

Jemena Northern Gas Pipeline Pty Ltd

Northern Gas Pipeline

Draft Environmental Impact Statement

APPENDIX U – NOISE MANAGEMENT PLAN

Public

August 2016



Jemena Northern Gas Pipeline Pty Ltd

ABN 12 607 728 790

Level 16, 567 Collins Street

Melbourne VIC 3000

Postal Address

PO Box 16182

Melbourne VIC 3000

Ph: (03) 9713 7000

Fax: (03) 9173 7516



Air Noise Environment
Environmental Monitoring and Assessment

Noise and Vibration Management Plan - Northern Gas Pipeline - FINAL

Jemena Limited

399-PA-EV-011 - Noise Management Plan

August 2016

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Prepared by:
Air Noise Environment

ABN: 13 081 834 513





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Brisbane Office

A: Unit 3, 4 Tombo Street,
Capalaba, QLD 4157
T: +61 7 3245 7808
E: qld@ane.com.au

Sydney Office

A: Level 6, 69 Reservoir Street
Surry Hills, NSW 2010
T: +61 1300 851 761
E: nsw@ane.com.au

Townsville Office

A: Level 1, 25 Sturt Street
Townsville, QLD 4810
T: +61 07 4722 2724
E: qld@ane.com.au





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The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Air Noise Environment Pty Ltd for the purposes of this project is both complete and accurate.





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1 Introduction

1.1 Purpose of the Management Plan

This Noise and Vibration Management Plan (NVMP) has been prepared by Air Noise Environment Pty Ltd on behalf of Jemena Ltd for construction and operation of the Northern Gas Pipeline (NGP).

This NVMP contains details of the potential noise and vibration impacts associated with the proposed pipeline construction and operational activity, legislative requirements and management tools to investigate and act on non-compliances.

1.2 Responsibility for the Management Plan

The Site Manager has day to day responsibility for implementation and compliance with this NVMP. The Site Manager is also responsible for disseminating information about the NVMP to all staff, contractors and visitors to the site.

It is essential that all personnel at the site are aware of the NVMP. Under the Queensland Environmental Protection Act 1994 and Northern Territory Waste Management and Pollution Control Act 2015, all persons and businesses have a duty to protect the environment and/or to report occurrences of environmental harm. This responsibility is implicit in the General Environmental Duty of the QLD and NT Act:

QLD General Environmental Duty

'A person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm.'

NT General Environmental Duty

'A person who:

- *conducts an activity that causes or is likely to cause pollution resulting in environmental harm or that generates or is likely to generate waste; or*
- *performs an action that causes or is likely to cause pollution resulting in environmental harm or that generates or is likely to generate waste,*
- *must take all measures that are reasonable and practicable to:*
 - *prevent or minimise the pollution or environmental harm; and*
 - *reduce the amount of the waste.'*

All employees, sub-contractors and visitors to the site must comply with the General Environmental Duty.



1.3 Structure of the Document

The NVMP is structured as follows:

- Sections 2 to 7 outlines the relevant legislation and standards, construction/operational activities, potential impacts and implementation procedures for the NVMP and management procedures in the event of a complaint.
- Appendix A - defines the plans and procedures for addressing and managing these risks.
- Appendix B - presents the forms that are to be used to document and assess compliance with the NVMP.





2 Proposed Pipeline

2.1 Pipeline Route

The Northern Gas Pipeline (NGP) is proposed pipeline 622 km in length, beginning at Warrego (Northern Territory) and extending east towards Mt Isa (Queensland). The majority of the pipeline is located in the Northern Territory and the final 165 km will be located in Queensland. The proposed pipeline will connect gas supplies from offshore and land-based sources in the Northern Territory to the eastern gas markets.

Several pipeline facilities are proposed at specific points along the pipeline route. These facilities include the following:

- Start of Line (SOL) facility at Warrego;
- End of Line (EOL) facility at Mt Isa; and
- Main Line Valve (MLV) sites for maintenance and operational requirements (total of 3).

Figure 2.1 presents the pipeline route and key features of the pipeline. Figure 2.2 presents a close-up of the pipeline route and EOL facility in Mt Isa.





Figure 2.1 - NGP Route and Facilities

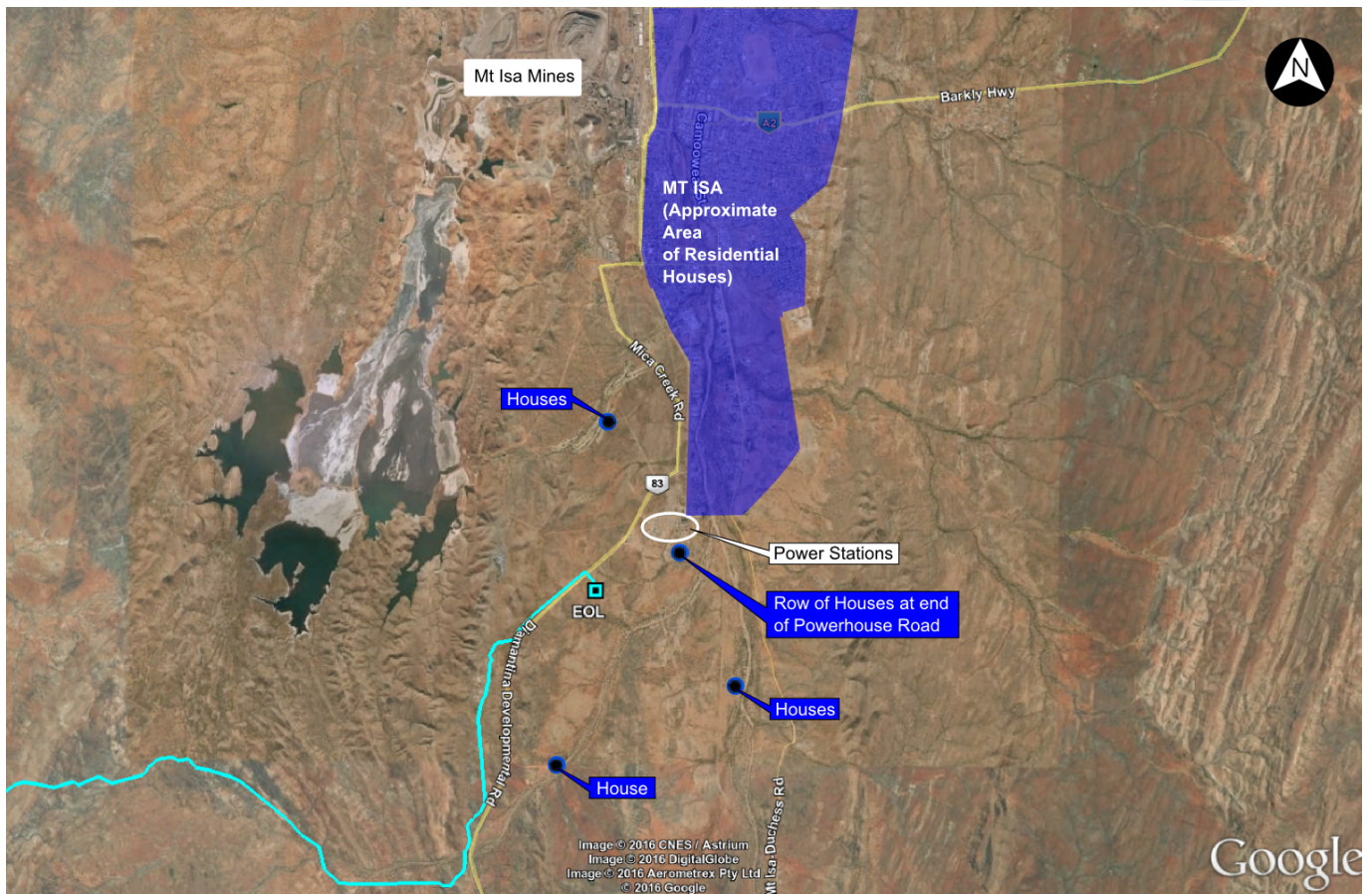
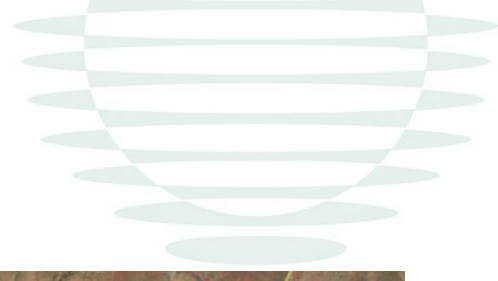


Figure 2.2 - Mt Isa Pipeline Route and EOL Facility

2.2 Nearest Sensitive Receptors

The pipeline route traverses primarily through isolated rural areas, thus limiting the number of potentially affected sensitive receptors. For pipeline activities, a typical (and conservative) radius of influence in a rural area with very low background levels may be considered to be 10 km. Potential noise impacts are typically limited outside this radius.

The nearest sensitive residential receptors to construction and operations are located at the end of the proposed pipeline in the Mt Isa area. These sensitive receptors include homesteads on large rural lots immediately outside Mt Isa and residential areas within Mt Isa. The nearest homestead is approximately 2 km from the EOL facility and 1 km from the pipeline route. The nearest houses in the Mt Isa city area are approximately 1.2 km north-east of the EOL facility.

Along the rest of the pipeline route, the number of potentially affected sensitive receptors are limited and include a small number of family outstations and a pastoral homestead (18 km east of MLV3). The nearest family outstation (No. 975) is 3.4 km south of the pipeline route. The pastoral homestead is 3.5 km north of the route. It is noted that the SOL facility is at a significant distance from sensitive receptors (at least 28 km) hence, no noise impacts on residential uses are expected from operation of SOL facility equipment.





Figures 2.1 and 2.3, and Table 2.1 identify sensitive receptors within 20 km of the pipeline route. Figure 2.1 also identifies the nearest sensitive receptors (family outstations 239, 248, 255 and 974) to the SOL facility. These receptors are noted to be between 28 to 46 km from this facility.

Table 2.1 - Summary of Sensitive Residential Receptors within 20 km of Pipeline Route

Receptor	Distance from Pipeline Route	Distance from Nearest Pipeline Facility	Population / No. of Dwellings
Tennant Creek	16.5 km South	41.5 km south-east of SOL Facility 121 km west of MLV1	3,061
Family Outstation 952	6.8 km South	41.8 km south-east of SOL Facility 121 km west of MLV1	3 houses
Family Outstation 975	3.4 km South	60 km east of SOL facility 101 km north-west of MLV1	2 houses
Family Outstation 721	14.8 km north	73 km east of SOL facility 95 km north-west of MLV1	8 houses
Family Outstation 732	12.4 km south	44 km south-east of MLV1	4 houses
Pastoral Homestead	3.5 km north	18 km east of MLV3	3 houses and a school
Homestead South of Mt Isa	1 km east	2.5 km south of EOL facility	Single house
Diamantina and Leichardt Power Stations Residences (Powerhouse Road)	1.2 km north-east	1.2 km north-east of EOL facility and pipeline	9 houses
Mt Isa	1.8 km north-east	1.8 km north-east of EOL facility	Township

Table 2.2 presents a summary of minimum separation distances to sensitive receptors for the SOL and EOL facilities, and MLV sites.

Table 2.2 - Separation Distances of Pipeline Facilities

Pipeline Facility	Distance to Nearest Residential Receptor
Start of Line Facility	28 km east of Family Outstation 248
End of Line Facility	1.8 km south-west of nearest house in Mt Isa





Pipeline Facility	Distance to Nearest Residential Receptor
	1.2 km south-east of houses along Powerhouse Road
MLV1	33 km south of Family Outstation 907
MLV2	88 km east of Family Outstation 732
MLV3	18 km west of the pastoral homestead

It is noted that along the proposed construction route a number of sensitive ecological noise receptors could exist (based on desktop ecological surveys) as follows:

- KP590 to KP623:
 - Roost sites for the Northern Leaf-nosed bat (*Hipposideros stenotis*) (threatened species)
 - Carpentarian Antechinus (*Pseudantechinus mimulus*)
 - Purple-necked Rock-wallaby (*Petrogale purpureicollis*). Both are threatened species.
- KP0 to K250 - Greater Bilby (*Macrotis lagotis*) (threatened species)
- Minor receptors include river and creek crossings, as they often provide important refuge habitat for a range of native fauna.
- Minor receptors includes seasonal swamps that may occur in the lateritic sand plains and rises (between KP223 to KP350), as they often provide important refuge habitat for a range of native fauna.

2.3 Pipeline Operational Facilities

2.3.1 SOL Facility

The Start of Line (SOL) facility consists of gas compression infrastructure to pressurise gas for transportation to the Mt Isa End of Line (EOL) facility. The facility will also comprise various filtration and separation equipment to remove liquids and impurities which may have formed in the gas pipeline through condensation. For emergency purposes, a flare and pipeline vent system is proposed to be constructed. Other supporting infrastructure includes an office, workshop, accommodation room and car park. Key equipment with a potential for noise emission impacts are summarised as follows:

- 2 x Export Compressor engines;
- 2 x Residue Compressor engines;
- 3 x Gas Engine Alternators (GEAs);
- High Pressure/Low Pressure (HP/LP) Flare; and
- Gas vent.



Use of the gas vent and flare will occur during commissioning, periodic testing, variations in incoming gas quality and in emergency situations. The flare system is expected to be up to 40 metres in height and is expected to operate approximately once every 6 months, typically for a 15 minute period during working hours. The SOL facility will operate continuously.

The noise emissions associated with the flare system are characterised by the gas jet noise and the combustion roar, which is associated with noise produced from energy release during the combustion process. The gas jet noise is dominated by high frequency components and is highly directional. Combustion roar on the other hand is dominated by low frequency components and is not considered highly directional.

As noted previously, the nearest sensitive receptors to the SOL facility are 28 km to the west. At such a large separation distance, these receptors are not expected to be affected by noise emissions from the SOL facility operations

Figure 2.3 presents the proposed layout of the SOL facility.

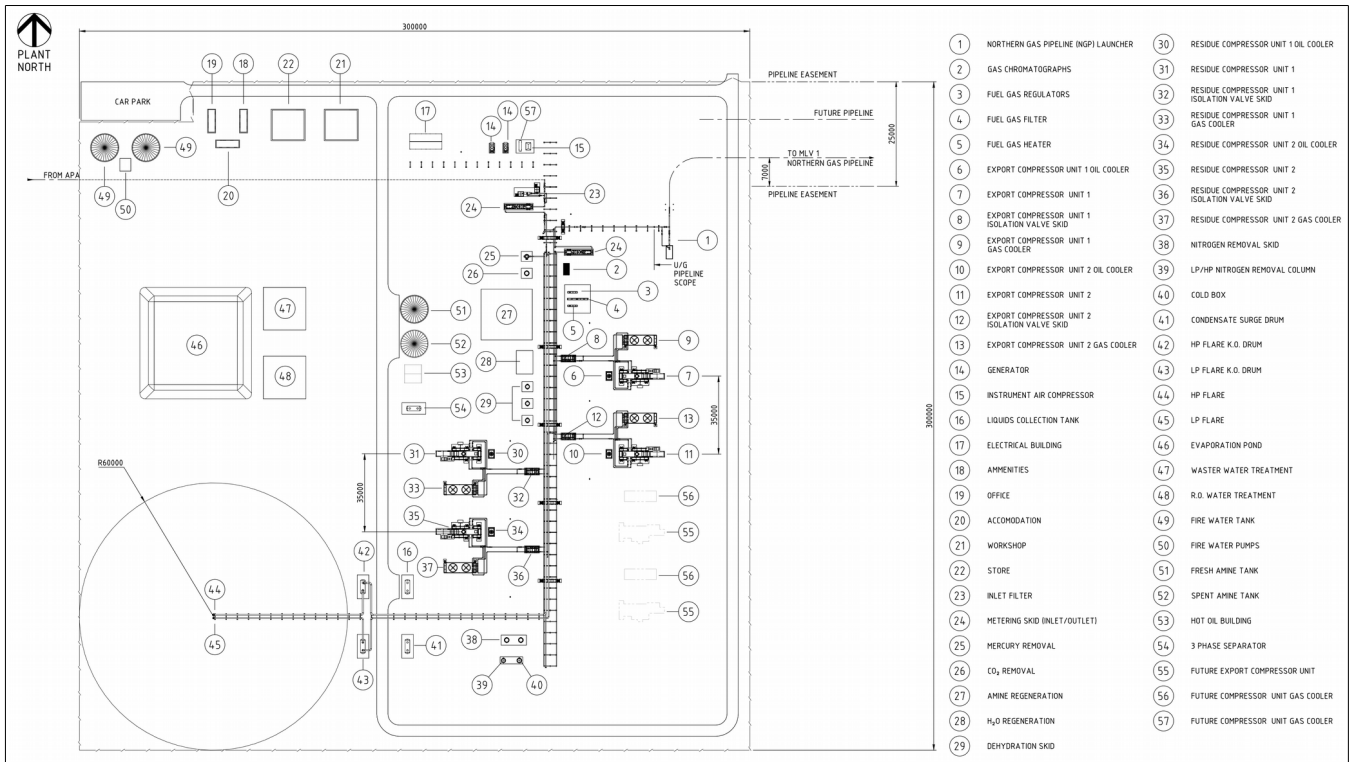


Figure 2.3 - Proposed SOL Facility Layout

2.3.2 EOL Facility

The End of Line (EOL) Facility provides additional gas compression infrastructure. Key equipment with a potential for noise emission impacts are summarised as follows:

- 2 x compressor engines;



- 1 x Gas Engine Alternators (GEAs);
- 1 x Boiler Heat Exchanger; and
- gas vent.

The EOL facility is expected to operate continuously. Use of the gas vent will occur during commissioning, periodic testing and in emergency situations. Figure 2.4 presents the proposed layout of the SOL facility.

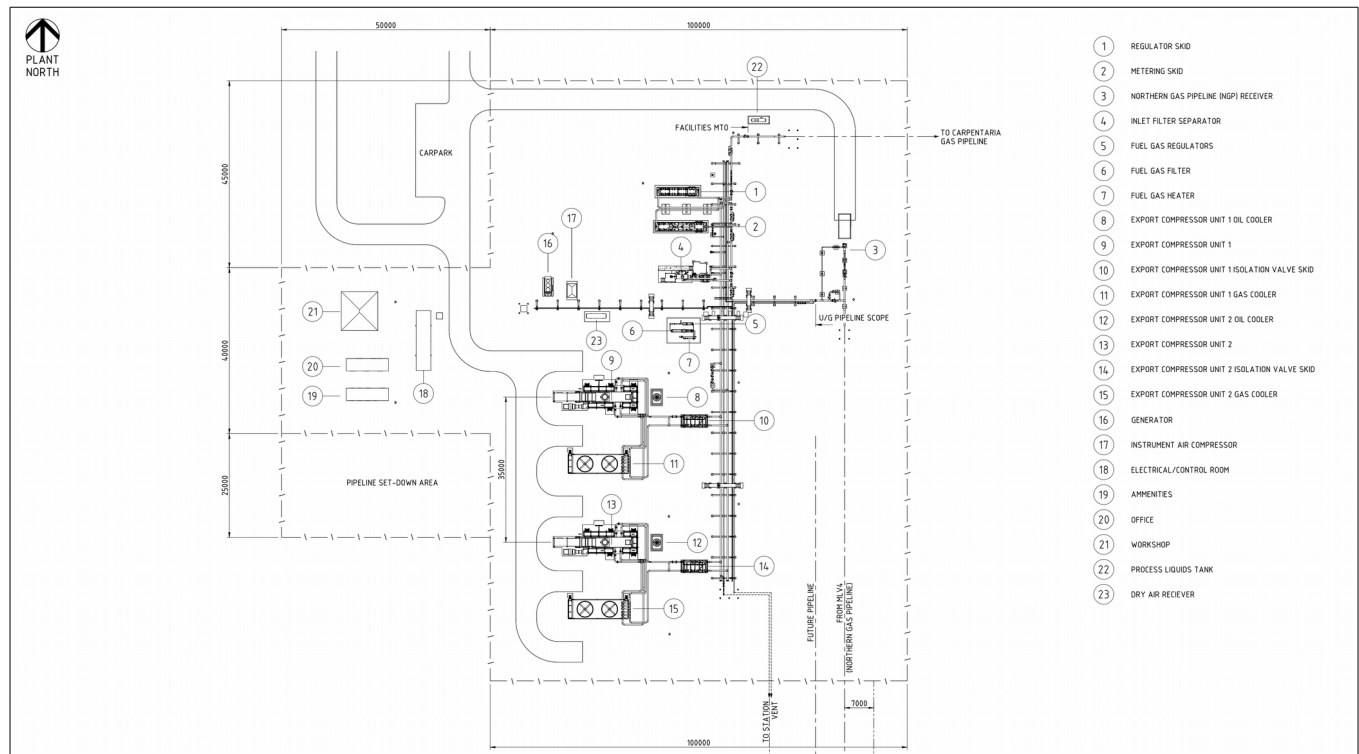


Figure 2.4 - Proposed EOL Facility Layout

2.3.3 Gas Venting

Gas venting will occur during emergency release of gas and maintenance periods at the SOL and EOL facilities. The venting duration is expected to be 15 minutes once every 6 months. For testing purposes, venting at the EOL and SOL facilities will also occur during commissioning.

There is a potential for noise impacts due to the high velocity of the gas release during emergency de-pressurisation. The high exit velocity often results in a tonal characteristic (in the higher frequencies) during the gas venting process. Venting would typically take 15 hours from when the valve is opened to when atmospheric pressure in the pipeline section is reached. As de-pressurisation occurs, the exit velocity gradually decreases, therefore, peak noise levels occur at the commencement of venting.

In addition to the gas vents at the SOL and EOL facilities, 3 main line valves (MLVs) are proposed along the pipeline route. The MLV sites provide a means of controlling gas flow along the pipeline



and, during an emergency, the valves are closed to isolate a section of the pipeline. Once isolated, the gas from the relevant section is vented prior to incident investigation and/or maintenance taking place.

2.4 Pipeline Constructions

Pipeline construction will be undertaken by individual crews (e.g. trenching, pipe laying) with each crew working sequentially along the pipeline route during construction. A 30 m wide Right of Way (ROW) will be utilised for the majority of the pipeline. In general terms, the pipeline construction process involves the following stages:

- clearing the Right of Way (ROW);
- preparing the pipeline (e.g. stringing, bending);
- excavating a trench for the pipeline;
- lowering the pipeline;
- backfilling and restoration.

Construction works specific to certain sections of the pipeline will also be required. This includes construction of the EOL and SOL facilities at each end of the pipeline, blasting only at hard rock locations and boring for trenchless crossings. Five main construction camps are proposed along the pipeline route. Potential noise impacts primarily relate to vehicular and mobile plant noise emissions from earthworks, construction and truck movements.

The construction hours for activities occurring near to sensitive receiver areas are proposed to be within the legislated construction hours as far as is practicable. The legislative construction hours for each state or territory are shown in Table 2.3. It is noted that no specific legislation for construction vehicles using state roads is provided. Where construction activities occur remote from sensitive receivers, and/or if no complaints are received as a result of construction noise, it is considered feasible they could occur 24 hours.





Table 2.3 - Legislative Construction Hours

Activity	Construction Hours Adjacent Sensitive Areas	Description and Justification
Pipeline Progression / Construction Sites / Blasting	<p>Daytime construction hours:</p> <p>Northern Territory</p> <ul style="list-style-type: none"> 7 am to 7 pm Monday - Saturday. <p>Queensland</p> <ul style="list-style-type: none"> 6:30 am to 6:30 pm Monday to Saturdays. 	<p>- The majority of construction equipment would be used during the day including impulsive or tonal sources such as rock breakers, concrete cutting, grinding.</p> <p>- Temporary possession of roads may need to be undertaken outside standard construction hours for safety and to reduce traffic delays for commuters.</p>
Construction Traffic	24 hours per day, up to seven days per week.	<p>- Construction traffic routes have been selected to minimise impacts on residential areas.</p> <p>- Construction traffic would be limited and managed during peak hours and special events.</p>





3 Legislation and Criteria

3.1 Legislation

Relevant Northern Territory and Queensland environmental legislation relating to noise impacts for the project are summarised in Table 3.1.

Table 3.1 - Relevant Legislation

Legislation	Description	Relevance
<i>Queensland</i>		
Environmental Protection Act 1994 (Revised 2008)	The Act imposes a general environmental duty on all persons to refrain from carrying out any activity that causes or has the potential to cause environmental harm. A duty to notify is established under the Act. Any person who becomes aware that serious environmental harm is caused or threatened has a duty under the Act to give notice in writing to the administering authority.	The general duty to protect the environment and to notify the authorities in the event of environmental harm applies to all staff and contractors. Section 440R also provides noise standards for various equipment such as regulated compressors, impacting tools and pumps.
Environmental Protection Regulation (2008)	The objective of the regulation is to provide basis for effective and efficient administration of the EP Act 1994.	Provides definitions and methodologies for the measurement of noise sources for compliance monitoring.
Environmental Protection (Noise) Policy 2008	The policy provides a framework for managing and minimising noise impacts on sensitive receptors. Acoustic quality objectives for various building types and a hierarchy for minimising noise impacts are presented.	The acoustic quality objectives do not specifically address the short-term nature of construction noise. However, where possible and as far as is practicable, the objectives should be achieved.
Land Access Code (2010) under the Petroleum and Gas (Production and Safety) Act 2004.	The Code identifies guidelines for communication between holders of authorities and occupiers of private land, and imposes conditions regarding the conduct of authorised activities on private land.	The Code applies to all resource permits for petroleum authorities under the Petroleum and Gas (Production and Safety) Act 2004. The Code identifies a need to minimise noise on a landholder's land through the management of vehicle speeds.
<i>Northern Territory</i>		
Waste	Similar to the QLD EP Act, the Act imposes a	The general duty to protect the environment





Legislation	Description	Relevance
Management and Pollution Control Act	general environmental duty on all persons to refrain from carrying out any activity that causes or has the potential to cause environmental harm. A duty to notify is also required by the Act.	and to notify the authorities in the event of environmental harm applies to all staff and contractors.

In addition to the Waste Management and Pollution Control Act, the NT EPA has issued a document 'Noise guidelines for development sites in the Northern Territory' (May 2014) which provides construction noise criteria and guidelines for the assessment of noise.

The QLD Environmental Protection Act provides the following legislation in relation to construction works:

'440R Building work

(1) A person must not carry out building work in a way that makes an audible noise -

(a) on a business day or Saturday, before 6.30 am or after 6.30 pm; or

(b) on any other day, at any time.'

In the NT, a Noise Management Plan must be developed and registered with the NT EPA if construction occurs outside the following hours:

- Outside the times 7am to 7pm Monday to Saturday; or
- Outside the times 9am to 6pm on a Sunday or public holiday; or
- Is likely to exceed the construction noise levels defined in these guidelines; AND
- The construction work is proposed, or taking place on, land within or directly adjacent to land zoned Commercial or Residential,

The above requirement are reflective of the fact that noisy activity being perceived as an environmental nuisance is dependent on the operating time of the activity.

3.2 Operational Noise

The Queensland Department of Environment and Heritage Protection (EHP) provides guidelines for establishing noise criteria for petroleum pipeline activities in the documents 'Prescribing noise conditions for petroleum activities' (15 March 2013) and 'Streamlined model conditions for petroleum activities' (2014). The documents specify noise emission limits that are considered to meet the intent of the Queensland Environmental Protection (Noise) Policy 2008, which is to protect and enhance the acoustic environment within Queensland. No operational noise criteria is specified by the NT EPA in any of the relevant environmental acts or guidelines. Therefore, the QLD noise criteria has been applied across the whole of the project area.



Table 3.2 presents the the EHP streamlined noise conditions relevant for the project.

Table 3.2 - Noise Emission Limits for Petroleum Activities (dB(A))

Period	Parameter	Short-Term Criteria	Medium-Term Criteria	Long-Term Criteria
Day 7 am – 6 pm	$L_{Aeq,adj,15-min}$	BG + 10	BG + 8	BG + 5
Evening 6 pm – 10 pm	$L_{Aeq,adj,15-min}$	BG + 10	BG + 8	BG + 5
Night 10 pm – 6 am	$L_{Aeq,adj,15-min}$ $Max L_{pA,15mins}$	BG + 3 55	BG + 3 55	BG + 3
Dawn 6 am - 7 am	$L_{Aeq,adj,15-min}$	BG + 10	BG + 8	BG + 5

The EHP provides the following definitions in relation to the categories of short-term, medium-term and long-term:

- 'A short term noise event is a noise exposure, when perceived at a receptor premise, which persists for an aggregate period not greater than eight hours and does not re-occur for a period of at least seven days. Recurrence is deemed to apply where a noise of comparable level is observed at the same receptor location for a period of one hour or more, even if it originates from a different source or source location.
- A medium term noise event is a noise exposure, when perceived at a receptor premise, which persists for an aggregate period not greater than five days and does not re-occur for a period of at least four weeks. Recurrence is deemed to apply where a noise of comparable level is observed at the same receptor location for a period of one hour or more, even if it originates from a different source or source location.
- A long term noise event is a noise exposure, when perceived at a receptor premise, which persists for a period of greater than five days, even when there are respite periods when the noise is inaudible within those five days.'

The long term criteria is applicable to the day-to-day operation of the EOL facility, which are expected to operate continuously. Table 3.3 presents the adopted criteria for residential receptors nearest to the EOL facility (Mt Isa area only). The noise criteria is derived from background noise monitoring undertaken in April 2016 and presented in the Noise Assessment Report for the NGP project.





Table 3.3 - Adopted Operational Noise Criteria for EOL facility

Nearest Sensitive Residential Receptors	Adopted Background Level (Day/Evening/Night) ^a dB(A)	L _{Aeq} Noise Criteria dB(A)	
		Day/Evening/Dawn	Night
Powerhouse Road Houses, Mt Isa (1.2 km)	34	39	37
Other Mt Isa Houses	29	34	32

^a Measured background levels (i.e. Rating Background Levels) were noted to be lowest during the day time for monitoring positions representative of the above sensitive receptors (MP7 for Powerhouse Road houses and MP4 to MP6 for other Mt Isa houses). Therefore, the day time RBL has been adopted for the evening and night period also.

In addition to the above criteria, it is also necessary to assess the potential for low frequency noise impacts from the operation of the EOL facility. The EHP model conditions for petroleum activities identify the following criteria for low frequency:

- 60 dB(C) measured outside the sensitive receptor; and
- the difference between the external A-weighted and C-weighted noise levels is no greater than 20 dB; or
- 50 dB(Z) measured inside the sensitive receptor; and
- the difference between the internal A-weighted and Z-weighted (Max L_{pZ}, 15 min) noise levels is no greater than 15 dB.

As internal noise levels cannot be accurately determined only the external low frequency noise goals have been referred to in this assessment. Prediction of internal noise levels requires availability of building construction details for the properties of interest, and this information is not available for the receptor groups considered in the assessment.

As discussed earlier, the nearest residential receptors to the SOL facility are at least 28 km away. Noise impacts would not be expected at such a large distance. Nevertheless, best practice management measures are still recommended for operation of the SOL facility and these are outlined in Section 5.

3.3 Construction Phase

3.3.1 Noise Criteria

The NT EPA specifies construction noise criteria in the Noise Guidelines for Development Sites in the Northern Territory (May 2014). The guideline specifies the following noise criteria for residential use areas:

$$L_{Aeq} = \text{Background Noise Level} + 5 \text{ dB}$$





It is noted that the only sensitive residential receptors likely to be impacted by construction in the Northern Territory include Outstation 975 (3.4 km from pipeline) and the pastoral homestead (3.5 km from pipeline).

For sensitive residential receptors in Queensland (located around the Mt Isa area), a background plus 5 dB criteria has also been adopted. The streamlined noise conditions for petroleum activities do not specifically address construction activity however, it is noted that a Background + 5 dB criteria is consistent with the long-term criteria.

Table 3.4 presents the adopted noise criteria at residential receptors nearest to proposed construction activity. The noise criteria is derived from background noise monitoring undertaken in April 2016 and presented in the Noise Assessment Report for the NGP project.

Table 3.4 - Adopted Construction Noise Criteria

Nearest Sensitive Residential Receptors to Construction	Adopted Background Level (Day/Evening/Night) ^a dB(A)	L _{Aeq} Day/Evening/Night Criteria dB(A)
Outstation 975 (3.4 km)	25	30
Pastoral Homestead (3.5 km)	27	32
Powerhouse Road Houses, Mt Isa (1.2 km)	34	39
Other Mt Isa Houses	29	34

^a Measured background levels (i.e. Rating Background Levels) were noted to be lowest during the day time for monitoring positions representative of the above sensitive receptors (MP7 for Powerhouse Road houses and MP4 to MP6 for other Mt Isa houses). Therefore, the day time RBL has been adopted for the evening and night period also.

3.3.2 Vibration Criteria

Guidelines and standards that can be referred to for assessing vibration impacts include the following:

- Environmental Noise Management – Assessing Vibration: A Technical Guide (2006), published by the NSW EPA;
- BS 7385-2: 1993 - Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration.

The NSW technical guide provides vibration criteria associated with human annoyance for the three categories of vibration:

- Continuous vibration (e.g. road traffic, continuous construction activity);
- Impulsive vibration includes less than 3 distinct vibration events in an assessment period (e.g. occasional dropping of heavy equipment); and



- Intermittent vibration includes interrupted periods of continuous vibration (e.g. drilling), repeated periods of impulsive vibration (e.g. pile driving) or continuous vibration that varies significantly in amplitude.

Table 3.5 and 3.6 presents the criteria for continuous/impulsive vibration and intermittent vibration, respectively.

Table 3.5: Continuous/Impulsive Vibration Criteria – Peak velocity (mm/s)

Location	Assessment Period	Preferred Limit (mm/s)	Maximum Limit (mm/s)
<i>Continuous Vibration</i>			
Critical areas	Day/night-time	0.14	0.28
Residences	Day-time	0.28	0.56
	Night-time	0.20	0.40
Offices, schools, educational institutions and places of worship	Day/night-time	0.56	1.1
Workshops	Day/night-time	1.1	2.2
<i>Impulsive Vibration</i>			
Critical areas	Day/night-time	0.14	0.28
Residences	Day-time	8.6	17
	Night-time	2.8	5.6
Offices, schools, educational institutions and places of worship	Day/night-time	18	36
Workshops	Day/night-time	18	36

Table 3.6: Intermittent vibration criteria (m/s^{1.75})

Location	Assessment Period	Preferred Value	Maximum Value
Critical areas	Day/night-time	0.10	0.20
Residences	Day-time	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	Day/night-time	0.40	0.80
Workshops	Day/night-time	0.80	1.60

The above criteria is suitable for assessing human annoyance in response to vibration levels. In order to assess potential damage to buildings, reference has been made to British Standard *BS 7385-2*:





1993 *Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration*. Table 3.7 presents vibration criteria for assessing the potential for building damage.

Table 3.7: Transient Vibration Levels for Building Damage

Type of Building	Peak Particle Velocity (mm/s) ^a	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures - industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
Unreinforced or light framed structures – residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
^a a 50% factor should be applied to the limits for the unreinforced or light framed structure vibration limits where low rise buildings are being considered or where resonance in the vibration is created.		

3.3.3 Blasting

Due to the unique nature of blasting, noise and vibration criteria separate to typical construction activities are required. The Queensland EHP provide noise and vibration criteria for blasting in the guideline 'Noise and vibration from blasting' (23 March 2006).

The criteria are as follows:

'Noise Criteria'

Blasting activities must be carried out in such a manner that if blasting noise should propagate to a noise-sensitive place, then

- (a) the air blast overpressure must not be more than 115 dB(linear) peak for nine out of any 10 consecutive blasts initiated, regardless of the intervals between blasts; and*
- (b) the air blast overpressure must not exceed 120 dB(linear) peak for any blast.*

Vibration Criteria

Blasting operations must be carried out in such a manner that if ground vibration should propagate to a noise-sensitive place:

- (a) the ground-borne vibration must not exceed a peak particle velocity of 5 mm/s 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 10 mm/s for any blast.'*





The above criteria are applicable at 4 m from the affected sensitive receptor facade. In the absence of NT criteria, references has been made to the QLD EHP guideline.

3.4 Ecological Criteria

3.4.1 Overview

Published research is available relating to the potential for noise impacts on fauna however, there are no government policies or other guidelines specifying a noise limit in relation to fauna. This is likely to be due to the range of species that have been researched, each with its own unique response to noise. Some specific studies of animal behaviour from noise disturbance are considered below.

3.4.2 Birds and Mammals

Literature discussing the effects of noise on birds generally focuses on environments where chronic noise has caused vacation from an area over time due to the inability of some species to adequately communicate above ambient noise levels (e.g. in busy urban areas or near to large industries). Based on research, there are no government policies or other widely-accepted guidelines in respect to the noise levels which may be acceptable to wildlife. The levels or character of noise that may “startle” or otherwise affect the feeding or breeding pattern of birds or other animals are also not firmly established in the technical literature.

A literature search of DIALOG and other scientific databases was completed by Worley Parsons¹, identified a paper by the NSW Department of Agriculture and Fisheries (Poole 1982²) and a study by the Swedish University (Algers et al 1978³) on the effects of continuous noise on animals.

It was concluded that birds tend to accept and/or adapt to constant steady noise levels, even of a relatively high level in the order of 70 dB(A). Poole found that continuous exposure to higher noise levels (from 70 dB(A) to 85 dB(A) and above) may cause some degree of behavioural changes in birds, non-specific to species. Observations of behaviour patterns also indicate a higher tolerance to intermittent, moderate level noise events such as road traffic. Sudden loud or impulsive or impact noises are capable of causing birds and other wild animals to become startled, which if repeated in the longer term, may affect feeding and possibly breeding habits in some bird species. On the other hand, there are instances where such noises have been used in an attempt to drive flocks of birds (and bats) away from particular sites (airports, waste disposal sites, etc.). Due possibly to the more “domesticated” nature of these bird species, the success of such trials have been limited.

3.4.3 Bats

A study of colony bats (Jinhong Luo et al 2014⁴), identified that torpid bats will rapidly habituate to

1 201001-00367-00-EN-REP-0002, prepared by Worley Parsons resources and energy, 29-Apr-13

2 Poole G, 1982. Sound Advise Poultry Notes. NSW Department of Agriculture and Fisheries.

3 Algers B, Ekesbo I, Strombery S, 1978. Noise Measurement in Farm Animal Environments. ACTA Veterinaria Scandinavica. Suppl.68, p19

4 Jinhong Luo, B.-Markus Clarin, Ivailo M. Borissov and Björn M. Siemers, Are torpid bats immune to anthropogenic noise? The Journal of Experimental Biology (2014) 217, 1072-1078 doi:10.1242/jeb.092890





repeated and prolonged noise exposure, and generally respond most strongly to colony and vegetation noise, and only weakly to traffic noise. It may be considered that certain construction activities may simulate vegetation noise, and higher frequency noise of bats (e.g, drilling). This is further supported by another study completed to investigate the impact on foraging preference by the greater mouse-eared bats (Andrea Schaub et al 2008⁵), identified that they would avoid foraging in areas where ambient noise masked the potential identification of prey noise. The experimental data suggest that foraging areas very close to highways and presumably also to other sources of intense, broadband noise (12 dB above ambient levels) are degraded in their suitability as foraging areas for such 'passive listening' bats, and would therefore be deterred from utilising such areas.

3.4.4 Summary of Criteria

Overall, the available body of research indicates that potential impacts primarily relate to short-term noise events which can result in flight and alert responses in animals. For the proposed pipeline, the following short-term noise events could result in temporary startle responses, however these events are not expected to result in long term impacts with the fauna likely to return upon cessation of the noisy activity:

- construction activity including blasting; and
- gas venting at facilities and MLVs.

The potential for noise impacts on fauna is expected to be minimal given that the above activities occur infrequently and for short durations. For construction of the mainline, construction would progress at up to 5 km a day therefore, any fauna in proximity to construction would be affected for very short periods of time only. The potential noise impacts on fauna from gas venting would also be limited, as this activity is expected for short periods and will occur infrequently (i.e. during commissioning, testing every 6 months for 15-minute periods and in emergency situations).

In view of the above information, long term noise is considered the main potential risk for fauna. Levels that are 12 dB(A) above existing L_{Aeq} levels and above a specific threshold level of L_{Aeq} of 65 dB(A) have been considered as screening tools for ecological noise impacts.

5 Andrea Schaub, Joachim Ostwald and Björn M. Siemers, 2008, Foraging bats avoid noise, The Journal of Experimental Biology 211, 3174-3180





4 Noise Risk Assessment

4.1 Summary of Noise Emission Sources

Based on a review of the pipeline project, Table 4.1 presents a summary of the potential noise emissions during the construction and operational phase.

Table 4.1 - Summary of Potential Noise Emissions

Noise Emission Source	Operating Details
<i>Construction Phase</i>	
Vegetation clearing	Preparation of ROW to provide unobstructed path for pipeline through removal of trees, boulders, debris, etc.
RoW and site road preparation	Ground is levelled to provide a level working surface for construction equipment.
Rock exposure and drilling	Blasting is required on an as needs basis depending on the type of rock material that needs to be removed to form a trench.
Ditching	Digging of trench using excavators and trenchers.
Pipe Stringing	Distribution of pipeline sections along route.
Bending	Bending of pipeline using a bending machine to conform pipeline to variations in the proposed route and topography.
Welding	Welding of pipe sections using welding rigs.
Alignment and Lowering	Preparing sections of pipe and lowering of pipeline into trench and undertaking any repairs.
Padding and Backfill	Further use of padding machine to fill trench directly around pipeline and backfilling to fill trench to grade.
Tie-In	Tie-in installation for future pipe work.
Clean-Up	Restoration of ROW (ie. Replacing top soil, removing construction debris, re-planting).
Cathodic Protection	Installation of cathodic protection to installed sections.
Hydrotesting	Testing the quality and performance of the pipeline by filling the pipeline with water and pressurising it.



Noise Emission Source	Operating Details
Road Maintenance	Maintenance and upkeep on access and roads utilised during construction.
Pipe Transport	Delivery of pipes to installation areas.
Above Ground infrastructure (e.g. mainline valves)	Construction of above ground infrastructure elements.
Camp Preparation	Site preparation and temporary generators, delivery of materials.
General Services	Service materials and equipment provided to all areas of the project.
Compressor Station	Equipment and temporary generators utilised in establishing the compressor station sites at the SOL and EOL.
<u>Operational Phase</u>	
SOL Facility - Gas Engine Alternators (3) and Compressor Turbines (4)	The facility will operate continuously however, only 2 compressor turbines and 2 GEAs will operate under normal conditions. During weekly compressor or GEA changeovers, all equipment would operate simultaneously for 5 hours.
EOL Facility - Gas Engine Alternators (1) and Compressor Turbines (2)	The facility will operate continuously however, only 1 compressor turbines will operate under normal conditions. Under elevated operation either 1 x GEA and a compressor, or 2 x compressor would operate simultaneously.
SOL Flare	Operation during commissioning, testing and emergencies only.
Gas Vents (SOL, EOL and MLV sites)	Operation during commissioning, testing and emergencies only.

4.2 Predicted Noise Impacts

4.2.1 Introduction

The potential risks associated with the project noise emission sources has been undertaken through a qualitative and quantitative analysis. The quantitative analysis has been completed using computational noise modelling. The methodology and results of the modelling are outlined in the



Noise Assessment Report for the project⁶. Based on the results of the modelling, the review of compliance with the relevant criteria are outlined in the following sections.

4.2.2 Construction

The modelling results for construction activities are summarised as follows:

- Mainline Construction
 - A number of construction activities are predicted to result in exceedance of the adopted noise criteria at this location, generally those activities occurring within 2.5 km of the residence.
 - Some impact on Powerhouse Road (Mt Isa) residences during ditching, padding and backfilling, hydrotesting and pipe transport.
- MLV Constructions
 - Significant level of compliance for all sensitive receivers.
- Main Mine Camp facilities
 - No predicted impacts on sensitive receivers as camp facilities are located at significant distances from sensitive receptors.
- SOL and EOL facilities
 - Some minor exposure to the Powerhouse Road (Mt Isa) residences from the EOL facility during venting.
- Construction Traffic
 - Given the isolated nature of the majority of the pipeline route, and the use of construction camps along the ROW, increase in traffic from construction activities is unlikely to result in a significant increase in noise levels at sensitive receptors.
- Blasting
 - Acceptable levels of noise from blasting activities are predicted beyond 400 m, with no residential sensitive receivers predicted within this distance.

The potential for noise impacts on fauna is expected to be minimal given that the construction activities occur infrequently and for short durations. Construction of the mainline will be sequential, therefore any fauna in proximity to construction would be affected for very short periods of time only with the 65 dB(A) screening criteria only exceeded within 200 m of the construction activities.

For longer term noise (days/weeks), which may impact on permanent nesting, roosting or colony area noise levels, potential for disturbance from noise is predicted up to 1 km from the activities. Longer term noise is expected to occur where generators and other plant will run for extended periods of time, e.g.:

- mainline valve construction,

⁶ Noise Assessment – Northern Gas Pipeline, May 2016 prepared by Air Noise Environment for Jemena Limited





- temporary camps, and
- main camp sites.

Table 5.2 of the Noise Assessment (Ref: 399-RP-EV-011) presents the predicted noise levels for each activity at given separation distances. Fauna areas falling within the separation distances from proposed activities predicted to exceed 65 dB(A) and 42 dB(A) for short and long term construction activities respectively have the potential to be impacted.

An assessment of the degree of impact to specific or significant habitat areas, and/or identified threatened species, is being considered by ecologists.

4.2.3 Operation

Based on the modelling of operational facilities and separation distances to nearest sensitive receivers, the following mitigation has been recommended for the pipeline operations:

- EOL Facility venting – provision of silencer or alternative nozzle to achieve a sound power level of 130 dB(A) or less;

In relation to venting, this activity would only occur during testing every 6 months for a 15-minute period. It is important to recognise that the typical frequency of gas venting is much less than that defined by the medium-term and short-term noise criteria specified by the EHP's model conditions for petroleum activities. Nevertheless, given the proximity to a larger population of affected sensitive receivers in the Mt Isa area, consideration of mitigation of noise from gas venting at the EOL facility is recommended.

During gas venting and flaring at the facilities, there is the potential for fauna within 1 km to be startled by the onset of noise, however provided the events are of short duration and infrequent, it is unlikely to result in displacement of fauna.

For permanent nesting, roosting or colony areas (e.g. bats) noise levels which may result in disturbance could occur up to 1 km, and should be reviewed where continuous noise is proposed for extended periods (days/weeks) near known or potentially significant habitat areas.

4.3 Potential Vibration Impacts

Potential vibration impacts would usually be limited to the construction hours (Section 3.3), and Monday to Saturday. Night-time works could occur during during hydrotesting, or as required for special considerations.

Due to the significant separation to nearest sensitive receivers (1 km), the potential for vibration impacts from operation of typical heavy machinery such as excavators, dozers and graders is likely to be limited to the nearest infrastructure element (underground pipeline, rail line or road). It is unlikely that structural damage would occur at distances greater than 30 m for typical construction activities proposed.





Based on modelling predictions⁷ for anticipated plant and equipment, mitigation measures and management procedures for vibration are not identified as necessary unless:

- construction activities occur within 150 m of a sensitive receiver,
- construction activities occur within 20 m of any heritage structures or other significant cultural assets (40 m for piling activities),
- blasting activities occur within 400 m of sensitive fauna sites.

It is recommended that monitoring of vibration impacts on the structure of any heritage building be undertaken throughout nearby construction works falling within the distances identified above (20 – 40 m).

Sensitive fauna could be affected by vibration and overpressure in proximity to the blasting however, the duration of days requiring blasting in a particular area would be limited. A ground-based survey is recommended to specifically identify sensitive fauna within 400 m of blasting. Alternatives to blasting should be adopted where possible if there is a significant habitat within 400 m of the alignment.

The need for blasting is subject to a review of the geological material along the route hence blasting may only be necessary in isolated locations. The impacts of blasting is dependent on a number of factors including the amount of charge and method of blasting (confined and unconfined).

4.4 Risk Assessment

Table 4.2 presents a risk assessment matrix based on the analysis undertaken. The matrix summarises the potential risks according to the likelihood of an event occurring and the subsequent consequence utilising the definitions in Table 4.3.

During construction, the risks associated with project noise emissions sources are expected to be Low, with the majority of activities being Unlikely and having a Minor consequence. This risk rating is partly due to the large separation distances of the proposed pipeline from sensitive receptors.

Computational noise modelling completed for all proposed construction scenarios indicate some degree of impacts on Mt Isa and homestead to the south-west.

The use of good management and restriction of construction to daytime periods where possible is expected to further reduce the potential construction noise impacts (likelihood of impacts corresponding to Rare). The most significant potential for impacts is that of 24/7 generators at temporary camp-sites. Impacts may occur if the generators are to located within 2 km of a sensitive receiver or 1 km of a sensitive fauna area. It is noted that the currently proposed alignment does not result in sensitive receivers within 2 km of temporary camp sites. Where sensitive areas are identified within 2 km, it is recommended that low noise emission generators are selected and, where necessary, additional shielding may need to be provided. It is noted the construction is expected to progress quickly, and impacts on any sensitive areas will be limited in duration.

⁷ Noise Assessment – Northern Gas Pipeline, May 2016 prepared by Air Noise Environment for Jemena Limited





Potential impacts from drill and blast have the potential to cause injury or displacement of threatened or endangered (and non-threatened) fauna, and careful consideration of fauna in areas surrounding these activities should be addressed prior to commencement. During operations, assuming the EOL facilities equipment is selected to achieve predicted compliance with the assessment criteria, the likelihood of impacts has been classed as Low.

During gas venting at the EOL facility, it is likely that occupants of sensitive areas will identify the noise source, however provided the venting is minimised in frequency (maintenance/testing), and restricted to daytime periods where possible, minimal impacts are predicted. In relation to emergency venting, the general population is typically more tolerant of noise in emergency situations. Nevertheless, design advice has been provided to achieve predicted compliance given an emergency vent situation from the EOL facility. Selection of appropriate flow rate and nozzle diameter, or additional silencer can aid in achieving minimal impacts on sensitive areas.

For the SOL facility there are no sensitive receivers noted within 28 km, other than potential fauna areas. As the potential for risks is Low, the need for further reduction of noise emissions is not likely to be necessary. If additional reduction of 24/7 noise is considered appropriate, it may be achieved via consideration of best practice mufflers, enclosures, baffles, and product selection to minimise the sphere of influence of noise emissions to potential future sensitive areas, and surrounding fauna

Short duration noise activities (flaring, gas venting) are predicted to have minimal impact due to the limited duration and sporadic nature of these activities, however, it is recommended that best practice measures to minimise the sphere of influence from noise emissions, as for the EOL facility, are adopted where reasonable and feasible.

For the Mainline Valve (MLV) stations 1 - 3, similar to the SOL facility, there are no sensitive receiver areas within the predicted sphere of influence. It is recommended that noise emissions are reduced where reasonable and feasible to do so, with due consideration for sensitive fauna areas surrounding each site.





Table 4.2 - Noise and Vibration Risk Assessment Matrix

Project activity	Impacts	Likelihood	Consequence	Risk (No Mitigation)	Proposed Mitigation/Management Measures	Likelihood	Consequence	Residual risk (After mitigation)
Construction								
General Construction	Noise impacts in areas where previously no activity existed (nuisance and/or health impacts)	2	2	Low	All predicted potentially affected residences or sensitive land uses informed via letter drop of construction activities, working hours, level and duration to be expected. Provide avenues for complaints or feedback, to allow investigation and optimisation of specific activities where possible. Inform residents of significant changes to activities, timeframes, or where out of hours work is required.	1	2	Low
General Construction	Noise impacts to fauna (mammals, birds, aquaculture) where previously no activity existed. Impacts to fauna behaviour and/or colonies, threatened or endangered species	2	2	Low	Utilising sphere of influence from modelling data, identify any significant potentially affected fauna areas. Consider best option to mitigate construction activities, relocate fauna, alternative construction methods etc. Seek Ecologists advice on impacts to specific species or areas.	1	2	Low
Earthworks (clearing, excavation, backfilling)	Noise impacts in areas where previously no activity existed (nuisance and/or health impacts)	2	2	Low	Inform residents, perform earthworks during preferred construction hours whenever possible.	1	2	Low
Drilling and Blasting	Intense and sudden noise or vibration impacts (nuisance and/or health impacts)	2	3	Moderate	Inform residents, perform blasting and drilling during periods of highest ambient noise or minimum intrusion (ie. middle of the day) when undertaken near residences. Temporary relocate residents within 400 m of	1	2	Low



Project activity	Impacts	Likelihood	Consequence	Risk (No Mitigation)	Proposed Mitigation/Management Measures	Likelihood	Consequence	Residual risk (After mitigation)
					blasting locations.			
Drilling and Blasting	High intensity noise impacts or blast overpressure on fauna (mammals, birds, aquaculture) Impacts to fauna behaviour and/or colonies, threatened or endangered species	3	3	Significant	Visually audit surrounding area prior to commencing activities each day, and prior to blast sequences. Where sensitive fauna discovered with 400 m of a blasting site, see Ecologist advice on potential harm to specific species and consider relocation, or alternative blasting methods (e.g. smaller charges).	2	2	Low
Operation of mobile equipment and vehicles	Higher frequency, or additional traffic, noise impacts in areas where previously minimal activity existed (nuisance and/or health impacts)	2	2	Low	Inform residents where feasible, perform transportation through isolated areas during preferred construction hours whenever possible, minimise reversing and high rev operation as far as practicable.	1	2	Low
All other construction activities (other than earth work-related stages)	Continuous noise impacts, potentially encroaching on normal activities (including sleep) in areas where previously minimal noisy activity existed (nuisance and/or health impacts)	1	2	Low	Inform residents directly affected. Position and locate large and constantly operating items of plant so exhaust/intake (loudest side) are oriented away from sensitive areas.	1	2	Low
Use of large scale temporary generators	Continuous elevated low frequency noise 24/7 (nuisance and/or health impacts)	1	3	Low	Regular maintenance and use of suitable mufflers, enclosures, and shielding for the proposed location, when operated within 400 m of sensitive receivers (including fauna)	1	2	Low
Operations								
SOL Facility	Continuous elevated low frequency noise 24/7 (nuisance and/or health impacts)	4	3	High	Regular maintenance and use of suitable mufflers, enclosures, and shielding for the	1	2	Low



Project activity	Impacts	Likelihood	Consequence	Risk (No Mitigation)	Proposed Mitigation/Management Measures	Likelihood	Consequence	Residual risk (After mitigation)
	impacts)				proposed location. No sensitive receivers located nearby.			
EOL Facility	Continuous elevated low frequency noise 24/7 (nuisance and/or health impacts)	4	3	High	Regular maintenance and use of suitable mufflers, enclosures, and shielding for the proposed location. Design and construct to achieve predicted compliance at most affected sensitive areas (including mufflers, silencers, enclosures as necessary)	2	3	Moderate
Gas Flaring (SOL Facility)	High volume noise potentially occurring any time (nuisance and/or health impacts)	2	2	Low	Where possible operate during daytime periods, and minimise length of time flaring occurs.	1	2	Low
Gas Venting	High volume noise potentially occurring any time (nuisance and/or health impacts)	3	2	Moderate	Review the design to include suitable flow rate and nozzle diameter, or additional silencer to facilitate sleep in surrounding sensitive areas should emergency venting occur. Restrict maintenance/testing venting exercises to daytime periods.	1	2	Low



Table 4.3 - Risk Assessment Matrix Definitions

Jemena Risk Matrix		Ref : Group Risk Management Manual JAA MA 0050 Rev 5					
CONSEQUENCES			Minor - 1	Serious - 2	Severe - 3	Major - 4	Catastrophic - 5
	Health & Safety		Minimal impact on health & safety (SGSPAA personnel or member(s) of the public).	Medical treatment injury or lost time injury (SGSPAA personnel) On-site first aid to a small number of member(s) of the public, lost time.	Single permanent partial disability (SGSPAA personnel) Medical aid required for member(s) of the public.	Single total permanent disability affecting SGSPAA personnel (i.e. unable to return to preinjury role or any other role as a result of injuries) Multiple hospitalisations, permanent disability, member(s) of the public with life threatening injuries.	1 or more fatalities or total permanent disabilities (SGSPAA personnel). 1 or more fatalities of member(s) of the public.
	Environment		No effect or minor on-site effects rectified with negligible residual effect.	On-site release of pollutants with minimal impact	Some loss of or damage to third party property. Temporary harm to the environment, containment to a small area, with no environmental off site release.	Destruction of third party property, Major consequence for the environment and rectification difficult, including environmental off site release.	Significant destruction of third party property. Substantial or long term damage to flora/fauna, soil/water, including environmental off site release.
FREQUENCY	Almost Certain - 5	Event is expected to occur in most circumstances	MODERATE	HIGH	EXTREME	EXTREME	EXTREME
	Likey - 4	Event will probably occur in most circumstances	MODERATE	SIGNIFICANT	HIGH	EXTREME	EXTREME
	Possible - 3	Event should occur at some time	MODERATE	MODERATE	SIGNIFICANT	HIGH	EXTREME
	Unlikely - 2	Event could occur at some time	LOW	LOW	MODERATE	SIGNIFICANT	HIGH*
	Rare - 1	Event may occur only in exceptional circumstances	LOW	LOW	MODERATE	MODERATE	SIGNIFICANT
RISK LEVEL		RISK MANAGEMENT ACTIONS					
EXTREME		Requires immediate action - Highest priority to treat risk - Senior level monitoring.					
HIGH		Requires immediate attention – must manage with senior level monitoring. Includes RHSEC and ERM / LT oversight of Unlikely Likelihood, Catastrophic Consequence					
SIGNIFICANT		Requires Management attention with a degree of priority. Includes RHSEC / ERM / LT oversight of Rare Likelihood, Catastrophic Consequence Events. High level					
MODERATE		Requires routine to periodic monitoring.					
LOW		"Business as usual" - should not require much attention but should be reviewed at least annually. Managed by routine policies and procedures.					



5 Noise and Vibration Management and Control

Noise and vibration management procedures should be implemented for the pipeline construction and operations. A summary of procedures that will assist in managing impacts are presented below:

- Construction:
 - limit construction activity to the hours designated by the relevant legislation;
 - NT - Environmental Protection Authority (7.00 am to 7.00 pm Monday to Saturday, excluding public holidays)
 - QLD - Environmental Protection Act (6.30 am to 6.30 pm Monday to Saturday, excluding public holidays)
 - where activities are not audible at sensitive receivers, and/or complaints do not arise, construction activities outside these hours may be acceptable
 - liaise regularly with the nearby affected sensitive receivers to inform them of potentially noisy activity, giving consideration to the potential radius of impact for each construction scenario as discussed in Section 4.2.2 and when night-works are proposed, potentially affected residents should be informed within 48 hours of commencement of construction;
 - all noise generating equipment and machinery operated on site should be properly maintained. Specifically, noise reduction equipment such as mufflers must be routinely checked to confirm it is fitted and functional. Where noise reduction equipment is not operating correctly, the machine must not be used until the defect is rectified;
 - reduce operating periods for particularly noisy activities, to provide respite periods;
 - where noise from equipment is highly directional, equipment should be directed in such a way that noise is minimised at sensitive receptors;
 - shut down equipment which are not required to operated (instead of unnecessary idling for extended periods)
 - where a proposed activity or equipment is known to be vibration intensive, a risk assessment of potential impacts should be undertaken. Vibration measurements should be undertaken (with equipment located at a safe distance from receptors) to confirm that appropriate levels can be achieved at potentially affected receptors. Where limits cannot be achieved, alternative methods may be required.
- Operations:
 - implement a regular maintenance program for the GEAs and compressor turbines to confirm equipment is operating at optimum efficiency;
 - where noise from equipment is highly direction, equipment should be directed in such a





way that noise is minimised at sensitive receptors

- General:
 - where complaints are received, it is recommended that the complaints are documented and noise and/or vibration monitoring should be undertaken. Example complaint forms are provided in Appendix B,. Measures for reducing noise levels should be identified as part of the complaint response process.
 - where blasting is proposed, potential blast noise and vibration impacts should be predicted based on site specific inputs (e.g. sensitive receptor locations, amount of charge, blasting method). Where limits cannot be achieved, alternative methods may be required.
 - fauna areas should be reviewed and compared with sphere of influence identified by modelling (described in Section 4.2.3) prior to commencement of construction activities in a new area.

A site-based management procedure (presented in Appendix A) has been developed for managing noise and vibration impacts. The above mentioned procedures are also summarised in this management procedure. The structure adopted for the procedure is as follows:

Table 5.1: Site-Based Noise and Vibration Management Procedure

Item	Description
Objectives/Targets:	The goals that the management plan seeks to attain.
Performance Indicators:	Performance indicators that provide a measure for achieving the objectives and targets outlined in the management plan
Control Measures:	The control measures that will be implemented to minimise the risk of environmental impact and, if undesirable impact or an unforeseen level of impact occurs, that specify the appropriate corrective action.
Monitoring:	The monitoring requirements that will allow measurement of actual performance against objectives and targets.
Responsibilities:	The persons responsible for implementing the management plan.
Reporting and Review:	The reporting information required to meet the objectives of the management plan and the expectations of both the administering authority and the community.



6 Monitoring and Reporting

6.1 Monitoring

The responsibility for monitoring of overall compliance with this NVMP lies with the overall Site Manager.

Specific monitoring and investigation of particular issues must also take place as appropriate. A noise and/or vibration investigation should be undertaken in the event of a valid complaint or under the request of the NT EPA or QLD Department of Environment and Heritage Protection (EHP).

Noise and/or vibration monitoring will be undertaken where necessary to further investigate a valid complaint, where standard mitigation strategies have not resolved the issues that resulted in the complaint. Where monitoring is completed, Noise monitoring, where required, is to be undertaken in accordance with the Department of Environment and Heritage Protection Noise Measurement Manual (2013). As the NT EPA does not specific preferred noise monitoring procedures, the QLD guideline should be referred to.

6.2 Complaints Handling

All complaints received in relation to noise must be recorded on a complaint report form (Form B) presented in Appendix B of this report.

The form will need to be completed in full for each complaint, detailing at least the following:

1. Time, date and nature of complaint;
2. Type of communication;
3. Name and contact details of complainant;
4. Response and investigation undertaken as a result of the complaint;
5. Name of the person responsible for investigating the complaint;
6. Action taken as a result of the complaint investigation;
7. Signature of the responsible person.

The complaint records must be kept on file for a period of not less than five (5) years.

6.3 Reporting to the Regulatory Authorities

Any incident where environmental harm is caused or threatened must be reported to the relevant regulatory authority (NT EPA or QLD EHP) immediately. An incident reporting sheet is provided in Appendix B.





7 Implementation and Document Control

7.1 Implementation

As the guidance presented in the NVMP is generally fairly simple, common-sense approaches to management of the relevant issues, formal training is not considered necessary. However, all personnel, contractors and visitors must comply with the requirements of the NVMP and it is the responsibility of the Site Manager to make all relevant persons or organisations aware of their environmental responsibilities.

7.2 Updating the Management Plan

It is recommended that the Site Manager completes a review of the scope and application of the NVMP prior to the start of construction. Interim reviews should also be undertaken in response to incidents that occur or significant changes that take place at the site.

Matters that may result in the necessity for an interim review of the NVMP include the following:

- Receipt of a valid complaint that results in the need for procedural changes;
- Changes to on-site activities with a potential to change noise emissions (e.g. changes to the proposed construction methodologies, installation of new equipment); and
- At the request of the administering authority.





Appendix A – Environmental Management Procedures





SITE BASED MANAGEMENT PLAN - NOISE

Objective/Target	<p>To prevent noise nuisance as a result of construction activity at sensitive receptors in the area surrounding the pipeline.</p> <p>To comply with the requirements of the QLD and NT legislation, including the QLD, Environmental Protection Act 1994, QLD Environmental Protection (Noise) Policy 2008 and NT Waste and Pollution Control Act.</p> <p>To prevent noise nuisance as a result of construction activity at sensitive receptors in the area surrounding the pipeline.</p> <p>To comply with the vibration limits outlined in the documents: Environmental Noise Management – Assessing Vibration: A Technical Guide (2006), BS 7385-2: 1993 - Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration.</p>
Performance Indicators	<p>The objectives of this management plan are not being achieved if valid noise complaints are received by Jemena, the QLD EHP or NT EPA.</p>
Control Measures	<ul style="list-style-type: none"> ● Limit construction activity to hours designated by the relevant legislation: <ul style="list-style-type: none"> ● QLD EP Act (6.30 am to 6.30 pm Monday to Saturday, excluding public holidays); ● NT EPA (7.00 am to 7.00 pm Monday to Saturday, 9.00 am – 6 pm on a Sunday or Public Holiday); ● where activities are not audible at sensitive receivers, and/or complaints do not arise, construction activities outside these hours may be acceptable ● Liaise regularly with nearby affected sensitive receptors to inform them of potentially noisy activity, giving consideration to the potential radius of impact for each construction scenario presented in Table 4.3 and when night-works are proposed. Potentially affected residents should be informed within 48 hours of commencement of construction; ● Equipment selection and maintenance: <ul style="list-style-type: none"> ● Use broadband reversing alarm systems (“quacker” alarms) in areas close to sensitive receivers during night works; ● select lower noise equipment and machinery; ● all noise generating equipment and machinery operated on site must be properly maintained. Specifically, noise reduction equipment such as mufflers must be routinely checked to confirm it is fitted and functional. ● Where noise reduction equipment is not operating correctly, the machine must





	<p>not be used until the defect is rectified;</p> <ul style="list-style-type: none">● Equipment siting:<ul style="list-style-type: none">● locate any continuous stationary machinery such as generators furthest from sensitive receptors● use existing structures and barriers to shield receptors from noisy activity or machinery;● Operation of equipment:<ul style="list-style-type: none">● reduce operating periods for particularly noisy activities, to provide respite periods;● where noise from equipment is highly direction, equipment should be directed in such a way that noise is minimised at sensitive receptors;● shut down equipment which are not required to operated (instead of unnecessary idling for extended periods).● Deliveries must occur within the standard hours of works;● Simultaneous operation of noisy plant must be avoided wherever practicable;● Any noise construction activities must be completed in the shortest time frame possible;● There should be no dropping of materials from heights, throwing of metal items, or slamming of doors;● Where a proposed activity or equipment is known to be vibration intensive, vibration measurements should be undertaken (with equipment located at a safe distance from receptors) to confirm that appropriate levels can be achieved at potentially affected receptors. Where limits cannot be achieved, alternative methods must be adopted.● Where complaints are received, these should be properly documented using the forms provided in Appendix B and noise and/or vibration monitoring should be undertaken. Measures for reducing noise levels should be identified as part of the complaint response process.● Where blasting is proposed, potential blast noise and vibration impacts should be predicted based on site specific inputs (e.g. sensitive receptor locations, amount of charge, blasting method). Where limits cannot be achieved, alternative methods must be adopted.● Identify sensitive fauna areas, and minimise noise, vibration and blast overpressure impacts as far as practicable.
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Monitoring	<p>Noise monitoring will be undertaken where necessary to further investigate a valid complaint and where standard mitigation strategies have not resolved the issues that resulted in the complaint.</p> <p>Monitoring shall be completed in accordance with the QLD Noise Measurement Manual.</p>
Responsible Person	<p>The Site Manager is responsible for ensuring the control measures are implemented, recording of observations, complaint investigation and implementation of monitoring and corrective actions where appropriate.</p>
Reporting	<p>If an noise complaint is received, it is necessary to complete an 'Environmental Noise Complaint Report'. QLD EHP or NT EPA should be notified if the investigation confirms that noise levels in excess of the relevant criteria have occurred.</p>





Appendix B – Noise Management Forms





FORM 1 - COMPLAINTS HANDLING AND REPORTING

Part A - Initial Communication (To Be Completed by Complaint Recipient)

Date and Time of Complaint	
Name and Address of Complainant	
Phone Number	
Type of Communication (letter, phone call, visit, etc)	
Site Representative to whom complaint was made	Name: Signature:
Description of Complaint	
Reported frequency of occurrence	

Part B - Action Report (To Be Completed by Site Manager)

Action taken to deal with complaint	
Visit to the complainant	Yes or No
Findings of the visit	
Detailed inspection of site to determine possible source of complaint?	Yes or No
Result of Investigation	
Action taken to eliminate cause	





Part C - Finalisation (To Be Completed by Site Manager)

Was a formal response issued to the complainant?	Yes or No
Was the cause of complaint eliminated?	Yes or No
Other Comments	

Parts B and C Completed by:

.....
(Name) (Signature) (Date)

This form must be kept in the complaints register maintained by the Site Manager.





FORM 2 - NOISE INCIDENT RESPONSE

Part A - Description of the Noise Quality Related Incident or Event

Date and Time of Complaint	
Employee who observed or reported the incident or event	Name: Signature:
Describe in detail the nature of incident or event noting: <ul style="list-style-type: none">• The performance indicators that have been breached• The extent of environmental harm that has occurred• If no environmental harm has occurred, identify the risk or potential for environmental harm	
Did a complaint occur as a result of the incident or event? Note the date that the complaint form was completed:	Yes or No Date:
Site Representative to whom complaint was made	Name: Signature:
Assess likely frequency of occurrence if an on-going issue, or risk of recurrence if a one-off incident	

Part B - Action Report

Detail the investigations that have taken place to determine the cause of the incident or event: Note: if monitoring has taken place, attach results of monitoring to this form when completed.	
Detail the actions or steps taken to deal with the incident or event to prevent recurrence or minimise environmental impact:	
Has the administering authority been notified of	Yes or No





the incident? If so, note date, time and the name of the Officer spoken to:	Date(s)
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Part C - Finalisation

Have the actions and steps to prevent recurrence of the incident or event been documented?	Yes or No Date(s)
Was an incident or monitoring report issued to the administering authority?	Yes or No
Was cause of the incident or event eliminated? If no, detail how the risk of future environmental harm has been minimised:	Yes or No
Other Comments	

Parts B and C Completed by:

.....
(Name) (Signature) (Date)

This form must be kept in the complaints register maintained by the Site Manager. The document must be made available for inspection by the relevant authorities or interested third parties (where appropriate) upon request.

