10. Noise and Vibration

10.1 Existing Noise Environment

10.1.1 Meteorology

Section 9.1.1 provides an overview of the meteorology for the region, which will influence the fate of Project noise emissions. Figure 9 1 shows that the dominant wind direction throughout the year is from the south east, resulting in noise levels radiating further in a north westerly direction. The Project area is also expected to be associated with temperature inversions at night, which will trap noise emissions allowing them to travel longer distances.

A detailed description is provided in Appendix J.

10.1.2 Existing emissions

The Project is situated in a relatively isolated location, with sensitive receptors and noise sources sparsely distributed across the region. Land use immediately adjacent to the Project is pastoral activities. Existing land use activities in the region that are likely to be associated with noise emissions include machinery operations on Anningie and Stirling stations, traffic noise on Stuart Highway and rail noise from the Alice Springs to Darwin railway.

10.1.3 Sensitive receptors

Noise sensitive receptors for the Project are considered consistent with those identified for the air quality assessment. Section 9.1 provides a list of the sensitive receptors, their distance to the Project and a figure presenting their location.

10.2 Noise and Vibration Criteria

In the absence of relevant Northern Territory guidelines or policies, noise and vibration criteria were selected from relevant state and international criteria. Where relevant, the assessment of potential noise impacts was confined to the nigh time criterion, as this is the time likely to have the greatest impact - that is, when temperature inversions usually occur and disturbance to sleep is possible.

10.2.1 Construction noise

Predicted construction noise was assessed with consideration to NSW Department of Environment and Climate Change (DECC) *Interim Construction Noise Guidelines* (ICNG) (DECC 2009). The ICNG recommend standard hours for construction activity and blasting (Table 10-1), with different criteria applied outside these times.

It is reasonable to assume working hours will extend outside the recommended standard hours, particularly for concrete pours during the hotter months, construction material delivery or to catch up on schedule delays. However, given the location of the mine site and the large distance between sources and receptors, this is not expected to cause an issue.

Table 10-1 ICNG recommended standard hours for construction works

Work type	Recommended standard hours of work
Normal construction	Monday to Friday: 7.00 am to 6.00 pm Saturday: 8.00 am to 1.00 pm No work on Sundays or public holidays
Blasting	Monday to Friday: 9.00 am to 5.00 pm Saturday: 9.00 am to 1.00 pm No work on Sundays or public holidays

The ICNG provides noise management for construction noise levels at residential receptors. The noise affected level is the background noise level plus 10 dBA during recommended standard hours and the background noise level plus 5 dBA outside of recommended standard hours. These criteria apply at the boundary of the most affected residences or within 30 m from the residence where the property boundary is more than 30 m from the residence. The noise affected level represents the point above which there may be some community reaction to noise. Where the noise affected level is exceeded, all feasible and reasonable work practices to minimise noise should be applied and all potentially impacted residents informed of the nature of the works, expected noise levels, duration of works and a method of contact.

Based on the distance between the Project and the closest non-mining sensitive receptor (approximately 30 km), background monitoring was not completed for this assessment. The NSW *Industrial Noise Policy* (INP) (EPA 2000) states where the background noise level is found to be less than 30 dBA then it is set to 30 dBA. The construction noise criteria were derived based on this (Table 10-2).

Table 10-2 Construction noise criteria $L_{Aeq(15\text{-}min)}$

Within recommended standard hours	Outside recommended standard hours	
	Evening (6.00 pm to 10.00 pm)	Night (10.00 pm to 7.00 am)
40	35	35

The ICNG states where construction works are planned to extend over more than two consecutive nights, the impact analysis should include maximum noise levels and the extent and number of times the maximum exceeds the rating background levels. As there is the potential for night works during construction, a maximum noise level criterion has also been set. The *Road Noise Policy* (RNP)(DECCW 2011) indicates people are unlikely to be woken by maximum internal noise levels below 50-55 dBA, and one or two noise events per night with maximum internal noise levels of 65–70 dBA are not likely to affect health and wellbeing significantly. For this Project a maximum noise level based on sleep disturbance criteria was set at 65 dBA based on the RNP recommended maximum internal noise levels of 55 dBA, and assuming a 10 dBA reduction in noise from outside to inside the building.

10.2.2 Operation noise

Operational noise criteria applied to this assessment were derived with consideration to the NSW INP. This policy provides guidance on the assessment of operational noise impacts and gives consideration to intrusive and amenity criteria designed to protect receptors from individual and cumulative noise sources significantly louder than background levels near a sensitive receptor.

Intrusive noise limits control the relative audibility of operational noise compared to the background level; whereas amenity criteria limit the total level of extraneous noise. The amenity criteria are determined based on the overall acoustic characteristics of the receptor area and the existing level of noise excluding other noises that are uncharacteristic of the usual noise environment. Residential receptor areas are characterised into 'urban', 'suburban', 'rural' or other categories based on land uses, the existing level of noise from industry, commerce and road traffic. The nearest residential receptors to this development were classified as rural.

Both intrusive and amenity criteria were calculated for each time period (day, evening and night) and the more stringent of the two applied for this assessment. Similar to the construction noise criteria, given the limited noise sources present in the region a background level of 30 dBA was set, consistent with the INP. The project specific noise levels for the proposed mine at identified sensitive receptors are provided in Table 10-3. These criteria apply at the boundary of the most affected residences or within 30 m from the residence where the property boundary is more than 30 m from the residence.

Table 10-3 Project specific noise criteria

Criterion	Nearest residential receptor		
	Day 7.00 am to 6.00 pm	Evening 6.00 pm to 10.00 pm	Night 10.00 pm to 7.00 am
A: Rating background level[1]	Not applicable since there is no existing industrial noise		
B: Intrusiveness criteria - (A + 5 dB)	35 LAeq (15-min)	35 LAeq (15-min)	35 LAeq (15-min)
C: Rural amenity criteria	50 LAeq (day)	45 LAeq (evening)	40 LAeq (night)
D: Amenity criteria	Not applicable since there is no existing industrial noise		
Project specific noise level	35 LAeq (15-min)	35 LAeq (15-min)	35 LAeq (15-min)

[1] The NSW INP states where the rating background level is found to be less than 30 dBA, then it is set to 30 dBA

Consideration was given to potential low frequency noise emissions from the Project, namely the power station. Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. Where required, the INP sets out the corrections to be applied for tonal, impulsive and intermittent and low frequency noise. However, this Project was not found to trigger this adjustment based on the sources present and model results.

10.2.3 Vibration

Vibration criteria have been adopted with consideration to the BS 6472-1:2008 (*Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting*), which provides suitable values for assessing human comfort criteria for residential building types. Typically, mine activities generate ground vibration of an intermittent nature. Under BS 6472-1:2008, intermittent vibration is assessed using the vibration dose value (VDV). Whilst the assessment of response to vibration in BS 6472-1:2008 is based on VDV and weighted acceleration, for construction related vibration, it is considered more appropriate to provide guidance in terms of peak particle velocity (PPV), since this parameter is likely to be more routinely measured based on the more usual concern over potential building damage.

Humans are capable of detecting vibration at levels well below those causing risk of damage to a building. The degrees of perception for humans are suggested by the vibration level categories given in BS 5228-2:2009 (*Code of practice for noise and vibration on construction and open sites – Part 2: Vibration*) as shown in Table 10-4.

Table 10-4 Guidance on the effects of vibration levels

Approximate vibration level	Degree of perception
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30 mm/s	Vibration might be just perceptible in residential environments.
1.00 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10.00 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

As there are no Australian Standards for the assessment of building damage caused by vibration, reference to German Standard DIN 4150-3 (*1999 Structural Vibration – Part 3: Effects of vibration on structures*) occurred. The vibration criteria presented in this standard exceed the human comfort criteria presented above. Therefore, the human comfort criteria were used to provide a conservative assessment of vibration.

The Australian and New Zealand Environment and Conservation Council (ANZECC) *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (1990)* are typically referred to when dealing with potential blasting noise and vibration. This guideline recommends the noise and vibration limits shown in Table 10-5.

Table 10-5 Recommended ANZECC 1990 blasting limits

Air blast overpressure	Ground vibration
115 dB(lin) peak	5 mm/s PPV.
The level of 115 dB may be exceeded on up to 5% of the total number of blasts over a period of 12 months, but never over 120 dB(lin) peak	The level of 5 mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months, but never over 10 mm/s.

ANZECC guideline recommends that blasting should only be permitted during the following hours:

- Monday to Saturday, 9.00 am to 5.00 pm; and
- no blasting on Sundays or public holidays.

The frequency of blasting should not take place more than once per day. This requirement does not apply to minor blasts such as clearing crushers, feed chutes, etc. When considering a time to initiate the blast, weather conditions must be assessed. Generally the atmosphere is most stable early morning and late afternoon due to the absence of direct ground heating from the sun.

Stuart Highway is the only public road potentially affected by the Project. It is not planned for redevelopment or upgrade. In the absence of NT road traffic noise criteria, construction works and operation road traffic noise targets for this road have been sourced from the NSW RNP. Recommended noise levels associated with land use developments are shown in Table 10-6. Where noise criteria levels are already exceeded, construction and operational traffic arising from the proposal should not lead to an increase of more than 2 dBA in existing noise levels.

Table 10-6 Road traffic noise criteria

Road category	Type of project / land use	Assessment criteria dBA	
		Day 7.00 am to 10.00 pm	Night 10.00 pm to 7.00 am
Local road	Existing residences affected by noise from new local road corridors. Existing residences affected by noise from redevelopment of existing local roads. Existing residences affected by additional traffic on existing local roads generated by land used developments.	$L_{Aeq\ (1\ hour)}$ 55 dB (external)	$L_{Aeq\ (1\ hour)}$ 50 dB (external)

10.3 Methodology

A summary of the method used to predict noise and vibration emissions and potential impacts is provided in the following sections. A more detailed description is provided in Appendix J.

10.3.1 Noise emissions

Construction will occur over a 24 month period and include civil excavation and earthworks, building construction, equipment fabrication and installation, waste removal and materials transfer. Typical noise levels produced by construction plant to be used on-site were sourced from AS 2436 – 2010 (*Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*) and GHD's database.

Construction noise impacts were estimated using a distance attenuation relationship formula which takes into account sound intensity losses due to spherical spreading, but ignores minor losses such as atmospheric absorption, directivity and ground absorption. As a result, predicted received noise levels are expected to slightly overstate actual received levels and thus provide a measure of conservatism.

Predicted maximum received noise levels during construction are shown in Table 10-7 for a variety of distances, with no noise barriers or acoustic shielding in place and with each plant item operating at full power. It is important to keep in mind the actual magnitude of off-site noise impact associated with construction will be dependent upon a number of factors. For example, the type of equipment used, intervening terrain and prevailing weather conditions will affect the noise levels present at sensitive receptor locations. Construction machinery will also move about the Project site, altering the directivity of the noise source with respect to individual receptors. It is also appropriate to assume machinery will not operate at maximum sound power levels constantly, and it is unlikely that all construction equipment would be operating at their maximum sound power levels at any one time.

Table 10-7 Predicted plant activity noise levels

Plant	Estimated Sound Power Level (dBA)	Estimated Sound Pressure Level, dBA at distance (m)						
		50	250	500	750	1000	3000	5000
Backhoe	104	62	48	42	39	36	26	22
Backhoe (with auger)	106	64	50	44	41	38	28	24
Bulldozer	108	66	52	46	43	40	30	26
Compactor	113	71	57	51	48	45	35	31
Compressor (silenced)	101	59	45	39	36	33	23	19
Concrete agitator truck	109	67	53	47	44	41	31	27
Concrete pump truck	108	66	52	46	43	40	30	26
Concrete saw	117	75	61	55	52	49	39	35
Concrete vibratory screed	115	73	59	53	50	47	37	33
Crane (mobile)	104	62	48	42	39	36	26	22
Excavator	107	65	51	45	42	39	29	25
Front end loader	113	71	57	51	48	45	35	31
Generator (diesel)	104	62	48	42	39	36	26	22
Grader	110	68	54	48	45	42	32	28
Hand tools (electric)	102	60	46	40	37	34	24	20
Hand tools (pneumatic)	116	74	60	54	51	48	38	34
Jack hammers	121	79	65	59	56	53	43	39
Piling (bored)	111	69	55	49	46	43	33	29
Rock breaker	118	76	62	56	53	50	40	36
Roller (vibratory)	108	66	52	46	43	40	30	26
Scraper	116	74	60	54	51	48	38	34
Truck (>20 tonnes)	107	65	51	45	42	39	29	25
Truck (dump)	117	75	61	55	52	49	39	35
Truck (water cart)	107	65	51	45	42	39	29	25
Vehicle (light comm/4WD)	106	64	50	44	41	38	28	24
Welder	105	63	49	43	40	37	27	23

During mine operation, the Project will have a number of noise sources, which will change over the life of the mine. Noise impacts will be most significant during early mine life as the depth of the pit will be minimal. As mine development progresses, the depth of the pit will increase, reducing the impact of noise emissions to sensitive receptors from equipment operating in the pit. For a conservative assessment, noise modelling against assigned night time $L_{A\ 10}$ noise levels has been completed for early mine life (end of year four) to predicted worst case noise levels. This year will also see the movement of around 11.6 Mt or ore and waste, a typical maximum annual production.

During early mine life, haul trucks will haul waste rock to the waste rock dump. As such, noise modelling has assumed haul road traffic at the required volumes to transport the estimated daily throughput from the pit. Blast hole drilling operations have been assumed to occur during day only.

All other Project sources (including the crushing and processing plants, tailings storage facility and gas fired power station) are assumed to be operating continuously. As such, these sources have been modelled as continuous sources at maximum sound power levels which is conservative.

Typical mining equipment noise levels have been obtained from noise assessments conducted on similar projects and GHD's noise source database. The noise model includes the operational mobile and fixed noise sources as presented in Table 10-8 and Table 10-9. These sound power levels are maximum predicted levels produced when machinery is operating under full load

Table 10-8 Modelled noise sources – mobile sources

Noise source	Number of items modelled	Sound power level (dBA)
Dump truck (Cat 777F)	7	115
Drill rig (Cat MD5125)	2	120
Track dozer (Cat D9T)	2	110
Wheel dozer (Cat 834)	1	115
Shovel (Cat 6018)	2	113
Shovel (Cat 6015)	1	107
Grader (Cat 16M)	1	111
Water truck (Cat 777D WT)	2	115
Wheel loader (Cat 980H)	7 (mine pit x 2, siding x 4)	113
Wheel loader (Cat 966H)	1 (bene plant)	105
Roller (Cat CS74)	1	108
Fuel truck (Cat 777G FT)	1	115
Road train	5	104
Light vehicles (utes and 4WDs)	10	100

Table 10-9 Modelled noise sources – fixed sources

Noise source	Number of items modelled	Sound power level (dBA)
Primary crusher (Grizzly)	1	116
Secondary crusher (jaw)	2	112
Dust collection (dry, silenced)	3	98
Screening plant	2	111
Apron feeders	1	99
Conveyor	11	94 per linear metre
Conveyor drive (unenclosed)	11	112
HPGR mills	2	117
Ball mill	2	117
Pumps (feed, sump or tails)	6	101
Pumps (slurry)	4	108
Agitated tank drive	2	110
Thickener drive	2	107
Filtration plant	2	120
Gas genset engine casing (1.4 MW)	28	106
Gas genset exhaust (1.4 MW, silenced)	28	115
Transformer (16 MVA)	4	64
Transformer (4 MVA)	4	53
Diesel genset engine casing (1.2 MW)	3 (emergency) + 12 (borefield)	108
Diesel genset exhaust (1.2 MW, silenced)	3 emergency) + 12 (borefield)	117

Noise impacts during operation were predicted using the acoustic computer model, CadnaA v4.4. CadnaA calculates environmental noise propagation according to the Conservation of Clean Air and Water in Europe (CONCAWE) noise prediction method (CONCAWE 1981). The CONCAWE prediction method is widely used in Australia for predicting noise impacts of mines, power stations and other industry. Terrain topography, ground absorption and atmospheric absorption were taken into account in the calculations. The model also considered buildings that have potential to affect noise propagation by means of screening or reflection, such as those that house the generators.

The noise model for end of year four operations gave consideration to four likely weather scenarios:

- neutral conditions – no wind;
- temperature inversion – worst case winds towards closest receptor;
- dry Season – 3 m/s wind from the south-east; and
- wet Season – 3 m/s wind from the north-west.

The assessment has been modelled based on available data, including proposed layouts for the mine and noise generating equipment and environmental factors. As such, although the modelling results are considered relatively conservative, they should be used as a guide for comparative purposes against the relevant noise criteria.

Road access for the traffic including construction, service, delivery and workforce vehicles will be exclusively from the existing Stuart Highway. As such, the estimated increase in traffic noise due to the Project is not expected to be noticeable to sensitive receptors and was not modelled.

10.3.2 Vibration emissions

The nature and levels of vibration emitted by the Project will vary with the activities being carried out on site. Energy from construction equipment is transmitted into the ground and transformed into vibrations, which attenuate with distance. Table 10-10 outlines typical vibration levels for different plant activities that may be generated on the Project site, sourced from the NSW Roads and Traffic Authority (RTA) *Environmental Noise Management Manual* (RTA 2001).

Table 10-10 Typical vibration levels for construction equipment

Plant item	Peak particle velocity at 10 m (mm/s)
Pile driving (impulsive)	12 - 30
Roller (15 tonne)	7.0 - 8.0
Dozer	2.5 - 4.0
Compactor (7 tonne)	5.0 - 7.0
Rock breaking	7.0
Backhoe	1.0

The magnitude and attenuation of ground vibration is dependent on the:

- efficiency of the energy transfer mechanism of the equipment (i.e. impulsive, reciprocating, rolling or rotating equipment);
- frequency content;
- impact medium stiffness;
- type of wave (surface or body); and
- ground type and topography.

The above factors cause inherent variability in ground vibration predictions in the absence of site specific measurement data. However the rate of vibration attenuation can be calculated using a regression analysis formula. Applying this formula, predicted ground vibrations at various distances are shown in Table 10-11 for typical construction equipment.

Table 10-11 Predicted construction equipment vibration levels (mm/s PPV)

Plant item	Human perception preferred criteria (maximum criteria)		Predicted ground vibration				
	Day	Night	10 m	30 m	50 m	100 m	300 m
Pile driving (Impulsive)	8.6 (17.0)	2.8 (5.6)	21.0	4.0	1.9	0.7	0.1
Roller (15 tonne)	0.28 (0.56)	0.2 (0.4)	7.5	1.4	0.7	0.2	<0.1
Dozer	0.28 (0.56)	0.2 (0.4)	3.3	0.6	0.3	0.1	<0.1
Compactor (7 tonne)	0.28 (0.56)	0.2 (0.4)	6.0	1.2	0.5	0.2	<0.1
Rock breaking	0.28 (0.56)	0.2 (0.4)	7	1.3	0.6	0.2	<0.1
Backhoe	0.28 (0.56)	0.2 (0.4)	1	0.2	0.1	<0.1	<0.1

10.4 Potential Impacts

10.4.1 Noise emissions

Given the intermittent and mobile nature of construction noise, the predicted impacts are considered conservative as they represent the maximum possible distances over which an acoustic impact may be audible during quiet ambient conditions. If such impacts were to occur, they would likely be intermittent and infrequent. Even with this conservative approach, the technical assessment concluded the construction activities were unlikely to cause audible noise or nuisance to any sensitive receptors, due to the distance between the construction works and receptors. Similarly the night-time sleep disturbance criterion for the Project was predicted to be met at all sensitive receptors during the construction period.

Predicted night $L_{Aeq\ (15\text{-}min)}$ noise levels generated at the end of year four of operation by the Project at the noise sensitive receptor locations are summarised in Table 10-12. For each of the four weather scenarios modelled it was assumed the mining, waste rock dumping, crushing plant and concentrator operations were at full production rates. No predicted night time $L_{Aeq\ (15\text{-}min)}$ noise levels are over the appropriate project specific noise level of 35 dBA.

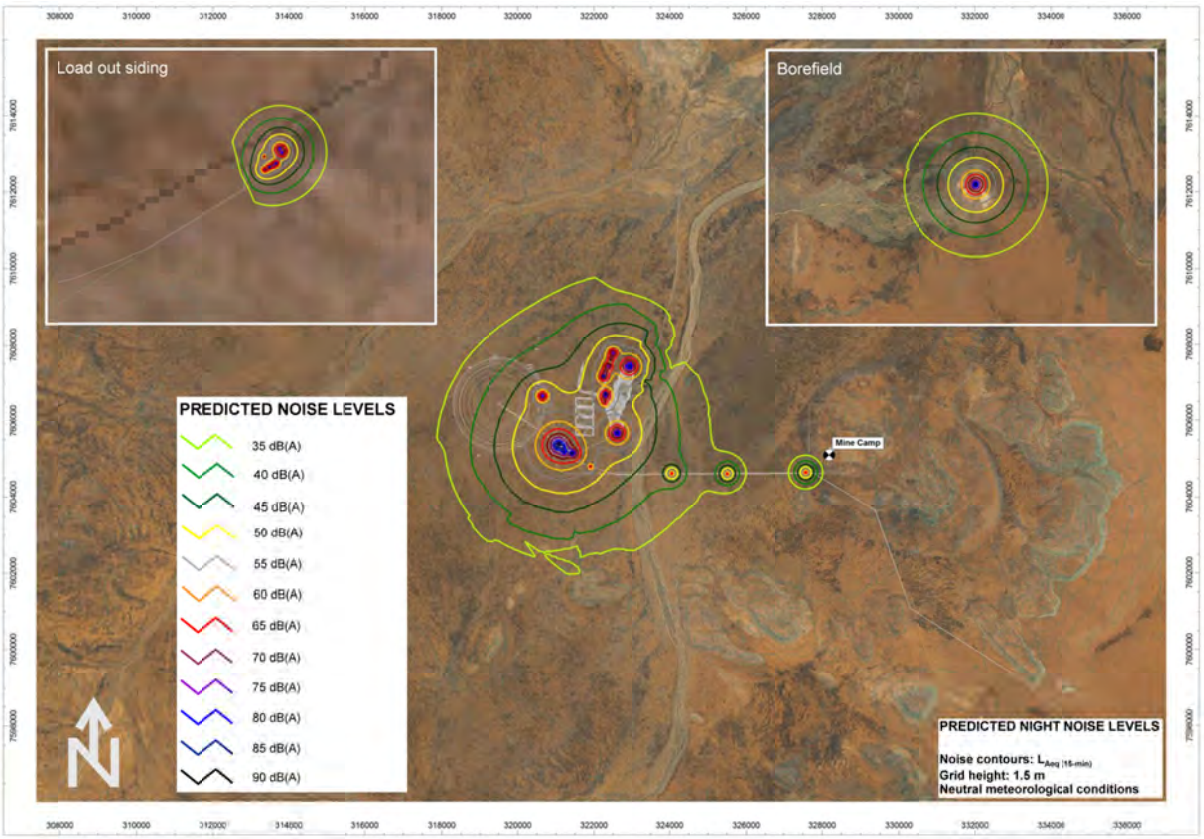
Night $L_{Aeq\ (15\text{-}min)}$ noise level contour plots for the Project during operation under each of the four weather scenarios modelled is shown in Figure 10-1. These plots provide the same information as presented in Table 10-12, only graphically. As with the tabulated information, the plots show there are no exceedances of the night level of 35 dBA predicted at any sensitive receptors.

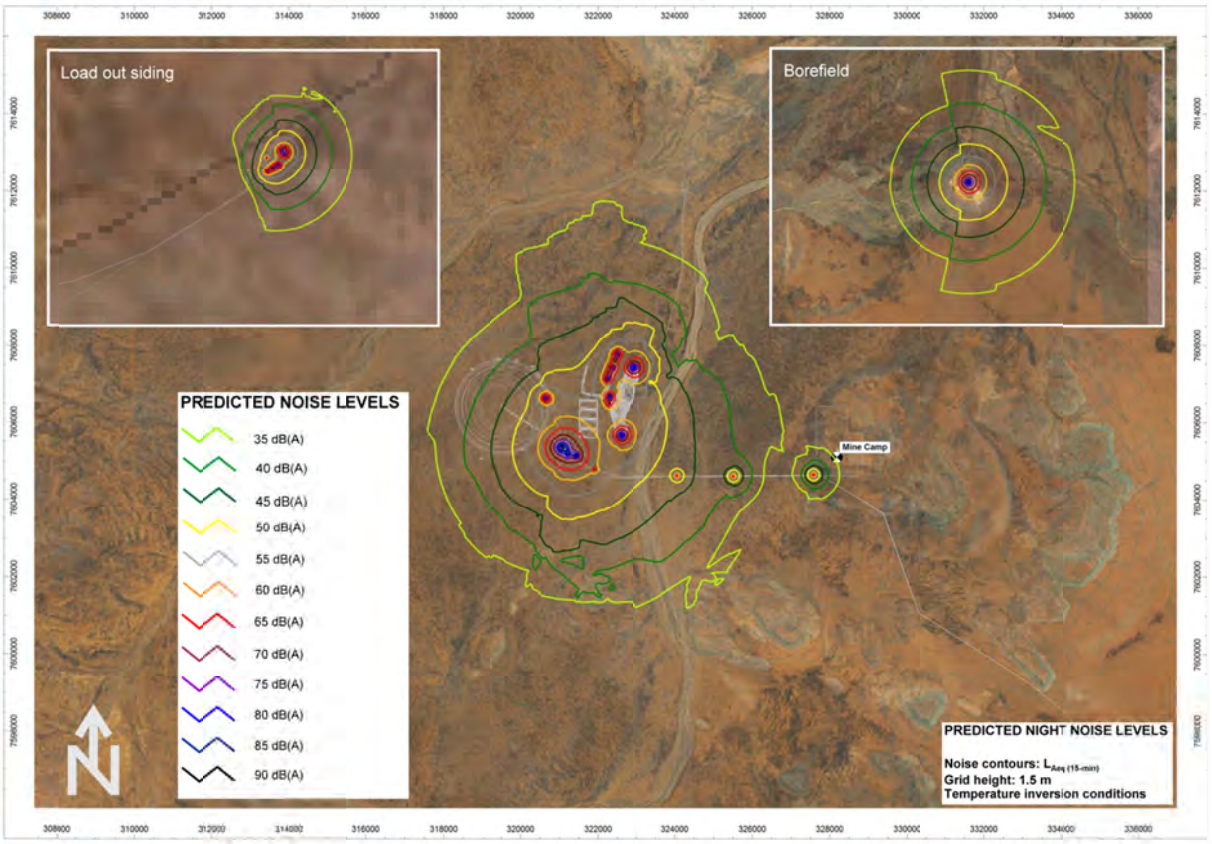
Table 10-12 Predicted night $L_{Aeq\ (15\text{-}min)}$ noise levels, dBA

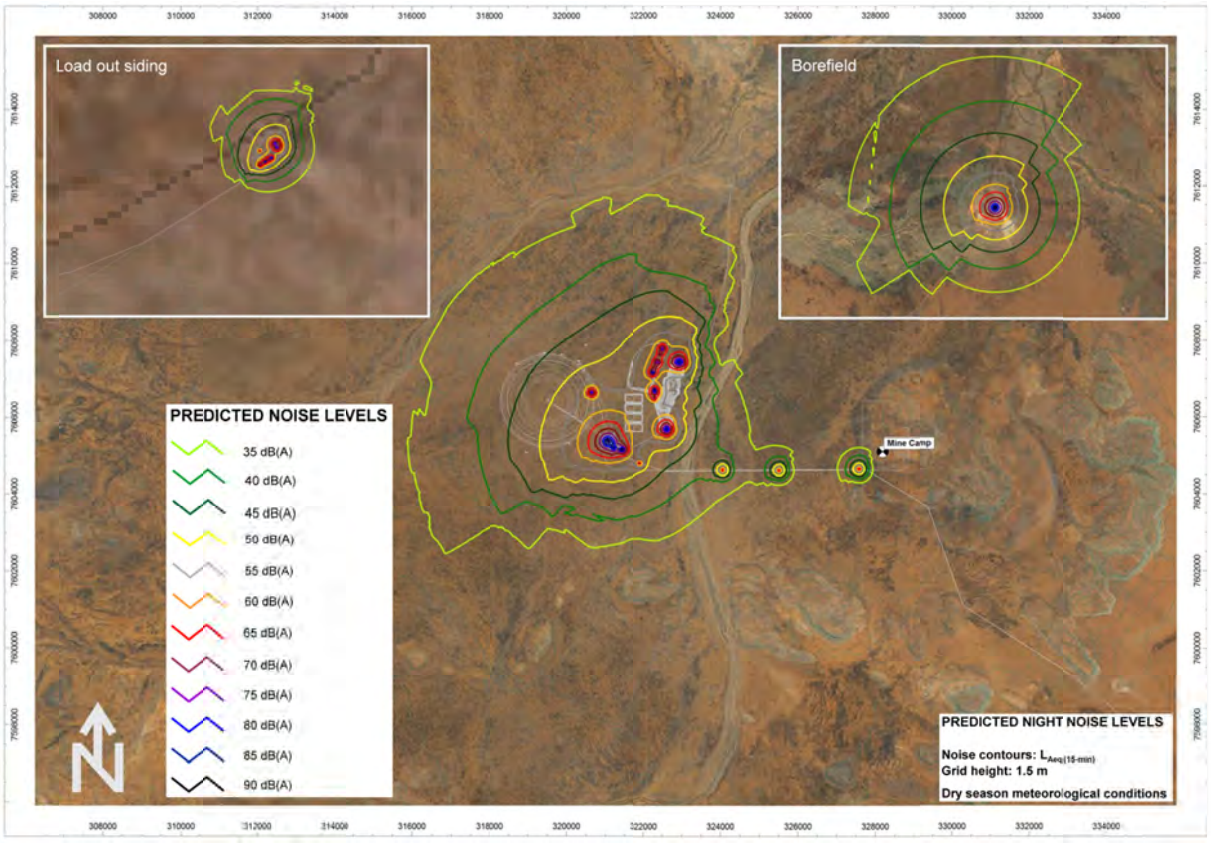
Receptor	Neutral	Temperature inversion	Dry season	Wet season
Mine camp site	29.3	34.3	28.6	33.0
Anningie Station	10.5	7.2	4.9	17.2
Wilora	13.1	12.5	6.3	21.8
Stirling Station	13.1	12.3	6.4	21.9
Ti Tree	7.3	7.0	0.8	16.3
Barrow Creek	9.6	7.3	2.2	18.7
Willowra	4.7	No impact predicted	6.2	0.3

10.4.2 Vibration emissions

Table 10-11 indicates that human perception guidelines for predicted ground vibration are likely to be met at a distance greater than 50 m, but less than 300 m from the construction activities. Given the distance to the nearest receptor from the mine site is 30 km, construction vibration is highly unlikely to exceed the human perception criteria and is not discussed further in this assessment.




Load out siding
Borefield
PREDICTED NOISE LEVELS
35 dB(A)
40 dB(A)
45 dB(A)
50 dB(A)
55 dB(A)
60 dB(A)
65 dB(A)
70 dB(A)
75 dB(A)
80 dB(A)
85 dB(A)
90 dB(A)
Mine Camp
PREDICTED NIGHT NOISE LEVELS
Noise contours: $L_{Aeq\ (15\text{-}min)}$
Grid height: 1.5 m
Temperature inversion conditions


Load out siding
Borefield
PREDICTED NOISE LEVELS
35 dB(A)
40 dB(A)
45 dB(A)
50 dB(A)
55 dB(A)
60 dB(A)
65 dB(A)
70 dB(A)
75 dB(A)
80 dB(A)
85 dB(A)
90 dB(A)
Mine Camp
PREDICTED NIGHT NOISE LEVELS
Noise contours: $L_{Aeq(15\text{-}min)}$
Grid height: 1.5 m
Dry season meteorological conditions

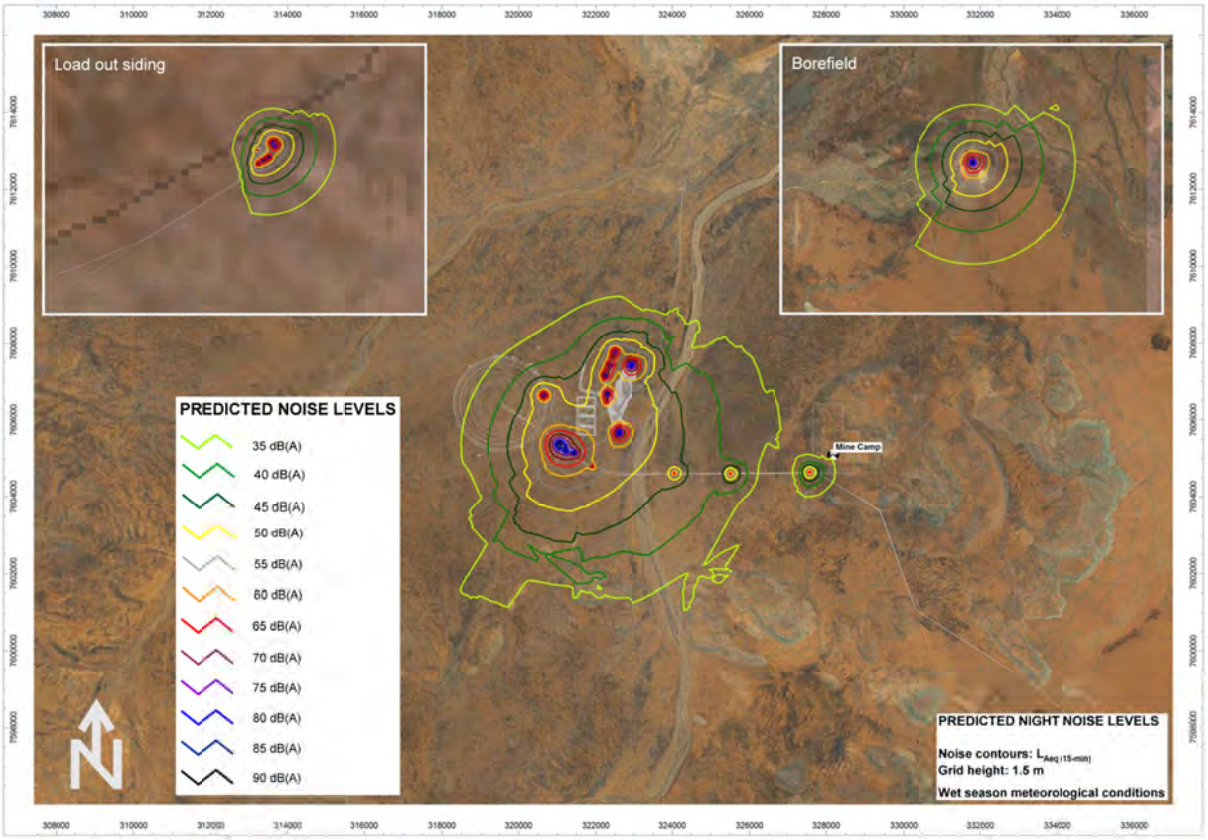


Figure 10-1 Predicted night $L_{AEq\,(15\text{-}min)}$ noise levels during operation

10.5 Noise Management Measures

Although the Project is not expected to cause adverse noise impacts, TNG will adopt the following measures during construction and operation to reduce emissions:

- where practical, construction work will be kept within the working hours prescribed by the ICNG (DECC 2009);
- equipment used on site will be in good condition, working order and fit for purpose, with preference given to silenced equipment whenever possible;
- equipment will be operated as intended by the manufacturer;
- as far as possible, material drop heights into or out of trucks will be minimised;
- preference will be given to broadband reversing alarms (audible movement alarms);
- fixed and mobile plant will be kept properly serviced and fitted with appropriate mufflers;
- where practical, machinery will be operated at low speed or power and will be switched off when not being used rather than left idling for prolonged periods;
- machines found to produce excessive noise compared to industry normal standards will be investigated and if required rectified or replaced;
- site workers will be made aware of the potential for noise impacts and encouraged to take practical and reasonable measures to minimise the impact during the course of their activities; and
- blasting will occur between 9:00 am and 5:00 pm.

Available literature suggests that the impact of noise from the Project is unlikely to result in negative impacts to either livestock or native fauna. As such, no specific management measures, other than those proposed in regard to management of impacts to human receptors, are required.

10.6 Summary of Impacts and Conclusions

This Project in unlikely to cause adverse noise or vibration impacts during construction or operation. The technical assessment completed predicts noise and vibration levels at sensitive receptors will comply with the noise criteria at all times. Even under worst case weather conditions and with plant operating continuously at maximum capacity, the Project was still showing compliance.

Predicted noise levels under the worst case conditions (wind assisted conditions during temperature inversion) at the nearest noise sensitive receptor (the Project's own mine camp) is 34 dBA, which is below the noise criteria of 35 dBA.

Although the Project is not expected to cause adverse noise impacts, the mitigation measures detailed in Section 10.5 will be applied to further reduce the risk of noise impacts.

The estimated increase in traffic noise levels due to the Project is not expected to be noticeable.

The nature and levels of vibration emitted by the Project will vary with the activities being undertaken. However, due to the distances between the sources and receptors, vibration is unlikely to have a significant impact.