus 5dB as per Table 2.2 of the NPI on more than 25% of any privately-owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls.

6.4 Traffic Noise Results

The results of the traffic noise calculations for operational road traffic volumes are presented in **Table 25** for the closest residential receivers to the road along each of the haul routes. The traffic noise contribution from the Project is predicted to remain below the assessment criteria at dwellings adjacent to the haulage routes. Furthermore, the total change in noise levels for the closest residential receivers are predicted to below the +12dB relative increase criteria.

Table 25 Operational Road Traffic Noise Levels – Residential Receivers

Receiver	Offset Distance (m)	Assessment Criteria[1]	Traffic Noise dB $LA_{eq(period)}$		Total Change
			Existing Traffic Noise	Future Traffic Noise	
Federation Site to Hera Mine					
1245 Burthong Rd (R1)	750m	Day 60 dB $LA_{eq(15hr)}$	10.3	14.6	+4.3dB
688 Burthong Rd (R2)	260m		19.4	25.3	+6.9dB
Hera Mine to Peak Gold Mine					
224 Burthong Rd (R3)[2]	75m	Day 60 dB $LA_{eq(15hr)}$	30.8	36.4	+5.6dB
39 Burthong Road (R4)	110m		27.0	32.6	+5.6dB
2082 Glenwood Rd	25m		38.9	44.2	+5.3dB
5826 Wallace Vale Rd	220m		24.7	25.9	+1.2dB
Hera Mine to Hermidale Rail Siding					
2 Grahams St (R5)	25m	Day 60 dB $LA_{eq(15hr)}$	42.1	45.0	+2.9dB
15 Nymagee St	15m		56.3	57.3	+1.0dB

Note 1: Day 7am to 10pm. Night 10pm to 7am.

Note 2: Receivers at 224 Burthong Road (R3) and 39 Burthong Road (R4) assessed for traffic contribution from Hera Mine to PGM and Hera Mine to Hermidale Rail Siding.

Initially, ore and tailings would be transported between the Federation Site and Hera Mine using modular B-triple and A-double road trains with a payload of approximately 50t. To reduce the number of haulage trips between the sites, it is proposed that 80t A-triple road trains may be used for the transport of ore and tailings.

A change to 80t A-triple road trains is expected to reduce the number of haulage trips by approximately one third. As the A-triple road train and A-double road train would utilise the same engine type and capacity, with only a change in the tailer configuration, it is anticipated that the change to 80t haulage trucks between the Federation Site and Hera Mine would result in a decrease in road traffic noise levels at the nearest receivers of up to 1.8dB $LA_{eq(15hr)}$, relative to the smaller capacity trucks.

6.5 Blasting Results

Blast overpressure and vibration have been calculated to the nearest receivers to the Federation Site, adopting a maximum probable MIC of up to 50kg for surface blasting within the quarry. Additionally, ground vibration from underground blasting with a maximum probable MIC of up to 450kg has been considered.

Calculated levels for overpressure and vibration have been compared to the relevant ANZEC criteria and are presented in Table 26. Results identify surface blasts of MICs up to 50kgs and underground blasts of MICs up to 450kg would satisfy relevant ANZEC overpressure and vibration criteria. Furthermore, a review of the project area identifies that there is no significant infrastructure in the locality. Hence, no impact to significant infrastructure would occur from blasting.

Notwithstanding, the proposed MIC blast patterns should be designed specifically to meet the relevant ANZEC guidelines at receivers and be completed in conjunction with an appropriate blast monitoring program.

Table 26 Blasting Emissions				
Receiver ID	Distance to Charge m	Surface Blasting		Underground Blasting
		Airblast Overpressure dBZ Peak	Ground Vibration mm/s	Ground Vibration mm/s
R1	6,890	87	0.02	0.11
R2	7,160	86.5	0.02	0.10
R3	11,160	81.0	0.01	0.05
R4	13,605	78.5	0.01	0.04
R5	15,060	77.2	0.01	0.03
R18	12,955	79	0.01	0.04
R19	6,670	87.5	0.02	0.19

6.6 Construction Phase Noise Results

Predicted noise levels during each of the construction scenarios, as described in **Section 5.5**, are provided in **Table 27**.

The results of the analysis show that noise emissions from construction activities are predicted to satisfy the relevant noise management levels at all receiver locations during standard and out of hours construction periods.

Table 27 Predicted Construction Phase Noise Levels							
Receiver	Predicted Noise Level, dB $LA_{eq(15min)}$				NML, dB $LA_{eq(15min)}$		Compliant
	S1	S2	S3	OOHW	Standard Hours	Out of Hours	
R1	<30	<30	<30	<30	45	35	✓
R2	<30	<30	30	<30	45	35	✓
R3	<30	<30	30	<30	45	35	✓
R4	<30	<30	<30	<30	45	35	✓
R5	<30	<30	<30	<30	45	35	✓
R18	<30	<30	<30	<30	45	35	✓
R19	<30	<30	<30	<30	45	35	✓

Note 1: Standard hours - the period from 7am to 6pm Monday to Friday or 8am to 1pm on Saturdays; Out of hours - the remaining periods.

Note 2: S1 – Construction works at Federation Site; S2 – Construction works on Services Corridor; S3 – Construction works on Hera Mine; and OOHW – night works during long concrete pours.

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7 Noise Monitoring and Management

7.1 Noise Management Measures

Although it is demonstrated that noise levels are predicted to meet the relevant noise goals and no further mitigation measures are required, to proactively address any potential residual noise impacts, a noise management plan (NMP) may be considered for the Project. The NMP will guide, manage, quantify and control noise emissions through the implementation of feasible and reasonable best management practices. These may include:

- Strictly adhering to the proposed hours of operation;
- Siting noisy equipment behind structures that act as barriers, or at the greatest distance from the noise-sensitive area;
- Keeping equipment well maintained and operating it in a proper and efficient manner;
- Employing 'quiet' practices when operating equipment, for example, positioning idling trucks in appropriate areas;
- Running staff-education programs and regular tool box talks on the effects of noise and the use of quiet work practices; and
- Maintain roads to ensure a smooth surface to reduce the incidence of impact noise including body rattles.

The Plan may also address the use of best available technology including alternatives to tonal reversing alarms and efficient muffler design.

7.2 Noise Monitoring

It is recommended that the Plan includes a provision for attended noise monitoring within the community in response to received complaints, if any. The operator attended noise measurements and recordings would be conducted to quantify noise emissions from the Project as well as the overall level of ambient noise.

When required, the operator shall quantify and characterise the energy equivalent (L_{Aeq}) intrusive noise level from the Project over a 15-minute measurement period. In addition, the operator shall quantify and characterise the overall levels of ambient noise over the 15-minute measurement interval. It is recommended that instrumentation used during the monitoring is to be equivalent to a Type 1 meter with 1/3 octave band analysis and have audio recording functionality for post processing source identification. It is noted that 1/3 octave band analysis is required to establish whether modification factors in accordance with the NPI are to be applied.

All acoustic instrumentation used as part of the attended monitoring program must been designed to comply with the requirements of AS IEC 61672.1-2019, Electroacoustics - Sound level meters - Specifications and shall have current calibration certificates. All instrumentation shall be programmed to record statistical noise level indices in 15-minute intervals including L_{Amax}, L_{Amin} and L_{Aeq}.

Instrument calibration shall be checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA. The measurement position(s) should be selected considering:

- weather conditions such as rain and wind, insect noise;
- the location and direction of any noise source/s;
- the most sensitive position at the affected receiver; and
- the need to avoid reflecting surfaces (where possible).

8 Discussion and Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has conducted an assessment of potential noise and vibration impacts from the proposed Federation Project south of Nymagee, NSW. The assessment has quantified potential construction noise emissions associated with site establishment and construction of new infrastructure and operational noise emissions associated with mining operations, material handling and transport operations.

The results of the NVIA demonstrate that operational noise levels would achieve the relevant NPI criteria for all assessment periods at each assessed receiver location. The assessment considered operations at both the Federation Site and the Hera Mine, including the simultaneous operation of the existing and new processing plants.

An assessment of maximum noise trigger levels demonstrated that noise emissions are predicted to remain below the EPA maximum noise trigger levels for sleep disturbance at all receiver locations.

Operational noise levels are not predicted to exceed the trigger levels for voluntary acquisition or vacant land acquisition at any receiver locations.

The road traffic noise assessment demonstrates that the road noise criteria as specified in the RNP will be satisfied for the nearest residential receivers adjacent to each of the proposed haul routes. It is noted that haulage vehicle movements are restricted to the day period only.

Airblast overpressure and ground vibration levels are predicted to meet the criteria at all assessed receivers for surface blasts for the maximum probable MIC of 50kg during quarrying activities. Additionally, ground vibration levels are predicted to meet the criteria at all assessed receivers for the maximum probable MIC of 450kg for underground blasting.

Based on the NVIA results, there are no noise or vibration related issues which would prevent the approval of the Project. The results of the assessment show compliance with the relevant operational and road noise criteria, without ameliorative measures being required.

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Appendix A – Glossary of Terms

A number of technical terms have been used in this report and are explained in **Table A1**.

Table A1 Glossary of Acoustical Terms

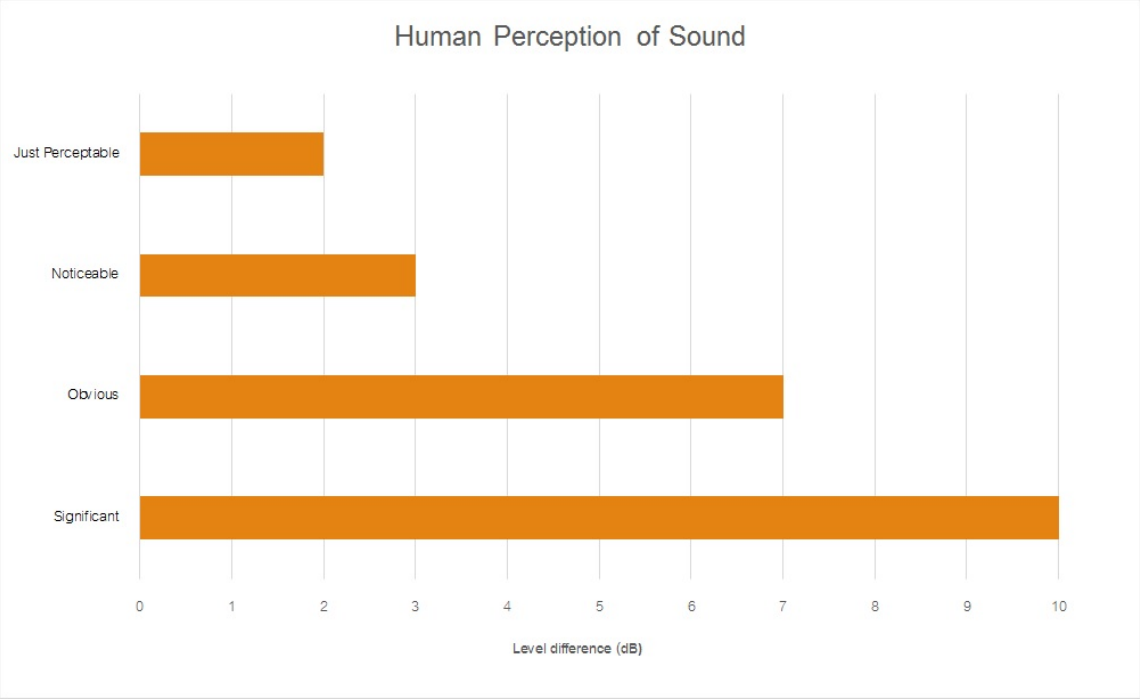
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Ambient Noise	The total noise associated with a given environment. Typically, a composite of sounds from all sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to sound.
Background Noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is usually represented by the LA90 descriptor
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Z-weighted or decibels Linear (unweighted).
Extraneous Noise	Sound resulting from activities that are not typical of the area.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A sound level which is exceeded 10% of the time.
LA90	Commonly referred to as the background noise, this is the level exceeded 90% of the time.
LAeq	Represents the average noise energy or equivalent sound pressure level over a given period.
LAmax	The maximum sound pressure level received at the microphone during a measuring interval.
Masking	The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.
RBL	The Rating Background Level (RBL) as defined in the NPI, is an overall single figure representing the background level for each assessment period over the whole monitoring period. The RBL, as defined is the median of ABL values over the whole monitoring period.
Sound power level (Lw or SWL)	This is a measure of the total power radiated by a source in the form of sound and is given by 10.log10 (W/Wo). Where W is the sound power in watts to the reference level of 10^{-12} watts.
Sound pressure level (Lp or SPL)	the level of sound pressure; as measured at a distance by a standard sound level meter. This differs from Lw in that it is the sound level at a receiver position as opposed to the sound 'intensity' of the source.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

Source	Typical Sound Pressure Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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Appendix B – NEWA Meteorological Data

Table B1 NEWA Analysed Daytime Meteorological Conditions, Cobar Airport AWS					
Direction ± 45°	Season	Day Percentage Occurrence %	Direction	Season	Day Percentage Occurrence %
0	Summer	5	180	Summer	4
0	Autumn	7	180	Autumn	9
0	Winter	6	180	Winter	11
0	Spring	4	180	Spring	6
22.5	Summer	6	202.5	Summer	4
22.5	Autumn	7	202.5	Autumn	9
22.5	Winter	8	202.5	Winter	12
22.5	Spring	5	202.5	Spring	7
45	Summer	6	225	Summer	4
45	Autumn	8	225	Autumn	7
45	Winter	7	225	Winter	10
45	Spring	6	225	Spring	6
67.5	Summer	6	247.5	Summer	4
67.5	Autumn	9	247.5	Autumn	6
67.5	Winter	7	247.5	Winter	9
67.5	Spring	5	247.5	Spring	6
90	Summer	6	270	Summer	4
90	Autumn	8	270	Autumn	5
90	Winter	7	270	Winter	7
90	Spring	5	270	Spring	5
112.5	Summer	5	292.5	Summer	4
112.5	Autumn	8	292.5	Autumn	6
112.5	Winter	7	292.5	Winter	7
112.5	Spring	6	292.5	Spring	5
135	Summer	5	315	Summer	4
135	Autumn	8	315	Autumn	5
135	Winter	8	315	Winter	6
135	Spring	6	315	Spring	4
157.5	Summer	3	337.5	Summer	5
157.5	Autumn	7	337.5	Autumn	6
157.5	Winter	6	337.5	Winter	6
157.5	Spring	4	337.5	Spring	4

Table B2 NEWA Analysed Evening time Meteorological Conditions, Cobar Airport AWS					
Direction ± 45°	Season	Evening Percentage Occurrence %	Direction	Season	Evening Percentage Occurrence %
0	Summer	5	180	Summer	11
0	Autumn	6	180	Autumn	22
0	Winter	10	180	Winter	20
0	Spring	7	180	Spring	16
22.5	Summer	9	202.5	Summer	10
22.5	Autumn	14	202.5	Autumn	21
22.5	Winter	16	202.5	Winter	18
22.5	Spring	13	202.5	Spring	16
45	Summer	17	225	Summer	8
45	Autumn	22	225	Autumn	13
45	Winter	17	225	Winter	12
45	Spring	20	225	Spring	12
67.5	Summer	17	247.5	Summer	5
67.5	Autumn	24	247.5	Autumn	9
67.5	Winter	18	247.5	Winter	10
67.5	Spring	21	247.5	Spring	10
90	Summer	17	270	Summer	3
90	Autumn	24	270	Autumn	5
90	Winter	17	270	Winter	7
90	Spring	20	270	Spring	6
112.5	Summer	17	292.5	Summer	3
112.5	Autumn	20	292.5	Autumn	2
112.5	Winter	15	292.5	Winter	6
112.5	Spring	18	292.5	Spring	4
135	Summer	15	315	Summer	2
135	Autumn	19	315	Autumn	2
135	Winter	17	315	Winter	6
135	Spring	15	315	Spring	3
157.5	Summer	10	337.5	Summer	3
157.5	Autumn	16	337.5	Autumn	4
157.5	Winter	14	337.5	Winter	8
157.5	Spring	11	337.5	Spring	3

Table B3 NEWA Analysed Night-time Meteorological Conditions, Cobar Airport AWS					
Direction ± 45°	Season	Night Percentage Occurrence %	Direction	Season	Night Percentage Occurrence %
0	Summer	6	180	Summer	12
0	Autumn	5	180	Autumn	13
0	Winter	9	180	Winter	8
0	Spring	6	180	Spring	10
22.5	Summer	12	202.5	Summer	9
22.5	Autumn	15	202.5	Autumn	11
22.5	Winter	19	202.5	Winter	8
22.5	Spring	16	202.5	Spring	9
45	Summer	15	225	Summer	4
45	Autumn	21	225	Autumn	7
45	Winter	18	225	Winter	7
45	Spring	18	225	Spring	6
67.5	Summer	17	247.5	Summer	3
67.5	Autumn	20	247.5	Autumn	5
67.5	Winter	19	247.5	Winter	7
67.5	Spring	19	247.5	Spring	6
90	Summer	17	270	Summer	2
90	Autumn	21	270	Autumn	4
90	Winter	18	270	Winter	6
90	Spring	19	270	Spring	4
112.5	Summer	17	292.5	Summer	2
112.5	Autumn	17	292.5	Autumn	3
112.5	Winter	9	292.5	Winter	6
112.5	Spring	14	292.5	Spring	3
135	Summer	14	315	Summer	2
135	Autumn	13	315	Autumn	2
135	Winter	9	315	Winter	6
135	Spring	11	315	Spring	2
157.5	Summer	11	337.5	Summer	3
157.5	Autumn	11	337.5	Autumn	3
157.5	Winter	6	337.5	Winter	7
157.5	Spring	8	337.5	Spring	3

Appendix C – Noise Contour Plots – Operational Phase

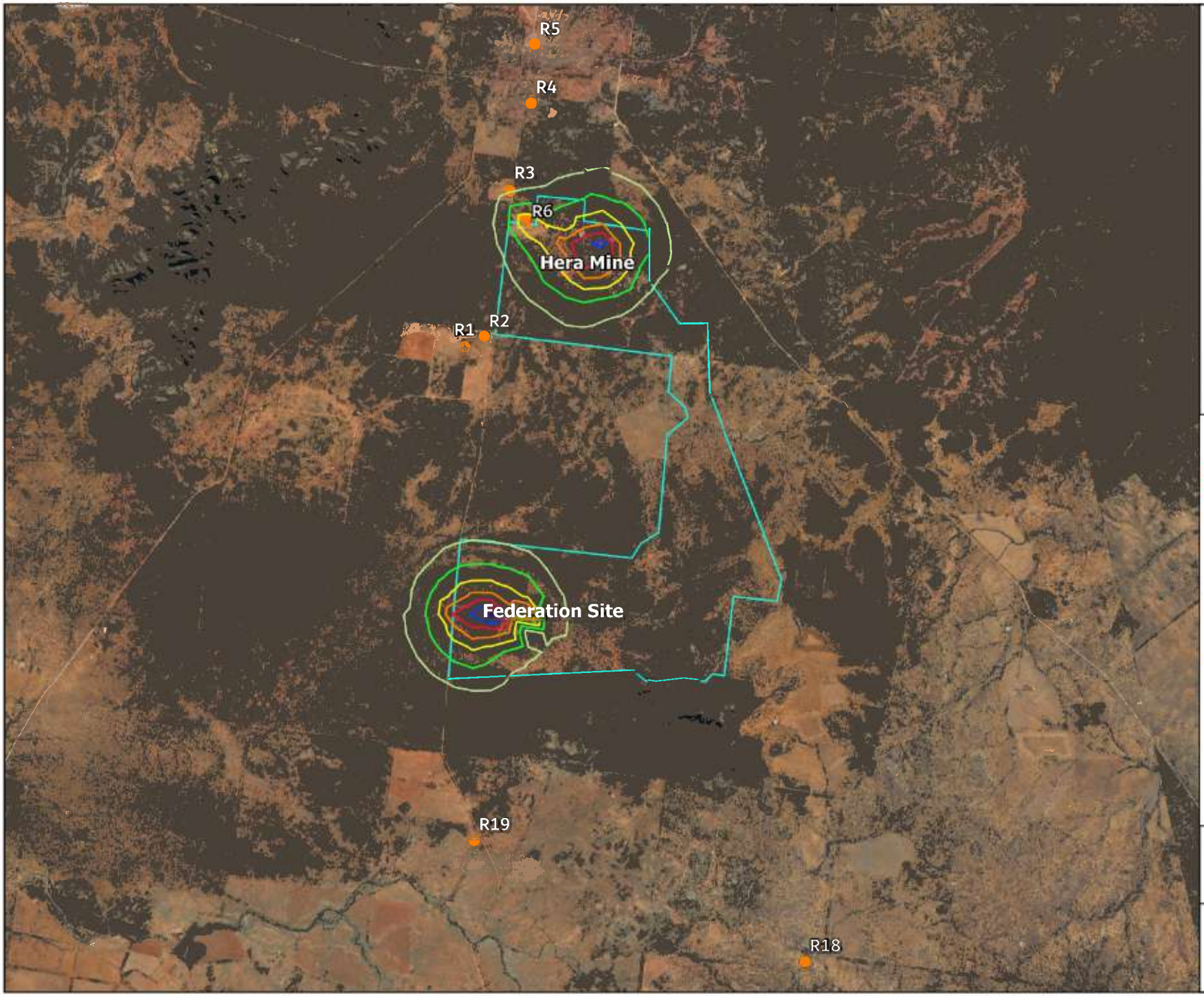


FIGURE C1

Operational Noise Contours

Day (Calm)

MAC201133-03

FEDERATION PROJECT

KEY

Project Boundary

Receiver Location

LAeq,15min Noise Contours

35 dB

40 dB

45 dB

50 dB

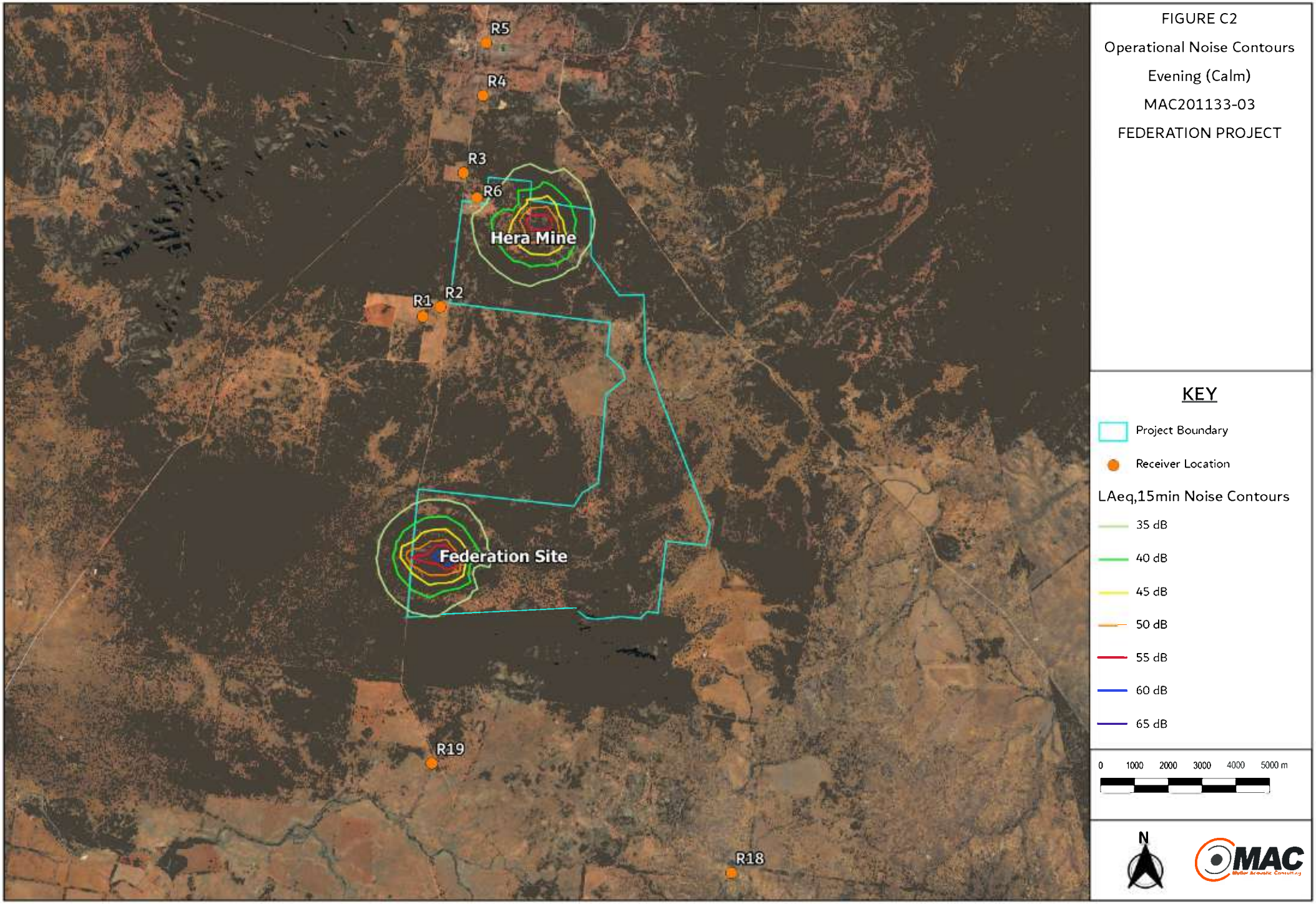
55 dB

60 dB

65 dB

0 1000 2000 3000 4000 5000 m

N


R5
R4
R3
R6
Hera Mine
R1
R2
Federation Site
R19
R18
FIGURE C2
Operational Noise Contours
Evening (Calm)
MAC201133-03
FEDERATION PROJECT
KEY
Project Boundary
Receiver Location
LAeq,15min Noise Contours
35 dB
40 dB
45 dB
50 dB
55 dB
60 dB
65 dB
0 1000 2000 3000 4000 5000 m
N
MAC

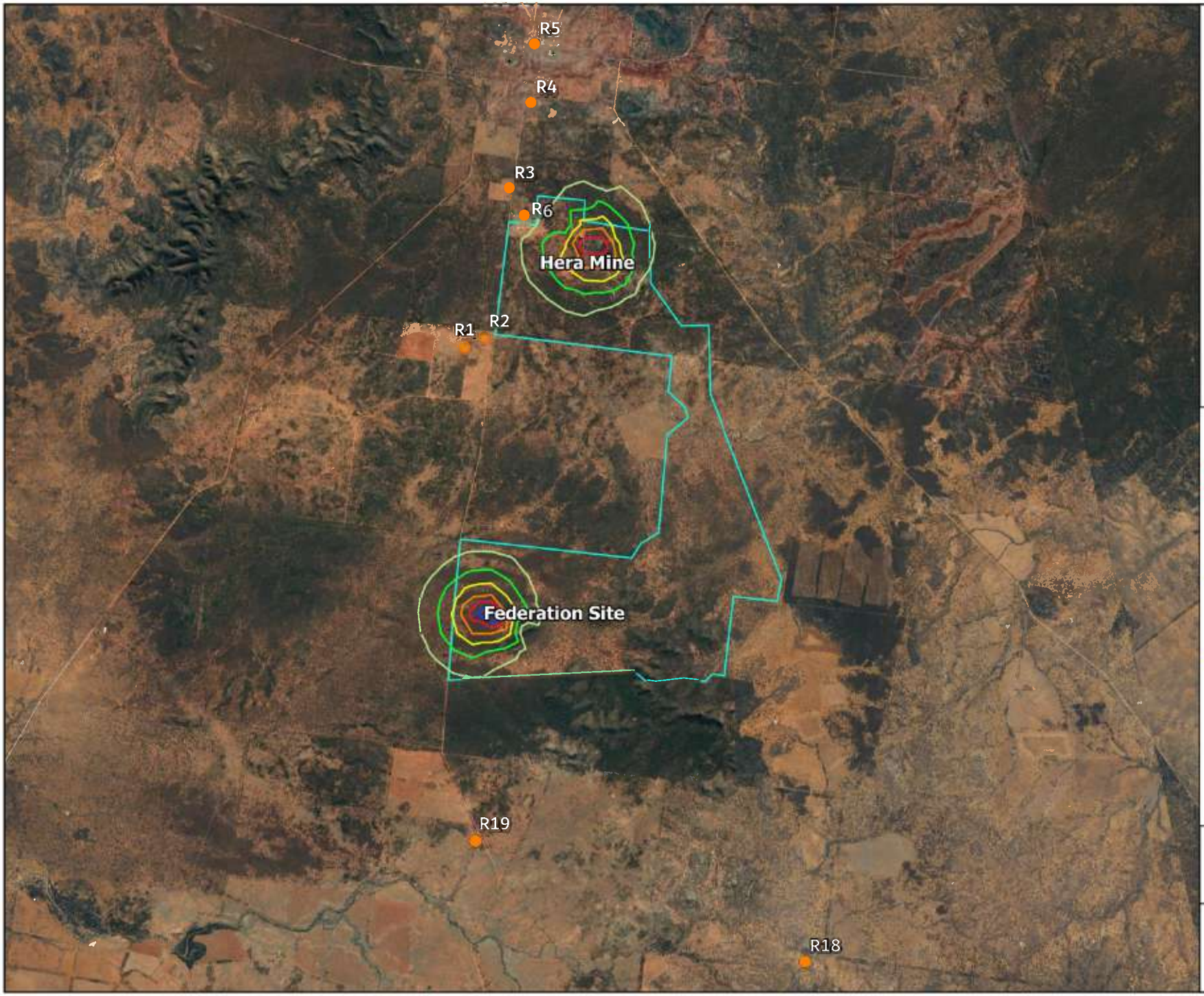


FIGURE C3

Operational Noise Contours

Night (Inversion)

MAC201133-03

FEDERATION PROJECT

KEY

Project Boundary

Receiver Location

LAeq,15min Noise Contours

35 dB

40 dB

45 dB

50 dB

55 dB

60 dB

65 dB

0 1000 2000 3000 4000 5000 m

N

MAC

Appendix D – Modelled Plant Locations


FIGURE D1
Location of Noise Sources
Federation Site
MAC201133-03
FEDERATION PROJECT
KEY
Diesel Generator
Drill
Ex
FEL
Grader
Haul Truck
Ventilation Fan
Water Cart
Paste Plant
Shotcrete Batching Plant
Road Truck
0
100
200
300
400
500 m
N
MAC

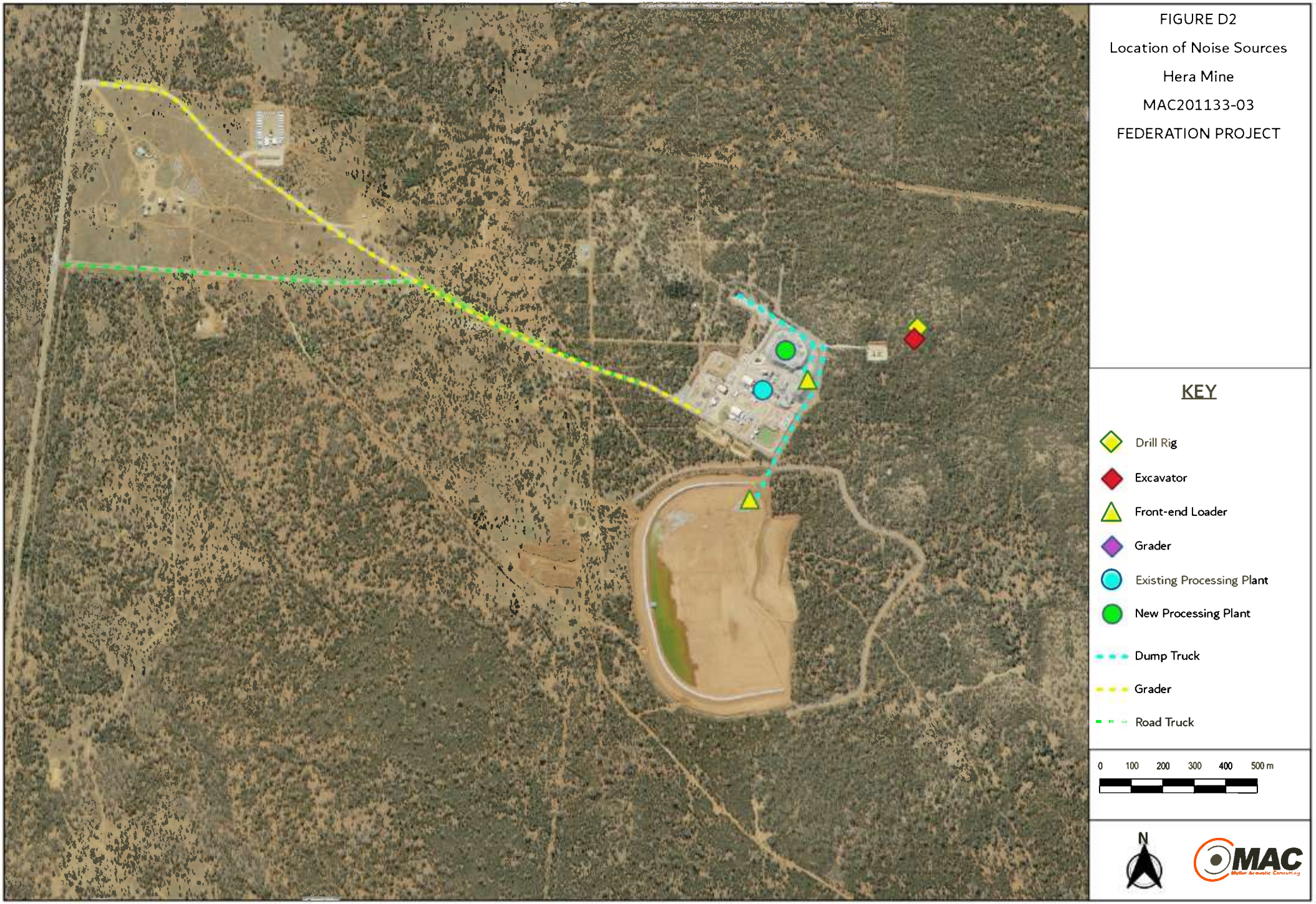


FIGURE D2
Location of Noise Sources
Hera Mine
MAC201133-03
FEDERATION PROJECT
KEY
Drill Rig
Excavator
Front-end Loader
Grader
Existing Processing Plant
New Processing Plant
Dump Truck
Grader
Road Truck
0 100 200 300 400 500 m
N
MAC

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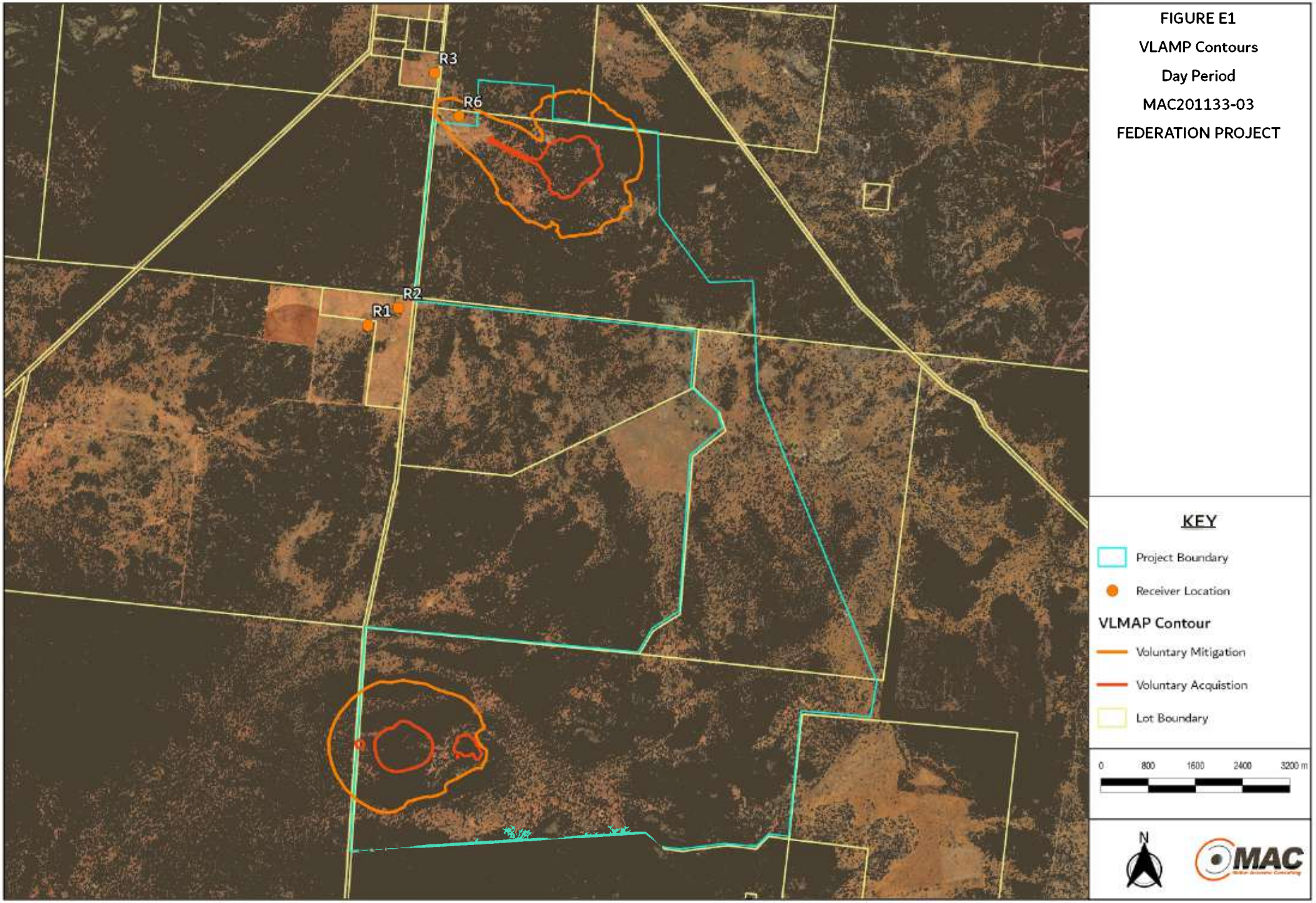
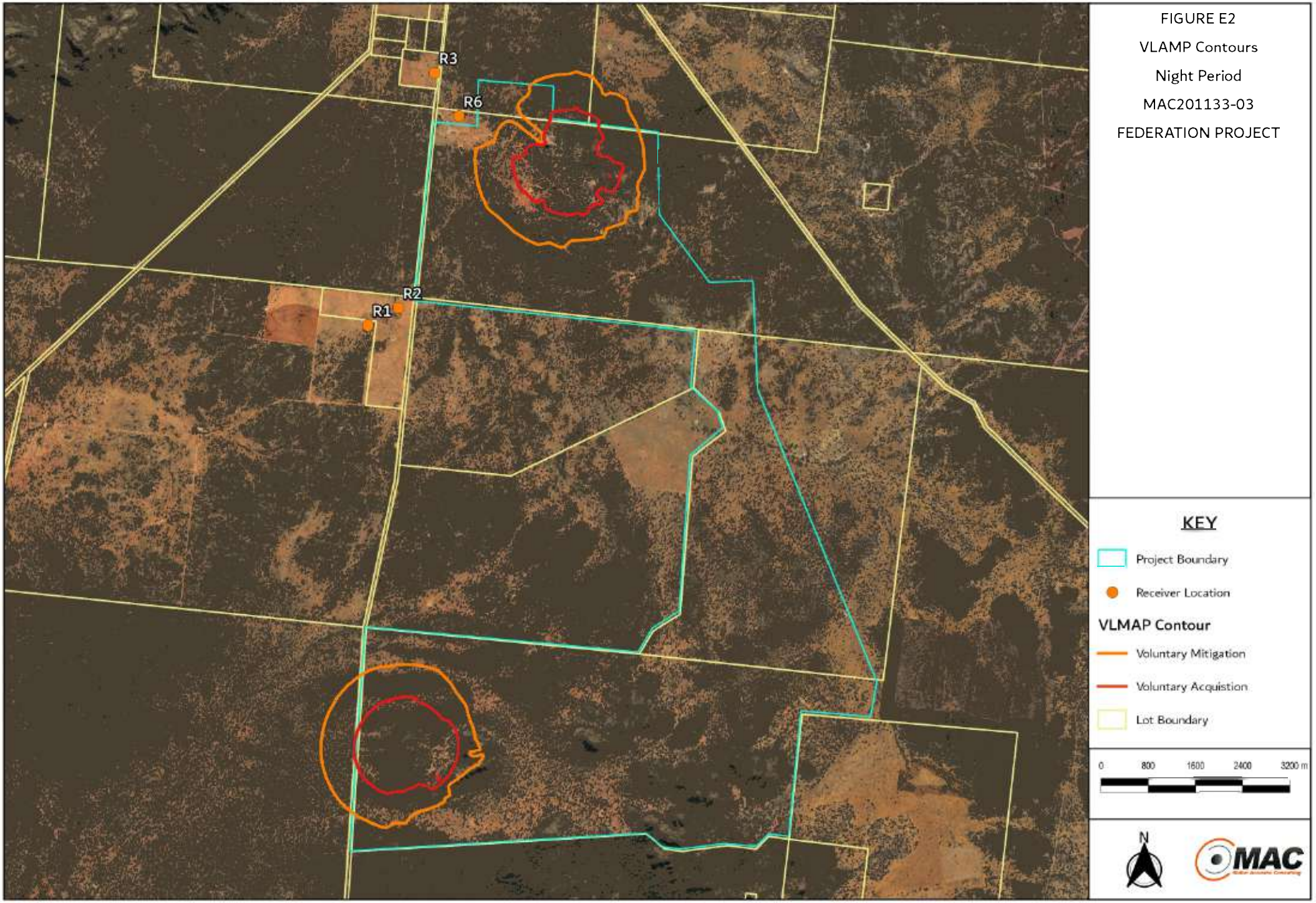
Appendix E – Noise Contour Plots – VLAMP


R3
R6
R2
R1
FIGURE E1
VLAMP Contours
Day Period
MAC201133-03
FEDERATION PROJECT
KEY
Project Boundary
Receiver Location
VLMAP Contour
Voluntary Mitigation
Voluntary Acquistion
Lot Boundary
0
800
1600
2400
3200 m
N
MAC


R3
R6
R2
R1
FIGURE E2
VLAMP Contours
Night Period
MAC201133-03
FEDERATION PROJECT
KEY
Project Boundary
Receiver Location
VLMAP Contour
Voluntary Mitigation
Voluntary Acquistion
Lot Boundary
0
800
1600
2400
3200 m
N
MAC

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