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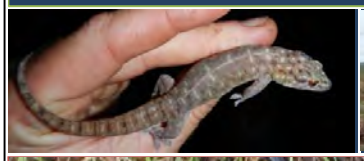
Noise Technical Report

Western Desert Resources Limited
Roper Bar Iron Ore Project



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Noise and Vibration Impact Assessment

Roper Bar Iron Ore Project

Western Desert Resources Limited

Project No: GC120062

Project Name: Roper Bar Iron Ore Project

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1 Introduction

1.1 Background

VDM Consulting was engaged by EcOz Environmental Services on behalf of Western Desert Resources Limited (WDRL) to prepare a noise impact assessment for the proposed mining extraction activities at Roper Bar Iron Ore Project over the mine leases No: MLA28266, MLA28267, MLA28264, MLA28962 and MLA28963.

This noise impact assessment report is prepared as part of an Environmental Impact Statement required to accompany the iron ore project development application.

1.2 Study Objectives

Study objectives are as follows:-

- Investigation of the existing noise amenity at the wider area around the Roper Bar Iron Ore Project to determine the existing noise amenity before the commencement of extractive operations.
- Review of the plans of the proposed mining operations to obtain information about the location and scope of activities undertaken at the subject site.
- Assessment of the potential noise impact from the proposed iron ore extraction, processing and haulage activities considering the maximum extent of operational boundaries, the hours of operation, the type and number of plant and equipment (including permanent processing plant, mobile plant, bulldozers, front end loaders and dump trucks) and site topography. The noise assessment was carried out on the basis of:
    - Determination of the existing noise amenity at the nearest noise sensitive places to the proposed extraction activities; and
    - Determination of the operational noise impacts from proposed iron ore extraction, processing and haulage activities by detailed noise propagation modelling using SoundPLAN software.
- Preparation of an Environmental Management Plan (EMP) – Noise Amenity for the proposed mining activities to ensure the operations are carried out in compliance with the *Northern Territory Waste Management and Pollution Control Act* and there are no adverse impacts on noise sensitive areas.

1.3 Description of the Subject Site

1.3.1 Site Location

The mining leases by the Western Desert Resources Ltd (WDRL) are located approximately 230 km east of Katherine, between the Towns River and Little Towns River approximately 40 km from the coast.

The locations of the mining leases No: MLA28266, MLA28267, MLA28264, MLA28962 and MLA28963 are presented in Figure 1.1.

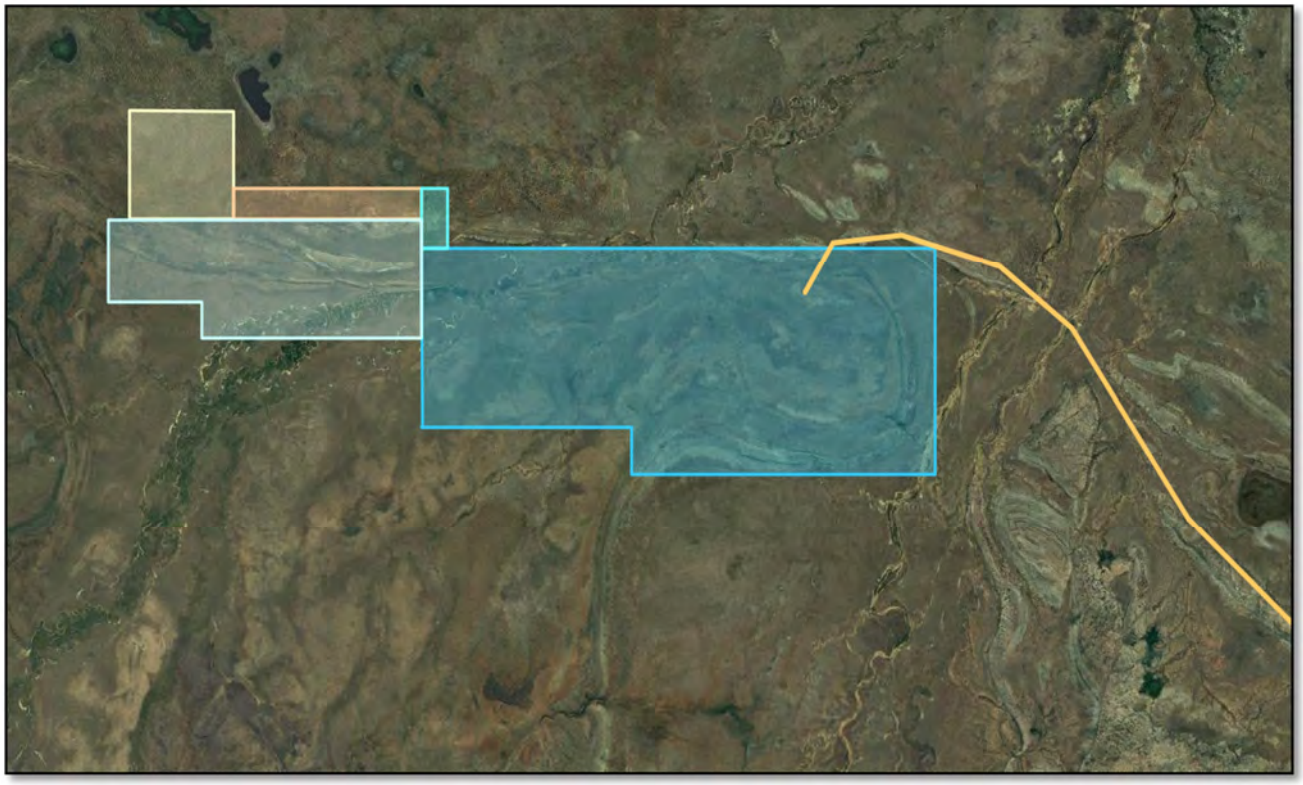


Figure 1.1: Location of the Mining Leases

WDRL intends to connect the Roper Bar Iron Ore Project with the Port of Bing Bong on the Gulf of Carpentaria via 165km long designated haul road. The haul road, with a grade not exceeding 7.5%, is anticipated to accommodate 380 tonne road trains at a frequency of up to 10 vehicles per day. The proposed alignment of the haul road is presented in Figure 1.2.

Figure 1.2: Alignment of the Haul Road to the Port of Bing Bong

2 Noise and Vibration Impact Assessment

2.1 Existing Noise Amenity

The existing noise amenity at the Roper Bar region is likely to be dominated by natural noise sources (e.g. birds and insects). Considering that the proposed iron ore mine is located at a distance of approximately 50km from any residential areas (Ngukurr), there are no urban, industrial and agricultural practices which may influence the existing noise amenity. The proposed iron ore extraction, processing and transport activities will introduce additional noise from the plant and equipment at the extraction site, the processing plant and along the haul road. Although the noise emissions from the mining equipment can be significant, the distance to the nearest residential areas will ensure inaudibility of the operational noise sources at the Roper Bar region and its surroundings.

To determine the existing noise amenity, site specific noise measurements were carried out by EcOz Environmental Services within the boundaries of the proposed mine site and near the Limmen River camp ground within the recently gazetted Limmen National Park, near Savannah Way. The noise measurement locations are presented in Figure 2.1.

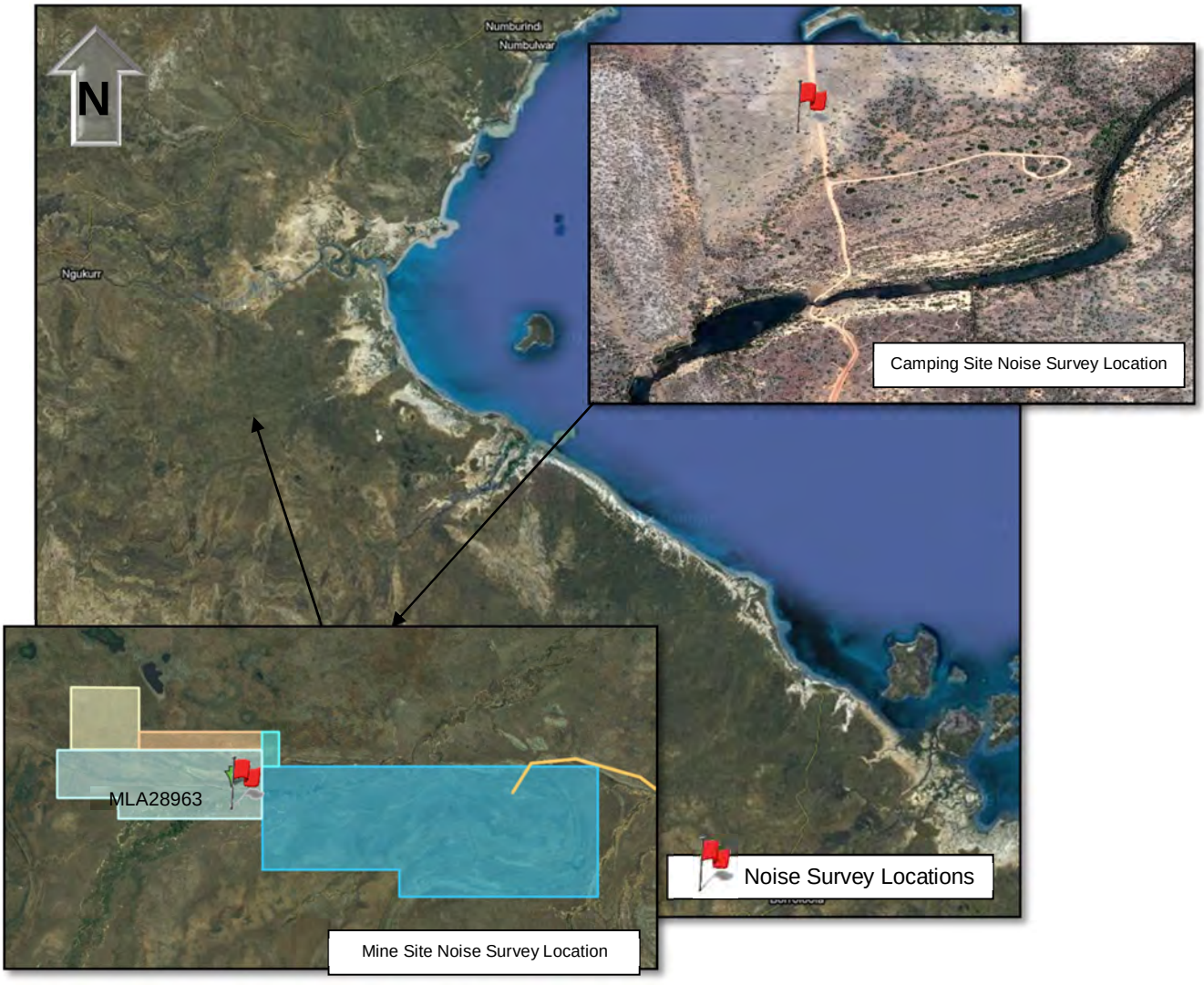


Figure 2.1: Noise Survey Locations

The noise measurement results within the boundaries of the proposed mine site are presented in Table 2.1.

Table 2.1 Noise Measurements - Within the Boundaries of the Mine Site

Date	L_{A90} (1-hour) [dB(A)]			L_{Aeq} (24-hour) [dB(A)]	L_{Aeq} (1-hour) [dB(A)]		
	Day	Evening	Night		Day	Evening	Night
Friday 24.02.2012	24	24	24	24	24	24	24
Saturday 25.02.2012	24	24	24	25	25	24	24
Sunday 26.02.2012	25	24	24	26	27	25	24
Median Level	**24**	**24**	**24**	**25**	**26**	**24**	**24**

The results of the background noise measurements near the Limmen River camp ground at the Limmen National Park are presented in Table 2.2.

Table 2.2 Noise Measurements – Limmen River Camp Ground (Limmen National Park)

Date	L_{A90} (1-hour) [dB(A)]			L_{Aeq} (24-hour) [dB(A)]	L_{Aeq} (1-hour) [dB(A)]		
	Day	Evening	Night		Day	Evening	Night
Thursday 8.03.2012	24	24	24	24	25	24	24
Friday 9.03.2012	24	-	-	25	25	-	-
Median Level	**24**	**24**	**24**	**25**	**25**	**24**	**24**

The background noise measurement results are very low indicating noise amenity of a remote outback area unaffected by urban or industrial development.

2.2 Noise Criteria

Under the Northern Territory Government Legislation the environmental noise (inclusive of vibration) is considered a form of pollution and it is regulated under the *Waste Management and Pollution Control Act.* The objectives of the Act are:

(a) *to protect, and where practicable to restore and enhance the quality of, the Territory environment by:*

(i) preventing pollution;
(ii) reducing the likelihood of pollution occurring;
(iii) effectively responding to pollution;
(iv) avoiding and reducing the generation of waste;
(v) increasing the re-use and re-cycling of waste; and
(vi) effectively managing waste disposal;

(b) to encourage ecologically sustainable development; and

(c) to facilitate the implementation of national environment protection measures made under the National Environment Protection Council (Northern Territory) Act.

The objectives of the *Waste Management and Pollution Control Act* are implemented by Environmental Protection Objectives whose purpose is to establish the principles on which:

(a) *environmental quality is to be maintained, enhanced, managed or protected;*
(b) pollution, or environmental harm resulting from pollution, is to be assessed, prevented, reduced, controlled, rectified or cleaned up; and
(c) effective waste management is to be implemented or evaluated.

The Act is not prescriptive in regards to the specific criteria to be used in the implementation of the Environmental Protection Objectives. As a result noise & vibration criteria from national or international standards or from environmental legislation from other States in Australia are used in specific acoustic investigations.

In this case the acoustic quality objectives from the Queensland *Environmental Protection (Noise) Policy 2008 (EPP (Noise))* are considered the most appropriate noise criteria. The noise limits from the *Qld EPP (Noise)* are well established and tested on numerous environmental noise impact assessments for the resources and infrastructure projects, thus it is considered highly relevant to the proposed Roper Bar Iron Ore Project.

The purpose of the acoustic quality objectives as defined in the EPP (Noise) is to protect the amenity of an acoustic environment. In the case of dwellings, the indoor daytime and evening noise limits protect the ability to have a conversation while the indoor night-time noise limits address sleep disturbance and sleep awakening. The EPP (Noise) also states, acoustic quality objectives for protected habitats (i.e. those identified in a conservation plan under the Nature Conservation Act 1992) as a qualitative criteria to be considered for the protection of health and biodiversity of ecosystems (mainly fauna protection).

Table 2.3 presents the relevant acoustic quality objectives for the Roper Bar Iron Ore mining project.

Table 2.3 Acoustic Quality Objectives

Location	Time of Day	Acoustic Quality Objectives (measured at the receptors) dB(A)			Environmental Value
		L_{Aeq} (1 hour)	L_{A10} (1 hour)	L_{A1} (1 hour)	
Dwelling (outdoors)	Day & Evening	50	55	65	Health and wellbeing for outside areas
Dwelling (indoors)	Day & Evening	35	40	45	Health and wellbeing for indoor areas
	Night	30	35	40	Health and wellbeing in relation to the ability to sleep
Commercial and retail activity (indoors)	When the activity is open for business	45	-	-	Health and wellbeing in relation to the ability to converse
Protected area, or an area identified under a conservation plan under the *Nature Conservation Act 1992*as a critical habitat or an area of major interest	Anytime	The level of noise that preserves the amenity of the existing area or place			Health and biodiversity of ecosystems

2.3 Vibration Criteria

As the Northern Territory *Waste Management and Pollution Control Act* does not prescribe specific noise & vibration limits, the criteria for the Roper Bar Iron Ore Project is based on Queensland guidelines. In 2006 the Queensland *Environmental Protection Agency (now Department of Environment and Resource Management)* has issued guidelines specifying the recommended human comfort criteria for:

a) Airblast overpressure level;

b) Ground vibration peak particle velocity; and

c) Times of blasting.

These guidelines were specifically developed in order to set appropriate criteria in the development approval conditions for activities such as mines and quarries.

2.3.1 Airblast Overpressure Criteria

The following criteria are applicable to airblast overpressure:

a) The airblast overpressure must not be more than 115dB(linear) peak for nine out of any 10 consecutive blasts initiated, regardless of the interval between blasts; and

b) The airblast overpressure must not exceed 120dB (linear) peak for any blast.

2.3.2 Ground Vibration

The following criteria are applicable to vibration:

a) The ground-borne vibration must not exceed a peak particle velocity of 5mm per second for nine out of any 10 consecutive blasts initiated, regardless of the interval between blasts; and

b) The ground-borne vibration must not exceed a peak particle velocity of 10mm per second for any blast.

2.3.3 Times of Blasting

Blasting should generally only be permitted during the hours of 9:00am to 3:00pm, Monday to Friday, and from 9:00am to 1:00pm on Saturdays. Blasting should not generally take place on Sundays or public holidays.

2.4 Consideration of Potential Ground Vibration

The iron ore extraction will be mainly carried out by conventional truck and shovel equipment. A large portion of the ore body is classified as low strength to soft and will be removed by hydraulic excavators. Blasting will be applied for the removal of hard rock intervals or for rock conditioning if required by surface mining machines. Any blasting will be conducted in accordance with the relevant legislative requirements (restricted to daylight hours).

The operation of the mobile mining equipment (bulldozers, excavators and trucks) and static plant (power generators, pumps, crushing and screening equipment) will be associated with localised ground vibration. Thus any ground vibration caused by the operation of the plant and equipment will be readily attenuated by the resilient properties of the soil.

It is recognised that it is difficult to predict impacts of blasting (airblast overpressure and ground vibration) due to the fact that every site has different characteristics. Considering significant distance to the accommodation area (the only vibration sensitive area within a distance of more than 2km from the extraction area) further investigation of ground vibration will not be required.

The ground vibration will have localised significance, similar to the airborne noise, because of its potential to cause disturbance to fauna habitats. The vibration from the occasional blasting have a potential to cause temporary loss of fauna habitat, however there are other factors, such as land disturbance, with more immediate effect than any occasional short duration localised vibration effects.

2.5 Noise Propagation Modelling

2.5.1 Noise Sources

The proposed Roper Bar Iron Ore Project will introduce a number of activities with a potential to generate significant noise emissions. The activities with the highest potential for noise generation are as follows:

- Iron ore extraction;
- Processing;
- Haulage;
- Operation of the airstrip; and
- Accommodation and recreation.

Each of these activities can generate various levels of noise with the potential impacts mainly limited to the noise sensitive areas in the vicinity of each of these activities. The other factors that influence the potential noise impact are the hours of operation, the number of plant and equipment and the sound power level of the dominant noise sources associated with each activity.

Based on the operational plan, the extraction activities at the Roper Bar Iron Ore Project will be conducted continuously 24 hours per day for around 315 days per year. Iron Ore will be transported along the 160km haul road to a load out facility (2-3km from the coast) at Bing Bong, where the mineral will be stockpiled.

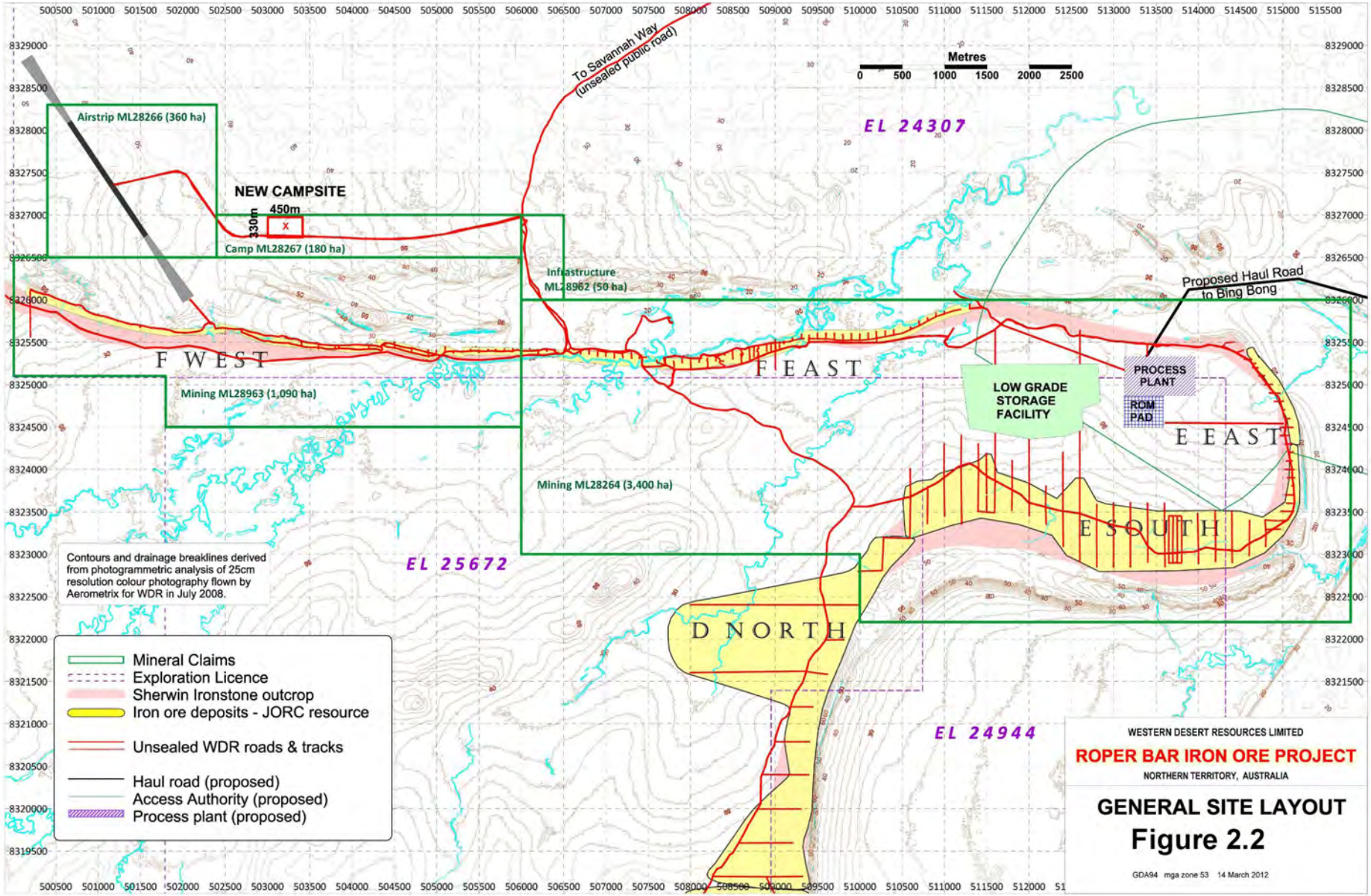
It is anticipated that the duration of the project will be 10 years. All works undertaken in association with the iron ore mine, including environmental impact control and mitigation, will be in accordance with an approved Environmental Impact Statement for the project.

The dominant noise sources associated with the proposed Roper Bar Iron Ore Project are presented in Table 2.4.

Table 2.4 Dominant Noise Sources

Activity	Noise Source Description	Quantity
Extraction	Excavator	2
	Dozer	2
	Dump trucks	10
	Graders	2
	Water Truck	2
	Service Truck	1
	Drill	6
	Light Vehicles	20
	Ancillary Equipment	10
Processing	Primary Crusher	1
	Secondary Crusher	1
	Screens	1
	Front end loaders	1
	Dump trucks	10
	Road Trains	3
	Power generator	1
	Pumps	5
	Parking Area	1
Haulage	Road Trains	10
Accommodation & Recreation	Power Generators	2
	Transformers	3
	Beer Garden	1
	Swimming Pool	1
	Sports Court	1
	Parking Area	1
Airstrip	Aircraft (Brasilia EMB 120)	1
	Aircraft (Brasilia M23)	1
	Aircraft (ERJ 170)	1

The layout of the proposed Roper Bar Iron Ore Project is presented in Figure 2.2.


To Savannah Way
(unsealed public road)
Metres
0 500 1000 1500 2000 2500
EL 24307
Airstrip ML28266 (360 ha)
NEW CAMPSITE
450m
330m
Camp ML28267 (180 ha)
Infrastructure
ML28962 (50 ha)
Proposed Haul Road
to Bing Bong
F WEST
F EAST
Mining ML28963 (1,090 ha)
LOW GRADE
STORAGE
FACILITY
PROCESS
PLANT
ROM
PAD
E EAST
Mining ML28264 (3,400 ha)
E SOUTH
EL 25672
D NORTH
EL 24944
Contours and drainage breaklines derived from photogrammetric analysis of 25cm resolution colour photography flown by Aerometrix for WDR in July 2008.
Mineral Claims
Exploration Licence
Sherwin Ironstone outcrop
Iron ore deposits - JORC resource
Unsealed WDR roads & tracks
Haul road (proposed)
Access Authority (proposed)
Process plant (proposed)
WESTERN DESERT RESOURCES LIMITED
ROPER BAR IRON ORE PROJECT
NORTHERN TERRITORY, AUSTRALIA
GENERAL SITE LAYOUT
Figure 2.2
GDA94 mga zone 53 14 March 2012

2.5.2 Sound Power Levels of the Dominant Noise Sources

The sound power levels for the typical equipment to be used in the operation of the Roper Bar Iron Ore Project are presented in Tables 2.5 and 2.6.

Table 2.5 presents single value sound power levels obtained from the SoundPLAN library.

Table 2.5 Sound Power Levels – Single Values

Type of Vehicle	Sound Power Level dB(A) (re 10^{-12} W)
Excavator	108
Primary Crusher	118
Secondary Crusher	122
Dump truck: 20 – 35t pay load	123
Pumps	109
Voice Level, raised	71
Beer Garden	66

Source: *SoundPLAN Library*
Note: *These values were adjusted for impulsiveness and/or tonality according to the characteristics of the noise*

Table 2.6 presents sound power levels in octave bands centre frequencies obtained from the SoundPLAN library and from onsite measurements by VDM Consulting on a similar mine site.

Table 2.6 Sound Power Levels – Octave Bands Centre Frequency Values

Description	dB(A)	Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Bulldozer ca 150kW	114	96	100	104	107	110	108	103	98
Truck Neutral	94	76	80	84	87	90	88	83	78
Truck: Backout Alerter Lmax	103	70	80	87	93	96	97	97	95
Truck > 7.5t gradient	67	49	53	57	60	63	61	56	51
Truck > 7.5t on grit < 30 km/h	64	46	50	54	57	60	58	53	48
Truck Accelerating Leq	72	54	58	62	65	68	66	61	56
Truck >7.5t on asphalt < 30km	61	43	47	51	54	57	55	50	45
Dozer, working cycle	117	90	99	105	110	112	111	104	95
Snow Blower (Transformers)	86	39	50	54	67	77	81	82	79
Diesel Generator	102	69	79	86	92	95	96	96	94
Deep Hole Gun Drill	108	75	85	92	98	101	102	102	100
Pump housing at Gasoline Pump	84	64	70	74	78	79	78	75	70
Mill (Tube Mill)	105	64	74	86	97	100	101	96	94
Drum Screen for Soil	112	79	89	96	102	105	106	106	104
Machine Shop (Lathes)	94	54	64	76	87	85	91	86	84
Metal Shop (Sanding, Hammering)	105	54	69	81	97	100	101	96	84

Source: *SoundPLAN Library*
Note: *These values were adjusted for impulsiveness and/or tonality according to the characteristics of the noise*

2.5.3 Noise Sensitive Places

The nearest noise sensitive areas to the proposed operations of the Roper Bar Iron Ore Project are:

- The aboriginal community in Ngukurr (population of 900) located approximately 50km north-north-east from the mine operation area;
- A camping facility at Towns River on Nathan River Road located approximately 15km north-east from the project area; and
- The Limmen River camp ground (Limmen National Park) in the vicinity of the proposed haul road to the Port of Bing Bong.

The nearest noise sensitive places relative to the proposed operations on the Roper Bar Iron Ore Project are presented in Figure 2.3.

Figure 2.3: Nearest Noise Sensitive Places

All of the above noise sensitive areas are located at significant distances from the mine site and are unlikely to be affected by noise emissions from the proposed Roper Bar Iron Ore Project. In this case the localised impacts on noise sensitive areas (e.g. accommodation area and administration buildings) within the boundaries of the mine site are of primary concern because of the implications on the long term noise amenity for the staff members that work and temporarily reside within the boundaries of the mine site.

2.5.4 Computer Model

The industrial module of the SoundPLAN acoustic modelling software was used to calculate the noise at the receiver locations. The calculations were carried out as per the procedures specified in the International Standard ISO9613. The calculation method for a single frequency is as follows:

$$L_S = [\ L_W + D_I + K_0\ ] - [D_S + S\ D]$$

Where:

L_S = sound pressure for a single frequency

L_W = sound power

D_I = directivity of the source

K_0 = spherical model

D_S = spreading

$S\ D$ = different contributing factors

The noise propagation losses, in addition to spreading, are calculated as a combination of screening, volume absorption (foliage, buildings) and the ground attenuation. In a large scale model dominated by distance, where the ground attenuation dominates the effect of the screening is zero dB. Where the screening effects by natural or manmade obstacles along the noise propagation path are bigger than the ground absorption, the ground absorption is ignored.

Under the ISO9613 calculation method the noise level at the receiver is calculated in terms of A-weighted equivalent sound pressure level (L_{Aeq}).

The noise propagation results were obtained as tabulated results as well as noise contours at 20m intervals and with an angle increment of 1^o. The receivers were located at an elevation of 1.5m above the finished floor levels of the nearest noise sensitive places (residences or noise sensitive administration buildings).

Conservative assumptions were made about the operational conditions at the iron ore mine, as follows:

- All noise sources at the mine site operate continuously during the hours of operation.
- Considering the significant distance from the sources to the receivers all sources were considered continuously operated point sources.
- There are no noise control measures implemented on site or at the receivers.
- The noise emissions from the sources that are associated with impulsive noise were adjusted for impulsiveness by addition of 5dB(A).
- The noise emissions from the sources that are associated with dominant noise at certain frequencies (tonality), such as pumps and generators, were adjusted for tonality by addition of 5dB(A).

2.6 Noise Propagation Modelling Results

2.6.1 SoundPLAN Noise Calculation Areas

The operational noise propagation modelling for the activities at the Roper Bar Iron Ore Project was carried out considering digital terrain model (DTM) developed for the overall mine site.

Considering the significant distance to the residences at the areas of Ngukurr and Towns River, the calculated noise levels at these noise sensitive places external to the mine site are very low and fully compliant with the requirements of *EPP(Noise)*.

To address the localised impacts on noise sensitive areas within the boundaries of the mine site, detailed noise propagation modelling was undertaken focussing on three distinctive noise calculation areas as follows:

- Noise impacts within the accommodation area;
- Noise impacts from the extraction activities on the accommodation area; and
- Noise impacts within the processing area.

The noise calculation area considered for the accommodation & recreation activities (accommodation area) is presented in Figure 2.4.

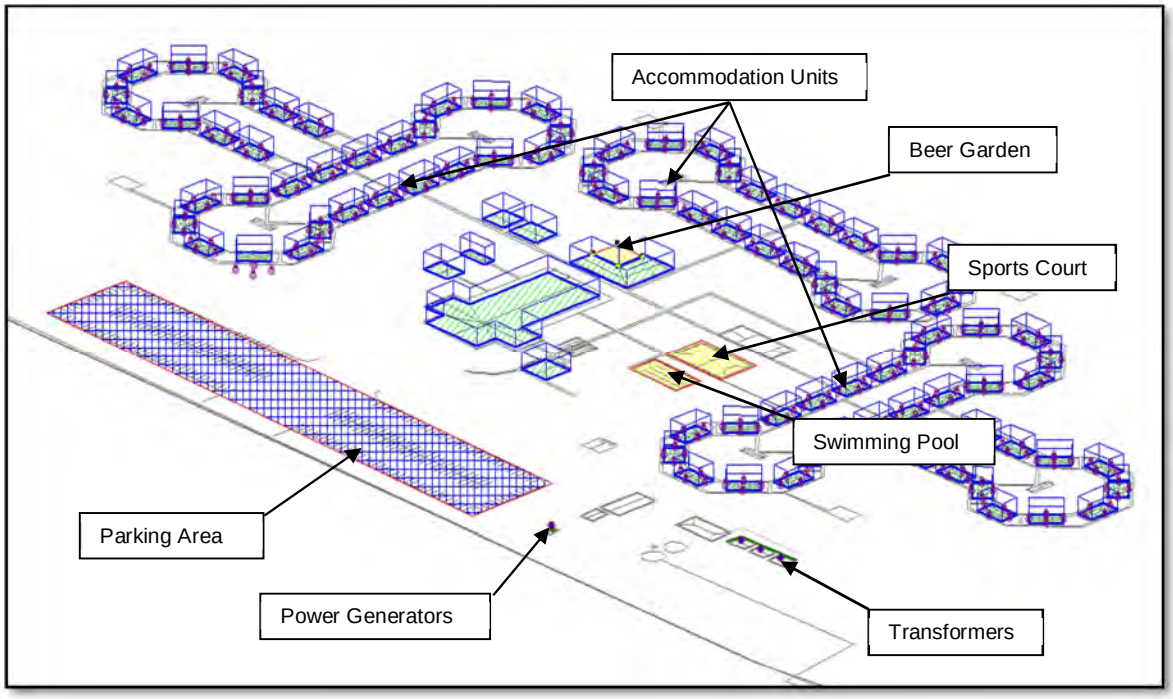


Figure 2.4: Noise Propagation Model – Accommodation Area

The noise calculation area considered for the potential noise impact from the extraction activities on the residential camp is presented in Figure 2.5.

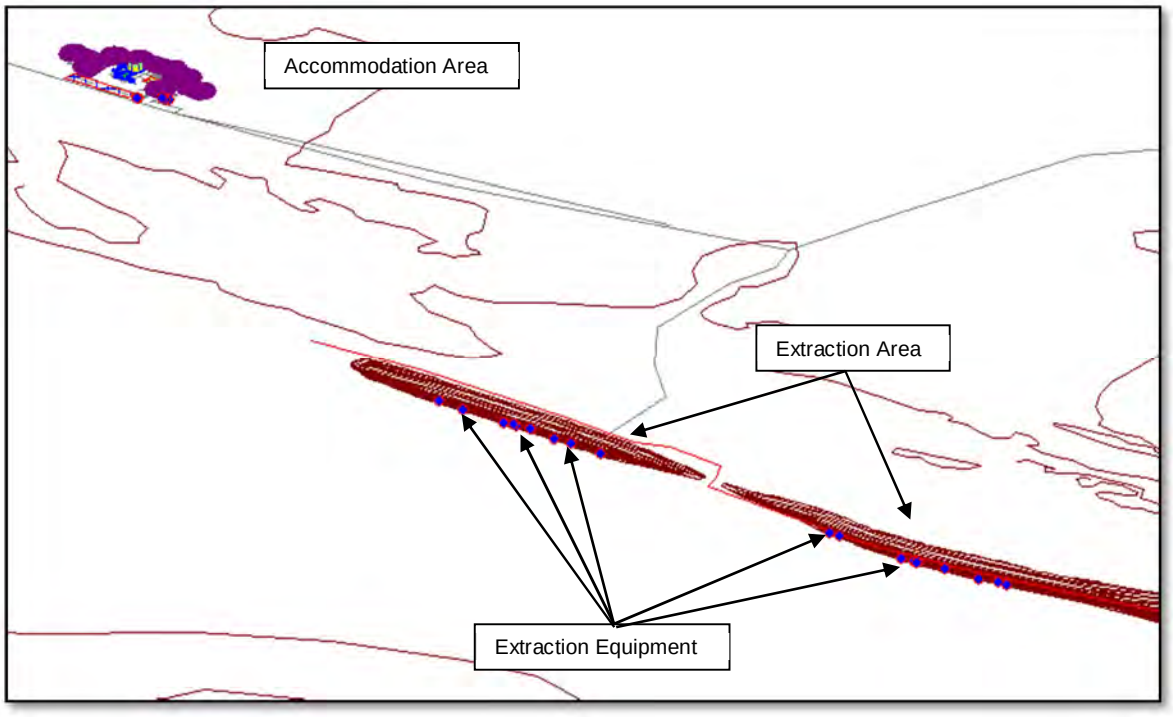


Figure 2.5: Noise Propagation Model – Extraction Area Relative to Accommodation Area

The noise calculation model for the processing area is presented in Figure 2.6.

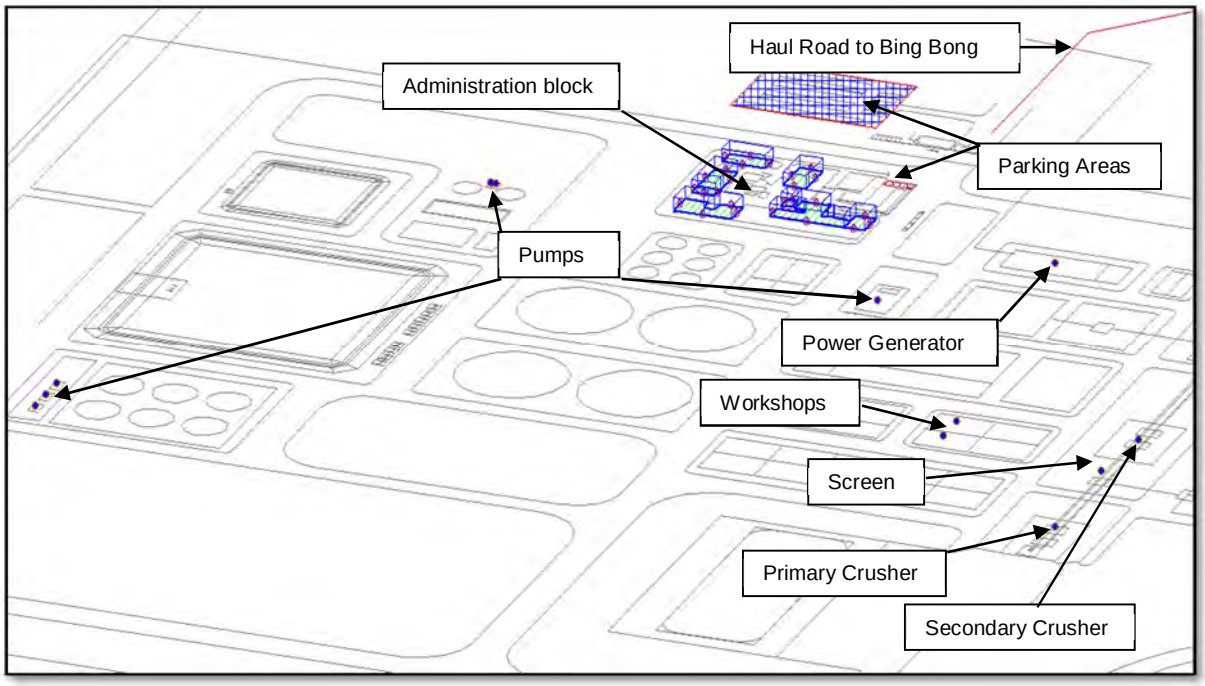


Figure 2.6: Noise Propagation Model – Processing

In addition to the three complex modelling scenarios presented above, the haul route noise emissions were modelled as line source with up to 10 road-trains movements. The proposed 160km haul road traverses mainly uninhabited areas with the only noise sensitive place being the Limmen River camp ground within the Limmen National Park.

When specific building structures are considered in the model (e.g. accommodation buildings or administration buildings) the noise propagation calculations are façade adjusted. Where point receivers are considered without predetermined building envelopes, the noise propagation calculations are free-field.

Because the limiting noise criterion (the lowest acceptable noise level) applicable to the nearest noise sensitive residential areas is based on protection of internal noise amenity, all the calculated noise levels are expressed in terms of equivalent indoor noise level.

2.6.2 Noise Calculation Results

The noise propagation modelling results for the most affected units within the accommodation area during day-time and evening are presented in Table 2.7 and in Appendix A.

Table 2.7 Accommodation Area - Noise Modelling Results – Daytime/Evening

Unit	Calculated $L_{Aeq, 1\text{-hour}*}$ dB(A)	Indoors Noise Criteria $L_{Aeq, 1hour*}$ dB(A)	Recommended Noise Control
Unit 55 (South West)	41	35	Acoustic Design as per AS3671-1989
Unit 62 (East)	37		

**Façade adjusted*

The noise propagation modelling results for the most affected units within the accommodation areas during night-time (before 7:00am and after 10:00pm) are presented in Table 2.8 and in Appendix A.

Table 2.8 Accommodation Area - Noise Modelling Results – Night-time

Unit	Calculated $L_{Aeq, 1\text{-hour}*}$ dB(A)	Indoors Noise Criteria $L_{Aeq, 1hour*}$ dB(A)	Recommended Noise Control
Unit 55 (South West)	41	30	Acoustic Design as per AS3671-1989
Unit 56 (East)	33		
Unit 57 (South East)	32		
Unit 62 (East)	37		

**Façade adjusted*

The noise propagation modelling results for the administration building located within the processing area are presented in Table 2.9 and in Appendix A.

Table 2.9 Processing Areas - Noise Modelling Results – Daytime/Evening

Office Block	Calculated $L_{Aeq, 1\text{-hour}*}$ dB(A)	Recommended Noise Control
Admin Office (South)	66	Acoustic Design as per AS3671-1989 to comply with the internal noise criteria from AS2107-2000
Canteen (East)	63	
EHS Office (East)	62	
Engineering Office (west)	59	
Fire Station (East)	62	
Medical Centre (South)	61	
Metallurgical Laboratory (East)	65	
Training Room (South)	67	

**Free-field conditions.*

The noise propagation modelling results for the Limmen River camp ground within the Limmen National Park (near Savannah Way), located at a distance of 2km away from the haul road, during day-time and evening, are presented in Table 2.10 and in Appendix A.

Table 2.10 Limmen River Camp Ground (Limmen National Park) – Daytime/Evening

Location	Calculated $L_{Aeq, 1\text{-hour}*}$ dB(A)	Indoors Noise Criteria $L_{Aeq, 1\text{hour}*}$ dB(A)	Recommended Noise Control
Camping Ground (Limmen National Park)	29	35	N/A

**Free-field conditions*

The noise propagation modelling results for the same camping ground within the Limmen National Park, during night-time (before 7:00am), are presented in Table 2.11 and in Appendix A.

Table 2.11 Limmen River Camp Ground (Limmen National Park) – Night-time

Location	Calculated $L_{Aeq, 1\text{-hour}*}$ dB(A)	Indoors Noise Criteria $L_{Aeq, 1\text{hour}*}$ dB(A)	Recommended Noise Control
Camping Area	29	30	N/A

**Free-field conditions*

The noise contours for the proposed operations of the Roper Bar Iron Ore Project are presented in Figures 2.7 (Accommodation Area), 2.8 (Extraction Area) and 2.9 (Limmen River Camp Ground, Limmen National Park).

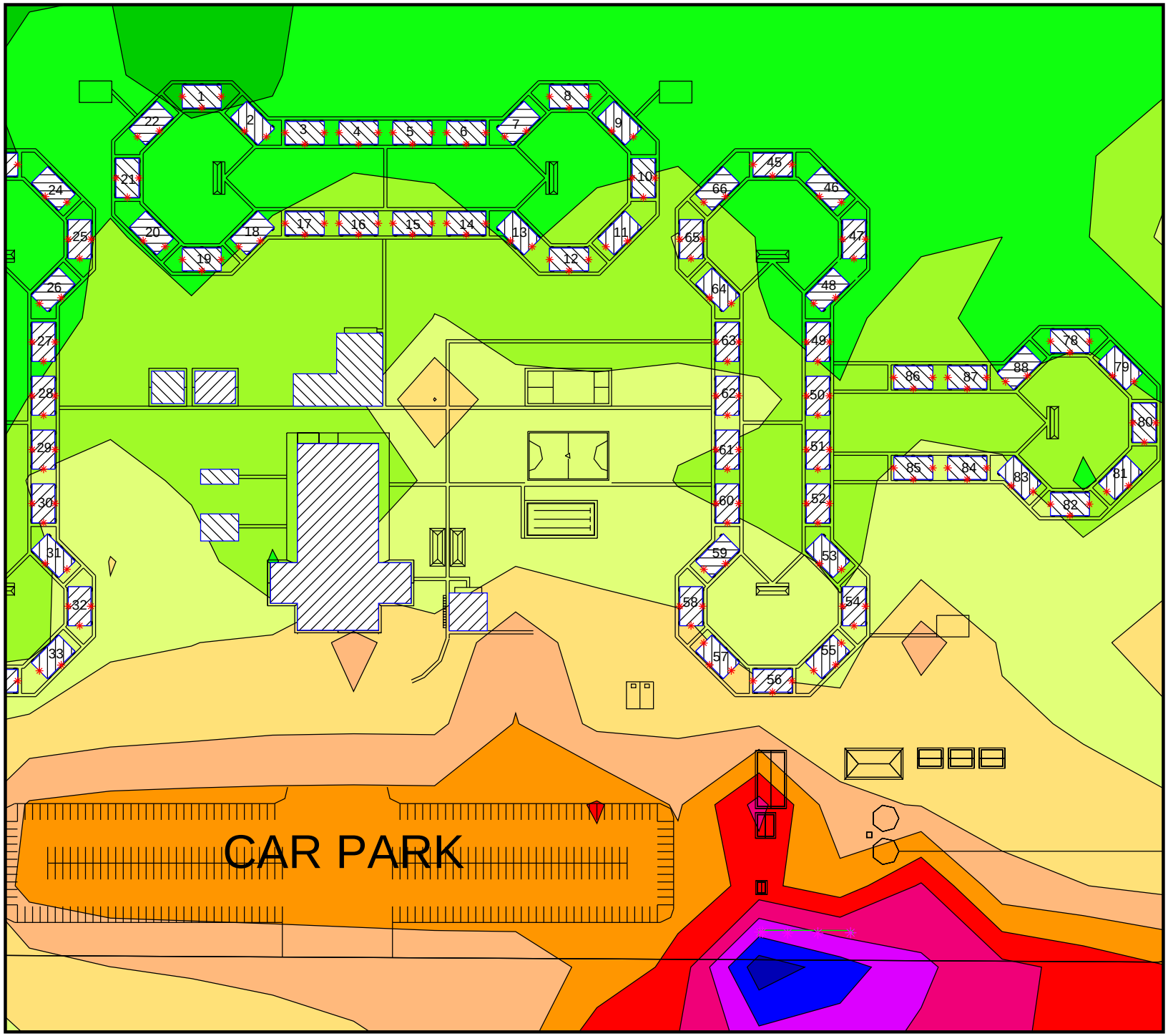


Figure 2.8
Accommodation Area
All Sources
Night-Time
L(max,adj,T) 1.8m (AGL)

Noise level
L(max,adj,T)
in dB(A) (Free-Field)

= 20
= 25
= 30
= 35
= 40
= 45
= 50
= 55
= 60
= 65
= 70
= 75

Angle Increment = 1
Grid Spacing = 5m

Signs and symbols

Point source
Access Road
Residential Buildings
Point receiver

Scale 1:2000

0 10 20 40 60 80 m

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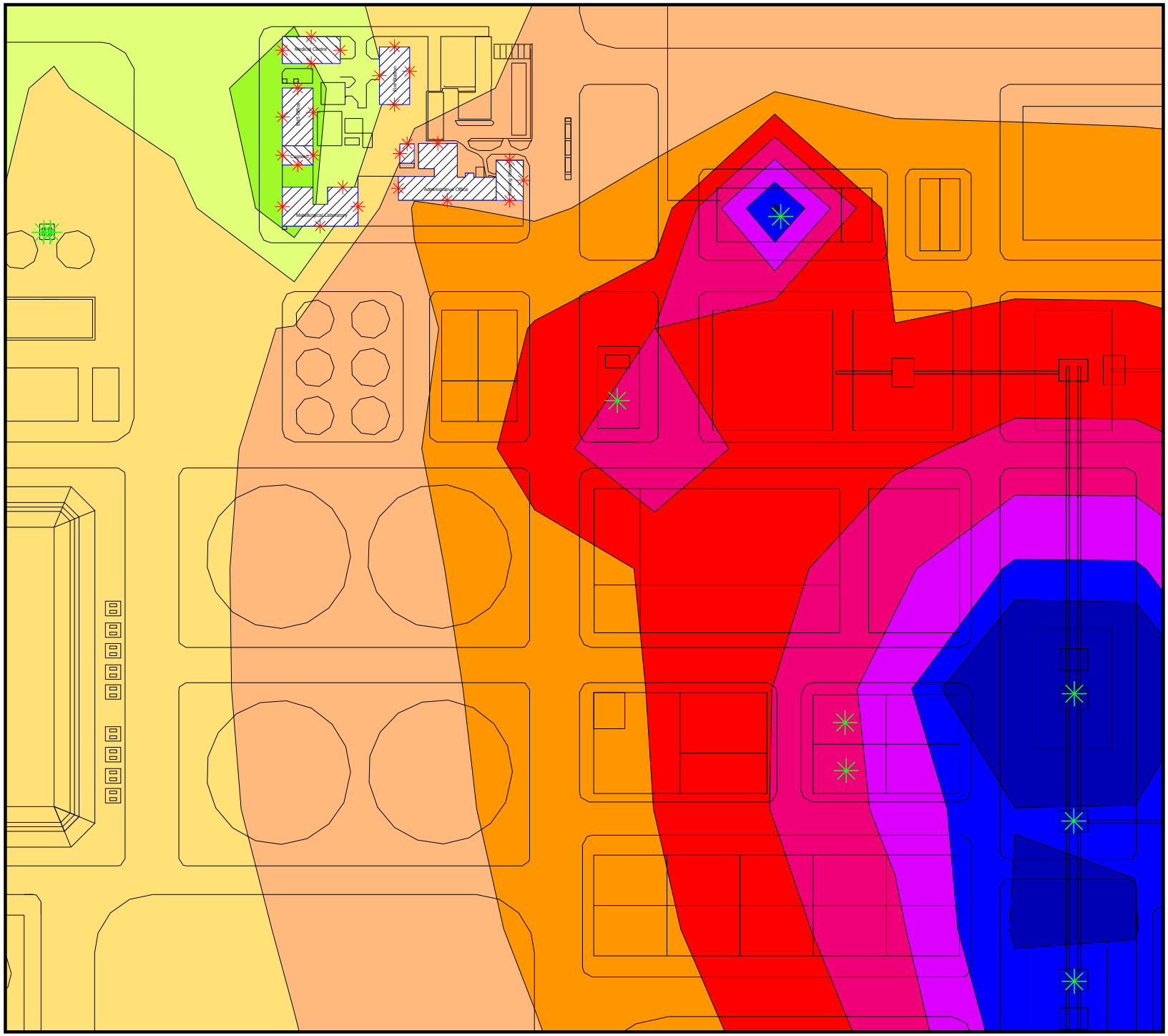

Figure 2.9
Administrative Block
All Sources
Daytime and Evening
L(max,adj,T) 1.8m (AGL)

Noise level
L(max,adj,T)
in dB(A) (Free-Field)

= 50
= 53
= 56
= 59
= 62
= 65
= 68
= 71
= 74
= 77
= 80
= 83

Angle Increment = 1
Grid Spacing = 5m

Signs and symbols
Point source
Offices
Point receiver

Scale 1:2250
0 10 20 40 60 80 m

VDM CONSULTING

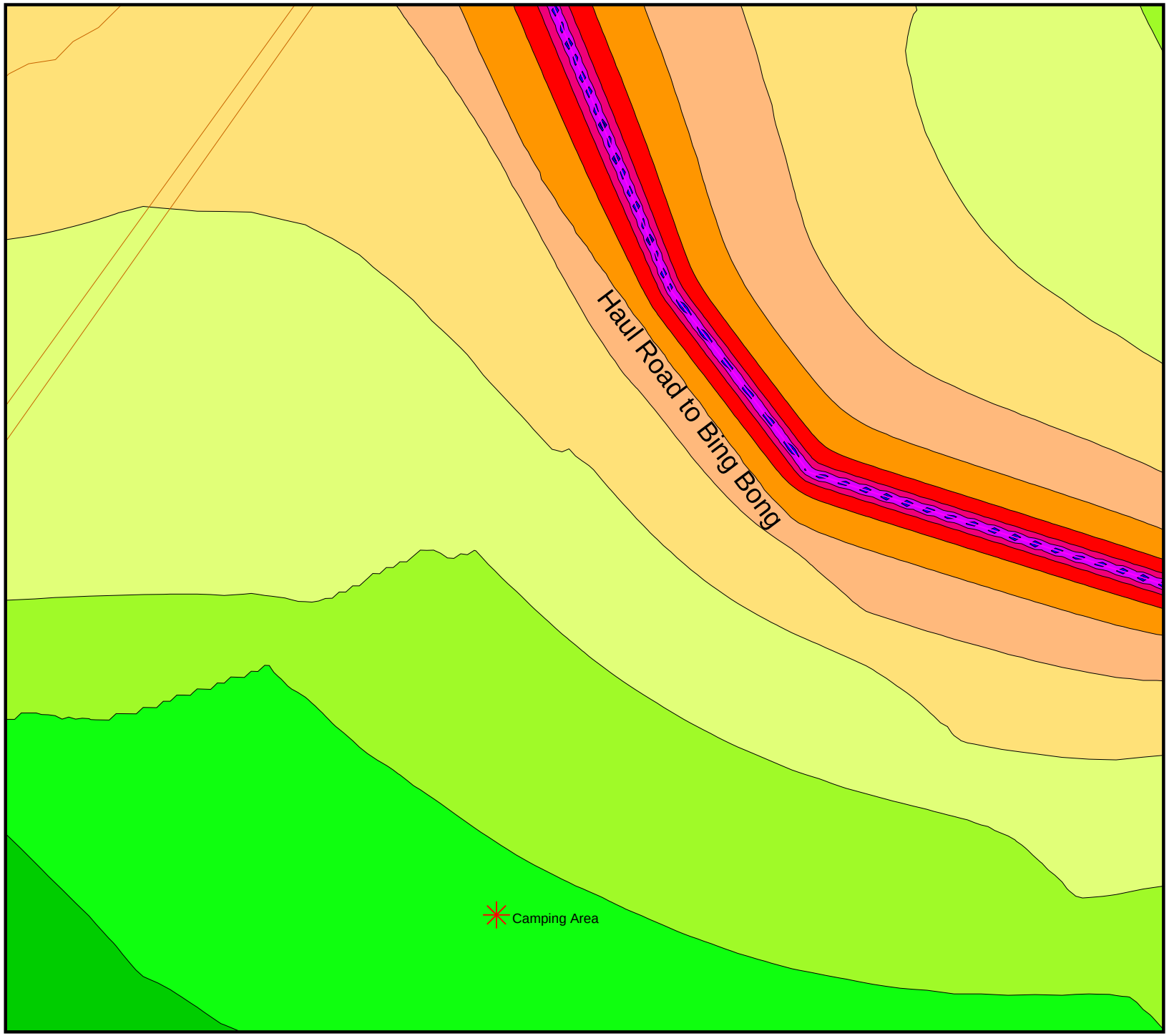

Figure 2.10
Camping Area
Haul Road to Bing Bong
Night-Time
L(max,adj,T) 1.8m (AGL)

Noise level
L(max,adj,T)
in dB(A) (Free-Field)

= 20
= 25
= 30
= 35
= 40
= 45
= 50
= 55
= 60
= 65
= 70
= 75

Angle Increment = 1
Grid Spacing = 5m

Signs and symbols
Haul Road
Camping Area

Scale 1:20000
0 100 200 400 600 800 m

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2.7 Discussion and Recommendations

With separation distances to the nearest residential areas exceeding 15km, it was expected that the operations at the Roper Bar Iron Ore Project will not cause impact on the existing noise amenity at residential areas. The alignment of the proposed haul road to the Port of Bing Bong passes at a distance of approximately 2km from an existing camping ground at the Limmen River Camp Ground (Limmen National Park). The noise propagation modelling results, considering conservative number of road train movements, indicate full compliance with the relevant noise criterion for the camping ground. The haul road noise emissions are unlikely to cause nuisance to the people using the Limmen River camp ground at the Limmen National Park.

For this project the operational noise emissions are of local concern mainly associated with potential noise impact on the individual units within the accommodation area and on the offices of the administration building at the processing area.

The noise propagation modelling results indicate that the detailed design of the accommodation area has to consider the potential noise impact on the individual units to ensure compliance with the internal noise criterion of 35dB(A)$L_{eq(1\text{-}hour)}$ for day-time and evening and 30dB(A)$L_{eq(1\text{-}hour)}$ for night-time.

Of particular concern is the potential noise impact from the power generators. Based on information from WDRL the following power generators will be required:

- Accommodation area (site camp) x 3 power generators (2 operational and 1 standby);
- Processing area x 2 power generators (1 operational and 1 standby);
- Stockyard x 2 power generators (1 operational and 1 standby); and
- Conveyance system x 2 power generators (1 operational and 1 standby).

To protect the noise sensitive areas within the boundaries of the accommodation area, the following noise control measures are recommended:

- Maintaining of maximum practicable distance between the power generator compound and the accommodation units;
- Use of not sensitive (maintenance or storage) buildings as screens between the power generators compound and the accommodation units;
- Use of natural acoustic barriers (elevated terrain) between noise sources and the accommodation area;
- Utilising acoustically attenuated power-generators (use of soundproofing and/or noise abatement devices around the power generators);
- Installing of shock-absorbing (vibration dampening) devices or materials around the primary sources of vibration; and
- Acoustic design of the building envelopes of the accommodation units as per the requirements of AS3671-1989 and AS2107-2000.

The administration building at the processing area is a noise sensitive place located at close proximity to a number of significant noise sources. The following noise control measures are recommended to ensure protection of the internal noise amenity at the offices of the administration building:

- Maintaining of maximum practicable distance between the major noise sources (particularly the crushers and power generators) and the administration building;
- Use of not sensitive (maintenance or storage) buildings as screens between the major noise sources and the administration building;

- Utilising acoustically attenuated plant and equipment (use of soundproofing and/or noise abatement devices around the significant process noise sources such as crushers);
- Installing of shock-absorbing (vibration dampening) devices or materials around the primary sources of vibration; and
- Acoustic design of the building envelopes of the administration building as per the requirements of AS3671-1989 and AS2107-2000.

In addition to the above environmental noise control measures, all the operations at the Roper Bar Iron Ore Project will comply with the National Standard for Occupational Noise (NOHSC: 1007(2000)). Hearing protection equipment will be made available and utilised in areas where engineering noise control measures are deemed inappropriate or ineffective. To ensure long-term compliance with the requirements for environmental and occupational noise control, WDRL is committed to undertaking periodic noise surveys to evaluate and ensure compliance with the environmental and occupational health and safety legislation.

The other issue to be considered associated with the operational noise impacts is the potential impact on fauna. The activities at the mining face (extraction area, processing area and haul road) may affect terrestrial fauna and birds, including potentially altering behavioural patterns, such as feeding and breeding. There are no specific regulatory mechanisms regarding noise effects on wildlife. The research studies undertaken recently generally indicate that there is a wide range of sensitivity to noise by different species.

A study by K. M. Parris and A. Schneider '*Impacts of Traffic Noise and Traffic Volume on Birds of Roadside Habitats'*, analysed the impact of traffic noise on two bird species - the Grey Shrike-Thrush and the Grey Fantail. The study indicates that the birds are adversely affected by traffic noise. The impact is significant on the birds with relatively low frequency call range. Their calls are likely to be masked by the characteristic of the traffic noise on Australian roads (particularly at the frequency of 2,000Hz). Parris and Schneider also found that the presence of birds is more correlated with traffic noise than with traffic volume.

The haul road will not traverse any critical habitat for threatened or conservation dependent species (refer to Chapter 3.7 of the Environmental Impact Statement – Biodiversity). Whilst noise sensitive species (particularly birds) are likely to suffer displacement as a result of the haul roads construction and operation, there is considered to be large areas of adjacent suitable habitat to which they may migrate to. Other less noise sensitive species will likely remain in the haul road corridor.

The noise propagation modelling results indicate rapid reduction of the noise emissions from the mining face (extraction area), processing area and along the haul road. At distances of approximately 100m from the boundary of the active operation areas, the noise emissions are reduced to below 60dB(A), which is considered a noise level that does not cause birds to leave their habitats. The potential noise impact on fauna is considered minimal and in the overall context of the project, the noise emissions are considered minor contributors to fauna habitat disturbance.

To minimise potential noise impact on fauna habitats the following noise control measures are recommended:

- Minimising the extent of the mining face to reduce physical loss of habitat and noise impact beyond the boundary of the mining face.
- Minimise idle operation of any plant and equipment to reduce duration of noise emissions.
- Maintenance of the noise reduction systems (mufflers or attenuators) on any mobile or stationary plant to reduce noise emissions.
- Scheduling of operations to prevent concentration of number of mobile and stationary plant at same locations to assist with noise propagation.

- Use of stockpiles as a form of noise attenuation barriers by locating any stationary plant behind the stockpiles.

- Use of broadband reversing alarm system to reduce extent of impulsive noise.

The recommended noise control measures to protect the noise amenity at the individual units within the accommodation area, the administration building at the processing area and the fauna habitats are included in the Environmental Management Plan (EMP) for Noise Amenity.

The noise level contours of the proposed operations of the Roper Bar Iron Ore Mine, focusing on the localised fauna habitat impact zones (with noise levels higher than 60dB(A) which are likely to impact on birds habitats) are presented in Figures 2.11 and 2.12.

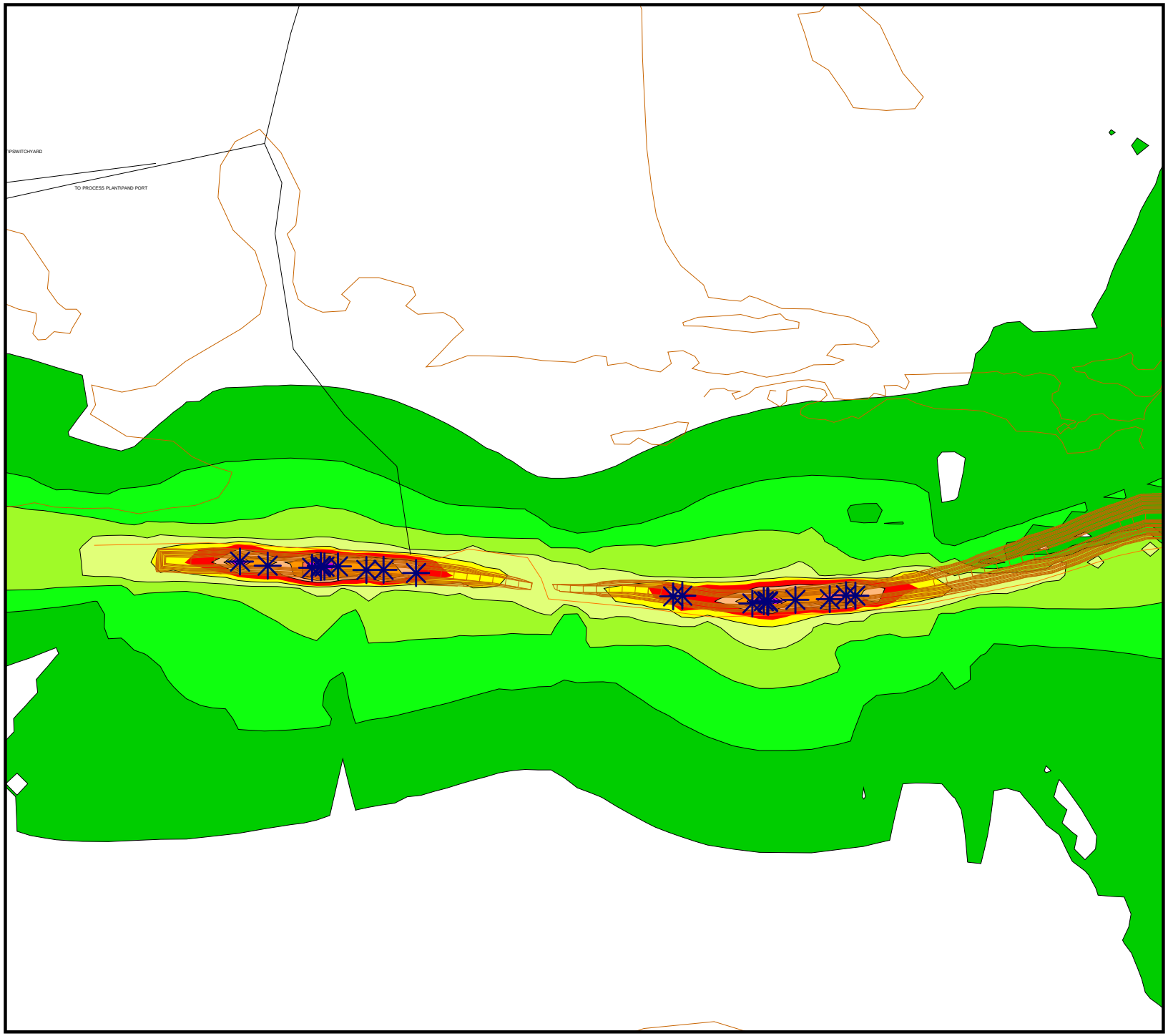

Figure 2.11
Extraction Area
Impact on Wildlife Habitats
Daytime
L(max,adj,T) 1.8m (AGL)

Noise level
L(max,adj,T)
in dB(A) (Free-Field)

= 35
= 40
= 45
= 50
= 55
= 60 dB - Limit Leve
= 65
= 70
= 75
= 80
= 85

Angle Increment = 1
Grid Spacing = 5m

Signs and symbols
Point source

Scale 1:20750
0 100 200 400 600 800 m

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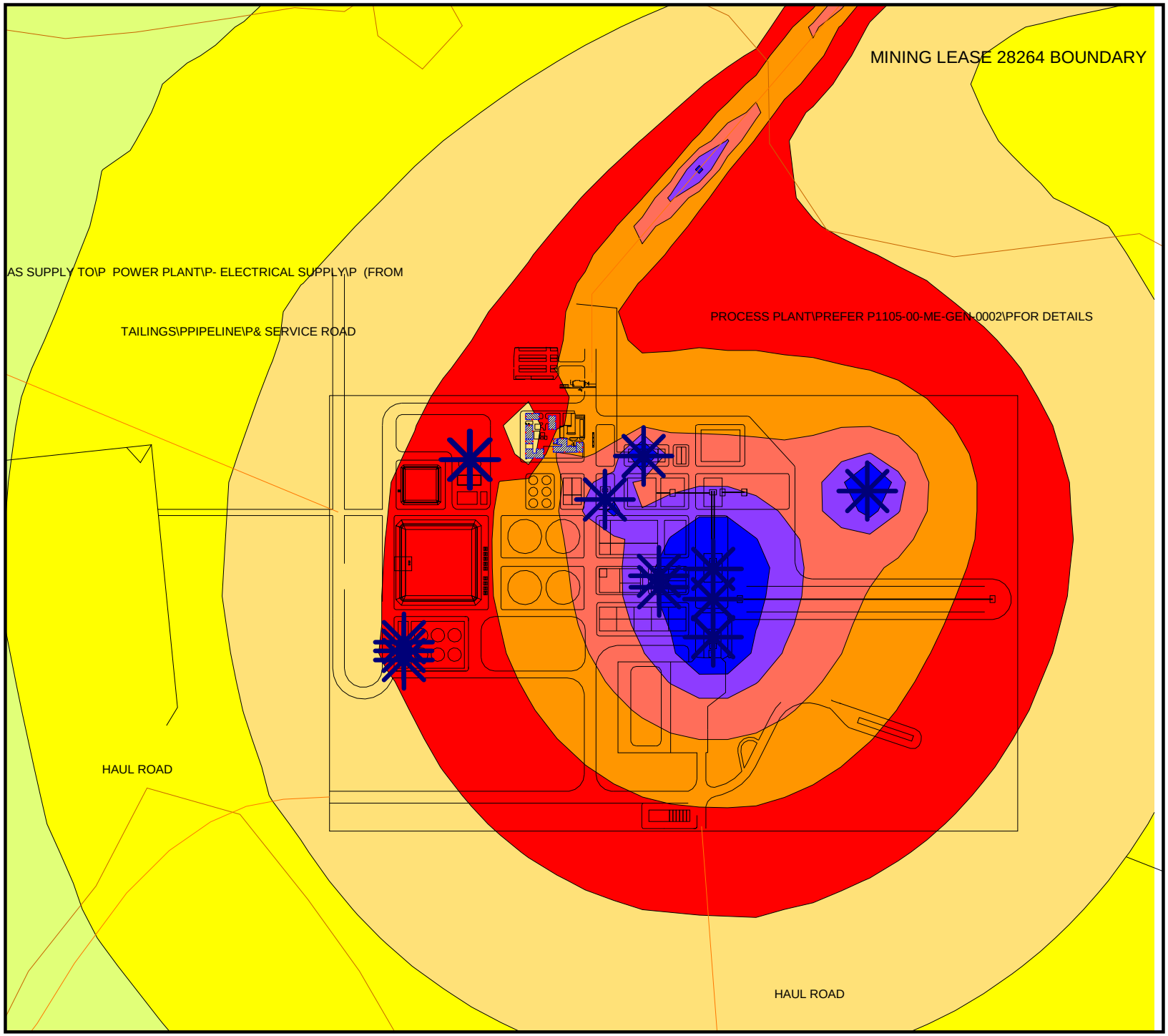

Figure 2.12
Process Area
Impact on Wildlife Habitats
Daytime
L(max,adj,T) 1.8m (AGL)

Noise level
L(max,adj,T)
in dB(A) (Free-Field)

= 36
= 40
= 44
= 48
= 52
= 56
= 60
= 64
= 68
= 72
= 76

dB - Limit Leve

Angle Increment = 1
Grid Spacing = 5m

Signs and symbols

Point source

Scale 1:9500

0 50 100 200 300 400 m

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3 Aircraft Noise Impact Assessment

The proposed runway required to facilitate arrival and departure from the mine site for the staff members and visitors is a potential noise source that has to be considered in the overall noise impact assessment. The primary concern with the aircraft arrival and departure on the proposed runway is the impact on the accommodation area. Therefore detailed aircraft noise impact assessment was undertaken as per the procedure specified in AS2021-2000.

3.1 Aircraft Internal Noise Criteria (Indoor Design Sound Level)

The internal criteria (indoor design sound level) for the individual residential units at the accommodation area are presented in Table 3.1.

Table 3.1 Indoor Design Sound Level dB(A)

Building Type and Activity (Houses, home units, flats, caravan parks)	Indoor Design Sound Level* dB(A)
Sleeping Areas, dedicated lounges	50
Other habitable spaces	55
Bathrooms, toilets, laundries	60

**Table 3.3 of AS2021 – 2000*

3.2 Aircraft Noise Levels

3.2.1 Site Coordinates and Related Aircraft Noise Levels

The proposed runway is located within the boundary of the mine site at a distance of more than 1km from the nearest residential units at the accommodation area. The elevation difference between the proposed runway and the accommodation area is 5m. A land height correction factor from Table 6.2 in AS2021 – 2000 was used to correct the coordinate distances.

The nearest unit is located at a distance of 1,320m to the north-east relative to the centreline of the proposed runway (DS or lateral distance) (Refer to Figure 3.1). The alignment of the nearest unit in north to south direction is 902m from the southern end of the runway and (DL distance from the closest end of the runway) and at a distance of 2,503m (DT) from the northern end of the runway. Considering the lateral (DS) distance from the proposed runway relatively low aircraft noise levels are expected at the nearest residence.

The location of the nearest residential unit at the accommodation area relative to the centreline of the proposed runway and the resulting maximum aircraft noise levels are presented in Table 3.2.

Table 3.2 Site Coordinates and Aircraft Noise Levels

Coordinates	Difference in Elevation	Aircraft Noise Level dB(A)	
DT = 2,503m	5m	Aircraft**	dB(A)*
DL = 902m		Light Aircraft – Take off (Due North)	59
DS = 1,320m			

**Table 3.23 of AS2021 – 2000*

ure 3.1: Proposed Aerodrome Layout

3.2.2 Site Acceptability

The predicted maximum aircraft noise level at the nearest residential unit at the accommodation area is 59dB(A). Based on the information from the proponent of the development the flight frequency will be low with a maximum of 1 flight per day, during the day-time only. Considering Table D1 in Appendix D of AS2021-2000, the nearest residence is located in an area with predicted maximum aircraft noise levels less than 80dB(A).

Therefore the accommodation area of the Roper Bar Iron Project is considered 'acceptable' under AS2021-2000 and is unlikely to be affected by intrusive aircraft noise. Whilst audible in a quiet rural environment, the expected maximum aircraft noise levels are unlikely to be perceived as intrusive outside or inside the residential units. There will be no requirement for specific acoustic design to any of the units at the accommodation area to protect from aircraft noise emissions.

4 Conclusions

Based on the noise impact assessment for the operation of the proposed Roper Bar Iron Ore Project, the following conclusions are made:

- The proposed Roper Bar Iron Ore Project will introduce extraction activities in the Roper Bar region. The identified iron ore resources will then be transported on a 164 km long haul road to a load out facility 2-3km from the Bing Bong port.

- With separation distances to the nearest residential areas exceeding 15km, it was expected that the operations at the Roper Bar Iron Ore Project will not cause impact on the existing noise amenity at residential areas.

- The alignment of the proposed haul road to the Port of Bing Bong passes at a distance of approximately 2km from the existing Limmen River Camp Ground in the Limmen National Park. The noise propagation modelling results, considering conservative number of road train movements, indicate full compliance with the relevant noise criterion for the camping ground. The haul road noise emissions are unlikely to cause nuisance to the people using the camping Limmen River Camp Ground at the Limmen National Park.

- For this project the operational noise emissions are of local concern mainly associated with potential noise impact on the individual units within the accommodation area and on the offices of the administration building at the processing area.

- To protect the noise sensitive areas within the boundaries of the accommodation area, the following noise control measures are recommended:

    - Maintaining of maximum practicable distance between the power generator compound and the accommodation units;

    - Use of non-sensitive (maintenance or storage) buildings as screens between the power generators compound and the accommodation units;

    - Use of natural acoustic barriers (elevated terrain) between noise sources and the accommodation area;

    - Utilising acoustically attenuated power-generators (use of soundproofing and/or noise abatement devices around the power generators);

    - Installing of shock-absorbing (vibration dampening) devices or materials around the primary sources of vibration; and

    - Acoustic design of the building envelopes of the accommodation units as per the requirements of AS3671-1989 and AS2107-2000.

- The administration building at the processing area is a noise sensitive place located at close proximity to a number of significant noise sources. The following noise control measures are recommended to ensure protection of the internal noise amenity at the offices of the administration building:

    - Maintaining of maximum practicable distance between the major noise sources (particularly the crushers and power generators) and the administration building;

    - Use of non-sensitive (maintenance or storage) buildings as screens between the major noise sources and the administration building;

- Utilising acoustically attenuated plant and equipment (use of soundproofing and/or noise abatement devices around the significant process noise sources such as crushers);
- Installing of shock-absorbing (vibration dampening) devices or materials around the primary sources of vibration; and
- Acoustic design of the building envelopes of the administration building as per the requirements of AS3671-1989 and AS2107-2000.

- In addition to the above environmental noise control measures, all the operations at the Roper Bar Iron Ore Project will comply with the National Standard for Occupational Noise (NOHSC: 1007(2000)). Hearing protection equipment will be made available and utilised in areas where engineering noise control measures are deemed inappropriate or ineffective.
- To ensure long-term compliance with the requirements for environmental and occupational noise control, WDRL is committed to undertaking periodic noise surveys to evaluate and ensure compliance with the environmental and occupational health and safety legislation.
- The other issue to be considered associated with the operational noise impacts is the potential impact on fauna.
- The haul road will not traverse any critical habitat for threatened or conservation dependent species. Whilst noise sensitive species (particularly birds) are likely to suffer displacement as a result of the haul roads construction and operation, there is considered to be large areas of adjacent suitable habitat to which they may migrate to. Other less noise sensitive species will likely remain in the haul road corridor.
- To minimise potential noise impact on fauna habitats the following noise control measures are recommended:
  - Minimising the extent of the mining face to reduce physical loss of habitat and noise impact beyond the boundary of the mining face.
  - Minimise idle operation of any plant and equipment to reduce duration of noise emissions.
  - Maintenance of the noise reduction systems (mufflers or attenuators) on any mobile or stationary plant to reduce noise emissions.
  - Scheduling of operations to prevent concentration of number of mobile and stationary plant at same locations to assist with noise propagation.
  - Use of stockpiles as a form of noise attenuation barriers by locating any stationary plant behind the stockpiles.
  - Use of broadband reversing alarm system to reduce extent of impulsive noise.
- The recommended noise control measures to protect the noise amenity at the individual units within the accommodation area, the administration building at the processing area and the fauna habitats are included in the Environmental Management Plan (EMP) for Noise Amenity.
- Minor ground born vibration produced by the mining equipment will be readily absorbed by the resilient quality of the ground. Considering significant distance to any residential areas, further investigation of ground vibration impacts in the Roper Bar region and its surroundings is not required.

- The proposed runway required to facilitate arrival and departure from the mine site for the staff members and visitors is a potential noise source that has to be considered in the overall noise impact assessment. The primary concern with the aircraft arrival and departure on the proposed runway is the impact on the accommodation area.

- The predicted maximum aircraft noise level at the nearest residential unit at the accommodation area is 59dB(A). Therefore the accommodation area of the Roper Bar Iron Mine is considered 'acceptable' under AS2021-2000 and is unlikely to be affected by intrusive aircraft noise.

- Whilst audible in a quiet rural environment, the expected maximum aircraft noise levels are unlikely to be perceived as intrusive outside or inside the residential units. There will be no requirement for specific acoustic design to any of the units at the accommodation area to protect from aircraft noise emissions

- Provided the recommended noise control measures are fully implemented in the detailed design and establishment of the facilities of the mine, the operational noise emissions will not impose any further constraints on the proposed Roper Bar Iron Mine Project.

5 References

- Australian Standard AS1055.2–1997 '*Acoustics - Description and measurement of environmental noise*'
- Australian Standard AS1217.7-1985 '*Acoustics – Determination of sound power levels of noise sources – Part 7. Survey Method*'
- Australian Standard AS2021-2000 '*Acoustics – Aircraft noise intrusion – Building sitting and construction*'
- Australian Standard AS1217.7-1985 '*Acoustics – Determination of sound power levels of noise sources – Part 7. Survey Method*'
- *Environmental Protection Act 1994*
- *Environmental Protection (Noise) Policy 2008*
- *International Standard ISO9613: 'Attenuation of Sound During Propagation Outdoors'*
- Queensland EPA, 2000, '*Noise Measurement Manual – For Use in Testing for Compliance with the Environmental Protection Act 1994*'
- Queensland EPA, 2004, '*Guideline 0804 – Noise: Planning for Noise Control*'
- Parris K.M. and Schneider A., 2009, '*Impacts of Traffic Noise and Traffic Volume on Birds of Roadside Habitats*'

6 Appendices

Appendix A – SoundPLAN Calculations Results

Appendix B – Environmental Management Plan (EMP) – Noise Amenity

Appendix A – SoundPLAN Calculation Results

Roper Bar Iron Ore Mine
Assessed receiver levels - NIA SP

Receiver	Fl	Dir	Ld dB(A)	Le dB(A)	Ln dB(A)
Admin Office	GF	W	62.9	62.9	62.9
Admin Office	GF	N	52.4	52.4	52.4
Admin Office	GF	S	66.3	66.3	66.3
Canteen	GF	W	45.8	45.8	45.7
Canteen	GF	S	55.5	55.5	55.5
Canteen	GF	E	62.8	62.7	62.7
EHS Office	GF	E	61.7	61.6	61.6
EHS Office	GF	N	60.0	60.0	60.0
EHS Office	GF	W	45.9	45.8	45.8
Engineering Office	GF	N	51.2	51.2	51.2
Engineering Office	GF	W	59.3	59.3	59.3
Fire Station	GF	W	55.6	55.5	55.5
Fire Station	GF	S	57.8	57.7	57.7
Fire Station	GF	E	62.2	62.2	62.2
Fire Station	GF	N	52.5	52.4	52.4
Medical Centre	GF	E	56.2	56.2	56.2
Medical Centre	GF	N	51.0	50.9	50.8
Medical Centre	GF	W	46.1	45.9	45.8
Medical Centre	GF	S	60.5	60.5	60.5
Metallurgical Laboratory	GF	W	47.6	47.6	47.6
Metallurgical Laboratory	GF	S	64.8	64.8	64.8
Metallurgical Laboratory	GF	E	65.2	65.2	65.2
Metallurgical Laboratory	GF	N	51.5	51.4	51.4
Training Room	GF	E	66.9	66.9	66.9
Training Room	GF	N	53.6	53.6	53.6
Training Room	GF	S	67.1	67.1	67.1
Unit 1	GF	S	32.7	34.3	27.9
Unit 1	GF	E	29.9	31.6	24.9
Unit 1	GF	W	26.1	25.3	23.6
Unit 2	GF	SW	32.6	34.6	25.9
Unit 2	GF	SE	33.3	35.3	27.0
Unit 3	GF	W	30.7	31.7	25.7
Unit 3	GF	S	29.8	30.2	27.0
Unit 3	GF	E	31.8	33.8	25.9
Unit 4	GF	E	29.3	28.5	27.0
Unit 4	GF	W	33.3	35.7	25.1
Unit 4	GF	S	31.7	32.9	27.1
Unit 5	GF	E	29.5	28.8	27.3
Unit 5	GF	W	27.8	28.1	25.0

Roper Bar Iron Ore Mine
Assessed receiver levels - NIA SP

Receiver	Fl	Dir	Ld dB(A)	Le dB(A)	Ln dB(A)
Unit 5	GF	S	30.3	30.5	27.0
Unit 6	GF	E	30.1	29.2	28.2
Unit 6	GF	S	29.9	29.6	27.8
Unit 6	GF	W	29.9	30.3	26.1
Unit 7	GF	SW	30.4	29.7	27.5
Unit 7	GF	SE	32.3	31.9	31.0
Unit 8	GF	W	28.3	27.4	26.1
Unit 8	GF	E	27.5	26.8	25.9
Unit 8	GF	S	30.4	29.7	27.9
Unit 9	GF	SE	28.7	27.7	26.5
Unit 9	GF	SW	30.1	29.4	27.2
Unit 10	GF	S	31.5	30.7	29.4
Unit 10	GF	E	29.7	28.9	28.1
Unit 10	GF	W	29.5	29.5	27.2
Unit 11	GF	SE	34.7	33.4	31.8
Unit 11	GF	SW	34.3	32.9	31.3
Unit 12	GF	W	34.7	34.1	32.5
Unit 12	GF	E	33.4	32.2	31.1
Unit 12	GF	S	36.2	35.4	34.2
Unit 13	GF	SW	35.0	34.8	32.4
Unit 13	GF	SE	35.1	34.3	32.8
Unit 14	GF	W	33.9	35.3	28.2
Unit 14	GF	E	34.5	33.9	33.4
Unit 14	GF	S	43.4	43.4	43.0
Unit 15	GF	W	35.8	38.1	27.5
Unit 15	GF	E	34.5	34.3	32.9
Unit 15	GF	S	37.0	38.3	32.2
Unit 16	GF	W	38.2	40.8	27.1
Unit 16	GF	E	33.7	33.6	31.9
Unit 16	GF	S	39.0	41.3	31.5
Unit 17	GF	S	40.2	42.7	29.3
Unit 17	GF	W	32.7	34.0	27.1
Unit 17	GF	E	37.0	39.1	31.0
Unit 18	GF	SW	41.9	44.6	30.5
Unit 18	GF	SE	41.4	44.1	29.0
Unit 19	GF	W	30.8	30.3	28.0
Unit 19	GF	E	40.7	43.5	28.1
Unit 19	GF	S	40.1	42.6	30.5
Unit 20	GF	SE	31.9	31.0	28.3

Roper Bar Iron Ore Mine
Assessed receiver levels - NIA SP

Receiver	Fl	Dir	Ld dB(A)	Le dB(A)	Ln dB(A)
Unit 20	GF	SW	33.8	33.1	31.4
Unit 21	GF	W	29.2	29.0	25.9
Unit 21	GF	E	30.3	31.7	26.3
Unit 21	GF	S	32.3	32.9	27.7
Unit 22	GF	SW	32.0	34.2	24.6
Unit 22	GF	SE	31.5	32.3	28.6
Unit 23	GF	W	23.0	22.5	21.3
Unit 23	GF	E	27.9	27.0	25.0
Unit 23	GF	S	29.2	28.7	26.1
Unit 24	GF	SE	31.2	33.3	23.7
Unit 24	GF	SW	27.5	26.3	24.6
Unit 25	GF	S	35.9	37.4	29.4
Unit 25	GF	W	25.9	25.4	23.7
Unit 25	GF	E	36.2	37.7	29.7
Unit 26	GF	SE	35.9	37.1	29.5
Unit 26	GF	SW	27.7	26.8	25.6
Unit 27	GF	W	28.3	28.0	25.7
Unit 27	GF	E	36.1	37.3	29.7
Unit 27	GF	S	32.2	32.9	28.6
Unit 28	GF	W	29.0	28.6	26.8
Unit 28	GF	E	35.4	34.8	32.0
Unit 28	GF	S	32.1	31.0	29.8
Unit 29	GF	W	33.9	33.6	33.2
Unit 29	GF	E	34.8	33.3	31.2
Unit 29	GF	S	33.3	32.3	31.3
Unit 30	GF	W	29.9	28.6	27.2
Unit 30	GF	E	38.6	38.1	37.4
Unit 30	GF	S	35.2	34.5	33.8
Unit 31	GF	SW	34.2	32.7	31.1
Unit 31	GF	SE	36.1	36.0	34.1
Unit 32	GF	W	32.6	31.0	29.3
Unit 32	GF	E	40.6	39.1	37.4
Unit 32	GF	S	41.6	39.9	38.2
Unit 34	GF	W	35.2	33.4	31.3
Unit 34	GF	E	42.5	40.8	38.9
Unit 34	GF	S	42.6	40.9	39.0
Unit 35	GF	SW	37.8	35.9	33.7
Unit 35	GF	SE	39.1	37.3	35.0
Unit 36	GF	W	27.5	26.3	25.0

Roper Bar Iron Ore Mine
Assessed receiver levels - NIA SP

Receiver	Fl	Dir	Ld dB(A)	Le dB(A)	Ln dB(A)
Unit 36	GF	E	34.0	32.9	30.7
Unit 36	GF	S	31.3	29.8	28.2
Unit 37	GF	SW	33.3	31.7	29.8
Unit 37	GF	SE	35.4	33.7	31.7
Unit 38	GF	W	25.0	24.3	23.4
Unit 38	GF	E	34.4	33.0	31.4
Unit 38	GF	S	33.7	32.0	30.3
Unit 39	GF	W	24.0	23.3	22.4
Unit 39	GF	E	32.7	31.2	29.3
Unit 39	GF	S	30.4	29.0	27.4
Unit 40	GF	W	23.9	23.5	22.3
Unit 40	GF	E	31.6	30.3	28.3
Unit 40	GF	S	30.9	30.2	29.4
Unit 41	GF	W	25.2	24.8	24.2
Unit 41	GF	E	31.3	30.4	28.5
Unit 41	GF	S	29.5	30.2	25.6
Unit 42	GF	SW	24.7	23.8	22.5
Unit 42	GF	SE	33.3	35.0	28.1
Unit 43	GF	W	22.3	22.0	21.1
Unit 43	GF	E	29.4	29.6	27.4
Unit 43	GF	S	25.7	26.3	22.4
Unit 44	GF	SE	30.3	30.6	26.3
Unit 44	GF	SW	27.6	27.3	24.0
Unit 45	GF	S	30.6	29.5	28.4
Unit 45	GF	W	29.6	28.5	27.3
Unit 45	GF	E	26.1	25.8	25.4
Unit 46	GF	SW	31.0	30.0	29.0
Unit 46	GF	SE	31.1	30.4	29.7
Unit 47	GF	W	31.5	30.9	30.1
Unit 47	GF	E	27.5	27.4	27.2
Unit 47	GF	S	27.9	27.6	27.2
Unit 48	GF	SE	27.9	27.4	27.0
Unit 48	GF	SW	31.5	30.7	29.8
Unit 49	GF	W	33.1	32.3	31.7
Unit 49	GF	E	28.6	28.3	28.1
Unit 49	GF	S	31.2	30.4	29.7
Unit 50	GF	W	32.7	31.7	30.7
Unit 50	GF	E	27.4	27.1	26.8
Unit 50	GF	S	32.3	31.4	30.6

Roper Bar Iron Ore Mine
Assessed receiver levels - NIA SP

Receiver	Fl	Dir	Ld dB(A)	Le dB(A)	Ln dB(A)
Unit 51	GF	S	34.2	33.5	32.9
Unit 51	GF	E	30.7	30.5	30.4
Unit 51	GF	W	37.9	37.6	37.3
Unit 52	GF	W	34.7	33.6	32.6
Unit 52	GF	E	31.1	31.0	30.8
Unit 52	GF	S	35.8	34.9	34.0
Unit 53	GF	SE	35.3	34.8	34.4
Unit 53	GF	SW	39.7	39.2	38.8
Unit 54	GF	S	35.5	34.9	34.4
Unit 54	GF	E	32.7	32.5	32.4
Unit 54	GF	W	37.5	36.8	36.2
Unit 55	GF	NE	35.3	35.2	35.1
Unit 55	GF	SE	40.5	40.3	40.1
Unit 55	GF	SW	50.7	50.7	50.6
Unit 56	GF	S	43.4	42.7	42.1
Unit 56	GF	E	43.2	43.2	43.1
Unit 56	GF	W	43.0	42.1	41.3
Unit 57	GF	NW	40.5	38.9	37.3
Unit 57	GF	SW	43.3	42.3	41.5
Unit 57	GF	SE	42.8	42.1	41.5
Unit 58	GF	E	34.6	34.0	33.6
Unit 58	GF	S	40.6	39.0	37.4
Unit 58	GF	W	40.2	38.5	36.8
Unit 59	GF	SW	36.4	35.4	34.4
Unit 59	GF	SE	36.3	35.7	35.2
Unit 60	GF	S	37.1	35.9	34.8
Unit 60	GF	W	36.9	35.3	33.6
Unit 60	GF	E	36.1	36.0	35.8
Unit 61	GF	W	36.3	34.7	32.8
Unit 61	GF	E	35.2	35.0	34.8
Unit 61	GF	S	35.6	34.3	33.0
Unit 62	GF	W	35.4	33.8	32.0
Unit 62	GF	E	46.6	46.6	46.6
Unit 62	GF	S	34.6	33.3	31.9
Unit 63	GF	S	33.5	32.3	31.2
Unit 63	GF	E	33.4	33.1	32.9
Unit 63	GF	W	34.8	33.3	31.7
Unit 64	GF	SW	34.8	33.5	32.0
Unit 64	GF	SE	32.0	31.3	30.6

Roper Bar Iron Ore Mine
Assessed receiver levels - NIA SP

Receiver	Fl	Dir	Ld dB(A)	Le dB(A)	Ln dB(A)
Unit 65	GF	E	29.0	28.3	27.6
Unit 65	GF	S	36.4	35.6	34.8
Unit 65	GF	W	34.0	32.6	30.9
Unit 66	GF	SE	30.5	29.7	29.0
Unit 66	GF	SW	28.9	28.2	27.4
Unit 67	GF	W	22.5	22.4	22.1
Unit 67	GF	E	23.6	24.3	21.0
Unit 67	GF	S	27.0	25.7	24.2
Unit 68	GF	SE	29.7	29.2	28.6
Unit 68	GF	SW	24.7	23.7	22.6
Unit 69	GF	W	22.0	22.0	20.9
Unit 69	GF	E	27.4	26.3	24.4
Unit 69	GF	S	29.4	28.8	28.2
Unit 70	GF	W	26.0	25.8	24.8
Unit 70	GF	E	30.7	31.7	25.7
Unit 70	GF	S	29.8	28.8	27.7
Unit 71	GF	W	27.3	26.6	25.6
Unit 71	GF	E	29.9	28.6	26.9
Unit 71	GF	S	29.8	28.3	26.7
Unit 72	GF	W	25.1	24.3	23.6
Unit 72	GF	E	30.7	29.2	27.5
Unit 72	GF	S	31.5	29.9	28.2
Unit 73	GF	SW	32.5	30.9	29.3
Unit 73	GF	SE	32.1	30.5	28.9
Unit 74	GF	W	23.3	22.5	21.7
Unit 74	GF	E	33.5	31.8	29.8
Unit 74	GF	S	32.9	31.2	29.3
Unit 75	GF	SW	23.5	22.6	21.8
Unit 75	GF	SE	24.1	23.4	22.2
Unit 76	GF	W	20.8	20.6	20.2
Unit 76	GF	E	29.4	28.9	27.7
Unit 76	GF	S	25.1	24.1	23.1
Unit 77	GF	SW	24.6	23.3	21.9
Unit 77	GF	SE	27.9	27.2	25.6
Unit 78	GF	E	26.4	26.1	25.9
Unit 78	GF	W	26.9	26.5	26.2
Unit 78	GF	S	31.0	30.4	29.9
Unit 79	GF	SW	33.6	33.2	32.9
Unit 79	GF	SE	30.0	29.8	29.7

Roper Bar Iron Ore Mine
Assessed receiver levels - NIA SP

Receiver	Fl	Dir	Ld dB(A)	Le dB(A)	Ln dB(A)
Unit 80	GF	E	28.9	28.9	28.8
Unit 80	GF	W	30.4	29.5	28.8
Unit 80	GF	S	31.2	30.7	30.3
Unit 81	GF	SE	34.9	34.8	34.7
Unit 81	GF	SW	31.0	30.7	30.5
Unit 82	GF	W	35.5	35.0	34.6
Unit 82	GF	E	31.6	31.5	31.4
Unit 82	GF	S	36.1	35.6	35.3
Unit 83	GF	SE	34.9	34.6	34.3
Unit 83	GF	SW	35.8	35.3	35.0
Unit 84	GF	W	36.7	36.5	36.4
Unit 84	GF	E	29.4	29.3	29.2
Unit 84	GF	S	35.7	35.3	35.0
Unit 85	GF	W	33.5	32.9	32.4
Unit 85	GF	E	29.4	28.7	28.1
Unit 85	GF	S	33.5	32.9	32.4
Unit 86	GF	W	31.2	30.5	29.8
Unit 86	GF	E	28.1	27.6	27.0
Unit 86	GF	S	32.0	31.3	30.7
Unit 87	GF	W	30.8	30.1	29.5
Unit 87	GF	E	26.3	26.1	25.9
Unit 87	GF	S	33.3	32.8	32.5
Unit 88	GF	SW	30.7	29.9	29.2
Unit 88	GF	SE	29.2	28.7	28.4

Roper Bar Iron Ore Mine
Assessed receiver levels - NIA Camping area SP

Receiver	Fl	Dir	SPL Daytime (7am - 6pm) dB(A)	SPL Night (10pm - 7am) dB(A)	SPL Evening (6pm - 10 pm) dB(A)
Camping Area	GF		28.6	28.6	28.6

Appendix B – Environmental Management Plan (EMP) – Noise Amenity

Element	Noise Amenity Management Plan
Objective:	Compliance with the requirements for pollution control (including noise & vibration) as per the objectives from Section 5 of the *Waste Management and Pollution Control Act.*
Performance Criteria:	• No noise & vibration complaints • Compliance with the objectives of the Waste Management and Pollution Control Act based on specific criteria from: o 'Acoustic Quality Objectives' of the Queensland Environmental Protection (Noise) Policy 2008 - EPP (Noise); and o Guidelines specifying the recommended human comfort criteria for: a) Airblast overpressure level; b) Ground vibration peak particle velocity; and c) Times of blasting.

Element	Noise Amenity Management Plan
Operational Management Strategy:	The recommended noise amenity management measures to be implemented during the operation of the Roper Bar Iron Ore Project are as follows: • Maintaining of maximum practicable distance between the power generator compound and the accommodation units. • Use of not sensitive (maintenance or storage) buildings as screens between the power generators compound and the accommodation units. • Use of natural acoustic barriers (elevated terrain) between noise sources and the accommodation area. • Utilising acoustically attenuated power-generators (use of soundproofing and/or noise abatement devices around the power generators). • Installing of shock-absorbing (vibration dampening) devices or materials around the primary sources of vibration. • Acoustic design of the building envelopes of the accommodation units as per the requirements of AS3671-1989 and AS2107-2000. • Maintaining of maximum practicable distance between the major noise sources (particularly the crushers and power generators) and the administration building. • Use of not sensitive (maintenance or storage) buildings as screens between the major noise sources and the administration building. • Utilising acoustically attenuated plant and equipment (use of soundproofing and/or noise abatement devices around the significant process noise sources such as crushers). • Installing of shock-absorbing (vibration dampening) devices or materials around the primary sources of vibration. • Acoustic design of the building envelopes of the administration building as per the requirements of AS3671-1989 and AS2107-2000. • Minimising the extent of the mining face to reduce physical loss of habitat and noise impact beyond the boundary of the mining face. • Minimise idle operation of any plant and equipment to reduce duration of noise emissions. • Maintenance of the noise reduction systems (mufflers or attenuators) on any mobile or stationary plant to reduce noise emissions. • Scheduling of operations to prevent concentration of number of mobile and stationary plant at same locations to assist with noise propagation. • Use of stockpiles as a form of noise attenuation barriers by locating any stationary plant behind the stockpiles. • Use of broadband reversing alarm system to reduce extent of impulsive noise.
Implementation Strategy:	Ensure that all staff members involved in the mining operations are aware of the potential for noise emissions, and operate as per the requirements of this EMP.

Element	Noise Amenity Management Plan
Monitoring:	The Site Supervisor will ensure the following noise amenity protection measures are implemented as necessary: • Carry out regular daily inspections to determine any excessive noise emissions. • Monitor the maintenance of any plant and vehicles to reduce noise emissions. • Monitor the compliance with scheduling of operations to prevent concentration of number of mobile and stationary plant at same locations to assist with noise propagation. • Monitor the compliance with the requirement to use the stockpiles as a form of noise attenuation barriers by locating any stationary plant behind the stockpiles. • Monitor the use of broadband reversing alarm system to reduce extent of impulsive noise.
Recording and Reporting:	The Site Supervisor or authorised staff member should maintain the following records: • Daily record of the operations carried out (e.g. extent of land disturbance, total material processed and number of vehicle movements on site). • Complaint log and complaint investigation records. • Noise monitoring records (if noise monitoring is required). These records will be available for audit by the relevant Administrative Authority on request. Should there be any need for noise monitoring to be carried out by a specialist consultant (i.e. due to noise complaint to an Administrative Authority) the Noise Monitoring Report will be made available to the relevant Administrative Authority that is managing the noise complaint issue. The Noise Monitoring Report should contain, as a minimum, the following information: • Noise monitoring methodology and instrumentation. • Noise levels recorded at the most exposed part of the sensitive place where the compliant has originated. • Analysis of the data and discussion of the results relative to the relevant acoustic quality objectives from *EPP(Noise).* • Recommendations for modified operations to reduce noise emissions or for implementation of additional noise control measures in areas where excessive noise emissions have been generated.
Corrective Action:	• The Site Supervisor will be responsible for immediate rectification of any identified non-conformance with the objectives of this EMP. • In the event that a non-conformance occurs as a result of poor practices, personnel on site will be made aware of the problem and informed of acceptable work practices.
Auditing Compliance:	The Site Supervisor will carry out regular reviews of the implementation of the noise amenity management practices. The audit will especially consider the level of compliance with the following: • Implementation of the requirement for noise emissions to be kept as low as practicably possible; and • Auditing compliance by assessing the number of noise complaints.
Responsibility:	The Site Supervisor and any authorised staff members responsible for implementation of the whole or parts of the requirements specified under this EMP.

Element	Noise Amenity Management Plan
Timing:	From commencement to completion of all operations.
Review:	Continual review of the EMP shall be practiced to ensure best management practices and continuous compliance with the objectives of this EMP.